What should Central Banks do about Real Estate Prices?*

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Abstract

Many central banks use inflation targeting as the basis for their monetary policy. The underlying notion of this approach is that there are no long term benefits in terms of reduced unemployment from having inflation. The traditional view is that monetary policy should focus on controlling consumer price inflation. Asset prices should only be considered in as much as they feed into consumer prices and short term output. However, Reinhart and Rogoff (2009) provide considerable evidence that collapses in real estate prices are the main cause of many financial crises. In this paper we consider how inflation targeting should be adapted to account for real estate prices. We develop a theory of real estate bubbles and show how these can be triggered by low interest rates. It is suggested that in small homogenous countries like Sweden interest rates can be used to prevent bubbles. In large economies this may not be desirable because bubbles tend to be regional. In all economies macroprudential policies have a role to play in preventing and pricking bubbles. However, there is an important issue of how effective they will be in practice.

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1. Introduction

Do central banks cause asset price bubbles? The crisis that started in the summer of 2007 has renewed interest in this important question. Taylor (2008), for example, has argued that loose monetary policy led to the real estate bubble that lay at the heart of the crisis in the U.S. and in other countries such as Ireland and Spain. This idea has a long history. Kindleberger (1978; p. 54) emphasizes the role of this factor in his history of bubbles: "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." Kaminsky and Reinhart (1999) and Reinhart and Rogoff (2009) provide extensive evidence that financial liberalizations and innovations lead to run ups and collapses in real estate prices that are at the heart of many financial crises. What is missing in these accounts is a theory of when and how such bubbles arise and the precise role of the central bank in causing them. The purpose of this paper is to provide such a theory.

We start in Section 2 with a discussion of the inflation targeting approach to monetary policy. The theory underlying this suggests that in the long run, monetary policy cannot affect unemployment and should therefore focus on medium term inflation. The conventional wisdom is that asset prices should only be taken account of to the extent that they affect consumer price inflation and other objectives that a central bank may have but should not be targeted directly. We argue that this approach has not performed well in terms of financial stability and needs to be revised to take into account the fact that monetary policy can trigger and enhance asset price bubbles and in particular real estate bubbles.

Section 3 contains a discussion of theories of bubbles. These can be divided into four categories. These are (i) bubbles based on infinite horizon OLG models, (ii) asymmetric

information bubbles, (iii) agency theories, and (iv) behavioral theories. It is suggested that agency theories provide the best foundation for developing a theory of monetary policy, credit and real estate bubbles.

A model of this kind based is developed in Section 4. It is argued that in normal times real estate prices are driven by consumer preferences for housing services and reflect these fundamentals. However, if interest rates are low enough and credit is plentiful enough then a threshold may be crossed, speculators may enter the market and create a bubble in real estate prices. When this bubble bursts the collapse in values can lead to a banking crisis as so often appears to happen in practice.

How can such bubbles be prevented? It is argued in Section 5 that in small countries such as Sweden and possibly the U.K. monetary policy and control of credit may have an important role to play. However, in large heterogeneous economies such as the U.S., Eurozone, and China such policies are unlikely to be effective. In such cases macroprudential policies based on controlling loan-to-value ratios, real estate transfer taxes, real estate taxes and restrictions on lending should be used to control bubbles. There is an issue of how likely they are to succeed.

Finally, Section 6 contains concluding remarks.

2. Traditional Views on Monetary Policy and Real Estate Prices

In recent years the conventional view in the macroeconomics literature has been that the best way to conduct monetary policy is for central banks to adopt inflation targeting. Giavazzi

and Mishkin (2006) give an excellent account of this.[1] Before the consensus on the desirability of inflation targeting developed, there was a widespread belief that there was a trade-off between unemployment and inflation. As the Philipps Curve illustrated, by lowering interest rates it was possible to stimulate the economy and lower unemployment but at the expense of higher inflation.

Phelps (1967) and Friedman (1968) argued instead that there was a natural rate of unemployment that the economy reverted to in the long run no matter what the rate of inflation. Lucas (1972, 1973, 1976) and Sargent and Wallace (1975) ushered in the rational expectations revolution by showing that there was no long run trade-off, only a short term one. Once it became accepted that monetary policy cannot affect the unemployment rate in the long run, the next step was to realize that monetary policy should be focused on controlling inflation. After the high inflation era of the 1970s and 1980s the inefficiencies of inflation were well appreciated and this led to the desire to lower inflation rates substantially.

Kydland and Prescott (1977), Calvo (1978), and Barro and Gordon (1983) pointed out that because there is a short term trade-off between unemployment and inflation there is a time-inconsistency problem. Governments tend to have a short term orientation because of the election cycle. As a result there is always the temptation to cut interest rates to boost the economy before an election even though there is no long run gain and in the short run there is the cost of increased inflation.

These contributions provide the intellectual foundations of inflation targeting. The practical implementation involves a number of measures. The first is establishing fiscal stability.

[1] This section draws on their account of inflation targeting.

If governments run large fiscal deficits and build up significant amounts of debt, there will be a temptation to inflate away the value of this debt. If, on the contrary, governments are fiscally responsible, price stability is feasible. This is the idea behind the Growth and Stability Pact in the 1992 Maastricht Treaty in the European Union, for example. According to this, countries in the Euro area must limit budget deficits to 3 percent of GDP and national debt to less than 60 percent of GDP.

The second necessary condition for inflation targeting to be viable is financial stability. Poor regulation and supervision of financial institutions may lead to large losses in the financial sector. This could, for example, prevent the raising of interest rates to fight inflation if the banks and other institutions were in a bad situation. Financial regulation has been mostly based on a microprudential approach. So far banks have been regulated on an individual basis. The idea was that if individual banks are limited in the risks they take, there cannot be a problem in the financial system. Unfortunately, the recurrent occurrence of systemic financial crises has shown that this approach is not correct. For financial stability to be achieved, macroprudential policies need to be designed based on systemic risks.

The third necessary measure is central bank independence to overcome the time-inconsistency problem as suggested by Rogoff (1985). By delegating the running of monetary policy to an independent central bank charged with maintaining low inflation, it is possible to prevent a boom-bust cycle. The particular mandates of central banks may differ depending on whether they are required to just fight inflation like the European Central Bank or whether in addition they are required to maintain full employment like the Federal Reserve. In either case, however, central banks should avoid using interest rate policy to accommodate political needs such as elections.

In order for inflation targeting to be implemented, a target consumer price inflation rate is chosen. This can be done by the central bank itself or by the government. The target inflation rate acts as a nominal anchor for the economy and the independent central bank has to ensure that this target is implemented. It does this by making medium term forecasts assuming that the interest rate policy remains the same. If inflation looks to be too high, the central bank will raise interest rates, while if it is set too low it will cut rates.

In practice many factors are taken into account in the process of setting interest rates particularly if the central bank has a dual mandate that is concerned with the level of economic activity as well as inflation. One of the main issues to have arisen with inflation targeting is the extent to which asset price inflation and in particular real estate prices should be taken into account in setting interest rates. It has been widely argued that central banks should only take asset prices into account to the extent they affect consumer price inflation and economic activity (see, e.g., Giavazzi and Mishkin, 2006). The idea is that asset prices are useful for providing information and may play a role in the transmission mechanism. However, they should not be targeted.

A standard tool of inflation targeting central banks is Dynamic Stochastic General Equilibrium Models (DSGE). These usually do not include a banking sector. The underlying assumption is presumably that problems in the banking sector are taken care of by regulation and systemic risk has been eliminated. To the extent there is a financial sector it consists of bond and stock markets that are important determinants of wealth. Where a more complex financial sector has been included in such models, as in Bernanke, Gertler and Gilchrist (1999), they typically involve a distortion based on a wedge in a first order condition that leads to inefficiency rather than a discontinuous event such as the bursting of a real estate bubble that causes a crisis.

The framework described above has turned out to be inadequate. Prudential regulation has been unable to maintain financial stability largely because it has not properly recognized the problem of systemic risk for banks. In practice systemic risk arises from a number of sources including common exposure to asset price bubbles, particularly real estate bubbles, liquidity provision and the mispricing of assets, multiple equilibria and panics, contagion, fiscal deficits and sovereign default, and currency mismatches in the banking system. Here we focus on real estate bubbles as the cause of systemic risk since the empirical evidence suggests this is arguably the most important source of systemic risk.

Reinhart and Rogoff (2009) provide persuasive evidence that collapses in real estate prices, either residential or commercial or both, are one of the major causes of financial crises. In many cases these collapses occur after bubbles in real estate prices that often appear to be associated with loose monetary policy and excessive availability of credit. When the bubbles burst, the financial sector and the real economy are adversely affected.

The current crisis provides a good example of this. Allen and Carletti (2009) argue that the main cause of the crisis was that there was a bubble in real estate in the U.S. but also in a number of other countries such as Spain and Ireland. When the bubble burst in the U.S., many financial institutions experienced severe problems because of the collapse in the securitized mortgage market. Problems then spread to the real economy. Figure 1 shows the movement in property prices in the U.S., Spain and Ireland. It can be seen that in all three countries house prices rose significantly and then dropped.

It can be argued that the real estate bubble in these countries was the result of loose monetary policy and global imbalances that led to excessive credit availability. Central banks, in

particular the Federal Reserve in the U.S., set very low interest rates during the period 2003-2004 to avoid a recession after the bursting of the tech bubble in 2000 and the 9/11 terrorist attacks in 2001 at a time when house prices were already rising quite fast. As argued by Taylor (2008) and illustrated in Figure 2, these levels of interest rates were much lower than in previous U.S. recessions relative to the economic indicators at the time captured by the "Taylor rule". In such an environment of low interest rates, people in the U.S. started to borrow and buy houses to benefit from their increasing prices.

As Figure 1 shows, Spain and Ireland also had very large run ups in property prices. According to Taylor (2008) and as shown in Figure 2, these countries also had loose monetary policies relative to the Taylor rule. Spain, which had one of the largest deviations from the rule, also had the biggest housing boom as measured by the change in housing investment as a share of GDP. Other countries in the Eurozone such as Germany did not have a housing boom. Their inflation rates and other economic indicators were such that for them the European Central Bank's interest rates did not correspond to a loose monetary policy.

As Allen and Gale (2000, 2003, 2004, and 2007) have argued, asset price bubbles are also caused by growth in credit. During the recent crisis, credit expanded rapidly in the countries with a loose monetary policy due to the presence of global imbalances. Several Asian countries started accumulating large amounts of reserves in the late 1990s and these grew to high levels. Figure 3 illustrates that this acquisition of reserves was primarily an Asian phenomenon. In Latin America and Central and Eastern European countries reserves did not increase significantly. There are a number of reasons behind this accumulation. Allen and Carletti (2009) argue that the Asian countries affected by the crisis of 1997 started accumulating reserves in response to the tough conditions that the International Monetary Fund imposed on them in exchange for financial

assistance. The motivations for the reserve accumulation of China, which is the largest holder, are probably more complex than this. Beside the precautionary reason, China started accumulating reserves to avoid allowing its currency to strengthen and damage its exports as well as to increase its political power. The accumulated reserves were mostly invested internationally. Much of it was invested in U.S. dollars in debt securities such as Treasuries, and Fannie and Freddie mortgage-backed securities. The large supply of debt in the U.S. helped to drive down lending standards to ensure that there was enough demand for debt from house buyers and other borrowers. However, funds did not only flow to the U.S. Spain and Ireland also ran large current account deficits as shown in Figure 4.

The burst of a real estate bubble has a clear effect on the stability of the financial sector as documented in Reinhart and Rogoff (2009). In the current crisis, for example, the sudden drop in securitized asset prices starting in the summer 2007 triggered by the fall in real estate prices and the large volatility that followed worsened the balance sheets of financial institutions significantly and froze several financial markets including the normally stable interbank market.

The financial crisis then spread to the real sector. The burst of a bubble can, however, also create direct damaging effects on the real economy. In Spain during the current crisis, for example, the bursting of the property bubble led to a doubling of unemployment in the country to around 20 percent. However, the financial sector was not much affected, at least initially, thanks to strict financial regulation and the use of some macroprudential instruments such as countercyclical loan loss ratios. The fact that the burst of a bubble can affect both the financial and the real sector significantly underlines the importance of preventing bubbles.

While most of the macroeconomic literature has argued that central banks should not target real estate and other asset prices, there are a number of papers that stress the importance of asset prices. Kiyotaki and Moore (1997) emphasize problems when asset prices collapse through collateral and other effects. Borio and Lowe (2002) and Borio, English and Filardo (2003) argue the question is not so much about pricking asset price bubbles, but whether central banks should lean against the buildup of financial imbalances which may later unwind at a much larger cost. Bordo and Jeanne (2002a, b) propose a model to investigate the optimal response of monetary policy to asset price booms when this risks leading to large collapses in lending and economic activity. They argue that taking preemptive action using monetary policy to prevent large run ups in asset prices can be desirable if significant falls in asset prices can have serious effects on real output. None of these papers model asset price bubbles and the role of interest rates in causing them.

Very few central banks have taken the approach of targeting real estate prices. An exception is Sweden's central bank, the Riksbank. Ingves (2007, pp. 433-434) explains the policy of the Riksbank is to look at property prices when making interest rate decisions. He explains the rationale for this in the following way.

> "Let me say at the outset what I and other members of the Executive Board have said on many occasions – Sveriges Riksbank does not have a target either for the level of house prices or for house price inflation, or for, or for any other asset price for that matter. However, when we observe long periods of high growth rates in asset prices and debt, growth rates that appear to be unsustainable in the long run, our view is that it is not reasonable to completely ignore that there may be risks associated with this, even though it is difficult to give consideration to these risks in any simple manner in our regular forecasting process. What this view has meant in practice is fairly marginal changes in the timing of our interest rate changes, and substantial public oral and written focus on the issue."

Ingves gives the example of February 23, 2006 when the Executive Board of the Riksbank voted to raise the interest rate by 0.25% because of house price increases.

3. Theories of Bubbles

One interpretation of the Riksbank's policy is that if there is evidence of a growing bubble in real estate central banks may want to take actions to try and cool such bubbles. In order to understand why this kind of response makes sense and what other policies should be used to combat bubbles in real estate prices and prevent financial crises it is necessary to have a theory of bubbles. What is missing from the Taylor (2008) explanation and much of the other literature on this topic is a theory of why low interest rates and credit expansion lead to real estate bubbles.

Arguably the most important reform to prevent future crises is to design policies that ensure that asset price bubbles are minimized. In order to do this we need tractable models of bubbles that can be used as a basis for policy analysis. Developing such theories has so far proved a difficult task.

Much of the early theoretical literature was concerned with showing that bubbles do not arise in standard models. Tirole (1982) argued that with a finite horizon or a finite number of agents, bubbles in which asset prices deviate from fundamentals are not consistent with rational behavior. Santos and Woodford (1997) have argued that the conditions under which bubbles arise in standard general equilibrium frameworks are very special.

Building on the overlapping generations model of Samuelson (1958), Tirole (1985) showed that bubbles could exist in infinite horizon models in which all agents are rational. A

literature based on developments of this model has developed. Recent contributions include Caballero and Krishnamurthy (2006), and Farhi and Tirole (2010). An important issue with these models is the extent to which the OLG framework is consistent with the kind of bubbles in real estate and stock markets that are documented in Kaminsky and Reinhart (1999), Reinhart and Rogoff (2009) and elsewhere where bank credit appears to play an important role and the bubbles grow very quickly before bursting.

A second branch of the bubbles literature builds on asymmetric information models where everybody rationally believes that they may be able to sell the asset at a higher price even though it is above its fundamental. Allen, Morris and Postlewaite (1993) developed a discrete-time, finite-horizon model where the absence of common knowledge led to bubbles in asset prices. However, the model is not very robust. Conlon (2004) and Dobles-Madrid (2010) develop more appealing versions of this kind of model that are more robust.

A third branch develops agency theories of bubbles. Allen and Gorton (1993) constructed a model with continuous time and a finite horizon in which an agency problem between investors and portfolio managers could produce bubbles even though all participants were rational. Allen and Gale (2000) develop a model with an agency problem in discrete time where bubbles arise as a result of an expansion in credit. Barlevy (2009) extends this kind of model to allow for more general debt contracts and dynamic considerations. Allen and Gale (2003, 2004, 2007) and Adrian and Shin (2008) explicitly focus on the relationship between lending and asset price bubbles.

The difficulty in reconciling bubbles with rational behavior resulted in many authors such as De Long, Shleifer, Summers and Waldmann (1990) developing a fourth type of asset pricing

model based on irrational behavior. Herring and Wachter (1999) provide a behavioral theory based on "disaster myopia". Recent contributions in this strand of the literature, which involve slight deviations from rationality and provide appealing models of bubbles, include Abreu and Brunnermeier (2003) and Scheinkman and Xiong (2003).

Perhaps the most promising theory of bubbles to analyze monetary policy is agency theories. Allen and Gale (2000, 2003, 2004, and 2007) show how a risk shifting problem in the banking system can lead to asset bubbles. The model is particularly applicable to real estate. Credit expansion interacts with risk shifting in two ways. By encouraging investors to fund risky investments at the current date, credit expansion has a contemporaneous effect on asset prices. However, the anticipation of future credit expansion can also increase the current price of assets and it turns out that this may have a greater effect on the likelihood of an eventual crisis. The first version of the model shows how asset prices are related to the amount of credit and how uncertainty about asset payoffs can lead to bubbles in an intermediated financial system because of risk shifting. In this version default and the resulting crisis is caused by low payoffs to risky assets. In the second version of the model, a dynamic model is developed where it is expectations about the future level of credit that are important in determining asset prices. Here default and crisis result from the actions of the central bank rather than the outcome of any exogenous uncertainty about real economic variables. The third version of the model shows how anticipated credit expansion can lead to financial fragility, in the sense that a crisis occurs unless the realized credit expansion is quite large. In other words a financial contraction is not needed to burst the bubble.

In practice the real estate market in many countries operates without bubbles for long periods of time. The Allen and Gale model does not incorporate an explanation of this but rather

focuses on how a bubble can arise. An important extension is to understand why there appear to be two regimes, one where fundamentals drive real estate prices and one where speculators enter the market and there is a bubble. The next section develops such a theory.

4. A Theory of Interest Rates, Credit, and Real Estate Prices

In normal times real estate prices are determined by the flow of housing services generated by the real estate. It is possible to rent housing each period. The rent is paid at the beginning of the period so H_1 is paid at date 1 for the period between dates 1 and 2. We assume there is a representative consumer that has a willingness to pay for S units of housing per period of H(S) where $H'(S) < 0$. When there is a fixed supply S_t of housing in period t the price paid is $H_t = H(S_t)$. The opportunity cost of capital per period of the consumers is ρ_C and they are risk neutral.

In addition to a rental market there is a market for buying houses at price P_t. The amount the consumers are willing to pay is the flow of housing services they receive or in other words, the rent they would pay. In the case where there are two dates t = 1, 2 and one period

$P_1 = H_1$.

A Two-Period Model

Next suppose there are 3 dates t = 0, 1, and 2 and two periods. The supply of housing at date 1 is random. It is low at S_1' with probability π in which case

$$P_1' = H_1' = H(S_1').$$

It is high at S_1'' with probability $1 - \pi$ in which case

$$P_1'' = H_1'' = H(S_1'').$$

Since $H'(S_t) < 0$, we have $P_1' > P_1''$ as shown in Figure 5.

At date 0 with supply S_0 we have the rental price

$$H_0 = H(S_0).$$

The price of the house at date 0 during these normal times, P_0^N, given consumers' risk neutrality and their opportunity cost of capital is ρ_C is

$$P_0^N = H_0 + \frac{\pi P_1' + (1-\pi)P_1''}{1+\rho_C}. \qquad (1)$$

At date t = -1 the price would similarly be

$$P_{-1} = H_{-1} + \frac{H_0}{1+\rho_C} + \frac{\pi P_1' + (1-\pi)P_1''}{(1+\rho_C)^2}. \qquad (2)$$

In normal times it can be seen that real estate prices are driven by the fundamentals of the expected flow of housing services.

The Role of Speculators

In bubble times it becomes worthwhile for speculators to enter the market. Speculators have wealth W. They are risk neutral and their opportunity cost is ρ_S. They earn this by

investing in alternative investments. Another possibility is to borrow and invest in real estate. Their cost of participating in the real estate market is ϕ. This represents their cost of investigating the market and so forth. If they borrow their loan to value ratio is λ so that if they buy x units of housing at price P_t then

$$\lambda P_t x + W - \phi = P_t x$$

or

$$W - \phi = (1-\lambda)P_t x.$$

At date 0 they can borrow x at r_0 and invest in real estate. Since they have limited liability, they receive

$$\text{Max } (0, H_0 x(1+\rho_S) + P_1 x - (1+r_0)\lambda P_0 x).$$

Given the random supply at date 1 and the resulting random price, there may be default. We focus on the case where there is no default when the price is high but there is when it is low so

$$H_0 x(1+\rho_S) + P_1' x > (1+r_0)\lambda P_0 x$$

and

$$H_0 x(1+\rho_S) + P_1'' x < (1+r_0)\lambda P_0 x.$$

There is thus default with probability $1 - \pi$ so that the speculators' expected profits are $\pi\left[H_0 x(1+\rho_S) + P_1' x - (1+r_0)\lambda P_0 x \right]$. Speculators will be unwilling to enter the real estate market provided

$$\pi\left[H_0 x(1+\rho_S) + P_1' x - (1+r_0)\lambda P_0^N x \right] - \phi(1+\rho_S) < W(1+\rho_S). \qquad (3)$$

The left hand side is the expected profits at date 1 less the participation cost paid at date 0. The right hand side is the amount earned by speculators in their alternative investment. In this case there will be normal times and real estate will be priced as in (1).

However, if the inequality is reversed then speculators will be willing to invest in real estate. In this case the purchase price of housing P_0 will be bid up above its fundamental P_0^N since real estate is in fixed supply in the short run until entrepreneurs no longer have an incentive to enter. This will occur when

$$\pi[H_0 x(1+\rho_S) + P_1' x - (1+r_0)\lambda P_0^B x] = (W-\phi)(1+\rho_S).$$

For a bubble we therefore need

$$P_0^B = \frac{H_0(1+\rho_S) + P_1' - (W-\phi)(1+\rho_S)/(\pi x)}{(1+r_0)\lambda} > P_0^N.$$

One special case of particular interest is where $\lambda = 1$, $W = \phi = 0$ and $\rho_S = \rho_C = r_0 = r$. Here

$$P_0^B = H_0 + \frac{P_1'}{(1+r)} > P_0^N = H_0 + \frac{\pi P_1' + (1-\pi)P_1''}{1+r},$$

since $P_1' > P_1''$. Hence in this case there is a bubble. The inequality illustrates why. For the speculators who are investing with borrowed money, what matters is the return distribution where they do not default. For the consumers, it is the whole return distribution that matters.

We have modeled speculators and consumers as different to bring out the differences between buying with your own money and investing with borrowed money. In practice, of course, consumers can be speculators.

If the supply of real estate at date 1 turns out to be high and prices are low then there will be a default at date 1 and this may cause a financial crisis if speculators make up a significant proportion of borrowers.

We have focused on the two-period case so far. If we keep lengthening the horizon the size of the bubble will grow because what is relevant for pricing with speculation is the upper part of the distribution of returns not the whole distribution as in normal times. There is a whole sequence of discounted upper parts of the distribution and so the bubble is larger as explained in Allen and Gale (2000). For example, if there is uncertainty about interest rates going forward then it will be the low interest rate that matters for pricing. What's more the greater the uncertainty, the higher the price of the asset. This is why risky assets tend to be more subject to bubbles than safer ones.

So far we have not discussed the lending decision of the bank. As discussed in Allen and Gale (2003, 2004, 2007) there are a number of ways to explain why banks are willing to rationally lend to speculators. The first is that government guarantees such as deposit insurance mean that it is the government rather than the bank that ultimately bears the downside of the speculation. Another possibility is that speculators are able to pool with other borrowers who effectively subsidize their losses. In this case in a competitive banking system it is ultimately depositors that bear the costs of speculation.

We have taken supply as fixed in the short run and with a random supply response in the long term. The randomness can be thought of as due to the uncertain supply response. In practice supply responses can be large if the bubble is long lasting and big. It is large supply responses that can be so damaging when the bubble bursts. The high unemployment in Spain and Ireland are examples of this.

5. Policies to Prevent Real Estate Bubbles

The previous sections have highlighted systemic risk arising from bubbles in real estate prices. This section discusses the policies that might be put in place to deal with this source of systemic risk. This includes the setting of interest rates and attempts to control global imbalances. In addition, we also discuss macroprudential regulatory measures that deal with systemic risk and no longer only with the risk of failure of single financial institutions. The current crisis has clearly shown that the microprudential approach to financial regulation is not sufficient to prevent systemic crises.

In order to avoid future crises it is of the utmost importance to try to be able to predict and identify real estate bubbles and prevent their emergence. In an important early paper, Borio and Lowe (2002) argue that while it is difficult to predict asset price bubbles and in particular property bubbles, it is not impossible. They provide evidence that rapid credit growth combined with large increases in real estate prices can lead to financial instability. In low inflation environments they suggest that inflationary pressures can first appear in asset prices rather than in the prices of goods and services. They argue that in such cases it may be appropriate to use monetary policy to prick asset bubbles and to preserve financial and monetary stability.

Interest Rate Policy

The setting of interest rates by central banks plays a significant role in the theory developed in the previous section as to whether the economy is in normal times or whether speculators are attracted to the real estate market. It can be seen from condition (3) that by cutting interest rates to very low levels it is possible to reverse the inequality and set off a bubble. It is this factor that central banks need to take account of when conducting monetary policy.

One factor that is important that is not incorporated in the model above is that real estate markets are not efficient. Unlike stock prices where returns follow random walks, in fact returns on housing are positively serially correlated as found by Case and Shiller (1989), Englund, Quigley and Redfearn (1998), and Glaeser and Gyourko (2007). This factor means that once a bubble is started it will make speculation more attractive and will make the bubbles longer lived. Presumably the positive serial correlation is due to the microstructure of real estate markets. Price discovery and the search process are very different in real estate markets than in stock markets.

One important issue is how bubbles should be pricked once they have started. Should central banks raise interest rates to prevent speculation? By raising rates enough it is possible to make speculation unattractive. For small homogeneous countries like Sweden this kind of policy is desirable. Thus the policy described by Ingves (2007) makes considerable sense. In medium sized economies like the U.K. it may also be a good idea to take into account real estate bubbles when setting interest rates. However, in large heterogeneous economies like the U.S., the

Eurozone, and China real estate bubbles tend to be regional. Raising interest rates to burst bubbles is then a blunt instrument and often will not be desirable because of its effects on regions without bubbles. In this case it will be necessary to use macroprudential policies to which we turn next. These policies also have an important role to play in smaller economies as interest rate increases alone may not be very effective in bursting bubbles.

Macroprudential Regulation

What exactly is meant by the term macroprudential regulation? Christensson, Spong and Wilkinson (2010) provide a nice summary. They identify three policy steps associated with macroprudential regulation and supervision:

1. Countercyclical regulatory policy
2. Control of contagion risk
3. Discretionary policies

The first involves increasing financial institutions' capital reserves when the economy is growing and financial institutions are not under stress. The second requires stronger supervision of systemically important firms, counterparty risk and financial infrastructure. The final one involves timely interventions by regulators and supervisors to deal with growing imbalances and risk exposures. In particular, it is necessary to intervene to cool down asset real estate and other asset price bubbles. It is this kind of macroprudential intervention that we will focus on in the discussion below. Countercyclical capital ratios and control of contagion risk are key policies but our focus here is in real estate bubbles and crises.

Before considering the details of discretionary macroprudential policy, an important issue is how likely it is that such interventions will actually be deployed. Christensson et al. (2010) provide some interesting insights into this question. They point out that the Financial Stability Reports (FSRs) that are currently produced by about 50 central banks involve an attempt to undertake many of the steps that will be necessary in undertaking discretionary macroprudential regulation. In particular the financial stability reports attempt to identify and track the key economic and financial risks that are likely to lead to a financial crisis. Christennson et al. (2010) consider the FSRs of the Netherlands, Norway, Spain, Sweden, and the U.K. over the period preceding and during the crisis. The authors find that these FSRs were successful in identifying many of the risks and unsustainable trends that led to the financial crisis. However, many were regarded as low probability events not worthy of action and several factors that were not important in the crisis were also identified. The authors' conclusion is that it is unrealistic to expect macroprudential regulation and supervision to reliably prevent a financial crisis. Nevertheless these kinds of intervention may be able to contribute positively to the prevention and ability to manage a crisis.

Whether or not interest rates can be used, it may often be desirable to use other forms of discretionary macroprudential regulation to prevent bubbles. It can be seen from the framework developed in Section 4 that some possible macroprudential policies to prevent dampen real estate bubbles include the following.

(i) Mandatory reductions in loan to value ratios.

(ii) Increases in taxes on real estate transfers.

(iii) Increases in annual real estate taxes.

(iv) Direct restrictions on real estate lending.

The first measure would involve limits on loan-to-value ratios that would be lowered as property prices increase at a faster pace. This can be effective for residential property but may be difficult to enforce for commercial property. The reason is that firms may be able to use pyramids of companies that effectively increase leverage. The second measure is to have property transfer taxes that are greater the higher is the rate of property price increases. The third is a shift towards higher annual real estate taxes as the bubble grows to make owning real estate less attractive. Finally, perhaps the most direct measure is to impose restrictions on real estate lending in regions where property prices are booming.

There is some evidence that as a result of its stimulus policies China is experiencing real estate bubbles in a number of major cities such as Beijing, Shanghai and Shenzhen. The government has tried a number of these macroprudential policies to cool these real estate markets. However, it seems that their success has so far been limited.

Global Imbalances

One of the important factors for bubbles to arise in the model of Section 4 is the easy availability of credit. This ensures that there will be enough funds for speculators to bid the price of the real estate to P_0^B. Although not modeled in Section 4, the easy availability of credit manifested itself in terms of high loan-to-value ratios. An important factor in this process in some countries, particularly the U.S., was financial innovation. The proliferation of subprime mortgages allowed the credit market to expand considerably.

It has been suggested that excessive credit emerged during the recent crisis because of large global imbalances and in particular the large holdings of foreign exchange reserves by Asian central banks. To prevent bubbles in the future, it is important to solve this problem. While it is individually advantageous for countries to self-insure by accumulating reserves, this is an inefficient mechanism from a global perspective. The accumulation of reserves by the Asian countries was at least partly a response to the policies that the IMF imposed on a number of countries during the Asian crisis in the late 1990s. Part of the problem was the fact that East Asian countries were not well represented in the senior staff of the IMF. It is therefore important to reform the governance structure of the IMF and of the other international organizations to ensure that the Asian countries receive equal treatment when they need financial help. This would reduce the need of these countries to accumulate reserves as a self insurance mechanism.

To reduce the large accumulation of reserves by China, other measures are necessary, however. For example, senior Chinese officials have proposed having a global currency to replace the dollar. This has the advantage that reserves can be created initially without large transfers of resources and the attendant risk of a crisis. All countries could be allocated enough reserves in the event of a crisis so that they could survive shocks. The problem is that an international institution like the IMF would need to implement the currency. There would then be again the issue of whether all countries, and in particular the Asian ones, are properly represented in the governance process of this institution.

A more likely medium term scenario is that the Chinese Rmb becomes fully convertible and joins the U.S. dollar and the euro as the third major reserve currency. With three reserve currencies there would be more scope for diversification of risks and China itself would have little need of reserves. This is perhaps one of the most practical solutions to the global

imbalances problem. The Chinese have already taken some steps in this direction. They have started to allow the settlement of trade in Rmb. They have also allowed the issue of Rmb bonds by Western companies such as McDonalds in Hong Kong. Of course, the most important aspect of being a reserve currency is full convertibility of the Rmb. That is still some way off and this is the sense in which this solution to the global imbalances problem is a medium term one.

Another important issue is whether countries should pursue policies to limit capital inflows. As has been argued already, countries like Spain and Ireland have run large current account deficits in the years preceding the crisis. These seem to have contributed to the emergence of bubbles in those countries. Going forward, it is important for countries to control their current account deficits if capital inflows are being invested in real estate and driving up prices.

5. Concluding Remarks

We have suggested that the empirical evidence in Reinhart and Rogoff (2009) and elsewhere suggests there is a strong relationship between run ups in property prices, which then collapse, and the occurrence of financial crises. Since such crises have large effects on real output and inflation this suggests that real estate prices should be taken account of when conducting monetary policy, particularly in small homogeneous countries like Sweden. The traditional approach to inflation targeting, where asset prices only play a limited role in the determination of monetary policy, needs to be adapted. The models on which policies are based should incorporate a financial sector where property price bubbles can arise and lead to a financial crisis. This paper has developed such a model and used it as the foundation for analyzing monetary and macroprudential policies.

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Figure 1

Housing Prices in Ireland, Spain and the U.S.

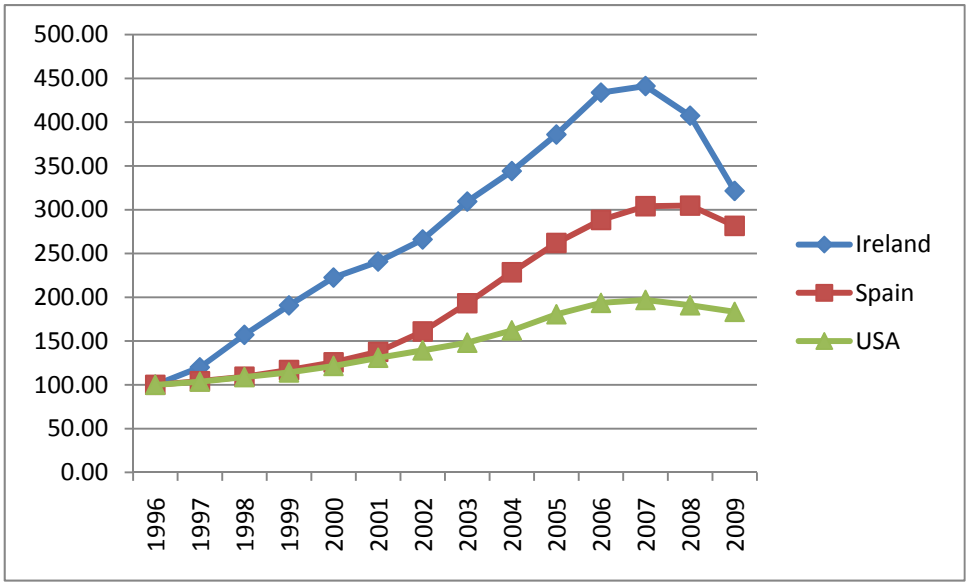


Figure 2

Deviations from the Taylor Rule in Ireland, Spain and the U.S.

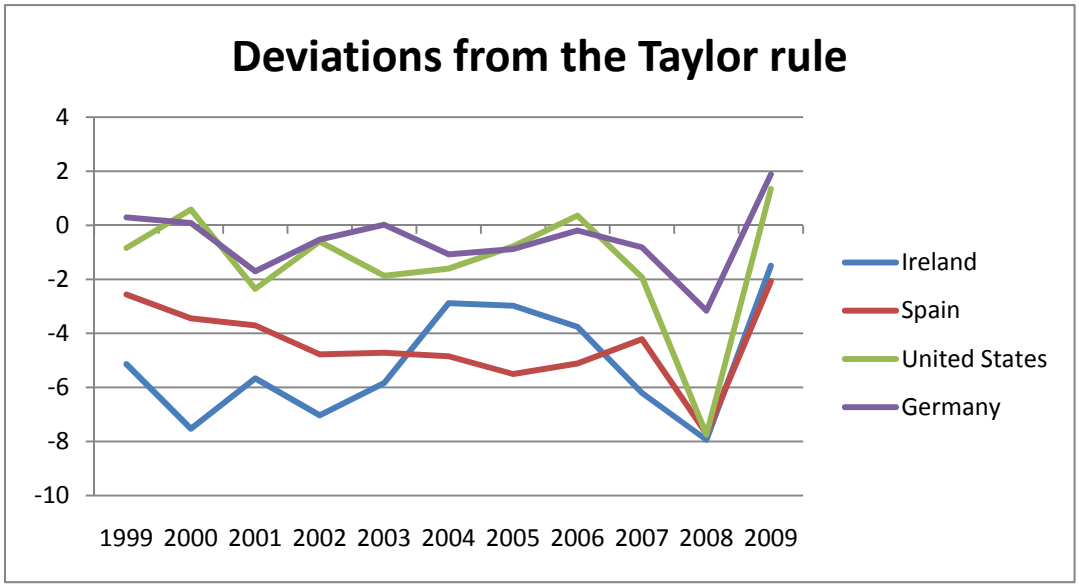
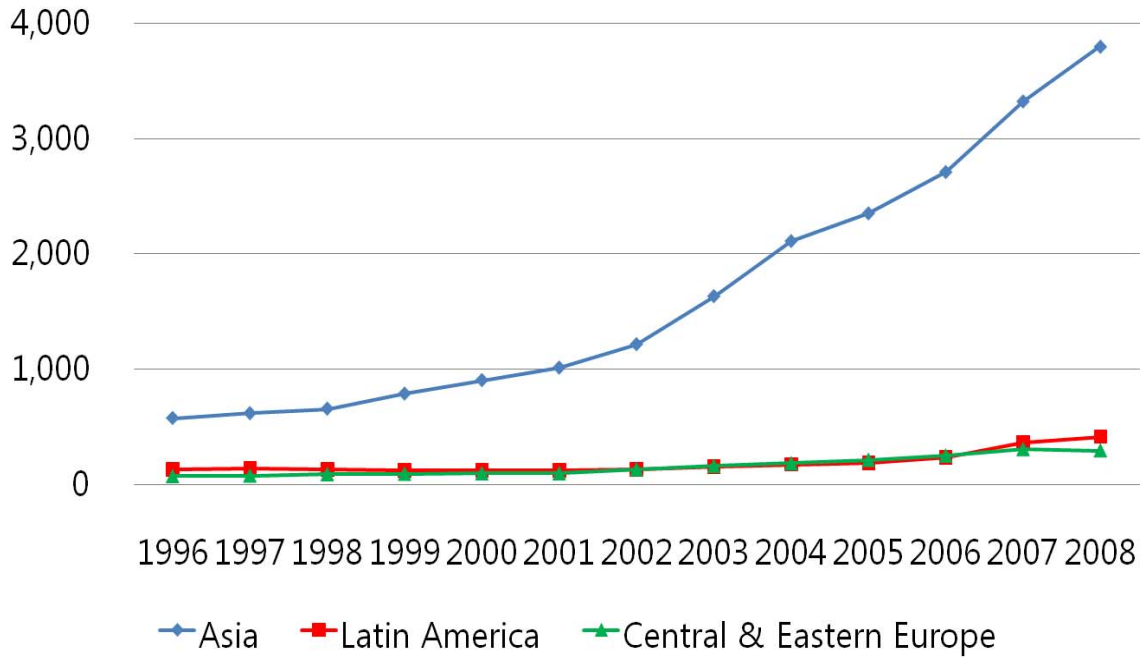


Figure 3

A Comparison of Foreign Exchange Reserves in Different Regions



Source: IMF website.

Asia is the six East Asian countries China, Hong Kong, Japan, Singapore, South Korea, Taiwan – province of China.

Figure 4

Current Account Deficits as a % of GDP in Ireland, Spain and the U.S.

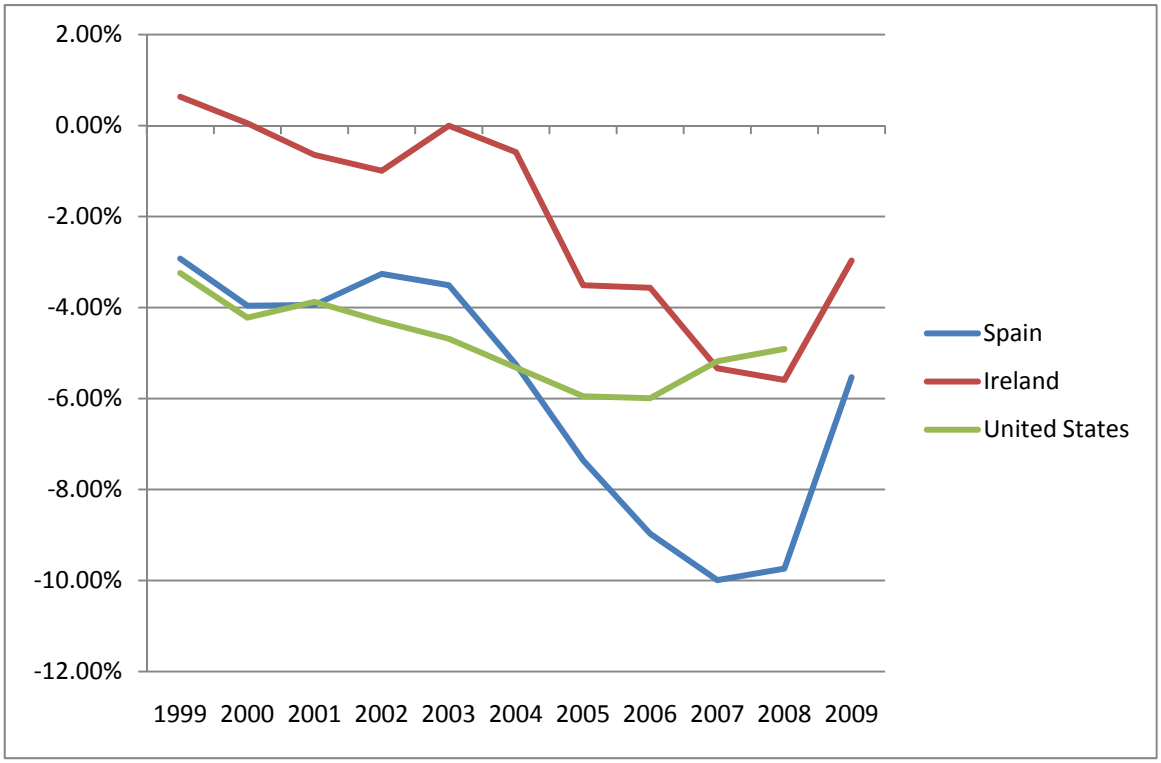


Figure 5

The demand and supply of housing services