CHAPTER 3

HOUSING FINANCE AND FINANCIAL STABILITY—BACK TO BASICS?

Summary

Housing market booms followed by busts have been associated with financial instability and significant costs to the economy in many countries over the years, reflecting the importance of the housing sector. Still, the degree to which such house price boom-bust episodes have led to more widespread financial instability differs between countries, in part because of important differences in countries' housing finance systems, including the role of government. This chapter analyzes housing finance systems in a number of representative advanced and emerging economies in order to identify factors that enhance the stability of housing finance systems and financial stability more generally. In particular, it examines aspects of housing finance systems in some advanced economies that contributed to financial instability in the recent crisis.

The chapter draws in large part on empirical analyses that confirm that rapid mortgage credit growth and strong house price increases go hand in hand. The analyses also account for the impact of a number of housing finance characteristics on mortgage credit and house prices. In particular, they suggest that government participation in housing finance exacerbated house price swings and amplified mortgage credit growth during the run-up to the recent crisis, particularly in advanced economies. Countries with more government involvement also experienced deeper house price declines. Moreover, higher loan-to-value ratios are significantly associated with higher house price and credit growth over time for advanced economies, in line with other studies. This effect disappears when emerging economies are included in the sample over the most recent period, possibly due to less formal loan limits in these countries, where lending to a large extent still takes place in unregulated sectors.

Based on an evaluation of evidence presented in the chapter, including the empirical analyses, three broad areas of best practices for stable housing finance systems emerge: (1) enhanced risk management, underwriting standards, and supervision; (2) more careful calibration of government participation; and (3) improved alignment of incentives of participants using capital market funding. When discussing these best practices, the chapter also notes additional aspects that need to be considered by policymakers in emerging market countries as they set up their housing finance systems.

Lastly, based on the best practices, the chapter makes specific recommendations for the housing finance system in the United States, where the recent crisis in part had its origins. This system remains unique in many ways and an overhaul is needed. The U.S. administration's recently released housing finance reform proposal is a welcome step. Reform of the U.S. housing finance system should address current gaps in the regulatory, supervisory, and consumer protection frameworks; aim for better defined and more transparent government involvement in the housing market, showing relevant items on the government's budget; reconsider the role of the housing government-sponsored enterprises, with a view to creating a more level playing field in mortgage markets; and encourage "safe" private-label securitization, including by improving the alignment of incentives. Such reforms would have a significant positive effect on the U.S. financial system and would help bolster global financial stability.

In many countries, house price swings have been associated with financial instability. There are several examples of house price booms and busts over the past two decades, including in Sweden in the early 1990s, and in Ireland, Spain, the United Kingdom, and the United States during the current crisis (Figure 3.1). These house price gyrations can carry a significant cost to the economy, reflecting the importance of housing in the construction industry, household budgets, and overall wealth. Still, the degree to which such house price boom-bust episodes have led to more widespread financial instability differs between countries, in part because of important differences in countries' housing finance systems, including the role of government in the housing market.

The recent financial crisis was triggered by problems in the U.S. domestic subprime mortgage markets, where cumulative loss rates of securitized subprime loan portfolios exceeded 20 percent by end-2010. In the wake of the crisis, U.S. housing defaults have accelerated, reaching their highest level since the 1930s, with 11.1 million residential properties (or 23.1 percent of the total) having negative equity mortgages (that is, where the outstanding loan balance is greater than the property value) as of end-2010 (CoreLogic, 2011).

The purpose of this chapter is to bring theoretical concepts and empirical evidence to bear on housing finance systems in a number of representative advanced and emerging economies in order to identify factors conducive to a stable housing finance system and financial stability more generally. In particular, the chapter will examine those aspects of housing finance systems in some advanced economies that have contributed to financial instability, in part through empirical analyses. It will make recommendations on how to mitigate these factors by outlining a number of best practices that emerge from evidence presented in the chapter. The chapter will also discuss the extent to which these best practices might be applicable in emerging economies as they set up their housing finance systems. In doing so, the chapter will not focus on other factors affecting financial stability, nor on other aspects of housing finance such as measures to promote social housing. The concept of housing finance will be interpreted broadly, encompassing not only specific product types and lender structures but also the degree of government participation and the importance of the legal system for a well-functioning mortgage market. The chapter concludes with a number of policy recommendations to encourage more stable housing finance systems in advanced and emerging market economies and some proposals specifically for the reform of housing finance in the United States.

Note: This chapter was written by a team headed by Ann-Margret Westin, and comprised of Dawn Yi Lin Chew, Francesco Columba, Alessandro Gullo, Deniz Igan, Andreas Jobst, John Kiff, Andrea Maechler, Srobona Mitra, and Erlend Nier, with research support from Ivailo Arsov and Yoon Sook Kim.

Housing Booms and Busts—Theory and Stylized Facts

Before examining the effects of housing finance on financial stability, it is useful to review why housing markets have been implicated in many episodes of financial instability. Housing booms and busts are often associated with systemic financial stress. The recent experiences in the United States, Spain, Ireland, and, to a lesser extent, the United Kingdom provide fresh examples of unsustainable housing booms that have turned into busts, with sizable output losses and banking crises in some cases.[1] Reinhart and Rogoff (2009) show that the six major historical episodes of banking crises in advanced economies since the mid-1970s were all associated with a housing bust. They document that this pattern can also be found in many emerging market crises, including the Asian financial crisis of 1997–98, with the magnitude of house price declines being broadly similar in both advanced and emerging market countries.[2]

Given that housing busts weaken household and financial sector balance sheets, housing-linked recessions are, on average, more severe than recessions that are not accompanied by housing busts. Based on 1960–2007 cross-country data from the Organization for Economic Cooperation and Development (OECD), Claessens, Kose, and Terrones (2008) show that output losses in recessions accompanied by hous-

[1]See Crowe and others (2011a), in particular their Figure 3.

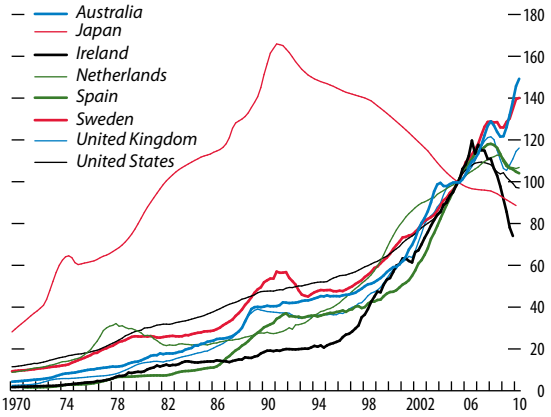
[2]Stresses on the financial system can of course arise from sources other than a housing bust, including sovereign and currency crises, a general deterioration of economic prospects, and regional contagion.

ing busts are two to three times greater than they would otherwise be. Moreover, housing busts tend to prolong recessions (averaging 18 quarters, compared with four quarters for the typical recession), as falling house prices act as a further drag on household consumption and residential investment while putting financial intermediary balance sheets under stress.

Since house purchases typically involve household borrowing, house prices are likely to be strongly driven by credit conditions and household leverage.[3] An influential set of studies (Stein, 1995; Kiyotaki and Moore, 1997) posit that households can borrow only a fixed multiple of their down payment. This assumption of a fixed "leverage ratio" implies an "accelerator" mechanism, where a positive or negative shock to income (or net worth) is amplified by an expansion, or contraction, in borrowing capacity, in turn influencing house prices. Positive shocks to household income translate into larger house price increases where prevailing leverage ratios are higher (e.g., in the United Kingdom), and smaller increases in countries where such leverage ratios are lower (e.g., in Italy).[4]

Leverage—and lending standards more broadly—can evolve in a procyclical fashion, resulting in powerful swings in house prices (Geanakoplos, 2010). Relaxing lending standards in good times drives up both credit and house price growth while a tightening of standards puts downward pressure on house prices. A number of studies of the recent housing boom in the United States show that rapid growth in credit to prime and subprime borrowers was associated with a sharp deterioration in lending standards that in turn fueled house price appreciation.[5]

Figure 3.1. House Price Indices
(2005 = 100)



Source: Organization for Economic Cooperation and Development.
Note: Nominal house prices.

[3]As documented in a large body of previous empirical literature, in addition to credit, house prices are strongly driven by fundamentals such as income and population growth. Parts of the theoretical literature stress nonfinancial frictions, such as overly optimistic (adaptive) expectations on both the demand and supply side as additional forces that can drive prices away from fundamentals (Shiller, 2008; McCue and Belsky, 2007; Burnside, Eichenbaum, and Rebelo, 2011).

[4]Existing evidence confirms the presence of such a mechanism both within the United States and across the OECD (Lamont and Stein, 1999; Almeida, Campello, and Liu, 2005).

[5]See Favara and Imbs (2009); Dell'Ariccia, Igan, and Laeven (2008); Geanakoplos (2010); and Mian and Sufi (2009a). U.S. subprime mortgage originations almost tripled over 2000–06, reaching $600 billion or 20 percent of all mortgage origina-

When the housing cycle turns, often triggered by a shock to expectations, and as house prices begin to fall, high existing leverage can further increase the severity of the housing bust through three main channels.[6]

- First, when house prices fall and lending standards for new loans tighten, homeowners with low or negative equity mortgages are unable to refinance and will increasingly be driven to—or will choose to—default on their loans. A default reduces a borrower's credit standing, making it difficult for the borrower to become eligible for a new mortgage and removing the household from the pool of potential buyers of homes, thus further depressing prices.[7,8]
- Second, following a borrower default, lenders will sell the property, leading to further price declines, especially when potential buyers are constrained by the tight lending standards that prevail in falling markets.[9]
- Third, homeowners with negative equity mortgages have reduced incentives to maintain their property, because the increase in value is likely to accrue to the lender if the probability of eventual default and foreclosure is high.

A housing bust can put considerable financial stress on financial intermediaries engaged in providing mortgage credit, affecting both their solvency and liquidity. High rates of default on mortgages reduce profitability and deplete available capital cushions, especially when recovery values achieved through foreclosure are lower than expected. Moreover, the bust can squeeze funding liquidity. For example:

- In the run-up to the recent crisis, large U.S. commercial and investment banks met a significant part of their funding needs through repurchase contracts of securitized mortgage assets held on their balance sheets. When the crisis materialized, the required margin (or haircut) on these contracts increased sharply, putting a squeeze on the banks' liquidity positions (Geanakoplos, 2010).
- Meanwhile, Irish banks met their funding needs mostly through deposits or unsecured wholesale funding, following a pattern that can be found in a number of housing bust episodes in various countries. Some of these funding sources can quickly dry up if the solvency of the lenders becomes increasingly uncertain.

Financial stress on lenders can lead to a contraction of mortgage credit and credit more broadly, adversely affecting both household consumption and business investment. In extreme cases, stresses on intermediary balance sheets can lead to a systemic financial crisis involving both a credit crunch and widespread failures of lenders.

Empirical evidence points to three underlying factors that have been associated with both housing busts and banking crises and that are particularly significant because of their impact on both the supply of credit and financial sector vulnerabilities in the run-up to the crisis:

- Excessive competition and aggressive lending, often in the wake of financial sector deregulation that prompts financial intermediaries to compete for market share by relaxing lending standards (seen in previous crises in Asia, including Japan, and in the Nordic countries, and in some OECD countries, including the United States, during the current crisis);[10]

tions in 2006. During this time, the required down payment on U.S. subprime mortgages gradually decreased, reaching a low of 2.7 percent in mid-2006, as house prices peaked.

[6]A shock to expectations can affect credit conditions, in turn precipitating the bust. For instance, according to Geanakoplos (2010), unexpectedly high default rates on subprime loans starting in 2007 constituted "scary bad news" that led to a repricing of risk, a tightening of loan terms, and a reduced supply of credit, in turn dragging down house prices.

[7]Mian and Sufi (2009b) document a tight relationship between the increase in the household debt-to-income ratio across 450 U.S. counties in the run-up to the crisis and subsequent increases in default rates and declines in house prices.

[8]An effective court-supervised personal bankruptcy framework, providing for collective enforcement of creditor rights and rehabilitation of debtors, can be a useful tool when multiple creditors are present. In the event of a widespread scenario of distressed household debt, such a framework may have to be complemented with more comprehensive government-sponsored debt restructuring programs. In designing such frameworks, it is essential to set up proper incentives and take into account the perspectives of both borrowers and creditors, also to mitigate any risks of moral hazard deriving from loan restructurings (Laeven and Laryea, 2009).

[9]There is strong evidence from the United States that foreclosures depress house prices and that this effect is much larger during the housing downturn than during the boom (Lin, Rosenblatt, and Yao, 2009).

[10]See Favara and Imbs (2009) and Dell'Ariccia, Igan, and Laeven (2008) for the U.S. prime and subprime mortgage segments, respectively, and Merrouche and Nier (2010) for evidence across the OECD.

- Capital inflows that sustain the supply of credit to households while leading to vulnerable funding for mortgage lenders and borrowers (seen in previous crises in Asia and the Nordic countries; and in many advanced and emerging economies during the current crisis);[11]
- An extended period of low monetary policy rates, as the reversal of this accommodative stance can lead to liquidity problems for households and lenders (seen in the U.S. savings and loan crisis and in the Japanese housing bubble of the 1980s). In the current crisis, the evidence on the role of monetary policy appears more mixed.[12]

Lastly, it is important to note that not all housing busts end in a financial crisis. There are examples of severe housing busts that left the financial sector largely unscathed (e.g., in Hong Kong SAR in the 1990s) (Crowe and others, 2011b). Whether a banking crisis emerges as a result of a housing bust may depend on whether the housing boom was the result of a deterioration of lending standards, the degree of leverage, or whether solvency and liquidity buffers are strong enough to sustain the financial system through the bust.[13]

Global Housing Finance Landscape

Housing finance systems differ considerably across countries along a number of dimensions, including product diversity, type of lender, mortgage funding, and the degree of government participation. Some of today's systems are the result of accident or history. Examples are the launch of the current Danish mortgage lending system after the great fire of Copenhagen in 1795, which spurred the need for an organized mortgage credit market to quickly provide funding to build a large number of new buildings (see Box 3.1); and the German *Pfandbriefe* (covered bond) system, which dates to 1769 and was heavily influenced by the aftermath of the Seven Years' War. In response to the latest crisis, a number of countries have also taken steps to further strengthen their mortgage market regulations (Table 3.1).

There is more diversity in the products offered in advanced economies (Table 3.2), which may reflect lenders' ability to hedge the related exposures and the broader range of funding opportunities. Housing finance systems in emerging and newly industrialized economies (ENIEs) have started to evolve only recently (Tables 3.3 and 3.4).[14] In some cases, they were spurred by deregulation: for example, capital account liberalization allowed the entry of advanced-economy financial institutions, while growing urbanization and changes in property ownership rules increased the demand for housing.

An efficient mortgage market relies on a number of fundamental legal underpinnings (Box 3.2). Among advanced economies, the key determinants of the market depth of housing finance are collateral and bankruptcy laws that define the legal rights of borrowers and lenders (Warnock and Warnock, 2008). The efficiency of the legal system may have an impact on borrowing costs and on the costs of financing for capital market products backed by mortgages. One important element relates to the costs, duration, and effectiveness of the enforcement and foreclosure process in the event a borrower defaults. Excessively long and costly enforcement and forced sale procedures may create uncertainties for lenders and investors. Information should be tracked through credit registries, allowing lenders to gauge default probabilities. Detailed information on housing transactions, including prices, should be available. This

[11]See Aizenman and Jinjarak (2009) for evidence on advanced and emerging economies, and the IMF (2010c) for emerging Europe. Merrouche and Nier (2010) find that the impact of capital inflows on the buildup of financial imbalances is attenuated where the supervisory environment is strong.

[12]Maddaloni and Peydro (2010) show that low policy rates led to a relaxation of lending standards for euro area banks over 2002–08. However, IMF (2009b) and Merrouche and Nier (2010) find no evidence that differences in the path of monetary policy across the euro area or wider OECD had an effect on household indebtedness or house prices between 1999 and 2007. For the United States, Del Negro and Otrok (2007) find that the effect of policy rates on house prices was small in comparison with the total magnitude of U.S. house price fluctuations over 1986–2005.

[13]Dynamic provisioning, as operated in Spain since 2000, is an example of such a buffer (Crowe and others, 2011b).

[14]This group of countries includes emerging Europe (including the Czech Republic, since its reclassification as an "advanced economy" was more recent than the period examined), Latin America, emerging Asia, and newly industrialized Asian economies (Hong Kong SAR, South Korea, Singapore, and Taiwan Province of China, also classified as "advanced" for *World Economic Outlook* purposes), and South Africa.

Table 3.1. Crisis Measures

Economy	Year	Measures
Brazil	2009	Banco do Brazil and the Federal Economic Fund to grant real estate loans at below-market rates; launch of a housing (Minha casa minha vida) subsidy program.
Canada	Mid-2008 to April 2011	Reduced maximum amortization periods (30 years from 35 years) for new government-backed insured mortgages with loan-to-value (LTV) more than 80 percent), increase in minimum down-payment (with insurance) from 0 to 5 percent. Tightened mortgage insurance rules in 2008, 2010, and 2011, requiring, among other things, all borrowers, regardless of choice of mortgage product, to qualify for a standard five-year fixed-rate mortgage, and reducing the maximum LTV ratio to 85 percent when refinancing. Require borrowers with variable rate loans or fixed for less than five years to be qualified at the average major lender-posted five-year rate. Withdraw government insurance backing on lines of credit secured by homes, such as home equity lines of credit.
Chile	2009	New subsidies to middle-income housing sectors; enhanced coverage for housing foreclosure insurance; increasing the LTV of state-subsidized housing to 90 percent; government will facilitate the use of negotiable mortgage-backed loans for house purchases and authorize the social security agencies to issue them.
China	Late 2009 to end-2010	Reduce tax incentives; tightening eligibility criteria for land-development projects; requiring state-owned enterprises to exit land and property development business if not already core; banning banks from extending loans to speculators; increasing down-payment requirements; and increasing interest rates.
Finland	2010	Recommendations for maximum amortization period of 25 years for mortgage affordability calculations and LTV limit of 90 percent.
Hong Kong SAR	September 2009 to end-2010	Lowering maximum LTV to 60–70 percent (depending on property value); LTV limit of 50 percent for non-owner occupied; standardizing debt-service-to-income (DTI) limits to 50 percent; insurance denied for LTVs>90 percent (from 95 percent).
Hungary	2009–10	General interest subsidies for housing replaced by a special mortgage program aimed at young families; LTV limit of 75 percent for all mortgage and long-term consumer loans in forint; modification in banks' scoring system for approval of household loans; funding by covered bonds restricted to an LTV limit of 70 percent. In June 2010, there was a ban on registering collateral for foreign-currency mortgage loans.
India	November 2010	LTV limited to 80 percent for residential loans; increase in risk-weights of housing loans (above 7.5 million rupees) to 125 percent; increase loan-provisioning for housing with "teaser rates" to 2 percent.
Ireland	2009	Introduced Code of Conduct on Mortgage Arrears for all regulated mortgage lenders; subsequently revised in 2010 to include more detailed requirements for lenders when dealing with borrowers experiencing arrears and financial difficulties.
Israel	May-October 2010	Guidelines to require banks to raise provisions by 0.75% for mortgages with LTV above 60%; higher risk-weights for highly levered floating interest mortgages.
Malaysia	March 2009 to November 2010	Mortgage-interest tax relief (up to a limit) for 3 years and deferred loan payments for retrenched home-owners for 1 year as crisis-stimulus; capital gains tax reinstated for properties sold within 5 years; LTV on third-homes limited to 70 percent.
Mexico	2009	Rules for constituting "niche banks" published in Nov. 2009, which will help specialized nonbank intermediaries to convert to niche banks. Changes also planned in the regulation of *sofoles*. A regulatory framework for covered bonds is about to be introduced to support long-term bank financing to the housing sector. The regulatory framework for asset-backed securities has been strengthened, through a mandatory requirement for issuers to maintain a subordinated bond as a percentage of total issuance; enhanced information and analytical tools available to investors; and increased requirements on trustees and portfolio administrators.
Netherlands	2010–11	New standards to prevent granting disproportionately large mortgage loans. The income and capacity to pay of the borrower have to be better accounted for, the loan-to-income ratios are stricter, and the LTV ratio cannot exceed 110 percent, with 50 percent of the loan being redeemed within 30 years.
Norway	2010	Residential mortgage guidelines on ability to pay and LTV limit of 90 percent.
Poland	2007 to January 2011	Mortgage interest-tax deductibility abolished; "Recommendation S" with tightened borrower-eligibility on foreign-currency mortgage loans, with lower cap on debt-service-to-income ratio.
Singapore	February 2010 to January 2011	Seller's stamp duty on property sold within a year introduced; LTV limit reduced from 90 to 80 percent (60 percent for second and subsequent mortgages granted by FIs regulated by the MAS); increasing housing grants to lower-income households; lengthening the minimum occupancy period for nonsubsidized flats; raising the seller's stamp duty rates to 16 percent if sold within a year, 4 percent if sold in the 4th year.
South Korea	July 2009 to August 2010	Lower LTV limits on non-speculative (in addition to the previous speculative) mortgages; tightened DTI limits. In 2010, temporary suspension of the DTI ratio cap for people who own at most one home; waiver period on transaction taxes for owners of multiple properties; and support for low-income homeowners, renters and the construction sector.
Spain	2007–10	Reduction of fees for changes in mortgage conditions; increase in public guarantees for certain mortgage securitizations; temporarily deferred loan payments for unemployed; strengthening in credit institutions' provisions for nonperforming loans.
Sweden	October 2010	Maximum LTV limit of 85 percent established by a Financial Supervisory Authority guideline.
Thailand	2009 to November 2010	LTV relaxed from 70 to 80 percent; risk-weights on LTV higher than 80 percent increased to 75 percent; relaxation of LTV limits for certain types of dwellings.
United Kingdom	2009 to January 2011	Contemplating tightened mortgage regulations, laying out a number of proposals in its 2009 Mortgage Market Review Discussion Paper, followed by two 2010 consultation papers on responsible lending, focusing on enhancing borrower affordability assessment, and improving the distribution and disclosure process, respectively. The UK government announced a package of measures to enhance consumer protection in the mortgage market. Notably, the FSA is given responsibility for the whole residential mortgage market, transferring some regulatory responsibilities from the office of fair trading.
United States	2008–10	From a supervisory perspective, tightened real estate evaluation and appraisal guidelines, enhanced disclosures for home mortgage transactions, and implemented registration requirements for mortgage loan originators; adopted policy supporting prudent commercial real estate loan workouts; and created an independent Consumer Financial Protection Bureau. From a housing support perspective, expanded scope of Community Reinvestment Act regulation to support communities affected by high foreclosure levels; and introduced programs to promote sustainable loan modifications. The Federal Reserve also purchased $1.25 trillion of agency MBS to reduce the cost and increase the availability of mortgage credit. From a financial stability perspective, injected capital and placed Fannie Mae and Freddie Mac in conservatorship.

Sources: Canada Mortgage and Housing Corporation (2010); Central Bank of Ireland (2010); Crowe and others (2011b); ECLAC (2010); EC (2007); European Mortgage Federation (2010); www.federalreserve.gov/; Finance Canada (2010); FSA (2009, 2010a, b); FIN-FSA (2010); Finansinspektionen (2010); Finanstilsynet (2010); Hong Kong Monetary Authority (2010a and b); Lea (2010b); Netherlands Authority for the Financial Markets (2010); www.hm-treasury.gov.uk/press_06_11.htm.

Table 3.2. Housing Finance Features in Advanced Economies, 2008

		Mortgage Funding			Mortgage Loan Features			
Economy	Main Lenders[1]	Deposits/Other	Covered Bonds/ Residential Loans Ratio (percent)	Residential Mortgage-Backed Securities/ Residential Loans Ratio (percent)	Predominant Interest Rate Type	Maximum LTV on New Loans[2]	Typical Loan Term (years)	Prepayment Penalties[3]
Australia	Bank and nonbank specialist "mortgage originators"; building societies and credit unions; mortgage brokers (30 percent)	Mainly, plus wholesale funds		16.7	Variable	90–100	25	Change in cost of funds
Austria	Banks and Bausparkassen (mainly savings banks)	Mainly	7.0	3.1	Fixed	80	25–30	
Belgium	Banks	Mainly		29.9	Fixed	100	20	
Canada	Banks and specialized nondepository and mortgage brokers (31 percent)	Mainly (banks); securitization (nonbanks)	1.0	31.0	Mixed	80 [95]	25–35	Higher of lost interest or three months, beyond a pre-specified penalty-free limit
Denmark	Mortgage and retails banks		114.7	0.1	Mixed	80	30	Yield maintenance on short-term fixed with noncallable bonds
France	Mortgage and retails banks	Mainly (banks)	22.5	1.8	Fixed	100	15–20	Maximum six months interest or 3 percent of outstanding balance
Germany	Banks and Bausparkassen (mainly savings banks)	Mainly	19.0	1.8	Fixed	80	20–30	Interest margin damage and reinvestment loss on fixed rate
Ireland	Banks and building societies and mortgage brokers	Mainly (banks)	15.6	29.6	Variable	100+	21–35	
Italy	Banks	Mainly	2.1	30.8	Mixed	80	20	
Japan	Banks and specialized mortgage institutions	Mainly		4.0	Mixed	70–80	20–30	None
Netherlands	Banks and mortgage banks and brokers (60 percent)	Mainly	3.6	30.8	Fixed	125	30	Yield maintenance on fixed rate
Portugal	Banks	Mainly, plus wholesale funds	14.5	27.3	Variable	90	25–35	
Spain	Banks (commercial and savings) and mortgage brokers (55 percent)	Some, plus covered bonds and securitization	45.6	24.1	Variable	100	30	2.5 percent up to yield maintenance on fixed rate; 0.5 percent on variable rate
Sweden	Bank and mortgage institutions	Some, plus covered bonds	53.7	0.3	Variable	80–95	30–45	
United Kingdom	Banks and building societies and mortgage brokers (60 percent)	Mainly	14.0	31.2	Variable	110	25	2–5 percent of amount repaid
United States	Banks and mortgage brokers (68 percent 2004; 10 percent 2010)	Mainly securitization	0.1	64.1	Fixed	100+	30	Up to 5 percent on ARMs only

Sources: Housing Finance Network; Lea (2010b); Crowe and others (2011b); Warnock and Warnock (2008); European Mortgage Federation; Federal Reserve Board; Reserve Bank of Australia; Bank of Canada; European Securitization Forum; European Central Bank (2009).

[1]Banks include commercial and savings banks.

[2]Maximum with insurance or for covered bonds in brackets; average for Japan and Sweden.

[3]ARM = adjustable rate mortgages; LTV = loan to value. There is complete waiver in certain circumstances, for instance, if the property is sold (Germany), hardship or relocation of the borrower (Netherlands), or the borrower is unemployed (France).

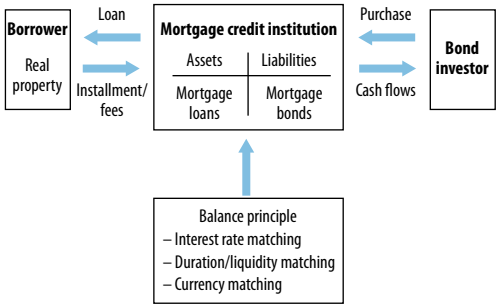
Box 3.1. The Danish "Balance Principle" Mortgage Model[1]

Denmark has a sophisticated housing finance system with a unique arrangement of asset-liability matching that has helped maintain mortgage market stability over the last two centuries.[2] The system, which relies on mortgage financing via covered bonds, underwent a regulatory overhaul in 2007 following the adoption by the European Union of the Capital Requirements Directive a year earlier. This box focuses on the market structure, products, and risk management practices prior to this overhaul. It also briefly describes the main changes under the new regulatory regime.

Danish mortgage banks are specialized lenders restricted to conducting narrowly defined mortgage credit activities. They originate and service mortgage loans and fund themselves through the issuance of mortgage bonds (including, since 2007, covered mortgage bonds, as discussed below). The mortgage bank adds a small margin, typically 50 basis points, to cover administrative costs, credit risk, and profit. The mortgage loan remains on the balance sheet of the mortgage bank throughout the loan term. The risk assumed by the mortgage banks is largely limited to credit risk, which is mitigated by strict loan underwriting criteria, including a maximum loan-to-value ratio of 80 percent. Market risk, including prepayment risk, is passed on to the bond investors, typically pension funds and commercial banks. Long-term fixed-rate bonds are callable by the bank at par in the event of prepayments. To fund mortgages with shorter-term resets, such as those with adjustable rates, various other configurations are available.

Under the strict balance principle, each new mortgage loan is in principle funded by the issuance of new mortgage bonds of equal size and identical cash flow and maturity characteristics. The traditionally dominant product in the Danish market—the 30-year, fixed-rate, callable annuity loan funded by a pass-through callable mortgage bond—is the prototype product associated with this balance principle. Starting in the mid-1990s, bullet mortgage bonds, having a shorter maturity than the associated adjustable-rate loans, came to dominate the market, with bonds being rolled over at the time interest rates are reset. In either case, proceeds from the sale of the bonds are passed to the borrower to purchase the property, and the interest and principal payments are passed to the investors holding the mortgage bonds (see figure). Bonds are issued on an ongoing basis by the mortgage bank in individual series backed by a specific pool of loans, resulting in large and liquid tradable bond issues. The functioning and liquidity of the secondary mortgage market has been facilitated by internal market-making agreements by Danish mortgage banks (prior to 2008), and the acceptance by banks of mortgage bonds issued by other banks when a borrower seeks to prepay the loan by delivering the bond, as discussed further below.

The Balance Principle



A distinctive feature of the Danish mortgage market is that borrowers can have the right to prepay their mortgage at any time at the lower of par value or the prevailing market price of the relevant mortgage bonds. For example, suppose that a homeowner takes out a DKr 200,000 30-year mortgage at 5 percent. Suppose that one year later the house must be sold and the mortgage prepaid. By then the outstanding balance would be about DKr 198,000. However, if interest rates had increased by 100 basis points, the homeowner would be able to pay it down for only about DKr 175,000. On the other hand, if rates had

Note: This box was prepared by Ann-Margret Westin with contributions from Jay Surti.

[1]This box draws on Danske Markets (2010); Frankel and others (2004); IMF (2007); and Realkreditrådet (2010).

[2]As a testament to the robustness of the Danish mortgage system, since its inception more than 200 years ago, all investors in Danish mortgage bonds have been paid in full.

decreased, the loan would be prepaid at par (that is, DKr 198,000). In the first case, the bank buys (puts) back the related mortgage bond in the market, and in the latter case the bank sells (calls) the bond. In both cases the bank's asset-liability balance is maintained.

The Danish mortgage market has changed somewhat since covered bond legislation came into force in 2007, bringing Danish markets in line with the covered bond provisions of the new Basel II-based EU Capital Requirements Directive. Since the introduction of the new framework, under which universal banks can also issue covered bonds alongside the established specialized mortgage banks, most of the new mortgage loan financing has been done through the issuance of covered (mortgage) bonds, against which regulatory capital requirements are less than on traditional mortgage bonds.[3] The 2007 legislation allows covered (mortgage) bonds to be issued under a general balance principle, which does not require strict cash flow matching. So far, two of the five biggest mortgage banks have opted to follow the general principle rather than the strict balance principle to take advantage of its flexibility. The new legislation also requires that loan-to-value thresholds apply on a continuous basis for the loans in the pool for the covered bonds and not only at the time of loan origination, as was the case before.

[3] While universal banks can issue covered bonds (*særligt dækkede obligationer*) to finance mortgages, only mortgage banks can issue covered mortgage bonds (*særligt dækkede realkreditobligationer*). In practice, however, there is little difference apart from differences in how universal banks and mortgage banks calculate capital adequacy requirements. Traditional mortgage bonds (*realkreditobligationer*) issued after December 31, 2007, are not compliant with the covered bond criteria in the EU Capital Requirements Directive.

helps appraisers value prospective house purchases for interested parties and allows lenders to keep track of the value of their collateral.

Mortgage Loan Characteristics Vary across Countries

Although the maturity of mortgage loans is typically 20 to 30 years, fixing mortgage interest rates for more than five years is rare. The U.S. mortgage market is unusual because of the prevalence of long-term fixed-rate mortgages with interest rates fixed for 30 years and their funding through residential securitization (see below). This may be a reflection of the influential role played by Fannie Mae and Freddie Mac, the two large U.S. housing government-sponsored enterprises (GSEs), and the existence of deep hedging markets for long-term interest-rate risk. Inflation-indexed interest rates are widely used in many ENIEs (particularly in Latin America) because of those countries' historically high and volatile domestic interest rates. The influx of cheap foreign funds into emerging Europe, especially during 2004–07, encouraged the use of interest rates indexed to foreign currency (mainly the euro, Swiss franc, and Japanese yen), with mortgages often denominated in these currencies.

Most countries have some form of prepayment penalties (Table 3.2). Prepayment penalties are designed to compensate the lender for reinvestment risk and for the cost of processing the repayment. In some countries, penalties have a stipulated maximum (e.g., in Canada, France, Italy, and Spain), and they are sometimes restricted to certain conditions (e.g., in Germany, if the borrower is moving out or if the lender refuses a request to increase the mortgage) (Lea, 2010b). Basically only the United States has no prepayment penalties for fixed-rate mortgages. In Japan, whether a penalty is required or not depends on each contract. Penalty-free prepayments are also allowed in Denmark, where the system relies on the so-called "balance principle"—that is, the terms of the loan are matched by the terms of the mortgage bond that funds it, allowing an unwinding of the funding side without rollover risk for the lender (Box 3.1).

Table 3.3. Housing Finance Systems in Emerging and Newly Industrialized Economies, 2008

		Mortgage Funding			
Economy	Main lenders	Deposits ("fx" if foreign currency funding is used and foreign currency loans granted)	Covered Bonds/ Residential Loans Ratio (percent)	Residential Mortgage-Backed Securities/Residential Loans Ratio (percent)	Notes
Brazil	Banks and nondepository mortgage companies and government housing companies	Largely (through housing finance schemes, directly and indirectly owned by government)			Two housing finance systems operate alongside each other: the Sistema Financeiro de Habitação and the Sistema de Financiamento Imobiliário. Only less than 50 per cent of property purchases were financed with mortgages.Under SFH regulations, banks are required to direct 65 percent of savings deposits balances into real estate lending. A goverment-owned bank has 75 percent share of the housing credit market.
Chile	Banks and mortgage administrators of insurance companies	Depends upon product		2.0	With a share of 58.7 percent, Hipotecarios No Endosables is by far the most important mortgage instrument-as its flexible terms enjoy growing popularity with banks and borrowers. These mortgages are mainly financed with issuances of long-term senior and subordinated corporate bonds.
China	Banks	Largely			The five large commercial banks, all of which are mostly state-owned, have the largest share.
Croatia	Banks (95 percent) and Bausparkassen	Largely(fx) plus parent bank funds			
Czech Republic[1]	Banks and Bausparkassen (33 percent)	Largely	50.6		Revenue interest from mortgage covered bond tax exempt until 2008.
Hungary	Banks (>50 percent), Mortgage banks (38 percent) and Bausparkassen (5 percent)	About half, fx	45.5		Since the crisis, covered bond funding has been restricted to low-LTV loans; and reduced incentives for foreign exchange mortgages.
India	Banks and housing finance companies	Deposits and capital markets, refinancing from National Housing Board		<1.0	Financing through the organized sector continues to account only for less than 30 percent of the total housing investment in India. Working to establish Mortgage Credit Guarantee Company which is intended to offer mortgage insurance services. HDFC Ltd., a special-purpose vehicle of the National Housing Board, issued its first mortgage-backed security in August 2000.
Indonesia	Banks	Mainly			Only a part (according to estimates 20–25 percent) of the total housing demand is financed by the mortgage sector. State-owned financial institution has the largest share.
Malaysia	Banks and Treasury Housing Loan Division	Some plus refinancing through Cagamas plus unsecured debt		4.0	Treasury Housing Loan Division (12 percent) which provides (subsidized) housing loans to government employees only; Employees' Provident Fund, early withdrawal for house ownership; Cagamas are government-promoted secondary mortgage liquidity facilities, are not involved in origination but only in refinancing. Loans sold to Cagamas are not off balance sheet. Malaysia has issued staff housing loan receivables via Cagamas, to further develop the asset backed securities market.
Mexico	Banks, nondepository SOFOLES, housing funds (INFONAVIT and FOVISSSTE, 51 percent)	Largely		10.0	INFONAVIT/FOVISSSTE (funds for housing for workers) loans carry an implicit subsidy; and the "Esta es tu casa" program which offers upfront subsidies for low-income households willing to buy property. The government offers indirect subsidies to the housing market by explicitly guaranteeing obligations of the Sociedad Hipotecaria Federal (SHF), a government housing finance agency. The SHF supports the market for residential mortgage-backed securities (RMBS) by offering mortgage insurance, financial guarantees and by assuring the liquidity of the market but it does not issue RMBS itself.

Table 3.3 *(continued)*

Economy	Main lenders	Mortgage Funding: Deposits ("fx" if foreign currency funding is used and foreign currency loans granted)	Mortgage Funding: Covered Bonds/ Residential Loans Ratio (percent)	Mortgage Funding: Residential Mortgage-Backed Securities/Residential Loans Ratio (percent)	Notes
Poland	Universal banks (the three largest players at end 2008 had a market share of about 35 percent for new mortgages).	Largely, fx	1.0		The share of foreign-currency mortgage lending declined to 30 percent in 2010 from 70 percent in the pre-crisis period.
Russia	Banks and mortgage banks and cooperatives	Nonbanks mainly deposits; banks other means refinancing through AHML, securitization, mortgage certificates and debt obligations.	18.2	0.1	The central bank estimates that only 10–15 percent of the real estate in Russia is bought using bank loans. In 2009: tax rebate increased for purchasing and building residential property; goverment support through grants and guarantees to the government-owned AHML, a mortgage liquidity facility.
Singapore	Banks and Housing Development Board				State-owned Housing Development Board has the largest share.
South Africa	Banks and specialized mortgage institutions, including government agencies	Mainly (including wholesale deposits from pension funds and insurance companies)			The National Housing Finance Corporation provides wholesale financing to financial intermediaries and lends directly to low-and medium income individuals. The Rural Housing Loan Fund lends to intermediary housing lenders who, in turn, lend to individual low-income earners.
South Korea	Banks (80 percent) and nonbanks and finance companies				Korea National Housing Corporation (KNHC) provides low-income public (rental) housing plus for sale; nonbanks offer bullet loans; foreign-bank sponsored lenders provide higher-LTV and low-interest loans to bypass regulations on domestic banks; since the 2008–09 crisis, regulators are shifting from LTV-driven standards to DTI driven ones. The government-sponsored Korea Mortgage Corporation (KoMoCo) issued several MBS collateralized by mortgage exposures, whose origination is subsidized by government funds.
Taiwan Province of China	Banks	Mainly			
Thailand	Banks and housing finance agencies	Mainly; also government-backed bonds	Low		State-owned financial institution has the largest share.

Sources: European Mortgage Federation; Housing Finance Network; Merrill Lynch Guide to Emerging Mortgage and Consumer-Credit Markets, Vol. 1.
Note: LTV = loan-to-value ratio; AHML = Agency for Housing Mortgage Lending.
[1]The Czech Republic has been reclassified as an advanced economy; it was an emerging economy during the pre-crisis years.

Loan-to-value (LTV) ratios on new loans vary widely across and within countries (Tables 3.2 and 3.4; and Box 3.3). For example, the average LTV ratio in Brazil ranges from 80 to 100 percent; in South Korea, the LTV range limit for covered bonds is substantially lower than that for insured mortgage loans (Table 3.4).[15] Average LTV ratios for new loans are not necessarily representative—for example, while the average LTV ratio in the United States was 76 percent in the years before the crisis, loans with LTV ratios above 100 percent were also widely available. Official LTV ratios are not informative in some ENIEs, where a majority of mortgage loans are originated in the unregulated sectors.[16] Some countries rely on regulatory LTV ceilings. However, such limits apply only to certain parts of their financial system, leaving room for regulatory arbitrage.

[15]See the section below on mortgage funding for a description of covered bonds.

[16]Lenders in the unregulated sector are neither regulated nor official credit-granting institutions.

Table 3.4. Mortgage Market Characteristics in Emerging and Newly Industrialized Economies, 2008

	Government Support							Interest Rate Type	Loan-to-Value Ratio (LTV)			
Economy	Subsidies to First-Time Buyers Up Front	Subsidies to Buyers through Savings Account Contributions	Subsidies to Selected Groups, Low-Income	Provident Funds Early Withdrawal for Housing Purposes	Housing Finance Funds, Govt. Agency Providing Guarantees, Loans	Tax Deductibility of Mortgage Interest	Capital Gains Tax Deductibility	Majority of the Contracts	Maximum Allowed with Mortgage Insurance	Average	Observed Maximum[1]	For Covered Bonds
Brazil	Yes	Yes	Yes	Yes	Yes			Variable		80–100	100	
Chile	Yes	Yes			Yes (credit enhancements to lenders)			Variable			75	75–100 (depending upon the mortgage product)
China			Yes	Yes				Variable		60	80	
Croatia		Yes, through Bauspar (15 percent)				Yes		Fixed/Variable	75			70
Czech Republic [2]		Yes (Bauspar, up to 15 percent)				Yes (up to maximum level)		Fixed (Mixed)			100	
Hungary		Yes, Bauspar						Variable (Mixed)			70	70 (in 2009)
India	Yes		Yes, through soft loans		Yes	Yes	Yes, if invested in a second property	Mixed			110	85
Indonesia	Yes		Yes (also to moderate income)		Yes			Variable			90	80–90
Malaysia			Yes, to government employees	Yes	Yes, through Cagamas, but without formal govt. support			Variable			80	90
Mexico	Yes	Yes (savings leveraged to market-based mortgage finance)	Yes	Yes (housing fund)	Yes			Variable			95 (depends upon the provider)	
Poland	Yes (limited interest rate subsidies during first 8 years of loan)					Only for loans originated before 2007 and subject to a cap	Yes (with limits)	Variable			100	
Russia			Yes		Yes	Yes		Fixed/Variable		60		85
Singapore			Yes, through Housing Development Board	Yes	Yes (loan origination)	Yes		Variable		<70	80	80–90
South Africa			Yes		Yes			Variable			100	
South Korea			Yes, through National Housing Fund		Yes (long-term fixed interest loans); MBS	Yes, up to a maximum		Variable	80	60–70	70	60–70 (40–60 regulatory)
Taiwan Province of China	Yes	Yes	Yes			Yes, up to a maximum		Variable			100	
Thailand	Yes, tax breaks				Yes	Yes, up to a maximum		Fixed/Variable			90-100	70–90 (100 by Government Housing Bank)

Sources: European Mortgage Federation; Housing Finance Network; Merrill Lynch Guide to Emerging Mortgage and Consumer-Credit Markets, Vol. 1; Warnock and Warnock (2008); Crowe and others (2011b).

Note: MBS = mortgage-backed securities.

[1]The observed maximum refers not only to published maximum LTV ratio, but also to anecdotal evidence from various sources cited.

[2]The Czech Republic has been reclassified as an advanced economy; it was an emerging economy during the pre-crisis years.

Box 3.2. Legal Prerequisites for Housing Finance Systems

To be effective and efficient, housing finance systems need to be supported by explicit legal institutions and instruments. These are not only necessary to acquire and transfer ownership rights in real estate, but also represent the foundation for the orderly functioning of mortgage lending. Legal arrangements must also take into account the additional layers of complexity raised by the mobilization of collateral in the secondary mortgage market. This box outlines the basic elements of a well-functioning legal framework for a housing finance system.

A robust legal framework for housing finance systems should include rules on the foundation of the system, mortgage lending, and the mobilization of loans and secured interest in collateral in secondary mortgage markets.

Foundation

The legal regime to *acquire and transfer ownership rights* in real estate should encompass (1) the accessibility of ownership rights over the land and the buildings on it; (2) the right to sell, lease, or encumber; and (3) the right to enjoy property without being hindered by third parties. These rights might be checked by the (constitutional) right of the state to acquire property for public needs.

Reliable and readily accessible *land registries* should identify and enforce ownership rights against third parties. Title insurance and property surveys by certified surveyors can address shortfalls in this area.

It should be possible to establish and enforce real estate *collateral* at low cost, ensuring predictability and efficiency as to the lender's ability to enforce its rights. The effective establishment of real estate collateral may be achieved through a variety of legal techniques. These include not only mortgages, but also instruments broadly resembling trusts, such as the provisional transfer of title to receivables or the fiduciary transfer of the secured property to the lender, and leasing structures. These instruments give rights of varying strength to the lender. For mortgages, key elements are:

- Clear rules for the creation of mortgages. Typically, this implies having an instrument securing the lien to the property, such as a deed in writing in a notarized form identifying the mortgaged property, and a registration requirement with a public registry. Priority will depend on the timing of registration; such registries should hence be reliable and readily accessible.[1]
- Priority rights of the lender over the mortgaged assets, which, as rights *in rem*, will also apply when the assets are transferred.
- Validity and enforceability of the mortgage in case of the borrower's bankruptcy.
- Enforcement rules ensuring that lenders can promptly foreclose and sell the secured assets at market value.

Mortgage Lending

A variety of legal (including regulatory and contractual) measures can incentivize mortgage lending and homeownership. Each may have a specific impact as it addresses different players, products, or stages involved in mortgage finance:

- The ranking of mortgage lenders impacts the availability and pricing of credit (with first-ranking liens offering strong incentives).
- Legislation may provide for the exemption from "claw-back provisions" allowing the reversal of transactions undertaken within a specific period before the borrower's insolvency. Laws may also provide that the proceeds from the sale of the mortgaged property are to go to the lender, outside of the ordinary bankruptcy proceeding (without the need for ascertaining the lenders' claim in such proceedings).
- Laws may exempt mortgage lenders from going to court to enforce their claims.
- Prudential requirements may facilitate access to finance for certain categories of borrowers where additional guarantees are provided, or set advantageous risk weightings on banks' capital ratios for owner-occupied mortgage loans.
- Government housing finance agencies may be established to develop the domestic housing finance market.

Note: This box was prepared by Dawn Chew and Alessandro Gullo.

[1]A question arises whether the transfer of the mortgage creditor should be registered: the development of mortgage-backed securities requires that such transfers be possible with minimal individual registration requirements.

Box 3.2 *(continued)*

Some of those measures may conflict with borrower/homeowner safeguards. For instance, special laws can provide triggers for the termination of mortgage loans on terms more favorable for borrowers than would otherwise apply under a more general framework.

Mobilization of Loans and Collateral in Secondary Mortgage Markets

A legal precondition for creating secondary mortgage markets hinges on the ability to legally assign (mobilize) the loans and corresponding security interest in collateral, which differs across jurisdictions. Key elements include:

- The fact that the mortgage is accessory to the loan claims, so that the assignment of the loan claims involves the transfer of the mortgage that secures them;
- Rules on the set-off of any amounts due by the borrower and by the lender;
- The enforceability of the assignment vis-à-vis the borrowers, once they are notified, so that amounts paid by them are due to the assignee without being trapped in the insolvency of the originating bank. This involves complying with formalities for the transfer of the mortgage;
- The mitigation of rules on claw-back, applicable in case of insolvency of the lender or of the borrowers; and
- The exemption of ordinary rules to facilitate the mobilization of collateral through mortgage funding schemes. For instance, securitization laws could provide for shorter claw-back periods or for simplified rules on the transfer of mortgages as a pool.

The ability to transfer collateral from one party to another through mortgage funding models creates economic and legal links, with the fund providers being given some forms of right or interest in the underlying mortgage loans. Legal frameworks should adequately reflect such links to protect financial stability, for instance, by earmarking mortgage payments to mortgage bonds (see Box 3.1 on the Danish model) or by legally prescribed overcollateralization requirements. Further, legal arrangements should align legal forms with the economic substance of these links and mitigate distorted incentives or informational asymmetries (see Box 3.7 on incentive misalignments).

In the wake of the recent crisis, there has been renewed interest in alternative mortgage products that encourage better risk management. They include shared equity models, where increases in property values are shared between the homeowner and the lender. They also include schemes that allow borrowers to limit their inflation risk (through index linking), or their interest rate risk (through capped mortgages, or products in which borrowers do not fully bear the cost of interest rate increases).[17] Property derivatives and insurance-type contracts for hedging could help protect investors or households against fluctuations in house prices. Moreover, so-called Islamic mortgages might promote better incentive alignment and reduce the financial stability risks that may be associated with conventional mortgages. Islamic financial products are based on the idea that lenders and borrowers share both risks and returns; such products also tend to offer more efficient dispute resolution because the lender retains ownership of the asset, akin to a financing lease (Jobst, 2007).

[17]Such products may be structured like insurance: the borrower pays a premium, and if rates go above a certain level, the protection pays out.

Substantial Government Presence in Housing Markets

Government participation in the housing markets takes many forms. It includes social housing policies to benefit low-income and first-time homebuyers; tax incentives; state-owned financial institutions that originate mortgage loans; and state-sponsored, or state-owned, housing finance agencies that (mostly) provide liquidity facilities for the mortgage markets

(Figures 3.2 and 3.3; and Table 3.5).[18] While the aim of government participation is generally to provide affordable housing and promote homeownership, it might also constrain competition in the financial sector, which in turn might widen interest rate spreads and limit the range of available mortgage products. Government participation is more prevalent in the average ENIE, reflecting the importance of large state-owned firms in the domestic mortgage markets and savings schemes encouraging house purchases. Among advanced economies, the United States is unusual because of its significant influence of government policies in the housing finance sector. Various forms of government participation in the housing market include the following:

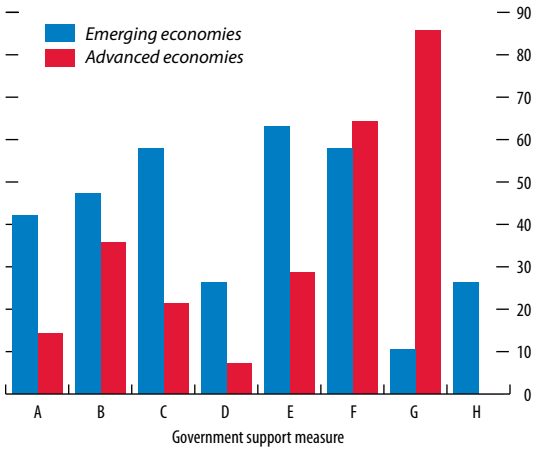
- **Affordable housing policy mandates.** Unlike the U.S. housing GSEs, none of the government-backed institutions in Japan or the Netherlands have a formal mandate to provide affordable housing for low-income households. Upfront subsidies to first-time or low-income homebuyers are much more prevalent in ENIEs. A unique feature in continental Europe, such as in Germany and Hungary, is the presence of a contractual savings system in which the government subsidizes housing loans by contributing to household savings accounts in specialized savings banks, or *Bausparkassen*.[19]
- **Housing finance agencies.** The United States is unique because of the preponderance of government-sponsored housing finance agencies involved in securitization markets (through Fannie Mae, Freddie Mac, and Ginnie Mae) and mortgage insurance (through the Federal Housing Administration) (Box 3.4).[20] The

[18]See Table 3.5 for an index of government participation constructed from a weighted-sum of eight types of measures (each takes the value 1 if it is present in a country, zero otherwise). While the index does not quantify the depth of government participation, it provides a snapshot of the breadth of its presence in the housing finance market.

[19]Contractual savings systems involve a contract that requires the customer to save an agreed amount over a prescribed period in return for a commitment by the credit institution to provide a loan on pre-specified terms whose amount depends on the amount saved (www.housing-finance-network.org/index.php?id=284). The French and German systems are slightly different (Dübel, 2009), but both require a longer-term savings requirement.

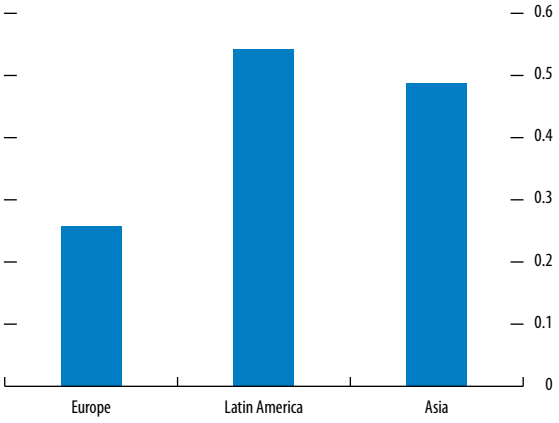
[20]Although Fannie Mae and Freddie Mac were not explicitly guaranteed, they enjoyed an implicit government guarantee;

Figure 3.2. Government Participation in Housing Finance
(Percentage of countries that have the government support measures detailed below)



Source: IMF staff estimates.
Note: See Table 3.5 for details. The government support measures in the x-axis are as follows:
A) subsidies to first-time or other buyer up front;
B) subsidies to buyers through savings account contributions or through preferential fees;
C) subsidies to selected groups, low income;
D) provident funds early withdrawal for house purchase;
E) housing finance funds or government agency that provides guarantees/loans;
F) tax deductibility of mortgage interest;
G) capital gains tax deductibility; and
H) state-owned institution majority market player >50 percent.

Figure 3.3. Government Participation in Housing Finance: Emerging and Newly Industrialized Economies
(Index of government participation)



Source: IMF staff estimates.
Note: Index lies between 0 and 1; the higher the index, the greater the government participation. See Table 3.5 for details of the index.

Table 3.5. Index of Government Participation in Housing Finance Markets, 2008

	Government Support Categories and Weights[1]									
		Category (A)–(D)			Category (E)	Category (F)–(G)		Category (H)		
Category Weight		0.25			0.25	0.25		0.25		
Subcategory Weight	0.0625	0.0625	0.0625	0.0625	0.25	0.125	0.125	0.25		
	Subsidies to First-Time or Other Buyers Upfront (A)	Subsidies to Buyers through Savings Account Contributions or through Preferential Fees (B)	Subsidies to Selected Groups, Low and Middle Income (C)	Provident Funds Early Withdrawal for House Purchases (D)	Housing Finance Funds, Government Agency Provides Guarantees, Loans (E)	Tax Deductibility of Mortgage Interest (F)	Capital Gains Tax Deductibility (G)	State-owned Institution Majority Market Player in Mortgage Lending > 50 percent (H)	Index of Government Participation (higher weight to subcategory H) (I)	Alternative Index of Government Participation (equal weights to the eight subcategories) (J)
Emerging and newly industrialized economies										
Brazil	1	1	1	1	1			1	0.75	0.75
Chile	1	1			1				0.38	0.38
China			1	1				1	0.38	0.38
Croatia		1				1			0.19	0.25
Czech Republic[2]		1				1			0.19	0.25
Hungary		1				1			0.19	0.25
India	1		1		1	1	1		0.63	0.63
Indonesia	1		1		1			1	0.63	0.50
Malaysia			1	1	1				0.38	0.38
Mexico[3]	1	1	1	1	1				0.50	0.63
Poland	1					1	1		0.31	0.38
Russia			1		1	1			0.44	0.38
Singapore			1	1	1	1		1	0.75	0.63
Slovak Republic[2]		1			1				0.31	0.25
Slovenia[2]		1				1			0.19	0.25
South Africa			1		1				0.31	0.25
South Korea			1		1	1			0.44	0.38
Taiwan Province of China	1	1	1			1			0.31	0.50
Thailand	1				1	1		1	0.69	0.50
Average (percent of countries in A-H and regional average of index in I-J)	**42**	**47**	**58**	**26**	**63**	**58**	**11**	**26**	**0.40**	**0.41**
Advanced economies										
Australia	1	1	1				1		0.31	0.50
Austria[3]	1	1	1						0.19	0.38
Belgium						1	1		0.25	0.25
Canada				1	1		1		0.44	0.38
Denmark						1	1		0.25	0.25
France		1				1	1		0.31	0.38
Germany		1					1		0.19	0.25
Ireland						1	1		0.25	0.25
Italy						1	1		0.25	0.25
Japan					1	1			0.38	0.25
Netherlands					1	1	1		0.50	0.38
Spain[3]		1				1	1		0.31	0.38
United Kingdom							1		0.13	0.13
United States			1		1	1	1		0.56	0.50
Average (percent of countries in A-H and regional average of index in I-J)	**14**	**36**	**21**	**7**	**29**	**64**	**86**	**0**	**0.29**	**0.31**

Sources: Housing Finance Network; Merrill Lynch Guide to Emerging Mortgage and Consumer-Credit Markets, Vol 1; Crowe and others (2011b); IMF staff estimates.

[1]Cells marked with "1" indicate the existence of the government participation measure; column (I) = 0.0625*{(A)+(B)+(C)+(D)} + 0.25*(E) + 0.125*{(F) + (G)} + 0.25* (H); Column (J) = 0.125 *{sum of (A)–(H)}.

[2]These countries are currently classified as advanced economies; they were emerging economies during the pre-crisis years.

[3]Government support in Mexico is available to workers only in the formal sector. Subsidies through downpayments in Spain, rather than through savings accounts contributions. An Austrian housing assistance scheme (*Wohnbauförderung*) supports mostly low-income and some first-time buyers.

market share of mortgages backed by government entities in other advanced economies, such as Japan and South Korea, is smaller than that of their U.S. counterparts (Lea, 2010a and b). Non-U.S. housing GSEs in advanced economies have only limited or no portfolio accumulation. The German development bank, *Kreditanstalt für Wiederaufbau*, provides mortgage loan subsidies to commercial banks that lend to borrowers that use these funds for energy-efficient housing and other socially desirable purposes (business start-ups, homes for the elderly). Malaysia's government-promoted secondary mortgage liquidity facilities (Cagamas) are involved in refinancing but not in origination.

- **Supervisory and regulatory structures.** Most advanced economies have a single mortgage regulator or rules governing the involvement of multiple regulators in this area. The United States is unusual because of its fragmented regulatory structure, with mortgage lenders regulated by multiple authorities, depending on the type of financial institution.[21]
- **Tax incentives.** Tax deductibility of mortgage interest is widespread among both advanced economies and ENIEs, although the nature of these tax breaks varies considerably. Most governments provide incentives for owner-occupied housing, mainly through favorable tax treatment. As noted in Keen, Klemm, and Perry (2010), within a comprehensive income tax system, a fully neutral taxation of owner-occupied housing would require full taxation of imputed rents and capital gains on housing, combined with mortgage interest deductibility. In practice, however, imputed rents and capital gains on primary residences are rarely taxed, creating a general bias toward housing, which is reinforced by the mortgage interest relief where it exists.[22] Many countries provide full or partial deduction of mortgage interest payments, often capped at low marginal tax rates. Only the United States allows for nearly full deductibility without taxing imputed rent.
- **Government participation and homeownership.** The rationale for government participation in housing finance is often to promote homeownership. However, the two factors are not always correlated. Many countries in western Europe, as well as Australia, have achieved high homeownership rates without extensive government participation (Figures 3.4 and 3.5; and Lea, 2010b). Some countries have lower rates of homeownership partly because of strong public support for rental housing. For example, Germany provides incentives for rental investment but not for homeownership.

Mortgage Funding Dominated by Deposits

Banks tend to play a major role in originating mortgage loans, which are mostly funded by bank deposits. However, the role of nonbanks and the use of wholesale and cross-border funds became increasingly important in the run-up to the recent crisis.[23] ENIEs tend to rely on traditional mortgage funding through bank deposits because of their relatively small financial sectors and their less-developed financial infrastructures. Covered bonds play a large (and increasing) role in Europe's mortgage funding markets. In 2008, covered bonds accounted for about half of the residential loans in Hungary, Spain, and Sweden, and for more than half in the Czech Republic.[24] In the United States and the (largely Asian) ENIEs, state support has encouraged securitization through the use of mortgage-backed securities (MBS) (Ketkar and Ratha, 2000; IMF, 2003; and Box 3.5).[25] In some ENIEs, only state-owned finance

during the recent crisis, these GSEs received over $130 billion in capital injections (and are hence now effectively government owned) and were placed in conservatorship (U.S. Treasury and HUD, 2011).

[21]While all U.S. mortgage lenders are subject to one or more federal and/or state laws, the strength and intensity of oversight of these companies varied prior to the crisis, with deposit-taking institutions and bank holding companies and their subsidiaries generally subject to more rigorous supervision compared with independent mortgage brokers and lenders.

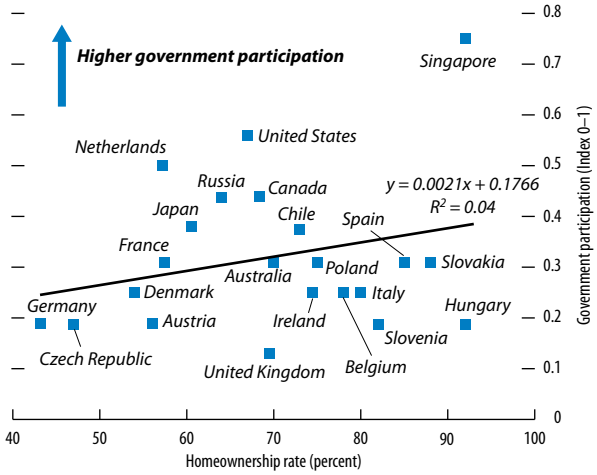
[22]The Netherlands and Switzerland being exceptions in that they tax imputed rent (IMF, 2009a).

[23]For instance, more than 50 percent of mortgages were sold through mortgage brokers (owned by banks and nonbanks) in the Netherlands, Spain, the United Kingdom, and the United States. Also, between 2004 and 2007, cross-border interbank loans grew on average by 25 percentage points of GDP in emerging Europe compared with about 11 percentage points of GDP in emerging Asia, and even less in Latin America.

[24]In the euro area, the outstanding value of mortgage covered bonds rose by almost 80 percent between 2003 and 2007 (ECB, 2009; Lea 2010a).

[25]In ENIEs, MBS were initially denominated in foreign currencies or inflation-indexed monetary units. Over the last

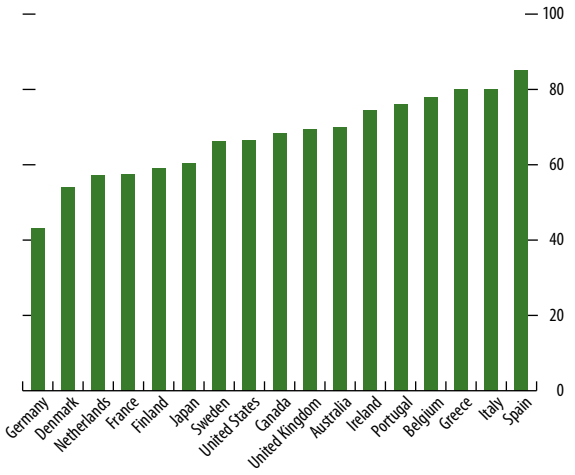
Figure 3.4. Homeownership Rate and Government Participation in Housing Finance



Sources: European Mortgage Federation; Australian Bureau of Statistics; Japan, Ministry of Internal Affairs and Communications, Statistics Bureau; Singapore, Department of Statistics; U.S. Census Bureau; and IMF staff estimates.

Figure 3.5. Homeownership Rate

(In percent of total number of dwellings; latest available year)



Sources: European Mortgage Federation; Australian Bureau of Statistics; U.S. Census Bureau; and Japan, Ministry of Internal Affairs and Communications, Statistics Bureau.

Note: Years for the data are as follows: United States, 2010; Denmark, Ireland, and Greece, 2009; Finland, Japan, the Netherlands, Spain, and Sweden, 2008; Belgium, France, and the United Kingdom, 2007; Australia, Canada, and Portugal, 2006; Germany and Italy, 2002.

agencies can issue MBS (Malaysia and South Korea). During the crisis, mortgage securitization slowed in many emerging economies, even though delinquency rates remained low and origination standards have generally been high. These markets have, however, generally recovered, reflecting persistent housing demand and growing local investor interest.

Covered bonds are debt obligations secured by a dedicated reference (or "cover") portfolio of assets, with the issuer remaining fully liable for all interest and principal payments. In the event of issuer default, investors have a preferred claim on the assets in the cover portfolio. In order to ensure that the payment obligations are sufficiently over-collateralized, issuers are obliged to immediately replace any nonperforming loans with performing loans. If these assets fail to generate sufficient cash flows upon liquidation to repay these investors, issuers may be fully liable up to their registered capital. Because of this dual recourse to both reference assets and the issuer, the funding costs of covered bonds typically are well below that of senior unsecured debt securities issued by the same institution.

In contrast, MBS are usually designed to be "bankruptcy remote" from issuers; their performance is solely based on the underlying assets. MBS transactions involve the transfer of risk associated with a portfolio of mortgage loans into special-purpose vehicles funded with the issuance of one or more "tranches" of securities.[26] Tranching allows MBS to offer more flexibility than covered bonds, because it creates securities with distinct risk-return profiles. Securitization also permits more flexibility in terms of asset-liability management, because issued securities pass all cash flows through to investors. In addition, securitization can be used to transfer market and credit risk to capital markets, whereas covered bonds transfer only market risk. Securitization also provides access to capital-market-

10 years, however, issuers in ENIEs have gravitated toward securitizing in local currencies in their domestic capital markets.

[26]Tranche holders are paid in specific order, starting with the "senior" tranches (least risky) and working down through one or more levels to the "equity" tranche (most risky). If some of the expected cash flows are not forthcoming (e.g., some loans default), and after any cash flow buffers are depleted, the payments to the equity tranche are reduced. If the equity tranche is depleted, then payments to the "mezzanine" tranche holders are reduced, and so on up to the senior tranches.

Box 3.3. Experience with Limits on Loan-to-Value Ratios for Residential Mortgages

A number of countries have used limits on loan-to-value (LTV) ratios to tame housing booms or increase resilience in the face of a bust. This box examines this practice to assess whether such ratios can be useful for other countries.

A number of countries have, historically or more recently, used limits on LTV ratios as a macroprudential tool. This experience is surveyed in Borio and Shim (2007) and Crowe and others (2011b). LTV limits can serve a number of objectives, including reining in booms in mortgage credit and real estate prices; reducing the probability of default when the housing market turns sour; and reducing losses, given default, by increasing recovery values. Before the crisis, several Asian emerging countries used LTV limits to tame real estate booms, while the explicit use of LTV limits in advanced economies has been relatively rare, with Canada and Denmark as the only significant examples.[1] Some countries have also combined LTV limits with limits on debt-service-to-income (DTI) ratios, such as in China, where the introduction of a 70 percent LTV ceiling in 1997 was followed up with 50 percent DTI limits in 2004. Hong Kong SAR has had LTV limits since the 1990s that are credited with reducing the fall-out from the real estate bust in 1997. In Croatia, on the other hand, a 75 percent LTV limit had little success as it pushed lending to unregulated sectors.

Since the beginning of the crisis, some countries have introduced new LTV limits. Canada, South Korea, and Sweden have introduced or lowered LTV limits; similarly, a few (mainly Asian) countries lowered eligibility limits as a countercyclical stimulus measure, but this was quickly reversed as renewed capital inflows rekindled fears of real estate booms (Malaysia, Thailand, China).

A recent IMF survey of 42 member country authorities on macroprudential tools found that more than a third of the countries recently implemented an LTV limit, while almost two thirds considered it a possible policy tool. According to the survey, the objectives of LTV limits are to promote financial stability and consumer protection more generally by limiting the spillover risk stemming from the housing sector. While it was deemed too early to assess the effectiveness of the LTV limits implemented in recent years, countries with a longer experience often saw it as an effective way of dealing with real estate booms.

Due to data limitations, the effect of LTV ratios in controlling real estate prices and mortgage activity is difficult to assess empirically. For example, the coverage of LTV limits can vary widely between countries. That said, the existing empirical literature tentatively supports the effectiveness of LTV ratios in taming housing booms.[2] For example, according to Crowe and others (2011b), a 10 percentage point tightening in the LTV ratio leads to a decline in house prices of between 8 and 13 percentage points. There is also evidence that LTV limits have an effect on the "financial accelerator mechanism," reducing the transmission from increases in income to increases in house prices (Almeida, Campello, and Liu, 2005). Evidence in Claessens, Kose, and Terrones (2011a and b) also indicate that lower LTV and DTI limits could be required for emerging markets, as they tend to suffer deeper recessions with more severe financial downturns than advanced economies do.

Note: This box was prepared by Francesco Columba, Srobona Mitra, and Erlend Nier.

[1]See Box 3.1 on strict underwriting standards, including LTV limits, in the Danish mortgage model.

[2]See Annex 3.2 for further empirical evidence of the impact of LTV ratios in reducing housing booms.

based funding to banks that do not have sufficient stand-alone credit quality to issue debt directly.

Furthermore, credit growth is generally stronger in an economy in which securitization plays a bigger role than in an economy dominated by covered bond financing. There are several reasons for this. The range of eligible assets that can be funded with covered bonds is typically quite narrow.[27] Moreover,

[27]The vast majority of covered bonds are issued under "special law" frameworks that set uniform standards for product structures, collateralization, and cover pool credit quality. Although they do

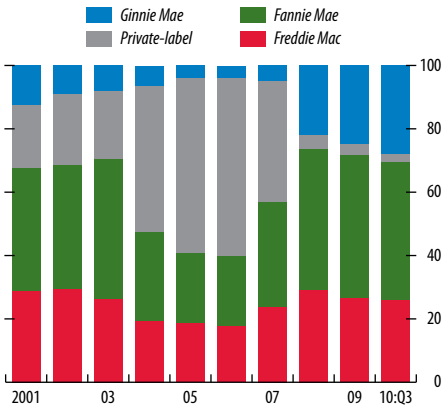
Box 3.4. Housing Finance and the U.S. Housing Crisis

Since the 1930s, the U.S. authorities have provided a wide range of support to facilitate access to mortgage credit. While this has provided access to stable and affordable long-term mortgage financing, there is limited evidence that it has boosted homeownership, made the system more efficient, or provided buffers against economic stress (in the absence of extraordinary fiscal support). Meanwhile, it may have exacerbated the amplitude of the recent boom-bust cycle. This box details the various forms of U.S. government participation in housing finance and evaluates their role in the U.S. housing crisis.

Government participation in the U.S. housing market includes a plethora of tax breaks and subsidies, including mortgage interest deductions at the federal level, as well as state and local property tax deductions and exclusion from capital gains taxation. There is also the 1979 Community Reinvestment Act that encourages U.S. depository institutions to lend in low-income neighborhoods. These initiatives may have promoted the purchase of more and bigger homes than would otherwise have been possible, exacerbating leverage and the severity of boom-and-bust dynamics. That said, these subsidies predated the recent housing crisis by many years and did not change in the run-up to the subprime boom (Tsounta, forthcoming; IMF 2010b; Committee on the Budget, 2008).

The government also provides mortgage market support through government-sponsored enterprises (GSEs) such as Fannie Mae and Freddie Mac. Before being brought into conservatorship in October 2008, these two major GSEs were private companies that were exempt from federal income taxes and securities registration requirements for their debt securities. They were also allowed to operate with lower capital requirements than their purely private-sector counterparts and benefited from an implicit government guarantee that lowered funding costs. Their business model involves purchasing primarily conventional conforming mortgages (meeting GSEs' underwriting standards and specific loan limits) from private lenders to hold in their own portfolios or package into mortgage-backed securities (MBS).[1] Since 1992, they have also had "affordable housing goals" to facilitate homeownership opportunities for low-income and minority groups.[2] Government-owned Ginnie Mae plays a similar role, except that it focuses on mortgages guaranteed by the Federal Housing Administration and the Department of Veterans Affairs. In addition, the Federal Home Loan Banks provide collateralized lending to mortgage originators to help them fund mortgages.

Market Share of Mortgage-Backed Securities, by Issuer
(In percent)



Source: Inside MBS & ABS.

The GSEs have enhanced liquidity in the mortgage finance system and created a deep and liquid secondary mortgage market that has significantly reduced regional differences in credit access (GAO, 1996, 2009). In addition, the GSEs' ability to standardize underwriting criteria and mortgage products, while eliminating credit risk for holders of agency MBS, has allowed the development of a dynamic forward market that has been an important component in the success of 30-year, no-prepayment-penalty, fixed-rate mortgages.[3] Also, GSE-underwritten

Note: This box was prepared by Andrea Maechler with contributions from Paul Mills.

[1]In exchange for a "guarantee fee," the GSEs guarantee the payment of interest and principal of their MBS, but investors continue to bear the interest rate and prepayment risk.

[2]For example, in 2008, 56 percent of the loans purchased by the GSEs were required to be granted to low-income families (up from 30 percent in 1993).

[3]The forward "to be announced" market, where MBS trades can be settled for a future date without specifying the

Box 3.4 *(continued)*

securitization has helped lower mortgage interest rates below what they otherwise would have been (by around 13 to 28 basis points), although GSE shareholders and executives have also greatly benefited from the GSEs' implicit subsidy (Naranjo and Toevs, 2002; Passmore, Sparks, and Ingpen, 2002; GAO, 2009; Passmore, Sherlund, and Burgess, 2005). In contrast, the GSEs' purchases of agency and private-label MBS for their own investment portfolio were found to have no significant effects on either primary or secondary mortgage rates (Lehnert, Passmore, and Sherlund, 2008).

There is only limited evidence that the GSEs' housing goals have supported homeownership for targeted groups (Brent and Thibodeau, 2004; Bostic and Gabriel, 2006), or that lower interest rates were particularly useful for increasing homeownership rates (Painter and Redfearn, 2002). Homeownership rates in the United States increased steadily throughout the 1990s and early 2000s, peaking in 2004 at just below 68 percent of all households (CBO, 2009). This lack of a strong correlation between homeownership and housing subsidies seems to hold across time and countries (Tsounta, forthcoming).

There is also mixed evidence on the stabilizing role of the GSEs during economic downturns in the absence of additional public support. Some studies found that the GSEs helped preserve wide access to mortgage credit during recent recessions in the United States, as well as during the Asian financial crisis and the Long Term Capital Management collapse in the late 1990s (Quigley, 2006; Peek and Wilcox, 2006). In contrast, the GAO (1996) found little buffering effect of Fannie Mae in some states during the savings and loan crisis in the 1980s. During the recent global financial crisis, the GSEs became instrumental in supporting the U.S. mortgage markets, although only after having been put in conservatorship and receiving considerable government support.

At the same time, the GSEs may have crowded private-sector lenders into peripheral and riskier markets (Ellen, Tye, and Willis, 2010). The GSEs lost much market share to private lenders when private-label MBS issuance exploded between 2004 and 2007 (Coleman, LaCour-Little, and Vandell, 2008; Dell'Ariccia, Igan and Leaven, 2008; Federal Housing Finance Agency, 2010). This explosion, which was driven by a combination of financial innovation, increased investor risk appetite, and lax supervision, focused on higher-risk portions of the market (e.g., subprime, alt-A, teaser rates).

The GSEs also purchased a large share of higher-risk mortgages and senior tranches of private label MBS in their efforts to maintain market share and pursue their increasingly tight affordable housing goals (Pinto, 2010; GAO, 2010). These nontraditional assets, particularly those purchased in 2006 and 2007, have accounted for the bulk of the GSE losses since the housing market began to deleverage sharply in 2007 (Federal Housing Finance Agency, 2010). However, Bhutta (2009) finds no evidence that the affordable housing goals led the GSEs to take great risks, and Dell'Ariccia, Igan and Laeven (2008) find that the dilution in underwriting standards (measured as lower denial rates of loan applications) was most acute in the nonconforming nontraditional mortgage markets, not those associated with the GSEs.

Government participation in the U.S. housing market has been pervasive but has not yielded many of the expected benefits to prospective or existing homeowners. It is clear that an overhaul is needed.

underlying pool of loans, allows mortgage lenders to lock in rates in advance of closing, further reducing interest rate risk for loan originators.

the on-balance-sheet nature of covered bonds requires full capital coverage of the underlying reference portfolio, which limits the range of potential issuers even in countries where covered bonds are not subject to special licensing. Also, the legal protection of covered bond investors implies an encumbrance of banks' highest-quality assets, which could conflict with depositors' rights in case of bank insolvency.

On the other hand, securitization's potential for risk transfer can lead to incentive misalignments between MBS issuers and investors with respect to the perfor-

make covered bonds rather rigid in comparison to MBS, these special laws also provide legal transparency and a regulatory stamp of approval, resulting in greater standardization, more cost-effective funding, and a more certain legal regime ensuring the enforceability of credit claims, especially as regards bankruptcy protection. Also, in some EU countries special law covered bonds get preferred regulatory treatment such as reduced regulatory risk weightings.

Box 3.5. Emerging Market Mortgage Securitization

The evolution of capital-market-based funding in emerging market economies has favored the development of mortgage-backed securities (MBS) over covered bonds (Ketkar and Ratha, 2000; IMF, 2003), often with substantial public sector involvement. This box reviews the current state of mortgage securitization in these countries and outlines some of the risks that remain.

In emerging market countries, governments often maintain a significant role in MBS markets, usually through the sponsorship of specialized mortgage agencies akin to the government-sponsored enterprises in the United States (Jobst, 2006). Mexico, South Korea, and Malaysia are the most prominent emerging market countries where such agencies have been created in response to concerns regarding housing finance shortages, as bank-based housing finance remains insufficient to meet rising credit demand. These institutions sometimes start out as direct lenders or insurers (e.g., South Korea) and then over time are given the additional task of promoting the development of the domestic MBS market (e.g., Mexico).[1] For instance, in 1999, the South Korean government created the Korea Mortgage Corporation, replaced in 2004 by the Korea Housing Finance Corporation, which has issued several MBS collateralized by mortgages whose origination is subsidized by government funds from the National Housing Fund and the National Agricultural Cooperatives Federation. Similarly, in Malaysia, the issuance of MBS backed by housing loan receivables by *Cagamas*, the government-promoted housing securitization body, has helped develop the domestic bond market. In Latin and Central America, Mexico has been a leader in state-sponsored mortgage securitization since 2009, when the *Fondo de la Vivienda del Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado* (Fovissste), the state employees' social security fund, and the *Instituto del Fondo Nacional de la Vivienda de los Trabajadores* (Infonavit), the government-run housing agency, overtook *sofoles* (specialized mortgage lending institutions) as the largest issuers of residential MBS through regular securitizations and the *Hipotecaria Total* platform, modeled after the Danish mortgage platform (see Box 3.1).

Despite these successes, mortgage securitization remains a work in progress in most emerging market countries, while recent global regulatory reforms have made covered bonds relatively more attractive as an alternative funding mechanism. Viable mortgage securitization markets require an adequate legal and regulatory framework—well-developed bankruptcy laws, clarity as to mortgage loan transfer procedures, and reliable issuer-investor dispute resolution mechanisms. In some cases, the local banking sector lacks the economies of scale to support cost-effective securitization operations, in which case the joint issuance of MBS via syndication can provide access to capital markets to small regional credit institutions.[2] That said, higher Basel III capital requirements will increase the costs that emerging market banks will face when securitizing their assets. As a result, the Mexican issuers, such as Infonavit and Fovissste, are expected to turn to covered bonds as an alternative to residential MBS during 2011.

Note: This box was prepared by Andreas Jobst.

[1]In the recent past, federal, state, and local authorities (municipalities and provinces) as well as government agencies in various emerging market countries have used securitization to monetize future local tax revenues, deferred sales tax revenue, oil and gas royalties, future water receivables, toll road revenues, and sovereign lease receivables as a relatively cheap funding source.

[2]For example, in Spain, regional savings banks known as *cajas* and credit cooperatives engage in so-called "club funding" as a way of syndicating their market-based funding of mortgages. Similar arrangements exist in Germany, where smaller savings banks (*Sparkassen*) syndicate the issuance of *Pfandbriefe*. In Italy (as well as in other countries), syndication of real estate financing has become the basis for multiseller transactions.

mance of the reference asset portfolio. A number of recent policy initiatives are aimed at mitigating these potential conflicts of interest, including several initiatives to incentivize issuers to retain more exposure to the credit risk of their securitization products.[28] However,

[28]The 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act requires a uniform 5 percent economic interest in

some of these initiatives ignore already existing risk retention mechanisms, such as overcollateralization, excess spread, and representations and warranties.[29] Meanwhile, the U.S. private-label mortgage securitization market remains almost completely shut down, and MBS issuance volumes elsewhere remain well below pre-crisis levels, leaving covered bonds as the primary source of capital-market-based mortgage funding.

Housing Finance and Financial Stability

As already discussed, housing booms and busts are intimately linked with the provision of credit. However, there has so far been little discussion about the extent to which national differences in housing finance relate to housing booms and busts.[30] This section examines more specifically the relationship between mortgage credit growth, house price movements, financial stability, and the role of housing finance characteristics in this context.

Several countries experienced strong growth in mortgage debt in the last decade before the crisis, including Australia, Denmark, Ireland, the Netherlands, Spain, Sweden, and the United States. The ratio of mortgage debt to GDP reached more than 100 percent by 2009 in Denmark and the Netherlands (Figure 3.6).[31] In some emerging European countries, mortgage debt grew by 25 to 45 percentage points of GDP over the decade (Figure 3.7). Based on 2004–05 data, the share of households with a mortgage ranged from approximately 45 percent in the United States to 40 percent in the United Kingdom and 20 percent in the euro area. While the share of households with a mortgage generally increases with income level, the share of households with mortgages in the United States remained higher relative to the euro area for all income levels; in particular, the percentage of low-income households with mortgage debt, which might have a bearing on financial stability, was only 4 percent in the euro area, compared with 10 percent for the United Kingdom and 16 percent for the United States (ECB, 2009).

The crisis has taken a toll on all mortgage markets, although the severity of its impact has varied between countries. The mortgage portfolio performance of U.S. banks has been significantly worse than that of their counterparts in other countries, reflecting the strong deterioration in U.S. underwriting standards, as well as the significant downturn of the real economy. Spain and the United Kingdom have also seen a substantial increase in mortgage defaults, but to a much lesser extent than in the United States. In general, while many countries have seen greater house price volatility compared with the United States, households in these countries have, in aggregate, faced lower levels of negative equity and lower default rates than their U.S. counterparts (Figure 3.8). Delinquencies on securitized loans in Europe, Canada, and Australia have increased, but remain well below those in the United States.

This section draws in large part on two sets of empirical studies summarized in Box 3.6 and outlined in Annexes 3.1 and 3.2, which reconfirm the relationship between rapid mortgage credit growth and strong house price increases. The analysis in Annex 3.1, which focuses on a sample of advanced and emerging economies in the recent crisis, indicates that, indeed, controlling for the state of the economy (as measured by GDP growth), stronger mortgage credit growth during the boom was associated with not only higher house price growth during that time, but also with a larger house price decline and higher levels of nonperforming loans during the subsequent bust. In fact, past mortgage credit growth and the state of the economy explain the bulk of the cross-country variation in the

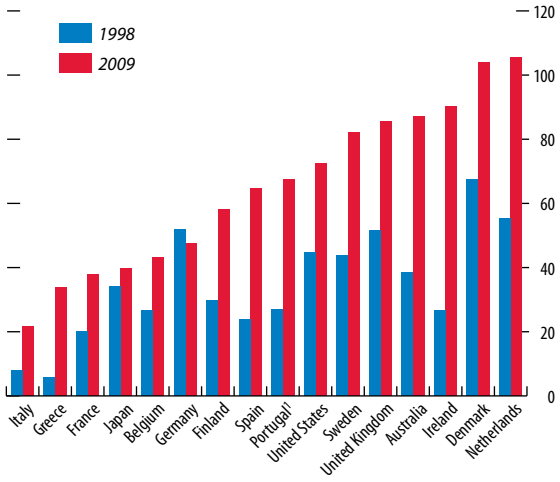
the underlying assets to be retained by issuers (with only a few permissible exemptions). Similar rules became effective in the European Union in January 2011 as part of the revised Capital Requirements Directive.

[29]Excess spread is the difference between the interest received from the underlying loan portfolio and what is paid out to bondholders, portions of which can accrue to securitizers if the loan portfolio performance exceeds preset levels. Representations and warranties are contractual clauses that allow securitization vehicles to put back loans to originators that do not meet pre-agreed underwriting standards; they can be accompanied by disclosure of repurchase requests to reveal deficiencies in underwriting standards. For further details, see IMF (2009c, Chapter 2).

[30]The available evidence is largely confined to the impact of institutional features on access to credit and the role of these features in determining more standard business cycles (IMF, 2008).

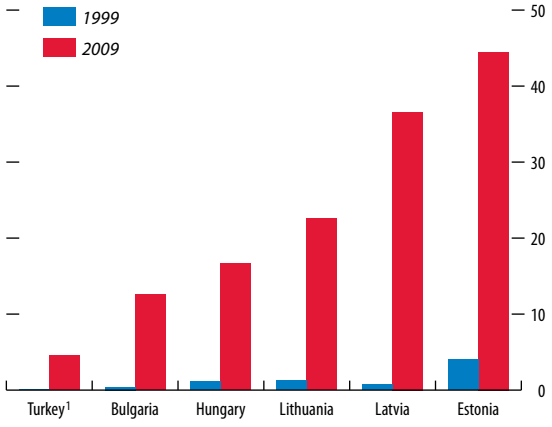
[31]The significant reliance on mortgage debt in Denmark reflects the effectiveness of the mortgage system; for example, the Danish corporate structure is dominated by small and medium-size enterprises that do not have access to the corporate bond market but frequently finance their business activities through mortgage loans (IMF, 2007).

Figure 3.6. Residential Mortgage-Debt-to-GDP Ratio: Advanced Economies
(In percent)



Sources: European Mortgage Federation; Bank of Japan; U.S., Board of Governors of the Federal Reserve Systems; U.K., Office for National Statistics; and Australian Bureau of Statistics.
[1]For Portugal, 1999 instead of 1998.

Figure 3.7. Residential Mortgage-Debt-to-GDP Ratio: Emerging Europe
(In percent)



Source: European Mortgage Federation.
[1]For Turkey, 2002 instead of 1999. 2002 = 0.1.

house price slowdown and the increase in bank loan losses during the bust. The analysis in Annex 3.2, which focuses on advanced economies over a longer time horizon, confirms the strong positive relationship between house price movements and household credit growth, also when controlling for the main fundamental drivers of house prices.[32] On average, a 10 percent increase in household credit is associated with an increase in house prices of about 6 percent. Moreover, the relationship works both ways, with house price increases in turn leading to stronger credit growth by boosting both household net worth and expectations of further house price increases. Lastly, the relationship between credit growth and changes in house prices is found to be stronger in the upswing; in the downturn, it almost disappears, suggesting that the speed of household deleveraging lags the fall in house prices.

Next, the empirical analyses in Annexes 3.1 and 3.2 are extended to account for the impact of a number of housing finance characteristics on mortgage credit and house price changes. They include the degree of government participation in the mortgage market, LTV ratios, and the types of mortgage products (Table 3.6).

Government Participation in the Mortgage Market

During the pre-crisis boom period, government participation in housing finance, as captured by a composite index (Table 3.5), tended to amplify the relationship between rising house prices and mortgage credit growth, particularly in advanced economies (Annex 3.1). Also, countries with more government participation experienced a deeper house price decline in the recent crisis. These findings are supported by the Annex 3.2 analysis, which suggests that government participation exacerbates house price swings for advanced economies over a longer time period, also accounting for other country-specific characteristics. The results might reflect both the lower cost of pre-crisis credit (due to government subsidization) and a relaxation in lending standards by the private sector

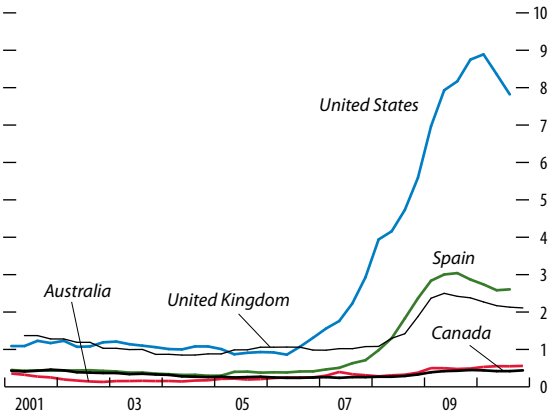
[32]Crowe and others (2011a) confirm this relationship. Lecat and Mesonnier (2005) also find a strong positive correlation between the growth of credit and house price increases in a study of 18 OECD countries from 1985–2002. The analysis in Annex 3.2 extends this sample, in particular by incorporating the more recent experience.

(due to increased competition between the private sector and the government).[33]

In addition to the analyses based on the composite government participation index, specific aspects of government participation are also included in the analyses in Annexes 3.1 and 3.2 to explain changes in house prices and mortgage credit. In particular, the analysis in Annex 3.2 suggests that subsidies to first-time home buyers, tax deductibility of capital gains on housing, and government provision of mortgage guarantees or credit tend to amplify house price swings by exacerbating both the boom and the subsequent bust. These results, which point to substantial unintended consequences of such government participation, are confirmed by a recent study by the OECD (2011) on housing policies, which suggests that certain tax breaks to homeowners are particularly likely to distort demand and lead to volatility in house prices.

Meanwhile, the presence of mortgage interest deductibility per se does not help to explain cross-country variations in house prices and mortgage credit growth during the recent crisis (Annex 3.1), although the extent and specific form of the interest deductibility might still matter. The distributional impact of mortgage interest relief can be complex, although deductibility is likely to favor wealthier households (see IMF, 2009a, 2010b; OECD, 2011).[34] Ellis (2008) suggests that in the United States, mortgage interest rate deductibility, combined with the lack of prepayment penalties, has contributed to growth in household leverage and mortgage indebtedness through cash-out refinance and second mortgages.[35] In particular, owner-occupied housing used to serve as a sort of forced savings mechanism in the United States, since households were required to make down payments of at least 20 percent to make the mortgages conform to the GSEs' criteria. More recently, however, the introduction of more accommodative mortgage products

Figure 3.8. Nonperforming Residential Mortgage Loans
(In percent of total residential mortgage loans outstanding)



Sources: Federal Reserve Bank of New York; Reserve Bank of Australia; Bank of Spain; U.K., Council of Mortgage Lenders; and Lea (2010b).
Note: Nonperforming loans that are more than 90 days in arrears. For Australia, Canada, and the U.S., banks only.

[33]See Chiquier and Lea (2009) for a discussion on how subsidized mortgage credit can jeopardize financial stability by encouraging rapid mortgage credit growth.

[34]For the United States, this was reiterated by the President's Advisory Panel on Federal Tax Reform (2005).

[35]A cash-out refinance means that the borrower takes out cash in addition to the existing loan balance, implying that the new loan balance will consist of the current loan balance plus the cash-out amount.

Table 3.6. Which Housing Finance Features Help Explain Growth in House Prices, Mortgage Credit, and Nonperforming Loans?

	Housing Finance Characteristics							Other Factors			
			Higher Government Participation Index (higher value = more participation; see Table 3.5)								
Effect On:	Higher LTV	Variable versus Fixed Rate	Overall Index	Subsidies to First-Time Buyers	Tax Deductibility of Capital Gains	Government Provision of Guarantees or Mortgage Loans	Tax Deductibility of Mortgage Interest	Higher Past Growth in Mortgage Credit	Higher House Price Growth	Lower GDP Growth	Reference
House price growth											
During recent crisis (2007–09), for advanced and ENIEs, did the characteristic contribute to decline in house prices?	—	—	x					x		x	Annex 3.1
Does the characteristic amplify house price booms in advanced countries over 1980–2010?	x	x	—	x	x	—	—	x			Annex 3.2
Does the characteristic amplify house price busts in advanced countries over 1980–2010?	x	x	x	x	x	x	—	x			Annex 3.2
Nonperforming loans/total loans growth											
During the recent crisis (2007–09), for advanced and ENIEs, did the characteristic contribute to increase in NPLs?	—	—	—				—	x		x	Annex 3.1
Mortgage credit growth											
Does the characteristic help explain increases in mortgage credit/GDP during the pre-crisis period (2004–07), for advanced and ENIEs?	—	x	x						x		Annex 3.1

Note: X = statistically significant at 10 percent level. An empty cell indicates that the characteristic was not included in that particular econometric specification; ENIEs = emerging and newly industrialized economies; NPLs = nonperforming loans.

together with higher median house prices implied that mortgage interest rate deductibility contributed to increased leverage, in turn contributing to the increase in house prices.[36]

[36]Apart from financial stability concerns, the U.S. mortgage interest rate deduction is also costly—at $104.5 billion in fiscal year 2011 it is the second largest tax expenditure, that is, government revenue that is foregone through the provisions of tax deductions, etc. Meanwhile, it does not seem to have had a discernible impact on the homeownership rate (Hilber and Turner, 2010). In this context, it is interesting to note the recent proposal by the U.S. Fiscal Commission to limit mortgage interest deductibility to $500,000 (compared with the current $1 million) and apply it only to first mortgages of principal residences (National Commission on Fiscal Responsibility and Reform, 2010).

Loan-to-Value Limits and Lending Standards

The empirical results on the impact of LTV ratios on financial stability are somewhat mixed. Based on maximum observed LTV ratios, the Annex 3.2 study suggests that a high LTV ratio strengthens the effect of real GDP growth on house price growth

Box 3.6. Empirical Analyses of the Relationships among House Prices, Credit, and Housing Finance Characteristics

Two empirical analyses are undertaken in the chapter on the relationship between house prices, credit, and housing finance characteristics. The first study focuses on the recent crisis for a larger sample of both advanced and emerging market economies; the other study focuses on a smaller sample of advanced economies over a longer time period.

The first analysis covers 36 advanced and emerging market economies during two episodes: the 2004–07 global liquidity expansion (the "boom" period), and the 2007–09 crisis period (the "bust") (see Annex 3.1). The aim is to capture the feedback effects between house price changes and financial stability (mortgage credit growth and loan-loss growth) during the recent crisis. In order to capture these cross effects, two equations are estimated using Zellner's "seemingly unrelated regressions" (SUR) model. All variables, except for the housing finance characteristics, are measured as growth rates over each of the two episodes. Controlling for real GDP growth, the additional influence of mortgage finance characteristics is explored—the predominant interest rate type (i.e., fixed versus other types); the maximum observed loan-to-value ratio; and an index of government participation (see Table 3.5).

The two-equation panel-data model of inflation-adjusted house price changes and the change in the share of nonperforming loans is estimated for both episodes. Next, the impact of different housing finance characteristics on cross-country crisis outcomes is estimated. Finally, the SUR model of pre-crisis mortgage credit growth and house price changes is estimated to test whether housing finance characteristics explain the pre-crisis mortgage credit boom, which is strongly associated with crisis severity.

The second analysis covers 19 countries in the Organization for Economic Cooperation and Development from 1980 to the second quarter of 2010 (see Annex 3.2). It examines the relationships among house prices and credit and the impact of housing finance characteristics on house price swings based on panel regressions that capture both the cross-section and time-series dimensions of the data, while controlling for differences across countries using country-fixed effects. The dependent variable in all regressions is the one-year change of the nominal house price index, which is regressed on a range of potential drivers of house prices.

The basic relationship between house price swings and household credit is examined, controlling also for the main fundamental drivers of house prices, namely real GDP growth, inflation, and the rate of population growth. Next, the contribution of different housing finance characteristics to house price volatility is examined. This analysis assesses (1) whether a given characteristic amplifies the effect of a change in fundamentals (such as income or population growth) on house prices; and (2) whether the characteristic affects the magnitude of housing busts across the sample. Last, the analysis is extended to examine whether government participation in housing markets—based both on the composite index and specific dimensions—amplifies the effect of income shocks on house prices and affects the magnitude of busts.

for advanced economies over time. This relationship is highly significant and economically relevant and also holds if population growth is substituted for GDP growth. The results also document a positive relationship between LTV ratios and the magnitude of house price busts, confirming the notion discussed earlier that higher leverage can adversely affect house price dynamics in the downturn. By contrast, when simultaneously estimating nonperforming loans and house price growth for a more varied set of countries (Annex 3.1), LTV ratios do not help explain house price or mortgage credit growth in the run-up to the recent crisis, or the depth of the house price downturn or increase in loan losses during the crisis. This might in part reflect the fact that LTV ratios may not be representative in many emerging economies, where loans are mostly originated by lenders in the unregulated sectors.

A positive relationship between LTV limits and house price increases over time is supported by other studies, although concerns regarding this relationship are also noted. Crowe and others (2011b), using LTV ratios at origination for the 50 U.S. states, find a strong positive association between LTV ratios and house price growth. However, they also note the difficulty in establishing the causality between LTV ratios and house price and mortgage credit dynamics. Also, a review of the experience of countries that have implemented mandatory LTV limits suggests that the effectiveness of such limits can erode over time (e.g., through regulatory arbitrage). Empirical studies on LTV limits are also hampered by a lack of data. Ideally, LTV limits could be combined with debt-service-to-income (DTI) limits, as discussed in Box 3.3; while the LTV ratio captures borrowers' ability to repay the loan by selling the property, the DTI ratio captures their ability to service the loan during its lifetime.

More generally, and as noted earlier, relaxed lending standards and increased household leverage have been shown to be associated with higher house price increases, which in turn are associated with stronger house price declines and financial stability problems during the bust. Furthermore, housing booms that are mainly driven by relaxed lending standards are more likely to result in a subsequent banking crisis. In fact, an overriding theme in the run-up to the recent crisis (and many earlier ones) was the erosion of mortgage underwriting standards in certain countries. This reflected increased competition and aggressive lending, lax regulation and supervision, and incentive misalignment for private-label residential mortgage-backed securitization. Aided by abundant liquidity, relaxed lending standards led to an overall increase in mortgage credit growth, including for low-income households, in turn spurring the house price boom and subsequent bust and significantly contributing to financial instability.

Mortgage Products

The empirical analyses suggest that the prevalence of variable-rate loans amplifies mortgage credit growth and in turn house price swings. While variable rate loans expose unhedged borrowers to interest rate risk and the banks to credit risk when interest rates go up, the lower variable rates relative to fixed rates might lure myopic borrowers to take on excessive credit.

Certain U.S. mortgage products have been linked to higher rates of default, such as subprime adjustable-rate mortgages, balloon mortgages, and interest-only mortgages.[37] Subprime loans and loans without any documentation, rare or nonexistent outside the United States, have defaulted at very high rates (Figure 3.9). Such loans have generally been originated by mortgage brokers that are subject to little or no supervision and have been regulated only by licensing agreements. Certain mortgage products such as second-lien contracts and silent second liens (whose existence is not disclosed to the originator of the first lien), which have been limited to the United States (ECB, 2009), have contributed to increased leverage. Meanwhile, as discussed above, reliance on foreign-currency-denominated mortgages (especially in euros, Swiss francs, and Japanese yen) in emerging Europe has exposed borrowers (and indirectly banks) to exchange rate risks, in particular as household incomes typically are denominated in local currencies.[38]

Still, product design has not been singled out as a cause of mortgage default outside the United States, and other factors could be more important in explaining delinquencies. In Spain and the United Kingdom, lower interest rates on adjustable-rate mortgages have been credited for keeping default rates down in the recent crisis. The United Kingdom also had a significant share of subprime lending, peaking at 8 percent of mortgages in 2006, with U.K. lenders providing loans to borrowers with both adverse credit and limited documentation (Lea, 2010a). However, while U.K. nonconforming private-label securitized

[37]A balloon mortgage does not fully amortize over the life of the loan, leaving a balance at the end of the term. An interest-only mortgage does not amortize at all; monthly payments consist only of interest, and the principal balance is paid off when the loan matures.

[38]For example, with 60 percent of new mortgage loans denominated in Swiss francs, Hungarian households experienced difficulty in repaying their debt as the Hungarian forint depreciated against the franc in 2010. The Hungarian authorities are currently discussing a support scheme for distressed mortgage borrowers (IMF, 2011).

loans have had high delinquency rates, the number of foreclosures has been much smaller than in the United States.[39] In the end, the dominant product in any given country will represent a balance between borrower and lender needs, as well as regulations, history, and degree of sophistication of the financial system (Lea, 2010b).

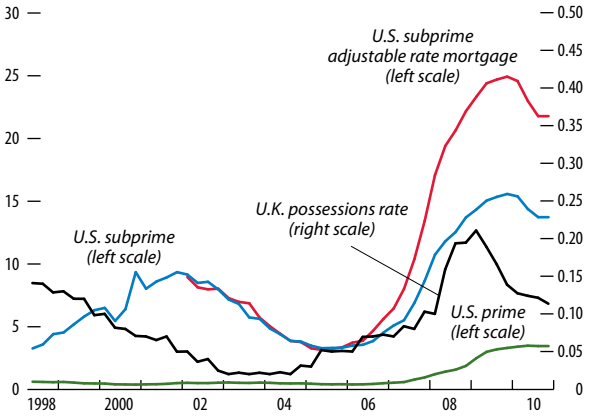
In addition to the housing finance characteristics included in the empirical analyses as discussed above, other housing finance characteristics might also be important for financial stability, including the role played by private-label securitization, nonrecourse mortgages, and lack of prepayment penalties. These factors are discussed further below.

Securitization and Servicing versus Covered Bonds

In the run-up to the crisis, private-label residential mortgage securitization in the United States was associated with a deterioration in underwriting standards and incentive problems. Furthermore, as loans have become delinquent, servicers currently have little incentive to renegotiate loans, even when they have the contractual ability to do so, because their income depends on fees that are based on the outstanding principal balance of the loans (Box 3.7). As a result, the U.S. homeowner mortgage support program (Home Affordable Modification Program—HAMP) puts an emphasis on the importance of incentivizing servicers (IMF 2009c, Chapter 2; Levitin and Twomey, 2011).

Covered bonds, backed by high-quality mortgages combined with greater accountability by the originating institutions, have contributed to safer mortgages in Europe and could complement securitization as capital-market mortgage financing.[40] Still, there might be challenges in introducing covered bonds in the United States, as noted by Surti (2010). Such a system would require stricter underwriting standards, because the

Figure 3.9. Home Foreclosures in the United Kingdom and the United States
(In percent of total residential mortgage loans)



Sources: U.S. Mortgage Bankers Association; and U.K., Council of Mortgage Lenders.

[39]In part this might reflect the existence of a homeowner mortgage support program in the United Kingdom, as well as historically low interest rates and recourse lending. In the United States, the Home Affordable Modification Program has been less successful in averting foreclosures, as evidenced by the small fraction of allotted funding actually spent, in part probably due to an insufficient emphasis on principal writedowns.

[40]Other factors also help explain the safety of mortgages in Europe, including lower LTV levels and full-recourse loans.

Box 3.7. Mortgage Finance Unbundling and Incentive Misalignments

Policymakers and observers are expressing increasing frustration with the efforts of U.S. mortgage servicers to mitigate foreclosures. This box explores some of the aspects of the servicing business that explain why volumes of loan modifications have been so disappointing, even though they apparently maximize expected loan portfolio net present values. The analysis demonstrates the importance of financial infrastructure in housing finance systems.

It is widely acknowledged that avoiding foreclosure more likely than not maximizes the net present value (NPV) of seriously delinquent loans (Fitch Ratings, 2008). Foreclosure is a lengthy process, and the severity of losses during such processes tends to be greater than during more orderly unwinds.[1] In many cases, the expected NPV of a seriously delinquent loan is maximized if creditors exercise some degree of forbearance, including loan modifications that involve partial forgiveness of payment and principal.

However, the foreclosure mitigation mathematics should also account for the possibility that modified loans will slip back into delinquency ("redefault") if the reduction in payments or principal is not sufficient, or that delinquent loans will become current ("self cure") without any loan modifications (Adelino, Gerardi, and Willen, 2009; Das, 2010; Haughwout and Okah, 2009).[2] In any case, most delinquent loans do not enter any sort of loss mitigation program, including those subsidized by the government, or even become part of foreclosure proceedings within six months of becoming seriously delinquent (Agarwal and others, 2011).

Furthermore, once securitized, seriously delinquent mortgages are less likely to be modified than are ("portfolio") loans held on lender balance sheets (Agarwal and others, 2011). This could be because the quality of securitized loans was so poor from the outset that, from the lender viewpoint, it is uneconomic to restructure them.[3] The poor modification performance has also been attributed to loan servicer under-resourcing, plus several potential incentive conflicts between servicers and mortgage-backed securities (MBS) holders.

Most loans that are securitized in the United States are managed by third-party servicers as agents for the trusts that represent the interests of the MBS investors.[4] Depending on the contractual arrangements, servicing income is usually comprised of:

- A percentage of the outstanding principal balance ("servicing fees") deducted each month from the payments received from borrowers;
- Interest income ("float") on the funds received from borrowers before sending them on to the trust (usually the payments come in at the beginning of the month and go out to the trusts at the end). These funds include escrow accounts for taxes and insurance;
- Ancillary fees charged to borrowers for late payments and bounced checks, and to the trust for collection costs, even on delinquent loans; and
- A "retained interest" in a first-loss tranche of the MBS (usually only if the servicer is an affiliate of the securitizer).

Although servicing and ancillary fee maximization would appear to incentivize servicers to avoid foreclosures, modification negotiation is expensive "high-touch" work, for which servicers are not compensated. Furthermore, all of that work is for naught if the modified loan redefaults or if the loan would have cured without modification. Neither are servicers in a hurry to foreclose seriously delinquent loans, because

Note: This box was prepared by John Kiff with contributions from Robert Sheehy.

[1]Foreclosure costs include the legal and other transaction costs; principal and interest payments lost during the foreclosure process; the higher loss severities associated with distressed sales of the property; and any further home price depreciation that might occur during the process.

[2]Also, the severity of the loss from a foreclosure can be reduced if the lender can recoup some of the deficiency (the amount by which the loan balance exceeds the foreclosure proceeds), although in cases where the delinquency is an affordability issue, as it probably is with many seriously delinquent U.S. subprime loans, such recourse may not be worth pursuing. Furthermore, in some of the hardest-hit U.S. states, lenders cannot legally pursue recourse actions on certain residential mortgagors (Pence, 2006).

[3]The ratio of total debt payments to income of borrowers whose loans have been modified under the U.S. government's Home Affordable Modification Program was 63 percent as of September 30, 2010.

[4]U.S. banks are unique in outsourcing mortgage loan servicing. See Levitin and Twomey (2011) for a comprehensive analysis of servicing economics.

Box 3.7 *(continued)*

they will ultimately be reimbursed for all of their fees accrued until the foreclosure process starts. In a period of large-scale delinquencies, foreclosure delays may thus be exacerbated by an incentive structure that does not press for rapid resolution.

In addition, MBS senior tranche holders, who make up the majority of MBS investors, are highly incentivized to push for foreclosures, so that they can accelerate their cash inflows at the expense of junior tranche holders.

In the end, servicing is more than just collecting and distributing periodic cash flows, and it should not be ignored in the design of a mortgage system. In traditional systems, in which loans are serviced by lenders that retain the economically material risk exposure to the loans, such special considerations are not necessary. However, in systems in which servicing has been unbundled, the interests of investors and the financial system would be better served by contractual arrangements that better anticipate large-scale serious delinquencies.[5] Also, potential conflicts of interest between servicers and investors should be disclosed.

[5]With regard to better aligning servicer compensation and cost structure, the U.S. initiative announced by the Federal Housing Finance Agency (www.fhfa.gov) on January 18, 2011, is a welcome development.

underlying mortgages would remain on the banks' balance sheet. Moreover, relatively lenient personal bankruptcy rules might not be conducive to the introduction of covered bonds in the United States; since issuers are required to replace defaulting loans in cover pools, this could imply more frequent asset replacement.[41]

Nonrecourse Mortgages

The use of full-recourse mortgage loans, which allow the lender to pursue deficiency judgments, has helped limit the number of foreclosures in advanced economies other than the United States.[42] Empirically, full recourse has been associated with lower default rates in Europe (Duygan-Bump and Grant, 2008). At the same time, lenders might have fewer incentives to undertake fair value assessments for full-recourse mortgages, which in turn could lead to riskier lending; lenders might also have fewer incentives to undertake loan modifications. In a minority of U.S. states, mortgage loans are considered nonrecourse debt.[43] Such mortgages have encouraged some borrowers to opt for "strategic default" (Ghent and Kudlyak, 2010; Jagtiani and Lang, 2010).[44] By further increasing the supply of housing, strategic defaults put further downward pressure on house prices. Nonrecourse mortgages might

[41]The Federal Deposit Insurance Corporation (FDIC) has also raised concerns about the protection of depositors in a covered bond system (see www.fdic.gov/news/news/speeches/chairman/spoct2510.html). These concerns, which in part may reflect unease regarding the procyclicality of residential mortgage loan quality in the United States (as underscored by their credit performance during the crisis), are generally addressed by capping the share of covered bonds in the total liabilities of a bank, in particular by limiting asset eligibility.

[42]A deficiency judgment is a court order against a borrower for the balance of the mortgage debt in the case of a sale of the foreclosed property that does not fully satisfy the loan obligations. In contrast, a nonrecourse mortgage implies that the lender has recourse only to the underlying property, not to any income or other wealth of the borrower.

[43]A limited number of U.S. states (California being the most significant) do not hold debtors personally liable for mortgage loans, thus prohibiting deficiency judgments. Other states limit deficiency judgments to the difference between mortgage debt and the fair value of the foreclosed property (instead of the sales price at foreclosure). Still other states prohibit deficiency judgments but only after nonjudicial foreclosure is chosen. Practices and interpretations vary significantly across states. In practice, deficiency judgments are sometimes not sought not because they are prohibited but due to the time and costs involved, and given borrowers' lack of other assets to satisfy the claim.

[44]That is, when a borrower who might be able to service the mortgage chooses to default because the value of the underlying property is less than the mortgage amount. See further Chapter 1 for a discussion of strategic default.

also give borrowers fewer incentives to maintain their properties, because they can more easily walk away in case of house price declines.

Lack of Prepayment Penalties

As noted above, the lack of prepayment penalties for fixed-rate mortgages in the United States is seen as having contributed to increased household leverage and mortgage indebtedness through cash-out refinancing. Such refinancing booms can lead to mortgage market volatility (ECB, 2009; Lea, 2010b). At the same time, while stringent payment penalties may act to deter equity withdrawal, they may also make it more expensive for borrowers to deleverage.[45] Also, Kiff (2009) suggests that transaction costs on U.S. mortgage refinancing often offset the lack of formal prepayment penalties. Hence, the impact of prepayment penalties on leverage may be limited.

Conclusions and Policy Implications—Back to Basics

This chapter discussed current housing finance practices in a number of representative advanced and emerging economies, as well as the impact of those practices on financial stability. National authorities and policymakers may find this analysis helpful as they reassess the structure and health of their housing finance systems, with particular attention given to those features that contribute to financial stability.

Country-specific housing finance systems vary significantly and have sometimes been shaped by pivotal historic events. Today's housing finance systems are determined by a range of factors, including the products offered to investors (floating or fixed interest rates over various maturities); the use of prepayment penalties; funding (deposits versus capital markets); the degree of lender recourse to defaulted borrowers' other assets and income; and government participation, including tax breaks. While different systems can work well to provide stable housing finance, a number of best practices emanate from the discussion and empirical analyses. They focus on enhanced underwriting and supervision; better calibrated government participation; and better-aligned incentives in capital-market mortgage funding.

Best Practices

Enhanced Risk Management, Underwriting Standards, and Supervision

It is almost impossible to overstate the importance of improved internal risk management and underwriting standards by all mortgage loan originators and brokers, with penalties for poor underwriting complemented by enhanced prudential supervision. Good underwriting standards that are consistent across various types of mortgage lenders and brokers will need to become, once more, a hallmark of the mortgage origination business. Such standards need to take into account the value of the underlying property, the borrower's creditworthiness, verification of the submitted information, and sound and independent appraisals.

In this context, LTV and DTI limits could serve as useful prudential tools to dampen credit and hence house price growth, although some caution will need to be exercised when implementing such limits, as discussed further below.[46] As shown above, past mortgage credit growth, together with the state of the economy, explain the bulk of the cross-country variation in the house price slowdown and the increase in bank loan losses in the recent crisis—the faster you grow, the harder you fall (Annex 3.1). While the evidence of the empirical analyses on LTV limits are somewhat mixed—possibly reflecting the fact that LTV ratios may not be representative in many of the emerging economies that are included in the Annex 3.1 analysis—the balance of evidence, also drawing on other empirical literature, seems to support a positive relationship between LTV ratios and credit and house price growth, at least in the short run. Together, such prudential measures, which would set the limits for

[45]Prepayment penalties are the norm in Canada, but borrowers can usually prepay 15 to 20 percent of the original mortgage loan balance annually without paying a penalty or any transaction cost (Kiff, 2009). Such a scheme potentially discourages the building of cash-out, refinancing-driven leverage, while encouraging deleveraging when the borrower has excess liquidity.

[46]The focus of this chapter is on the underlying structure of housing finance systems, rather than on macroprudential measures such as countercyclical LTV limits (see Crowe and others, 2011a) and dynamic provisioning.

conforming loans, would provide a buffer to draw on in a housing bust (Crowe and others, 2011a).

Still, as noted earlier, the effectiveness of prudential limits might weaken over time as borrowers are pushed into the unregulated sectors. Hence, it will be important to implement such limits consistently across mortgage originators (banks and nonbanks). It will also be important that such limits be comprehensive and take into account all liabilities of the borrower, in addition to the first mortgage. The exact definition of conforming loan will need to take into account individual country housing and mortgage market characteristics, such as the relative cost of real estate. Lastly, absolute LTV limits might be blunt instruments that exclude potentially creditworthy first-time buyers/borrowers.[47] Rather, mortgages that do not meet the strict LTV prudential limit could, for example, still be made available to those borrowers who agree to purchase adequate mortgage insurance.[48] Alternatively, bank supervisors would need to assign higher capital risk weights for nonconforming mortgages (Scharfstein, 2010).

Better-Calibrated Government Participation

The role of government in the housing market should be carefully reviewed as it may unintentionally contribute to financial instability.[49] In particular, there is a need for well-calibrated government participation with less focus on direct provision of mortgage credit and more concern about systemic effects and externalities. Better calibrated government participation would also rely on more targeted measures to achieve social objectives, such as affordable housing for low-income households. Dedicated government agencies need to be transparent and carefully constructed. In addition, government guarantees should be explicit and priced upfront to mitigate the moral hazard problem—that is, lenders taking excessive risk based on the implicit assumption that the government will eventually rescue them in the event of a crisis.

A disproportionate focus on homeownership might exacerbate house price swings through government-led subsidization of mortgage loans and a relaxation of lending standards in response to growing competition between the government and financial firms. Some countries might want to reconsider their policies in this regard: for example, good-quality rental housing could be a better option for low-income households. A more level tax treatment across owner-occupied and rental housing would help reduce the current bias toward homeownership. In particular, in the absence of taxation of imputed rents and capital gains on housing, countries should reassess policy tools such as mortgage interest deductibility, which should be capped and apply only to first mortgages on primary residences.

Improved Alignment of Incentives in Capital Market Funding

Originator-investor incentives in the private-label residential mortgage securitization markets should be well aligned. In the run-up to the recent crisis, incentive misalignments in the U.S. residential MBS underwriting process incentivized the maximization of mortgage volumes (and fees) at the expense of mortgage quality. In this regard, the aforementioned policy initiatives that are designed to incentivize loan originators to retain credit risk exposure to their securitization transactions and the underlying loans may be helpful. Also, a general improvement of underwriting standards, as discussed above, should help support the revival of private-label securitization (IMF, 2009c). As discussed in Box 3.7, servicing standards and oversight also need to be improved, and servicer incentives should be better aligned with those of the originators and investors.

Covered bonds could become an important capital market complement to securitization for mortgage funding. However, any effort to encourage covered bond markets should take into account their potential impact on bank failure resolution and deposit insurance programs.

Additional Important Aspects

The best practices outlined above represent important steps toward a more stable housing finance system.

[47]See Financial Services Authority (2009) for further discussion about concerns in using LTV limits.

[48]Mortgage insurance plays an important role in high-LTV lending in some countries (Blood, 2009) and can be an important tool for reconciling the policy goals of widening access to homeownership while mitigating the risks of such lending. Proponents also point to the built-in insurer incentives to promote prudent and countercyclical lending standards, as insurers would be likely to raise premia in the boom (and reduce them during the bust) (Joyce and Molesky, 2009).

[49]Government participation in the mortgage market is also costly from a public finance point of view, even as it has not proven particularly effective in raising homeownership rates.

There are also other aspects of housing finance that might have a bearing on financial stability but that might work differently in different countries, depending on their legal framework, financial infrastructure, and so on. Moreover, when it comes to mortgage products, there may be important differences in viewpoint between lenders and borrowers. For example, while an interest rate cap on adjustable-rate mortgages reduces the potential payment shock to (and default risk of) borrowers, it can reduce the yield for lenders. Mortgages that limit borrowers' personal liability have been shown to provide incentives for them to strategically default on their mortgage. However, the extent to which lenders actually pursue deficiency judgments in the case of delinquencies on full-recourse mortgages also depends on a number of other factors, including the legal infrastructure of the country and the other resources of the borrower. Also, efficient loss mitigation mechanisms for seriously delinquent mortgage loans are important, as speed can be of the essence in avoiding negative feedback loops of housing market stress.

For policymakers in emerging economies who are in the process of developing housing finance structures, there are additional aspects to be considered when implementing the best practices outlined above. In particular, it will be important that the new systems be commensurate with the legal and financial infrastructures of the country. As discussed in Box 3.3, LTV and DTI limits should be lower for emerging markets, as they tend to suffer deeper recessions with more severe financial downturns than advanced economies (Claessens, Kose, and Terrones, 2011a and b). Also, as noted previously, the implementation of LTV limits might be particularly challenging in some of these economies because a large share of mortgage origination is accounted for by the unregulated, informal financial sector. Meanwhile, DTI limits might not properly take into account incomes derived from informal sectors.

Furthermore, risky and complex products such as foreign currency mortgages or foreign-currency-indexed mortgage rates should be avoided in markets that do not provide sufficient hedging opportunities or where originators are unable to price in the related risk.[50] Also, the choice of funding tools, such as covered bonds or securitization, will need to depend on the ability to oversee the risks involved and fully understand the underlying legal components. Moreover, government participation in emerging economies should focus on better regulation and information provision (e.g., through the creation of credit bureaus and efforts to increase financial literacy among consumers), while refraining from directly providing mortgage products or distorting mortgage prices through subsidies and tax exemptions (Chiquier and Lea, 2009).

Reform of the U.S. Housing Finance System

The U.S. housing finance system is unusual in many respects. An overhaul of important aspects of this system is needed, in line with the best practices outlined above and in Box 3.4, and as discussed in the recent U.S. Financial Sector Assessment Program (IMF, 2010a). It is noteworthy that while the United States did not experience the largest house price decline among advanced economies in the recent crisis, it did experience the most severe impact on its mortgage market and financial system among large economies. The U.S. administration has recently published a proposal for reform of the U.S. housing finance system, underlining the need for further discussion on this topic (U.S. Treasury and HUD, 2011). While an overhaul of the housing finance system will take years to complete, U.S. authorities need to step up their efforts now to develop and implement an appropriate action plan.

In line with the best practices outlined above, there is a pressing need for enhanced internal risk management at financial institutions and for improved underwriting standards and supervision. Current gaps in the regulatory, supervisory, and consumer protection frameworks should be addressed. Moreover, there is a need for better-defined and more transparent government participation in the housing market, with all such policy measures, including strict affordable housing policy goals, transparently shown in the government's budget. Housing tax expenditures should be reviewed, and the role of the GSEs should be reassessed so as to create a more level playing field in the U.S. mortgage markets. While the GSEs were not at

[50]Households in emerging economies typically have limited opportunities to hedge against foreign currency risks, although in countries where remittances play an important role, there are in fact some natural hedging possibilities.

the root of the recent crisis, their structure contributed to the recent financial distress (U.S. Treasury and HUD, 2011). A more level playing field combined with better incentive alignment in the private-label MBS market will help revive this market. Such reforms would have a significant positive effect on the U.S. financial system and would help bolster global financial stability. They would also help strengthen U.S. sovereign creditworthiness, given the current public finance burden of the GSEs (see Chapter 1).

The U.S. administration's recent recommendations on housing finance reform (U.S. Treasury and HUD, 2011) appear broadly in line with the discussion in this chapter. Indeed, the recommendations focus on winding down the GSEs by gradually raising their insurance guarantee fees, reducing their investment portfolios, and lowering the ceiling for conforming loans. The recommendations also focus on reducing the government's role in housing finance. In particular, they deemphasize homeownership as a policy goal and call for more focused housing policies, including more explicit and targeted government participation. However, they do not address the mortgage interest tax deduction, which, as discussed in the chapter, is both expensive and regressive. The recommendations also note the importance of improving market oversight while increasing transparency and accountability, and they emphasize the need for incremental change, mindful of operational complexities of transition, not least because of the still fragile state of housing markets.

The U.S. administration's report presents three long-term options with different degrees of explicit government participation, all of which appear to be headed in the right direction, although some concerns and challenges remain.

The first option—a fully privatized system of housing finance with a government role limited to helping narrowly targeted groups of low-income borrowers—implies the least government participation. This could raise uncertainty and moral hazard during times of crisis, as many might expect government support in times of severe financial stress. It also assumes that private markets are able to step in and substitute for GSE issuances at an affordable price, which could lead to more volatile mortgage markets.

The second option—a privatized system plus a public guarantee mechanism that could be scaled up in a crisis—could, for example, use an above-market guarantee fee that would be attractive only during market stress. However, it faces important design challenges, such as avoiding crowding out private markets in normal times and fueling moral hazard during turbulent times (e.g., if the premium is lowered during stress).

The third option is a privatized system plus public catastrophic reinsurance, with first-loss insurance coverage from private sources (the reinsurance would pay out once shareholders of private guarantors are wiped out).[51] That option is likely to provide the lowest-cost access to mortgage credit and would make government participation (and taxpayer exposure) explicit. However, pricing the catastrophic insurance will be challenging given the need to avoid overinvestment in housing that would exacerbate distortions and contingent liabilities.

In the foreseeable future, there seems to be a continued need for government guarantees for securitized mortgages, given the significant remaining uncertainty and vulnerability in the U.S. mortgage market, particularly in the private-label residential MBS market. Substantial swings in the cost of mortgage financing could be particularly damaging at a time when weaknesses in real estate markets continue to weigh on the economic recovery. However, government guarantees should be explicit and fully accounted for on the government's balance sheet. Over the medium term, and with appropriate reforms to encourage "safe" securitization as discussed in the chapter, the GSEs should be wound down to make way for private-label securitization to reemerge as a viable option. Ultimately, the details of implementation will be key. The challenge will be to strike the right balance between delivering an appropriate level of explicit government participation and discouraging another cycle of overinvestment.

In conclusion, a vibrant and healthy mortgage market is an important factor driving both macroeconomic growth and global financial stability. Learning from experience, policymakers should seek to establish robust mortgage market structures and provide adequate oversight aimed at ensuring their careful implementation.

[51]This would be similar to FDIC deposit insurance.

Annex 3.1. The Impact of Housing Finance Modes on House Prices and Loan-Loss Growth during the Recent Crisis[52]

House price changes, mortgage credit growth, and loan losses are influenced by mortgage market structures, and the empirical results presented in this annex highlight which mortgage market features are the most influential. The aim is to capture the feedback effects between house price changes and loan-loss growth or that between the house price changes and mortgage credit growth. Then the additional influence of mortgage finance characteristics is explored. The analysis covers 36 countries during two episodes: the 2004–07 global liquidity expansion (the "boom"), and the 2007–09 crisis period (the "bust").

Econometric Model

A two-equation panel-data model of inflation-adjusted home price changes and the change in the proportion of nonperforming loans is estimated. The simultaneous equation setup captures the feedback between house price growth and financial stability, with mortgage market structures as potential drivers of both during each of the two episodes. Controlling for real GDP growth, three potential housing finance characteristics are considered: the predominant interest rate type (fixed (= 1) versus "other"); the maximum observed loan-to-value (LTV) ratio; and an ordinal measure of government participation (a zero to 1 index that weighs eight forms of participation).[53] In order to capture the cross-effects of loan performance on house prices and vice versa, the equations are estimated using Zellner's "seemingly unrelated regressions" (SUR) model. All variables, except for the housing finance characteristics, are measured as growth rates over each of the two episodes.

$$\Delta H_{it} = \alpha_1 + \beta_1 \Delta FS_{it} + \gamma \Delta Y_{it} + \Phi_1 \text{ (Housing Finance Characteristics)} + \varepsilon_{1it}$$

$$\Delta FS_{it} = \alpha_2 + \beta_2 \Delta H_{it} + \gamma_2 \Delta Y_{it} + \Phi_2 \text{ (Housing Finance Characteristics)} + \varepsilon_{2it} ,$$

where

i = 1…36 countries (although, some specifications substantially reduce the sample;

t = 2004–2007, 2007–2009 (two episodes);

H = Real House Price; Y = Real GDP Growth;

FS = Financial Stability; and

ΔFS = {Change in non-performing loans/loans ("NPL-ratio"), Change in (mortgage) credit/GDP ratio}.

Estimation method: SUR with period and country-fixed effects, or SUR cross-section.

Economies and Data Sources

The economies are Australia, Austria, Belgium, Bulgaria, Canada, China, Czech Republic, Denmark, Spain, Estonia, Finland, France, Germany, Greece, Hong Kong SAR, Hungary, Ireland, Italy, Japan, South Korea, Lithuania, Latvia, Mexico, Malaysia, the Netherlands, Norway, the Philippines, Poland, Russia, South Africa, Singapore, Slovenia, Sweden, Thailand, Taiwan Province of China, the United Kingdom, and the United States.

The emerging and newly industrialized economy (ENIE) dummy equals 1 for Bulgaria, China, the Czech Republic, Estonia, Hong Kong SAR, Hungary, South Korea, Lithuania, Latvia, Mexico, Malaysia, the Philippines, Poland, Russia, South Africa, Singapore, Slovenia, Thailand, and Taiwan Province of China. Some specifications limited the sample of countries according to availability of data.[54]

Data on house price indices are from the Organization for Economic Cooperation and Development and the Global Property Guide, deflated by consumer price indices from the IMF's International Financial Statistics; mortgage or housing credit from Haver Analytics; index of government participation constructed in Table 3.5 (sources listed in the table); interest rate type and LTV ratios from Warnock and Warnock (2008); and non-

[52]This annex was prepared by Srobona Mitra.

[53]The participation measures considered are upfront subsidies to first-time buyers; subsidies to low-income buyers; indirect subsidies through saving-account contributions; early withdrawals from provident funds for house purchases; existence of housing finance funds owned by government; presence of tax deductibility of mortgage interest; tax deductibility of capital gains; and majority market share of state-owned financial institutions as mortgage originators. See Table 3.5 for details.

[54]The Czech Republic and Slovenia are currently classified as "Advanced Economies" for World Economic Outlook purposes. However, they were part of the ENIE group during most of the 2004–07 period and have been included among the ENIEs for the purpose of this econometric analysis.

performing loans/total loans from Statistical Appendix tables on financial soundness indicators in previous issues of the IMF's *Global Financial Stability Report*.

Results

- Growth in house prices and overall loan-losses in the economy are associated with each other (Table 3.7, columns 1 and 2). Controlling for the state of the economy (GDP growth), 1 percent lower house price growth is associated with about a 0.1 percentage point higher nonperforming loan (NPL) ratio.
- Growth in house prices and mortgage credit growth feed back into each other as well (Table 3.7, columns 3 and 4). In particular, 10 percentage point higher mortgage credit in percent of GDP is associated with 16 percentage points higher growth of real house prices. This is comparable to the 6 percent higher growth of nominal house prices found in Annex 3.2, although credit growth is measured differently. Furthermore, 10 percent higher house price growth is associated with a 0.4 percentage point higher ratio of mortgage credit to GDP.
- Past mortgage credit growth and the recession explain the bulk of the cross-country variation in the house price slowdown and the increase in banking sector loan losses during the crisis (Table 3.7, columns 5 and 6). In particular, 1 percentage point higher mortgage credit growth (in percent of GDP) during the pre-crisis boom is associated with 0.66 percentage point lower house price growth and a 0.15 percentage point higher NPL ratio during the crisis.
- There is mild evidence that countries with variable interest rates experienced a deeper house price downturn and higher nonperforming loans during this crisis (Table 3.7, columns 7 and 8), but these effects are not statistically significant. However, taking into account the evidence in Table 3.8 (columns 5 and 6) that countries with predominantly variable rates had higher mortgage credit growth during the boom episode, and that the boom-time credit growth explains the subsequent bust, the effect of the interest rate type is already accounted for when the boom-time credit growth is included in Table 3.7, columns 7 and 8.
- Greater government participation in housing finance did not provide a cushion against the crisis (Table 3.7, columns 9 and 10). Among housing finance characteristics, countries with higher government participation in housing finance experienced a deeper house price downturn after a level effect on emerging economies is accounted for. No separate effect of the tax deductibility of mortgage interest was found (and not shown in the table), mainly because of its preponderance across countries.
- Maximum LTV ratios do not help explain crisis outcomes or the pre-crisis boom (columns 11 and 12 in Table 3.7 and columns 7 and 8 in Table 3.8). Maximum observed LTV ratios neither explain the depth of the house price downturn or the increase in loan losses during the crisis. Furthermore, threshold effects of high LTV ratios (for instance, above 80 percent) were not found to be important for the outcome on financial stability. Typical and average LTV ratios on new loans are not representative for guiding policies on financial stability purposes when much higher LTV ratios are widely available. For instance, the average LTV ratio in the United States was 76 percent, but LTV ratios of 100 percent were widely available before the crisis. Crowe and others (2011b), using LTV ratios at origination across a panel of the 50 U.S. states, find a strong association between LTV ratios and house price growth. Also, as shown in Annex 3.2, there is some evidence that LTV ratios could explain house price movements over a longer sample in advanced economies.
- Mortgage credit growth was fueled by house price growth and vice versa (columns 3 and 4 in Table 3.7, and columns 1 and 2 in Table 3.8). However, during the crisis, it is hard to explain the mortgage credit crunch, owing to the multitude of factors that could have restrained mortgage lenders or household borrowers.
- Mortgage credit and real GDP growth explains 50 percent of the pre-crisis house price growth; real house price growth alone explains 20 percent of mortgage credit growth before the crisis.
- Government participation amplified the effect of higher house prices on mortgage credit growth before the crisis, but mostly in advanced economies (Table 3.8, columns 3 and 4). This effect is also confirmed (but not displayed) and strengthened if the real house price equation is excluded from the two-

Table 3.7. Joint Determinants of Growth in Real House Prices, Mortgage Credit, and Loan Losses

	Two-Episode Panel (2004–07 and 2007–09)[1]		Two-Episode Panel (2004–07 and 2007–09)[1]		Crisis—2007–09 Episode Cross-Section (Basic)		Crisis—2007–09 Episode Cross-Section (Type of Interest Rate)		Crisis—2007–09 Episode Cross-Section (Government Participation)		Crisis Episode Cross-Section—2007–09 Episode (LTV)	
	Seemingly Unrelated Regression (Feasible GLS)		Seemingly Unrelated Regression (Feasible GLS)		Seemingly Unrelated Regression (Feasible GLS)		Seemingly Unrelated Regression (Feasible GLS)		Seemingly Unrelated Regression (Feasible GLS)		Seemingly Unrelated Regression (Feasible GLS)	
Explanatory Variables	Change in real house price (percent)	Change in NPL ratio (pp)	Change in real house price (percent)	Change in housing credit/ GDP ratio (pp)	Change in real house price (percent)	Change in NPL ratio (pp)	Change in real house price (percent)	Change in NPL ratio (pp)	Change in real house price (percent)	Change in NPL ratio (pp)	Change in real house price (percent)	Change in NPL ratio (pp)
	Equation 1	Equation 2	Equation 1	Equation 2	Equation 1	Equation 2	Equation 1	Equation 2	Equation 1	Equation 2	Equation 1	Equation 2
	1	2	3	4	5	6	7	8	9	10	11	12
Change in real house price (percent)		–0.07		0.04		–0.07		–0.07		–0.15		0.13
		(0.01)***		(0.02)*		(0.06)		(0.06)		(0.08)*		(0.07)**
Change in NPL ratio (pp)	–7.51		–4.31	–0.75	–0.66		–0.64		–0.97		0.93	
	(0.98)***		(1.07)***	(0.38)**	(0.54)		(0.54)		(0.50)*		(0.45)**	
Change in mortgage credit-to-GDP ratio (pp)	0.83	–0.02	1.64									
	(0.37)**	(0.04)	(0.38)***									
Change in real GDP (percent)	2.3	0.11	2.73		0.5	-0.2	0.51	–0.21	0.42	–0.18	0.93	–0.35
	(0.26)***	(0.04)***	(0.27)***		(0.25)**	(0.08)***	(0.25)**	(0.08)***	(0.23)*	(0.09)*	(0.21)***	(0.08)***
Change in mortgage credit-to-GDP ratio (pp) in 2004–07					–0.66	0.15	–0.65	0.15	–0.63	0.11	–1.16	0.35
					(0.24)***	(0.08)**	(0.24)**	(0.08)*	(0.20)***	(0.09)	(0.18)***	(0.09)***
Type of interest rate (predominantly fixed = 1, others = 0)							0.61	–0.71				
							(4.42)	(1.42)				
Index of government participation (0-1, see Table 3.5)[1]									–16.25	–3.47		
									(7.51)**	(3.21)		
LTV ratio (maximum observed)											0.01	0.02
											(0.08)	(0.03)
Dummy for ENIEs (DUMENIE)									–4.59	0.93	–10.80	3.04
									(2.39)*	(1.01)	(2.12)***	(0.95)***
Constant	–25.5	–0.61	–36.61	6.79	–0.64	0.16	–0.75	0.28	7.19	0.76	–4.53	–1.71
	(7.9)***	(0.89)	(8.00)***	(2.05)***	(1.73)	(0.56)	(1.89)	(0.61)	(3.12)**	(1.38)	(6.97)	(2.83)
Country fixed effects	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No
Period fixed effects	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No
No. of observations	66	66	66	66	32	32	32	32	23	23	32	32
R^2	0.94	0.90	0.95	0.78	0.62	0.60	0.62	0.60	0.67	0.63	0.62	0.61

Source: IMF staff estimates.

Note: NPL ratio = Nonperforming loans/total loans; LTV = loan-to-value; GLS = generalized least squares; pp = percentage points; ENIEs = emerging and newly industrialized economies. Standard errors in parenthesis; ***, **, * = statistically significant coefficients at the 1, 5, and 10 percent levels.

[1]The results are robust to both the indices of government participation shown in Table 3.5.

Table 3.8. Joint Determinants of Growth in Real House Prices and Mortgage Credit, Pre-Crisis Episode, 2004–07

	Pre-crisis—2004–07 Episode Cross-Section (Basic)		Pre-crisis—2004–07 Episode Cross-Section (Government Participation)		Pre-crisis—2004–07 Episode Cross-Section (Type of Interest Rate)		Pre-crisis—2004–07 Episode (LTV)	
	Seemingly Unrelated Regression (Feasible GLS)		Seemingly Unrelated Regression (Feasible GLS)		Seemingly Unrelated Regression (Feasible GLS)		Seemingly Unrelated Regression (Feasible GLS)	
	Change in Real House Price (percent)	Change in Mortgage Credit/GDP Ratio (pp)	Change in Real House Price (percent)	Change in Mortgage Credit/GDP Ratio (pp)	Change in Real House Price (percent)	Change in Mortgage Credit/GDP Ratio (pp)	Change in Real House Price (percent)	Change in Mortgage Credit/GDP Ratio (pp)
Explanatory Variables	Equation 1	Equation 2	Equation 1	Equation 2	Equation 1	Equation 2	Equation 1	Equation 2
	1	2	3	4	5	6	7	8
Change in real house price (percent)		0.12		0.25		0.14		0.16
		(0.02)***		(0.14)*		(0.02)***		(0.02)***
Change in mortgage credit-GDP-ratio (pp)	3.88		1.73		4.99		4.33	
	(0.62)***		(0.55)***		(0.64)***		(0.61)***	
Change in real GDP (percent)	2.05		–1.13		1.14		1.18	
	(0.49)***		(1.37)		(0.64)*		(0.67)*	
Dummy for ENIEs (DUMENIE)			–10.97	–2.51	36.15	–8.69	27.92	–7.69
			(16.10)	(2.96)	(13.45)***	(1.76)***	(13.28)**	(1.96)***
Change in real GDP (percent) * DUMENIE			1.97					
			(1.49)					
Index of government participation (see Table 3.5)[1]			–11.71	0.77				
			(17.19)	(9.22)				
Change in real house price * Index of government participation				0.36				
				(0.57)				
Change in real house price * Index of government participation * DUMENIE				–0.73				
				(0.42)*				
Type of interest rate (Predominantly fixed = 1, others = 0)					54.26	–7.85		
					(62.22)	(2.68)***		
Type of interest rate * Change in real GDP					–1.92			
					(7.18)			
LTV ratio (maximum observed)							0.39	-0.05
							(0.34)	(0.07)
Constant	–27.73	3.33	16.3	1.88	–42.81	7.46	–65.38	10.44
	(9.64)***	(1.23)***	(12.09)	(3.66)	(10.25)***	(1.27)***	(30.71)**	(6.24)*
No. of observations	36	36	26	26	36	36	36	36
R^2	0.51	0.20	0.27	0.38	0.52	0.48	0.52	0.34

Source: IMF staff estimates.

Note: LTV = loan-to-value; GLS = generalized least squares; ENIEs = emerging and newly industrialized economies; pp = percentage points. Standard errors in parenthesis; ***, **, * = statistically significant coefficients at the 1, 5, and 10 percent levels.

[1]The results are robust to both the indices of government participation shown in Table 3.5.

equation model or if a different index of government participation is used (from Table 3.5). This result complements the finding in Annex 3.2 that government participation amplifies house price swings over a longer time series for advanced economies.

Annex 3.2. Evidence on House Prices, Credit, and Housing Finance Characteristics in Advanced Economies[55]

This annex examines empirically the extent to which house prices are driven by credit and whether and how differences across countries in housing finance systems affect house price dynamics. The data are for 19 countries in the Organization for Economic Development and Cooperation (OECD) from the first quarter of 1980 to the second quarter of 2010.[56] The annex examines empirical relationships between house prices and potential drivers using panel regressions that allow for exploiting variation in both the cross-section and time-series dimensions of the sample, while controlling for differences across countries using country-fixed effects.

The dependent variable in all regressions is the one-year change of the nominal house price index,[57] which is regressed on a range of potential drivers of house prices. Some of the exercises examine housing busts. Based on quarterly data for the 19 countries during the period examined, the analysis identifies 37 episodes of nominal house price declines lasting more than a year (busts).

The first exercise examines the basic relationship between house price swings and household credit. The results suggest that house price appreciations are positively and strongly associated with the growth in household credit extended by banks (Table 3.9). On average, a 10 percent increase in household credit leads to a 6 percent increase in nominal house prices. The results remain strong when credit growth is lagged. They continue to hold when year fixed effects are included, which control for all common variation across time (including potentially correlated house price swings).

There is also evidence that increases in house prices lead to further increases in credit (not shown), suggesting a two-way relationship where increases in credit and house prices feed each other.

Most interestingly, the relationship is different during periods of housing busts: during a bust the positive relationship between household credit growth and house price changes nearly disappears. This may be explained with deleveraging processes that lag the decrease in nominal house prices.

A second set of exercises examines whether the relation between house price swings and the growth in household credit holds when controlling for the main fundamental drivers of house prices, namely real GDP growth, inflation, and the rate of population growth (Table 3.10).

The results show that the relation between credit and prices remains statistically strong when fundamental drivers are included and that inclusion of the additional controls does not change the magnitude of the effect. The effect of the growth of bank loans to households on house price swings is similar in magnitude and sign to that of real GDP growth (Table 3.10, equation 8).

The growth of population has a quite large effect, but it is less statistically significant than that of GDP growth. It may compete with household credit, since higher population growth would tend to lead to household formation and new household borrowing. Inflation does not seem to play a role in house price dynamics.

Additional exercises verify that the relationship between credit and prices is robust to the inclusion of further control variables, such as short- and long-term interest rates and unemployment.

A third set of exercises investigates how different characteristics of housing finance affect the magnitude of house price swings. These exercises exploit both the cross-sectional and time series dimensions of the dataset by allowing changes through time (e.g., in income) to interact with differences across countries (in housing characteristics), resulting in a large number of observations. Since the effects of housing finance characteristics on house prices would work through an effect on credit, credit growth is dropped from the regressions.

The exercise finds that both loan-to-value (LTV) ratios and the prevailing contract type play a role in amplifying house price dynamics. A high LTV ratio strengthens the effect of real GDP growth on house price growth (Table 3.11). This relationship is highly significant and economically relevant, with a coefficient nearly half of the base effect. It is in line with prior evidence obtained

[55]This annex was prepared by Francesco Columba and Erlend Nier.

[56]The sample length differs across countries depending on data availability.

[57]OECD nominal house price data.

Table 3.9. House Prices and Household Bank Credit

Explanatory Variables	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5	Equation 6	Equation 7	Equation 8
Bank loans to households one-year percent change	0.76***	0.54***			0.64***	0.52**		
	0.17	*0.20*			*0.19*	*0.21*		
Bank loans to households one-year lagged percent change			0.47***	0.32**			0.37**	0.27**
			0.14	*0.13*			*0.13*	*0.14*
Bank loans to households one-year percent change * bust dummy					–0.51**	–0.39		
					0.21	*0.26*		
Bank loans to households one-year lagged percent change * bust dummy							–0.36*	–0.13
							0.19	*0.23*
Bust dummy					–0.05**	–0.05**	–0.07***	–0.07***
					0.02	*0.02*	*0.02*	*0.02*
Constant	–0.01	0.02	0.01	–0.01	0.01	0.01	0.04***	0.02
	0.01	*0.03*	*0.01*	*0.01*	*0.02*	*0.03*	*0.01*	*0.01*
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
R^2	0.31	0.46	0.12	0.36	0.50	0.57	0.41	0.52
Number of observations	289	289	285	285	289	289	285	285

Source: IMF staff estimates.
Note: The dependent variable is the one-year growth rate of nominal house price index. Standard errors are below parameter estimates in italics. Estimation peformed by panel regression and standard errors are clustered by country. ***, **, and * = statistically significant coefficients at the 1, 5, and 10 percent levels.

Table 3.10. House Prices, Household Bank Credit, and Macroeconomic Controls

Explanatory Variables	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5	Equation 6	Equation 7	Equation 8
Bank loans to households one-year percent change	0.55***	0.57**	0.76***	0.64***	0.75***	0.63***	0.52***	0.55***
	0.16	*0.19*	*0.18*	*0.19*	*0.18*	*0.19*	*0.17*	*0.18*
Real GDP one-year percent change	0.94***	0.58***					0.95***	0.60***
	0.20	*0.17*					*0.21*	*0.17*
CPI annual inflation			–0.01	0.01			–0.01	0.01
			0.01	*0.01*			*0.01*	*0.01*
Population one-year percent change					1.02	1.14	1.82**	1.55*
					0.93	*0.86*	*0.91*	*0.85*
Bank loans to households one-year percent change * bust dummy		–0.63***		–0.54*		–0.53**		–0.69***
		0.18		*0.24*		*0.20*		*0.2*
Bust dummy		–0.03*		–0.05**		–0.05**		–0.03
		0.02		*0.02*		*0.02*		*0.02*
Constant	–0.01	0.01	–0.01	0.01	–0.02	0.01	–0.02**	–0.01
	0.01	*0.02*	*0.01*	*0.02*	*0.01*	*0.02*	*0.01*	*0.02*
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.39	0.52	0.31	0.49	0.32	0.50	0.39	0.53
Number of observations	289	289	289	289	287	287	287	287

Source: IMF staff estimates.
Note: The dependent variable is the one-year growth rate of nominal house price index. Standard errors are below parameter estimates in italics. Estimation performed by panel regression and standard errors are clustered by country. ***, **, and * = statistically significant coefficients at the 1, 5, and 10 percent levels.

by Almeida, Campello, and Liu (2005) and points to the presence of an accelerator mechanism: a high LTV ratio amplifies the effect of income shocks on house prices.

A further and novel finding is that the prevalence of more flexible rate contracts also amplifies house price swings associated with changes in income, perhaps because these contracts look more affordable to prospective borrowers, even though they make households carry greater interest rate risk.

Both results continue to hold when housing characteristics are interacted with the growth in population, rather than growth in GDP, as an alternative measure

Table 3.11. House Prices and Housing Finance Characteristics

Explanatory Variables	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5	Equation 6
Real GDP one-year percent change	0.88***	0.24	1.12***	1.08***	0.51***	–0.02
	0.14	*0.29*	*0.15*	*0.15*	*0.15*	*0.30*
Population one-year percent change	0.18*	0.10	–0.03	–0.07	0.09	–0.02
	0.10	*0.10*	*0.07*	*0.06*	*0.08*	*0.10*
Maximum LTV ratio * real GDP one-year percent change	0.41***				0.37***	
	0.09				*0.10*	
Flexibility of mortgage interest rate * real GDP one-year percent change		0.62***				0.53***
		0.15				*0.16*
Bust dummy			–0.07***	–0.06***	–0.06***	–0.05***
			0.01	*0.01*	*0.01*	*0.01*
Bust dummy * maximum LTV ratio			–0.01***		–0.01***	
			0.00		*0.00*	
Bust dummy * flexibility of mortgage interest rate				–0.02***		–0.01***
				0.00		*0.00*
Constant	0.01***	0.02***	0.04***	0.01***	0.04***	0.04***
	0.00	*0.00*	*0.01*	*0.02*	*0.01*	*0.00*
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.27	0.27	0.34	0.34	0.37	0.38
No. of observations	543	543	543	543	543	543

Source: IMF staff estimates.

Note: The dependent variable is the one-year growth rate of nominal house price index. Standard errors are below parameter estimates in italics. Estimation peformed by panel regression and standard errors are clustered by country. ***, **, and * = statistically significant coefficients at the 1, 5, and 10 percent levels. LTV = loan to value.

of changes in housing demand. They do not change when country-fixed effects are dropped and instead a random effects model is estimated (not shown).

Perhaps most interestingly, these housing finance characteristics are shown to have an effect on the severity of the bust. Where LTV ratios are high, busts are deeper on average. Likewise, where contract terms are more flexible, busts are deeper on average, with the annual decline in house prices about 25 percent faster for both variables.

Overall, the results suggest that contract terms and lending standards matter for house price dynamics. Policies that aim to reduce the amplitude of booms and busts in the housing sector may consider exploring tools such as a maximum LTV ratio or a move to more fixed-rate and longer-term contracts.

Finally, the analysis examines the effect of government participation in housing markets. The analysis looks at both a composite index of government participation, also used in Annex 3.1, and specific dimensions of the index. For all variables, the exercise examines whether participation amplifies the effect of income shocks on house prices and whether participation affects the magnitude of busts.

The analysis finds fairly strong evidence that government participation tends to exacerbate house price swings, both when looking at the composite index of government participation in a bust and during both booms and busts when focusing on specific dimensions (Table 3.12).

Subsidies to first-time buyers are shown to both amplify house price swings in the upturn and lead to deeper subsequent busts. Similarly, tax deductibility of capital gains tends to both amplify the boom and exacerbate the bust.

Perhaps most strikingly, government provision of guarantees or mortgage loans tends again to exacerbate rather than cushion housing busts, all else equal, pointing to substantial unintended consequences of such participation.

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Table 3.12. House Prices and Government Participation

Explanatory Variables	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5	Equation 6	Equation 7	Equation 8
Real GDP one-year percent change	1.19**	1.06***	1.41***	1.08***	1.09***	1.11***	1.81***	1.18***
	0.45	*0.20*	*0.26*	*0.15*	*0.24*	*0.21*	*0.27*	*0.19*
Population one-year percent change	0.07	–0.20	0.07	–0.07	0.01	–0.06	0.01	–0.01
	0.07	*0.48*	*0.08*	*0.06*	*0.07*	*0.06*	*0.08*	*0.06*
Government participation * real GDP one-year percent change	1.10							
	0.89							
Subsidies to first time homebuyers * real GDP one-year percent change			0.57*					
			0.27					
Capital gains tax deductibility * real GDP one-year percent change					0.74**			
					0.31			
Government Agency providing guarantees/loans * real GDP one-year percent change							–0.40	
							0.43	
Bust dummy		–0.03**		–0.06***		–0.04**		–0.06***
		0.01		*0.01*		*0.01*		*0.01*
Bust dummy * Government participation		–0.15***						
		0.04						
Bust dummy * Subsidies to first time homebuyers				–0.04**				
				0.01				
Bust dummy * Capital gains tax deductibility						–0.04***		
						0.00		
Bust dummy * Housing finance funds/Government Agency providing guarantees/loans								–0.04 **
								0.01
Constant	0.01**	0.04***	0.01**	0.03**	0.01***	0.04***	0.01**	0.04***
	0.00	*0.00*	*0.00*	*0.01*	*0.00*	*0.00*	*0.01*	*0.00*
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.26	0.36	0.26	0.34	0.27	0.35	0.26	0.34
No. of observations	398	398	398	398	398	398	398	398

Source: IMF staff estimates.

Note: The dependent variable is the one-year growth rate of nominal house price index. Standard errors are below parameter estimates in italics. Estimation peformed by panel regression and standard errors are clustered by country. ***, **, and * = statistically significant coefficients at the 1, 5, and 10 percent levels.

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