

# **Asset Prices, Financial Stability and Monetary Policy\***

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November 2, 2010

Last Revised: February 27, 2011

## **Abstract**

The theoretical and empirical literatures on monetary policy and real estate prices are rapidly evolving. There is considerable debate about whether monetary policy should play a role in forestalling dangerous real estate bubbles that have the potential to trigger financial crises. This paper provides a selective survey of this literature. The focus is on research that incorporates financial frictions and asset price bubbles that have the potential to create the discontinuous collapses that have been witnessed periodically. The possible role of macro-prudential regulation in controlling real estate prices is also discussed. Our conclusion is that monetary policy and macro-prudential regulation both need to be used to guard against real estate bubbles.

Paper presented at November 12, 2010 Swedish Riksbank Workshop on  
Housing Markets, Monetary Policy and Financial Stability

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\* We are grateful to Frank Smets and Marie Hoerova for helpful suggestions on the literature. We also thank our discussants Luci Ellis and Jean-Charles Rochet, other participants at the November 12 Workshop, and members of RUTH-Commission of Inquiry into the Swedish Housing Market for many helpful comments. Sevinc Cukurova and Balint Horvath provided excellent research assistance.

## 1. Introduction

This paper gives a selective review of the literature on monetary policy and real estate prices, including both empirical and theoretical contributions.<sup>1</sup> The literature is rapidly evolving and there is considerable debate, particularly about whether monetary policy should play a role in forestalling dangerous real estate bubbles, even if the monetary authorities can recognize them. There is no question that too much of the academic literature on monetary policy is built on models with perfect financial markets, which essentially assume away any debt catastrophes associated with real estate crashes. The small literature that does incorporate financial frictions mainly does so in a way that creates second-order distortions, but does not yield the kind of catastrophic discontinuous collapses that have been witnessed periodically in practice.

This paper surveys recent research that attempts to incorporate financial frictions and bubbles, and to allow for a possible role for monetary policy in exacerbating leverage cycles. We discuss this literature in sections 3-6 of the paper. Section 7 discusses the view that properly tuned macro-prudential regulation policy can relieve monetary policy of any need to focus on real estate prices except as a helpful indicator in predicting near and medium-term inflation and unemployment. Our read of the literature is that it is probably dangerous to adopt any extreme position. Even if macro-prudential regulation is the first line of defense, it can be subject to political pressures that leave significant vulnerabilities if monetary policy is not vigilant. Fundamentally, because of the central banks role as lender of last resort, macro-prudential policy and monetary policy have to be inter-linked.

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<sup>1</sup> We focus particularly on real estate cycles as leverage tends to be very high in this sector and, for many consumers it is both their main asset and their main liability. Equity price bubbles can in principle present similar issues where debt finance is important. Our theoretical analysis takes both kinds of cycles into account.

In section 2 of the paper, we give an introduction to some related empirical literature, underscoring both the importance of being alert to real estate bubbles, while at the same time showing how difficult they can be to quantify in practice.

## 2. Evidence on Real Estate Prices and Financial Crises

The empirical literature on house price bubbles and monetary policy, while limited, still presents a strong case for continuing attempts by central banks to monitor major upward spikes in house prices as an important part of any approach to risk management. As Reinhart and Rogoff (2009), argue, credit-boom-fueled housing price spirals are particularly pernicious. In economies where a significant portion of consumers are credit constrained, a sharp rise in housing prices can have effects on consumption far in excess in of the usual relatively small wealth effects. At the same time, the financial liberalizations undertaken by many countries in the 1980s and 1990s have led to greatly expanded loan to value ratios in the housing market, thereby raising the financial system's vulnerability to a housing price collapse. Similar arguments can be made concerning commercial real estate.

There is, however, enormous debate surrounding how reliably central banks can identify housing price bubbles in the data. The nearly decade long global housing price boom that occurred in the run-up to the 2007 financial crisis is illustrative of the issues. In the September 2004 *World Economic Outlook*<sup>2</sup>, IMF economists identified a number of global factors that contributed to the boom, including per capita income growth, interest rates and bank credit. For 18 industrialized countries, covering the period 1971-2003, they report the regression

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<sup>2</sup> See *IMF World Economic Outlook*, September 2004, Ch. 2, "The Global House Boom", Marco Terrones (lead author).

below.<sup>3</sup>

TABLE 1: A cross country analysis of housing price growth, 1971-2003

<u>Explanatory Variables</u>	<u>Dependent Variable (Real House Price Growth)</u>
(Standard deviations in parentheses) Number of observations: 524	
Lagged real house price growth	0.521 (0.030)
Lagged house affordability ratio	-0.144 (0.021)
Real per capita disposable income growth	0.530 (0.119)
Short term interest rate	-0.507 (0.109)
Real Credit growth	0.109 (0.036)
Lagged real stock price growth	0.033 (0.009)
Population growth	1.754 (0.623)
Bank crisis	-2.426 (0.952)

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Looking at deviations from the overall cross-country regression line, the IMF researchers argue that, on average, the model is able to explain most of the increase in housing prices internationally over the sample period, 1971-2003. However, they identified four countries: Australia, Ireland, Spain and the United Kingdom, as having price increases ten to twenty percent above the level that could be explained by fundamentals. United States housing price increases, through 2003, had a deviation of a less than ten percent from the regression line

In general, a major problem in looking for housing price bubbles is that it can be hard to assess the risk of long-term structural shifts in key underlying macroeconomic parameters, For example, many analysts have pointed to the apparent trend decline in global long-term real

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<sup>3</sup> IMF WEO, September 2004, Table B2.1

interest rates as justifying a world wide increase in housing prices. This point was emphasized in the IMF's April 2008 World Economic Outlook, which indentified declining real interest rates as a major driver of global house price increases during the 2000s. Of course, not only did interest rates decline in the financial center countries, but they declined disproportionately more in periphery countries, particularly in the Eurozone, possibly in ways that were partly transitory, As has become all too painfully evident in the Eurozone periphery countries, there is always a risk that over the long run, real interest rates trends will reverse, creating problems in regions where housing purchases are heavily leveraged.

Macroeconomic volatility is another fundamental determinant of asset prices that is dangerous to extrapolate. . Using relatively standard consumption capital asset pricing models, Lettau and Ludvigson (2007)<sup>4</sup>) showed that one could rationalize a significant share of the trend rise in risky asset prices thanks to the long period of the Great Moderation, where macroeconomic volatility fell significantly. Post 2008, of course, it is far from clear how much of this trend fall in volatility is actually permanent versus temporary.

Finally, whereas the global financial crisis revealed the malign side of financial deepening, it is also the case the financial development helped make housing a more liquid asset for many consumers, particularly in countries where it is possible to add second mortgages or refinance as housing prices rise. Rising liquidity also, in principle, can contribute to a rise in housing prices.

Indeed, after the global financial crisis and the subsequent collapse of housing prices in many countries, especially the United States, many of the above rationales for higher housing

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<sup>4</sup> See Lettau and Ludvigson (2007) and related citations within.

prices seem now to ring hollow. Certainly the argument that all real asset prices should be higher because of the Great Moderation (decline in macroeconomic volatility) now seems far less convincing as macroeconomic volatility has spiked. The argument that houses are worth more because they are have become more liquid clearly rested far too much on pro-cyclical factors that have gone into reverse as housing prices have fallen. But other core rationales for high housing prices still stand. Whereas global risk premia have risen after the financial crisis, global real interest rates have remained at very low levels.g Population growth continues to drive housing prices in many countries, particularly where, due to geography and regulation, supply remains scarce. The contrast between the United Kingdom and the United States is a good case in point. Whereas housing prices in the United States have fallen over 35% in real terms (by the Case Shiller index), they fell only 15% in the UK, and have since risen back roughly 10%. In contrast to the US, where millions of new homes are built each year in normal times, zoning restrictions have kept UK residential investment relatively small.

Just as housing prices depend on a variety of complex fundamentals, leverage is also a function of fundamentals. In the UK, if home prices remain firm and real interest rates remain low, one might expect a lower pace of deleveraging than in the United States. In countries such as Canada and Sweden, where the financial system was more resilient during the crisis, leverage and house prices are rising and now stand above pre-crisis levels.

One useful way to analyze housing price trends is to look at cross country analysis, using new data bases on housing prices (e.g., such as those presented by Reinhart and Rogoff, 2009.) It is particularly helpful to take out global factors, so as to be able to focus on idiosyncratic country trends. Even so, there are limitations. The IMF 2004 paper was prescient in calling the housing bubbles in the Spain and Ireland. But in Australia, another country labeled by the IMF

report as significantly overvalued at the end of 2003, trend housing prices have continued to rise sharply. Indeed, in the Economist (October 23, 2010) index of housing prices, Australia is listed as the most overvalued housing price market in the sample based on price to rent ratios (63%). (Sweden, too, is listed as very richly valued (42%).)

It certainly appears to be the case that the transmission mechanism for monetary policy has changed over time, particularly for countries such as the United States with very deep and sophisticated mortgage markets. As Leamer (2007) notes, traditionally, residential real estate investment cycles have played a surprisingly significant role in major monetary cycles, despite the fact that on average, residential real estate (and associated industries such as home furnishings) are usually at most 5 or 6 percent of GDP in normal times. But as financial liberalization has proceeded, housing price fluctuations have become increasingly important in the transmission from housing to the real economy. As the IMF *World Economic Outlook* (April 2008) argues, the effect of monetary policy on housing prices has become increasingly important relative to the effect on housing investment. As we will later discuss, recent theoretical advances also suggest that monetary policy can exacerbate bubbles in a leverage cycle.

Despite all the uncertainties, one strong argument for taking account of housing prices in monetary policy is seen in the literature on the aftermath of financial crisis. Large and very-long lasting housing price collapses are the norm. Table 2 is taken from Reinhart and Rogoff (2009), chapter 13:

Table 2 (from Reinhart and Rogoff, 2009). Real Housing Price Cycles and Banking Crises

Country	Crisis date	Peak	Trough	Duration of downturn	Magnitude of decline (in percent)
Advanced economies: The Big 5					
Finland	1991	1989:Q2	1995:Q4	6 years	-50.4
Japan	1992	1991:Q1	Ongoing	Ongoing	-40.2
Norway	1987	1987:Q2	1993:Q1	5 years	-41.5
Spain	1977	1978	1982	4 years	-33.3
Sweden	1991	1990:Q2	1994:Q4	4 years	-31.7
Asian Crisis: The Big 6					
Hong Kong	1997	1997:Q2	2003:Q2	6 years	-58.9
Indonesia	1997	1994:Q1	1999:Q1	5 years	-49.9
Malaysia	1997	1996	1999	3 years	-19.0
Philippines	1997	1997:Q1	2004:Q3	7 years	-53.0
South Korea	1997		2001:Q2	4 years	-20.4
Thailand	1997	1995:Q3	1999:Q4	4 years	-19.9
Other emerging					
Argentina	2001	1999	2003	4 years	-25.5
Colombia	1998	1997:Q1	2003:Q2	6 years	-51.2
Historical episodes					
Norway	1898	1899	1905	6 years	-25.5
US	1929	1925	1932	7 years	-12.6

Sources: Bank of International Settlements and the individual country sources described in the Data Appendix in Reinhart and Rogoff (2009).

As the table illustrates, the average fall in housing prices after a financial crisis is very substantial (36%) whereas the duration of the fall (from peak to trough) lasts an average of five years, even excluding Japan.

The table contains only two pre-World War II housing price collapses, as long-dated time series on housing prices are scarce. However, other measures of housing market collapse indicate a similar pattern. Table 3 (taken from Reinhart and Rogoff, chapter 16) illustrates the depth and breadth of the housing price declines that occurred around the Great Depression.

Table 3. Indices of total building activity in selected countries in the Great Depression of the 1930s (from Reinhart and Rogoff, 2009, Chapter 16)

(1929 = 100)

Country	Indicator	1932
South Africa	Buildings completed (value)	100
Argentina	Permits (area)	42
Australia	Permits (value)	23
Belgium	Permits (number)	93
Canada	Permits (value)	17
Chile	Permits (area)	56
Colombia	Buildings completed (area)	84
Czechoslovakia	Buildings completed (number)	88
Finland	Buildings completed (cubic space)	38
France	Permits (number)	81
Germany	Buildings completed (rooms)	36
Hungary	Buildings completed (number)	97
Netherlands	Buildings completed (dwellings)	87
New Zealand	Buildings completed (value)	22
Sweden	Buildings completed (rooms)	119
United Kingdom	Permits (value)	91
United States	Permits (value)	18
Average		64
<i>Memorandum item:</i>		
United States	Permits (number)	
September 2005 peak = 100		100
		25 <sup>1</sup>

Source: Carmen M Reinhart and Kenneth Rogoff, *This Time is Different: Eight Centuries of Financial Folly*, Princeton University Press 2009,

<sup>1</sup> Through February 2009.

If one invokes the “Greenspan principle” that monetary policy should not try to lean against the wind in asset price bubbles, but only clean up “the mess” afterwards, then it must certainly be acknowledged that the “mess” after banking crises can be quite large.

### 3. The Traditional View on Monetary Policy and Real Estate Prices

Having provided a cursory view of the empirical literature, we now discuss the literature on the theory of monetary policy and real estate prices, also discussing further empirical work where particularly relevant.

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.<sup>5</sup> 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

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<sup>5</sup> This section draws on their account of inflation targeting.

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 tradeoff 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. Rogoff (1985) proposed, as an institutional solution to the time consistency problem, creating an independent central bank that places a significant weight on an inflation target.

These contributions provide the intellectual foundations of inflation targeting or more broadly, the establishment of an independent central bank with a conservative attitude towards inflation. As many central bank designers recognized, achieving inflation and macroeconomic stability involves a number of supporting measures, beyond establishing an independent central bank with a high weight on maintaining inflation stability. The first is establishing fiscal stability. If governments run large fiscal deficits and build up significant amounts of debt, there will be a temptation to undermine the independence of the central bank, and pressure is to inflate away the value of this debt. If, on the contrary, governments are fiscally responsible, price stability is feasible.

The second necessary condition for a stable inflation regime 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. In most countries throughout most of history, banks have been regulated largely 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 to determine the mandate of the central bank. Mandates 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 practice, the different mandates of central banks often imply greater differences in communication strategies than actual interest rate policy. In the run-up to the financial crisis, inflation targeting was a mandate that many central banks gravitated towards, albeit with widely differing interpretations encompassing a very broad range of institutions and policies. The appeal of inflation targeting as a communication device was appealing to central bankers especially because it underscores their desire for independence from fiscal policy, as well as from election cycles.

In order for inflation targeting to be implemented, in any form, 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. This used to be done assuming a constant rate but the Riksbank and a number of other central banks now project a path of policy rates going forward. 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. The policy response depends on the type of shock that has hit the economy and normally on how the policy maker weighs stabilizing inflation and output. 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. In some countries such as Sweden and Australia real estate prices are discussed and taken into account from a financial stability perspective. This is discussed further below.

A standard tool of inflation targeting central banks is Dynamic Stochastic General Equilibrium Models (DSGE). These usually do not include a banking sector, nor indeed any kind of friction in financial markets. (In the abstract world of much modern macroeconomic theory, banks are simply a device for dealing with transactions frictions and agency problems, which are simply assumed away for analytical convenience and computational tractability.) 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 a real estate bubble that causes a crisis.

#### 4. Problems with the Traditional View and New Approaches

The framework described above has turned out to be inadequate to say the least. Prudential regulation has failed 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 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 this is arguably the most important source of systemic risk.

As already mentioned above, Reinhart and Rogoff (2009) provide 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 real property prices in Ireland, Spain, Sweden and the U.S. It can be seen that in Ireland, Spain and the U.S. prices rose significantly and then dropped. It is interesting to note that prices have fallen much more in Ireland than in Spain or the U.S. This is why the Irish banking system has been so badly affected and why they have already required a bail out from the European Financial Stability Fund. In Spain prices have not fallen very far yet and this is one of the reasons their banking system has fared better than in Ireland (though the story is far from over yet). The figures for the U.S. are for the country as a whole. One of the important factors is that the real estate bubbles in the U.S. were regional in nature. They were focused in areas such as Las Vegas, Miami, and Los Angeles. Many parts of the U.S. did not suffer from very large movements. Interestingly Sweden has had a very large run up and now has real prices that are higher relative to their 1996 level than the peak that occurred in Spain.

It is wrong to say that economists missed this problem entirely. We have already discussed warnings in the IMF World Economic Outlook (September 2004) which echoed earlier warnings in the April 2003 World Economic Outlook, warnings that were repeated albeit in the run-up to the crisis. But as we will discuss below, during a bubble, there are very strong political pressures on regulators to ignore such problems, a classic symptom of the “This Time is Different” syndrome.

In fact, 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. These are problems that might have been addressed to help mitigate the crisis, had they been more broadly recognized and understood. 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 growing prices. Unlike stocks, where returns are serially uncorrelated, returns on housing are positively serially correlated as found by Case and Shiller (1989), Englund, Quigley and Redfearn (1998), and Glaeser and Gyourko (2007). If this correlation is due to economic factors such as market microstructure effects rather than measurement problems, this means that by lowering interest rates significantly below the current rate of house price appreciation, the Fed effectively created a profitable opportunity to buy property. Other public policies such as the tax deductibility of interest on mortgages contributed further to the advantages of buying property and the housing boom.

The issue of how much monetary policy contributed to the real estate and leverage bubble is controversial, with some observers pointing to the fact that central bank was largely successful in achieving its inflation mandate. One narrow answer to this point is to follow the rationale of some central banks for taking into account housing prices, namely that the central bank should have a longer horizon than just a couple years, since it is by nature extremely difficult to call the timing of financial market crashes.<sup>6</sup>

Figure 1 illustrates the run-ups in property prices in Spain and Ireland we have already discussed. According to Taylor (2008) and as shown in Figure 2, these countries also had loose

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<sup>6</sup> Reinhart and Rogoff (2011) discuss a range of models suggesting that countries vulnerability to financial crises can be assessed quantitatively but that the exact timing depends on factors such as confidence which can be extremely fragile.

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. Sweden did not deviate nearly as much as Spain and Ireland from the Taylor rule. The rise in prices there may therefore reflect changes in fundamentals rather than being a bubble.

There is considerable debate about whether the Taylor rule provides a firm indication of the "correct" level of interest rates. Furthermore, it is difficult to use monetary policy to lean against asset price bubbles in individual countries in a single currency area such as the Eurozone. Bernanke (2010) has argued that the Taylor rule is sensitive to the choice of inflation measure and to whether actual or forecasted inflation and output gaps are used. Once changes in these measures are introduced, it is no longer clear whether interest rates were unusually low given the state of the economy or whether house prices were unusually high given interest rates and the state of the economy. Bernanke (2010) concludes that Taylor's claim is not persuasive enough. He suggests that what seems to have played a crucial role in setting the stage for the crisis is financial innovation in the form of mortgage contracts and securitization. Rather than interest rates being set too low, the implications of financial innovation for monetary policy transmission were not understood by monetary policy makers. This failure together with weak financial regulation and supervision set the stage for the crisis.

However, on the other side of this debate there is a considerable amount of evidence accumulating that low interest rates increase risk taking by banks both in terms of real estate and other loans. This is the so-called risk-taking channel of monetary policy. Maddaloni and Peydró

(2010) consider the impact of low interest rates and securitization on bank lending standards and risk taking using data from the Euro area and the U.S. They find evidence that low short term (policy) interest rates result in a softening of lending standards and increase in bank risk taking. This effect is magnified when supervision standards for bank capital are weak, interest rates are held low for an extended period, and the more securitization there is in an economy. Their results are more in line with Taylor's view that loose monetary policy is an important cause of the crisis.

Jiménez, Ongena, Peydró, and Saurina (2010) consider the impact of short term interest rates on banks' risk taking. They use a unique data set from Spain on all loans since 1984 as well as all loan applications since 2002 up until the beginning of 2009 that can be matched with relevant bank and firm information. They find that loose monetary policy in terms of low short term interest rates leads banks to take greater risks when granting loans, particularly banks with lower capital. Low long term rates have much smaller effects. Ioannidou, Ongena and Peydró (2009) study data from the credit register in Bolivia and find similar results.<sup>7</sup>

As Allen and Gale (2000, 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 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

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<sup>7</sup> There is now a large literature with similar results using a variety of data sets on the importance of the risk-taking channel. See, e.g., Gambacorta (2009), Altunbas, Gambacorta and Marques-Ibanez (2010), Bekaert, Hoerova and Lo Duca (2010), and Delis and Kouretas (2010).

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 (among others such as Portugal and Greece) also ran large current account deficits as shown in Figure 4. Interestingly Sweden has not run a large deficit as the figure shows. This also suggests that price rises in Sweden might not have been driven to quite the same extent as in the United States by low interest rates and abundant credit. Nevertheless, the authorities still need to be alert to high private leverage even if Sweden overall is a net creditor to the rest of the world.

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 affected as much as one might infer, at least initially, thanks to strict financial regulation and the use of some macroprudential

instruments such as countercyclical loan loss ratios. (Whether Spain's better macro-prudential regulation will prove enough in the face of other structural weaknesses remains an open question as the European debt crisis unfolds.) 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 or the possible role of interest rates in causing them.

Very few central banks have taken the approach of targeting real estate prices. Cecchetti (2005) and Cagliarini, Kent and Stevens (2010) give the examples of Australia and Sweden. In Australia in 2003 an increase in interest rates that was partially justified to the public by developments in the housing markets led to a softening of the real estate market and a fall in nominal house prices in a number of areas of the country.

Sweden's central bank, the Riksbank, has for some time considered property prices when making interest rate decisions. Ingves (2007, pp. 433-434) 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.

The current practice of the Riksbank is well illustrated by the Executive Board minutes for their October 2010 meeting. There was an extensive discussion of the potential danger from a future drop in housing prices and the likelihood of this occurring. On the one hand, there was a considerable expansion in households' mortgage debt and housing prices might continue to rise as a result. On the other hand, marginal mortgage holders who have new loans and the highest levels of indebtedness were not perceived as particularly vulnerable as they could pass extreme stress tests. In the end there was a divergence of opinions but interest rates were increased with the fears about the housing market going forward playing some part in the decision.

## 5. Theories of Real Estate 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 macroeconomics literature on this topic is a theory of why low interest rates and credit expansion lead to real estate bubbles.

Standard neoclassical theory and the efficient markets hypothesis suggest that bubbles cannot occur. In practice, one important factor in the development of bubbles appears to be the amount of liquidity provided by the central bank as money or credit. 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.”

The sequence of events in the current crisis is, in fact, often observed. Kaminsky and Reinhart (1999) study a wide range of crises in 20 countries including 5 industrial and 15 emerging ones. A common precursor to most of the crises considered is financial liberalization and significant credit expansion. These are followed by an average rise in the price of stocks of about 40 percent per year above that occurring in normal times. The prices of real estate and other assets also increase significantly. At some point the bubble bursts and the stock and real estate markets collapse. In many cases banks and other intermediaries were overexposed to the equity and real estate markets and about a year later on average a banking crisis ensues. This is often accompanied by an exchange rate crisis as governments choose between lowering interest rates to ease the banking crisis or raising interest rates to defend the currency. Finally, a significant fall in output occurs and the recession lasts for an average of about a year and a half.

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 finite horizons 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 large 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.<sup>8</sup>

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 asset pricing models 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).

Given the evidence in Maddaloni and Peydro (2010) and the other papers mentioned above that low interest rates lead to increased risk taking, perhaps the most promising theory of bubbles to analyze monetary policy is agency theories. Allen and Gale (2000, 2003, 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.

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<sup>8</sup> See also Diamond and Rajan (2009).

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 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 there is a bubble. For example, suppose that in normal times those investing with borrowed money will receive a steady stream of income from investing in safe investments. If they invest in a risky asset to shift risk and the investment does not turn out well they will be unlikely to be able to borrow going forward. There is therefore an important issue as to whether a short run gain from taking a risk is worth it given the alternative of an ongoing safe stream of income. Only when circumstances are right will it be worthwhile to engage in the risky investment that drives the

bubble. One of the important inputs into this trade-off is likely to be interest rates that are perceived to be temporarily low. Thus by creating a very favorable environment for real estate investment it is possible to depart from normal times and set off a bubble.

Another factor that seems important in setting off real estate bubbles in the kind of model outlined is the availability of credit. This is where global imbalances and the large current account deficits of countries such as the U.S., Spain and Ireland seem to have played an important role in the setting off and continuation of the bubble.

The other important feature that needs to be incorporated in such a model is the positive serial correlation of real estate returns found by Case and Shiller (1989), Englund, Quigley and Redfearn (1998) and Glaeser and Gyourko (2007). This empirical observation is important as it shows that if real estate prices are currently rising, then it is likely this will continue. For example, Glaeser and Gyourko (2007) find that a \$1 increase in one year will on average be followed by a \$0.71 increase the following year. Thus once a real estate bubble has started it is likely that it will persist for some time. This positive serial correlation of returns is currently not well understood. One possibility is that the search nature of the market microstructure means that idiosyncratic and aggregate shocks are difficult to disentangle and this results in the correlation. Another possibility is that the data is inadequate. Much more research needs to be done on this topic.

The kind of theory of real estate bubbles sketched above can provide a justification for the type of policy outlined by Ingves (2007). By avoiding low interest rates it may be possible to prevent the start of a bubble and by maintaining interest rates at relatively high levels and restricting credit it may be possible to cool them off and prevent real estate prices going to very

high levels. This will also reduce the severity of any subsequent collapse and possible crisis that will follow. The other thing that this type of theory suggests is that discretionary macroprudential policies that make it more expensive to trade real estate may have an important role to play in preventing or dampening bubbles and subsequent financial crises. We turn to a discussion of these two kinds of policy next.

#### 6. What should be the Role of Monetary Policy in Preventing Real Estate Bubbles?

How should a central bank with a policy of flexible inflation targeting give consideration to house prices and credit growth? The current state of the literature precludes any simple answer to this question.

Many major financial crises result from the bursting of real estate bubbles. These financial crises can be very costly. As a result it is important that central banks try to predict and prevent bubbles. However, separating out bubbles from rises in prices due to changed fundamentals and determining when they are going to burst is difficult.

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.

Bubbles, in particular real estate bubbles, seem to be related to loose monetary policy and excessive credit supply. As argued in the previous section one way to prevent them is then through interest rate policy. In particular, very low interest rates at a time when property prices are static or increasing should be avoided. Once they have started increasing, an important question is whether interest rates should be raised to prick them. It may be possible and desirable to do this in economies with a high degree of homogeneity as in small countries like Sweden or possibly medium sized counties like the U.K.

The problem is more complicated in heterogeneous economies like the U.S., the Eurozone, and China. Different regions within these economies differ in terms of economic fundamentals and the rate of property price increases. Using interest rates to prick bubbles will not be so desirable because this will adversely affect the areas that do not have bubbles. The recent events in the Eurozone constitute a clear example. The interest rate policy followed by the European Central Bank was correct for countries like Germany where there was no bubble but it was inappropriate for Spain and Ireland, where it arguably contributed to the creation of the property bubbles. A tighter policy may have been effective for preventing the bubble in these countries but at the cost of a recession or at least slower growth in some of the other countries.

Even in small homogeneous countries, using interest rates to prick real estate bubbles may be difficult for political reasons. In particular when such policies are first introduced, it may be difficult to explain why it is worth causing a recession to burst a property bubble. The recent crisis and its effects on the real economy may have made such arguments much easier to make, however.

Assenmacher-Wesche and Gerlach (2008, 2010) have argued that it is extremely costly in terms of reductions in GDP to use monetary policy to deal with real estate bubbles. They use a vector autoregression methodology to study the relationships between inflation, economic activity, credit, monetary policy and property and equity prices in 17 OECD countries using quarterly data from 1986-2006. Among other things they find that to offset a 15 percent rise in residential property prices the central bank might have to depress real GDP by 5 percent. This suggests that monetary policy should not be used to prick real estate bubbles as it is simply too costly.

They do not use a theory of bubbles in their analysis. An important issue is that much of the time, as discussed above, real estate markets do not have bubbles. For example, it seems that in the U.S. property prices were determined by fundamentals from the 1930's through to the 1990's. There were no sudden run-ups and collapses in prices. This suggests that there are important threshold effects. Much of the time when prices are driven by fundamentals large rises in interest rates will be required to reduce property prices even a few percent as their results suggest. However, in bubble times this may not be the case. The rise in Japanese interest rates at the beginning of 1990 that pricked the Japanese stock and real estate bubbles took many years to have its full effect but this has been dramatic. Much careful empirical work based on theories of bubbles is needed to understand how effective monetary policy can be in controlling property bubbles.

In summary, while raising interest rates to dampen or prick real estate bubbles may have a role to play in some small countries such as Sweden, in large countries like the U.S. or monetary areas such as the Eurozone it is likely to be costly to do this. In both cases, however,

macroprudential policies are likely to be needed to try to control property bubbles. We turn to these next.

## 7. Macroprudential Policies to Prevent Real Estate Bubbles

The previous sections have highlighted systemic risk arising from bubbles in real estate prices. This section discusses the macroprudential regulatory measures and the policies that might be put in place to deal with this source of systemic risk. What is most important is that the new macroprudential regulation deals 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.

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 interest 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. Christensson 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. 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) Elimination of tax deductibility of interest.
- (v) 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. For those countries that have tax deductibility of mortgage interest, eliminating it may help reduce property prices. 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.

As discussed in the previous section, one of the major causes of bubbles is excessive credit. During the recent crisis it has been suggested that excessive credit emerged because of large global imbalances. 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.

As argued above, 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 again be 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.

## 8. 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. Unfortunately, much research remains to be done to develop such models.

In the absence of such models, thorough discussion of the influences of monetary policy on the housing sector of the type currently undertaken by the Executive Board of the Riksbank seem a very sensible input to the setting of interest rates. The problems involved in detecting real estate bubbles and the uncertain effects of interest rates on them mean that monetary policy

alone is unlikely to deal with the problem. Macroprudential policies are likely to be needed to buttress the effects of monetary policy. Controlling bubbles is a difficult task that needs as many tools as possible.

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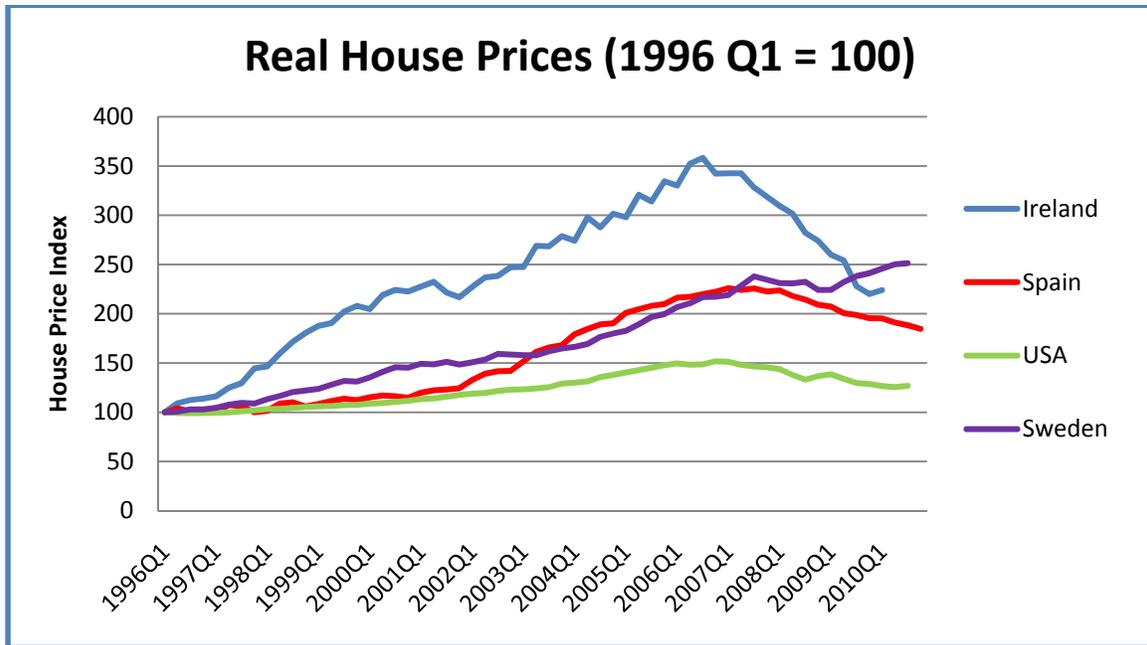
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**Figure 1**

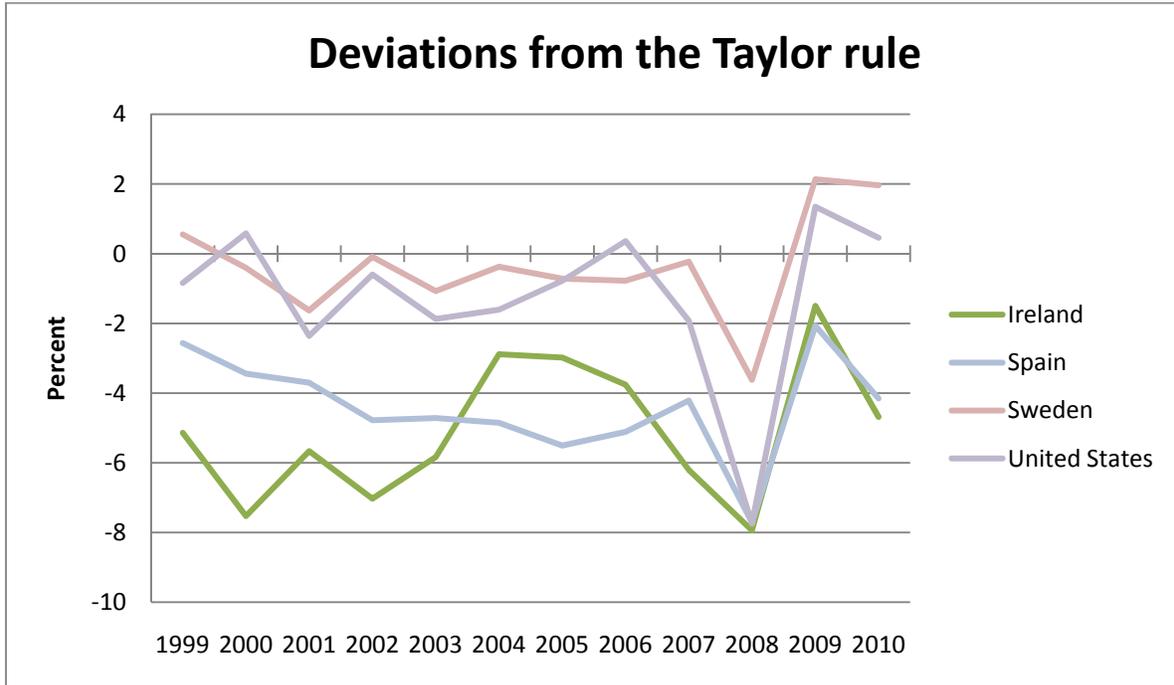
Housing Prices in Ireland, Spain, Sweden and the U.S.



Sources: Irish Dep. of the Environment, Banco de España, FHFA, Statistics Sweden, OECD.

**Figure 2**

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



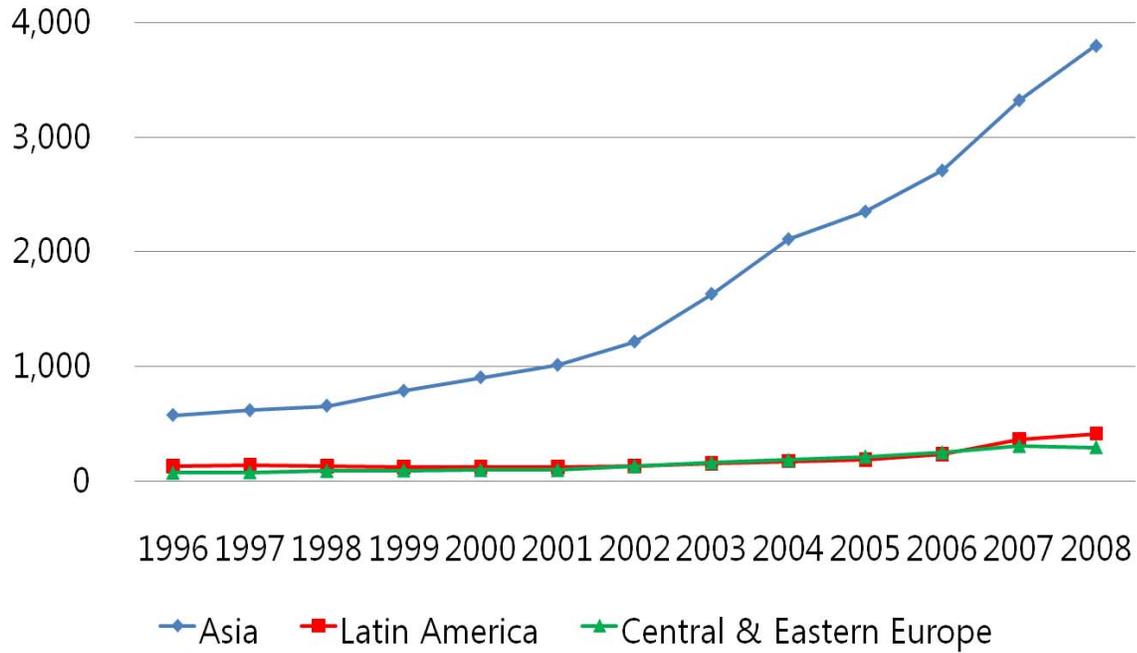
Source: Data on inflation and output gap from the IMF World Economic Outlook Database and calculated the implied interest rate according to the formula

$$TR_t = CPI_t + (\text{average IR over the sample period}) + 0.5*(CPI_t - 2\%) + 0.5*\text{output gap}_t,$$

where  $TR_t$  is the implied interest rate in period  $t$ ,  $CPI_t$  is the consumer price index and IR is the central bank's official interest rate.

**Figure 3**

A Comparison of Foreign Exchange Reserves in Different Regions

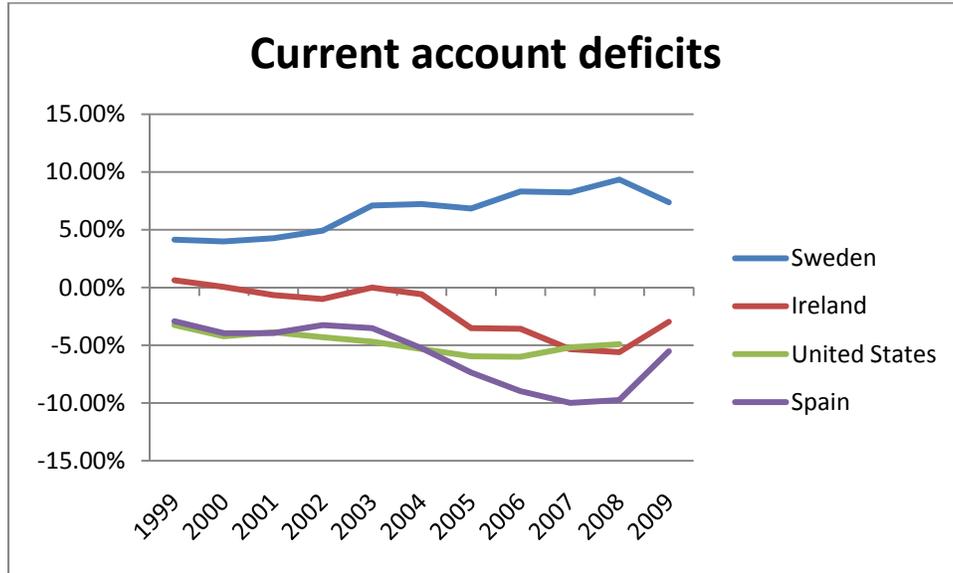


Source: IMF website.

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, Sweden and the U.S.



Source: Eurostat.