

Policies for Macrofinancial Stability: Managing Real Estate Booms and Busts

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I. INTRODUCTION

Real estate boom-bust cycles can have far-reaching consequences. These booms are generally accompanied by fast credit growth and sharp increases in leverage, and when the bust comes, debt overhang and deleveraging spirals can threaten financial and macroeconomic stability. Despite these dangers, the traditional policy approach to real estate booms has been one of “benign neglect” (Bernanke, 2002, and Greenspan, 2002), notwithstanding the more proactive approach adopted by a few central banks (Mishkin, 2011). This was based on two main premises. First, the belief that, as for other asset prices, it is extremely difficult to identify unsustainable real estate booms, or “bubbles” (sharp price increases not justified by fundamentals), in a timely manner. Second, the notion that the distortions associated with preventing a boom outweigh the costs of cleaning up after a bust. The crisis has challenged (at least the second of) these assumptions.

The burst of the real estate bubble in the United States triggered the deepest recession since the Great Depression, which quickly spread to other countries; in particular those with their own home-grown bubbles. Traditional macroeconomic policy rapidly reached its limits, as monetary policy rates approached the zero bound and sustainability concerns emerged on the fiscal front. And despite the recourse to extraordinary measures (ranging from bank recapitalization to asset purchase programs and quantitative easing), the aftermath of the crisis has been characterized by a weak recovery, as debt overhang and financial sector weakness continue to hamper economic growth. Bubbles remain hard to spot with certainty. But this task can be made easier by narrowing the focus to episodes involving sharp increases in credit and leverage, which are, after

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all, the true source of vulnerabilities. While early intervention may engender its own distortions, it may be best to undertake policy action on the basis of a judgment call (as with inflation) if there is a real risk that inaction could result in catastrophe.

Yet, a call for a more preventive policy action raises more questions than it provides answers. What kind of indicators should trigger policy intervention to stop a real estate boom? If policymakers were fairly certain that intervention were warranted, what would be the policy tools at their disposal? What are their impacts? What are their negative side effects and limitations? What practical issues would limit their use? This chapter explores these questions.

It should be recognized at the onset that a more proactive policy stance can help reduce the risks associated with real estate booms, but will inevitably entail costs and distortions. With this in mind, the chapter reaches the following conclusions. Policy efforts should focus on booms that are financed through credit and when leveraged institutions are directly involved, as the following busts tend to be more costly. In that context, monetary policy is too blunt and costly a tool to deal with the vulnerabilities associated with increased leverage, unless the boom occurs as a result of or at the same time as broader economic overheating. Fiscal tools may be, in principle, effective. But, in practice, they would likely create distortions and are difficult to use in a cyclical fashion. Macroprudential tools (such as limits on loan-to-value ratios) are the best candidates to deal with the dangers associated with real estate booms as they can be aimed directly at curbing leverage and strengthening the financial sector. But their careful design is key to minimize circumvention and regulatory arbitrage. Further, they will entail a cost to the extent that some agents find themselves rationed out of credit markets.

The chapter opens with a summary of how real estate boom-bust cycles may threaten financial and macroeconomic stability. Then, it discusses different policy options to reduce the risks associated with real estate booms (the focus is on cyclical policies; a discussion of the impact of structural measures is in IMF, 2011), drawing upon several country experiences and the insights from an analytical model (a more detailed analysis of country cases is in Crowe et al., 2011). The chapter concludes with a brief discussion of guiding principles in using public policy measures to deal with real estate booms.

II. THE CASE FOR POLICY ACTION ON REAL ESTATE BOOMS

Before the crisis, the main policy tenet in dealing with an asset price boom was that it was better to wait for the bust and pick up the pieces than to attempt to prevent the boom ex-ante (admittedly, this was less true in emerging market economies, which often paid close attention to real estate markets). Given this prescription, the characteristics of a particular asset class (such as how purchases are financed and what agents are involved, or whether the asset has consumption value besides investment value) were secondary details. Yet, if post-bust policy intervention is of limited effectiveness and, thus, the costs associated with a bust are large, these details are critical to determine whether it is worth attempting to contain a boom in the first place. From this standpoint, several frictions and externalities make the case for early policy intervention in real estate market booms stronger than for booms in other asset classes.

Leverage and the link to crises

From a macroeconomic stability perspective, what matters may be not the boom in itself, but how it is funded. Busts tend to be more costly when booms are financed through credit and leveraged institutions are directly involved. This is because the balance sheets of borrowers (and lenders) deteriorate sharply when asset prices fall.² When banks are involved, this can lead to a credit crunch with negative consequences for real economic activity. In contrast, booms with limited leverage and bank involvement tend to deflate without major economic disruptions. For example, the burst of the dot-com bubble was followed by a relatively mild recession, reflecting the minor role played by leverage and bank credit in funding the boom.

Real estate markets are special along both these dimensions. The vast majority of home purchases and commercial real estate transactions in advanced economies involve borrowing. And banks and other levered players are actively involved in the financing. Moreover, homebuyers are allowed leverage ratios orders of magnitude higher than for any other investment activity. A typical mortgage loan carries a loan-to-value ratio of 71 percent on average across a global sample of countries. In contrast, stock market participation by individuals hardly ever relies on borrowed funds. And when it does, loans are subject to margin calls that prevent the buildup of highly leveraged positions.

During the current crisis, highly leveraged housing markets had a prominent role. In particular, the decline in U.S. house prices was at the root of the distress in the market for mortgage-backed securities. When house prices started to fall, both speculative buyers and owner-occupiers that were unwilling or unable to repay their mortgages could not roll them over or sell their properties and started to default (Mayer et al., 2008). As uncertainty about the quality of the underlying loans increased, the value of mortgage-backed securities began to decline. Investors holding these securities and their issuers, both often highly leveraged themselves, found it increasingly difficult to obtain financing and some were forced to leave the market. This, in turn, decreased the available funds for mortgage financing, starting a spiral. The role of the boom and associated leverage in explaining defaults is evident in Figure 1.

This pattern is not limited to the United States, nor is it new to this crisis. The amplitude of house price upturns prior to 2007 is statistically associated with the severity of the crisis across countries (Figure 2; see also Claessens et al., 2010). Put differently, the U.S. market may have been the initial trigger, but the countries that experienced the most severe downturns were those with real estate booms of their own. And, historically, many major banking distress episodes have been associated with boom-bust cycles in property prices (Figure 3; see also Herring and Wachter, 1999, and Reinhart and Rogoff, 2008). Looking at the twelve infamous episodes, house price plunged 25 percent in the three-year period from their peak while real GDP dropped by 6 percentage points compared to the level when house prices were at their peak (Figure 4).

²In models as in Kiyotaki and Moore (1997), the collateral role of property magnifies swings as real estate cycles become correlated with credit cycles. A two-way amplification process develops between rising house prices and credit boom during upswings, and declining prices and a credit crunch during downturns.

Another distinguishing feature of “bad” real estate boom-bust episodes seems to be coincidence between the boom and the rapid increase in leverage and exposure of households and financial intermediaries. In the most recent episode, this was the case in over half the countries in a 40-country sample (Table 1). Almost all the countries with “twin booms” in real estate and credit markets (21 out of 23) ended up suffering from either a financial crisis or a severe drop in GDP growth rate relative to the country’s performance in the 2003–07 period. Eleven of these countries actually suffered from both damage to the financial sector and a sharp drop in economic activity. In contrast, of the seven countries that experienced a real estate boom, but not a credit boom, only two went through a systemic crisis and these countries, on average, had relatively mild recessions.

Wealth and supply-side effects

Real estate is an important, if not the most important, storage of wealth in the economy. Additionally, the majority of households tend to hold wealth in their homes rather than in equities. Typically, in advanced economies less than half of households own stock (directly or indirectly) while homeownership rate hovers around 65 percent (Guiso et al., 2003).³

In addition, the supply-side effects associated with house price dynamics can be substantial. The construction sector, a significant contributor to value added, takes property prices as a signal and adjusts production accordingly. As a result, the interaction between real estate boom-busts and economic activity is not limited to financial crises, but extends to “normal times.” In most advanced economies, house price cycles tend to lead credit and business cycles (Igan et al., 2009). This suggests that fluctuations in house prices create ripples in the economy through their impact on residential investment, consumption, and credit while the reverse effect is not as prominent, implying that the housing sector can be a *source* of shocks, or at least there is a two-way relationship between house prices and economic activity (IMF, 2011). In advanced economies, recessions that coincide with a house price bust tend to be deeper and last longer than those that do not, and their cumulative losses are three times the damage done during recessions without busts (Table 2). Again, by contrast, recessions that occur around equity price busts are *not* significantly more severe or persistent than those that do not (Claessens et al., 2008).

Illiquidity, opacity, and network effects

Boom-bust cycles are an intrinsic feature of real estate markets. This reflects delays in supply response to demand shocks and the slow pace of price discovery due to opaque and infrequent trades as well as illiquidity owing to high transaction costs and the virtual impossibility of short sales. In other words, real estate prices and construction activity can be expected to display large

³ While stock market fluctuations are typically larger, the wealth loss associated with real estate busts tends to be larger because of spillover effects. For instance, during the dot-com bust, the value of American households’ equity holdings declined by 44 percent or US\$5.4 trillion. The real estate bust that started at the end of 2006 has *so far* brought about a 15 percent decline in the value of real estate assets, or US\$3.7 trillion. However, total wealth lost stands at US\$10 trillion or 13 percent of end-2006 total household assets.

swings over long periods, even absent the distortions due to institutional features of real estate finance and policy actions (Igan and Loungani, 2011).⁴

Network externalities also complicate the picture. Homeowners in financial distress (and in particular in negative equity) have diminished incentives to maintain their properties and do not internalize the effects of this behavior on their neighbors. Similarly, foreclosures (and the associated empty houses) tend to diminish the value of neighboring properties beyond their effect through fire sales. The double role of real estate as investment and consumption good may reduce mobility and increase structural unemployment, as households in negative equity may be reluctant or unable to sell and take advantage of job opportunities elsewhere. The preferential tax treatment of homeownership exacerbates this problem, by creating a wedge between the cost of owning and renting. Hence, a housing bust may weaken the positive association between employment growth and mobility. Indeed, U.S. regions where house prices have declined more, pushing an increasing number of households into negative-equity territory, experienced sharper declines in the mobility rate (defined as the portion of households that move from the region to another region).

III. POLICY OPTIONS

The crisis has lent some support to the camp favoring early intervention in real estate boom-bust cycles. Policy proved to be of limited effectiveness in cleaning up the mess. In several countries, monetary easing, fiscal stimulus, direct support to the financial sector, and special housing market initiatives helped, but could not prevent the largest recession since the Great Depression. Ultimately, there have been large costs, including social and human elements due to foreclosures and job losses associated with the bust. While the issue remains of distinguishing “bubbles”—that is, price misalignments relative to economic fundamentals—from large or rapid movements in prices, better yardstick indicators (such as price-income and price-rent ratios, measures of credit growth, and leverage) can be developed to guide the assessment of the risks posed by a run-up in prices and the decision to take action against “bad” booms.⁵ And, similar to other policy decisions, action may have to be taken under considerable uncertainty when the costs of inaction can be prohibitively high.

If we accept the notion that intervention may be warranted even though it is often difficult to separate good from bad booms, the question arises as to which policy lever is best suited to reining in the latter. The main risks from real estate boom-bust cycles are associated with increased leverage in both the real (in particular, households) and financial sectors. Then, policies should, whenever possible, aim at containing these risks rather than price increases. In that context, one could think of policies as targeting two main objectives (not to be taken as the basis for a mutually exclusive categorization): (i) preventing real estate booms and the associated

⁴ Another factor that could delay adjustment of prices to fundamentals in real estate markets is the existence of a large set of investors with adaptive expectations (Case and Shiller, 2003; Piazzesi and Schneider, 2009).

⁵ Note that, while leverage is the real target, price misalignment ratios can act as helpful indicators as well because of the aforementioned two-way relationship between credit and prices. Also, in practice, these ratios can signal vulnerabilities as more households stretch their finances to pay for housing services.

leverage buildup at household and banking sectors altogether, (ii) increasing the resilience of the financial system to a real estate bust. Table 3 gives a summary of policy measures available towards these objectives along with their pros and cons.

It should be recognized at the onset that there is no silver bullet. Each policy will entail costs and distortions, and its effectiveness will be limited by loopholes and implementation problems. Broad-reaching measures (such as a change in the monetary policy rate) will be more difficult to circumvent, and hence potentially more effective, but will typically involve greater costs. More targeted measures (such as maximum loan-to-value ratios) may limit costs, but will be challenged by loopholes, jeopardizing efficacy.

What follows are explorations. The narrative in the paper focuses on residential real estate. However, several (although not all) of the measures discussed would easily apply to commercial real estate booms as well. We examine the potential role of monetary, fiscal, and macroprudential policies. Supply-side housing policies (such as publicly provided housing and land sales) widely used in a few countries (Hong Kong SAR and Singapore in particular) are not discussed here, since they would be difficult to export to different institutional settings. We discuss the benefits and challenges associated with the various policy options, using case studies of countries with experience in the use of particular measures and, where possible, cross-country evidence. Finally, policy options are also examined through the lens of a stylized theoretical model.

A. Monetary Policy

Can monetary tightening stop or contain a real estate boom? An increase in the policy rate makes borrowing more expensive and reduces the demand for loans. Besides, higher interest payments lower the affordability index (the ratio of median household income to income necessary to qualify for a typical mortgage loan) and shrink the number of borrowers that qualify for a loan of certain amount. Indirectly, to the extent that monetary tightening reduces leverage in the financial sector, it may alleviate the financial consequences of a bust even if it does not stop the boom (Adrian and Shin, 2009; De Nicolo et al., 2010).

Yet, monetary policy is a blunt instrument for this task. First, it affects the entire economy and is likely to entail substantial costs if the boom is limited to the real estate market. Put differently, a reduction in the risk of a real estate boom-bust cycle may come at the cost of a larger output gap and the associated higher unemployment rate (and possibly an inflation rate below the desired target range). Obviously, these concerns are diminished when the boom occurs in the context (or as a consequence) of general macroeconomic overheating. Then, the distortions associated with monetary tightening would be minimized. Indeed, when financial constraints are present and real estate represents an important vehicle for collateral, a policy rule reacting to real estate price movements and/or credit growth (in addition to inflation and the output gap) can dominate a traditional Taylor rule but only for booms that occur in the context of general macroeconomic overheating (see Section IV).

A second concern is that, during booms, the expected return on assets (in this case, real estate) can be much higher than what can be affected by a marginal change in the policy rate. It follows that monetary tightening may not directly affect the speculative component of demand. If that is

the case, it may have the perverse effect of leading borrowers (who would have otherwise qualified for standard mortgages) towards more dangerous forms of loans (such as interest-only, variable-rate loans, and in some cases foreign-currency loans).⁶ Moreover, in the presence of free capital mobility, the effectiveness of monetary policy may be limited, especially for not-fully-flexible exchange rate regimes. Finally, the effectiveness of a change in the policy rate will also depend on the structure of the mortgage market. In systems where mortgage rates depend primarily on long-term rates, the effectiveness of monetary policy will depend on the relationship between long and short rates.

To a large extent, empirical evidence supports these concerns, leading to the bottom line that monetary policy could in principle stop a boom, but at a very high cost. At first glance, there is little evidence across countries that the precrisis monetary stance had much to do with the real estate boom. Inflationary pressures were broadly contained throughout the period and the extent of house price booms does not appear correlated with real interest rates or other measures of monetary conditions, except in a subsample of euro zone countries (IMF, 2009). This lack of a relationship may be partly due to the rapid decline in import prices driven by the trade integration of emerging economies—notably China—that may have offset relatively high inflation in nontradables sectors (IMF, 2006). Housing booms were indeed more salient in countries which experienced a decline in import prices relative to the general price level. But the relationship between the monetary policy stance and house prices remains weak (albeit more statistically significant) after controlling for this issue (with Taylor residuals based on domestic inflation rather than overall CPI inflation). Put differently, policymakers would have to “lean against the wind” dramatically to have a meaningful impact on real estate prices and credit, with large effects on output and inflation. This intuition is confirmed by a panel vector autoregression, which suggests that, at a 5-year horizon, a 100 basis point hike in the policy rate would reduce house price appreciation by only 1 percentage point, compared to a historical average of 5 percent increase per year (see Crowe et al., 2011, for details). But it would also lead to a decline in GDP growth of 0.3 percentage points.

Part of the problem may be that speculation is unlikely to be stemmed by changes in the monetary policy stance. Indeed, there is some evidence that conditions in the more speculative segment of mortgage markets are little affected by changes in the policy rate. For example, in the United States, denial rates (calculated as the proportion of loans originated to applications received) in the market for prime mortgages appear highly related to changes in the federal funds rate, with banks becoming more choosy when the rate increases. In contrast, denial rates for subprime loans (typically more linked to speculative purchases) do not seem to move systematically with monetary policy (see Crowe et al., 2011).

B. Fiscal Tools

In most systems, a variety of fiscal measures (transaction taxes, property taxes, credits, deductibility of interest payments) bear on the decision to invest in real estate. The “net” result is

⁶ For instance, Brzoza-Brzezina et al. (2007) find that in the Czech Republic, Hungary, and Poland, monetary tightening led to decreased domestic currency lending but accelerated foreign-currency-denominated loans.

often a socially driven favorable treatment of homeownership (and sometimes housing-related debt).⁷ In theory, some of these fiscal tools could be adjusted in a cyclical manner to influence house price volatility, while preserving the favorable treatment of homeownership on average over the cycle. Yet, if the net present value of all future taxes are capitalized in property prices, adjusting taxes countercyclically around the same expected mean would not affect the prices.⁸ In practice, moreover, cyclically adjusted fiscal measures may be of limited use. First, the evidence on the relationship between the tax treatment of residential property and real estate cycles is inconclusive. Second, technical and political economy problems may complicate implementation.

At the structural level, the tax treatment of housing does not appear to be related across countries to the amplitude of real estate cycles: during the most recent global house price boom, real house prices increased significantly in some countries with tax systems that are highly favorable to housing (such as Sweden) as well as in countries with relatively unfavorable tax rules (such as France). Similarly, appreciation was muted in countries with both favorable systems (e.g., Portugal) and unfavorable ones (e.g., Japan). Overall, taxation was not the main driver of house price developments during the recent global housing boom (Keen et al., 2010). Furthermore, levels of homeownership (the main excuse for favorable tax treatment of housing) are, if anything, (again not significantly) *negatively* related to the degree to which the tax system is favorable to owning one's own home.

In addition, the scope for the use of fiscal tools in a cyclical setting is likely to be limited. The institutional setup in most countries separates tax policy from monetary and financial regulation policies, making it extremely hard to implement changes in tax policies as part of a cyclical response with financial stability as the main objective. Instead, local governments may use lower property or transaction tax rates to attract residents during good times if the burden in the case of a bust is shared with other jurisdictions. The ability of cyclical transaction taxes to contain exuberant behavior in real estate markets may be further compromised if homebuyers do not respond to these taxes fully, because they consider them to be an acceptable cost for an investment with high returns and consumption value. Also, during a boom phase, the incentives to "ride the bubble" may increase efforts to circumvent the measure by misreporting property values or folding the tax into the overall mortgage amount. Finally, as with most tax measures, the distortions created by a cyclical transaction tax may make it more difficult to evaluate a property, which already tends to be a hard task, and also the mobility of households with potential implications for the labor market.

Transaction taxes

Transaction taxes that change with real estate conditions may be, in theory, promising in dealing with booms (Allen and Carletti, 2010). But it should be recognized that these taxes induce

⁷ See, for instance, Cremer and Gahvari (1998) for economics of tax treatment of owner-occupied housing.

⁸ Further to this point, adjusting taxes according to the cycle violates the principle of tax smoothing, which minimizes the excess burden of the taxes.

considerable distortions in real estate markets and, indirectly, in labor markets through their impact on mobility. On the bust side, the use of time-limited tax credits linked to house purchases in the United States and the suspension of stamp duty in the United Kingdom helped stabilize the housing market. And, especially in the United States, the stabilization in prices and revival of activity disappeared with the expiration of the tax breaks (IMF, 2010). On the boom side, China and Hong Kong SAR have recently introduced higher stamp duties to dampen real estate prices and discourage speculation. Their experience, however, indicates that transaction volume responds more than prices do (suggesting that the associated collateral costs are high) and the impact of the introduction of the tax may be transient.

Property taxes

Some evidence from the United States suggests that higher rates of property taxation may help limit housing booms as well as short-run volatility around an upward trend in prices (more details can be found in Crowe et al., 2011). A one standard deviation (\$5 per \$1000 of assessed value) increase in property tax rates is found to be associated with a 0.9 percentage point decline in average annual price growth (compared to annual growth of around 5.6 percent per year). One interpretation of this finding is that property taxes, indirectly taxing imputed rent, may mitigate the effect of other tax treatments favoring homeownership and perhaps reduce speculative activity in housing markets. Of course, caveats apply in deriving implications from this evidence. First, municipalities often face pressure to reduce tax rates when markets are booming and tax revenues are high. This implies that some of the negative correlation between prices and taxes may be spurious, and challenges the ability to use property taxes as a countercyclical tool.⁹ In addition, the results may be specific to the U.S. housing market, whose characteristics differ markedly from those in many other advanced economies, let alone emerging markets. Moreover, property tax rates clearly did not cause (or prevent) the emergence of a national housing boom in the United States, although they may have limited its impact on some areas, and the impact at the national level of a hypothetical national property tax might be very different from the localized impact of local taxes.

Mortgage interest tax deductibility

Theoretically, mortgage interest tax deductibility, by encouraging debt-financing, may lead to higher household debt and more leveraged loans, and, in turn, to more severe financial sector distress during real estate downturns. Empirically, tax reforms that reduce the value of mortgage interest relief have been shown to lead to lower loan-to-value ratios (see Hendershott et al., 2003, for the United Kingdom and Dunskey and Follain, 2000, for the United States). And, they are estimated to cause an immediate decline in house prices of around 10 percent (see Agell et al., 1995, for Sweden and Capozza et al., 1996, for the United States). This evidence suggests that a more neutral tax treatment may help make the economy less vulnerable to real estate busts by reducing incentives for leverage and avoiding artificially elevated prices and homeownership rates. Yet, these estimates are based on one-off changes, hinting at the difficulties in using mortgage interest tax deductibility rules in a cyclical way. Further, eliminating interest

⁹ Also, despite their impact on prices, neither transaction nor property taxes directly get to credit and leverage.

deductibility will not eliminate booms. Before the recent crisis, some countries that tax mortgage interest experienced rapid growth in prices and household debt levels (such as Australia) while others that allow full deductibility did not have as big a boom (such as Switzerland).

C. Macroprudential Regulation

At least in theory, macroprudential measures such as higher capital requirements or limits on various aspects of mortgage credit could be designed to target narrow objectives (for instance, household or bank leverage) and tackle the risks associated with real estate booms more directly and at a lower cost than with monetary or fiscal policy.

Against the benefit of a lower cost, these measures are likely to present two shortcomings. First, they may be easier to circumvent as they target a specific type of contracts or group of agents. When this happens, these measures can be counterproductive, as they may lead to liability structures that are more difficult to resolve/renege in busts. Second, they may be more difficult to implement from a political economy standpoint. Over time, monetary policy decisions have come to be accepted as a necessary evil thanks to central banks' increasingly achieving credibility and independence. In contrast, the use of these measures could be considered an unnecessary intrusion into the functioning of markets. The more direct impact of these measures would also complicate implementation as winners and losers would be more evident than in the case of macro policies (although several countries seem to have dealt effectively with this problem).

We focus our analysis on three specific sets of measures. First, capital requirements or risk weights that change with the real estate cycle. Second, dynamic provisioning, that is, the practice to increase banks' loan loss provisions during the upswing phase of the cycle. And third, the cyclical tightening/easing of eligibility criteria for real estate loans through loan-to-value (LTV) and/or debt-to-income (DTI) ratios.¹⁰ These macroprudential tools may be able to achieve both objectives: (i) reducing the likelihood and/or magnitude of a real estate boom (for instance, by imposing measures to limit household leverage), and (ii) strengthening the financial system against the effects of a real estate bust (for example, by urging banks to save in good times for rainy days).

A caveat is in order before we start our analysis. A major limitation in assessing the effectiveness of macroprudential tools stems from the fact that macroprudential policy frameworks are still in their infancy, and only a handful of countries have actively used them (Table 4; also see Borio and Shim, 2007, and CGFS, 2010). And these measures have been typically used in combination with macroeconomic policy and direct interventions to the supply side of housing markets (such as in Singapore), further complicating the challenge to attribute outcomes to specific tools.

Yet, much can be learned from case studies. Following the Asian crisis, some countries in the region took a more heavy-handed approach to deal with risks posed by real estate booms.

¹⁰ Other measures not discussed here include cyclical ceilings on portfolio exposure to real estate, speed limits on real estate lending, and restrictions on certain type of loans. These tools have been used even more sparingly.

Countries in Central and Eastern Europe experimented with various measures to control the rapid growth in bank credit to the private sector in the 2000s. Others put in place a dynamic provisioning framework. Table 5 presents a summary of policy experiences with real estate booms (a detailed account of country cases is in Crowe et al., 2011). On the whole, success stories appear to be few, perhaps to some extent reflecting the learning curve in expanding the policy toolkit, improving the design of specific tools, and sorting out implementation challenges. But, when policy succeeded in slowing down a boom and avoiding a systemic crisis in a bust, it almost always involved some macroprudential measures.

Higher capital requirements/risk weights

Background

Capital regulation has a procyclical effect on the supply of credit. During upswings, better fundamentals reduce the riskiness of a given loan portfolio, improving a bank's capital adequacy ratio and its ability to expand its assets. In a downturn, the opposite happens, possibly leading to deleveraging through fire sales. Procyclical capital requirements could help reduce this bias. Further, by forcing banks to hold more capital in good times, it would help build buffers for future losses (see Gordy and Howells, 2006, and references therein).¹¹

For real estate loans, the procyclical element of capital regulation is largely absent. In most countries, existing rules do not take collateral values into consideration or reflect the heterogeneity among loans backed by real estate, other than the commercial-residential distinction. Under Basel II's standard approach, risk weights for property loans are fixed (50 percent for residential mortgages and 100 percent for commercial property loans). As a result, mortgage loans with predictably different default probabilities (for instance, because of different LTV ratios or exposure to different aggregate shocks) are often bundled in the same risk category and no adjustment is made over time to account for the real estate cycle.¹² In this context, capital requirements or risk weights linked to real estate price dynamics could help limit the consequences of boom-bust cycles. By forcing banks to hold more capital against real estate loans during booms, these measures could build a buffer against the losses during busts. And, by increasing the cost of credit, they might reduce demand and contain real estate prices themselves.¹³ Finally, weights could be fine-tuned to target regional booms.

Implementation challenges

¹¹ The discussion focuses on the price-related measures of capital regulation, but exposure limits would have similar implications working as a quantity-based measure.

¹² Fixed risk weights are applicable only under the standard approach of Basel II. Under the internal-rating-based approach, regulators (and banks) can split loans into subcategories based on several risk indicators and vary risk weights accordingly. A few countries have applied higher risk weights to high-LTV loans (see Table 3 in Crowe et al., 2011, for more on country-by-country policy actions and their outcomes).

¹³ Obviously, the increase in the cost of borrowing may have a side effect: credit rationing may set in, reducing welfare gains associated with access to finance.

A few caveats are in order. First, absent more risk-sensitive weights, an across-the-board increase in risk weights (or capital requirements) carries the danger of pushing lenders in the direction of riskier loans (this is essentially the risk-shifting effect identified by models in the spirit of Stiglitz and Weiss, 1981). Thus, the introduction of procyclical risk weights for real estate loans should be accompanied by the implementation of a finer cross-sectional risk classification as well. Second, as with any other measure increasing the cost of bank credit (when credit is in high demand), procyclical risk weights may be circumvented through recourse to nonbank intermediaries, foreign banks, and off-balance-sheet activities. Third, these measures will lose effectiveness when actual bank capital ratios are well in excess of regulatory minima (as often happens during booms). Fourth, while improving the resilience of the banking system to busts, tighter requirements are unlikely to have a major effect on credit availability and prices. Put differently, they are unlikely to reduce vulnerabilities in the real (household) sector. Finally, regulators may be reluctant to allow banks to reduce risk weights during a bust (when borrowers become less creditworthy).

Evidence

The empirical evidence on the effectiveness of these measures is mixed. In an effort to contain the rapid growth in bank credit to the private sector and the associated boom in asset markets, several countries have raised capital requirements and/or risk weights on particular groups of real estate loans. Some attempts (such as the cases of Bulgaria, Croatia, Estonia, and Ukraine) failed to stop the boom; others (such as the case of Poland) were at least a partial success.¹⁴

Yet, it is not easy to say why measures taken in one country may have been more effective than those taken elsewhere or how much other developments account for the observed changes. Furthermore, even in countries where tighter capital requirements appeared to produce some results on controlling the growth of particular groups of loans, real estate price appreciation and the overall credit growth remained strong.

Dynamic provisioning

Background

Dynamic provisioning (the practice of mandating higher loan loss provisions during upswings and one of the elements in Basel III) can help limit credit cycles.¹⁵ The mechanics and benefits are similar to those of procyclical capital requirements. By forcing banks to build (in good times) an extra buffer of provisions, it can help cope with the potential losses that come when the cycle turns (see, for example, the case of Spain). It is, however, unlikely to cause a major increase in

¹⁴ Evidence on exposure limits is scant. Many countries have constant exposure limits, but there is no apparent relationship between the level of these limits and real estate boom-bust episodes.

¹⁵ As has been the case for capital requirements, procyclicality of regulations governing loan loss provisions was subjected to criticism before the crisis (see, for instance, Laeven and Majnoni, 2003).

the cost of credit, and thus to stop a boom. That said, one advantage over cyclical capital requirements is that dynamic provisioning would not be subject to minima as capital requirements are, so it can be used when capital ratios maintained by banks are already high. Provisioning for property loans could be made a specific function of house price dynamics. In periods of booming prices, banks would be forced to increase provisioning, which they would be allowed to wind down during busts. As in the case of risk weights, provisioning requirements could depend on the geographical allocation of a bank's real estate portfolio.

Implementation challenges

As noted, this type of measure is primarily targeted at protecting the banking system from the consequences of a bust. Consequently, it is not meant to have a significant impact on credit and contain other vulnerabilities associated with a boom, such as increases in debt and leverage in the household sector. In addition, practical issues and unintended effects such as calibration of rules with rather demanding data requirements and earnings management (which may raise issues with tax authorities and securities markets regulators) should be discussed in each country's context to design a framework that best fits the country's circumstances. There are also other shortcomings, similar to those of procyclical risk weights (being primarily targeted at commercial banks, dynamic provisioning may be circumvented by intermediaries outside of the regulatory perimeter). Lastly, application of the measure only to domestically regulated banks may hurt their competitiveness and shift lending to banks abroad, raising cross-border supervision issues.

Evidence

The experience with these measures suggests that they are effective in strengthening a banking system against the effects of a bust, but do little to stop the boom itself. Spain led the countries that have adopted countercyclical provisioning and constitutes an interesting case study for a preliminary assessment of its effectiveness. Starting in 2000 and with a major revision in 2004, the Bank of Spain required banks to accumulate additional provisions based on the "latent loss" in their loan portfolios (for more details on the Spanish dynamic provisioning framework, see Saurina, 2009). Dynamic provisions forced banks to set aside, on average, the equivalent of 10 percent of their net operating income. Yet, household leverage grew by a still-high 62 percent in Spain. At the end of 2007, just when the real estate bust started, total accumulated provisions covered 1.3 percent of total consolidated assets, in addition to the 5.8 percent covered by capital and reserves (for some perspective, the value of the housing stock has, so far, decreased by roughly 15 percent in real terms). Hence, Spanish banks had an important buffer that strengthened their balance sheets when real estate prices started to decline and the economy slipped into recession.

Limits on loan-to-value and debt-to-income ratios

Background

A limit on LTV can help prevent the buildup of vulnerabilities on the borrower side (in particular in the household sector). Containing leverage will reduce the risks associated with declines in house prices. Put differently, the lower the leverage, the greater the drop in prices needed to put a

borrower into negative equity. In turn, this will likely result in fewer defaults when the bust comes, as more borrowers unable to keep up with their mortgages will be able to sell their houses. In addition, in case of default, lenders will be able to obtain higher recovery ratios. On the macro front, a limit on LTV will reduce the risk that a large sector of the real economy ends up with a severe debt overhang. In addition, it will reduce the pool of borrowers that can obtain funding (for a given price) and thus will reduce demand pressures and contain the boom.

Similar to limits on LTV, DTI limits will rein in the purchase power of individuals, reducing the pressure on real estate prices. In particular, they will be effective in containing speculative demand (they will screen out borrowers that would qualify for a mortgage only on the assumption the house would be quickly turned around). They will also reduce vulnerabilities, as borrowers will have an “affordability” buffer and will be more resilient to a decline in their income or temporary unemployment.

Implementation challenges

Careful design of these measures is key to limit circumvention. For instance, in Korea, lower LTV limits for loans with less than three years of maturity spurred a boom in loans originated with maturity of three years *and* one day. In the United States, during the housing boom, the practice of combining two or more loans to avoid mortgage insurance (which kicked in when LTV exceeded 80 percent) became common.¹⁶ An LTV limit applied to a borrower’s overall exposure would improve effectiveness. Similarly, an obvious way to get around a DTI limit would be to extend sequential loans and report the ratios separately. In Hong Kong SAR, where regulators impose maximum limits on the debt service ratio (which takes into account the payments the borrower has to make on non-mortgage loans as well), supervisors often encounter cases where lenders choose not to report all outstanding debt obligations.

Circumvention may entail significant costs, as it may result in liability structures that can complicate debt resolution during busts (for example, in the United States, it is often second-lien holders that object to restructuring). In addition, circumvention may also involve shifting of risks not only across mortgage loan products, but also outside the regulatory perimeter, through expansion of credit by nonbank, less-regulated financial institutions and/or by foreign banks (which may result in increased currency mismatches as the proportion of foreign-currency-denominated loans rises).

As it has been for monetary policy, calibration of these tools will be a learning process. And a clear communication strategy will need to be developed to improve their efficiency. Frequent intervention and excessively sharp changes in the limits may lead to confusing signals and carry the risk of generating policy-induced real estate cycles.

¹⁶ With these “piggyback” loans the first lien would cover 80 percent of the home value and the remainder would be split between a second lien loan and a down-payment (which could be as low as zero).

The narrow target nature of these measures may increase political economy obstacles (as happened in the case of Israel),¹⁷ particularly since the groups more impacted by LTV and DTI limits tend to be those more in need of credit (poorer and younger individuals). In addition, unlike with more “macro” measures, the consequences of these limits are immediate and transparent. That said, several Asian countries were successful in introducing various incarnations of these measures. Beyond these political economy considerations, LTV and DTI limits, by rationing sensitive groups out of credit markets, will entail a cost in terms of diminished intertemporal consumption smoothing and lower investment efficiency.

Evidence

Establishing a causal link running from LTVs to price and credit dynamics is a hard task. At the cross-country level, a major concern is the lack of time dimension: In many countries, there are no data available for multiple points in time. Even when data availability is not a problem, very few countries have time variation in maximum LTV allowed since this has not been an active part of the regulatory agenda. Another issue is that in many cases there are no *mandatory* maximum limits and the values reported are simple guidelines for mortgage insurance or prudential concerns. Hence, because of the feedback loop between mortgage credit availability and house price movements, endogeneity remains a concern.

With these caveats in mind, the scant existing empirical evidence suggests that these are promising measures. For example, in a simple cross-section of 21 (mostly) developed countries, maximum LTV limits are positively related to house price appreciation between 2000 and 2007 (Figure 5). And back-of-the-envelope calculations suggest that a 10 percentage point increase in maximum LTV allowed by regulations is associated with a 13 percent increase in nominal house prices. Regressions on a panel of U.S. states from 1978 to 2008 suggest a weaker association with house price appreciation of a given LTV at loan origination: roughly 5 percent increase in house prices for a 10 percentage point increase in LTV. Duca et al. (2010) construct a series for LTV faced by first-time home buyers and estimate a cointegration model of house price-to-rent ratios at the national level for the U.S. between 1979 and 2007. Their results imply an impact of 8-11 percent on house prices from a 10 percentage point increase in LTV for first-time home buyers, assuming rents remain constant.

A review of the experience of countries that experimented with changing mandatory LTV limits in response to real estate market developments also suggests that doing so can be quite effective. For instance, when the Korean authorities introduced LTV limits in September 2002, month-on-month change in house prices decreased from 3.4 percent to 0.3 percent immediately and remained low until April 2003. Subsequent reductions in LTVs were also followed by significant drops in the house price appreciation rate. A similar pattern applies to DTI limits, with month-on-month change dropping from 2.3 percent in July 2005 to 0.2 percent in August 2005 with the introduction of the measure. Interestingly, the measures had a much smaller (or no) impact on prices in “non-speculative” areas where the limits were untouched. The impact on year-on-year

¹⁷ <http://www.businessweek.com/news/2010-05-24/bank-of-israel-may-increase-housing-loan-provisions-update1-.html>

changes, however, has been smaller, since prices tend to start increasing at a faster pace again after the first immediate reaction.¹⁸ In Hong Kong SAR, prudent lending practices guided by LTV and DTI limits have been credited with pausing the house price boom briefly in 1994 and guarding the system against the fallout from the crash in 1997 (Wong et al., 2004; also see Wong et al., 2011).

IV. MODEL-BASED EVALUATION OF POLICY OPTIONS

This section provides a quantitative evaluation of the policy trade-offs discussed in the previous sections, using a dynamic stochastic general equilibrium (DSGE) model that incorporates a housing sector and credit markets. Recently, DSGE models have become a popular tool to analyze optimal policy under credit market frictions (see, for instance, Kannan et al., 2009; Angelini et al., 2010). But a main disadvantage is that they do not have the capability to replicate non-linear dynamics often observed in a crisis context, nor can they incorporate bubbles in a tractable way. Hence, the analysis in this section deals with house price fluctuations that come from fundamentals and reflect the expected present discounted value of rents. Put differently, these are booms that reflect general macroeconomic overheating. However, even in this context, the analysis supports the view that tools that are narrower in focus (by addressing a specific rigidity) can perform better (Table 6).

The model has conventional New Keynesian features: prices and wages do not adjust immediately. Households make decisions on how much to invest in housing, in addition to choosing their consumption of nondurable goods. To make the model's dynamics more realistic, consumption and residential investment are assumed to adjust slowly, and it is costly for workers to shift from producing consumption goods to building houses, and vice versa. The presence of these nominal and real frictions means that monetary policy can stabilize the economy, by affecting interest rates and, hence, spending on both nondurables and housing. Credit is introduced by assuming that some agents are more impatient than others and prefer to consume early and borrow. The lending rate is modeled as a spread over the policy (or deposit) rate that depends on the balance sheet position of potential borrowers. This assumption generates a feedback loop between credit spreads, house prices, and net worth of households. The spread also depends on a banking sector markup (i.e., a financial shock) and a policy instrument, which may take the form of a macroprudential or a fiscal tool. A main shortcoming is that the banking sector markup is exogenous and independent of the balance sheet of the banks.

The objective is to determine which policy regime is better at stabilizing the economy in the face of pressures on the housing market. The conclusions that can be drawn from this analysis depend crucially on which shocks drive the house price boom. To illustrate the importance of correctly identifying the drivers of the housing boom, policy regimes are examined under two shocks: a

¹⁸ This pattern, potentially an indication of the difficulty of calibrating these rules in practice, may elicit frequent intervention by policymakers.

financial shock that prompts a relaxation in lending standards, and a positive productivity shock that leads to an increase in income.¹⁹

Effectiveness of monetary policy

Suppose the central bank follows a standard Taylor (1993)-type rule, whereby it raises rates whenever CPI inflation is running above target or when the economy is expanding at a faster rate than its fundamentals suggest (i.e., the output gap is positive). This rule can be expanded by including reactions to nominal house price inflation, nominal mortgage credit growth, or both. When the economy is hit by a productivity shock, this augmented rule leads to an improvement in welfare, mostly due to a decline in output gap volatility, especially when the rule responds to house prices. This is because the shock reflects a change in one of the fundamentals, income, that drives house prices. In the case of a financial shock, welfare is improved by responding to real estate prices and credit, because policy directly targets the source that triggers the feedback loop.

If both productivity and financial shocks are present, reacting to credit is superior to reacting to real estate prices. This is because the optimal response to credit developments is broadly the same for both shocks, while the optimal response to changes in house prices is very different across shocks. It follows that when shocks are difficult to identify, the best option is to directly respond to credit growth as it helps keep in check the push on house prices while at the same time containing the relaxation in credit conditions.

Effectiveness of fiscal policy

Taxes on homeownership and housing transactions, in principle, can curb demand for housing and tame exuberance in real estate markets. Consider a property tax imposed on homeowners, to whom the tax receipts are paid back as a lump sum. The policymaker can set two parameters in the tax rule. First, the steady-state level tax rate, and second, the cyclical reaction of the tax rate to house price inflation. In either case, the welfare improvements are small. High property taxes are needed to have some bite in reducing the volatility of house prices (and the associated accelerator effect), but this leads to highly distorted prices, and hence the overall small welfare improvement.

Effectiveness of macroprudential policy

In the model, policies that can directly affect the spread between lending and deposit rates can help stabilize the cycle. For instance, by lowering maximum LTV when house prices increase, the supervisory authority can lower the volume of credit, increasing the spread between lending and deposit rates and hence reducing the accelerator effect. In order to assess the efficacy of this macroprudential rule, we look at the impulse-response to a 1 percent permanent reduction in the

¹⁹ Financial and total factor productivity (TFP) shocks explain a large fraction of the fluctuation in main U.S. macroeconomic variables (Nolan and Thoenissen, 2009).

steady-state LTV. Initially, interest rate spreads increase 25 basis points, and credit decreases on impact by 0.3 percent.²⁰ The increase in lending rates leads to a decline in private consumption (0.15 percent), consumer prices (0.02 percent), residential investment (0.2 percent), and real house prices (0.07 percent). The central bank provides support by cutting the policy rate (which equals the deposit rate in this economy) and this helps cushion the downturn. Overtime, residential investment and house prices return to their initial values and credit is permanently reduced by 1 percent.

The next question is whether welfare can be improved if the LTV is tied linearly to certain observables such as credit growth and house price inflation. Under either shock, the macroprudential instrument brings important welfare gains, mostly due to the fact that the volatility of the output gap is greatly reduced. It turns out that an LTV reacting to nominal credit growth is superior than one linked to house price fluctuations: the macroprudential instrument directly addresses the financial friction in the model, so it is optimal to have it react to excessive credit under each or both shocks.

V. CONCLUSION

The correct policy response to real estate booms is, like many other policymaking decisions, an art more than a science. Of the policy options considered, macroprudential measures appear to be the best candidates to achieve the objective of curbing real estate prices and leverage because of their ability to attack the problem at its source, their adaptability to accommodate the specific circumstances in different locations at different times, and their added benefit of increasing the resilience of the banking system.

Provisional policy recommendations, from the evidence and analysis reviewed, depend on the characteristics of the real estate boom in question (see Figure 6). If property prices are out of sync with income and rent *and* leverage is increasing rapidly, taking action is advisable.²¹ In deciding which policy option to choose, policymakers should adopt a wider view of the economy and complement targeted measures with broader macroeconomic tightening if the boom is a part or reflection of general overheating in the economy.

This brings us to the following tentative core principles that could guide policymakers in designing an effective toolkit to deal with real estate booms:

- Widen the policy perspective to recognize imbalances that do not necessarily show up in traditional measures of inflation targets and output gaps;

²⁰ BIS (2010) estimated that an increase of 1 percent in bank capital requirements also leads to an increase of 25 basis points in the spread between lending rates and the cost of funds for banks. Hence, the exercise can also be thought of as increasing capital requirements.

²¹ It is worth noting that additional uncertainty may be involved since leverage can be a lagging indicator. Hence, a close watch on credit origination, including by nonbank financial intermediaries, is warranted.

- Recognize the local features of real estate markets and use targeted macroprudential tools rather than across-the-board monetary policy responses to respond to excessive and destabilizing movements in prices and activity;
- Complement measures aiming to reduce the risk of bubbles with those aiming to increase the resilience of the financial system and well-defined resolution frameworks to speed up the cleaning in the aftermath of bubbles that survive the first line of defense;
- Minimize distortions due to special treatment of housing and homeownership and strengthen supply-side response to mitigate the impact of demand shocks in the longer horizon.

However, going forward, two important questions will need to be answered when it comes to applying these principles in practice. First, what are the potential complementarities and conflicts between monetary and macroprudential policies and what is the best policy design framework to accommodate them? Undoubtedly, there is a complex relationship between the objectives of macroeconomic and financial stability, the respective primary objectives of monetary and macroprudential policy. Take the option of raising capital requirements for loans secured by real estate, which would increase the cost of borrowing in this segment through interest rate changes, which could also spill over to other loan types. Any kind of credit rationing that may stem from this move could also alter real activity. Both consequences are in the realm of monetary policy. In turn, recent studies show that loose monetary policy can fuel risk-taking incentives and a buildup of leverage, which could warrant tighter macroprudential rules. Given these interactions, the best option may be to consider the macroprudential policy framework alongside, not apart from, the monetary policy decision.

Second, should the macroprudential framework be based on discretion or rules? On the one hand, a discretionary framework has the advantage that the measures could be better calibrated to particular situations and circumvention may be less likely because of the temporary nature of the measure (less incentive, less time to learn). On the other hand, a rules-based framework could be better because political economy problems may be less severe (no fight to put measures in place during a boom), adjustment of private agents' behavior to the new framework may already accomplish a certain degree of prudence, and time inconsistency is not an issue. The choice for the framework would need to weigh these pros and cons. We leave these questions to future research.

REFERENCES

- Adrian, T., and H. S. Shin, 2009, “Money, Liquidity, and Monetary Policy,” *American Economic Review* 99 (2), 600–605.
- Agell, J., P. Englund, and J. Södersten, 1995, “Swedish Tax Policy in Theory and Practice,” Appendix No. 1 to the Tax Reform Evaluation Report.
- Allen, F., and E. Carletti, 2010, “What Should Central Banks Do About Real Estate Prices?” unpublished manuscript.
- Angelini, P., S. Neri, and F. Panetta, 2010, “Macroeconomic Stabilization Policies: Grafting Macroprudential Tools in a Macroeconomic Framework,” Bank of Italy Working Paper.
- BIS (Bank for International Settlements), 2010, “Assessing the Macroeconomic Impact of the Transition to Stronger Capital and Liquidity Requirements,” Interim Report by the Macroeconomic Assessment Group established by the Financial Stability Board and the Basel Committee on Banking Supervision, Bank for International Settlements, Basel, Switzerland.
- Bernanke, B. S., 2002, “Asset Price Bubbles and Monetary Policy,” Remarks before the New York Chapter of the National Association for Business Economics, New York, NY, Oct. 15 (available at <http://www.federalreserve.gov/boarddocs/speeches/2002/20021015/>).
- Borio, C., and I. Shim, 2007, “What Can (Macro)-Prudential Policy Do to Support Monetary Policy?” BIS Working Paper No. 242.
- Brzoza-Brzezina, M., T. Chmielewski, and J. Niedzwiedzinska, 2007, “Substitution between Domestic and Foreign Currency Loans in Central Europe: Do Central Banks Matter?” National Bank of Poland Working Paper.
- Capozza, D. R., R. K. Green, and P. H. Hendershott, 1996, “Taxes, Mortgage Borrowing and House Prices,” Wisconsin-Madison CULER Working Paper No. 96-06, University of Wisconsin Center for Urban Land Economic Research.
- Case, K. E., and R. J. Shiller, 2003, “Is There a Bubble in the Housing Market?” *Brookings Papers on Economic Activity* 34 (2), 299–362.
- CGFS (Committee on the Global Financial System), 2010, “Macroprudential Instruments and Frameworks: A Stocktaking of Issues and Experiences,” Report submitted by the Committee on the Global Financial System, CGFS Papers No. 38, Bank for International Settlements, Basel, Switzerland.
- Claessens, S., M. A. Kose, and M. E. Terrones, 2008, “What Happens During Recessions, Crunches and Busts?” IMF Working Paper No. 08/274.

- Claessens, S., G. Dell’Ariccia, D. Igan, and L. Laeven, 2010, “Cross-Country Experiences and Policy Implications from the Global Financial Crisis,” *Economic Policy* 25, 267–293.
- Cremer, H., and F. Gahvari, 1998, “On Optimal Taxation of Housing,” *Journal of Urban Economics* 43 (3), 315–335.
- Crowe, C., G. Dell’Ariccia, D. Igan, and P. Rabanal, 2011, “How to Deal with Real Estate Booms: Lessons from Country Experiences,” (forthcoming) IMF Working Paper.
- De Nicolo, G., G. Dell’Ariccia, L. Laeven, and F. Valencia, 2010, “Monetary Policy and Risk Taking,” IMF Staff Position Note No. 2010/09.
- Duca, J. V., J. Muellbauer, and A. Murphy, 2010, “House Prices and Credit Constraints: Making Sense of the U.S. Experience,” Oxford University Working Paper.
- Dunsky, R. M., and J. R. Follain, 2000, “Tax-Induced Portfolio Reshuffling: The Case of the Mortgage Interest Deduction,” *Real Estate Economics* 28, 683–718.
- Gordy, M. B., and B. Howells, 2006, “Procyclicality in Basel II: Can We Treat the Disease Without Killing the Patient?” *Journal of Financial Intermediation* 15, 395–417.
- Greenspan, A., 2002, “Economic Volatility,” Remarks at a symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, WY, August 30 (available at <http://www.federalreserve.gov/boarddocs/speeches/2002/20020830/#f2>).
- Guiso, L., M. Haliassos, and T. Jappelli, 2003, “Household Stockholding in Europe: Where Do We Stand and Where Do We Go?” *Economic Policy* 18 (36), 123–170.
- Hendershott, P. H., G. Pryce, and M. White, 2003, “Household Leverage and the Deductibility of Home Mortgage Interest: Evidence from U.K. House Purchases,” *Journal of Housing Research* 14, 49–82.
- Herring, R. J. and S. Wachter, 1999, “Real Estate Booms and Banking Busts: An International Perspective,” Center for Financial Institutions Working Papers 99-27, Wharton School Center for Financial Institutions, University of Pennsylvania.
- Igan, D., A. N. Kabundi, F. Nadal-De Simone, M. Pinheiro, and N. T. Tamirisa, 2009, “Three Cycles: Housing, Credit, and Real Activity,” IMF Working Paper No. 09/231.
- Igan, D., and P. Loungani, 2011, “Global Housing Cycles,” (forthcoming) IMF Working Paper.
- IMF, 2006, *World Economic Outlook: Globalization and Inflation* (Chapter 3. How Has Globalization Affected Inflation?), International Monetary Fund, Washington, DC.

- IMF, 2009, *World Economic Outlook: Sustaining the Recovery* (Chapter 3. Lessons for Monetary Policy from Asset Price Fluctuations), International Monetary Fund, Washington, DC.
- IMF, 2010, *World Economic Outlook: Recovery, Risk, and Rebalancing* (Box 1.4. Dismal Prospects for the Real Estate Sector), International Monetary Fund, Washington, DC.
- IMF, 2011, *Global Financial Stability Report* (Chapter 3. Housing Finance and Financial Stability), International Monetary Fund, Washington, DC (forthcoming).
- Kannan, P., P. Rabanal, and A. Scott, 2010, "Monetary Policy and Financial Stability Rules in a Model with House Price Booms," IMF Working Paper No. 09/251.
- Keen, M., A. Klemm, and V. Perry, 2010, "Tax and the Crisis," *Fiscal Studies* 31 (1), 43–79.
- Kiyotaki, N., and J. Moore, 1997, "Credit Cycles," *Journal of Political Economy* 105 (2), 211–248.
- Laeven, L., and G. Majnoni, 2003, "Loan Loss Provisioning and Economic Slowdowns: Too Much, Too Late?" *Journal of Financial Intermediation* 12 (2), 178–197.
- Laeven, L., and F. Valencia, 2010, "Resolution of Banking Crises: The Good, the Bad, and the Ugly," IMF Working Paper No. 10/146.
- Mayer, C., K. Pence, and S. M. Sherlund, 2008, "The Rise in Mortgage Defaults," FRB Finance and Economics Discussion Series No. 2008-59.
- Mishkin, Frederic S., 2011, "How Should Central Banks Respond to Asset-Price Bubbles? The 'Lean' versus 'Clean' Debate after the GFC," RBA Bulletin, June, pp. 59-70.
- Nolan, C., and C. Thoenissen, 2009, "Financial Shocks and the U.S. Business Cycle," *Journal of Monetary Economics* 56 (4), 596–604.
- Piazzesi, M., and M. Schneider, 2009, "Momentum Traders in the Housing Market: Survey Evidence and a Search Model," *American Economic Review* 99 (2), 406–411.
- Reinhart, C. M., and K. S. Rogoff, 2008, "This Time Is Different: A Panoramic View of Eight Centuries of Financial Crises," unpublished manuscript.
- Saurina, J., 2009, "Dynamic Provisioning: The Experience of Spain," Crisis Response Note 7, The World Bank Group.
- Stiglitz, J. E., and A. Weiss, 1981, "Credit Rationing in Markets with Imperfect Information," *American Economic Review* 71 (3), 393–410.

- Taylor, J. B., 1993, "Discretion versus Policy Rules in Practice," *Carnegie-Rochester Conference Series on Public Policy* 39 (1), 195–214.
- Wong, J., L. Fung, T. Fong, and A. Sze, 2004, "Residential Mortgage Default Risk in Hong Kong," Hong Kong Monetary Authority Working Paper.
- Wong, E., T. Fong, K. Li, and H. Choi, 2011, "Loan-to-Value Ratio as a Macroprudential Tool: Hong Kong's Experience and Cross-Country Evidence," Hong Kong Monetary Authority Working Paper No. 01/2011.

Table 1. Booms, Crises, Macroeconomic Performance

Boom	followed by financial crisis	followed by poor performance	followed by financial crisis or poor performance	followed by financial crisis and poor performance	Number of countries
Real estate	53%	77%	87%	43%	30
Credit	67%	78%	93%	52%	27
Real estate but not credit	29%	71%	71%	29%	7
Credit but not real estate	100%	75%	100%	75%	4
Both	61%	78%	91%	48%	23
Neither	27%	18%	45%	0%	11

Notes: The sample consists of 40 countries. The numbers, except in the last column, show the percent of the cases in which a crisis or poor macroeconomic performance happened after a boom was observed (out of the total number of cases where the boom occurred). The last column shows the number of countries in which a boom occurred. A real estate boom exists if the annual real house price appreciation rate during 2000-2006 is above the ad-hoc threshold of 1.5 percent or the annual real house price appreciation rate in the upward phase of the housing cycle prior to the crisis exceeds the country-specific historical annual appreciation rate. A credit boom exists if the growth rate of bank credit to the private sector in percent of GDP is more than the arbitrary cut-off of 20 percent or it exceeds the rate implied by a country-specific, backward-looking, cubic time trend by more than one standard deviation. A financial crisis is a systemic banking crisis as identified in Laeven and Valencia (2010). Poor performance is defined as more than 1 percentage point decline in the real GDP growth rate in 2008-09 compared to the 2003-07 average.

Table 2. Recessions with and without House Price Busts

	without bust	with bust	with severe bust
Duration	3.2	4.5 **	4.6 **
Amplitude	-2.0	-3.2 *	-4.1 **
Cumulative loss	-3.5	-10.4 **	-14.0 *

Source: Reproduced from Table 8 in Claessens et al. (2008).

Notes: The sample includes 21 OECD countries. Mean values are shown. Duration is expressed in quarters. Severe busts are those that are in the top half of all house price bust episodes. * and ** indicate that the difference between means of recessions with house price busts and recessions without house price busts is significant at the 10 percent and 5 percent levels, respectively.

Table 3. Policy Options to Deal with Real Estate Booms

	Potential impact	Side effects	Practical issues
<u>Macroeconomic Policy</u>			
<i>Monetary measures</i>			
Interest rates Reserve requirements	responding to property prices and/or real estate loan growth	potential to prevent booms, less so to stop one that is already in progress	inflict damage to economic activity and welfare
			identifying 'doomed' booms and reacting in time; constraints imposed by monetary regime
<i>Fiscal measures</i>			
Transaction / Capital gains taxes linked to real estate cycles	automatically dampen the boom phase	impair already-slow price discovery process	incentive to avoid by misreporting, barter, folding the tax into the mortgage amount
Property taxes charged on market value	(could) limit price increase and volatility	-	little room for cyclical implementation
Abolition of mortgage interest deductibility	reduce incentives for household leverage and house price appreciation	(potentially) inflict damage on the real estate sector by taking away a sectoral advantage	little room for cyclical implementation
<u>Regulatory Policy</u>			
<i>Macro-prudential measures</i>			
Differentiated capital requirements for real estate loans Higher risk weights on real estate loans	increase cost of real estate borrowing while building buffer to cope with the downturn	costs associated with potential credit rationing	may get too complicated to enforce, especially in a cyclical context; effectiveness also limited when capital ratios are already high
Dynamic provisioning for loans collateralized by real estate	increase cost of real estate borrowing while building buffer to cope with the downturn	earnings management	data requirements and calibration
Limits on mortgage credit growth	(could) limit household leverage and house price appreciation	loss of benefits from financial deepening	move lending outside the regulatory periphery
Limits on exposure to real estate sector	(could) limit leverage and price appreciation as well as sensitivity of banks to certain shocks	costs associated with limiting benefits from specialization	shift lending to newcomers for whom exposure limits do not yet bind or outside the regulatory periphery
Limits on loan-to-value ratio Limits on debt-to-income ratio	(could) limit household leverage and house price appreciation while decreasing probability of default	costs associated with potential credit rationing	calibration is difficult, circumvention is easy

Table 4. Survey-Based Assessment of Policy Frameworks as of September 2010

	Monetary policy		Tax system		Regulatory structure							
	Credit growth explicitly considered?	Property prices explicitly considered?	Transactions tax?	Mortgage interest deductibility?	Restrictions on ...							
					which financial institutions can extend mortgage loans?	type of mortgages?	loan-to-value ratio?	debt-to-income ratio?	mortgage credit growth rate?	real-estate-specific loan loss provisioning?	real-estate-specific risk weights?	full recourse on mortgages?
No	78%	64%	6%	39%	50%	81%	53%	50%	94%	61%	56%	25%
Yes	22%	36%	94%	61%	50%	19%	47%	50%	6%	39%	44%	75%
directly (not through, e.g., the rent component of CPI)	14%	8%										
subject to restrictions			64%	44%								
cyclically-based										11%	11%	

Notes: Compiled responses from 36 countries. The numbers correspond to the proportion of respondents giving a particular answer. Country-by-country responses to this brief in-house survey are in Crowe et al. (2011).

Table 5. Stylized Facts on Policy Responses to Real Estate Booms: Stocktaking

Measure	To address ...	Used in ...	Impact?
<i>Macroeconomic</i>			
Monetary tightening	Rapid credit growth and/or real estate boom	Croatia, Iceland, Latvia, Ukraine; Australia, Israel, Korea, Sweden	Not always effective, capital flows and currency switching risk are major limitations
Maintaining a flexible and consistent foreign exchange policy	Rapid credit growth	Czech Republic, Poland	Foreign-exchange-denominated credit growth slowed down in Poland but not in Romania
Fiscal tightening or removal of incentives for debt financing (e.g., mortgage interest tax relief)	Rapid credit growth and/or real estate boom	Estonia, Netherlands, Poland, United Kingdom; Lithuania, Spain	Limited effect on house prices, slightly more on household leverage
Additional/higher transaction taxes to limit speculative activity	Real estate boom	China, Hong Kong SAR, Singapore	Some effect on transaction activity, but not long lasting
<i>Macroprudential</i>			
Higher/differentiated capital requirements or risk weights by loan type	Rapid credit growth and/or real estate boom	Bulgaria, Croatia, India, Poland, Norway	Not always effective, some side-effects of shifting the risk elsewhere in the system
Tighter/differentiated loan classification and provisioning requirements	Rapid credit growth and/or real estate boom	Bulgaria, Croatia, Greece, Israel, Ukraine	Limited effect
Dynamic provisioning	Resilience to cyclical downturn/bust	China, Colombia, India, Spain, Uruguay	So far so good on bank distress, small or no impact on credit conditions
Tightening eligibility requirements, e.g., limits on loan-to-value ratios	Real estate boom	China, Hong Kong SAR, Korea, Malaysia, Singapore; Sweden	Short-lived effect on prices and mortgage activity

Notes: The table gives a snapshot; it is not meant to be a comprehensive and detailed list of cases where authorities took one or more of the measures listed to address credit/real estate developments. Bolivia and Peru have also put in place a dynamic provisioning framework and Romania had employed a battery of policy measures to address rapid credit growth; yet these countries are not included in the table due to lack of house price data. Dynamic provisioning in China and India is discretionary rather than rules-based. In the entries in the "Used in ..." column, countries following a semicolon implemented the measure under question only in the recent bust phase.

Table 6. Performance of Policy Rules in a DSGE Model

Type of shock:		Productivity	Financial	Both
Original Taylor		8	10	10
Monetary policy	+ reaction to real estate prices	1	5	5
	+ reaction to mortgage credit	3	6	3
	+ reaction to both prices and credit	1	3	3
Fiscal policy	+ constant tax	10	10	9
	+ cyclical tax	7	8	8
	+ both taxes	8	7	7
Macro-prudential policy	+ rule on real estate prices	6	3	6
	+ rule on mortgage credit	4	2	1
	+ rule on both prices and credit	4	1	1

Notes: Policy rules are compared to the original Taylor rule and ranked in terms of their welfare costs under each shock scenario. Rank 1 corresponds to the rule that would deliver the largest welfare improvement and is highlighted. When two rules deliver roughly the same improvement, they are assigned the same rank.

Figure 1. Leverage: Linking Booms to Defaults

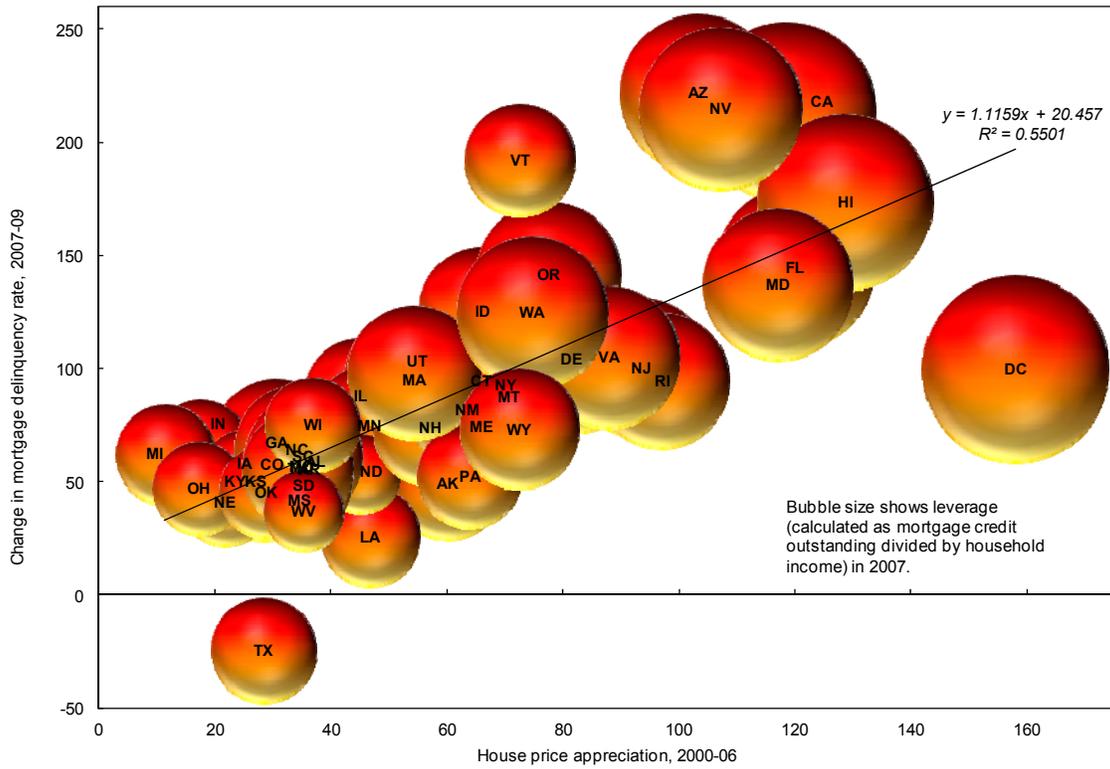


Figure 2. House Price Run-Up and Severity of Crisis

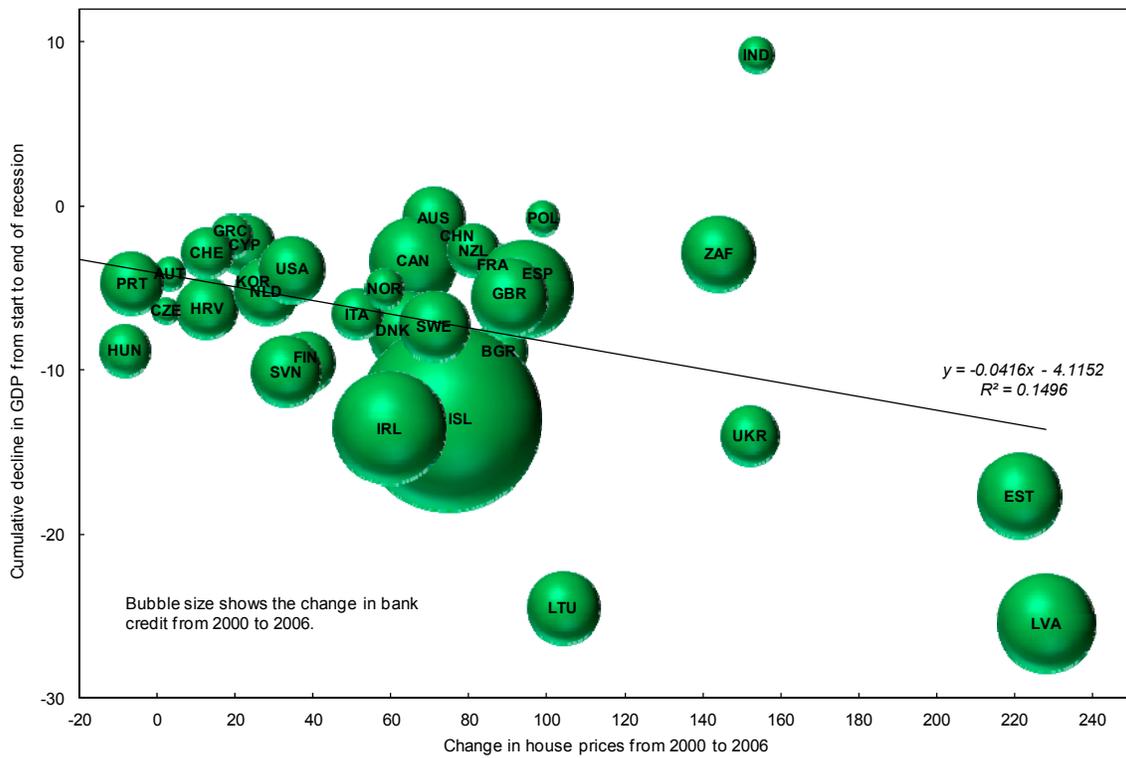
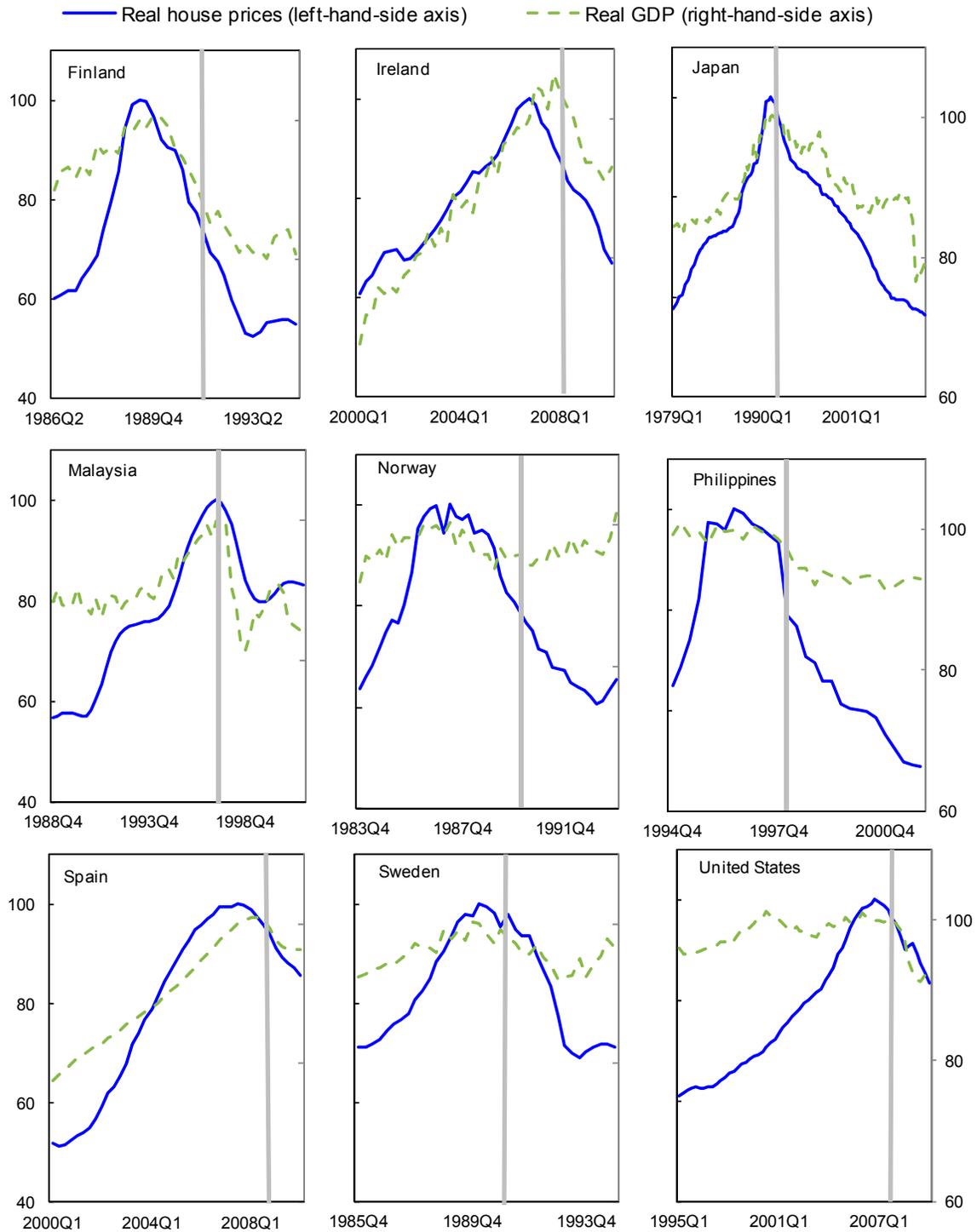


Figure 3. House Price Boom-Busts and Financial Crises: Selected Episodes



Sources: OECD, Global Property Guide; *International Financial Statistics*; IMF staff calculations.
 Notes: Crisis beginning dates, shown by the gray lines, are from the 2003 update of the Caprio-Klingebiel Database (1996, 1999) by Caprio, Klingebiel, Laeven, and Noguera, further complemented in Laeven and Valencia (2010). Real GDP series are detrended.

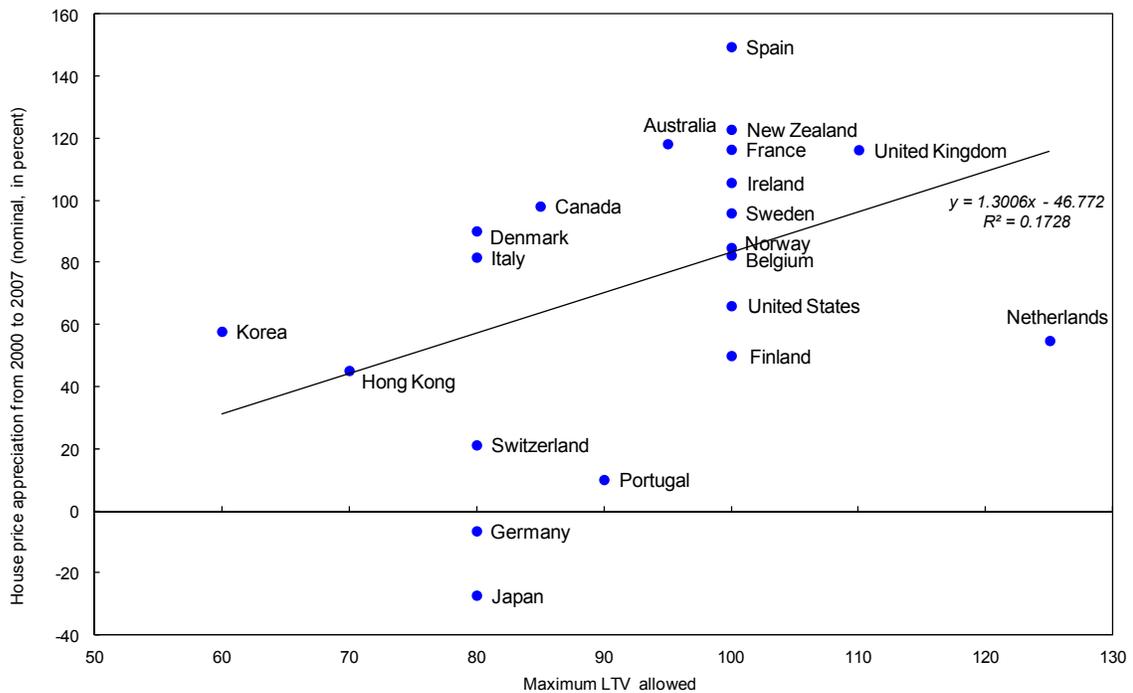
Figure 4. House Price Boom-Busts and Financial Crises: Average Damage



Sources: OECD, Global Property Guide, IMF staff calculations.

Notes: The paths of real house prices and real GDP 8 quarters before and 12 quarters after the house price peak (dated 0) for 12 infamous episodes (Spain in the early 1980s, Australia, Denmark, Finland, Norway, and Sweden in the late 1980s, Japan in the early 1990s, Malaysia and Philippines in the late 1990s, and Ireland, Spain, and the United States in the 2000s) are shown. Crisis dates are from the 2003 update of the Caprio-Klingebiel Database (1996, 1999) by Caprio, Klingebiel, Laeven, and Noguera, further complemented in Laeven and Valencia (2010).

Figure 5. Maximum LTV and House Prices



Sources: BIS, OECD, UNECE, ECLAC, IDB, European Mortgage Federation, International Union for Housing Finance, International Union of Tenants, national statistics, and central bank statistics.

Notes: Maximum LTV allowed refer to new mortgage loans and, in most cases, shows the limits over which additional requirements such as mortgage insurance would apply.

Figure 6. Dealing with Real Estate Booms

