

Balling, Morten et al.

Proceedings

Property Prices and Real Estate Financing in a Turbulent World

SUERF Studies, No. 2013/4

Provided in Cooperation with:

SUERF – The European Money and Finance Forum, Vienna

Suggested Citation: Balling, Morten et al. (2013) : Property Prices and Real Estate Financing in a Turbulent World, SUERF Studies, No. 2013/4, ISBN 978-3-902109-70-5, SUERF - The European Money and Finance Forum, Vienna

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Property Prices and Real Estate Financing in a Turbulent World

PROPERTY PRICES AND REAL ESTATE FINANCING IN A TURBULENT WORLD

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SUERF – The European Money and Finance Forum
Vienna 2013

SUERF Study 2013/4



CIP

Property Prices and Real Estate Financing in a Turbulent World

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Authors: Morten Bækmand Nielsen, Jesper Berg, Christian Sinding Bentzen, Henrik Schönemann, Alan Boyce, R. Glenn Hubbard, Christopher Mayer, James Witkin, Per Callesen, Giovanni Dell'Ariccia, Deniz Igan, Kevin J. Lansing, Marius Jurgilus, Ronan Lyons, Margarita Rubio, José Carrasco-Gallego, Radu Tunaru

Keywords:

Chapter 2: Housing bubbles, housing prices, household debt

Chapter 3: Commercial real estate, United Kingdom

Chapter 4: Real estate booms, bubbles, financial and macroeconomic stability

Chapter 5: Real estate credit, monetary policy, welfare, DSGE, LTV

Chapter 6: Ireland, housing market cycle, property ladder, amenity prices

Chapter 7: Housing bubbles, household debt, foreclosures, Norway, United States

Chapter 8: Mortgages, EU, mortgage models, housing-related debt

Chapter 9: Accelerated amortization, mortgage delinquency, refinancing, impact to tax payers

JEL Codes: G21, R21, R31, R38

Vienna: SUERF (SUERF Studies: 2013/4) – December 2013

ISBN: 978-3-902109-70-5

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1. INTRODUCTION

Morten Balling and Jesper Berg

On 15th November 2012 in Copenhagen, SUERF and Nykredit in association with Danmarks Nationalbank organised a conference on “*Property prices and real estate financing in a turbulent world.*” The papers included in this SUERF Study are based on contributions to the conference.

Per Callesen, Governor, Danmarks Nationalbank has written chapter 1: “Property prices, debt and financial stability”. Housing bubbles were an important driver of economic activity and imbalances in the years building up to the financial crisis in 2008. GDP-contraction across countries after these bubbles burst is correlated with the strength of the preceding increase in house prices. In the case of Denmark, house prices and the output gap have been strongly correlated over a long period of time. Causality works in both directions. Higher growth in income pushes house prices upward. Higher house prices make new construction more profitable, household wealth increases and the value of collateral goes up. This impacts on consumption. Stabilizing house prices is therefore important from both a macroeconomic and a macroprudential perspective. In Denmark, the tax value of interest deductions has been reduced since the 1980s. A series of fiscal and regulatory austerity measures have been carried out. The cost has been a period of low growth, while the benefits have been a financially much stronger economy. Later, a ceiling was put on property taxation. Tax payments for most homeowners were decoupled from the value of houses. In 2003, interest-only loans from mortgage institutions were introduced. From a financial stability point of view, this was bad timing and contributed to volatility. Danish households have a high level of debt in relation to their disposable income. This is also the case in the Netherlands, Sweden and Norway. However, in these countries households also own large financial assets, partly in connection with private pension systems. Arrears on loans and losses in mortgage institutions are low. The Danish mortgage system is healthy, and so is the private pension system.

Chapter 2, “The fundamental economic term of commercial real-estate in UK” is written by *Radu S. Tamaru*, University of Kent. The real-estate market is dichotomized into residential properties and commercial properties. In UK there are well-established indexes for both categories: the Halifax and Nationwide index for residential prices and the IPD Index (based on The Investment Property Data Bank) for commercial properties. In the chapter, the author examines the financial economic information revealed by the IPD Index, and he searches for some analytical insight into capturing the dynamics of the index. His idea is that

observed property prices are assembled from an unobservable ‘real’ property price linked to macroeconomic conditions and the interest rate environment, and a noisy component given by market sentiment. Between January 1993 and July 2007 all IPD index logarithmic returns were positive. This long series of positive returns created an illusion among investors. It implied that they did not give proper consideration to macroeconomic evidence. That changed fundamentally in 2008. During the subprime crisis investor behavior changed from illusion to disillusion and the market prices occasionally fell well below the level indicated by fundamental economic considerations. IPD property derivatives can, according to the author, be used for risk management purposes. Investors have access to Eurex futures that can be utilized to hedge out property risk and avoid the consequences of price crashes.

Giovanni Dell’Ariccia and *Deniz Igan*, IMF Research have authored chapter 3: “Dealing with real estate booms”. Until the global financial crisis, the main policy tenet in dealing with a real estate boom was one of ‘benign neglect’. It was considered better to wait for the bust and pick up the pieces than to attempt to prevent the boom. The crisis challenged this view. But preventive policy action is difficult to implement. The authors conclude that policy efforts should focus on booms that are financed through credit and where leveraged institutions are directly involved. Macroprudential tools (such as limits on loan-to-value ratios) are the best candidates to deal with real estate booms as they can be aimed directly at curbing leverage and strengthening the financial sector. Cycles are a common feature of real estate markets. Stylized facts suggest that the longer and higher prices go up, the more they will come down. Housing cycles are closely intertwined with credit and business cycles. Peaks and troughs are not far from each other. There are significant differences across countries. Legal and institutional structures matter. In order to improve policy options, the quality of empirical data should be heightened. Real estate is an important storage of wealth in the economy. Monetary policy is a blunt instrument for the task at hand. It is difficult to use fiscal tools. So, macroprudential regulation in the form of higher capital requirements, dynamic provisioning and limits on loan-to-value and debt-to-income ratios are the most promising options.

Chapter 4, “Restrictions to credit on real estate: implications for monetary policy and welfare” has been written by *Margarita Rubio*, University of Nottingham, and formerly Banco de España, and *José Carrasco-Gallego*, Banco de España. The authors study the interaction of macroprudential tools and monetary policies. They use a dynamic stochastic general equilibrium (DSGE) model which features a real estate market in order to evaluate the performance of a rule on the loan-to-value (LTV). Then they analyze how this rule complements the monetary policy conducted by central banks. They find that macroprudential rules mitigate the effects of booms on the economy by restricting credit. Interest rate shocks have

weaker effect on the economy and the combination of monetary policy and the macroprudential rule enhances welfare, especially when monetary policy responds only to inflation but does not respond to output and house prices. Macroprudential tools aim at promoting the stability of the financial system in a global sense, not just the individual institutions. Systemic risk is defined as risk of disruption to financial services that is caused by an impairment of all or parts of the financial system and has the potential to have serious negative consequences for the real economy. The authors introduce a rule so that the LTV depends on the economic situation. This rule can moderate credit booms. Diagrams illustrate impulse responses to housing demand shocks respectively expansionary monetary policy. They conclude that the goals of the central bank should be extended to not only keeping inflation low but also to have a stable financial system.

Chapter 5, “Inside a bubble and crash: evidence from the valuation of amenities” has been written by *Ronan C. Lyons*, Oxford University. Using a rich dataset of one million property listings in Ireland, the author examines the relationship between housing market amenities and housing market cycles. The housing market is among the most important markets in modern economies. It constitutes perhaps the single most important class of consumption good. Housing is also the most prevalent investment good. In Ireland, it was estimated that in 2007 72 percent of household wealth was in real estate. Similar figures can be found in other countries. The housing market has accordingly assumed a central role in explanations of the global economic and financial crisis starting in 2007. Ireland’s economic fortunes have in many respects been a microcosm of those globally. Despite the global nature of the crisis, central to the domestic changes in Ireland’s economic fortunes were domestic factors, in particular at the end of a domestic real estate bubble. The chapter uses a detailed dataset of property advertisements in Ireland over the period 2006-2011 to investigate the relationship between location-specific amenities, which are reflected in house prices, and the housing market cycle. Amenities are at the core of differences between property values in different locations and so how they are priced across bubble and crash periods may give an insight in what happens in a real estate bubble. The author surveys the literature on the importance of amenities in real estate markets. In the empirical study he applies 22 location-specific variables. Among them are distance to the coast, lakes or rivers, distance to polluting facilities and waste facilities, distance to transport facilities like train stations and roads and distance to schools and hospitals. All distance-based amenities have a statistically significant effect on accommodation costs. Their influences on pricing differ, however, with respect to their counter-cyclical respectively pro-cyclical characteristics.

Chapter 6, “Housing bubbles and expected returns to homeowners: Lessons and policy implications” is authored by *Marius Jurgilus*, Norges Bank and *Kevin J.*

Lansing, Federal Reserve Bank of San Francisco and Norges Bank. House prices in many industrial countries increased dramatically in the years prior to 2007. Countries with the largest increase in household debt relative to income experienced the fastest run-ups in house prices over the same period. In the chapter the authors compare the US housing market experience to ongoing housing market trends in Norway with the aim of considering whether a bubble can be distinguished from a rational response to fundamentals. Much of the strength of the US economy during the mid-2000s was linked to the housing boom. One way in which a bubble might be distinguished from a situation with rationally low risk premiums is to examine investors' expectations about future returns on the asset. Survey data confirm that investor expectations tend to be extrapolative. Models built on such expectations appear to be a promising way to capture the behavior of real-world asset prices. In a model on house price growth in Norway, lagged house price growth helps to explain current house price growth. In Norway, the explosive growth in home remodeling gives a strong contribution to the price development. An unsettled question in economics is whether policymakers should take deliberate steps to prevent or deflate suspected asset price bubbles. Norges Bank recently announced a new loss function for monetary policy analysis that is explicitly designed to take into account the risk that a period of abnormally low interest rates may contribute to a build-up of financial imbalances. Low interest rates can increase the risk that debt and asset prices will move up and remain higher than what is sustainable over the economic cycle. By incorporating the interest level in the loss function, the bank is seeking to counter the build-up of such imbalances.

Chapter 7, "A heavenly match or recent developments in mortgage lending in the EU and some tentative reflections on its positioning in the financial structure", is authored by *Jesper Berg*, *Christian Sinding Bentzen*, *Morten Bækmand Nielsen* and *Henrik Schoenemann*, Nykredit. Mortgages are by far the biggest liability on households' balance sheets and make up a substantial chunk of banks' lending. In the Euro area, more than 30 % of the lending of the MFIs is mortgage-related. The typical maturity of a mortgage in the EU is 30 years. A lot has happened over the last 30 years. A lot might happen over the next 30 years. The match of institutions dependent on short-term funding with borrowers who need a 30-year commitment must have been made in heaven, if it is to be a stable relationship. The variety of mortgage lending across countries is immense. Developments in mortgage lending in the EU have differed dramatically across countries during the financial crisis. To make a systematic assessment, the authors apply four criteria: Affordability, resilience towards falling property prices, robustness during and after periods of financial stress, and degree of government intervention. For the Euro-Zone on aggregate, housing related debt levels for households have increased remarkably since the introduction of the euro in 1999. The growth rate

in housing debt was particularly pronounced in the pre-crisis years whereas levels have stabilized since 2008. The increase in indebtedness up to 2007 reflects disposable income growth, low interest rates and increasing house prices. The gross wealth of Euro-Zone households increased rapidly up until 2006. As declining house prices have deteriorated the gross non-financial wealth since 2007/2008, the net wealth of Euro-Zone households has also declined. Expansive monetary policy since 2008 has counteracted the adverse economic shocks following the financial crisis. The extent depends on the mortgage structure. House price dynamics and housing debt dynamics are closely related. A mortgage has many dimensions and covered bonds come in many varieties. Many covered bonds are rated by the global rating agencies. Most of the bonds have a high rating. Europe has demonstrated better performance than the US measured by the four criteria. The European mortgage finance systems were less entangled in government support than the system in the US. There is a lot of emphasis on the need to move from a microprudential focus, where the objective is the stability of single institutions, to a macroprudential focus, where the objective is the stability of the financial system as a whole. Still, most regulatory initiatives – also in the EU – aim at a segment of the financial system.

Chapter 8, “The case for accelerated amortization”, is authored by *Alan Boyce*, Absalon Project and *R. Glenn Hubbard*, *Christopher Mayer* and *James Witkin*, Columbia Business School. The authors write about ‘Underwater borrowers’ i.e. owners of houses where the mortgage debt exceeds the value of the house. Such borrowers represent a considerable part of the homeowners in the US. The authors analyze the costs and benefits of a government policy that would offer to pay the closing costs for underwater homeowners who choose a shorter amortization period for their refinanced mortgage. They estimate that the proposed program could save American taxpayers up to USD 6.7 billion through lower default rates and smaller losses on foreclosed homes for mortgages guaranteed by Fannie Mae and Freddie Mac. Borrowers have a large incentive to refinance, as their current mortgage rate greatly exceeds today’s much lower interest rates. The government has a strong incentive to encourage borrowers to reduce their amortization term when refinancing as long as the cost of encouraging them to do so does not exceed the estimated public savings. The authors argue that a program to pay the closing costs of borrowers who choose to pay off their mortgage more quickly would lead over one million underwater borrowers to choose a shorter amortization mortgage. It would enable these homeowners to get out of debt more quickly and lower their estimated likelihood of default. The program would also help to stabilize the housing market.

In the last decade, property prices have been extremely volatile all over the world. The papers in the present SUERF Study are written by researchers, central bankers, mortgage experts and other practitioners with a deep understanding of

real estate markets and their interaction with mortgage markets and developments in the economy as a whole. We hope that SUERF readers will appreciate the insights provided by their contributions.

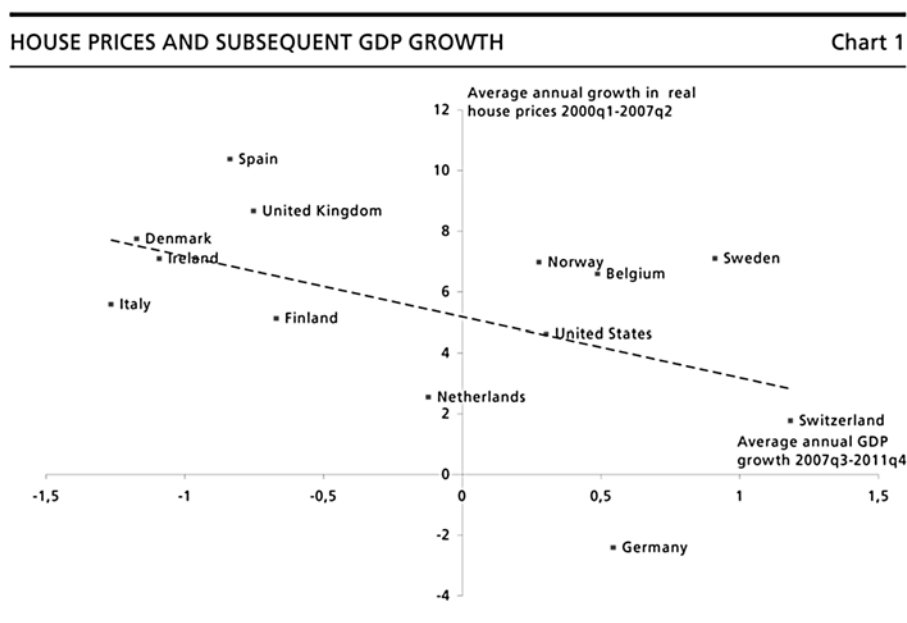
2. PROPERTY PRICES, DEBT AND FINANCIAL STABILITY

Per Callesen

2.1. HOUSING BUBBLES

Housing bubbles were an important driver of activity and imbalances in the years building up to the financial crisis in 2008. GDP-contraction across countries after the bust of these bubbles is correlated with the strength of the preceding increase in house prices, *cf.* chart 1.

Chart 1

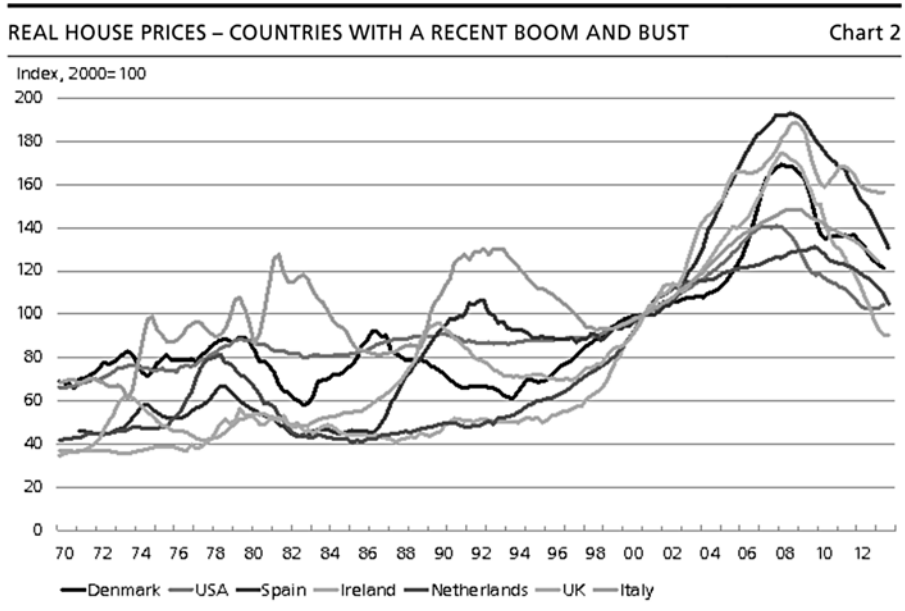


Source: OECD.

One group of countries experienced fairly sharp house price increases until 2008 and a sharp fall of between 30 and 50 per cent until 2012, *cf.* chart 2. In Ireland, Spain, and to some extent the UK, this came on top of already strong increases over several decades, and was for the former two countries accompanied by very large construction booms and current account deficits. Italy, UK and USA experienced substantial, but more moderate, current account deficits, yet ran

fiscal deficits of close to three per cent of GDP even at the peak of the bubble and the accompanying temporary tax revenues. Denmark and the Netherlands had on the other hand continuous current account surpluses and healthy fiscal situations, but nevertheless also build housing bubbles.

Chart 2



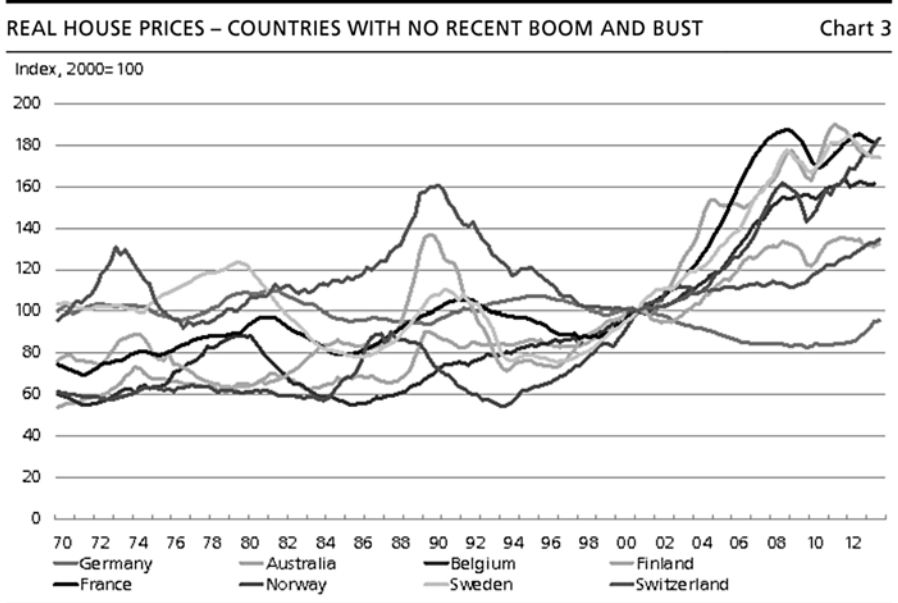
Source: OECD, *House Price Database*.

Another group of countries did not experience a boom and bust over the recent decade, *cf.* chart 3. Some actually had rather pronounced price increases, but did not face a subsequent bust, at least not yet. The strong difference between these two groups and the large difference between the macroeconomic conditions in between countries in the group with a boom and bust suggest that country specific factors and circumstances played a major role in driving the bubbles.

2.2. THE IMPACT OF HOUSE PRICE FLUCTUATIONS

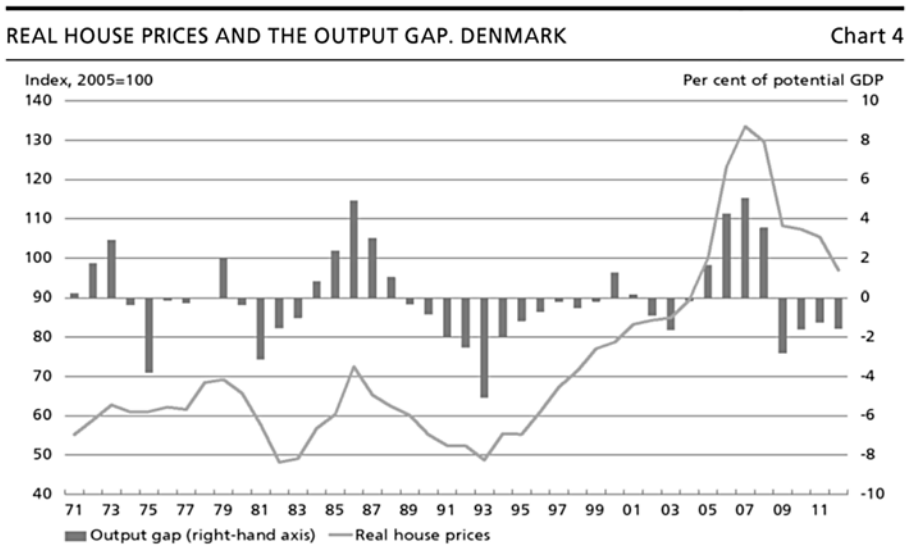
In the case of Denmark, house prices and the output gap has over a long history been strongly correlated, *cf.* chart 4. Causality works in both directions. Higher growth and income is one factor pushing house prices upwards. At the same time, house prices strongly affect general economic activity. The three main transmission channels are a) the relative profitability of new construction increase

Chart 3



Source: OECD, House Price Database.

Chart 4



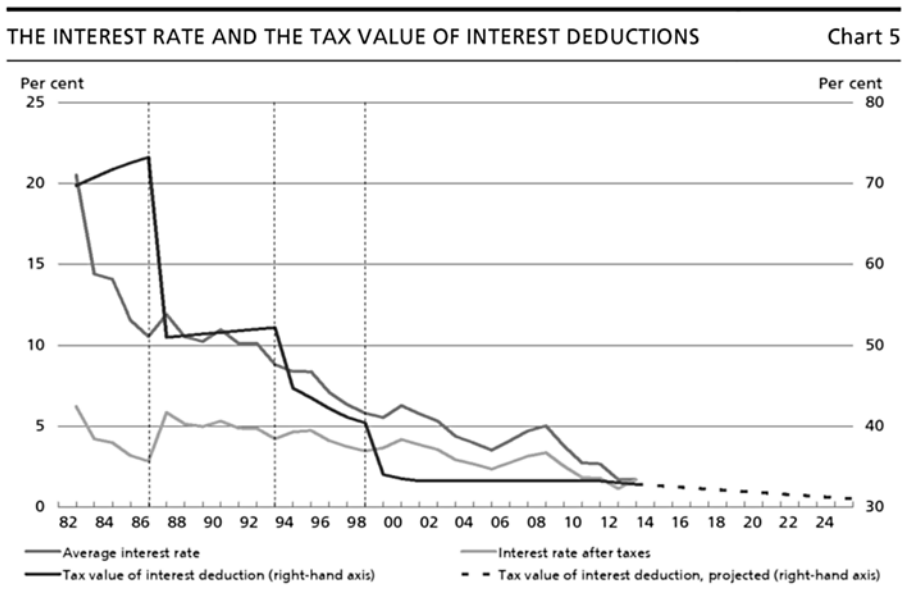
Source: Statistics Denmark and Danmarks Nationalbank.

when prices of the existing stock goes up, b) higher house prices push up housing values, which are a major component of household wealth and c) the value of houses is used as collateral for the purpose of borrowing. Hence, stabilizing house prices is potentially rather important from both a macroeconomic and a macroprudential perspective.

2.3. KEY FACTORS DRIVING HOUSE PRICES

The Danish economy came from a state of poor financial, fiscal, current account and debt positions in the 1970s and 1980s to one of much stronger fundamentals. In addition – and to a large extent driven by both these improvements and international developments – interest rates have come down very substantially, *cf.* charts 5 and 6. Also real interest rates (not shown) have come down since the early 1980s – inflation has been broadly low and stable since the mid 1980s. Although partly countered by reductions in the tax value of interest payments (personal taxation), also the interest rate after tax has declined strongly. In addition, substantial increases in real disposable income have taken place. Together, these shifts suggest that the upward level shift of house prices over several decades is driven by fundamentals.

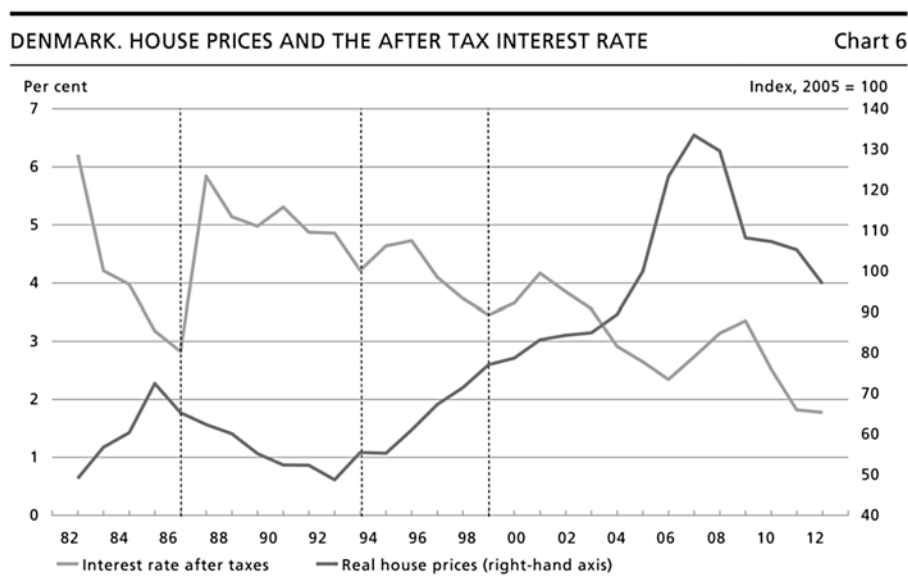
Chart 5



Source: The Danish Ministry of Taxation and MONA databank.

Note that the tax value of interest deductions has come down from levels providing extreme incentives for borrowing and tax arbitrage in the then strongly asymmetric tax system. Note also the extended decline in real house prices from the mid 1980s until 1993. The sharp cut in the (extremely high) tax value of interest deductions in the first tax reform of 1986 was one of a long list of fiscal and regulatory austerity measures deliberately targeting the end of decades of both private and public sector over-borrowing. The cost was a seven year period of low growth. The benefits were a financially much stronger economy. The 1990s combined a recovery with series of strong structural measures in particular in labour markets, bringing down structural unemployment to much lower levels, while gradually improving the fiscal and current account positions further.

Chart 6



Source: The Danish Ministry of Taxation and MONA databank.

The dynamics of house prices has an inherent build-in component of volatility, due to the durability of the asset, the limited supply of new houses in the short and medium run as well as ‘speculative’ components. Anticipating higher (lower) prices, buyers would rush (hesitate) to buy and sellers hesitate (rush) to sell, thereby reinforcing current trends.

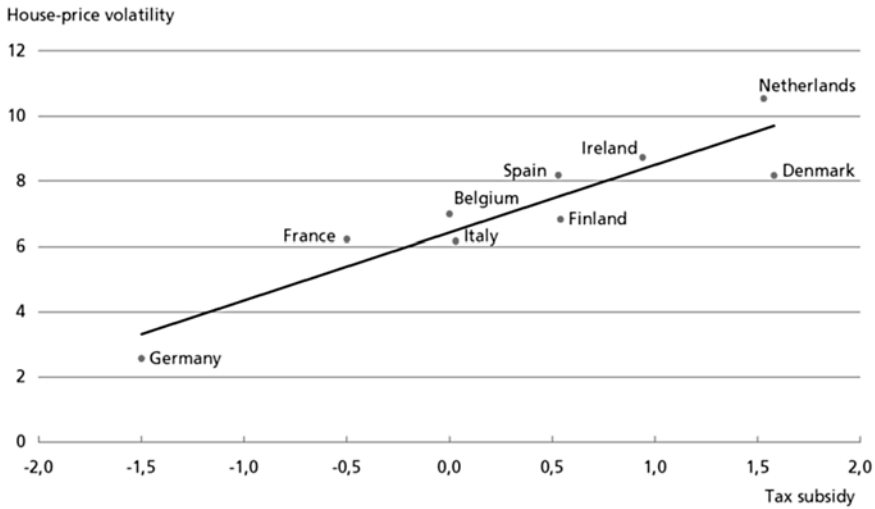
This volatility can be dampened or reinforced by policies. One such factor is the level of housing subsidies (owner occupied housing is very often subsidized), *cf.* chart 7. The level of volatility tends to increase with the level of tax subsidies, such as high tax values of interest deductions and low values of property

taxation. Denmark and the Netherlands tend to have the highest volatility, no doubt driven, *inter alia* by (still) relatively high tax values of interest deductions.

Chart 7

HOUSE PRICE FLUCTUATIONS AND TAX SUBSIDIES

Chart 7



Source: Data supplied by Paul van den Noord (OECD) and own estimates for Denmark.

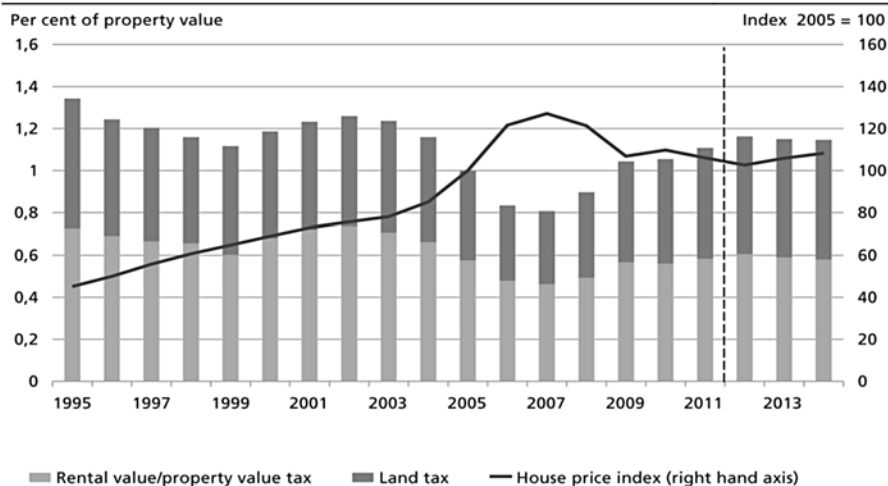
In Denmark volatility was increased by two major changes in property taxation starting from 2002. The first implied a ceiling of the nominal tax payment of imputed rent (property-value tax) fixed at the level paid in 2001 for each individual house. This decoupling of imputed rent from the value of houses implies that the implicit tax rate declines (increases) with rising (falling) level of house prices, thus producing a strong pro-cyclical pattern. Pro-cyclicity was reinforced further by introducing a (variable) limit of at the most 7 per cent for the annual increase in payments of land taxes. The latter thus aligns payments of land taxes with the value of land in the long term, but with heavy delays. In combination total property taxes fell from around 1.2 per cent before the takeoff of the house price bubble to 0.8 per cent at the peak of the bubble – subsequently returning close to the point of departure, *cf.* chart 8.

The second driver of increase of volatility was introduced by legislation in 2003 which gave home owners access to interest-only loans from mortgage institutions which – as standalone institutions or ring-fenced from the banking system – provide the vast majority of mortgages for housing in Denmark. The impact of interest-only mortgages was in principle less straightforward and predictable

Chart 8

IMPLICIT TAX RATES OF PROPERTY (IMPUTED RENT AND LAND) IN DENMARK

Chart 8



Source: Danmarks Nationalbank. Forecast based on Monetary Review 2012, 4th quarter.

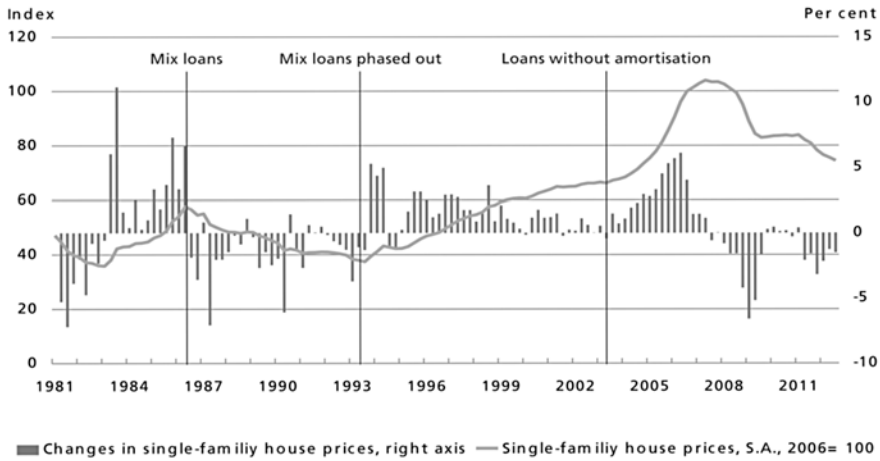
than that of decoupling property tax payments from the value of houses. Redemption of mortgages is basically a vehicle of savings, not a cost for households. In addition it was argued, at the time of introduction, that in the absence of such a market opening, banks or foreign institutions would in these times of modern financial markets have offered comparable products. Empirically, however, redemption of mortgages appears to strongly affect house prices, *cf.* chart 9. Three major changes have been introduced since the mid 1980s. First, from 1987, a mandatory combination (mix loans 40/60 weight respectively) of serial loans (constant redemptions) and annuity loans (constant overall debt service) contributed to the lengthy period of falling house prices. Second, the abolishment of mix loans from 1993 contributed to strong house prices increases over that decade. Thirdly the interest-only loans from 2003 undoubtedly reinforced the bubble, even if the changes in property taxation are likely to have had the strongest impact. These incidents suggest a significant effectiveness of possible macroprudential measures.

The timing of interest-only loans appeared to be particularly bad, but the construction also adds a more permanent contribution to volatility: Overall debt service increases and decreases with the level of house prices thus working as a countercyclical stabilizing factor. By including redemptions, this stabilizing factor is accordingly higher, provided that house-owners factor in some component of redemptions as a cost, *inter alia* due to liquidity concerns. Such an effect does

Chart 9

MAJOR CHANGES IN MORTGAGE MARKET REGULATION. DENMARK

Chart 9



Note: Real house prices.

Source: Statistics Denmark.

have empirical support. According to research by Danmarks Nationalbank¹, the combination of interest-only mortgages and the nominal freeze of imputed rent taxation can explain most of the rapid house price increases in 2004-07 and – in particular the nominal tax freeze – has permanently increased the expected volatility of house prices.

Yet another change has affected the Danish mortgage market since its introduction in the late 1990s, namely the so-called flex-loans, which are long term variable rate mortgages being refinanced by a sequence of issuance of new mortgage bonds with a maturity of *inter alia* one year (most often), two years or three years. Previously all mortgages were based on fixed rate 20 or 30 year bonds. Now more than 50 per cent of all mortgages are based on flex-loans and most of the refinancing has hitherto taken place in only one specific month, December. Unlike the changes in property taxation and interest-only mortgages variable rate mortgages can in normal times be expected to reduce rather than expand house price volatility. This is the case if the variable interest rates follow the normal business cycle thus rising in recoveries and falling in recessions. Due to the Danish fixed exchange rate policy the interest rates would normally shadow those of the euro area, and variable mortgages would thus have a

¹ DANMARKS NATIONALBANK, (2011) *Monetary Review*, “The Housing Bubble that Burst: Can House Prices be Explained? And Can Their Fluctuations be Dampened?”, 1st Quarter, Part 1.

counter-cyclical impact when the business cycle is aligned with that of the euro area – which is normally the case.

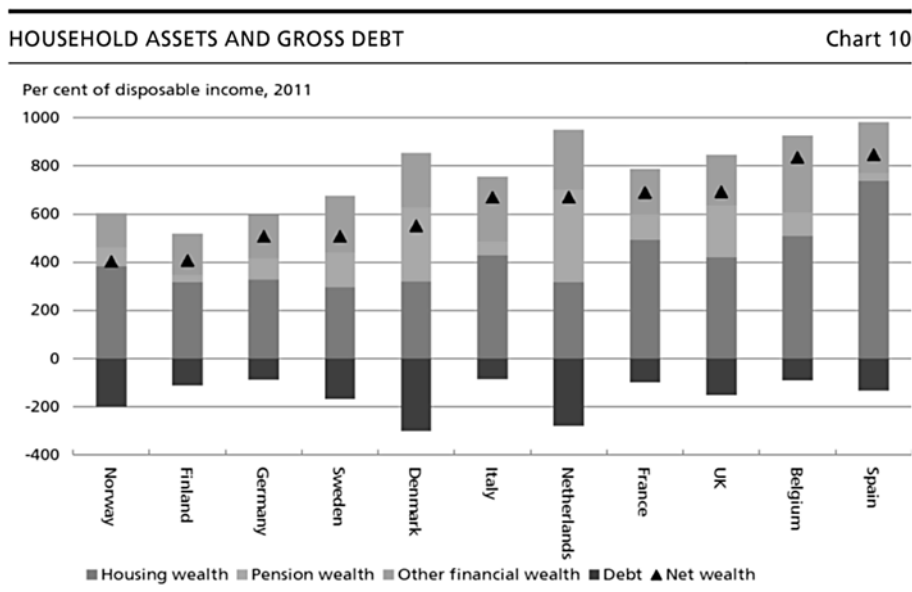
Exceptions to that rule has however been experienced, in particular where recessions are combined with periods of downward currency pressure, such as in 1993 and 2008, where Danmarks Nationalbank had to increase unilaterally its policy rates to back the fixed exchange rate. In such cases a concentrated refinancing of short term mortgages is not helpful.

Late 2012 borrowing rates based on one year flex-loans came as low as 0.3 percent (to be added is a contribution to the mortgage institution of 0.4-0.8 percentage points), thus strongly supporting the fairly weak activity of the economy and providing large savings for households.

2.4. HOUSEHOLD DEBT, ARREARS AND LOAN IMPAIRMENTS

Since the 2008 financial crisis one new area of attention in international comparisons has been the level of household debt, which varies strongly between countries, *cf.* chart 10. Does such debt reflect vulnerability or financial sophistication? Is it a problem, and in what respect? If it is a major concern, what can be done about it?

Chart 10



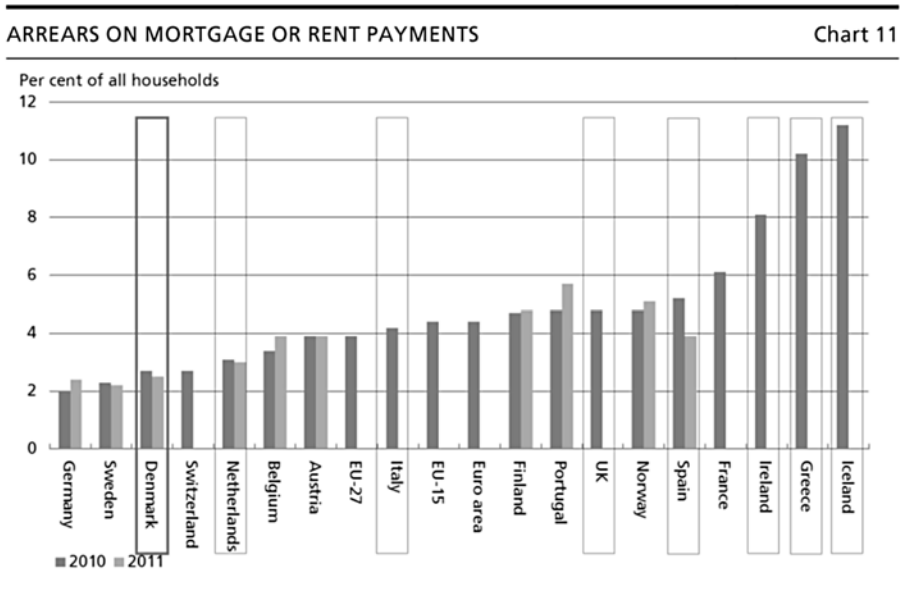
Source: OECD, national central banks and own calculations.

A first observation from chart 10 is that four of the countries with the highest gross debt ratios are – in declining order – Denmark, the Netherlands, Sweden and Norway. These four countries are among those OECD-countries with the largest current account surpluses and positive net foreign investment positions relative to their size, thereby providing a first indication that household debt figures need to be accompanied by deeper analysis.

A second observation is that households in Denmark, the Netherlands and Sweden also hold large financial assets, part of which being private pension savings. Norwegian households hold less financial assets. On the other hand the Norwegian government holds the so-called petroleum fund – Norway being one of the wealthiest countries in the world.

One indicator of financially stressed households is the share of households in arrears on mortgage or rent payments, *cf.* chart 11. Unfortunately comparable data for mortgages only has not been identified. As it appears, Denmark, in line with the Netherlands and Sweden, are countries with rather low ratios of financially stressed households after the crisis. One should also note that while the largest levels of arrears are found in countries with collapsed housing bubbles, there are notable exceptions. In other words, although all the housing bubbles were very costly for the overall economy, some countries were more financially robust than others and therefore had less financial stress.

Chart 11



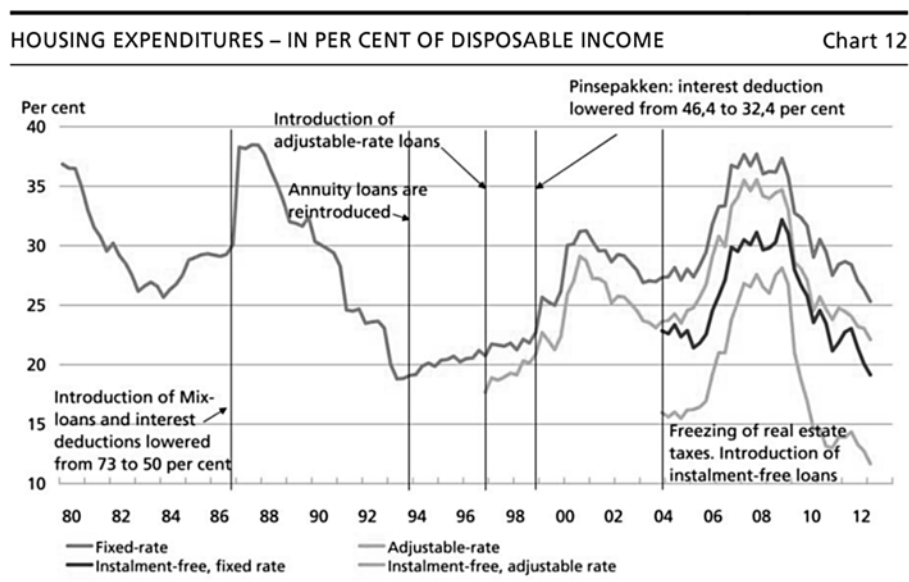
Note: A red box indicates a recent boom and bust in the house prices.

Source: The European Union Statistics and Income and Living Conditions (EU-SILC).

The low level of household arrears are confirmed by the low level of loan impairments faced by Danish mortgage institutions. Since the peak of the bubble, the cumulated losses in these institutions add up to no more than around one per cent of the outstanding mortgages. Among the explanations is the fact that housing expenditures including interest payments, in spite of the high gross debt ratio, are at a historical low, *cf.* chart 12. Sensitivity analysis, based on micro-data, suggests that the economic situation of a large majority of households is robust towards even substantial increases in interest rates in the order of, say, 5 percentage points, see references in footnote 2 below.

For these reasons financially stressed household did not in Denmark become a prominent factor in the financial crisis. Most of lending to households was provided by mortgage institutions, with rather appropriate safety margins, not by banks. Many banks, in particular the smaller and medium sized, have faced substantial trouble, but not due to lending to households. Trouble in banks came predominantly from too risky exposures against commercial real estate and certain segments of the business sector.

Chart 12

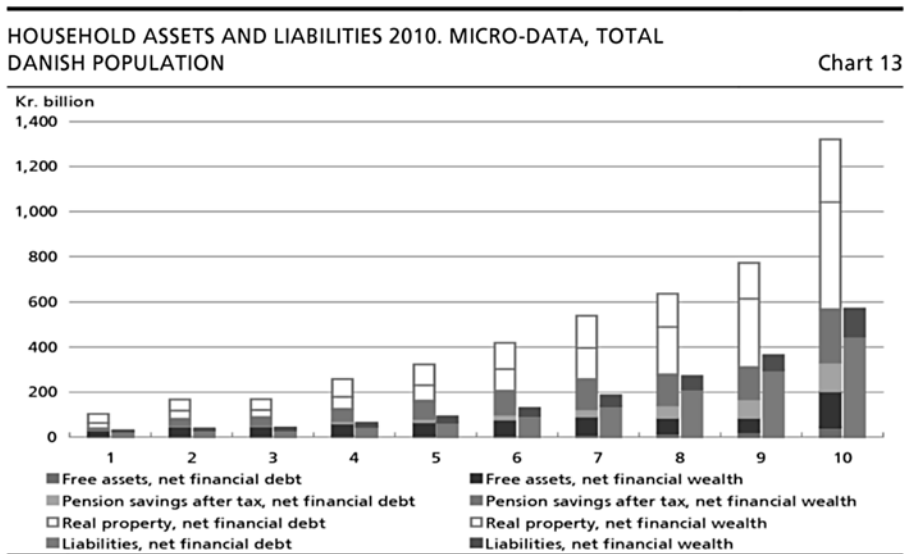


Note: The housing burden in the form of stylized financing costs, including property taxes, on the purchase of a single-family house as a ratio of the average household disposable income. Financing costs are based on a mortgage loan plus a bank-financed loan for the portion that cannot be financed by a mortgage loan. See *Monetary Review 1st Quarter 2011 – Part 2*.

Source: Statistics Denmark, Association of Danish Mortgage Banks, Realkredit Danmark, Skat (Danish tax authorities) and Danmarks Nationalbank.

A more basic explanation is the distribution of debt and assets among households, cf. chart 13². This chart is based on micro-data for the entire population, collected from tax registers, financial institutions and pension funds. Over 50 per cent of all gross debt is held by those 20 per cent of the population having the highest disposable income levels. Debt appears to be a luxury good: the median ratio gross debt to disposable income varies from below 100 per cent for the first 60 per cent of the population ranked according to income, gradually increasing with size of income to almost 300 per cent for the 10 per cent highest earners.

Chart 13



Note: The horizontal axis rank the population according to the level of disposable income in deciles (10 percentage points in each group).

Red boxes cover assets or liabilities of households with a net financial liability position (thus excluding their value of real property). Blue boxes cover assets or liabilities of households with a net financial asset position. Private pension wealth (cumulated savings) are net of postponed income taxes (payments are subject to income tax as pensions or if prematurely bought back).

Source: Mortgage banks, Statistics Denmark and own calculations.

Within each decile of the income distribution the size of financial assets are at par with the level of debt (on top of the households financial assets) comes the value of their houses) are at par with the level of debt. A sizeable share of financial assets and liabilities position reflect inflated balance sheets, in the sense that a significant proportion of gross debt is held by households with net financial assets.

² Comprehensive analyses of the Danish household debt situation are found in Danmarks Nationalbank, (2011) *Monetary Review*, “Household Balance Sheets and Debt – an International Country Study”, 4th Quarter, Part 2, Danmarks Nationalbank, (2012) *Monetary Review*, “The Wealth and Debt of Danish Families”, 2nd Quarter, Part 2, Danmarks Nationalbank, (2012) *Monetary Review*, “Danish Families’ Financial Robustness, Variable Rates and Deferred Amortisation”, 4th Quarter, Part 2.

Thus as the main rule Danish households hold debt to finance a house, but also hold sizeable financial assets, either fairly liquid or as private pension savings. Asymmetric tax treatment of capital income is an important explanation. Private pension savings is to some extent mandatory or invested on an individual basis in bank managed funds. The largest part of it is based on quasi-mandatory contributions negotiated by labour market parties. The overall amount of private pension assets sums up to some 160 per cent of GDP (of which an estimated 40-50 percent represent postponed income taxes, since pension contributions are tax deductible while payments are subject to income tax – and since private pension payments partly reduce public pension payments).

Younger households have not accumulated sizeable pension wealth, but can expect over their lifetime to build up such wealth. An important factor behind the holding of large gross debt may be that newer generations of households do not to the same extent as their parents need to pay back mortgages before the point of retirement. It would be surprising if households do not to some extent react to the buildup of pension assets, based on either some mandatory or quasi-mandatory agreements or tax incentives, by reducing other savings and hence, increasing gross debt.

On the positive side both the Danish mortgage system and the private pension system, are well developed, sophisticated and healthy. On the negative side, the size of the overall leverage of households appears empirically across countries to add some contribution to the volatility of private consumption.

The level of private pension assets is expected to increase further before maturing at around 200 per cent of GDP. As a result, still more generations will have sizeable supplementary private pension income when they retire. Accordingly, household gross debt is unlikely to diminish. A hypothetical large reduction of such gross debt seems to require one out of two unwarranted or unlikely conditions to bet. By definition assets and liabilities of other sectors would have to adjust accordingly.

It cannot be recommended to give up striving for strong government finances or provide incentives for the corporate sector to structurally take up more borrowing (although corporate financial savings currently are at a historically and surprisingly high level).

Two remaining options could be either to cut back the private pension system in order to encourage the full repayment of mortgages ahead of retirement or to increase the already high overall savings level of the country. One component of the inflated household balance sheet (due to private pensions and mortgages, respectively) may be due to remaining asymmetries in the tax treatment of capital income. But the size of that component should not be exaggerated given the

predominantly (quasi)mandatory share of the pension system, and it cannot be recommended to cut back the private pension system, which is a healthy, actuarially fair defined contribution system providing large welfare and macroeconomic benefits. The current account surplus is already high (5-6 percent of GDP) and the net foreign investment position is positive by 30-40 per cent of GDP. Even higher surpluses and net foreign asset positions triggered by household debt reduction may happen, but would also induce a feedback from higher net wealth stimulating private consumption and most likely in the end prevent an accelerating net asset position from building up.

The high household gross debt level thus needs to be explained, overseen and managed including with a view to avoid a too high level for vulnerable segments of household and too careless lending by financial institutions.

2.5. CONCLUSIONS

- house prices have a strong bearing on the overall business cycle, in many cases one of the most important factor or transmission mechanism behind recoveries and recessions;
- housing bubbles may lead to banking crisis and/or financially distressed households. Limited bank exposure to households and an overall healthy balance sheet of households may on the other hand provide robustness against such stress;
- the wealth effect of changes in house prices will take its tolls on household spending and construction, irrespective of the debt level of households;
- in addition, banks can be expected to be affected indirectly by a housing bubble due to the general exposure to the real economy and due to a correlation between house prices and the prices of commercial real estate;
- house price volatility cannot be avoided, but automatic stabilizers – *inter alia* through the tax system – can reduce such volatility;
- macroprudential measures are available as second best alternatives to deal with excessive volatility in house prices. Evidence suggests that such measures can be effective;
- overall, higher financial buffers in households, enterprises and the financial sector will improve resilience against higher volatility in house prices (and other financial and real economy fluctuations). There is a need for buffers to increase with the level of house price volatility. Over the period of building up such buffers, overall demand for consumption and investment will be weak or contracting. In Denmark, the current historically high level of private financial savings suggests that private agents have been engaged in building such high buffers since the start of the financial crisis.

3. THE FUNDAMENTAL ECONOMIC TERM OF COMMERCIAL REAL-ESTATE IN UK

Radu Tunaru

Abstract

In this paper it is argued that there is a fundamental economic term underpinning the evolution of commercial real-estate in UK in the long run. Hence, the observed property prices gravitate around this economic term spanned by macroeconomic variables including interest rates. It is shown that this market experienced an unprecedented bull run between 1993 and 2007 leading investors to lose sight of fundamental macro variables. The correction that followed should have been expected in light of the persistent inflated market sentiment. Moreover, during the subprime crisis investors behaviour changed from illusion to disillusion and the market prices occasionally fell well below the level indicated by fundamental economic term¹.

3.1. BACKGROUND

It is well known that in G7 countries between 40% and 60% of total wealth is locked in real-estate. This asset class represents intrinsically a major component for capitalist economies. Unfortunately, the financial products that accompany this asset class are very few, due to a suite of factors such as lack of fungibility of real-estate assets, slow trading clock, tax, legal and trading costs issues for the spot markets and so on. Nevertheless, no investment bank or large investment fund can claim they have taken care of diversifying risk if they do not hold a commensurate exposure to real-estate. Hence, investment banks, for example, should always be long real-estate risk and offer the much needed counterparty for other market participants who are searching for short real-estate risk positions.

In addition, recent history shows that whenever a stock market bubble bursts, such as the dot.com bubble of 2000-2002, investors move their capital from high-yield assets to the Old Economy stable assets like real-estate that are considered more tangible. In general many stock market crashes are associated, one way or another, with real-estate problems.

¹ Acknowledgements: The author is very grateful to Made Reina Candradewi, Stuart Heath, Tony Key, Byron Morgan, Hashem Pesaran, Deepesh Shah, Silvia Stanescu and conference participants in the SUERF/Nykredit 2012 Conference in Copenhagen for inspiring discussions on this subject. The team at EUREX was fantastic in supporting this line of research, including data availability. All mistakes are obviously mine.

The real-estate market is dichotomised into residential properties and commercial properties. In U.K. there are well-established indexes for both categories, the Halifax and the Nationwide indexes for residential prices and the IPD index for commercial properties. The residential property has similar characteristics to bond markets where credit considerations are very important and the pre-booked cash-flows are essential. There is also a consumption aspect for housing properties since by de facto, property owners ought to live somewhere. By contrast, commercial property has a mixture of bond and equity investment characteristics. The bond component is given by the short-term lease, while the investment part kicks in when the lease expires and then opportunity for growth, i.e. increase in rents, or delay of leasing, is dictated by supply and demand considerations. The effect of storage in commercial real-estate markets has been investigated recently by Geman and Tunaru (2012).

In this paper we are concerned with the financial economic information revealed by the IPD index and we are searching for some analytical insight into capturing the dynamics of this appraisal index with econometrics techniques. Real-estate prices and therefore indexes are predictable due to the built-in serial correlation. The idea we put forward in this paper is that the observed property prices are assembled from an *unobservable* 'real' *property price* linked to the macro-economic conditions and interest rates environment, and a noisy component given by *market sentiment*. The latter reflects the difference between the price observed on the market and the one that should be observed on the market from a fundamental economic point of view. This type of decomposition should apply for both types of property, but in this paper we will focus on commercial property.

What would be the advantages of calibrating such a model on property index data? First of all it would help to understand the past evolution and in particular what leads to property crashes. Secondly, policy makers and market participants can identify which macroeconomic variables are important for determining the course of property prices. Last but not least, financial contracts can be valued better and they can be used more confidently in managing real-estate risk.

3.2. THE UP AND DOWN OF THE COMMERCIAL PROPERTY MARKET

There has been a long debate on the notion of cycle in property market. Baum (2001) provides a good revision on the subject. The Investment Property Databank (IPD, 1994, 1999) describes the empirical evidence in favour of cycles, although in their opinion sometimes there can be multiple cycles superimposed.

These 'recurrent but irregular' patterns are not necessarily the result of a single cyclical process. They could be the product of overlapping cycles of different lengths (5 and 9 years). It is tempting to see a shorter cycle as demand driven, linked to the business cycle in the economy, and a longer one as supply driven, linked to slower fluctuations in new development. The property cycle is linked to the economic cycle, but the precise nature of the relationship varies from one cycle to another. (IPD, 1999)

Clearly, the property markets go up and down and there has been plenty of evidence that property crashes may cause economic crises. When do we know that there is a new cycle and when do we know that an economic crisis is imminent? A simplistic way to characterise the property cycles is to look for the local peaks in total returns which mark a change in trend. IPD (1999) identified in this way six completed cycles between 1921 and 1998. The cycles varied in length between 4 and 12 years, being on average 8 years long. While commercial real-estate sector figured prominently in the 1990s at the heart of economic activity, problems in this sector were linked to bad debt for banks triggering a global economic downturn. The last decade was in a sense 'missing' a commercial real estate cycle as very eloquently advocated by Zhu (2002).

However, in my view there are two major contributors to the cycles in property prices. First, there is an underlying macroeconomic and interest rate environment that establishes the fundamental current property price and direction of price movement². In other words, in a rich country you expect current property prices to be high. If the economy is also growing then it is likely that prices will continue to increase in the immediate future. The same type of thinking applies in the opposite direction for a poor country, and also for a slowing economy, and for all possible combinations such as rich country with slowing economy and poor country but with growing economy. This factor is responsible to some extent for the serial correlation effect that is well documented in property markets. The difficulty in pinpointing exactly the property cycles resides in the fact that this fundamental level of property returns *also* evolves over time.

The second factor is what I usually call the market sentiment and it can be defined as the difference between the observable property prices and their unobservable fundamental levels. The market sentiment element of property price return is an aggregate measure of individual opinions. As pointed out above, quantifying the market sentiment is not straightforward, particularly for the uninformed or

² There is a large body of literature pointing out the linkages between property prices and macroeconomy. For example, Barras (1994) shows that rents have clearly been strongly pro-cyclical with GDP while Tsolacos and McGough (1995) indicated that there is a strong relationship between macro-economic variables and rental data. Other previous studies were dealing also with housing prices, see DiPasquale & Wheaton (1994), Clapp and Giaccotto, 1994, Case and Shiller, 1990, Quigley (1999), MacKinnon and Zaman (2009) and Fabozzi et al. (2010, 2012), for some examples.

inexperienced investor. Hence, when the market sentiment is small, a degree of confidence given by collective adaptive behaviour is established. Property bubbles then can arise when the market sentiment becomes disproportionately high, either at one specific moment or cumulatively over a period of time. In other words the observed property prices become dissociated from their fundamental underpinnings. If nobody has a contrarian view, then this bubble may persist through autocorrelation effects, as suggested by Bjorklund and Soderburg (1997). The bubble will burst when some of the investors already have changed their opinion and they have started taking short positions in property markets, and when a critical mass of investors realising that their assets are overvalued are aggressively moving in the opposite direction.

The market sentiment as understood in this paper is similar to the concept of investor sentiment discussed in more details by Clayton *et al.* (2009) and it is along the lines of Baker and Wurgler (2006, 2007) who identified investor sentiment as a ‘belief’³ about the growth in future cash flows or risks embedded in the particular asset (or both) based on the current flow of information. The nascent of this component in other asset classes, such as equity or foreign exchange, is usually impeded by rational risk-averse arbitrageurs who would act whenever a departure from fundamental no-arbitrage value appears. However, for real-estate, the lack of short selling in the spot market, illiquidity and friction costs, plus a lack of fungibility and a high degree of heterogeneity among investors, all contribute to a differentiation of real-estate as an asset class.

3.3. THE FUNDAMENTAL ECONOMIC TERM OF COMMERCIAL REAL-ESTATE IN THE UK

One standard approach to determine the fundamental economic term is to fit a multivariate regression model of IPD Index monthly returns on a set macro-economic variables and interest rate variables such as the Percentage Growth in Gold Price, the Returns on the Spot Exchange Rate USD into Sterling Pound, the Change in UK Unemployment rate, the Change in UK Inflation Rate, the Change in UK LIBOR 3-Month, the Change in UK LIBOR 6-Month, the Change in UK LIBOR 12-Month, the Change in UK Treasury Bill Tender 3M Middle Rate, the Change in GLC UK implied inflation spot curve, the Change in GLC UK implied real spot curve, the Change in Official Bank of England Rate, the Growth Rate of Index of Production, the Returns of FTSE 100 Price Index, the Change in FTSE 100 Dividend Yield, the Change in GBP 5 year Swap Rate, the Change in GBP 10 year Swap Rate. From an econometric point of view, our model selection

³ Clayton *et al.* (2009) called investor sentiment ‘misguided belief’ suggesting that the sentiment is measuring the departure of observable price or return from the fundamental price or return.

procedure is general to specific, that is we start with a large number of variables as possible candidates and then we eliminate sequentially non-significant explanatory variables until we retain only significant variables.

Using data between January 1987 and December 2011 the methodology outlined above leads to the model spanned by the variables in Table 1. The GDP growth variable is available only quarterly but I have used linear interpolation to expand the series to monthly frequency. Not surprisingly the main variables determining the evolution of commercial property in UK are GDP growth, changes in inflation, changes in implied inflation and changes in Bank of England Base Rate (BBR). The GDP and inflation show the state of the economy, the implied inflation is indicative of where the economy seems to go and the BBR is a mechanism that central bank can use to put the economy back on an improved path. In addition, the R-squared goodness-of-fit measure of 60% is in line with similar studies in housing markets where predictability was shown at the level of R-squared between 50% and 60%.

Table 1. Multiple linear regression final model selection results. The variables are GDPGrowth – the monthly growth rate of UK GDP, CHANGEINF – the monthly change in rate of inflation, CHANGEGLCINF – the monthly Change in GLC UK implied inflation spot curve and CHANGEBOERATE – the monthly change in Bank of England Base rate.

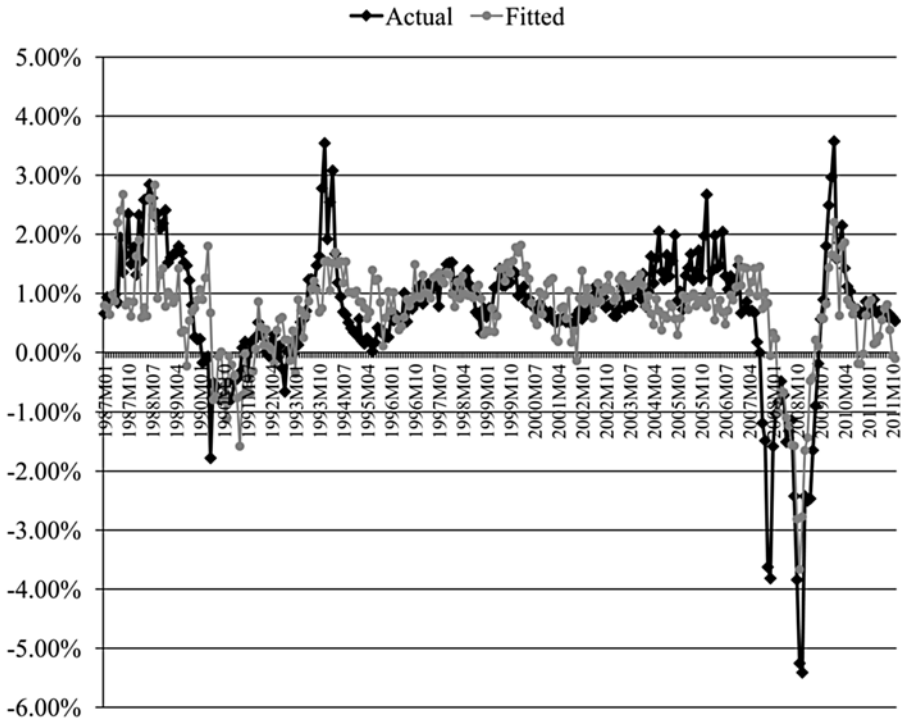
Variable	Coefficient	Std. Error	t-statistic	Prob
C	0.3461	0.0965	3.58	0.0004
GDPGROWTH	2.2202	0.3245	6.84	0.0000
CHANGEINF	0.4113	0.1186	3.47	0.0006
CHANGEGLCINF	0.4189	0.2005	2.09	0.0376
CHANGEBOERATE	0.6105	0.1143	5.34	0.0000
R-square	60%			

The significant variables selected in Table 1 span what I call the fundamental economic term (FET), see Tunaru (2012). Hence, the series of IPD returns and corresponding to the fundamental economic term returns illustrated in Figure 1, depict the main argument of this study. The returns on commercial property prices in the UK should be the ones described by the FET. However, the observed historical series shows differences from FET which can be attributed to the commercial real-estate market sentiment.

The graph in Figure 1 reveals some important facts and points out some important ideas. Quite extraordinarily, between 1993 and 2007 all returns on IPD index were positive. It is unlikely that any other asset class had only positive values for the same period or a similar long period. Ruff (2007) indicated that the

commercial real-estate income yield in the U.S. between 1965 and 2006 was always larger than 7% and averaged at 9.6%. While the subprime crisis burst in the third quarter of 2007, it was linked directly to the residential rather than the commercial properties. However, it seems clear now that the commercial real-estate market was also ‘irrationally exuberant’, to use a term poignantly employed⁴ by Robert Shiller, see Shiller (2005), well before the subprime crisis.

Figure 1. Comparison of actual IPD return series and the fundamental economic term between January 1987 and December 2011.



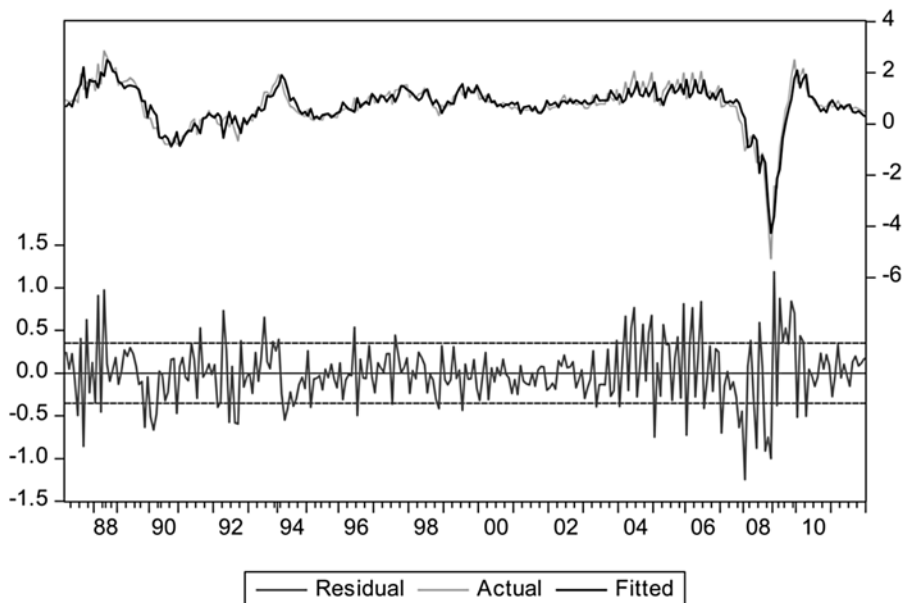
The ‘Actual’ series is for IPD index returns while the ‘Fitted’ series is for the values obtained with the variables in Table 1.

Another important observation related to Figure 1 is that the property crashes appear to occur when the difference between the observable commercial-property index and the fitted FET is large, see the crashes of 1990, 1993 or 2010, or is consecutively positive for a long period as in 2004-2006. Hence, the FET term can be used to signal property market crashes or corrections. It can be also observed that this signalling works in the opposite direction, when the observable

⁴ The term ‘irrational exuberance’ has been coined by Alan Greenspan, chairman of the Federal Reserve Board in Washington, in a black-tie dinner speech entitled ‘*The Challenge of Central Banking in a Democratic Society*’ at the American Enterprise Institute in Washington on December 5, 1996.

index drops much lower than the corresponding FET a jump up usually follows, as in 1990 and 2008. This shows that the market can be too optimistic but also too pessimistic.

Figure 2. The final model when considering lagged returns of IPD as covariate information.



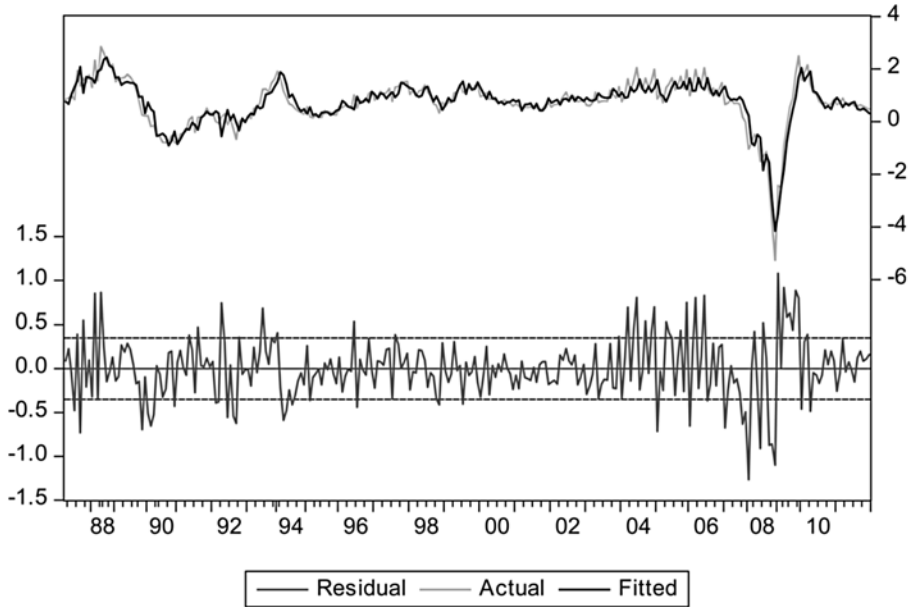
Note: the period of study is January 1987 to December 2011.

Model fitting is plotted relative to the axis on the right while the series of residuals are scaled with the axis on the left. The model producing these results contain the significant variables GDPGROWTH, CHANGEGLCINF and the lagged logarithmic return of IPD.

One way for policy makers to fully understand the dynamics of the commercial property prices is to search for a model with a high R-squared value that explains the variation in the data. Due to the serial correlation inherent to this market, the lag of IPD return series is added to the analysis. Looking at the entire period 1987 to 2011, the variables which are significant now are GDPGROWTH, CHANGEGLCINF and the lagged logarithmic return of IPD. This model has a very good R-squared measure, equal to 85%. The next question would be if this model can be improved on by adding additional lags. In other words what kind of memory does the commercial property market have?

The investigations that I have done point out that a maximum of two lags of the property index returns will be able to capture excellently the dynamics of the IPD index very well. This can be seen in Figures 2 and 3.

Figure 3. The final model when considering the first two lagged returns of IPD as covariate information.

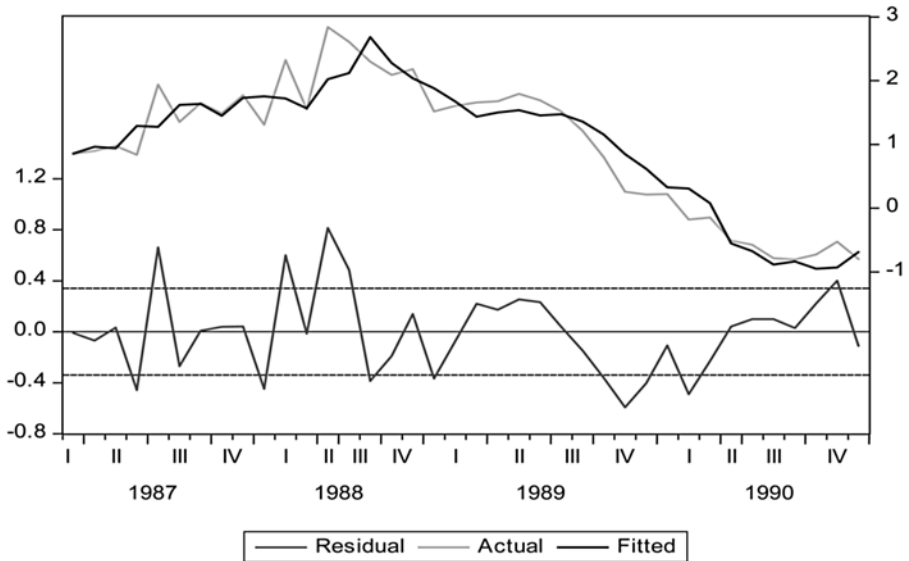


Note: the period of study is January 1987 to December 2011.

Model fitting is plotted relative to the axis on the right while the series of residuals are scaled with the axis on the left. The model producing these results contains the significant variables *GDPGROWTH*, *CHANGEGLCINF* and the first two lagged logarithmic return of IPD.

The next level of the analysis is to magnify our models over different subperiods. Econometric analysis shows that there were three distinct periods for commercial property evolution in UK, 1987 to 1990, 1991 to 2007 and 2008 to 2011. The models for the fundamental economic term during each period was constructed differently, see Figures 4, 5 and 6. Thus, in the late 80s GDP growth and the previous two months returns of IPD contributed to the formation of the FET, as shown in Figure 4. The 90s and early years of this millennium were characterised by a FET determined only by the two lags of IPD return, showing that market sentiment was overpowering and investors did not pay attention to GDP anymore. The fitting of the FET is described in Figure 5. After the subprime crisis shock the FET formation was different, see Figure 6, the second lag of IPD not being significant, GDP growth is again important and investors also paid attention to measures of inflation, and in particular to the implied inflation for the five year horizon.

Figure 4. The final model when considering the first two lagged returns of IPD as covariate information.



Note: the period of study is January 1987 to December 1990.

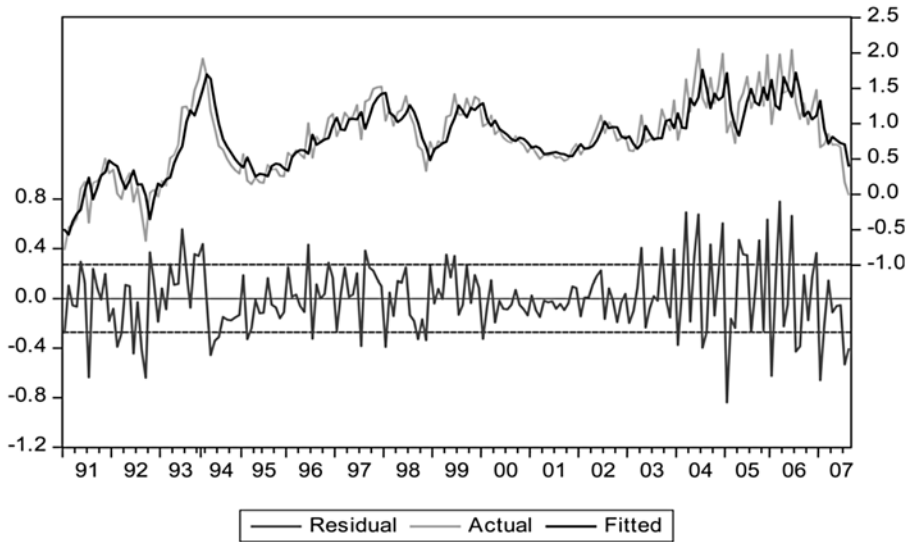
Model fitting is plotted relative to the axis on the right while the series of residuals are scaled with the axis on the left. The model producing these results contains the significant variables GDPGROWTH and the first two lagged logarithmic return of IPD.

The fact that lagged values of the real estate series are relevant for the evolution of real estate return series is in line with other previous research, see Brooks & Tsolacos (1999). A similar conclusion was found empirically in U.S. (see Ling, 2005), where real-estate pricing is also driven at times mainly by market sentiment.

3.4. USING THE FUNDAMENTAL ECONOMIC TERM FOR POLICY MAKING

The linkages between problems in real estate markets and problems in financial systems have preoccupied researchers for a long time. Borio and Lowe (2002) pointed out that a very steep increase in property prices might trigger the formation of financial imbalances and Hilbers *et al.* (2001) presented empirical evidence from the last two decades in which real estate imbalances could have signalled banking crises.

Figure 5. The final model when considering the first two lagged returns of IPD as covariate information.



Note: the period of study is January 1991 to December 2007.

Model fitting is plotted relative to the axis on the right while the series of residuals are scaled with the axis on the left. The model producing these results contains the significant variables the first two lagged logarithmic return of IPD.

While mortgage securitization has been largely blamed for contributing to the subprime crisis, I would like to point out the environment surrounding commercial real-estate in the previous millennium. Funding for commercial property loans was provided mostly by banks and insurance companies who had to carry real-estate risk and credit risk bundled in a mortgage on their balance sheet. Because of the lack of homogeneity these type of loans carried quite substantial interest rates which in turn meant that the real-economy was adjusting slower to new market conditions, change in technology and global shocks. If this mortgage funding disappeared instantaneously as it did in the 1990s, the mortgage borrowers could be forced out of business because of lack of funding.

Securitization solved this problem by providing an additional funding channel and it also homogenised the loans. This also implies lower interest rates for borrowers therefore reducing their risk of bankruptcy due to liquidity problems. The success of securitization for commercial property was unprecedented. The Federal Reserve flow of funds indicated that the outstanding securitized commercial mortgages were USD 2 billion in 1980s, USD 72 billion in 1990s and reached USD 630 billion by the end of 2006. The securitization also allowed for

Figure 6. The final model when considering the first two lagged returns of IPD as covariate information.



Note: the period of study is January 2008 to December 2011. Model fitting is plotted relative to the axis on the right while the series of residuals are scaled with the axis on the left. The model producing these results contains the significant variables GDPGROWTH, CHANGEGLCINF and the first lagged logarithmic return of IPD.

greater participation, which was claimed to be good because it helped spreading out the risk. On the other hand it also meant that, due to the longer maturity of the commercial backed securities, a critical mass of investors were exposed or potentially contaminated, in case problems surfaced. Furthermore, securitization also had another hidden problem. As soon as this process stops it will ignite a massive landslide of losses that would trigger changes in interest rates and blockages of the funding system. The overreliance on securitization as a source of funding and the potential catastrophic disasters when the process is misused can be compared to the usage of antibiotics in medicine. What will happen if for some reason they cannot be used? What will the consequences be? Do the positives outweigh the negatives?

3.5. FINAL DISCUSSION

Here we summarise the main points of my study for policy makers, regulators and financial markets participants. Statistical analysis points out that between January 1993 and July 2007, all IPD index logarithmic returns were positive. I conjecture that this is the only asset class where returns were positive for such a long period of time. The illusion created by this long series of positive returns can be explained by the fact that property investors did not give proper consideration to macroeconomic evidence.

The fitting of FET was exceptionally good over the period January 2008 to December 2011, indicating that investors in commercial property space in UK paid a lot more attention to the macro variables than in the previous period. The model fitting best the data for the period January 1991 to December 2007 was based solely on IPD return lag, indicating a lot of momentum, inertia and investor's exuberance.

The model can be used for trading strategies based on disillusion effect but also for policy making and inference on the state of real-estate, this very important market for the global economy. The Eurex futures contracts provide an opportunity to trade commercial property risk long and short, taking advantages of the signals given by the FET. It seems logical to me that having more maturities on IPD futures will complete the futures curve and will allow trades to be executed on the shape of the curve. In this way the liquidity of shorter maturities may be improved and banks can then utilize Eurex futures to hedge out property risk and avoid price crashes.

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4. DEALING WITH REAL ESTATE BOOMS

Giovanni Dell’Ariccia and Deniz Igan¹

4.1. INTRODUCTION

Until the global financial crisis, the main policy tenet in dealing with a real estate boom was one of ‘benign neglect’ (Bernanke, 2002). The widespread consensus was that it was better to wait for the bust and pick up the pieces than to attempt to prevent the boom. This was based on two assumptions. First, the belief that it is extremely difficult to identify unsustainable real estate booms, or ‘bubbles’, in real time. Second, the notion that the distortions associated with preventing a boom outweigh the costs of cleaning up after a bust.

The crisis has challenged this view. Post-bust policy intervention was of limited effectiveness and, thus, the costs associated with this particular bust were daunting. While early intervention may engender its own distortions, it may be best to undertake policy action on the basis of a judgment call (as with inflation) if there is a real risk that inaction could result in catastrophe.

Yet, a call for a more preventive policy action raises more questions than it provides answers. What kind of indicators should trigger policy intervention to stop a real estate boom? If policymakers were fairly certain that intervention were warranted, what would be the policy tools at their disposal? What are their impacts? What are their negative side effects and limitations? What practical issues would limit their use? What are the optimal institutional arrangements for their control? This paper explores these questions taking the characteristics of housing cycles and the linkages between housing and mortgage markets and business cycles into consideration.

It should be recognized at the onset that there is no silver bullet. A more proactive policy stance can help reduce the risks associated with real estate booms, but will inevitably entail costs and distortions, and its effectiveness will be limited by loopholes and implementation problems. With this in mind, we reach the following conclusions. Policy efforts should focus on booms that are financed through credit and when leveraged institutions are directly involved, as the following busts tend to be more costly. In that context, monetary policy is too

¹ This paper derives from “Policies for Macrofinancial Stability: Options to Deal with Real Estate Booms,” available as IMF Staff Discussion Note No. 11/02 and co-authored with Christopher Crowe and Pau Rabanal. The authors thank the participants at the BOK-IMF Workshop on Managing Real Estate Booms and Busts and the SUERF/Nykredit Conference ‘*Property prices and real estate financing in a turbulent world*’ for useful comments. The views expressed here are those of the authors and do not necessarily represent those of the IMF, its Executive Board, or its Management.

blunt and costly a tool to deal with the vulnerabilities associated with increased leverage, unless the boom occurs as a result of or at the same time as broader economic overheating. Fiscal tools may be, in principle, effective. But, in practice, they would likely create distortions and are difficult to use in a cyclical fashion. Macroprudential tools (such as limits on loan-to-value ratios) are the best candidates to deal with the dangers associated with real estate booms as they can be aimed directly at curbing leverage and strengthening the financial sector. But their careful design is crucial to minimize circumvention and regulatory arbitrage. Further, they will entail a cost to the extent that some agents find themselves rationed out of credit markets.

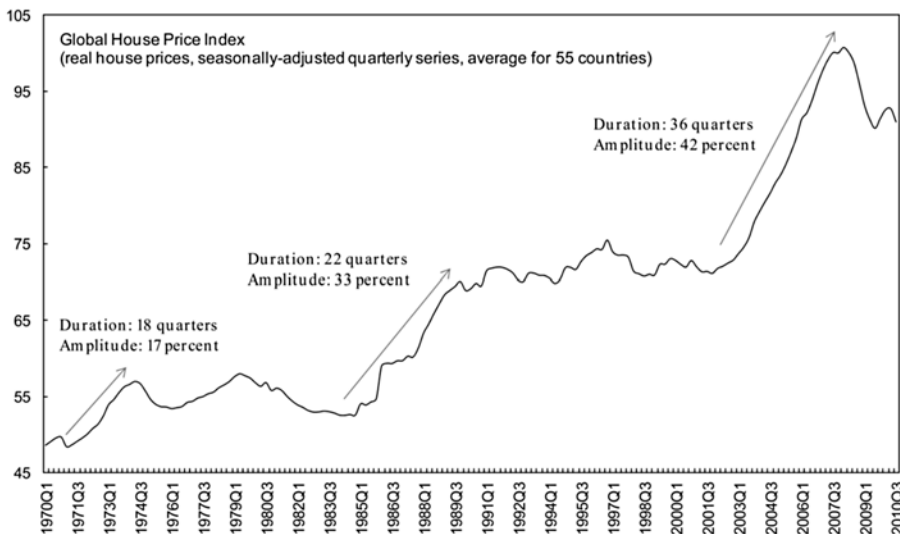
In what follows, we first give a summary of how real estate boom-bust cycles are linked to the broader economy and may threaten financial and macroeconomic stability. Then, we discuss different policy options to reduce the risks associated with real estate booms, drawing upon several country experiences (a more detailed analysis of country cases is in Crowe *et al.*, 2011). We conclude with a brief discussion of the tradeoffs involved in designing a macroprudential regulator.

4.2. THE STATE OF KNOWLEDGE ON REAL ESTATE MARKETS AND LINKAGES TO THE ECONOMY

Real estate markets have come to the fore of economic policy discussions in the aftermath of the global financial crisis given the role they played in instigating the turmoil in markets. What do we know about real estate cycles, especially in residential markets? What do we know about linkages between housing, credit, and business cycles? How can we improve our knowledge? These are the questions to which this section aims to provide some answers.

Cycles, sometimes rather pronounced, are a common feature of real estate markets. Several features could explain this fact, for example, the delay in demand and supply responses given the time to build and the physical constraints on the supply side (i.e., land is in limited supply and zoning restrictions put additional limits on new construction). From a global perspective, the cyclical movements are evident in Figure 1, which shows the average real house price index across countries since the 1970s. There have been three episodes during which prices increased at a particularly rapid pace: first, in the early 1970s; second, in the mid-1980s; and third, in the early 2000s. The last upturn, however, has been much larger and longer than the first two.

Figure 1: Global House Price Index (real house prices, season ally-adjusted quarterly series, average for 55 countries)



Sources: OECD, BIS, *Global Property Guide*, national sources; authors' calculations.

The fact that the last upturn has been larger and longer has implications for the downturn phase. Stylized facts on the duration and amplitude of house price cycles suggest that, the longer and higher prices go up, the more they will come down (Igan and Loungani, 2011). The average upturn during the past cycles in a sample of OECD countries lasted 20 quarters and prices rose by 48 percent while the downturn lasted 18 quarters and prices fell by 23 percent. In the present cycle, the upturn was 38 quarters and prices increased by a mind-blowing 126 percent. The downturn has so far spanned 20 quarters with the price fall reaching about 20 percent. This comparison suggests that real house prices at a global scale may still continue their path downward for a couple of more years.

What matters even more for policymakers is the fact that housing cycles are closely intertwined with credit and business cycles (these linkages and the reasons behind them will be discussed more in the next section on the case for policy action in response to housing cycles). In general, credit and house prices cycles tend to be slightly more protracted on average than business cycles but the peaks and the troughs are not too far from each other across cycles in different markets. Credit and housing (both in terms of price and quantity – proxied by residential investment) cycles also tend to have larger swings than real activity cycles. Housing cycles lead credit and business cycles over the long run, reflecting housing’s feature as an asset whose value is ultimately driven by ‘fundamentals’ in the long run.

It is important to note that there are significant differences across countries in terms of these general patterns. In particular, legal and institutional structure of housing finance systems (often emerging as a product of historical events), the degree of government intervention, and supply responsiveness are crucial elements determining the characteristics of housing cycles and the degree of spillover to the rest of the economy. For example, the presence of mortgage equity withdrawal, prevalence of variable-rate mortgages, typical loan-to-value ratios, etc. have bearings on the strength of wealth effects on consumption that may emerge as a result of a surge in house prices. Similarly, housing credit provision by government-owned and government-sponsored entities, rent controls, social housing initiatives, tax treatment of housing, etc. may introduce a wedge between rents and house prices with implications for housing tenure choice and economic activity. Geographical conditions as well as urban planning policies can amplify cycles and affect how cyclical movements in house prices and construction activity spill over to the other parts of the economy. As a result, the estimated impact of a decline in house prices on real GDP varies considerably across countries (Figure 2). Some of these differences can be traced back, for instance, to the features of the mortgage markets (Table 1).

Figure 2

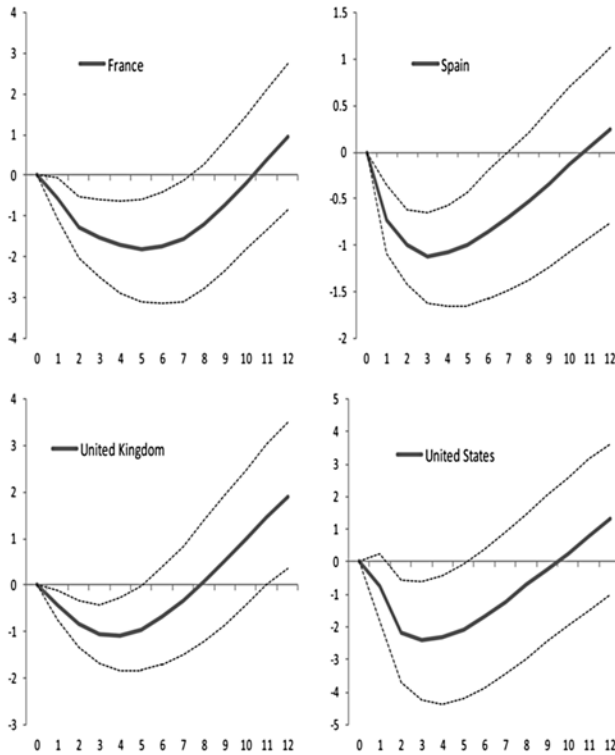


Table 1

	Average estimated impact on GDP by VAR analysis (in percent)	Countries included in the calculation of average impact
Penalty-fee prepayment and refinancing available	-2.77	Australia, Denmark, Japan, United Kingdom, United States
not available	-1.71	Austria, Belgium, Canada, Finland, France, Germany, Greece, Italy, Netherlands, Norway, Spain, Sweden
Option to withdraw mortgage equity available	-2.27	Australia, Canada, Denmark, Finland, Greece, Ireland, Japan, Netherlands, Norway, Sweden, United Kingdom, United States
not available	-1.61	Austria, Belgium, France, Germany, Italy, Spain
Typical loan-to-value ratio at origination less than or equal to 60 percent	-0.06	Austria, Italy
between 60 and 79 percent	-1.67	Canada, Finland, France, Germany, Norway, Spain, United Kingdom
more than or equal to 80 percent	-2.21	Australia, Belgium, Denmark, Ireland, Japan, Netherlands, Sweden, United States

At a cross-sectional perspective, it is interesting to observe that country cycles are largely driven by global factors whose role has increased over time, especially for credit and business cycles, and that U.S. cycles tend to lead other countries' respective cycles (Igan *et al.*, 2009).

What does such a state of knowledge imply for conduct of macroeconomic policy in relation to real estate markets? There appears to be two broad lessons. First, a uniform policy prescription of taking into account asset prices in monetary policy making is probably not the wisest direction. Statistical properties of housing cycles vary across countries. In addition, some shocks to house price inflation appear to be persistent, suggesting that monetary policy should not react to such a shock at all. Second, domestically-focused policies may not be enough. The role of global factors has increased even for the ultimate nontradable good (i.e., real estate) and the room for policy coordination across borders has potentially grown.

Before we move on to discussing the case for policy intervention and the available policy options in detail, a word on challenges facing the researchers focusing on the nexus of macroeconomics and real estate markets is warranted. Availability of reliable data continues to be a major issue. After the global financial crisis, there have been several initiatives to fill the information gap on this front. Badly-needed improvement in construction of harmonized time series of real estate prices and information gathering on other indicators such as transactions, construction, mortgages as well as legal and structural characteristics are in progress. Meanwhile, initiatives to improve provision of data at the micro level (e.g., households, loans, banks regarding their real-estate-related activities)

should also be a part of the agenda. These initiatives would help with a more in-depth analysis of real estate market characteristics and policy effectiveness, our understanding of which is still at its infancy as to be discussed in more detail below.

4.3. THE CASE FOR POLICY ACTION ON REAL ESTATE BOOMS

4.3.1. Leverage and the Link to Crises

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

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

During the current crisis, highly leveraged housing markets had a prominent role, but this pattern is not limited to the United States, nor is it new to this crisis. The amplitude of house price upturns prior to 2007 is statistically associated with the severity of the crisis across countries (Claessens *et al.*, 2010). Put differently, the U.S. market may have been the initial trigger, but the countries that experienced the most severe downturns were those with real estate booms of their own. And, historically, many major banking distress episodes have been associated with boom-bust cycles in property prices (Reinhart and Rogoff, 2008). A distinguishing feature of 'bad' real estate boom-bust episodes seems to be coincidence between the boom and the rapid increase in leverage and exposure of

households and financial intermediaries. In the most recent episode, almost all the countries with ‘twin booms’ in real estate and credit markets (21 out of 23) ended up suffering from either a financial crisis or a severe drop in GDP growth rate. Eleven of these countries actually suffered from both damage to the financial sector and a sharp drop in economic activity. In contrast, of the seven countries that experienced a real estate boom but not a credit boom, only two went through a systemic crisis and they, on average, had relatively mild recessions.

4.3.2. Wealth and Supply-side Effects

Real estate is an important, if not the most important, storage of wealth in the economy. Additionally, the majority of households tend to hold wealth in their homes rather than in equities. Typically, in advanced economies less than half of households own stock (directly or indirectly) while homeownership rate hovers around 65 percent. In addition, the supply-side effects can be substantial. In most advanced economies, house price cycles tend to lead credit and business cycles (Igan *et al.*, 2009). This suggests that fluctuations in house prices create ripples in the economy through their impact on residential investment, consumption, and credit while the reverse effect is not as prominent, implying that the housing sector can be a *source* of shocks. Recessions that coincide with a house price bust tend to be deeper and last longer than those that do not, and their cumulative losses are three times the damage done during recessions without busts. Again, by contrast, recessions that occur around equity price busts are *not* significantly more severe or persistent than those that do not (Claessens *et al.*, 2008).

4.3.3. Illiquidity, Opacity, and Network Effects

Boom-bust cycles are an intrinsic feature of real estate markets. This reflects delays in supply response to demand shocks and the slow pace of price discovery due to opaque and infrequent trades as well as illiquidity owing to high transaction costs and the virtual impossibility of short sales. In other words, real estate prices and construction activity can be expected to display large swings over long periods, even absent the distortions due to institutional features of real estate finance and policy actions. Network externalities also complicate the picture. Homeowners in financial distress have diminished incentives to maintain their properties and do not internalize the effects of this behavior on their neighbors. Similarly, foreclosures reduce the value of neighboring properties beyond their effect through fire sales. The double role of real estate as investment and consumption good may reduce mobility and increase structural unemployment, as households in negative equity may be reluctant or unable to sell and take

advantage of job opportunities elsewhere. Hence, a housing bust may weaken the positive association between employment growth and mobility.

4.4. POLICY OPTIONS

The crisis has lent some support to the camp favoring early intervention in real estate boom-bust cycles. If we accept that intervention may be warranted although it is difficult to separate good from bad booms, the question arises as to which policy lever is best suited to reining in the latter. The main risks from real estate boom-bust cycles come from increased leverage in both the real (in particular, households) and financial sectors. Then, policies should, whenever possible, aim at containing these risks rather than price increases. In that context, policies should target two main objectives (not to be taken as a mutually exclusive categorization): (i) preventing real estate booms and the associated leverage buildup altogether, (ii) increasing the resilience of the financial system to a real estate bust. Table 2 gives a summary of policy measures available towards these objectives along with their pros and cons.

Table 2

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

What follows are explorations. The narrative focuses on residential real estate but several (although not all) of the measures discussed would easily apply to commercial real estate booms as well. We examine the potential role of monetary, fiscal, and macroprudential policies. We discuss the benefits and challenges associated with the various policy options, using case studies of countries with experience in the use of particular measures and, where possible, cross-country evidence.

4.4.1. Monetary Policy

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

Yet, monetary policy is a blunt instrument for this task. First, it affects the entire economy and is likely to entail substantial costs if the boom is limited to the real estate market. Put differently, a reduction in the risk of a real estate boom-bust cycle may come at the cost of a larger output gap and the associated higher unemployment rate (and possibly an inflation rate below the desired target range). Obviously, these concerns are diminished when the boom occurs in the context (or as a consequence) of general macroeconomic overheating.

A second concern is that, during booms, the expected return on real estate can be much higher than what can be affected by a marginal change in the policy rate. It follows that monetary tightening may not directly affect the speculative component of demand. If that is the case, it may have the perverse effect of leading borrowers towards more dangerous forms of loans. For instance, in the Czech Republic, Hungary, and Poland, monetary tightening led to decreased domestic currency lending but accelerated foreign-currency-denominated loans (Brzoza-Brzezina *et al.*, 2007). Moreover, under free capital mobility, the effectiveness of monetary policy may be limited, especially for not-fully-flexible exchange rate regimes. Finally, the structure of the mortgage market also matters: in systems where mortgage rates depend primarily on long-term rates, the effectiveness of monetary policy will depend on the relationship between long and short rates.

To a large extent, empirical evidence supports these concerns, leading to the bottom line that monetary policy could in principle stop a boom, but at a very high cost. Policymakers would have to 'lean against the wind' dramatically to

have a meaningful impact on real estate prices and credit, with large effects on output and inflation. This is confirmed by a panel vector autoregression, which suggests that, at a 5-year horizon, a 100 basis point hike in the policy rate would reduce house price appreciation by only 1 percentage point, compared to a historical average of 5 percent increase per year (see Crowe *et al.*, 2011, for details). But it would also lead to a decline in GDP growth of 0.3 percentage points.

4.4.2. Fiscal Tools

A variety of fiscal measures (transaction taxes, property taxes, deductibility of interest payments) bears on the decision to invest in real estate. The result is often a socially driven favorable treatment of homeownership (and sometimes housing-related debt). In theory, some of these fiscal tools could be adjusted cyclically to influence house price volatility, while preserving the favorable treatment of homeownership on average over the cycle.

Yet, if the net present value of all future taxes are capitalized in property prices, adjusting taxes countercyclically around the same expected mean would not affect the prices. Also, the evidence on the relationship between the tax treatment of residential property and real estate cycles is inconclusive: during the most recent global house price boom, real house prices increased significantly in some countries with tax systems that are highly favorable to housing (such as Sweden) as well as in countries with relatively unfavorable tax rules (such as France). Similarly, appreciation was muted in countries with both favorable systems (e.g., Portugal) and unfavorable ones (e.g., Japan). Overall, taxation was not the main driver of house price developments during the recent global housing boom (Keen *et al.*, 2010).

Technical and political economy problems may further complicate implementation of cyclically adjusted fiscal measures. In most countries, tax policy is separated from monetary and financial regulation policies, making it extremely hard to implement changes in tax policies as part of a cyclical response with financial stability as the main objective. Instead, local governments may use lower property or transaction taxes to attract residents during good times if the burden in the case of a bust is shared with other jurisdictions. The ability of cyclical transaction taxes to contain exuberant behavior may be further compromised if homebuyers do not respond to these taxes fully, because they consider them to be an acceptable cost for an investment with high returns and consumption value. Also, during a boom phase, the incentives to ‘ride the bubble’ may increase efforts to circumvent the measure by misreporting property values or folding the tax into the overall mortgage amount. Finally, as with most tax measures, the distortions

created by a cyclical transaction tax may make it more difficult to evaluate a property, which already tends to be a hard task, and also the mobility of households with potential implications for the labor market.

4.4.3. Macroprudential Regulation

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

Against the benefit of a lower cost, these measures are likely to present two shortcomings. First, they may be easier to circumvent as they target a specific type of contracts or group of agents. When this happens, these measures can be counterproductive, as they may lead to liability structures that are more difficult to resolve/renege in busts. Second, they may be more difficult to implement from a political economy standpoint since their use could be considered an unnecessary intrusion into the functioning of markets and since winners and losers would be more evident than in the case of macro policies.

We focus our analysis on three specific sets of measures: (1) capital requirements or risk weights that change with the real estate cycle, (2) dynamic provisioning (the practice to increase banks' loan loss provisions during the upswing phase of the cycle), (3) cyclical tightening/easing of eligibility criteria for real estate loans through loan-to-value (LTV) and debt-to-income (DTI) ratios. These tools may be able to achieve both objectives: (i) reducing the likelihood and/or magnitude of a real estate boom (for instance, by imposing measures to limit household leverage), and (ii) strengthening the financial system against the effects of a real estate bust (for example, by urging banks to save in good times for rainy days).

A major limitation in assessing the effectiveness of macroprudential tools stems from the fact that macroprudential policy frameworks are still in their infancy, and only a handful of countries have actively used them. And these measures have been typically used in combination with macroeconomic policy and direct interventions to the supply side of housing markets (such as in Singapore), further complicating the challenge to attribute outcomes to specific tools.

Yet, much can be learned from case studies. Following the Asian crisis, some countries in the region took a more heavy-handed approach to deal with risks posed by real estate booms. Countries in Central and Eastern Europe experimented with various measures to control the rapid growth in bank credit to the private sector in the 2000s. Others put in place a dynamic provisioning

framework. On the whole, success stories appear to be few, perhaps to some extent reflecting the learning curve in expanding the policy toolkit, improving the design of specific tools, and sorting out implementation challenges. But, when policy succeeded in slowing down a boom and avoiding a systemic crisis in a bust, it almost always involved some macroprudential measures (a detailed account of these cases is in Crowe *et al.*, 2011).

4.4.3.1. Higher Capital Requirements/Risk Weights

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

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

A few caveats are in order. First, absent more risk-sensitive weights, an across-the-board increase in risk weights (or capital requirements) carries the danger of pushing lenders in the direction of riskier loans. Thus, the introduction of procyclical risk weights for real estate loans should be accompanied by the implementation of a finer cross-sectional risk classification as well. Second, as with any other measure increasing the cost of bank credit (when credit is in high demand), procyclical risk weights may be circumvented through recourse to nonbank intermediaries, foreign banks, and off-balance-sheet activities. Third, these measures will lose effectiveness when actual bank capital ratios are well in excess of regulatory minima (as often happens during booms). Fourth, while improving the resilience of the banking system to busts, tighter requirements are

unlikely to have a major effect on credit availability and prices. Put differently, they are unlikely to reduce vulnerabilities in the real (household) sector. Finally, regulators may be reluctant to allow banks to reduce risk weights during a bust (when borrowers become less creditworthy).

The empirical evidence on the effectiveness of these measures is mixed. In an effort to contain the rapid growth in bank credit to the private sector and the associated boom in asset markets, several countries have raised capital requirements and/or risk weights on particular groups of real estate loans. Some attempts (such as the cases of Bulgaria, Croatia, Estonia, and Ukraine) failed to stop the boom; others (such as the case of Poland) were at least a partial success. Yet, it is not easy to say why measures taken in one country may have been more effective than those taken elsewhere or how much other developments account for the observed changes. Furthermore, even in countries where tighter capital requirements appeared to produce some results on controlling the growth of particular groups of loans, real estate price appreciation and the overall credit growth remained strong.

4.4.3.2. Dynamic Provisioning

Dynamic provisioning (the practice of mandating higher loan loss provisions during upswings and one of the elements in Basel III) can help limit credit cycles. The mechanics and benefits are similar to those of procyclical capital requirements. By forcing banks to build (in good times) an extra buffer of provisions, it can help cope with the potential losses that come when the cycle turns (see, for example, the case of Spain). It is, however, unlikely to cause a major increase in the cost of credit, and thus to stop a boom. That said, one advantage over cyclical capital requirements is that dynamic provisioning would not be subject to minima as capital requirements are, so it can be used when capital ratios maintained by banks are already high. Provisioning for property loans could be made a specific function of house price dynamics. In periods of booming prices, banks would be forced to increase provisioning, which they would be allowed to wind down during busts. As in the case of risk weights, provisioning requirements could depend on the geographical allocation of a bank's real estate portfolio.

This measure is primarily targeted at protecting the banking system from the consequences of a bust rather than having a significant impact on credit and contain other vulnerabilities, such as increases in debt and leverage in the household sector. In addition, practical issues and unintended effects such as calibration of rules with rather demanding data requirements and earnings management (which may raise issues with tax authorities and securities markets regulators) should be discussed in each country's context to design a framework

that best fits the country's circumstances. There are also other shortcomings, similar to those of procyclical risk weights (being primarily targeted at commercial banks, dynamic provisioning may be circumvented by intermediaries outside of the regulatory perimeter). Lastly, application of the measure only to domestically regulated banks may hurt their competitiveness and shift lending to banks abroad, raising cross-border supervision issues.

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

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

A limit on LTV can help prevent the buildup of vulnerabilities on the borrower side. The lower the leverage, the greater the drop in prices needed to put a borrower into negative equity. This will likely reduce defaults when the bust comes as more borrowers unable to keep up with their mortgages will be able to sell their houses. In addition, in case of default, lenders will be able to obtain higher recovery ratios. On the macro front, a limit on LTV will reduce the risk that a large sector of the real economy ends up with a severe debt overhang. In addition, it will reduce the pool of borrowers that can obtain funding (for a given price) and thus will reduce demand pressures and contain the boom.

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

Careful design of these measures is key to limit circumvention. For instance, in Korea, lower LTV limits for loans with less than three years of maturity spurred a boom in loans originated with maturity of three years *and* one day. In the United States, during the housing boom, the practice of combining two or more loans to avoid mortgage insurance (which kicked in when LTV exceeded 80 percent) became common. Similarly, an obvious way to get around a DTI limit would be to extend sequential loans and report the ratios separately. In Hong Kong SAR, where regulators impose maximum limits on the debt service ratio (which takes into account the payments the borrower has to make on non-mortgage loans as well), supervisors often encounter cases where lenders do not to report all outstanding debt obligations. Circumvention may entail significant costs, as it may result in liability structures that can complicate debt resolution during busts (for example, in the United States, it is often second-lien holders that object to restructuring). In addition, circumvention may also involve shifting of risks not only across mortgage loan products, but also outside the regulatory perimeter, through expansion of credit by nonbank, less-regulated financial institutions and/or by foreign banks (which may result in increased currency mismatches as the proportion of foreign-currency-denominated loans rises).

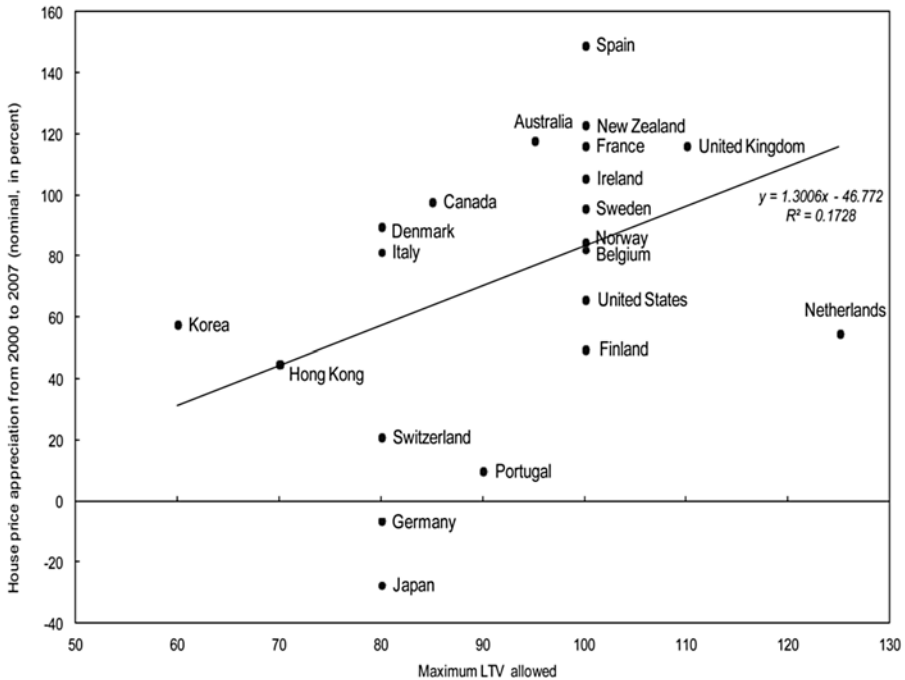
The narrow target nature of these measures may increase political economy obstacles (as happened in the case of Israel), particularly since the groups more impacted by LTV and DTI limits tend to be those more in need of credit (poorer and younger individuals). In addition, unlike with more ‘macro’ measures,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

The scant existing empirical evidence suggests that these are promising measures. For example, in a simple cross-section of 21 (mostly) developed countries, maximum LTV limits are positively related to house price appreciation between 2000 and 2007 (Figure 3). And back-of-the-envelope calculations suggest that a 10 percentage point increase in maximum LTV allowed by regulations is associated with a 13 percent increase in nominal house prices (see also Duca *et al.*, 2010).

Experiences of countries that experimented with changing mandatory LTV limits in response to real estate market developments also suggest that doing so can be quite effective. When the Korean authorities introduced LTV limits in September 2002, month-on-month change in house prices decreased by 3 percentage points immediately and remained low until April 2003. A similar pattern applies to DTI limits, with month-on-month change dropping by 2 percentage points in August 2005 with the introduction of the measure. Interestingly, the measures had a

much smaller (or no) impact on prices in ‘non-speculative’ areas where the limits were untouched. The impact on year-on-year changes, however, has been smaller, since prices tend to start increasing at a faster pace again after the first immediate reaction. In Hong Kong SAR, prudent lending practices guided by LTV and DTI limits have been credited with pausing the house price boom briefly in 1994 and guarding the system against the fallout from the crash in 1997 (Wong *et al.*, 2004; also see Wong *et al.*, 2011).

Figure 3: Maximum LTV and House Prices



Sources: BIS, OECD, UNECE, ECLAC, IDB, European Mortgage Federation, International Union for Housing Finance, International Union of Tenants, national statistics, and central bank statistics. Notes: Maximum LTV allowed refers to new mortgage loans and, in most cases, shows the limits over which additional requirement such as mortgage insurance would apply.

4.5. WHO SHOULD CONTROL THE MACROPRUDENTIAL LEVER?

If, as suggested in the analysis above, macroprudential tools are to play an important role in how authorities deal with real-estate booms and busts, the question arises of who should be in charge of macroprudential policy. Economists and policy makers are still far from reaching a consensus on this question. What follows are preliminary explorations.

Several issues bear on the question of who should control the macroprudential lever, and, in particular, on whether it would be better to centralize monetary and macroprudential policies under one roof or to keep them under separate agencies. First, as in other policy contexts, there exists a trade-off between policy coordination and credibility. Second, there is the issue of information sharing (the debacle in dealing with the Northern Rock crisis highlighted the problems associated with agency coordination). Third, since expertise is path dependent there is the issue of how to best exploit the experience and talent already accumulated in existing agencies. This is especially critical in small countries in which there may be a shortage of human resources. This section focuses primarily on the game-theoretical problems associated with the first issue.

Start with separate agencies with different mandates. Think about a central bank (pretty much like those we have now) in charge of monetary policy and tasked with price and output stability. It is obviously not indifferent to bank risk taking and financial stability, but puts greater weight and priority on its traditional mandate: low inflation and output gap. Think about a financial authority in charge of macroprudential policy and tasked with macro-financial stability. It does care about inflation and growth, but not for themselves, only to the extent that they affect the stability of balance sheets. It focuses on things like credit growth, leverage, and debt overhang, that more directly affect financial stability.

In principle, this is a simple problem. We have two instruments (the policy rate and macroprudential policy) and two objectives (some combination of output/price-stability and financial stability). The complication is that each instrument affects both objectives. Interest rates will affect behavior in financial markets and macroprudential policy will, through its effects on the cost of credit, affect aggregate demand. This means that policy action by one regulator entails an externality for the objectives of the other. Absent other issues, the obvious solution to solve an externality is consolidation: put everything under one roof. A centralized authority will always be able replicate what independent regulators would do. However, separate agencies playing Nash may not end up coordinating on the first-best centralized solution.

The example of the relationship between fiscal and monetary authorities may be useful. Relative to the coordinated solution, the Treasury will push for greater output (a larger deficit) anticipating that the central bank will increase interest rates in reaction. The CB will keep interest rates higher as it will assume that the Treasury will run a larger deficit. The result will be an equilibrium where the deficit and the policy rate are both higher than optimal (implying more crowding out).

One can imagine a similar game between the central bank and the macroprudential regulator. For example, in a recession, the central bank may cut the

policy rate aggressively to stimulate demand. Worried about the effects of a relaxed monetary stance on risk taking, the financial authority reacts by tightening macroprudential regulation. Anticipating this response and its contractionary effect on demand, the central banks cuts rates even more aggressively. And so on. The outcome is a policy mix with too low interest rates and too tight macroprudential measures relative to what a coordinated solution would deliver.

The problem is that there is a second complication: Policy effectiveness (especially on the monetary policy front) depends critically on the credibility of institutions. And this will be inevitably undermined when an institution is tasked with potentially conflicting objectives.

Again, the example of fiscal and monetary policy is useful. It was concluded long ago that central bank independence from the Treasury is critical to preserve price stability. Absent independence, the credibility of the central bank will be challenged by concerns about its willingness to act against inflation, as it may be too concerned about output and the effects of an increase in interest rates on public deficits (see Barro and Gordon, 1983).

A similar argument can be made for separation between monetary and macroprudential policymaking. Take the case of an economy with rising inflation, but too little risk taking that has resulted in stagnant credit (for example after some shock has raised risk aversion). A joint regulatory authority will have a harder time convincing the public that it will fight inflation (and thus anchor expectations), when this conflicts with the other objective. This, in turn, will worsen the sacrifice ratio (as for the fiscal/monetary policy case). Then, a Nash game between two separate independent regulators may dominate the coordinated solution.

The key tradeoff is, then, between coordination and credibility. In the absence of credibility issues, a joint regulator will always be preferable (although in the absence of conflicts, coordination can help reducing the shortcomings of separate agencies). But if credibility is central and conflicts between the two objectives are likely, the preferable solution will entail separate and independent authorities.

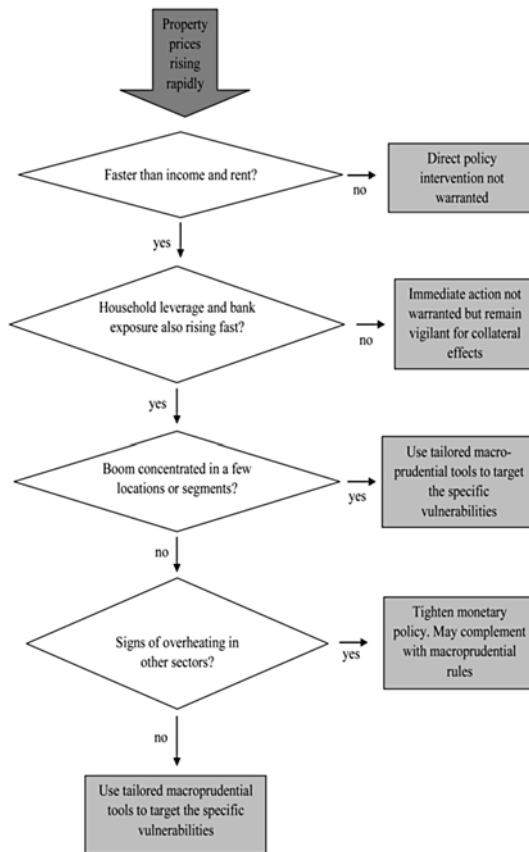
The optimal structure may depend on the relative weight of these concerns and needs to figure in the remaining aspects that were mentioned at the outset. In that context, when the policymakers are closely aligned institutionally, as under the new arrangements in the United Kingdom and the EU (ECB, ESRB), separate accountability arrangements for monetary and macroprudential policy may help address credibility concerns.

4.6. CONCLUDING REMARKS

The correct policy response to real estate booms is, like many other policymaking decisions, an art more than a science. Macroprudential measures seem to be the best option to achieve the objective of curbing real estate prices and leverage because they attack the problem at its source, adapt to specific circumstances in different locations at different times, and give the added benefit of increasing the resilience of the banking system.

Ultimately, policy recommendations depend on the characteristics of the real estate boom in question (Figure 4). If property prices are out of sync with income and rent *and* leverage is increasing rapidly, taking action is advisable. In deciding which policy option to choose, policymakers should adopt a wider view of the economy and complement targeted measures with broader macroeconomic tightening if the boom is a part or reflection of general overheating in the economy.

Figure 4: Dealing with Real Estate Booms



Looking ahead, should a more proactive use of macroprudential tools become the norm, the question arise of who should be in control of these levers. In particular, the close interaction with monetary policy raises the question of whether the central bank should be charged with both price and financial stability. In that context, a trade-off emerges between policy credibility/accountability and the efficiencies stemming from coordination. When the former is paramount, separate agencies are preferable. When the latter prevails, a centralized solution would dominate.

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5. RESTRICTIONS TO CREDIT ON REAL ESTATE: IMPLICATIONS FOR MONETARY POLICY AND WELFARE

Margarita Rubio and José A. Carrasco-Gallego

Abstract

The real estate sector has been the origin of the recent financial crisis. This fact has raised the discussion among policy makers and researchers on the need of macroprudential policies to avoid systemic risks in financial markets caused by the expansion of credit. However, these new measures need to coexist with the traditional monetary policy. In this paper, we study the interaction of macroprudential tools and monetary policies. We use a dynamic stochastic general equilibrium (DSGE) model which features a real estate market in order to evaluate the performance of a rule on the loan-to-value (LTV). Then we analyse how this rule complements the monetary policy conducted by central banks. Our findings are the following: the macroprudential rule mitigates the effects of booms on the economy by restricting credit; when both macroprudential and monetary policies are active, interest-rate shocks have weaker effects on the economy; and, the combination of monetary policy and the macroprudential rule is unambiguously welfare enhancing, especially when monetary policy responds only to inflation but does not respond to output and house prices¹.



“Monetary policy has been at the centre of the debate in economics for almost a century, and there is now a high level of consensus about its goals, its tools, and how to gauge its effectiveness. However, the macroprudential framework is still fuzzy, and being developed with the benefit of hindsight after the crisis that started in 2007 with the bursting of the sub-prime bubble.”

Speech by Lorenzo Bini Smaghi, Member of the Executive Board of the ECB, at the OeNB Annual Economic Conference on “The Future of European Integration: Some Economic Perspectives”, Vienna, 23 May 2011.

¹ This article summarizes some of the results found in Rubio and Carrasco-Gallego (2012) (www.dynare.org/wp-repo/dynarewp023.pdf) presented in the SUERF/Nykredit Conference “Property prices and real estate financing in a turbulent world” held in Copenhagen on 15 November 2012.

5.1. INTRODUCTION

In the aftermath of the crisis, policymakers and researchers coincide in the necessity to change the regulatory framework to a macroprudential view. Traditional measures have not seemed to be sufficient to avoid crises neither have allowed a fast and effective recovery. The severity of the recession and the high level of unemployment have been caused, at least in part, by the complexity and the fragility of financial markets. Those facts have made it clear we have to search a new regulatory approach. The growing interconnection of financial markets raises an urgent need of having a more stable financial system. A real debate about the reforms that need to be made in the financial and regulatory system has been opened by the crisis and its consequences. Central Banks and other institutions are making research on the policy instruments that have to be used in order to avoid similar episodes.

A macroprudential approach is one of the new types of policy interventions designed to mitigate the risk of the financial system as a whole, that is, the systemic risk. The term macroprudential refers to the use of prudential tools to explicitly promote the stability of the financial system in a global sense, not just the individual institutions. The goal of this kind of regulation and supervision would be to avoid the transmission of financial shocks to the broader economy.

The 13th Annual International Banking Conference, sponsored by the International Monetary Fund and the Federal Reserve Bank of Chicago on September 23-24 2010 focused on this debate. There, participants discussed the theory behind macroprudential (financial system level) regulations and analyzed the inadequacy of past supervisory practices that relied exclusively on microprudential (individual firm level) policy.

We find a good definition of what a macroprudential policy is by The Financial Stability Board, the Bank for International Settlements and the International Monetary Fund. They define macroprudential policy as “a policy that uses primarily prudential tools to limit systemic or system-wide financial risk, thereby limiting the incidence of disruptions in the provision of key financial services that can have serious consequences for the real economy, by dampening the build-up of financial imbalances and building defences that contain the speed and sharpness of subsequent downswings and their effects on the economy; identifying and addressing common exposures, risk concentrations, linkages and interdependencies that are sources of contagion and spillover risks that may jeopardize the functioning of the system as a whole”².

² See Financial Stability Board, Bank for International Settlements and International Monetary Fund (2011).

In order to be rigorous, we also look for a definition of systemic risk, and the same institutions define it as “a risk of disruption to financial services that is caused by an impairment of all or parts of the financial system and has the potential to have serious negative consequences for the real economy”³. For these purposes, financial services include credit intermediation, risk management, and payment services.

However, it has become evident that we do not totally understand what systemic risk means and how it affects the macroeconomy. Then, in order to implement a sound macroprudential policy, it is important to fully understand the interactions between the financial sector, institutions and markets, other policies, and the macroeconomy. Furthermore, under a new regulation setting, we need to think again about the effectiveness of traditional policies such as monetary policy. It is crucial to understand how the new macroprudential measures affect the conduction of monetary policy and to monitor and evaluate those policies. In the short run, monetary policy actions to activate the recovery will only have its proper effect if they are transmitted through a correctly working financial system. A stable financial system may deliver a monetary policy transmission mechanism in which the goals of the central bank are achieved in a more effective manner. In the long run, macroprudential policies conducted by central banks may reinforce the primary objectives of monetary policy, apart from ensuring a financial stability objective. Moderating credit and asset price cycles may help achieve the long-run price stability and stable economic growth objective. All this is a real challenge for central bankers and policy makers. Research is needed in order to assess not only the effects of specific macroprudential policy instruments but also what the interactions with the standard monetary policy are.

Furthermore, the interaction between housing markets, macroprudential and monetary policies is crucial. Following Volcker (2010), dangerous excesses in housing markets together with other prolonged disequilibria in the economy accounted for the severity of the recession and the elated financial turmoil. The rapid rise in the sub-prime mortgage was the initial cause of the financial crisis.

Following this line of research, we use in this paper a dynamic stochastic general equilibrium (DSGE) model with features a housing market in order to evaluate the effects on the main macroeconomic variables and on welfare of a rule on the loan-to-value ratio (LTV).

A rule on the LTV ratio introduces a macroprudential policy on the economy, in the sense that the ratio will be more restrictive whenever house prices and output increase in the economy. We evaluate the effects of this macroprudential policy both from a positive and a normative point of view.

³ See Financial Stability Board, Bank for International Settlements and International Monetary Fund (2009).

From a positive perspective, results show that with this rule booms are moderated because a tighter limit on credit is set. When we combine this rule with monetary policy, we find that monetary policy has weaker effects on the economy when macroprudential policies are active because the latter policy restricts the financial accelerator effects.

From a normative perspective, we also obtain several interesting results. First, unambiguously, when monetary policy and a rule for the LTV ratio interact, the introduction of this macroprudential measure is welfare enhancing. Second, welfare gains increase when the LTV responds more aggressively to changes in output and house prices. Lastly, when the interest rate responds to inflation, output and house prices instead of only to inflation, the welfare improvement is comparable to the one obtained by introducing the explicit macroprudential rule to the LTV. That is, welfare gains are larger if monetary policy only responds to inflation. The reason for that is that when the Taylor rule for the interest rate also responds to output and house prices the financial accelerator is less strong and this could be interpreted as a macroprudential measure by itself. Introducing an extra macroprudential tool may be redundant.

The rest of the paper continues as follows. Section 5.2. presents some evidence on some macroprudential experiences. Section 5.3. briefly describes the model. Section 5.4. presents results from simulations. Section 5.5. concludes.

5.2. EVIDENCE

Some central banks have implemented measures to moderate credit and asset price booms, complementing the traditional monetary policy. Authorities have learned with the crisis that microprudential supervision is not enough. There are many institutions whose complex networks create systemic risk. Thus, macroprudential supervision is needed to measure and manage the overall levels of risk in financial markets. And, for some central banks, quoting Caruana (2010), “because of the euro, the interest rate was not an available tool. Macroprudential policy was the only option”⁴.

Just as examples of macroprudential experiences, not being exhaustive⁵, we can mention some cases.

There is some macroprudential experience in emerging markets, especially in Asia. Among the tools that have been used, we find countercyclical capital buffers linked to credit growth, countercyclical provisioning, LTV limits or direct

⁴ Pp. 24-25.

⁵ For an exhaustive review see Financial Stability Board, Bank for International Settlements and International Monetary Fund (2009).

controls on lending to specific sectors. Most of those Asian instruments were taken during phases of rapid credit increase, but some were also imposed in the aftermath of the crisis. Measures were generally calibrated from starting from existing microprudential settings with adjustments for particular macro circumstances that were seen as relevant. For instance, an 80% LTV maximum is widely seen by these nations as a norm or benchmark for residential real estate loans from a microprudential point of view, and a number of economies have caps at this level. Tightenings of this instrument typically took the form of 10 or 20 percentage point reductions, some of which were reversed when conditions in the targeted markets were seen to have normalized.

Since mid-2000, the Bank of Spain introduced some macroprudential measures such as the dynamic or statistical provisioning for loan loss reserves. This measure had a microprudential role, as it was applied to individual institutions, and a macroprudential purpose, due to its countercyclical impact, which damps excess procyclicality in the financial sector. Under this system, banks must make provisions against credit growth according to historical loss information for different types of loans. This practice gave banks a greater cushion than they would otherwise have had, and kept their fragility from further deepening the downturn [See Saurina (2009a,b) and Caruana (2010)].

McCauley (2009) showed that emerging market central banks have been regular practitioners of macroprudential policy and gave as an example the Reserve Bank of India's decision to raise the Basel I weights on mortgages and other household credit in 2005. Caruana (2010) compared this policy with imposing or lowering maximum LTV ratios. The Committee on the Global Financial System proposed a similar macroprudential measure in 2010 to promote greater stability in haircuts in securities markets⁶.

In the USA, the Dodd-Frank Wall Street reform and Consumer Protection Act of 2010 mandated that a Financial Stability Oversight Council monitor and manage system-wide risk.

In 2009, the Committee on the Global Financial System (CGFS) conducted a very complete survey on the use of macroprudential instruments with the help of 33 central banks. The CGFS saw that macroprudential instruments or interventions had been widely applied and were viewed as more effective than monetary policy in addressing specific imbalances. The most common measures have been instruments to limit credit supply to specific sectors that are seen as prone to excessive credit growth. These include several restrictions on mortgage lending (caps on LTV ratios or debt/income ratios) and credit card lending limits. Some emerging market economies have used reserve requirements to prevent the

⁶ See Committee on the Global Financial System (2010a).

build-up of domestic imbalances arising from international capital flows. Instruments targeting the size or composition of bank balance sheets (such as loan-to-deposit ceilings, institution-specific capital add-ons or time-varying capital charges) seem to have been less frequently used, a range of such instruments have been introduced in response to the financial crisis, or were, at that time, under consideration.

5.3. THE MODEL

A microfounded general equilibrium model is needed in order to explore all the interrelations that appear between the real economy and the financial system. Our specification is analytically tractable and allows for closed form solutions for the steady state of the model⁷.

Specifically, our model consists of an economy composed by borrowers and savers. The reason to have these two types of consumers in the model is that in a model with a representative agent, borrowing is zero and thus, it is not possible to impose restrictions on credit.

Borrowers are impatient (they have a low discount factor) and need collateral to obtain loans. Then, they face a collateral constraint which is more or less tight depending on the LTV ratio. They can borrow a proportion of the present discounted value of their housing holdings.

Savers are patient (they have a high discount factor) and maximize their utility function by choosing consumption, housing and labor hours.

The representative firm converts household labor into the final good.

The central bank follows a Taylor rule for the setting of interest rates responding to inflation.

In standard models, the LTV ratio is a fixed parameter which is not affected by economic conditions. However, in this case we introduce a rule so that the LTV depends on the economic situation. We can think of regulations of LTV ratios as a way to moderate credit booms. When the LTV ratio is high, the collateral constraint is less tight. And, since the constraint is binding, borrowers will borrow as much as they are allowed to. Lowering the LTV tightens the constraint and therefore restricts the loans that borrowers can obtain. Recent research on macroprudential policies has proposed Taylor-type rules for the LTV ratio so that it reacts inversely to variables such that the growth rates of GDP, credits, the credit-to-GDP ratio or house prices. These rules can be a simple illustration of how a macroprudential policy could work in practice.

⁷ See the detailed model, the parameter values and all specific results in Rubio and Carrasco-Gallego (2012).

5.4. SIMULATION

Here, we assume that there exists a macroprudential Taylor-type rule for the LTV ratio, so that it responds to output and house prices. This kind of rule would deliver a lower LTV ratio in booms, when output and house prices are high, therefore restricting the credit in the economy and avoiding a credit boom derived from good economic conditions⁸.

The parameter values are standard in the literature. We simulate the impulse responses of our baseline model given a positive technology shock and a house-price shock. Both shocks represent a boom for the economy, in the sense that they increase output, house prices and therefore borrowing and consumption. Then, in order to assess how the macroprudential rule interacts with monetary policy, we consider a monetary policy shock.

The first shock, a positive technology shock, causes an increase in output and, thus, consumption for all agents increases. Borrowing increases and borrowers demand more housing, which is compensated by a decrease in the housing by the savers, given that the supply of housing is fixed. The increase in house prices increases consumption for borrowers further, given the collateral constraint they face. In this model, wealth effects are present through the collateral constraint. Situations in which house prices increase make the value of the collateral higher, and thus, wealth effects expand the economy even further. The increase in output activates the LTV rule and the collateral constraint becomes tighter. We see that, in this case, the effects on borrowing of the shock are not so strong. Since borrowers cannot borrow as much as they would do with a higher LTV, consumption and housing demand do not increase as much. This leads to a weaker response of output and inflation when the macroprudential rule is active. These results show that macroprudential regulation could help monetary policy to achieve its primary objective, price stabilization. Figure 1 presents the impulse responses to a 1 percent shock to technology.

In case of a house price shock, impulse responses also show how consumption, housing, borrowing and house price responses are softened by the macroprudential measure. In figure 2 we can see the effects of a 25 percent house price shock. For the same reasons stated in the previous case, the increase in house prices directly affects the collateral constraint and borrowers are able to borrow more out of their housing collateral, which is worth more now. Wealth effects permit them consume both more houses and consumption goods. The increase in house prices is therefore transmitted to the real economy and output increases. When house prices increase, the macroprudential rule becomes active and the LTV ratio decreases, therefore restricting the credit in the economy. As in the

⁸ Funke and Paetz (2012) consider a non-linear version of this macroprudential rule for the LTV.

previous case, consumption and housing demand do not increase as much when the macroprudential rule is in action.

Figure 1: Impulse Responses to a Technology Shock. Macroprudential versus no Macroprudential

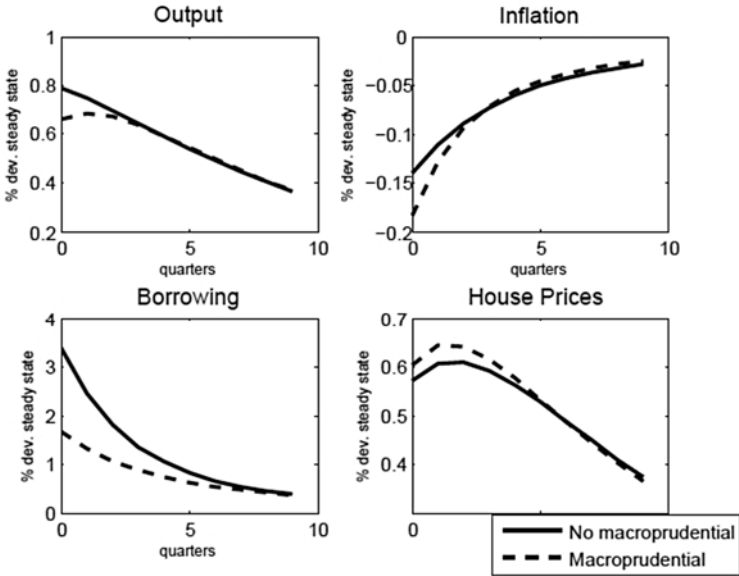
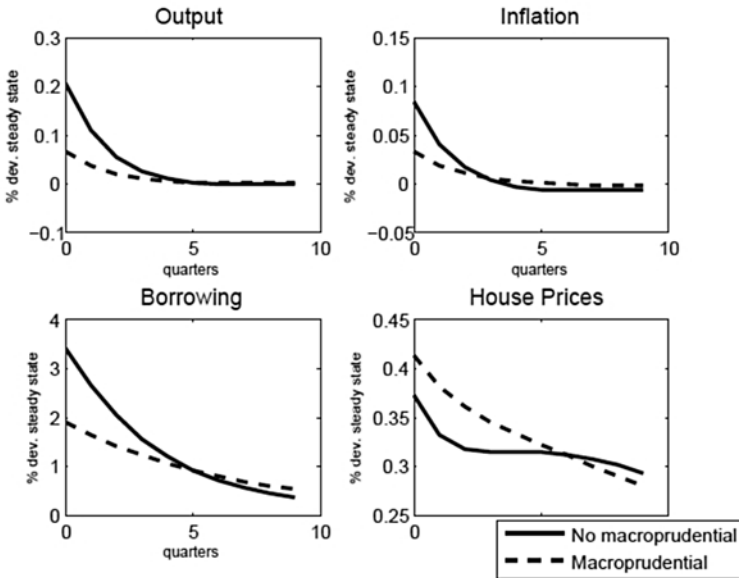
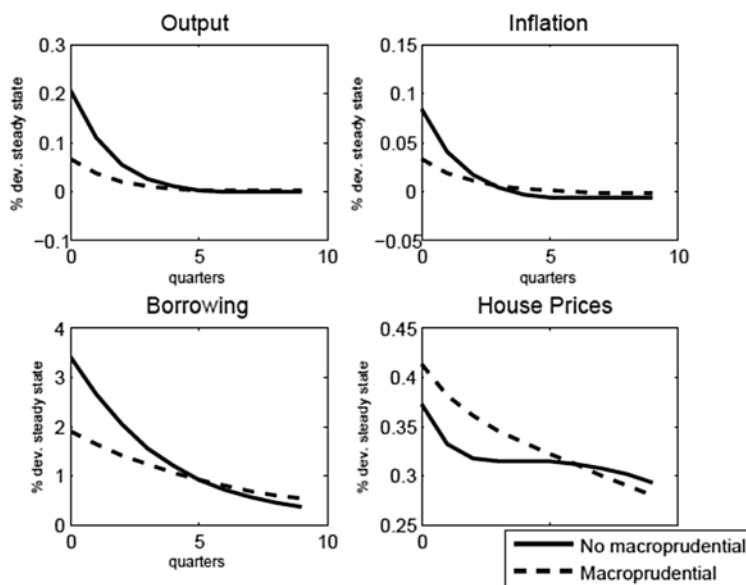


Figure 2: Impulse Responses to a Housing Demand Shock. Macroprudential versus no Macroprudential



Finally, we consider a monetary policy shock: a one standard deviation decrease in the interest rate. Remember that here, monetary policy responds only to inflation, which is empirically plausible, since the main goal of most central banks is price stability. Figure 3 shows impulse responses for the monetary policy shock. We see that this expansionary monetary policy has stronger effects when the macroprudential measure is not active. The macroprudential policy mitigates the effects of monetary policy because it restricts borrowing. This, in turn increases output and house prices. Output increases because the decrease in the interest rate stimulates the economy through borrowing. House prices increase because they are an asset price which inversely moves with interest rates. The increase in prices makes the collateral more valuable and this gives an extra push to output. However, when a macroprudential rule is applied, the borrowing constraint becomes tighter and the financial accelerator effects that the collateral constraint introduces are weaker. Then, the impact on output and inflation of a decrease in the interest rate is not as strong.

Figure 3: Impulse-Responses to an Expansionary Monetary Policy (decrease in interest rate). Macroprudential versus no Macroprudential



5.5. WELFARE MEASURE

We numerically evaluate welfare with two experiments: first, when the Taylor rule of the central bank is the only policy tool, and then, when it interacts with the macroprudential rule, that is, the rule to the LTV. As a measure of welfare, we

consider a second order approximation of the future stream of utility of all agents.

5.5.1. Welfare Comparison Across Taylor rules (No LTV Rule)

We consider different cases; first, a Taylor rule which responds just to inflation; second, a Taylor rule which responds to inflation and output; and finally, a Taylor rule which responds to inflation, output and house prices.

As pointed out by Iacoviello (2005), a Taylor rule in which the output parameter is set to zero amplifies the financial accelerator mechanism since the central bank does not intervene when output falls. Then, introducing a response to output in the policy rule makes it more restrictive. If, additionally, the interest rate also responds to house prices, the Taylor rule becomes even tougher. In some sense, we could interpret these extended rules as being macroprudential by themselves, since they are constraining the financial accelerator by increasing the interest rates in booms and therefore constraining credit.

We find gains in term of welfare when the Taylor rule of the Central bank responds to prices and output. If the Taylor rule also responds to house prices, the welfare gains are even larger. Iacoviello (2005) shows that a Taylor rule which responds to asset prices does not yield significant gains in terms of output and inflation stabilization. However, it may yield gains in terms of financial stabilization and this gives higher welfare to the economy. Then, through allowing the Taylor rule to respond to output and house prices, the central bank is implementing a macroprudential policy and extending its goals not only to stabilize inflation but also to stabilize the financial system through moderating the financial accelerator effect.

5.5.2. The LTV Rule Interacting with the Taylor Rule

We take different values for the parameters of the LTV rule in order to observe the sensitivity of the results with respect to the aggressiveness of the macroprudential rule. Also, we consider three types of Taylor rules for the Central bank.

First, we contemplate a Taylor rule that responds only to inflation, that is, the priority of the central bank is to stabilize prices. This kind of rule would be consistent with a central bank such as the ECB, which explicitly states the first priority as inflation stabilization. We see that, using both policy measures at the same time is unambiguously welfare enhancing.

Welfare of borrowers increases with the introduction of the macroprudential rule because tightening the collateral constraint avoids situations of overindebtedness in which debt repayments are a burden for them and can benefit from more financial stability in the economy. This welfare gain is at the expense of savers, who lose from having this measure in the economy, given that they are not financially constrained. However, the borrower's welfare gain compensates the loss of the savers and globally, the measure is welfare increasing. We also find that welfare increases by more, the larger the response of the LTV to house prices and output is. We can conclude then that the economy gains in terms of welfare with the introduction of this rule because it gives financial stability.

Secondly, we consider a Taylor rule that responds to inflation and output, that is, although the first priority of the central bank is to stabilize prices, it also takes into account output growth⁹. This Taylor rule interacts with the macroprudential rule. The welfare analysis shows that qualitatively, results are maintained with respect to the previous case. However, we see that welfare gains are not as large as in the case in which the central bank has only one objective. The reason for that is that, as we have seen, introducing a positive output reaction to the interest rate restricts the financial accelerator effect in the economy, that is, it is a macroprudential policy by itself. Therefore, introducing an extra macroprudential policy, although it helps stabilizing the financial system, can be redundant.

Finally, we consider the full Taylor rule that responds to inflation, output, and also house prices. In this case, the gains are even smaller than in the previous case because monetary policy responding to output and asset prices is acting an even stronger macroprudential measure than in the previous case. The gains of introducing an additional macroprudential tool are marginal, as compared with the first case. Then, we can conclude that the central bank, by an appropriate combination of parameter values in its Taylor rule could do the job of a macroprudential regulator.

5.6. CONCLUSION

We analyze a macroprudential rule on the LTV ratio and evaluate the impact of this macroprudential policy both on the main economic variables and on welfare.

We notice that by restricting credit on real estate introducing a macroprudential tool, the effects of booms in the economy can be mitigated. Furthermore, this rule on the LTV is unambiguously welfare enhancing for the economy because it yields a more stable financial system.

⁹ This kind of rule would be consistent with a central bank such as the Federal Reserve, that also takes into account output and unemployment when making monetary policy decisions.

From a positive perspective, when the macroprudential rule on the LTV ratio interacts with the traditional monetary policy transmission mechanism channel, monetary policy has weaker effects on the economy. Thus, macroprudential regulation could help monetary policy to achieve inflation control.

On the other hand, from a normative perspective, we obtain several results: when monetary policy and a rule for the LTV ratio interact, the introduction of this macroprudential measure is unambiguously welfare enhancing; furthermore, welfare gains increase when the LTV responds more aggressively to changes in output and house prices. Although, when the Taylor rule responds to output and house prices instead of only to inflation, the welfare improvement is comparable to the one obtained by introducing the explicit macroprudential rule to the LTV. This extended Taylor rule could be considered macroprudential by itself because it restricts the financial accelerator effect and increases financial stability. Then, introducing an extra macroprudential measure gives much smaller welfare gains.

Then, the central bank, with an extended Taylor rule, could act as a macroprudential regulator. However, the goals of the central bank should be increased to not only to keeping inflation low but also to have a stable financial system. The open question here would be if these two objectives could be in conflict at some point and it would be better to have a separate institution that would implement the macroprudential policy and would be in charge of the stability of the financial system.

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6. INSIDE A BUBBLE AND CRASH – EVIDENCE FROM THE VALUATION OF AMENITIES

Ronan C. Lyons¹

Abstract

Using a rich dataset of one million property listings in Ireland, 2006-2011, this paper examines the relationship between housing market amenities and the housing market cycle. Falling marginal amenity prices during the crash would suggest lock-in concerns dominate, while rising prices in the crash would suggest a ‘property ladder’ effect, pushing up the price of low-amenity property during the bubble. While no one clear picture emerges across all amenities, there is more evidence in favour of countercyclical prices and a property ladder effect.

6.1. INTRODUCTION

The housing market is among the most important markets in modern economies. It constitutes perhaps the single most important class of consumption good. Shelter alone makes up 32% of the urban CPI in the U.S., more than any other category, while housing comprises 24% of the UK’s RPI, likewise the single biggest weight. Housing is also the most prevalent investment good: a 2001 study found that 54% of US household wealth was in real estate, while a study of wealth in Ireland in 2007 estimated the proportion to be 72% (Bank of Ireland, 2007, Lockett, 2001).

Unsurprisingly, then, the housing market has assumed a central role in explanations of the global economic and financial crisis starting in 2007. The group of OECD economies enjoyed an unprecedented boom in housing prices over the late 1990s and early 2000s. This was followed by a rise in defaults in the U.S. mortgage market, in particular its sub-prime segment, which – due to a range of financial innovations such as securitization – had an impact on the global financial system. The following years have seen the effects spread to global trade (2008-2009) and sovereign debt (from 2010).

¹ This is a shorter version of a working paper presented at the SUERF-Nykredit Conference, “Property prices and real estate financing in a turbulent world”, Copenhagen, November 2012. For more details or for regression output not presented here, please contact the author. The author is grateful to John Muellbauer for his encouragement and insight as supervisor, to Neil Cremins, Richard Dolan, Justin Gleeson and Sean Lyons for their assistance with data, and for helpful comments from Paul Cheshire, James Poterba, Steve Redding, Frances Ruane, Richard Tol and participants at the 2011 SERC Annual Conference and Oxford Gorman Workshop for helpful comments. The usual disclaimer applies.

Ireland's economic fortunes have in many respects been a microcosm of those globally. The period from the mid-1990s to 2007 was one of very strong economic growth in Ireland, initially export-led but in later years fuelled by the availability of cheap credit and an unprecedented building boom. From 2007, the economic downturn was severe. National income fell from €163bn in 2007 to €128bn in 2011 (GNP in current prices), while government finances deteriorated sharply, with fiscal deficits of 10% of GDP per year by 2010. Unemployment rose from below 5% in 2007 to almost 15% by 2011, while large inward migration flows changed to emigration.

Despite the global nature of the crisis, central to the dramatic change in Ireland's economic fortunes were domestic factors, in particular the end of a domestic real estate bubble. This highlights the links that exist between housing and other aspects of the economy, including financial stability, the labour market, the government finances, and public service provision. To understand how a housing cycle can affect economic fluctuations, it is important not only to understand the channels through which housing and the wider economy are related, but also how the housing market itself works.

Yet the mechanics of the housing market remain poorly understood. The housing market is an inherently spatial one and, property-specific attributes aside, differences in price across the market reflect location-specific amenities. With nominal house prices falls of up to 60% between 2006 and 2011, Ireland is a natural case study for studying the ups and downs of housing markets.

This paper uses a new and detailed dataset of property advertisements in Ireland over the period 2006-2011 to investigate the relationship between location-specific amenities, which are reflected in house prices, and the housing market cycle. Amenities are the core of differences between property values in different locations and so how they are priced across bubble and crash periods may give an insight in what happens in a real estate bubble. Comparing prices and rents, one might expect owner-occupiers to pay more for amenities in the expectation of amenity-specific capital gains, which would not benefit tenants.

If these expectations exist, it is likely that they would be greatest during the bubble and of least concern in the crash. This would be reflected in the price of amenities falling between bubble and crash periods. Alternatively, the valuation of amenities may be smaller in the bubble than in the crash, if there is a pervasive need to 'get on the ladder' in the frenzy of a bubble².

The paper is structured as follows. Section 2 outlines briefly related economic theory and literature, while section 3 provides details on the data used in this

² Price relativities may also reflect supply considerations, in particular, overconstruction in certain areas (and of certain types) due to zoning laws and subsidies.

analysis. Section 4 outlines the model and empirical strategy and Section 5 presents the results. Section 6 concludes.

6.2. THEORY & RELATED LITERATURE

6.2.1. Economic Theory

The earliest economic explanation of why rents vary by location comes from Von Thunen (1863), whose theory of farmers sorting by opportunity cost of distance to a market extends in a straightforward fashion to models of household location selection. Models along these lines date from Alonso (1964), where, in a monocentric city, one would expect those households with the highest opportunity cost of distance from a given central business district (CBD) to locate closest to it.

As outlined by Straszheim (1987), in a standard monocentric model, a household derives utility from its quantity of land consumed (q), its location or distance from the centre (u), and the numeraire composite consumption good (z). Its expenditure includes rent per unit of house size (r) and transport costs (T). The optimization problem yields an equation of the marginal rate of substitution across housing and non-housing with their price ratio, and the bid-rent gradient from the CBD outwards can be assumed, via partial equilibrium analysis, or derived, via general equilibrium analysis, where assumptions are made about utility levels at different locations. Either way, households will move away from the centre, along the rent gradient, until the marginal disutility of a longer trip just offsets the savings achieved for land consumed.

Hedonic Markets and Implicit Prices. There is an important caveat to the von Thunen set of theories, namely that all models assume that cities are monocentric and indeed that these centres are exogenous. There are a large number of potential considerations beyond employment that may affect a household's choice of residence, from market depth to environmental. Allowing an n -dimensional amenity vector and relaxing the restrictions on the location of amenities across the city space suggests that a more complicated bid function for given levels of utility and income is required.

Rosen's (1974) model does this and involves composite goods whose package of attributes (amenities) cannot be 'untied'. The value function $\theta(z_1, \dots, z_n; u, y)$ represents the expenditure a consumer is willing to pay for different alternative values of z , for a given utility index and income level and is the multi-dimensional counterpart to Alonso's bid-rent function. The value function θ gives the amount the consumer is willing to pay, while market prices are given by $p(z)$. The optimum will be where these two surfaces are tangent to each other.

In practical terms, this means that the value of an amenity should be reflected in the price. A suitable empirical strategy will be able to highlight the marginal willingness to pay for access to that amenity by holding other factors constant and varying access to the amenity. It is this approach that underlines the analysis conducted in this paper.

Valuation of amenities over the market cycle. Theoretically, the valuation of amenities over the market cycle is an under-explored area. One theory suggests that one might expect higher price housing to be more volatile over the market cycle (Stein 1995), due to the presence of down-payments and the fact that the typical household holds most of their private net wealth in housing. Consider a negative shock to house prices: this hinders movers from making their next down payment, depressing demand. If high-priced homes are purchased primarily by trade-up buyers, then their prices should have a greater variance over the real estate cycle. The prior expectation, according to this liquidity constraint model, is that houses with higher prices would both rise and fall more dramatically than those with lower prices.

As houses with higher prices are those in locations with greater amenities, this liquidity constraint model suggests procyclical amenity prices: that the price of amenities would rise in the bubble and then fall in the crash. Alternatively, expectations during the bubble of capital gains may lead to a ‘property ladder’ effect, where greater importance is attached by buyers to having any property, even one with poor amenities, than at other points in the cycle. Consequently, relatively less importance is attached to amenities, and thus countercyclical amenity prices would be evidence of ‘property ladder’ effects.

6.2.2. Literature

Since Rosen’s (1974) seminal paper, a large empirical literature has developed, estimating the implicit price of a wide range of amenities³. Much of the early literature focused on environmental public goods, such as air and water quality – reviews are given by Smith & Huang (1995) on air quality, Boyle & Kiel (2001) on water quality and Kuminoff *et al.* (2010) on environmental amenities. There is also a large literature on the effect of transport facilities on property values, although the hedonic method is just one of a number of methods used here (Debrezion *et al.*, 2007, RICS Policy Unit 2002, Wrigley *et al.*, 2001).

A good overview of the hedonic valuation of amenities method and of the findings from recent research on the value of education, transport and safety amenities, is given by Gibbons & Machin (2008). They stress the use of quasi-

³ There are over 5,600 papers citing Rosen (1974), according to Google Scholar Harzing (2007).

experimental approaches that exploit variations in the supply of amenities. Literature on other amenities – in particular social capital but also market-depth – is much less developed at this stage, most likely as the bulk of empirical work is at city or county-level and thus there is significantly less variation in population-specific characteristics than at country-level⁴.

Two comments on the literature are worthwhile. The first is that, by and large, well-specified studies – especially those that both control for omitted variables and exploit supply-side variation – do find that a wide range of amenities is factored into the cost of accommodation with the expected sign, although there is often little agreement across researchers on the magnitude. This may be understandable given that the studies vary hugely in terms of regions (and time periods) analyzed, as well as sample sizes and exact specification.

The second is that the established literature has a number of limitations. As is pointed out by Kuminoff *et al.* (2010), there is no reason to assume that amenities have time-constant prices, yet this is overwhelmingly the strategy adopted in the literature to date, more than likely due to sample size limitations. Likewise, there is very little information on the valuation of amenities in the lettings segment of the residential property market, again more than likely due to limitations of data.

One glimpse into the relationship between amenities, including market depth and social capital amenities, and the market cycle is given by Case & Mayer (1996). They find that amenities such as employment, education and low crime shifted the distribution of prices during the boom, but far less so if at all during the bust. For example, towns with a larger share of residents working in the declining manufacturing sector witnessed smaller increases in house prices over the boom-bust cycle, while house prices appreciated faster in towns with a larger percentage in 1980 of middle-aged residents, a sign of age-specific amenities. With school enrolment falling rapidly in the period, the premium attached to homes in high-quality school districts fell during the boom.

Nonetheless, despite the impact of amenities during the boom, Case & Mayer (1996) do not find evidence in favour of Stein's (1995) hypothesis, in relation to liquidity constraints, that the spread of house price is procyclical. Controlling for amenities, low-priced towns saw faster house price growth to 1988 and then greater falls after that. Also, distance to Boston mattered both in the boom and the bust: over the period as a whole, for a town one standard deviation closer to Boston than the average (15 miles compared to 32), house prices grew 5% faster, reflecting either Boston's high-income employment mix or the amenities it offers to nearby residents.

⁴ The literature on the hedonic pricing of amenities in the Irish property market, the focus here, is somewhat more limited. Mayor *et al.* (2009) and Mayor *et al.* (2008) examine amenities in the Dublin housing market during the final stages of the bubble (2001-2006), finding evidence that both urban green space and transport access are valued in house prices.

6.2.3. Categories of Amenities

It is possible to think of a multitude of location-specific attributes that may impact on a property's desirability. A natural ordering of these amenities is by permanence or mobility. At one end of the spectrum are first-nature endowments of geography and environment. At the other end are population-specific, rather than location-specific amenities, such as market depth or social capital. Such amenities are hypothetically mobile, although taken as given by any individual actor as a point in time. For the purposes of this analysis, five categories of amenities are considered. From least mobile to most, they are: environmental amenities and facilities, transport facilities, human capital services, market depth, and social capital:

1. geography suggests that landscape and natural capital may matter, such as proximity to coastline or lakes. This category also includes distance from 'disamenities' such as waste facilities, mobile phone masts or power stations;
2. transport facilities, such as motorways, train stations or light rail services, often feature prominently in property advertisements and quality of life rankings;
3. also prominent in property advertisements are human capital amenities, such as nearby schools. It should be noted that, particularly with a busy facility such as a hospital, there may be disamenities associated with living too close to certain facilities;
4. amenities relating to market depth are those of von Thunen and Alonso recast: people need to be near centres of economic activity both as suppliers (of factor services) and as consumers (of market goods and services);
5. lastly, households may value population-specific (rather than location-specific) amenities, what one may term social capital amenities. Such amenities are less easy to measure, but may include the professional composition of a neighbourhood, its ethnic homogeneity or diversity, or perceptions of safety and crime.

6.3. DATA

6.3.1. Advertised Prices

The principal dataset used comes from the online accommodation portal, daft.ie, which provides price (rent) information as well as property attributes, including location. Over the period 2006-2011, daft.ie was the largest property website in Ireland across a range of metrics including number of properties, estate agents, page impressions per month and unique IP addresses per month; daft.ie's parent company estimates that its coverage of both sales and lettings markets is above

90%. With rich local listings, this enables a depth of modelling of regional property markets in Ireland heretofore impossible without great expense.

The sales component of the full dataset includes 624,935 properties listed for sale between January 2006 and December 2011. 276,431 observations are dropped as their locations were not known to a sufficient level of accuracy – a process explained in more detail in Section 3.2.3. This left a final sales sample of 348,504 ads. Of these, 147,265 were existing ads whose price had changed. The dataset captures sellers’ expectations and so includes as a separate entry existing ads where the price, and thus seller’s expectation, has been changed.

As is outlined in Table 1, the bulk of properties listed were three-bedroom or four-bedroom properties, while the most common property types were detached and semi-detached. In terms of regional distribution, 105,000 properties were in Dublin while over 45,000 were listed in the other four cities (Cork, Galway, Limerick and Waterford). Outside the main cities, a further 105,000 Leinster properties were listed, 55,000 from Munster and almost 40,000 from Connacht-Ulster.

After excluding properties whose location is not known to sufficient accuracy, the lettings component of the dataset comprises 680,389 ads, of which just over one quarter (195,851) were existing ads whose advertised rent had changed. Compared to the sales dataset, there are a greater proportion of smaller properties and Dublin properties: the most common property size is two-bedroom, while Dublin properties comprise almost half of all ads. Summary stats for both components of the dataset are given in Table 1.

Table 1: Dataset size, by Cohort

Category	Cohort	Sales		Lettings	
		Count	Percent	Count	Percent
Size	One-bedroom	9,557	2.7%	69,684	10.2%
	Two-bedroom	56,242	16.1%	252,827	37.2%
	Three-bedroom	161,395	46.3%	223,224	32.8%
	Four-bedroom	99,852	28.7%	112,806	16.6%
	Five-bedroom	21,458	6.2%	21,848	3.2%
Region	Dublin	105,112	30.2%	319,934	47.0%
	Other cities	44,800	12.9%	107,874	15.9%
	Leinster	104,777	30.1%	159,054	23.4%
	Munster	55,182	15.8%	57,447	8.4%
	Connacht-Ulster	38,633	11.1%	36,080	5.3%
Total		348,504	100.0%	680,389	100.0%

There are three distinguishing features about this dataset. The first is its size (over a million observations), not only relative to the size of Ireland’s housing market

– the country had in Census 2011 just over two million households – but also in absolute terms, compared to studies from other countries. In their review of 69 hedonic studies of willingness to pay for environmental amenities in the two decades to 2006, Kuminoff *et al.* (2010) find that only about one in five (22%) contains more than 10,000 observations. The second is the fact that the dataset covers an entire country. Only about one in ten hedonic studies (9%) has been at the national level (Kuminoff *et al.* 2010). The third distinguishing feature is the fact that both sales and lettings markets are included: this is the first study of this type known to the author that has comparable data for both.

Bid-ask spreads. A concern in relation to the data is that the price information included is advertised prices, and as such sellers' expectations, and not transaction prices. In an extremely illiquid market, an asking price from January may be associated with a transaction in September – or none at all. Nonetheless, existing evidence suggests a very close correlation between the asking and closing prices (Lyons, 2013).

6.3.2. Location

Three dimensions of a property's location are used in this research: its regional market, to enable accurate pricing of different property types, its local market, to capture factors not included in the analysis, and its exact physical location, used to calculate distance to amenities.

6.3.2.1. Regional Markets

Five broad regions in the Irish property market are defined. The first is Dublin city. The second regional market contains the four other cities in Ireland combined (Cork, Galway, Limerick and Waterford), whose populations vary from 50,000 to 275,000. These are not contiguous but may share marginal price effects due to their status as regional cities. The other three regional markets are based on Ireland's provinces, but excluding the city areas: Leinster, Munster and Connacht-Ulster.

As noted by Conniffe & Duffy (1999), a frequently absent feature of hedonic models was investigating the extent to which time and other attributes interact. Thus, the model includes interacted time-type and timesize controls, allowing the relative price between, for example, two and threebedroom properties or between semi-detached properties and apartments to vary between bubble (2006-2007) and crash (2009-2011) periods⁵. Furthermore, these are interacted with each of

⁵ 2008, a period when the market was still in adjustment, is included in neither period and acts as a control where relevant.

the regional markets (with Dublin as control). Statistical significance of region-time variable combinations signifies that the price differential (or change in price differential, for crash variables) in a particular region is different to that in Dublin⁶.

6.3.2.2. Local Markets

At a more granular level, areas are grouped into one of about 400 local markets. These are fixed effects, designed to capture the impact on price of locality-specific factors that are not included in a given specification, including location-specific and population-specific attributes or indeed any pure label effects. These markets have been manually configured for each part of the country, according to a combination of the volume of listings, geographic coherence and market logic. Each is interacted with the let categorical variable, allowing the fixed effect for each local market to vary between sales and lettings segments.

6.3.2.3. Exact Location

The final locational attribute used is the property's physical coordinates. The addresses of each property advertised is converted upon listing by Daft.ie into XY coordinates. Also given is a level of accuracy with which these coordinates are known. Both are products of addresses being applied to the Geodirectory service, run jointly by Ireland's official mapping and postal services (OSI and *An Post*). This accuracy can vary from area-level through townland, village and street-level to building-level. Only building-level and street-level locations would be accurate enough to include in a study of amenity valuation which calculates distance based on XY coordinates, hence those listed at a poorer level of accuracy were excluded.

6.3.3. Property Attributes

Among the independent variables are a range of property-specific controls, which also come from the daft.ie dataset. These are grouped into four categories: the time the ad was listed (by calendar quarter), property type, property size (measured in bedrooms and bathrooms, and in the case of lettings properties the occupancy of the bedrooms), and other features including facilities and terms of the ad.

Type. The most fundamental distinction by type is between apartments and houses. Within apartments, there are additional variables for duplexes (in sales) and 'flats' (in lettings; referring to parts of houses that have been subdivided for

⁶ For more on the specifics of these interacted variables, see Lyons (2012).

lettings accommodation). For houses, there is additional information in the sales segment: terraced, semi-detached, detached and bungalow. It is also known in the sales segment if the property is part of a new development and variables capturing the effect on price of new developments, and specifically any extra effect for apartments in new developments.

Size. Size is measured by number of bedrooms (one to five) and then number of bathrooms relative to number of bedrooms (as outlined in Table 2). For lettings properties, the occupancy of each bedroom is also known and this is measured by number of single bedrooms out of the total number of bedrooms.

Features and terms. Particularly for lettings properties, a range of other features are known. These include utilities, white goods and some terms of the ad (such as lease length and whether an agent is involved). These are outlined in Table 2.

All variables are set up as categorical variables. The literature suggests that where possible, regional differences in price differentials associated with particular property types should be allowed for (Allen *et al.*, 1995). Thus, following Lyons (2012), all type, size and feature variables are interacted with bubble and crash periods, to allow price differentials for different properties to vary over the market cycle. Type and size variables are also interacted with regional markets, to allow differentials (and changes in differentials) to vary around the country. These type-period-region variables are also interacted with a categorical variable for the lettings segment, to allow price differentials to vary by segment. The precise variables are explained in Table 2.

Table 2: Summary of Property-specific Variables Used

Variable	Description (controls in <i>italics</i> ; segment-specific variables denoted by [S] (sales) and [L] (lettings))
Time	Categorical time variables for each quarter from 2006:I to 2011:IV
Type	Apartment (basic, duplex [S] or flat [L]); house ([S]: terraced, semi-detached, detached, apartment, bungalow)
Bedrooms	Number of bedrooms (one, two, three, four, five)
Bathrooms	Number of bathrooms relative to number of bedrooms as follows: one-bed (one or more), two-bed (one or more), three-bed (one, two or more), four-bed (one, two or more), five-bed (one, two or more)
Bedroom size	[L]: stated occupancy of bedrooms (measured by number of single rooms): one-bed (zero or one), two-bed (zero, one or two), three-bed (zero, one or more), four-bed (zero, one, two or more), five-bed (zero, one, two or more)
Features	[L]: information is available for a range of utilities (including central heating, an alarm system, cable TV and the internet), white goods (washing machine, dryer, dishwasher and microwave) and other features (wheelchair accessible, parking and [S] garden)
Terms	[L]: a range of contract terms are also included (whether pets are allowed, whether rental allowance is considered, a short or long lease, relative to a 12-month control, and [S] whether an agent is used)

6.3.4. Location-specific Attributes

Included in the models as explanatory variables are a range of variables capturing the distance of each property from a range of location-specific amenities. In total, 22 spatial amenities are included, covering each of the five categories of amenity outlined in Section 2.3: environmental amenities and facilities; transport facilities; human capital services; market depth; and social capital. The data are described below.

6.3.4.1. Environmental Amenities

Four natural endowments are included in the research, coastline, beaches/bathing facilities, lakes and rivers, and two environmental disamenities are also included: waste facilities and polluting facilities. Ireland has extensive coastline, 1,448km in total, and coastline coordinates are from Ireland's Environmental Protection Agency (EPA). Bathing facilities, most of which are beaches, are given by the Corine Land Cover (CLC) map of the European environmental landscape, which is based on interpretation of satellite images (Environmental Protection Agency, 2012a). Ireland is also home to numerous lakes, rivers and streams. Geographic Information Systems (GIS) data on these are contained in WFD Ireland (2012). The location of waste facilities, which are permit-only, and of polluting facilities, so-termed under the system of Integrated Pollution Prevention Control (IPPC) Licensing, are available from Environmental Protection Agency (2012b).

6.3.4.2. Transport Amenities

Four location-specific transport amenities are included: train stations, rail track, the primary road network and the secondary road network. The location of all passenger and light rail stations is known, as is the location of rail track, through Railway Procurement Agency (2012). The nature of the station is also known, in particular whether the station is light rail (*Luas*), suburban, Intercity, or Northern Ireland Rail. The primary and secondary road network data come from a complete dataset of the road network on the island of Ireland, produced by NavTeq (2012). Each element of the road network has numerous attributes, including its 'functional class'. Those roads with a 'functional class' of 1 are part of the primary road network, while those with functional class 2 are the secondary road network.

6.3.4.3. Human Capital Amenities

Proximity to primary and secondary schools and to hospitals is also included in this research. The coordinates of all primary and secondary schools were provided directly to the author by the Department of Education and Skills in

Ireland, who maintain an annual census of all schools in Ireland (Department of Education, 2012). The location of hospitals was provided by researchers at the National Institute of Regional & Spatial Analysis at NUI Maynooth.

6.3.4.4. Market Depth Amenities

Three labour market variables are included. Information is available from the April 2006 Census on the neighbourhood unemployment rate, on the average commute in kilometres, and the contemporaneous sectoral allocation of the labour force (Central Statistics Office, 2012a). The proportion of people employed in agriculture is used as a simple reduced form index of employment opportunity for an area. These three indicators give different measures of the local labour market amenity: unemployment, commuting, and opportunity. These can be best thought of as area-level fixed effects, as they are not timevarying and labour market conditions changed substantially over the period under consideration.

Two other ‘market depth’ variables are included, also from Central Statistics Office (2012a). The first is the percentage of single people in an area. A ‘marriage market premium’ might exist in the rental market, i.e. those who have not yet formed households might be prepared to pay more than those who have, to live in an area with more potential marriage partners. The second, motivated by New Economic Geography, is population density, which should capture any premium for being close to population centres and agglomeration. All Census-based variables are based on associating with any property the attributes of the Census district in which it lies. There are just over 3,400 Census districts in total in Ireland.

6.3.4.5. Social Capital Amenities

Social capital factors, such as class, educational attainment, diversity or sense of community in an area, may have an impact on property prices. However, without a more rigorous treatment, many of these factors belong in a secondstage analysis that attempts to describe the underlying demand curve. Much of the literature already includes local unemployment rates, to capture some index of neighbourhood quality. In this analysis, unemployment is treated as part of the labour market amenity. Instead, for social capital and neighbourhood quality, the focus is on attributes related to social capital that are, in a relative sense, more exogenous or difficult to change.

Four are included in this analysis. Two factors are exogenous in the short run: the average building size (in rooms) and the average age of properties (in years) in a neighbourhood, measuring an area’s spaciousness and maturity. The other two

variables are measures of community that market participants may take as relatively exogenous: the percentage of the population that speaks Irish regularly, and the proportion of an area's population in State-provided accommodation. Irish-speaking (Gaeltacht areas) areas, controlling for employment opportunities, may exhibit community cohesion effects. As with market depth, all social capital variables are in effect fixed effects, based on a property's Census district and Central Statistics Office (2012a).

An overview of the 22 location-specific variables is given in Table 3. Those calculated using 2006 Census information, rather than distance – best interpreted as fixed effects – are marked in italics.

6.4. MODEL

6.4.1. General Specification

The price of each property in the database can be represented as the sum of the estimated value of its constituent components as well as an error term, ε , reflecting the gap between the predicted value and the actual value; in matrix algebra:

$$\log(\text{price}_i) = \beta_0 \text{let}_i + X_{1i}^0 \beta_1 + X_{2i}^0 \beta_2 + X_{3i}^0 \beta_3 + X_{4i}^0 \beta_4 + \varepsilon_i \quad (1)$$

where: let_i refers to whether the property is for sale or to let, X_{1i}^0 refers to property-specific characteristics, including size and type, X_{2i}^0 refers to the time period; and X_{3i}^0 refers to local market fixed effects, and X_{4i}^0 refers to location-specific amenities.

Table 3: Summary of Location-specific Variables Used Census-based in italics

Category	Amenity
Environmental	Coastline; bathing facilities; lakes; rivers; waste facilities; polluting facilities
Transport	Train stations (by type); rail track; primary road network; secondary road network
Human Capital	Primary schools; secondary schools; general hospitals
Market Depth	Unemployment rate; average commute; proportion in agriculture; proportion of single people; population density
Social Capital	Area spaciousness; area maturity; proportion of Irish speakers; proportion in State-provided accommodation

6.4.2. Amenity Variables

The underlying hypothesis of this research is that access to an amenity will be reflected in the price. For market depth and social capital amenities, a property's access is given by Census 2006 results. For the remaining categories of amenity – environmental, transport and human capital – access to amenities is in the form of a distance. The measure of access used (X_{4i}^0) is the log of the Euclidean distance in metres, calculated using ArcGIS software.

To investigate the relationship between amenity prices and phase in the market cycle, as well as to control for differences in amenity valuations across regions and across segments, distances (or Census scores) are interacted with a range of categorical variables. Any property in Ireland's five cities (Dublin, Cork, Galway, Limerick and Waterford) is classified as urban, the remainder as rural. Any property listed before January 1 2008 is included in the bubble period, while any listed on or after January 1 2009 is included in the crash period. The typical baseline cohort is, then, rural properties for sale listed during 2008⁷.

The log specification is a useful approximation for increasing order of magnitude in distances: an additional 100 metres is treated very differently when the starting point is 250 metres compared to 25 kilometres. Nonetheless, it is quite restrictive in one sense: a change in distance between 55 metres ($\ln - dist = 4$) and 148 metres ($\ln - dist = 5$) is treated equivalently to one from 1.1 km ($\ln - dist = 7$) and 3 km ($\ln - dist = 8$). While distance may matter, it is not clear a priori that this exact relationship will hold. Thus, for all amenities, four further sets of interactions with log-distance were included. The first two are log-distance interacted with buffer variables that take a value of 1 if a property is within 250 metres of an amenity and if a property is between 250 metres and 1,600 metres (roughly one mile). The latter two are these variables in turn interacted with *let*. These variables enable the relationship between amenity value and distance to vary by distance and also by segment⁸.

⁷ For some amenities, such as lakes, bathing facilities, density of population, and proportion in agriculture, no urban-rural split was included, as there are limited supplies of the amenity in either rural or urban segments. For train station, a rural-urban split would merely be reflecting different train services, which can be captured directly, by including interactions for the various station types. For two amenities, the average commute and population density, two additional interactions with log-distance were included: both bubble and crash were interacted with *let*, to allow the change over the course of the market cycle vary by segment.

⁸ All properties and the bulk of amenities are indicated on the map as points, whereas in reality they are polygons. Thus, one other modification, to prevent small distances (and any measurement error at small distances) skewing the results was to set the minimum log-distance from an amenity to 3 (20 metres), or 4 (55 metres) where the property's location is known only to street level.

6.5. RESULTS

6.5.1. Valuation of Amenities

Figures 1 and 2 outline how the cost of accommodation is related to the presence of 22 amenities. Figure 1 outlines the effect for distance-based amenities (environmental, transport and human capital). As these are all represented on the log scale, where greater distance (a higher log score) reflects poorer access to a desired amenity, the coefficient should be positive. All distancebased amenities have a statistically significant effect on accommodation costs. However, not all accord with prior expectation: those markers that are open (rather than filled black) have an effect counter to expectation.

There are five amenities where the sign is the opposite to initial expectation but in only one case, that of waste facilities, is this a puzzle. For both lakes and rivers, proximity is punished, rather than rewarded – this suggests that flood risk, not captured elsewhere in the model, may be important. Similarly, there is a clear negative association between accommodation costs and proximity to both primary schools and hospitals. This may reflect costs of congestion. Almost one quarter of all properties in the dataset have locations within 250 metres of a primary school, while just 4% are more than a mile away, meaning the interactions allowing for a different relationship between distance and costs below 0.25 km and between 0.25 km and 1.6 km are important. These interactions suggest that what is captured is indeed congestion effects. The reward for distance from a primary school is less pronounced for properties at a distance of 250 m-1.6 km than at a distance of less than 250 m.

Figure 2 outlines the effect on prices and rents of the nine Census-based amenities (market depth and social capital). The bulk of these amenities have clear effects on cost of accommodation in line with expectations: increasing the proportion of pre-1914 properties in an area (area maturity) by ten percentage points boosts prices by about 2%, while increasing the average number of rooms in an area (area spaciousness) by one room has almost twice as large an effect.

All three labour market metrics have significant effects. Increasing the 2006 unemployment rate by five percentage points is associated with a fall in the cost of accommodation of about 4%, while there is an effect of 6%-7% associated with increasing the proportion of the labour force in a district involved in agriculture by ten percentage points, or increasing the average commute by 10 km.

Across the property market as a whole, a greater proportion of single people in an area is associated with lower prices. For two amenities, the proportion in State-provided housing and density of population, there are effects that, at

Figure 1: Coefficient (and 95% confidence interval) on Log-distance for Amenities I

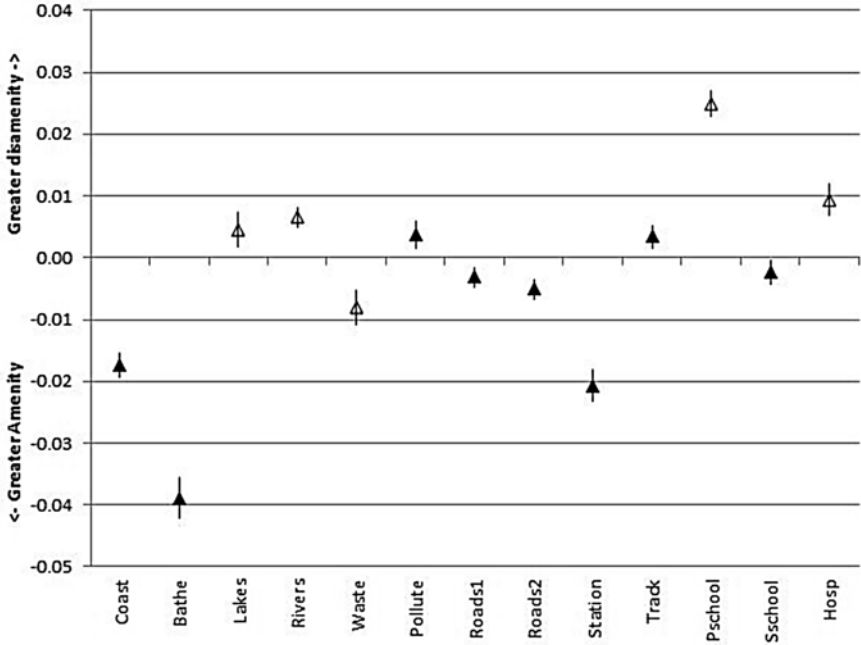
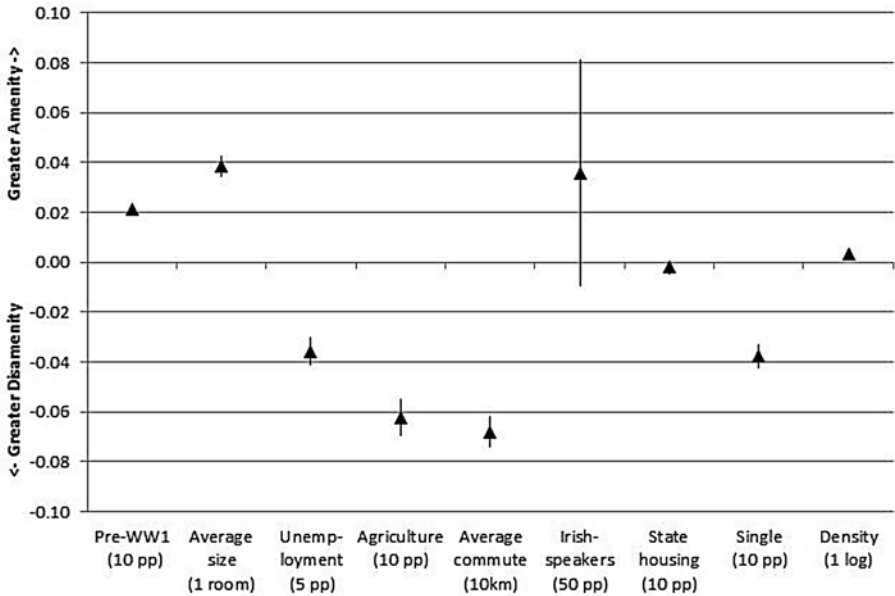


Figure 2: Coefficient (and 95% confidence interval) on Log-distance for Amenities II



reasonable magnitudes, are small. Lastly, for the proportion that speak Irish regularly, there is a positive but noisy relationship with costs of accommodation.

Urban and Rural Valuations. Urban interactions were included for fourteen of the 22 amenities, to control for structural differences (and possible income elasticities) in amenity prices. For nine of the fourteen, there is amplification of the amenity (or disamenity) effect in urban areas. For example, for three Census variables – area maturity, area spaciousness and the 2006 unemployment rate – the effect on prices is roughly twice as large for urban properties than for rural properties. It is also worth noting a quadratic relationship between prices and population density: once in a city, greater density is associated with lower prices but outside the cities, density and prices are – *ceteris paribus* – positively correlated.

Sales and Lettings Valuations. Controls are also included for differences between sales and lettings segments. Theoretically, the expectation is that a broader range of factors are incorporated into prices than rents and that the valuation of amenities or disamenities will be greater in the sales segment (reflected by offsetting coefficients in the Lettings column in Table 4). For 19 of the 22 amenities, this is indeed the case. For example, whereas a five percentage point increase in the 2006 unemployment rate was associated with 7% lower prices in urban markets, this effect was just 1.7% in the urban lettings market.

6.5.2. Valuations over the Market Cycle

The core hypothesis to investigate is the valuation of amenities over the course of the market cycle, exploiting the end of long real estate bubble in Ireland in 2006-2007 and the huge change in market conditions by 2009-2011.

There are competing prior expectations. The liquidity constraints story suggested that the spread of prices would be procyclical and thus, given that the top end of the housing market is high-amenity, that the price of amenities would be procyclical also. Where ‘property ladder’ effects dominate, though, the opposite would be the case: owning a house at all would be more important in a bubble than owning the right house and thus the relative price of low-amenity properties would increase in the bubble.

The final two columns of Table 4 include the coefficients associated with categorical variables for properties listed during the bubble (2006-2007) and crash (2009-2011), interacted with log-distance. Focusing initially on distance-based amenities (rather than disamenities or Census-based attributes), procyclicality would be reflected additional costs to distance in the bubble (– in ‘Bubble’ column) which fade in the crash (+ in ‘Crash’ column).

Table 4: Coefficients on Log-distance Interacted with Urban, Lettings, Bubble and Crash Variables: Stars Denote Statistical Significance

Amenity	Base	Urban	Lettings	Bubble	Crash
Coast	-0.017***	-0.019***	0.016***	0.002**	-0.004***
Bathe	-0.039***		0.014***	-0.006***	0.011***
Lakes	0.005***		-0.009***	0.003***	-0.005***
River	0.007***	-0.008***	-0.007***	-0.001*	0.000
Waste	-0.008***	-0.010***	0.006***	-0.007***	0.004***
Pollute	0.004***	0.013***	-0.012***	-0.002*	0.002**
Roads1	-0.003***	-0.001	0.002*	-0.005***	0.003***
Roads2	-0.005***	0.001	0.008***	-0.002***	-0.000
Station	-0.021***		0.007***	0.001	0.001
Track	0.003***	0.006***	0.002	0.001	-0.004***
Primary School	0.025***	0.003***	-0.025***	0.000	0.005***
Post-prim School	-0.002*	-0.004***	-0.000	0.002	0.002*
Hospital	0.009***	-0.013***	-0.008***	-0.005***	0.004***
Maturity	0.210***	0.148***	-0.298***	-0.011	-0.058***
Spaciousness	0.038***	0.025***	-0.049***	-0.001	-0.005***
Irish-speakers	0.072		-0.150***	-0.267***	0.040
State housing	-0.020		0.025*	-0.041**	-0.033**
Unemployment	-0.715***	-0.694***	1.073***	0.066	-0.343***
Agriculture	-0.624***		0.477***	0.098*	0.134***
Av commute	-0.007***		0.001	0.003***	-0.004***
Single	-0.377***	0.303***	0.103***	0.018	0.033**
Pop Density	0.003**		-0.009***	-0.001	-0.006***

Countercyclical amenity prices would be reflected in the opposite: + in the bubble, – in the crash.

Of the six distance-based amenities (excluding waste facilities), there is evidence of countercyclical pricing for the coastline but procyclical pricing for bathing facilities (beaches) and access to the primary and secondary road network. The value of proximity to train stations was acyclical, while any changes on access to secondary schools were marginal. Of the six distance-based disamenities, the bulk exhibited countercyclical pricing, including polluting facilities, rivers (although the effect is small) and the congestion effects associated with primary schools and hospitals. Two disamenities – proximity to lakes and to rail track – exhibited procyclical pricing.

Of the nine Census-based amenities, there is clear evidence of countercyclical pricing for two labour market amenities: the unemployment rate and the average commute. The penalty associated with an unemployment rate five percentage points higher in 2006 was 5% in the crash period, compared to 3.2% in the bubble. Similarly, the punishment associated with distance from employment increased significantly: extending the 2006 average commute by ten kilometres had a cost of 4% in the bubble but 11% in the crash. However, the cost of a greater proportion working in agriculture diminished in the crash. This may reflect the limitations of using fraction in agriculture as a reduced-form index of employment opportunity: farm incomes increased substantially in 2010, for example, while construction employment and incomes fell further that year (Central Statistics Office, 2012*b*, Teagasc, 2011).

Two more secondary amenities, such as an area's maturity and its spaciousness, exhibit procyclical pricing: the reward to both fell in the crash. The effect on other amenities, including the proportion of Irish speakers or State housing, is less clear.

Thus, of the 22 amenities included in the analysis, there is clear evidence of that the price of amenities increased, in relative terms, in the crash for seven, including two important labour market amenities and geographical amenities and disamenities such as coastline and proximity to polluting facilities. Nonetheless, there was evidence of procyclical amenity pricing for an equal number of amenities, including access to the road network, proximity to rail track and an area's maturity and spaciousness⁹.

Summary. In summary, once potential effects of flooding (rivers) and congestion (primary schools and hospitals) are considered, almost all amenities are reflected with the correct sign: the only exception is waste facilities during the bubble. Also, it was overwhelmingly the case that urban and price effects were larger in absolute size than rural and rent effects. In relation to the cyclicity of amenity pricing, while no clear results emerge, there is some evidence that 'property ladder' effects are more important. The differential for six of the 13 amenities increased in the crash (coast, lakes, rivers, primary schools, hospitals and polluting facilities), while for four (bathing facilities, primary and secondary roads and rail track) it diminished.

⁹ To check the robustness of these results, regressions were run on (1) only Dublin observations and (2) all non-city observations (results not shown for brevity). The bulk of these results still hold, for example the countercyclicity of the price of coastline or distance from primary schools, hospitals or (for Dublin) polluting facilities. There are some differences, however: the fall in the premium on area maturity, for example, is primarily a non-city phenomenon, as is the countercyclicity of the value attached to shorter commute distances.

6.6. CONCLUDING THOUGHTS

Understanding housing markets and their cycles is key to understanding economic fluctuations, due to the importance of housing as a good and an asset. This paper has explored the relationship between amenity valuations and the housing market cycle. Following in the footsteps of a long literature, it traced the impact of amenities on property prices and also on rents, a less common feature of the literature. Twenty-two amenities, across five broad categories, were included in the analysis and once the potential for congestion and flooding effects is understood, almost all amenities had not only a clear impact on the cost of accommodation but also with the correct sign. For example, moving a property from 1km from the coast to 100m away was associated with a 10% increase in price.

Additionally, the property moved from 1km to 100m from the coast would see an increase in price of almost 15% in the cities compared to 10% elsewhere, while the rent effect was 6.5%, suggestive of income elasticities and search costs or buyer lock-in respectively. If amenity prices were procyclical, that suggests the dominant force in a bubble is the 'lock-in' effect: during the frenzy of a bubble, people pay over the odds to secure access to amenities which are by their very nature fixed in supply. However, if the price of amenities increased in the crash, this would suggest that 'property ladder' concerns dominated: normally people prefer to reward access to amenities, but in the bubble, the principal concern is not having any property, pushing up the relative price of low-amenity properties.

There was no clear result from the 22 amenities on the cyclicity of amenity prices, however the balance was in favour of countercyclical prices: the premium enjoyed by a property 100m from the coast compared to one 1km away increased from 9.8% to 11.1% between bubble and crash. Similarly, the price associated with an increase in a district's average commute of 10km rose from 4% in the bubble to 11% in the crash.

Future work could extend the range of amenities included (e.g. metrics of school quality, crime rates, urban green space, retail facilities) and possibly the range of property attributes (energy efficiency, age, size in square meters). More fundamentally, to ensure robustness of amenity valuations, future research can take advantage of numerous variations in the supply of amenities during the period considered (including the opening of significant new primary roads and motorways, as well as the opening and closure of schools).

Ultimately, with information on both sales and lettings segments, it will be worthwhile to understand the return on real estate, as expressed by the rent-house price ratio. Much of the focus on this ratio has been over time; there are few explanations in the literature as to why this ratio would vary over space.

Incorporating the search costs and lock-in/property ladder effects outlined earlier in a model with micro-foundations would be a significant step in that direction.

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7. HOUSING BUBBLES AND EXPECTED RETURNS TO HOMEOWNERSHIP – LESSONS AND POLICY IMPLICATIONS

Marius Jurgilas and Kevin J. Lansing

Abstract

House prices in many industrial countries increased dramatically in the years prior to 2007. Countries with the largest increases in household debt relative to income experienced the fastest run-ups in house prices over the same period. During the run-up, many economists and policymakers maintained that U.S. housing market trends could be explained by fundamentals. But in retrospect, studies now mostly attribute events to a classic bubble driven by over-optimistic projections about future house prices which, in turn, led to a collapse in lending standards. A common feature of all bubbles which complicates the job of policymakers is the emergence of seemingly-plausible fundamental arguments that seek to justify the dramatic rise in asset prices. A comparison of the U.S. housing market experience with ongoing housing market trends in Norway once again poses the question of whether a bubble can be distinguished from a rational response to fundamentals. Survey evidence on people's expectations about future house prices can be a useful tool for diagnosing a bubble. In light of the severe economic fallout from the recent financial crisis, central bank views on the use of monetary policy to lean against bubbles appear to be shifting¹.

7.1. INTRODUCTION

House prices in many industrial countries increased dramatically in the years prior to 2007. Countries with the largest increases in household debt relative to income experienced the fastest run-ups in house prices over the same period (Glick and Lansing, 2010, International Monetary Fund, 2012a). Within the United States, house prices rose faster in areas where subprime and exotic mortgages were more prevalent (Tal, 2006, Mian and Sufi, 2009, Pavlov and Wachter, 2011). In a comprehensive report, the U.S. Financial Crisis Inquiry Commission (2011) emphasized the effects of a self-reinforcing feedback loop in

¹ Any opinions expressed here do not necessarily reflect the views of the managements of the Norges Bank, the Federal Reserve Bank of San Francisco, or the Board of Governors of the Federal Reserve System. For helpful comments and suggestions, we would like to thank Farooq Akram, Øyvind Eitrheim, Ola Grytten, Oscar Jorda, Tassos Malliaris, Gisle Natvik, Bjørn Naug, Einar Nordbø, Lisa Reiakvam, Dagfinn Rime, Øistein Røisland, Ilva Søvik, and Fredrik Wulfsberg. We also thank William Emmons (FRB St. Louis), Torsten Slok (Deutsche Bank), and Jakob Windstrand (Sveriges Riksbank) for kindly providing data used in Figures 8 and 11.

which an influx of new homebuyers with access to easy mortgage credit helped fuel an excessive run-up in house prices. The run-up, in turn, encouraged lenders to ease credit further on the assumption that house price appreciation would continue indefinitely. When the optimistic house price projections eventually failed to materialize, the bubble burst, setting off a chain of events that led to a financial and economic crisis. The ‘Great Recession’, which started in December 2007 and ended in June 2009, was the most severe U.S. economic contraction since 1947, as measured by the peak-to-trough decline in real GDP (Lansing, 2011).

This article compares the U.S. housing market experience to ongoing housing market trends in Norway with the aim of considering whether a bubble can be distinguished from a rational response to fundamentals. Case and Shiller (2004) make the point that “the mere fact of rapid price increases is not in itself conclusive evidence of a bubble...The notion of a bubble is really defined in terms of people’s thinking about future price increases.” Survey evidence on people’s expectations about future house price appreciation can therefore be a useful tool for diagnosing a bubble. As was true in the United States, housing investors in Norway appear to expect high future returns on real estate even after a sustained run-up in the price-rent ratio. Such views are directly at odds with the idea that a decline in the risk premiums of rational investors is the explanation for the run-up in house prices.

7.2. FUNDAMENTALS VERSUS BUBBLE

The term ‘bubble’ is used to describe an asset price that has experienced a sustained run-up beyond the level that can be justified by economic fundamentals (see Lansing, 2007). According to Stiglitz (1990), a bubble exists when the price of an asset is high today “only because investors believe that the selling price will be high tomorrow.” The fundamental value of an asset is typically measured by the present-value of expected future cash or service flows that will accrue to the owner. Service flows from housing are called ‘imputed rents’. The discount rate used in the present-value calculation is comprised of a risk-free yield and a compensation for perceived risk, i.e., a risk premium. Their sum defines the rate of return that an investor expects to receive to justify purchase of the asset. All else equal, a lower risk premium implies a lower expected return and a lower discount rate in the present-value calculation. Future service flows will be discounted less and the fundamental value will rise. The fundamental value could also rise if service flows from the asset are expected to grow faster over time due to some underlying structural change, such as faster long-run income growth.

In the years following the 2001 recession, house prices in the United States and many other countries rose rapidly. Media attention soon focused on the possibility of a housing bubble. But Fed Chairmen Alan Greenspan (2004a) voiced skepticism: “Housing price bubbles presuppose an ability of market participants to trade properties as they speculate about the future. But upon sale of a house, homeowners must move and live elsewhere. This necessity, as well as large transaction costs, are significant impediments to speculative trading and an important restraint on the development of price bubbles.” However, even at the time, it was widely-accepted that Japan had experienced an enormous real estate bubble in the late 1980s. As noted by Shiller (2007), the presence of large transaction costs can actually make bubbles more likely because pricing inefficiencies become difficult to exploit via arbitrage. Moreover, according to data compiled by the National Association of Realtors, as much as 40 percent of U.S. residential sales during the mid-2000s were coming from buyers of vacation or investment homes – thus avoiding the need for them to ‘move and live elsewhere’. Indeed, the possibility of housing speculation was brought up at the December 14, 2004 meeting of the Federal Open Market Committee, where some participants noted “signs of potentially excessive risk-taking...[including] anecdotal reports that speculative demands were becoming apparent in the markets for single-family homes and condominiums.”

Still, many economists and policymakers maintained that U.S. housing market trends could be explained by fundamentals. A paper by New York Fed economists McCarthy and Peach (2004) concluded that “a home price bubble does not exist”, instead arguing that observed price trends could be explained by fundamentals such as increases in personal income, demographic forces, and declines in nominal mortgage interest rates². In a February 2004 speech, Fed Chairman Alan Greenspan (2004b) stated that “American consumers might benefit if lenders provided greater mortgage product alternatives to the traditional fixed-rate mortgage.” As house prices continued to rise, the lending industry marketed a range of exotic mortgage products, e.g., loans requiring no down payment or documentation of income, monthly payments for interest-only or less, and adjustable rate mortgages with low introductory ‘teaser’ rates that reset higher over time. While sold as a way to keep monthly payments affordable for the large influx of new and often credit-impaired home buyers, the exotic lending products paradoxically harmed affordability by fueling the price run-up.

Commenting on the rapid growth in subprime mortgage lending, Fed Chairman Alan Greenspan (2005) offered the view that the lending industry had been dramatically transformed by advances in information technology: “Where once more-marginal applicants would simply have been denied credit, lenders are now

² Similar arguments were put forth in a September 2005 New York Fed Staff Report by Himmelberg *et al.* (2005).

able to quite efficiently judge the risk posed by individual applicants and to price that risk appropriately”³. In a July 1, 2005 media interview, Ben Bernanke, then Chairman of the President’s Council of Economic Advisers, argued that fundamental factors such as strong growth in jobs and incomes, low mortgage rates, demographics, and restricted supply were supporting U.S. house prices. In the same interview, Bernanke stated his view that a substantial nationwide decline in house prices was ‘a pretty unlikely possibility’. At the December 12, 2006 FOMC meeting, committee members voiced their opinion that any weakness in housing was unlikely to significantly impact other sectors of the U.S. economy.

It is now clear that much of the strength of the U.S. economy during the mid-2000s was linked to the housing boom itself. In the aftermath of a burst technology stock bubble, the Federal Reserve reduced the federal funds rate to just 1% and held it there for over 12 months during 2003 and 2004 – a policy path substantially below that implied by the well-known Taylor rule. Some studies find evidence that Fed’s interest rate policy during this period contributed to the run-up in house prices (Taylor, 2007, McDonald and Stokes, 2011). Low mortgage interest rates set off a refinancing boom, allowing consumers to tap the equity in their homes to pay for all kinds of goods and services. The consumption binge was accompanied by a rapid increase in household debt relative to income and a decline in the personal saving rate (Lansing, 2005). Hundreds of thousands of jobs were created in construction, mortgage banking, and real estate. In various ways, stimulus from the expansion of the housing bubble helped to mitigate, or perhaps simply postpone, the economic fallout from the burst stock market bubble. Recently, in a review of the Fed’s forecasting record leading up to the crisis, Potter (2011) acknowledges a “misunderstanding of the housing boom...[which] downplayed the risk of a substantial fall in house prices” and a “lack of analysis of the rapid growth of new forms of mortgage finance.”

7.3. CAN LOWER RISK PREMIUMS EXPLAIN THE RUN-UP?

Cochrane (2009) argues that one cannot easily tell the difference between a bubble and a situation where rational investors have low risk premia, implying lower expected returns on the risky asset. Specifically, he remarks “Crying bubble is empty unless you have an operational procedure for distinguishing them from rationally low risk premiums.” Along similar lines, Favilukis *et al.* (2011) argue that the run-up in U.S. house prices relative to rents was largely due to a financial market liberalization that reduced buyers’ perceptions of the riskiness of housing

³ According to the report of the U.S. Financial Crisis Inquiry Commission (2011, p. 70), new subprime mortgage originations went from \$100 billion in the year 2000 to around \$650 billion at the peak in 2006. In that year, subprime mortgages represented 23.5% of all new mortgages originated.

assets. The authors develop a theoretical model where easier lending standards and lower mortgage transaction costs contribute to a substantial rise in house prices relative to rents, but this is not a bubble. Rather, the financial market liberalization allows fully-rational households in the model to better smooth their consumption in the face of unexpected income declines, thus reducing their perceptions of economic risk. Lower risk perceptions induce households to accept a lower rate of return on the purchase of risky assets like houses. A lower expected return leads to an increase in the model's fundamental price-rent ratio, similar to that observed in the data. In the words of the authors, "A financial market liberalization drives price-rent ratios up because it drives risk premia down... Procyclical increases in price-rent ratios reflect rational expectations of lower future returns."

In our view, the relaxation of lending standards in the mid-2000s was an endogenous consequence of the house price run-up, not an exogenous fundamental driver of the run-up. Standards were relaxed because lenders (and willing borrowers) expected house price appreciation to continue. Empirical evidence supports this view. Within the United States, past house price appreciation in a given area had a significant positive influence on subsequent loan approval rates in the same area (Dell'Ariccia *et al.*, 2011, Goetzmann *et al.*, 2012).

7.4. BUBBLE EVIDENCE: HIGH EXPECTED RETURNS NEAR MARKET PEAK

One way in which a bubble might be distinguished from a situation with rationally low risk premiums is to examine investors' expectations about future returns on the asset. Rational investors with low risk premiums would expect low future returns after a sustained price run-up, whereas irrationally exuberant investors in the midst of a bubble would expect high future returns because they simply extrapolate recent price action into the future. As discussed below, survey data from both stock and real estate markets confirm that investor expectations tend to be extrapolative⁴. Overall, the evidence appears to directly contradict the view that declining risk premiums (resulting in low expected returns) were the explanation for the run-up in U.S. house prices relative to rents.

Shiller (2000) developed a questionnaire to study investor expectations about future stock market returns in Japan and the U.S. during the 1990s. From the data, he constructed an index of 'bubble expectations' which reflected the belief that stock prices would continue to rise despite being high relative to

⁴ See also Lansing (2006) and Jurgilas and Lansing (2012).

fundamentals. He found that the index moved roughly in line with movements in the stock market itself, suggesting that investors tend to extrapolate recent market trends when making predictions about future returns.

Two additional studies by Fischer and Statman (2002) and Vissing-Jorgenson (2004) also find evidence of extrapolative expectations among U.S. stock market investors during the late 1990s and early 2000s. Using survey data, they found that investors who experienced high portfolio returns in the past tended to expect higher returns in the future. Moreover, expected returns reached a maximum just when the stock market itself reached a peak in early 2000.

In a comprehensive study of the expectations of U.S. stock market investors using survey data from a variety of sources, Greenwood and Shleifer (2013) find that measures of investor expectations about future stock returns are: (1) positively correlated with the price-dividend ratio and past stock returns, and (2) positively correlated with investor inflows into mutual funds. They conclude (p. 30) that “[O]ur evidence rules out rational expectations models in which changes in market valuations are driven by the required returns of a representative investor...Future models of stock market fluctuations should embrace the large fraction of investors whose expectations are extrapolative”⁵.

Using survey data on homebuyers in four metropolitan areas in 2002 and 2003, Case and Shiller (2004) found that about 90 percent of respondents expected house prices to increase over the next several years. More strikingly, when asked about the next ten years, respondents expected future annual price appreciation in the range of 12 to 16 percent per year – implying a tripling or quadrupling of home values over the next decade. Needless to say, these forecasts proved wildly optimistic. In a study of data from the Michigan Survey of Consumers, Piazzesi and Schneider (2009) report that “starting in 2004, more and more households became optimistic *after* having watched house prices increase for several years.”

Anecdotal evidence further supports the view that U.S. housing investors had high expected returns near the market peak. The June 6, 2005 cover of *Fortune* magazine was titled “Real Estate Gold Rush – Inside the hot-money world of housing speculators, condo-flippers and get-rich-quick schemers.” One week later, the June 13, 2005 cover of *Time* magazine was titled “Home \$weet Home – Why we’re going gaga over real estate.” Both covers depicted happy and celebrating housing investors – all suggesting a rosy outlook for U.S. real estate.

In surveys during 2006 and 2007, Shiller (2007) found that places with high recent house price growth exhibited high expectations of future price appreciation and that places with slowing house price growth exhibited downward shifts in

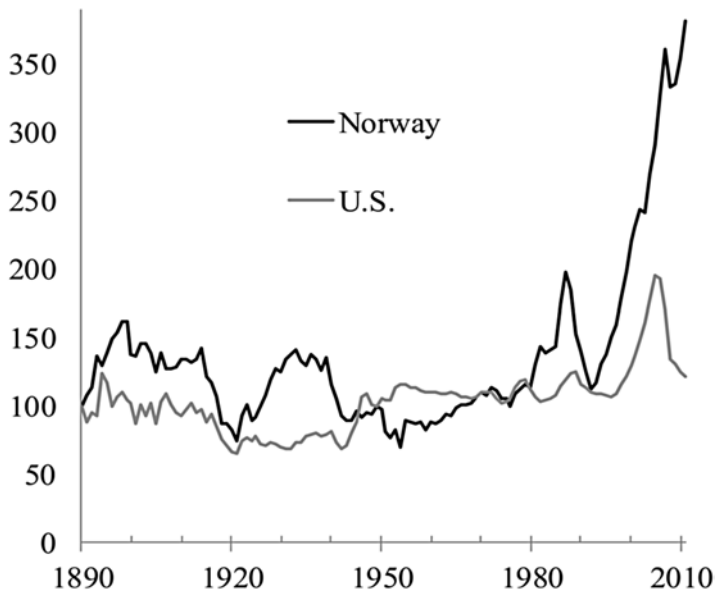
⁵ Gelain and Lansing (2013) apply this advice to a model of housing market fluctuations.

expected appreciation. Indeed by 2008, in the midst of the housing market bust, Case, Shiller, and Thompson (2012) show that survey respondents in prior boom areas now mostly expected a decline in house prices over the next year. In a review of the time series evidence on housing investor expectations, the authors conclude (p. 17) that “12-month expectations [of future house prices changes] are fairly well described as attenuated versions of lagged actual 12-month price changes”⁶.

The takeaway for researchers is that models in which investors employ extrapolative or moving-average type forecast rules appear to be a promising way to capture the behavior of real-world asset prices.

7.5. APPLYING U.S. LESSONS TO NORWAY

Figure 1: Real House Price Indexed to 100 in 1890



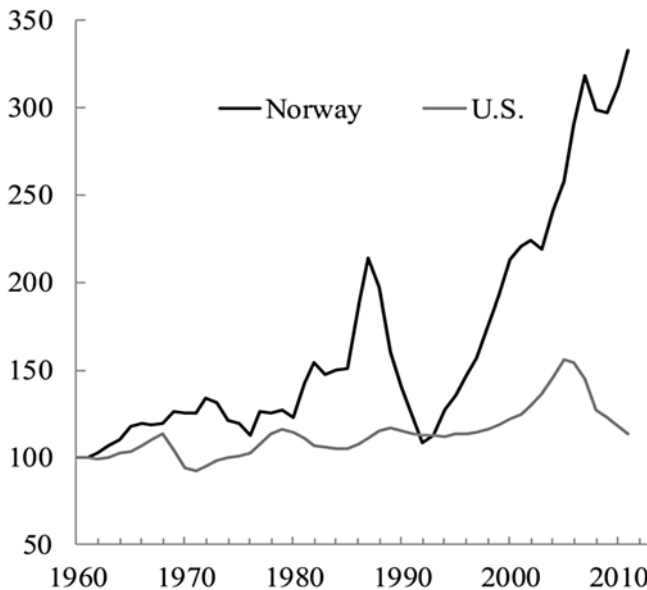
Source: Updated from Shiller (2005) and Eitrheim and Erlandsen (2004, 2005).

Lessons learned from the U.S. experience may help in assessing whether housing bubbles exist elsewhere. Norway is an instructive case. Figure 1 plots real house prices in the U.S. and Norway from 1890 to 2011. U.S. data are updated from Shiller (2005) while data for Norway are updated from Eitrheim and Erlandsen (2004, 2005). Both series show that real house prices were relatively stagnant for

⁶ Similarly, Lansing (2009a) shows that survey forecasts of U.S. GDP price inflation are well-approximated by a moving-average of past observed inflation rates.

most of the 20th century. Norway and other Nordic countries experienced a major house price boom in the late 1980s followed by a crash in the early 1990s. The crash was accompanied by a financial crisis in Norway, Finland, and Sweden, resulting in numerous bank failures (Moe *et al.*, 2004 and Knutsen, 2012). Interestingly, the earlier boom-bust pattern in Norway is similar in magnitude to the recent boom-bust pattern in U.S. house prices. After peaking in 2006, U.S. real house prices have since dropped by nearly 40 percent. Starting in the late 1990s, Norwegian house prices experienced another major boom but so far no bust. On the contrary, real house prices in Norway have continued to rise by nearly 30 percent since 2006.

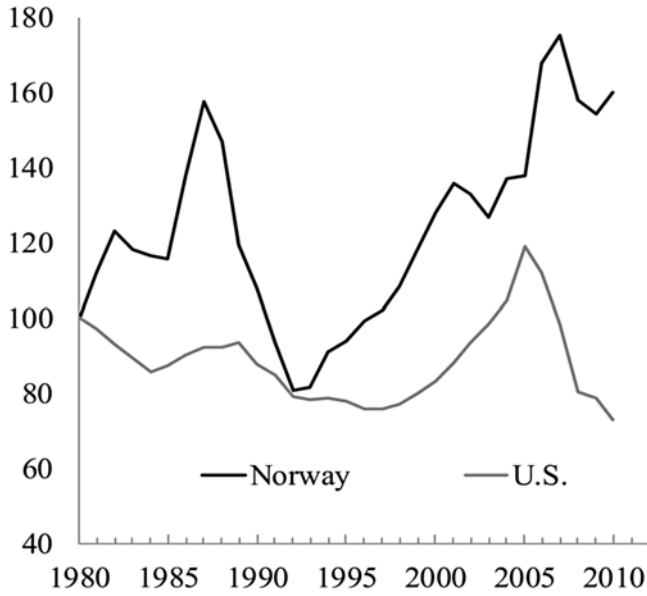
Figure 2: Ratio of House Price to Rent, 1960-2011. Ratio Indexed to 100 in 1960



Source: Lincoln Institute of Land Policy, Statistics Norway.

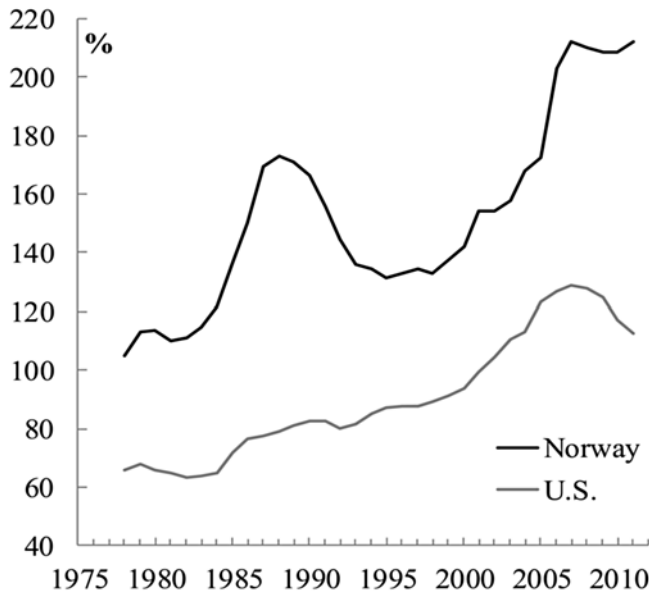
Figure 2 plots price-rent ratios in the U.S. and Norway from 1960 onwards. The U.S. ratio peaked in early 2006 and has since fallen to its pre-boom level. The price-rent ratio for Norway has continued to trend upwards and currently stands about 50 percent above the last major peak achieved two decades ago. Figure 3 plots price-income ratios in the U.S. and Norway from 1980 onwards. Again, the recent ratio in Norway is substantially above the last major peak. Figure 4 compares household leverage ratios in the two countries. The U.S. ratio of household debt to disposable personal income peaked at about 130 percent in 2007. The household leverage ratio in Norway has risen rapidly over the last decade and currently stands at around 210 percent.

Figure 3: House Prices Deflated by per Capita Disposable Income, Indexed to 100 in 1980



Source: FRB St. Louis, Norges Bank.

Figure 4: Ratio of Household Debt to Disposable Income, 1978-2011



Source: FRB St. Louis, Norges Bank.

Using data extending through 2008, Anundsen and Jansen (2011) find strong evidence of a self-reinforcing feedback loop between Norwegian house prices and household debt. In the words of the authors: “Higher housing prices result in higher credit growth due to collateral effects, which again spurs housing price growth and so on.” Akram (2012) also finds that Norwegian house prices and household debt respond positively to each other in both the short-run and long-run. Consistent with such a link, the Norges Bank (2012a) recently stated (p. 41): “Policy measures which are directly aimed at restraining credit growth will thus also have a fairly immediate effect on the rise in house prices, and vice versa.”

Some studies have found that at least part of the run-up in Norwegian house prices can be explained by changes in fundamentals. Variables involving lagged house prices are often included in such studies as part of an error correction specification. Jacobsen and Naug (2005), for example, report that favorable after-tax lending rates, low unemployment, and strong growth in wage income have all contributed to higher house prices using data extending through the first quarter of 2004. However, their study also finds that lagged house prices help to explain movements in current house prices, which suggests the presence of non-fundamental factors such as extrapolative expectations. Indeed, a long-term multi-country study by the International Monetary Fund (2004) found that lagged house price growth was an important explanatory variable for observed house price growth even after taking into account a wide range of other variables such as per capita real income growth, the level of interest rates, population growth, stock price growth, and the growth rate of real credit. The last two variables might also be viewed as reflecting non-fundamental factors. Recall that Japan experienced twin bubbles in stocks and real estate in the late 1980s while mortgage credit and house prices rose together in a self-reinforcing feedback loop during the U.S. housing bubble of the mid-2000s⁷.

To illustrate the crucial role of lagged house price growth in helping to explain current house price growth in Norway, we estimate the following simple regression equation using quarterly data over the period 1991.Q3 to 2012.Q1:

$$\Delta_4 hp_t = \alpha + \beta_1(\Delta_4 hp_{t-1}) + \beta_2(\Delta_4 gdp_t) + \beta_3(r_t) + \varepsilon_t,$$

where $\Delta_4 hp_t$ is the four-quarter change in the logarithm of the real house price index, $\Delta_4 gdp_t$ is the four-quarter growth rate of real GDP, r_t is the real mortgage interest rate (four-quarter average nominal mortgage rate minus four-quarter average inflation), and ε_t is an error term. The empirical model is estimated with and without lagged house price growth as an explanatory variable and the results

⁷ A more recent IMF empirical study by Igan and Loungani (2012, Table 4) omits lagged house price growth as an explanatory variable but continues to include the lagged ratio of house prices to income, stock price growth, and credit growth. All three variables are often significant in helping to explain quarterly changes in real house prices in a variety of countries over the period 1970 to 2010.

Table 1: Explaining House Price Growth in Norway

$$\Delta_4 hp_t = \alpha + \beta_1(\Delta_4 hp_{t-1}) + \beta_2(\Delta_4 gdp_t) + \beta_3(r_t) + \varepsilon_t$$

$\Delta_4 hp_t$	I	II	III
α	0.11*** (4.89)	0.01 (1.14)	0.01** (2.48)
β_1		0.80*** (12.02)	0.85*** (17.6)
β_2	1.63*** (4.65)	0.22 (0.94)	
β_3	-0.01*** (-5.24)	-0.001 (-0.67)	
R^2	0.45	0.79	0.79
Obs.	85	84	84

Notes: Sample period is 1991.Q1 to 2012.Q1. Δ_4 denotes the 4-quarter change, $hp_t = \log$ of real house price, $gdp_t = \log$ of real GDP, $r_t = \text{real interest rate defined as 4-quarter average nominal mortgage rate less 4-quarter average inflation rate}$. *t*-statistics are shown in parenthesis. *** indicates the variable is significant at the 1% level and ** indicates the variable is significant at the 5% level.

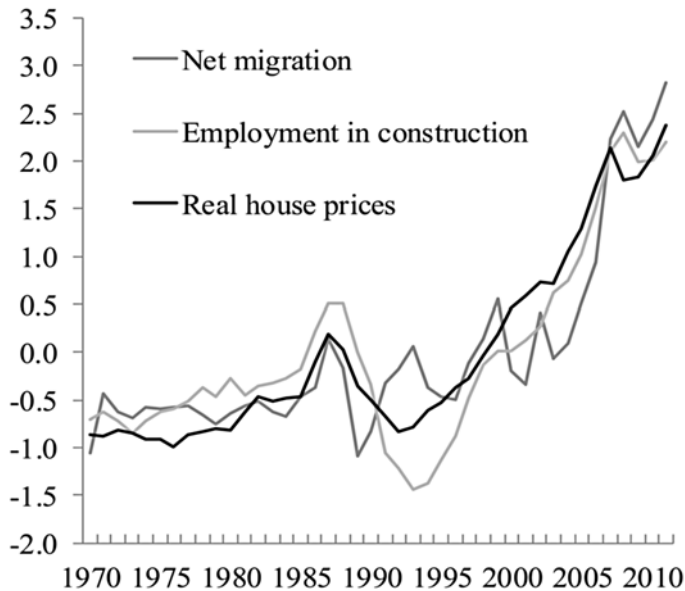
are reported in Table 1. The table shows that when lagged house price growth is omitted from the regression, the fundamental explanatory variables ($\Delta_4 gdp_t$ and r_t) are both significant and the associated coefficients have the expected sign (Column I in Table 1). By themselves, however, these variables can only account for 45% of the variance in real house price growth over the sample period. In contrast, the inclusion of lagged house price growth allows this simple empirical model to account for nearly 80% of the variance in real house price growth over the past 20 years (Column II in Table 1). Indeed, a simple first-order autoregressive time series model of real house price growth that completely ignores any fundamental variables performs just as well (Column III in Table 1).

Population growth in Norway, and more specifically the country's recent high immigration rate, is often cited as a possible fundamental driver of house prices. Figure 5 shows that real house prices and net migration have both increased relative to their long-run averages over the past decade. Similarly, employment in the Norwegian construction sector has trended up over the same time period. However, a careful examination of the data shows that house price movements tend to consistently lead movements in the other two series⁸. In other words, it appears that the rapid rise in Norwegian house prices is contributing to high

⁸ Evidence is based on Granger causality tests applied to an estimated vector error-correction model that includes real house prices, cumulative net migration, and construction employment over the sample period 1970 to 2011.

immigration rates, possibly by stimulating demand for workers in construction and other sectors tied to the housing market.

Figure 5: Net Migration, Employment in Construction Sector, and Real House Prices in Norway



Note: All series shown as deviations from sample mean scaled by sample standard deviation.
Source: Statistics Norway.

Restricted supply is another fundamental argument that is frequently put forth to justify the rise in Norwegian house prices. It is often argued that the limited buildable acreage in and around major cities such as Oslo prevents housing supply from keeping up with housing demand, thus driving up prices. Similar arguments were used to forecast never-ending house price run-ups in coastal areas during the U.S. housing boom (Leamer, 2002). However, to the extent that rental housing is viewed as a substitute for purchasing a home, restrictions on supply would be expected to similarly drive up rents – something which is not observed in the data as evidenced by the rising price-rent ratio (Figure 2). A recent empirical study by Anundsen and Heebøl (2012) shows that U.S. regions with the lowest housing supply elasticities experienced the most pronounced boom-bust episodes in house prices from 2000 to 2010. The authors attribute their findings to a financial feedback mechanism whereby rapidly rising house prices in supply-restricted areas contributes to a loosening of lending standards which causes prices to overshoot on the upside. The same mechanism operates in reverse when

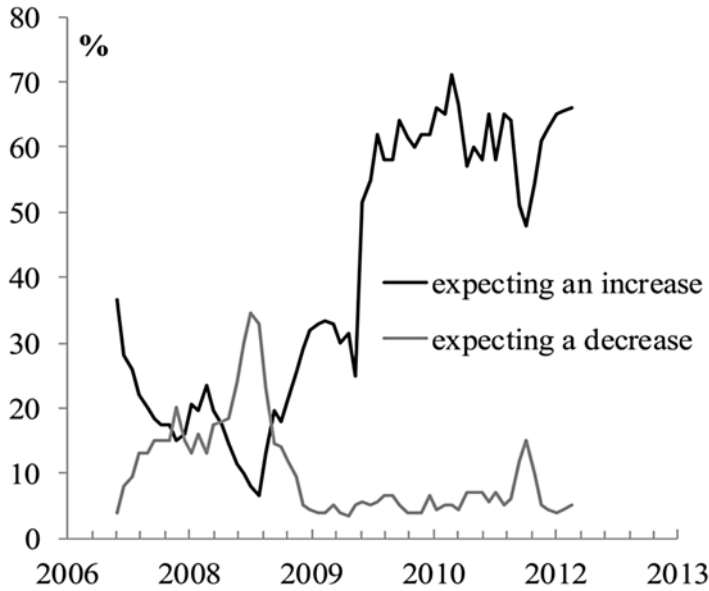
house prices start falling, causing supply-restricted areas to also experience the most severe price declines.

In a report issued last year, the International Monetary Fund (2012b) concluded “[F]undamentals appear to explain part, but not all, of the house price boom in Norway. In particular, fundamentals such as higher income, population growth, and tax changes have all boosted demand. Additional pressures on prices have come from the slow adjustment of supply. However, non-fundamental factors such as optimistic price expectations – which are unlikely to be sustainable and could change quickly – have also played a role. Low interest rates and favorable financing conditions may also not be sustainable indefinitely. On balance, model-based estimates...suggest that Norwegian residential property prices may be misaligned by 15 to 20 percent.”

History tells us that episodes of sustained rapid credit expansion together with booming stock or house prices are almost always followed by periods of stress in the financial system (Borio and Lowe, 2002, Riiser, 2005, Grytten, 2011). The recent Norwegian housing market trends have thus raised concerns among regulators about risks to financial stability. The Norges Bank (2012a) identifies the household sector as having a high level of risk or vulnerability to shocks. A report by the Financial Supervisory Authority (FSA) of Norway (2012a) emphasized the risks posed by growing debt burdens relative to income, high loan-to-value ratios, greater recourse to interest-only borrowing, and a widespread belief among residents that house price appreciation will continue. The report also noted that indebtedness had risen the most among young and low-income borrowers – a trend reminiscent of the U.S. housing boom. A report by the Norwegian Ministry of Finance (2012) noted that the proportion of home purchase loans with loan-to-value ratios exceeding 90% has increased markedly to 38% in 2011 and that one-in-four new residential mortgage loans was made on interest-only terms – the highest level since 1994. Most recently, the FSA (2012b) raised concern about the explosive growth in the issuance of covered bonds as a cheap funding source for Norwegian banks operating in the residential mortgage market⁹. According to the report, “Banks’ access to relatively favorable funding of home loans on the covered bond market may thus have spurred growth in mortgage lending and intensified price pressures in the housing market.”

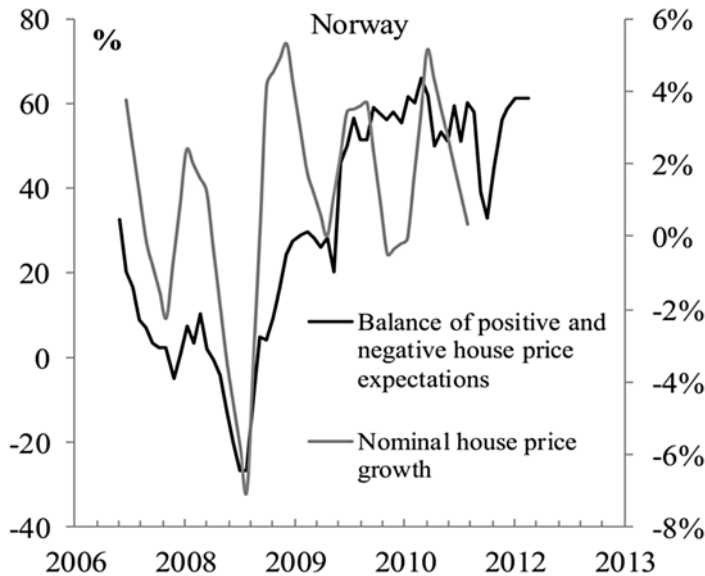
⁹ A covered bond is a structured finance product similar to a mortgage-backed security, but without risk transfer. Investors in covered bonds have an explicit claim to a pool of mortgages that are subject to quality criteria (e.g., less than 75% LTV). If, during the lifetime of the covered bond, assets in the collateral pool deteriorate, the issuer of the bond (the bank) must replace ineligible assets in the pool with assets that meet the quality criteria. Cao and Jurgilas (2013) develop a theoretical model to examine the financial stability implications of bank funding via covered bonds.

Figure 6: Expectations of Norwegian Households for House Prices over the next 12 Months



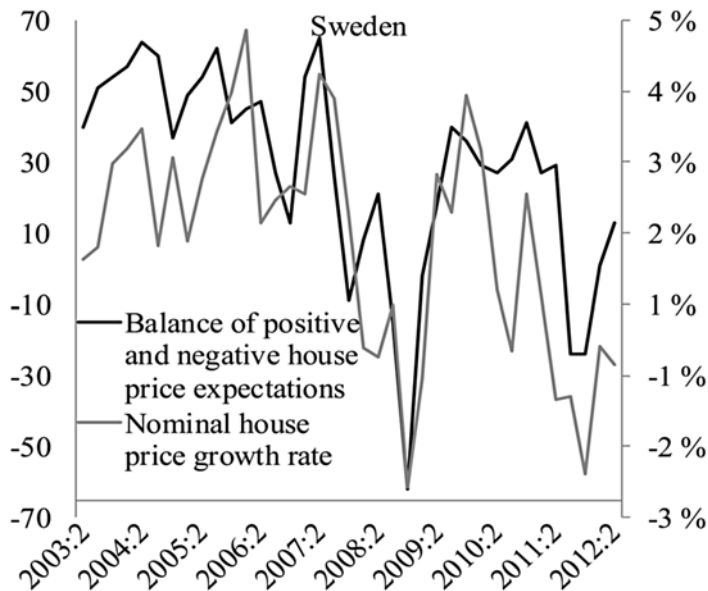
Source: Financial Supervisory Authority of Norway.

Figure 7: House Price Expectations (balance between those expecting an increase and a decreases, left axis) and Nominal House Price Growth (right axis) in Norway



Source: Norges Bank, Financial Supervisory Authority of Norway.

Figure 8: House Price Expectations (balance between those expecting an increase and a decreases, left axis) and Nominal House Price Growth (right axis) in Sweden



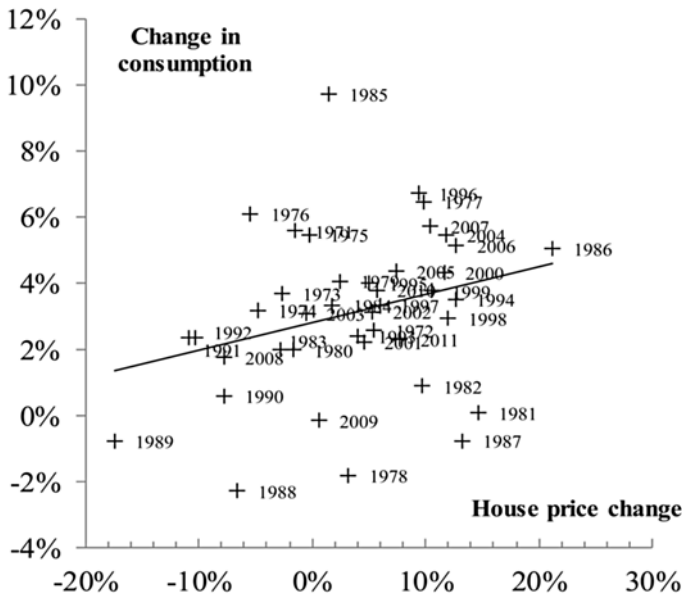
Source: Deutsche Bank (Torsten Slok) and Sveriges Riksbank (Jakob Windstrand).

Figure 6 plots the results of a recent survey which shows that the percentage of Norwegian households who believe that property prices will keep rising has gone up from a low of 10 percent in 2008 to nearly 70 percent in 2012. Comparing Figure 6 to the price-rent ratio in Figure 2 suggests that Norwegian households expect high future returns on housing even after a sustained run-up in the price-rent ratio. This pattern is directly at odds with the idea of rationally low risk premiums. Figure 7 shows that the balance of Norwegian households expecting a house price increase over the next 12 months is strongly correlated with nominal house price growth over the preceding 12 months. Figure 8 shows that a similar pattern holds for Sweden. Both figures suggest that housing investors employ extrapolative or moving-average type forecast rules.

Another trend suggestive of housing speculation in Norway is the explosive growth in home remodeling. According to a recent news article, Norwegians were on track to purchase 1.5 million new kitchen cabinets in 2012 – a huge number given the country’s population of only about 5 million people (Berglund, 2012). A spokesperson for the home furnishings firm IKEA is quoted in the article as stating “Norway is in a class of its own when it comes to remodeling.” Since remodeling projects are typically financed with home equity loans, the home improvement boom is contributing to the buildup of household leverage. Choi *et al.* (2011) note that spending on U.S. home remodeling surged during the boom

years of the mid-2000s but then dropped precipitously after 2007 when house prices were falling. They argue that such behavior is consistent with a model of housing speculation whereby existing homeowners seek to participate in the market for appreciating housing structures while holding their land ownership fixed.

Figure 9: Changes in Real Household Consumption and Real House Prices, 1971-2011

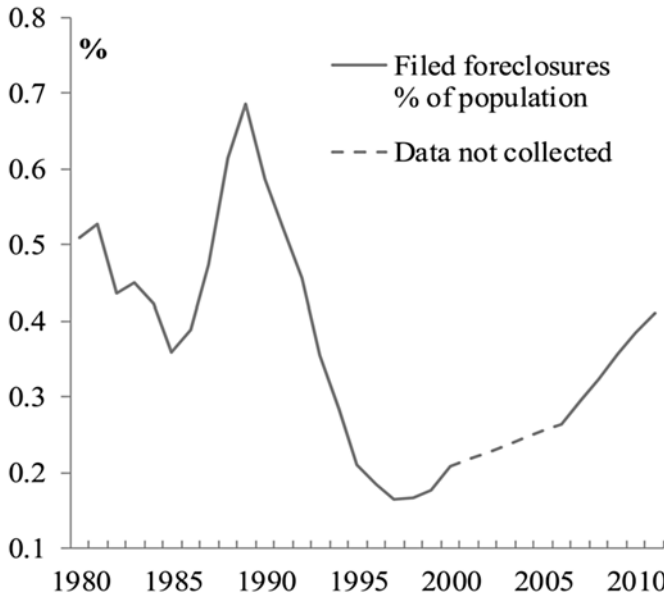


Source: Norges Bank.

Figure 9 shows that there is a positive correlation between real house price changes and real consumption growth in Norway. A property price decline of 15 to 20 percent would be expected to exert a significant drag on overall economic growth. In an effort to address such risks, the FSA (2012a) has urged banks to: (1) reduce the maximum loan-to-value ratio on mortgages, (2) impose a maximum loan-to-income ratio on borrowers, (3) limit the issuance of interest-only mortgages, and (4) allow for a future interest rate increase of 5 percentage points when assessing a borrower's debt-servicing ability. If fully implemented, such measures would help lean against the expansion of a credit-fueled housing bubble.

Figure 10 plots mortgage foreclosure filings in Norway as a percentage of the population. The source data are from the Norwegian court administration, as described by Grindaker (2013). The data show that foreclosure filings increased by 55% from 2006 to 2011, suggesting that financial stress among Norwegian

Figure 10: Filed Foreclosures as a Percent of Population



Source: Norwegian court administration (*Begjæringer om tvangssalg*), Grindaker (2013).

households is on the rise, despite what appears to be an otherwise healthy economy. It's worth noting that U.S. mortgage delinquencies started trending up well before the onset of the Great Recession (U.S. Financial Crisis Inquiry Commission, 2011, Chapter 11).

7.6. POLICY IMPLICATIONS

“Nowhere does history indulge in repetitions so often or so uniformly as in Wall Street...The game does not change and neither does human nature”, observed legendary speculator Jesse Livermore way back in the year 1923¹⁰. History has proven him right. The dramatic run-up and crash of the U.S. stock market in the late 1920s was followed decades later by twin bubbles and crashes in Japanese real estate and stocks during the late 1980s and early 1990s. Nordic countries experienced a boom-bust episode in real estate prices that led to a banking crisis in the early 1990s. These events were followed by the U.S. technology stock mania of the late 1990s, which reversed course in March 2000. Most recently, a global housing bubble during the mid-2000s nearly brought down the world's financial system when, like all preceding bubbles, it ultimately burst. Despite

¹⁰ From Livermore's thinly-disguised biography by E. Lefevère (1923, p. 180).

these many historical examples, the appropriate response of monetary policy to booming asset prices and rapid credit growth remains an unsettled issue.

A common feature of all bubbles which complicates the job of policymakers is the emergence of seemingly-plausible fundamental arguments that seek to justify the dramatic rise in asset prices. One fundamental argument for asset price run-ups involves a decline in the risk premium of rational investors. However, as we have argued, this explanation seems clearly refuted by a variety of evidence which shows that real-world investors typically expect high future returns near market peaks.

Shiller (2005) documents that major speculative bubbles have generally coincided with the emergence of some ‘new era’ theory that involves the introduction of new technology¹¹. The enthusiasm expressed by Greenspan (2005) for the use of new information technology to efficiently price risk in the subprime mortgage market fits perfectly with this pattern. Excessive run-ups in asset prices can have important consequences for the economy as firms and investors respond to the price signals, potentially resulting in capital misallocation¹².

Another lesson from history is that bubbles can be extraordinarily costly when accompanied by significant increases in borrowing. On this point, Irving Fisher (1930, p. 341) famously remarked, “[O]ver-investment and over-speculation are often important; but they would have far less serious results were they not conducted with borrowed money.” The use of leverage magnifies the contractionary impact of a decline in asset prices. The typical residential housing transaction is financed almost entirely with borrowed money. It is therefore not surprising that: (1) housing-bust recessions tend to be longer and more severe than stock-bust recessions (International Monetary Fund 2009), and (2) the severity of housing-bust recessions is positively correlated with prior increases in household leverage (Glick and Lansing, 2010, International Monetary Fund, 2012a). A study by King (1994) identified a positive correlation between prior increases in household leverage and the severity of the early 1990s recession using data for ten major industrial countries from 1984 to 1992. He also notes that U.S. consumer debt more than doubled during the 1920s – a factor that no doubt contributed to the severity of the Great Depression in the early 1930s. The unwinding of excess household leverage typically involves lengthy periods of sluggish growth in GDP and employment (Reinhart and Reinhart, 2010, Roxburgh *et al.*, 2012). As noted originally by Persons (1930, p. 119), “When the process of expanding credit ceases and we return to a normal basis of spending

¹¹ Major stock price run-ups occurred in the early 1900s (high speed rail travel), the 1920s (mass-production of automobiles), the 1960s (television and space travel), and the late 1990s (internet-based business model). For additional discussion, see Lansing (2009b).

¹² Lansing (2012) examines the welfare consequences of technology-driven bubbles in a model where excessive asset price run-ups can affect the economy’s trend growth rate.

each year...there must ensue a painful period of readjustment.” Such outcomes were certainly true for the U.S. housing market of the mid-2000s. Time will tell whether things will turn out differently for the Norwegian housing market.

The extensive harm caused by the global financial crisis raises the question of whether policymakers could have done more to prevent the buildup of dangerous financial imbalances, particularly in the household sector. An important unsettled question in economics is whether policymakers should take deliberate steps to prevent or deflate suspected asset price bubbles¹³. The mainstream view prior to the crisis was that central banks should not attempt to prick a suspected bubble. Instead, according to former Fed Chairman Alan Greenspan (2004c), they should follow a “strategy of addressing the bubble’s consequences rather than the bubble itself.” This view is predicated on the idea that it is difficult for policymakers to identify a bubble in real time.

However, central banks regularly respond to economic variables that are difficult to measure in real time, such as the ‘output gap’, defined as the difference between actual and potential GDP. According to Borio and Lowe (2002), bubble-popping skeptics fail to sufficiently take into account the asymmetric nature of the costs of policy errors when faced with a suspected bubble (p. 26): “If the economy is indeed robust and the boom is sustainable, actions by the authorities to restrain the boom are unlikely to derail it altogether. By contrast, failure to act could have much more damaging consequences, as the imbalances unravel.”

In the midst of the U.S. housing boom, former Fed Chairman Paul Volcker (2005) called attention to several disturbing economic trends in an opinion piece titled “An Economy on Thin Ice.” Specifically, he noted that “personal savings in the United States have practically disappeared”, and that “home ownership has become a vehicle for borrowing.” He called for federal policies to ‘forcibly increase’ the saving rate as a way to address the growing imbalance between domestic spending and domestic production.

The official report of the U.S. Financial Crisis Inquiry Commission (2011) states (p. xvii): “We conclude this financial crisis was avoidable...Despite the expressed view of many on Wall Street and in Washington that the crisis could not have been foreseen or avoided, there were warning signs. The tragedy was that they were ignored or discounted. There was an explosion in risky subprime lending and securitization, an unsustainable rise in housing prices, widespread reports of egregious and predatory lending practices, dramatic increases in household mortgage debt...among many other red flags. Yet there was pervasive permissiveness; little meaningful action was taken to quell the threats in a timely manner. The prime example is the Federal Reserve’s pivotal failure to stem the

¹³ For an overview of the various arguments, see Lansing (2003, 2008).

flow of toxic mortgages, which it could have done by setting prudent mortgage-lending standards.”

In light of the severe economic fallout from the crisis, policymakers’ views regarding the use of monetary policy to lean against bubbles appear to be shifting¹⁴. In an interview during the crisis (*Wall Street Journal*, 2008), Fed Chairman Ben Bernanke was asked “What are the lessons of the last few years from the economy and from the financial markets for the conduct of monetary policy?” In response, Bernanke said, “[O]bviously the last decade has shown that bursting bubbles can be an extraordinarily dangerous and costly phenomenon for the economy and there is no doubt that as we emerge from the financial crisis, we will all be looking at that issue and what can be done about it.”

In a speech years earlier, Bernanke (2002) emphasized that central banks should take deliberate steps to prevent deflation. In particular, he asserted that “Sustained deflation can be highly destructive to a modern economy and should be strongly resisted...For this reason, as I have emphasized, prevention of deflation is preferable to cure.” The most well-known historical examples of deflation have occurred in the aftermath of burst asset price bubbles, specifically during the U.S. Great Depression of 1930s and Japan’s lost decades of the 1990s and 2000s. If a bursting bubble can set the stage for deflation which in turn would be “highly destructive to a modern economy”, then the same logic of “prevention is preferable to cure” would seem to imply that monetary policy should strive to prevent bubbles from becoming too large in the first place. In the words of San Francisco Fed President Janet Yellen (2009), “What has become patently obvious is that not dealing with certain kinds of bubbles before they get big can have grave consequences. This lends more weight to arguments in favor of attempting to mitigate bubbles, especially when a credit boom is the driving factor.”

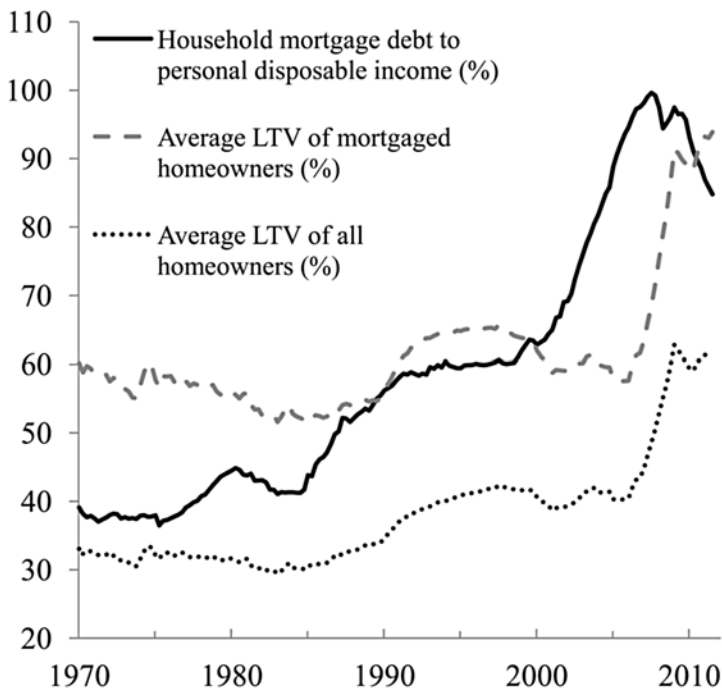
This brings us to the question of what policy instruments should be used to lean against bubbles. A broad view of monetary policy includes regulatory oversight of financial markets and institutions. Many have argued that a central bank’s interest rate policy is too blunt an instrument and that macroprudential regulations are better suited to restraining bubbles. However, macroprudential policy may not be a magic bullet. Unfortunately, as history attests, regulations put in place after a crisis to prevent financial imbalances are often unwound over time, setting the stage for the next bubble and crisis (Gerding, 2006). In this regard, a central bank’s interest rate policy may have a distinct advantage because it stands ready to be deployed against bubbles by vigilant central bankers, regardless of the regulatory environment. As noted by Boivin *et al.* (2010), even

¹⁴ Malliaris (2012) reviews the evidence of a shift in central bank policy thinking in favor of leaning against bubbles.

if one stipulates that macroprudential regulation should be the first line of defense against financial imbalances, it need not be the only line of defense.

An example of the dangers of relying solely on macroprudential guidelines can be found in the U.S. housing boom of the mid-2000s. Figure 11 shows that standard loan-to-value measures did not signal any significant increase in household leverage during the boom years because the value of housing assets rose together with mortgage debt in a self-reinforcing feedback loop. Only after the collapse of house prices did the loan-to-value measures provide an indication of excessive household leverage. But by then, the over-accumulation of household debt had already occurred. Indeed, in a February 2004 speech, Fed Chairman Alan Greenspan (2004b) remarked “Overall, the household sector seems to be in good shape, and much of the apparent increase in the household sector’s debt ratios over the past decade reflects factors that do not suggest increasing household financial stress.” Similarly, in an April 2004 speech, Fed Governor Donald Kohn (2004) stated “And, while [household] debt has been increasing, assets on household balance sheets have been rising even more rapidly. Barring a collapse in house or equity prices...household net worth should remain comfortably above the levels of a few years ago.”

Figure 11: Leverage Ratios for U.S. households: Loan-to-value (LTV) versus Debt to Income



Source: FRB St. Louis (William Emmons) and Federal Reserve Flow of Funds Accounts.

A basic problem with loan-to-value constraints is that the denominator (i.e., value) is subject to excess volatility. A debt-to-income constraint represents a more prudent lending criterion than a loan-to-value constraint because income, unlike asset value, is less subject to distortions from bubble-like movements in asset prices. Figure 11 shows that the ratio of U.S. household mortgage debt to disposable personal income started to rise rapidly around 2001 – about five years before the peak of the bubble – thus providing regulators with an early warning signal of a potentially dangerous buildup of household leverage. Unfortunately, the signal was not heeded.

A study by Gelain *et al.* (2013) shows that increasing the emphasis on the borrower's wage income in the lending decision can help dampen fluctuations in household debt and other macroeconomic variables in the context of a quantitative general equilibrium model. Interestingly, the most successful stabilization policy in the model calls for lending behavior that is basically the opposite of what was observed during the U.S. housing boom. As the boom progressed, U.S. lenders placed less emphasis on the borrower's wage income and more emphasis on expected future house prices. So-called 'no-doc' and 'low-doc' loans became increasingly popular¹⁵. Loans were approved that could only perform if house prices continued to rise, thereby allowing borrowers to refinance. In retrospect, it seems likely that stricter adherence to prudent debt-to-income guidelines would have forestalled much of the housing bubble, such that the subsequent reversal and the resulting financial turmoil would have been far less severe¹⁶.

Recently, the Committee on International Economic and Policy Reform (2011) issued a report that called for central banks to go beyond their traditional emphasis on flexible inflation targeting and adopt an explicit goal of financial stability. The committee recommended that macroprudential tools be used in conjunction with monetary policy to achieve this goal. Some central banks are already moving in this direction. In its recent renewal of the inflation-control target, the Bank of Canada (2011) stated (p. 26): "Where imbalances pose an economy-wide threat and/or where the imbalances themselves are being encouraged by a low interest rate environment, monetary policy might itself be the appropriate tool to support financial stability."

Along similar lines, the Norges Bank recently announced a new loss function for monetary policy analysis that is explicitly designed to take into account the risk

¹⁵ According to the report of the U.S. Financial Crisis Inquiry Commission (2011, p. 165), "Overall, by 2006, no-doc or low-doc loans made up 27% of all mortgages originated."

¹⁶ A cross-country empirical study by Lim *et al.* (2011) examines the use and performance of loan-to-value constraints versus debt-to-income constraints together with other macroprudential policy tools. Their regression results (p. 53) show that the implementation of a debt-to-income cap is more effective than a loan-to-value cap in reducing the growth rates of real estate prices and credit.

that a period of abnormally-low interest rates may contribute to a build-up of financial imbalances (Evjen and Kloster, 2012). As explained in the Norges Bank Monetary Policy Report (2012b, p. 16): “Low interest rates for extended periods can increase the risk that debt and asset prices will move up and remain higher than what is sustainable over the economic cycle....High debt levels make borrowers more vulnerable and increase the risk of long-term instability in the real economy. A sudden, unexpected drop in incomes, higher unemployment or other macroeconomic shocks may result in a fall in property prices, creating imbalances between borrowers’ debts and the value of leveraged assets. By incorporating the interest rate level in the loss function, the Bank is seeking to counter the buildup of such imbalances.”

Bank of England Governor Mervyn King (2012) recently stated “It would be sensible to recognize that there may be circumstances in which it is justified to aim off the inflation target for a while in order to moderate the risk of financial crises. Monetary policy cannot just mop up after a crisis. Risks must be dealt with beforehand.”

Going forward, it seems likely that more central banks will reach the conclusion that a balanced approach involving both macroprudential regulation (first line of defense) and interest rate policy (second line of defense) is the best way to prevent credit-fueled financial imbalances.

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8. A HEAVENLY MATCH OR RECENT DEVELOPMENTS IN MORTGAGE LENDING IN THE EU AND SOME TENTATIVE REFLECTIONS ON ITS POSITIONING IN THE FINANCIAL STRUCTURE

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and Henrik Schönemann*

Abstract

This paper reviews developments in mortgage lending in the EU, including the assessment of covered bonds – a major source of finance for mortgages – by rating agencies. Mortgage models in the EU come in many different varieties reflecting that EU legislation allows a diversity of models. The different mortgage models are assessed against four criteria and in a structural context. It is possible to draw some tentative conclusions as to the relative performance of mortgage models^{1,2}.



Mortgages are by far the biggest liability on households balance sheet and make up a substantial chunk of bank's lending, in the Euro area more than 30 percent of lending of the MFIs. In some sense they are an anomaly on banks' balance sheets or at least an extreme stretch of the maturity transmission of banking. The typical maturity of a mortgage in the EU is 30 years.

Stop for a moment and reflect on what has happened over the last 30 years. The fall of the Berlin Wall, the integration of Eastern Europe in the EU, the rise of China, the internet, the shift from stagflation to fears of deflation etc. And in the narrow financial world, the S+L crisis, The Asian crisis, the dot com bubble, the financial crisis and the government debt crisis. Or a very specific development as the disappearance of the market for anything but very short term unsecured interbank lending leaving long term contracts dependant on a LIBOR that is set with limited foundation in actual transactions. Who knows what will happen over the next 30 years?

¹ The authors are all employees of Nykredit, However, the views expressed do not necessarily represent the views of Nykredit.

² Data work by Lasse Pedersen.

The match of institutions dependant on short term funding with borrowers who need a 30 year commitment must have been made in heaven, if it is to be a stable relationship. Funnily enough more earthly (re)designers of the financial system has considered changing many aspects of the financial system, but not this part. Both the Vickers Report³ and the Liikanen report⁴ focus instead of leaving market functions and non-retail operations outside the perimeter of core banking. The biggest issue in relation to the policy considerations on mortgage lending is the risk weights, where there seems to be an increased consensus on the need to raise the risk weights or at least set a limit on how low they can be.

Mortgage lending comes in more than fifty shades of grey. The variety across countries is immense, cf. ECB(2009)⁵.

Developments in mortgage lending in the EU has differed dramatically across countries during the financial crisis. While there is some pattern that suggests that countries that saw significant growth up to the financial crisis, has suffered particular hardship during the crisis, in line with Reinhart and Rogoff (2009)⁶ more general results, there are also differences as to how hard a fall similar upturns gave rise too.

To make a more systematic assessment, we need some criteria. There are many possible criteria for assessing a mortgage system. Here we focus on four: Affordability, resilience towards falling property prices, robustness during and after periods of financial stress, and government intervention, cf. also Berg and Nielsen (2012)⁷.

We are not the only ones assessing mortgage systems. Credit rating agencies are in this business for money. While their recent record is somewhat wobbly, so is the record of most others. Credit rating agencies assessment is particular easy to monitor in relation to the covered bonds that they rate.

In this paper, we mostly take a narrow perspective on mortgage lending. A next step would be to analyze mortgage lending in a broader perspective. The overall objective of financial reform should be to allocate risk in a sensible manner, rather than take all risk out of the system or push it to the least regulated segment.

³ Final Report Recommendations, September 2011, ICB, London.

⁴ High-level Expert Group on reforming the structure of the EU banking sector, Chaired by Erkki Liikanen, Final Report, Brussels, 2 October 2012.

⁵ Occasional Paper Series, No. 101, March 2009, Task Force of the Monetary Policy Committee of the European System of Central Banks, Housing Finance in The Euro Area.

⁶ C. M. REINHART and K. ROGOFF, *This Time Is Different: Eight Centuries of Financial Folly*, Princeton University Press, 2009.

⁷ J. BERG and M. BAEKMANN NIELSEN, "A New Housing Finance System for the Us?", to be published in *Re-developing America*.

The structure of this paper runs as follows. Section 1 is a primer on banking, the inherent instability of banking and structural ways of addressing this instability, including recent proposals. Section 2 updates some of the key numbers in the 2009 ECB report on Housing Finance in the Euro area to cover the years of the financial crisis and broadens it to include numbers from four important non-Euro EU countries. Section 3 is a generic introduction to mortgage lending and the many possible permutations of mortgage lending parameters. Section 4 reviews developments in rating agencies assessments of covered bonds from different EU countries. Section 5 assesses the developments across countries, including some important non-EU countries, on the basis of the four mentioned criteria. Section 6 concludes and provide a link to broader issues in relation to the financial structure.

8.1. A PRIMER ON BANKING INSTABILITY AND STRUCTURAL REMEDIES

Financial intermediation can be illustrated by a balance sheet of a very simple bank that has deposits and capital as liabilities and loans and liquid assets as assets, cf. chart 1. This balance sheet can illustrate the benefits and risks, the externalities associated with bank failure, and a number of different ways to contain these risks, including – but not limited to – increases in capital requirements and the introduction of liquidity requirements.

Chart 1. A Simplified Bank Balance Sheet

Assets	Liabilities
Loans	Liquid deposits
Liquid assets	Capital

Banks creates welfare by paying interest on liquid deposits and by making loans available at comparable low rates because of the maturity transformation and credit transformation banks performs. The bank relies on the fact that normally the withdrawals and deposits more or less cancel each other out. The liquidity of deposits can thus under normal circumstances be maintained at low cost.

Furthermore, banks skill set and scale gives them a comparative advantage as monitors of credit quality.

As described by *Bagehot* in 1873⁸ and modeled 110 years later by *Diamond and Dybvig*⁹ this is not a stable equilibrium. If a run starts there is an incentive to be among the first that get out. Or in a slight rephrasing of Mervin King's statement, while it is not smart to start a bank run, it is definitely smart to be among the first in the pack running. The reason is that a bank is worth much more as a going concern than in a forced liquidation. The first, who get out, gets paid from the liquid assets. At some stage the less liquid loans has to be sold. In a market under pressure that is likely to happen at prices below par. Thus the capital of the bank will be reduced. When the capital is gone, there is not enough assets left to pay the remaining depositors. A depositor with perfect foresight thus has an incentive to be among the first that gets out.

The failure of a bank is costly also for others than those who have contributed capital and deposits. There are negative externalities.

Most countries have deposit insurance that protects ordinary depositors. The deposit insurance entails costs for those that finance the pay outs. This create negative externalities. The case for deposit insurance is twofold. One, bank's accounts are opaque and the ordinary depositor has little chance of understanding them. Two, deposit insurance reinserts some stability in the unstable banking model by lessening the incentive to run.

Bank failures also have social costs, as a result of that credits are cut and projects abandoned. Other banks have difficulties in stepping in as new lenders because of the informational asymmetries, or in bankers language the lack of credit history. In some cases the forced liquidation of assets depresses the valuation of assets owned by other banks, and starts a financial accelerator effect. *Bernanke* describes in his work on the Great Depression, how the financial accelerator drove falling collateral values and declining overall capacity by banks to lend. This, much more than losses on counterparty exposures, was a main driver of the recent financial crisis¹⁰.

The fact that the negative externalities can both be associated with the liability side of a financial intermediary and the asset side is very important for the design of financial regulation. It may not be a trivial exercise to handle the negative externalities arising from the liability side. However, it is much more complex to deal with the negative externalities arising from the asset side, cf. recent work on shadow banking¹¹. While the regulatory perimeter is fairly well defined in

⁸ BAGEHOT, *Lombard Street: A description of the money market*, London, 1873.

⁹ DIAMOND and DYBVIG, *Bank runs, deposit insurance, and Liquidity*, JPE, 1983.

¹⁰ Cf. *Journal of Economic Perspectives*, Winter 2011.

¹¹ EUROPEAN COMMISSION, *Green Paper, Shadow Banking*, Brussels, 19 March 2012, COM(2012) 102 final.

relation to the liability side, i.e. deposit takers (banks), it is much wider and less well defined in relation to the asset side, the funding of the economy.

It is very important to be clear on which externalities should be addressed. Measures that address the externalities associated with the liability side could unintentionally shift activity to the unregulated funding industry. The end result could be that, while we have a safe banking system, non-banks dominates funding, which becomes very volatile.

Supervisors have traditionally focused on capital buffers that could cover losses on the loans. In the most recent proposals for a new regulatory framework, international liquidity standards are introduced for the first time. Liquid assets protect a bank from having to do forced selling and thereby serves as a buffer to capital.

There are many ways to address the inherent risks of banks. Narrow banking is one possibility. The risks can also be reduced by changing the deposit contract. The deposit contract can be made similar to mutual funds, where you have the right to a share of the pie rather than a fixed amount.

The riskiness of the bank construction also depends on the more general design of the surrounding economy. If creditor protection is limited, defaults on loans are more likely and the costs in case of default will be higher. Similarly, a social safety net lowers risks of default and costs.

The non deposit taking specialized mortgage system that exists in a number of European countries, including but not only Denmark, combine some of these features with a balance principle that makes it a very ‘dull’ system, cf. chart 2. These days, ‘dull’ is a plus word, as it implies safe.

Chart 2. The Specialized Mortgage Bank

Assets	Liabilities
Loans	Bonds
Liquidity	Capital

The Danish mortgage system is a pass through system, where payments on loans pass through to bondholders. The bond holder cannot withdraw her funds as a

depositor can. There is no maturity transformation and the intermediary is not exposed to interest rate risk¹². Credit risk is contained through personal liability as opposed to the no recourse loans that caused so many problems in the US. The legal system ensures that foreclosure is unusually quick, around 6 months, and the social safety net means that in most parts of the country families can service their debt with one family member unemployed. Originate to hold as opposed to originate to distribute results in sharp credit assessments.

Covered bonds have been criticized for creating structural subordination of depositors as assets are set aside for covered bond holders. It is important to note that such structural subordination per definition does not apply to specialized institutions that do not take deposits. Here, any other creditors are consenting adults, who do not rely on deposit insurance.

8.2. MORTGAGE LENDING IN THE EU DURING THE FINANCIAL CRISIS

This section describes the development of key housing related statistics before and during the financial crisis. ECB (2009) conducted a similar analysis of the pre-crisis trends; hence, the data presented here is an updated version of the ECB analysis extended in both the time dimension as well as a broader set of countries, thus including some of the non-euro members.

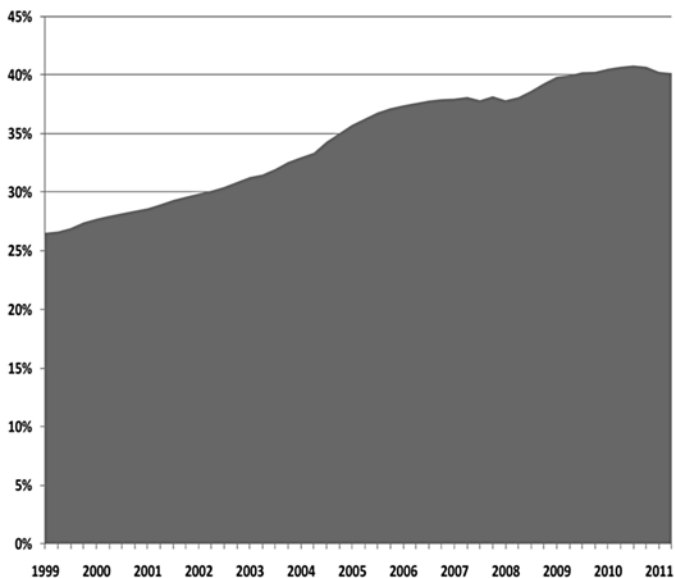
For the Euro-zone on aggregate, housing related debt levels for households have increased remarkably since the introduction of the Euro in 1999. As of 2011, housing related debt constitutes roughly 40 percent of Euro-zone GDP up from 25 percent in 1999, cf. chart 3. The growth rate in housing debt among European households was particularly pronounced in the pre-crisis years whereas levels have stabilized since 2008.

On a disaggregate level there are large differences among European countries reflecting the different mortgage market structures across member states (see chart 4). Most countries (with Belgium, Germany and Ireland as exceptions) have experienced rather large increases in the level of indebtedness from pre-crisis

¹² It is sometimes mentioned that the Danish version of ARMs creates a liquidity risk. Traditionally Danish mortgage loans were 20 or 30 year fixed rate mortgages with a conversion option should interest rates fall. The bonds issued to finance the mortgages matched the loans in terms of maturity, interest rate and conversion option. In the 1990ties ARMs were introduced, where interest rates were reset from once a year to once every ten years. The ARM loans were financed by auctioning mortgage bonds compatible with the interest rate reset. Thus, the mortgage institutions are exposed to a liquidity risk should they not be able to sell the bonds. However, that risk is much more limited than in systems where the interest rate reset on mortgages is not aligned with the refinancing. In the Danish system mortgage institutions are obliged to pass on the rate set at the auctions to the borrower. Therefore, they are never left with an interest rate risk that in turn can create a liquidity risk, as buyers of the bonds will be reluctant to acquire bonds issued by institutions that are potentially at risk in the event of increases in interest rates.

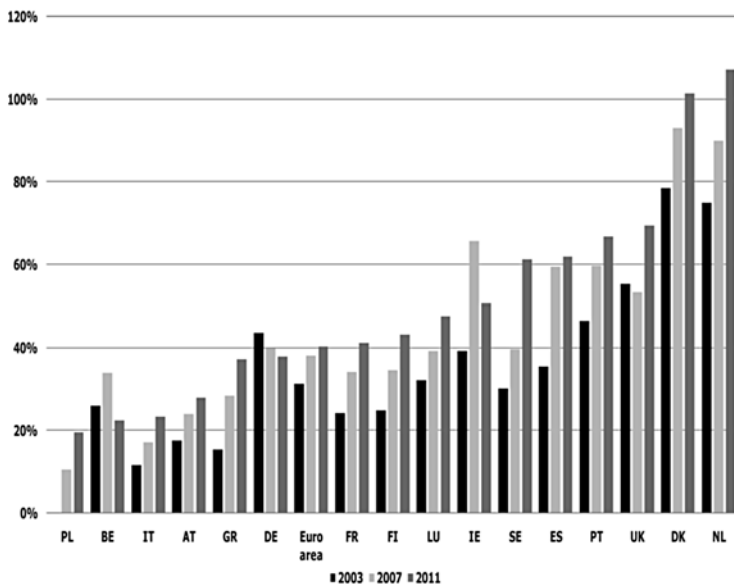
levels. The Netherlands rank as the most indebted Euro-member relative to domestic GDP sharply followed by non-Euro member Denmark.

Chart 3. Euro-zone Household Housing-related debt in Percent of Euro-zone GDP



Source: ECB.

Chart 4. Household Housing-related Debt in Percent of Domestic GDP



Source: ECB and European Mortgage Federation.

The increase in indebtedness reflects development of a range of factors such as disposable income growth, low interest rates and increasing house prices. From 1999 to 2007 real disposable incomes were characterized by steady positive annual growth rates averaging 1.5 percent for the Euro-zone countries, cf. chart 5. Among member states growth rates display great diversity; real disposable incomes thus increased by more than four percent per annum in Greece, Spain and Ireland whereas Germany and the Netherlands experienced annual growth rates of less than one percent. The crisis years since 2007, in contrast, reveals the exact opposite figures. Accordingly, the countries that experienced the most rapid growth prior to the crisis tend to be the countries hit hardest (with Sweden and Finland as notable exceptions).

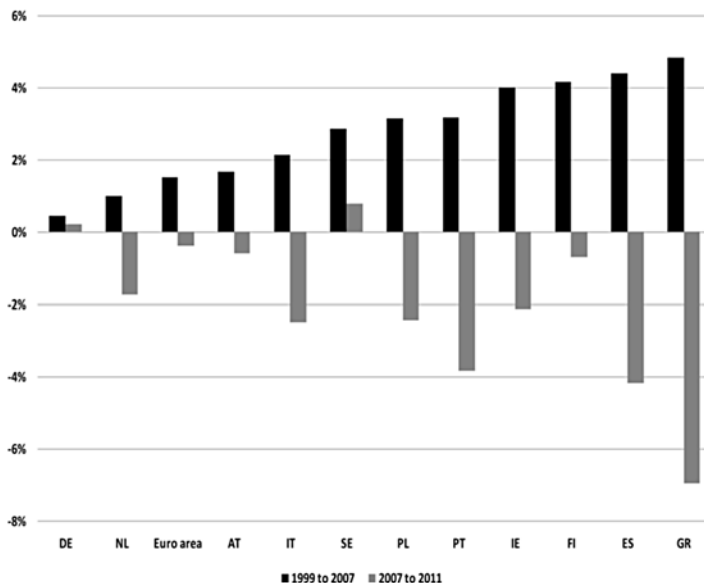
Chart 6 plots the average annual growth rate of nominal GDP against the average annual growth rate of housing related debt. In the pre-crisis period 2003 to 2007, there was a strong positive correlation between the two variables. This correlation both reflects the increased ability of the more wealthy households to take up more debt as well as simultaneous credit multiplier affecting GDP positively following financial liberalization and increased competition among mortgage banks, cf. ECB (2009). In the crisis years after 2007 the positive correlation has persisted; the lower intercept reflects that a given growth rate of loans for house purchase is associated with a lower growth rate of GDP. Note also that the growth rate of the housing-related debt both tends to be positive and higher than the growth rate of nominal GDP.

The asset side of the households balance sheets as measured by the stock of non-financial assets relative to GDP reflect a similar pre-crisis pattern as the liability side. Hence, the gross wealth of the Euro-zone households increased rapidly up until 2006. As declining house prices have deteriorated the gross non-financial wealth since 2007/08, the net wealth of Euro-zone households has also declined.

The increase in debt levels since the introduction of the Euro has also been fueled by declining interest rates up until 2006. The expansive monetary policy conducted by ECB since the onset of the financial crisis has pushed down interest levels which has made debt servicing easier for households. Accordingly, in spite of the vast decline in disposable incomes, the average housing burden for the Euro-zone expressed as total housing related interest expenditures in percent of disposable income, has declined sharply since the peak in 2008 (see chart 7).

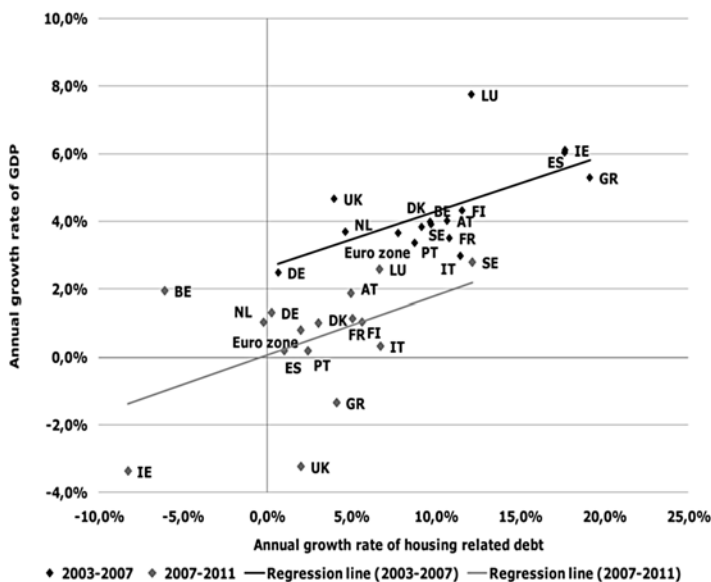
The extent to which the expansive monetary policy has counteracted the adverse economic shocks following the financial crisis depends among other things on the mortgage structure of the member states. Households in countries with a high share of mortgage lending based on adjustable-rate mortgages should, *ceteris paribus*, face lower interest rates on their mortgage. This is indeed the case, cf. chart 8.

Chart 5. Average Annual Growth Rates of Real Disposable Income



Note: Data only available for a subset of European Union member states.
 Source: ECB and Eurostat.

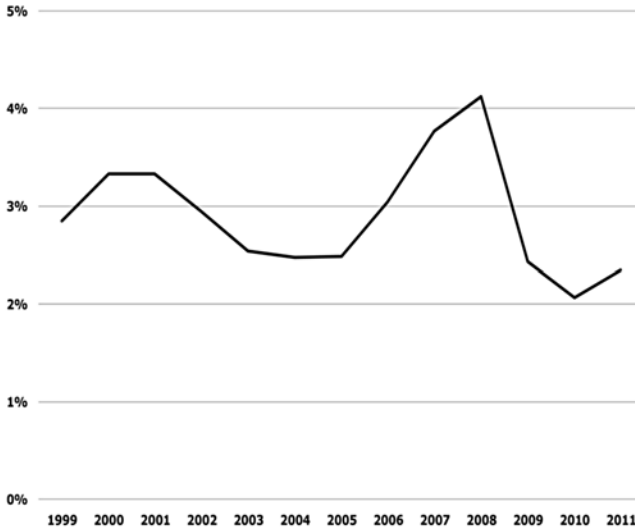
Chart 6. Average Annual Growth Rate of Nominal Gdp against Annual Growth Rate of Housing Related Debt



Source: ECB and Eurostat.

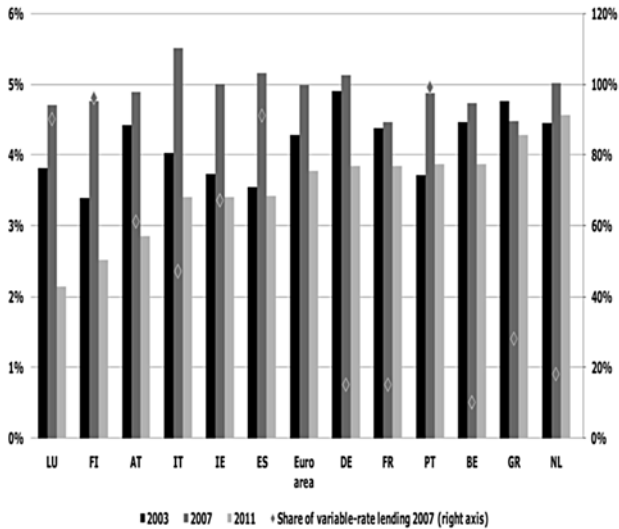
Not surprisingly, households in countries like Luxembourg and Finland are the ones benefitting the most from the expansive monetary policy. But so does households in Spain, Ireland and Italy that on average face lower interests on their mortgage than the typical German or Dutch household.

Chart 7. Euro-zone Households' Interest Expenditure in Percent of Disposable Income



Source: ECB.

Chart 8. Average Cost of Housing Loans and Share of Variable Lending



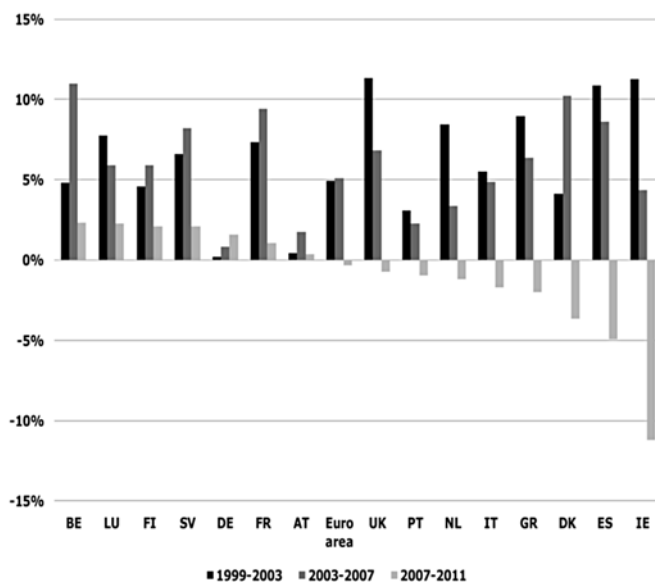
Note: Data only available for members of the Euro-zone.
Source: Eurostat.

House price dynamics and housing debt dynamics are closely related. Chart 9 displays the average annual growth rates of nominal house prices across the European Union member states. Not surprisingly, the countries experiencing the largest pre-crisis increases in house prices also tend to be the countries with the largest declines during the crisis. Chart 10 plots the average annual growth rates against the average annual growth rates of housing loans. The regression lines is not to be interpreted as a causal relationship, but it does reveal some interesting points. Hence, it seems that the positive correlation that one would expect has persisted throughout the crisis though with a lower intercept.

The health of national housing markets can also be illustrated by the change in the ratio of sales to total stock of dwellings. Ireland, the UK and Spain have experienced the greatest drop from pre-crisis levels whereas the activity rates of Germany and France have remained fairly constant, cf. chart 11.

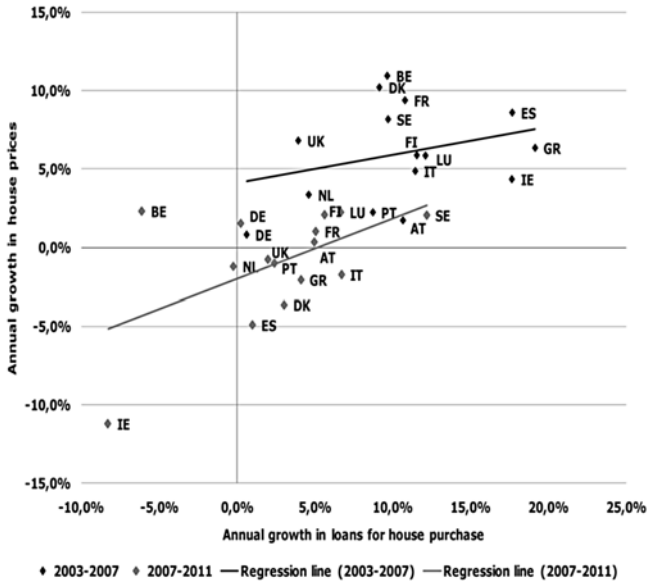
ECB (2009) concluded that housing finance was a growing area of business for European banks as the share of loans for house purchase accounted for a growing share of total loans to non-MFIs. With local exceptions, this trend has continued throughout the financial crisis, cf. chart 12.

Chart 9. Annual Nominal House Price Growth



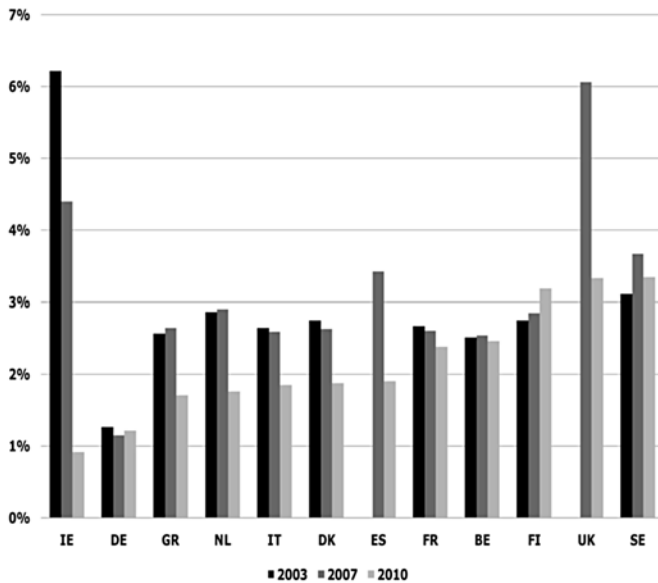
Sources: Eurostat and European mortgage federation.

Chart 10. Annual Growth in Loans for House Purchase Against Annual Houseprice GROWTH



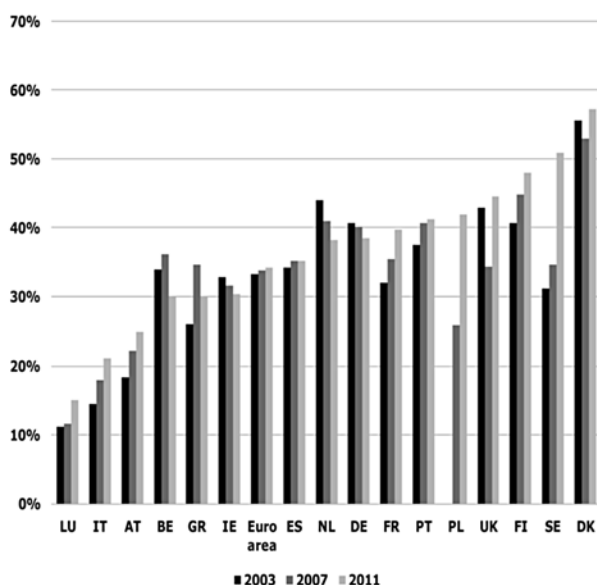
Source: Eurostat and European Mortgage Federation.

Chart 11. Number of Transactions in Percent of Total Stock of Dwellings



Source: European Mortgage Federation.

Chart 12. Loans for House Purchase in Percent of Total Non-mfi Loans



Source: ECB.

The relative effect of shocks to the mortgage market on the wider domestic economy depends among other things on the share of home ownership. In this respect it is interesting that the distressed economies around the Mediterranean and Ireland rank highest on this figure, cf. chart 13.

As a final illustration of the differences of housing markets across the European Union, chart 14 shows the distribution of housing loans granted depending on the age of the head of the household. German house buyers are by far the oldest in Europe which is also reflected in the low owner occupy rates in Germany. On average across the member states, the generations aged 31-40 and 41-50 constitute the majority of people taking up new housing loans.

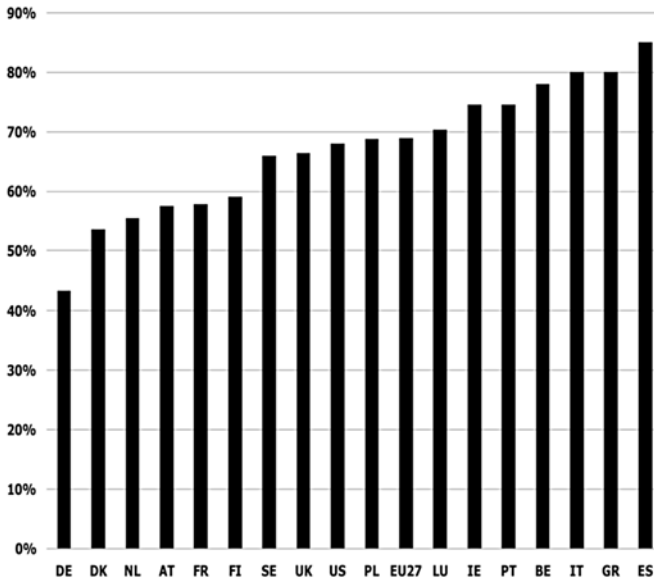
8.3. THE DIVERSITY OF MORTGAGE MODELS

If you believe a mortgage is a simple product, you have not studied the permutations that are possible in the EU. You can look at a mortgage from the perspective of a borrower and from the perspective of how the mortgage is financed.

From the borrowers perspective ECB(2009) covers the questions of:

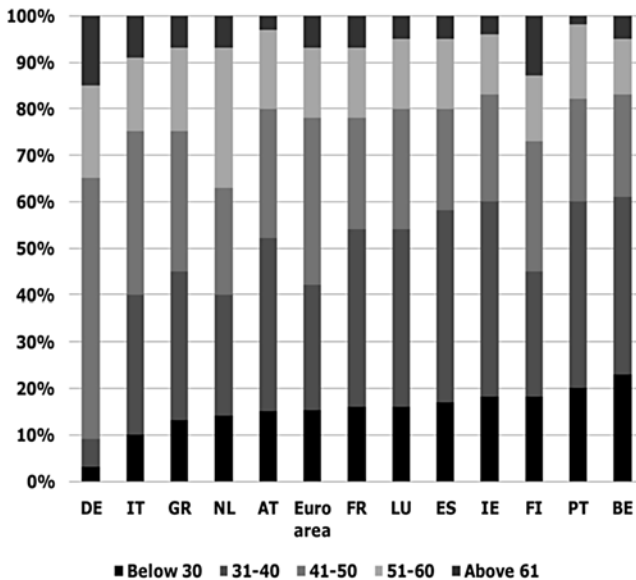
- the interest rate;
- the maturity;

Chart 13. Owner Occupy Rates



Note: Latest available year. Numbers for Denmark do not include cooperative housing.
 Source: European Mortgage Federation.

Chart 14. Distribution of Housing Loans Granted in 2007, by Age of the Head of the Household



Source: ECB.

- the loan to value;
- the repayment profile;
- the possibilities for early repayment;
- the non-interest costs of a mortgage;
- the purpose of a mortgage;
- the taxation issues;
- the bankruptcy and foreclosure practices.

The basic choices with regard to interest rates are whether the rates are fixed or variable, and whether they are capped. The choices made in the Euro area span the whole spectrum and there are substantial differences across countries.

With regard to maturity, the bulk of mortgages are within the 20-30 year interval, but in some cases can go to 60 years, and in others are individual and linked to years to retirement. Furthermore, there are models that allow for variable maturity, where the maturity depends on the level of interest rates, i.e. the higher the interest rates/payments, the lower the amortization and the longer the maturity.

Loan to value ranges from 60-100+ percent. However, the differences on LTVs extend beyond percentages. The definition of value also differs. Models include the German Mortgage Lending Value that is set conservatively to avoid business cycle fluctuations to result in lower market prices than the initially set lending value, the Dutch value practice that assumes a 'fire sale' and other models that are based on a more normal sale process. Anecdotal evidence suggests that the financial crisis has resulted in a reduction in LTVs on new loans in many countries.

The repayment profile range from models, where not even the full interest is paid to models where there are substantial amortization payments. As with LTV, the financial crisis has made lenders more cautious in granting interest only loans and teaser loans. Furthermore, repayment profiles are increasingly dependent on how aggressive other parameters are set, i.e. the higher the LTV, the more required repayments.

Early repayment possibilities also differ. In many countries early repayment possibilities are regulated by contracts, but in some also by law.

The non-interest costs of a loan can be fixed or variable, and any combination of the two. They include fees to the lender and fees to others, including taxes.

There can also be restrictions on the purpose of loans, and differing parameters, cf. above, according to loan purposes. Compared to the US, the practice of home equity withdrawal is fairly limited.

Houses are favorite tax objects, not least because a house is not mobile. However, most countries also have tax deductibility of interest, although typically subject to many limitations.

Bankruptcy and foreclosure procedures have proved very important during the financial crisis. In the Euro area countries, borrowers are generally personally liable, as opposed to the US. However, the length of foreclosure procedures differ substantially, from around 6 months to more than 5 years; the latter making mortgage lending a questionable business.

ECB(2009) only covers the euro countries. Also in four major countries outside the euro area, UK, Poland, Sweden and Denmark, there is a wide variety of models. Rates are predominantly variable, maturities are as diverse as in the Euro area, LTVs are in the high end, repayment profile and prepayment fees differs as in the Euro area, non-interest costs are the norm, there is greater scope for home equity withdrawal than in the Euro area, and taxation differs as does foreclosure procedures.

On the funding side, there are basically three choices:

- funded by deposits;
- funded by covered bonds;
- funded by (R)MBS.

Most countries use a combination of the three funding models. The major difference between a covered bond and an RMBS is that a covered bond is an on-balance sheet funding tool, where the bondholders have recourse against the issuing bank, whereas an RMBS is issued out of a special vehicle and the bondholder does not have recourse to the originator, cf. ECBC (2012).

Comparisons are easiest to make across countries in relation to the framework for issuing covered bonds. According to ECB(2009) covered bond issuance was possible in all but two of the Euro area countries, an additional four countries had, however, never seen an issuance of a covered bond. All but the two countries, where covered bond issuance was not possible, had a special law at the national level for covered bonds. However, in only three countries did the law precede 1990.

According to ECBC (2012) one of the two countries that did not have a legislative framework has since established it and the last country is in the process of doing so. Only three countries have yet to issue a covered bond.

The four non-Euro EU countries earlier covered, all have frameworks that makes it possible to issue covered bonds and have all seen issuance. The UK as the exception has a framework that builds primarily on existing general law and contractual structures.

Like the mortgage contract, covered bonds come in many varieties, cf. ECBC(2012) including:

- issued by specialised issuer or general bank/credit institution;
- eligible assets;
- valuation methods and LTV criteria, cf. above;
- asset-Liability management requirements;
- transparency of cover pool;
- cover pool monitoring and general supervision;
- segregation of cover assets and bankruptcy remoteness of covered bonds;
- compliance with EU legislation.

The institutions that are allowed to issue covered bonds differ widely across the EU. In some countries, the right is limited to banks, in other countries to specialized mortgage lenders, and in yet other countries both banks and specialized institutions can issue covered bonds.

The cover pools can generally include:

- residential mortgages;
- commercial mortgages;
- exposures to public institutions;
- risk on financial institutions;
- derivatives.

Typically there are restrictions on the two latter components. In some countries loans backed by ships or airplanes can also be included. In a few countries loans from securitization vehicles can also be included, often related to the sourcing of mortgages from smaller institutions.

Valuations can be based on sales prices, lender employed or independent appraisers. The valuations are either market values or a prudent value, i.e. corrected for cyclical fluctuations/fire sale effects/minimum long term value. LTVs are generally set at 60-80 percent, with commercial real estate typically in the lower end and residential real estate in the higher end.

Requirements as to asset-liability management differs a lot across countries. Requirements include tests of the value of cover assets to outstanding covered bonds, liquidity tests, and market risk tests. Often there is a requirement for excess capital, i.e. that the value of the cover pool exceed the value of the covered bonds by a certain percentage. In a few instances there is a perfect or near perfect match of cash flows on mortgages and covered bonds.

The official requirements on transparency differ widely, and in practice various market initiatives as well as individual disclosures are setting the standard. There are two prominent market initiatives. The European Covered Bond Councils label initiative (ECBC) and the Covered Bond Investors Councils (CBIC) template

guidelines on transparency. ECBC guidelines cover general information on the covered bond as well as more detailed information on the underlying assets. The CBIC guideline include requests for data on the cover pool composition, more qualitative information explaining various concepts in relation to the covered bond, e.g. how nonperforming loans are defined, and ratings information.

Cover pools are often, but not always, monitored by external cover pool monitors. In some instances, cover pools are monitored by the issuer under the supervision of the national FSA. Covered bond issuers are almost everywhere supervised by the national FSA.

Cover assets are always registered and with a few exceptions segregated from the issuing institution in case of insolvency of the latter. A special administrator is normally appointed to manage the cover pool. Covered bonds do not normally automatically accelerate in case of insolvency of the issuing bank. The objective is instead to repay bondholders according to the bonds contractual maturity.

8.4. RATINGS OF COVERED BONDS

There are four global rating agencies that rate covered bonds: Moody's, S&P, Fitch and DBRS¹³. A rating of a covered bond is an assessment of whether payments will be made on a timely basis.

In broad terms all the rating agencies evaluates the same parameters but the exact methodologies varies. The starting point for a rating of a covered bond is the rating of the issuer reflecting that the covered bond holder has recourse to the issuer. For all three agencies analysed here the rating of the issuer provides a floor for the rating of the covered bond. The issuer rating furthermore plays a significant role throughout Moody's methodology, while S&P and Fitch only look at the issuer rating with regard to capping the number of notches a covered bond can be rated above the rating of the issuer. Each of the three agencies has a different name for the cap and slightly differing methodologies are used in arriving at the cap for a specific covered bond issuance. Compared to securitizations such as RMBS, covered bonds with a similar cover pool could be rated lower because of the cap on the rating relative to the issuer rating.

All of the rating agencies do extensive analysis of the cover assets and projected cash flows to determine the likelihood of the cover being capable of meeting the payment obligations. The rating of a covered bond is then based on the rating of the cover pools capacity to meet payment obligations subject to the lower bound of the issuer rating and the upper bound of the issuer rating plus the cap.

¹³ DBRS has as of yet only played a minor role and is therefore not included in the discussion below.

The analysis of the cover assets and the projected cash flow includes stress test of losses, interest and currency risk. If needed assets are assumed to be sold or refinancing obtained in stressed markets. Overcollateralization is included in the analysis, although subject to varying restrictions. Not only the quantity, but also the quality of overcollateralization differs among cover pools.

Ratings of covered bonds has over the last years in particular been influenced by the downward adjustment of sovereign and issuer ratings as well as changes by all the rating agencies to their covered bond rating methodology.

Moody's and S&P publishes data on their covered bond ratings, including the calculation of the cover pools, that is somewhat comparable and can be used to illustrate the two rating bureaus assessment of the quality of the specific covered bonds, including the differences across countries¹⁴.

Moody's rate as of Q2 2012 over 200 covered bond programs of which 80 have primarily public sector assets and are excluded from the analysis below. Three programs from the two non-EU countries that have rated programs are also excluded. This leaves 103 programs from 18 EU countries.

S&P rate as of Q2 2012 over 150 covered bond programs of which 54 have ratings that are not linked to the issuer and therefore not part of the analysis. 25 of the remaining programs have primarily public sector assets and are excluded from the analysis below. Five programs from three non-EU countries are also excluded. This leaves 68 programs from 12 EU countries.

Covered bonds are generally highly rated by Moody's and S&P. 70% are rated AAA, and much better rated than the issuer. However there is a close link to the issuer rating, where banks rated below A have difficulties obtaining a AAA rating. The countries that have suffered most during the debt crisis has had greatest difficulties in upholding AAA ratings. There is no systematic difference between the rating patterns of Moody's and S&P.

Chart 15 and 16 show the two rating agencies assessment of how much higher the covered bond rating can be than the issuer rating; For Moody's the TPI and for S&P the Max potential uplift. The upper bound that is set by the two caps is a significant restriction. Moody's TPI was at the end of Q2 2012 a binding restriction for 23 percent of the rated covered bonds and an additional 43 percent only had a leeway of 1 notch, implying that a downgrade of 2 notches of the issuer would result in a downgrade of the covered bond.

Moody's is generally more restrictive than S&P. Denmark and Germany fare best across the board.

¹⁴ Moody's European Covered Bonds Monitoring Overview: Q2 2012, Moody's Investors Service, and Global Covered Bond Characteristics and Rating Summary Q2 2012, Standard & Poor's.

Chart 15. Moody's TPI Distribution

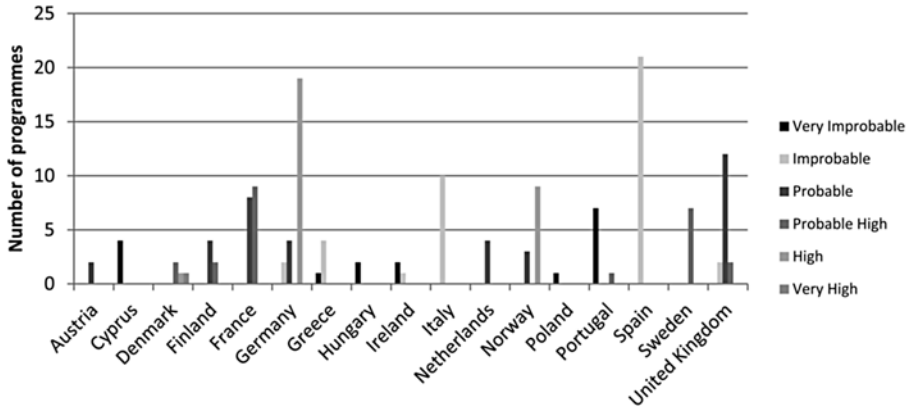


Chart 16. S&P Max Potential Uplift Distribution

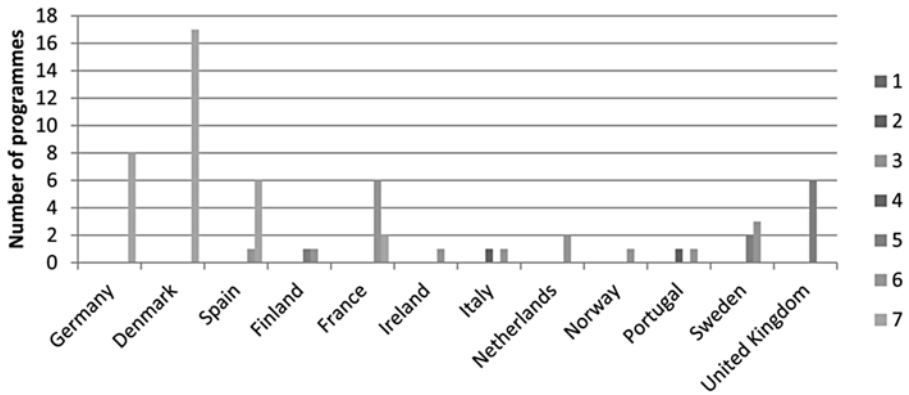


Chart 17 and 18 show how the two rating agencies assess collateral risk and market risk, respectively. Collateral risk, with a few exceptions in particular related to countries that have suffered during the debt crisis, does not differ that much. What differs and also matters most is market risk. Again, there is no systematic difference between the rating patterns of the two rating agencies. Over the last three years, Moody's has increased significantly its assessment of market risk, whereas collateral risk has remained remarkably stable. Spain stands out in terms of high credit and market risk. In particular on the market risk side issues from the same country tend to be clustered.

Chart 17. Moody's Assessment of Collateral and Market Risk

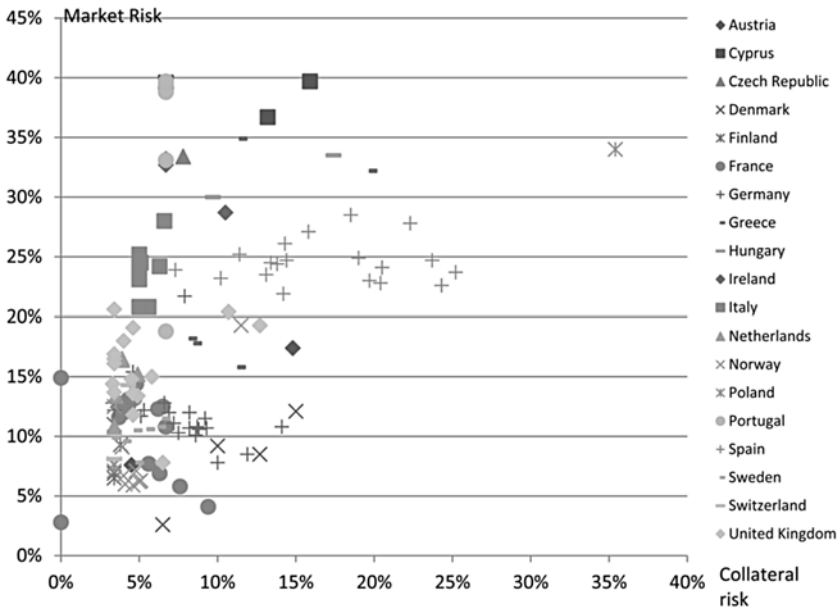


Chart 18. S&P assessment of asset default risk and ALMM risk

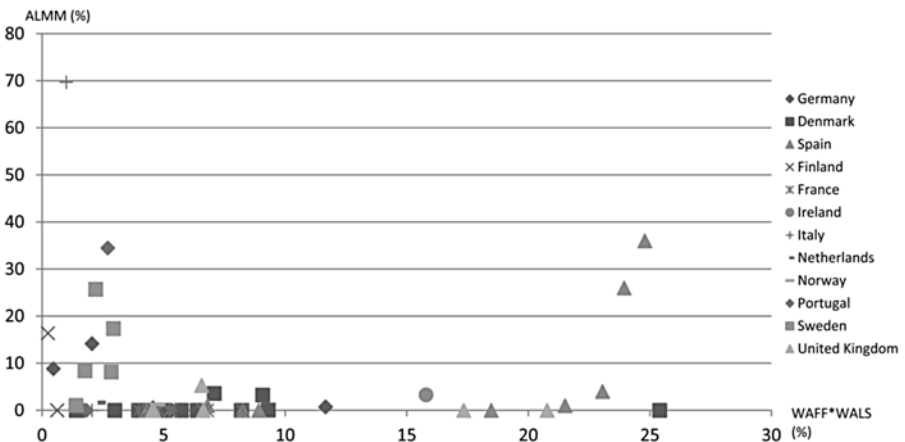


Chart 19 and 20 show the required actual overcollateralization and total overcollateralization to achieve a AAA rating, disregarding any restrictions from TPI/Maximum potential uplift.

Many programs have substantially more collateral than required and a number of programs have more than 50% actual overcollateralization. Again Spain is the

outlier. UK, France and Italy are among the countries where many covered bond programs suffer from high overcollateralization.

Chart 19. Moody's Assessment of Actual Overcollateralization and Required Overcollateralization for Aaa

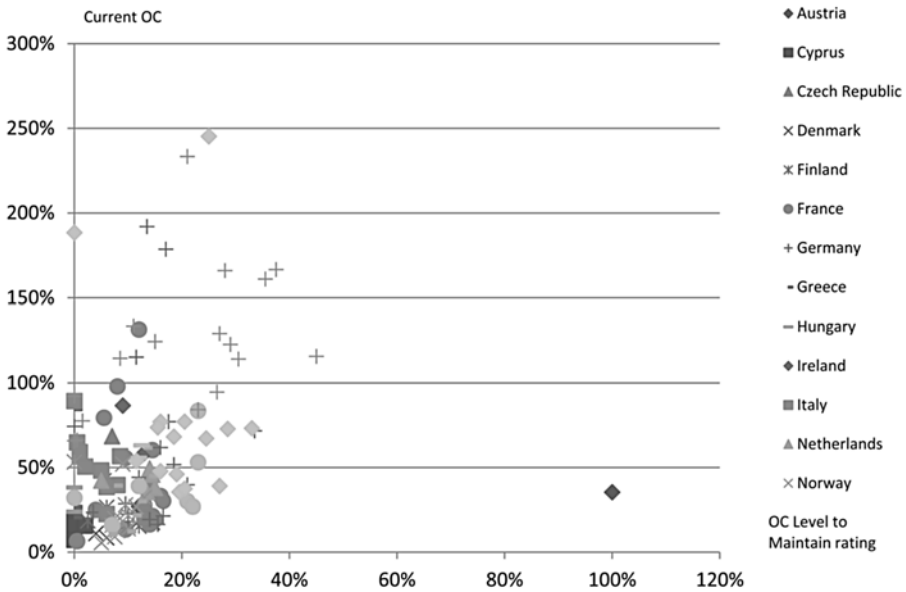
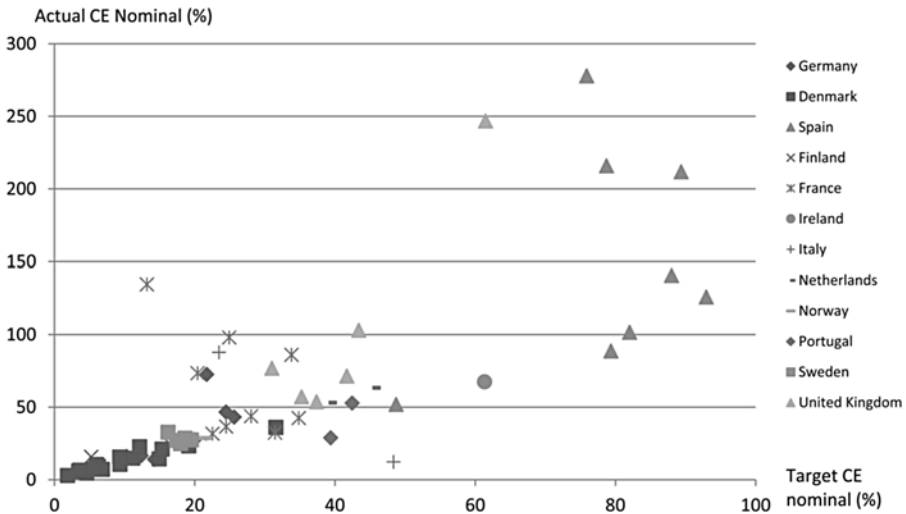


Chart 20. S&P Assessment of Actual Overcollateralization and Required Overcollateralization for AAA



8.5. AN ASSESSMENT OF MORTGAGE MODELS

We focus on four objectives for a mortgage system:

1. a mortgage system should make it possible for households to acquire a home when they need it most i.e. early in an individual's productive life when income and savings are likely to be lowest (the affordability problem). This rules out systems with high owner down payment requirements, which would otherwise have been an obvious way to reduce the risks in mortgage finance;
2. a mortgage system should be robust when house prices fall, e.g. a fall in house prices should not put the financial system at risk. This suggests that the risks should be distributed to those who can handle them;
3. a mortgage system shall be able to continue to finance mortgage lending during and after a financial crisis;
4. government involvement in the form of guarantees, regulatory benefits or other subsidies should be minimal.

8.5.1. Affordability

A mortgage system should make it possible for individuals to acquire a home when they need it most i.e. early in an individual's productive life when income and savings are likely to be lowest (the affordability problem). Low income tend to result in relatively high debt-to-income ratios for young borrowers which lenders normally associate with higher credit risk. The quest for affordability rule out systems with high owner financing requirements, which would otherwise have been an obvious way to reduce the risks in mortgage finance.

Germany, and to some extent Netherlands, are outliers in the Euro area, when it comes to the time in the life cycle housing loans are granted. When it comes to owner occupy rates, Germany is an outlier and Spain is the leader.

The mortgage products available in most developed economies are long dated, interest rates are low to moderate and access to credit has historically been easy – also for young families. Hence affordability is at first sight not a major concern. But the ongoing regulatory changes will lead to higher capital requirements for banks overall and will likely lead to upwards pressure on bank's required margins on the products they offer – including mortgage loans.

Affordability of mortgage loans cannot be assessed in isolation. In some countries like the US, Germany, Denmark and Sweden there are large specialized mortgage lenders that will sell mortgage loans to consumers as a stand-alone product. In many countries mortgage loans are provided by universal banks as part of a packed financial offering. Sometimes a mortgage loan can be conditioned on the

customer buying a life insurance contract at the same time. Hence you should be cautious when comparing mortgage rates across countries as the rates may not reflect the true cost of achieving housing finance. Moreover many countries lightens the burden of mortgage payment by allowing full or partial tax deductibility for interests paid on mortgages. The comparison of after-tax interest expenses on mortgage loans between countries is thus complicated by large differences in tax regimes.

The average costs of housing loans are also difficult to compare because they are highly dependent on the interest rate definition, in particular whether it is variable or fixed.

Another crucial aspect of affordability is the cost of operating the housing finance value chain. An example of a very costly system is the United States, where the process of extending, servicing and funding a mortgage loan is divided between numerous agents that each have to run independent and costly procedures to process documents, conduct due diligence etc. This atomized value chain adds significant costs to the consumer and has proved to work as an impediment to efficient refinancing and funding.

The perceived (and later realized) government backing of the Government Sponsored Enterprises in the USA bestowed a funding advantage on the GSEs that has been estimated to at least 50 bps. The true cost of a mortgage loan in the US would therefore probably be significantly higher without the government backing of the GSEs. It can be argued that the subsidy has allowed a very costly mortgage system with many participants simply because it was 'affordable' and that in a system without the funding subsidy the system would have to be leaner and more efficient.

8.5.2. Resilience towards falling property prices

A mortgage system should be robust in case of falls in house prices, e.g. a fall in house prices should not put the financial system at risk. This suggests that the risks associated with housing finance should be distributed to those agents who are best suited to handle them.

Falling house prices erodes the value of the collateral behind the mortgage loans and hence reduces the credit quality of the mortgage loan portfolios. In combination with increasing unemployment or other factors reducing the borrower's ability to meet their mortgage obligations falling house prices is a key driver of delinquencies and foreclosures. The widespread use of non-recourse or limited recourse mortgage loans in some countries creates an extra risk in connection with a deterioration in property values namely an incentive for homeowners with negative equity in their homes to walk away from their

mortgages. The most extreme examples of this has been some states in the USA during the recent financial crisis, but the phenomenon has also been seen in the UK in the 1990s.

Credit risk should at least for some meaningful part be shouldered by the lenders and house price risk should be mitigated by prudent loan-to-value thresholds. There should also be some sort of recourse to the homeowner in order to secure that the homeowner retains an incentive to keep making mortgage payments even after his home equity has been depleted by falling property prices.

Ireland, and to a lesser extent Spain and Denmark, stand out as the countries, where house prices have declined substantially during the financial crisis. In Spain, the covered bond issuers have to pose substantial overcollateralization on collateral/credit risk in order to maintain their rating. This suggests that the system has not been very resilient in the face of falling property prices. Overcollateralization levels in Denmark are much lower suggesting greater resilience.

The ratings of covered bonds and the possible TPI/potential uplift also suggest that the covered bond systems of Germany, Denmark, France and Sweden are seen as the stronger systems.

A special feature in the Danish housing finance system is the so-called alternative redemption clause¹⁵. This clause allows homeowner – as an alternative to normal prepayment – to redeem his loan by buying back the bonds issued to fund his mortgage in the secondary market and delivering them to the mortgage bank. Thus, a borrower may buy back his loan and refinance at a higher coupon, thereby reducing the size of the loan, when interest rates rise¹⁶.

8.5.3. Robustness during and after periods of financial stress

Transparency is key to investor confidence in the housing finance system and the individual lender /issuer and hence to a well functioning funding market for mortgages. The US MBS market has for many years been characterized by low transparency and this opaqueness was multiplied in the run-up to the crisis by ever more sophisticated structured bond funding tools. The ability of the GSEs to retain mortgages as portfolio investments did not make matters better. It created

¹⁵ GYNTELBERG, KJELDSEN *et al.* in BARDHAN (2011), and FRANKEL, GYNTELBERG *et al.* in *BIS Quarterly Review*, March 2004.

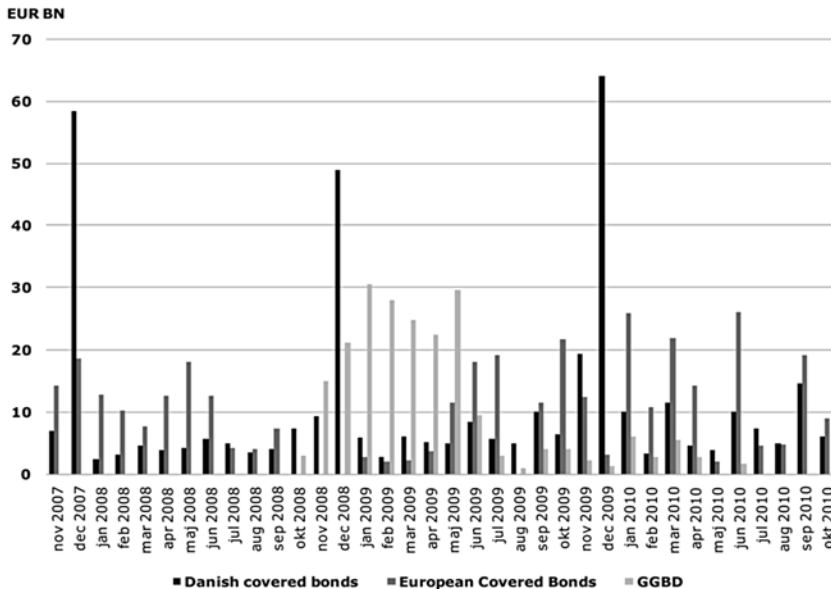
¹⁶ In the Danish system covered bonds include the options granted to borrowers. E.g. the option to redeem at either market price or par. The investor prices these risks, when the bond is acquired. Interest rate risk and prepayment risk are thus handled by the capital markets i.e. professional bond investors and distributed prudently in the financial system with investors with sufficient capital to withstand interest rate and prepayment shocks. In the US system interest rate risks from options are managed by the GSEs, and constitutes an added risk in the US system.

risks where none were necessary. The proximate cause for the September, 2008, nationalization of the GSEs was their inability to roll their debt. These financial innovations made it virtually impossible for investors – and perhaps also regulators – to assess risks. The result was that during financial stress investors lost all confidence in the issuers and refused to invest in the new bond issues necessary to roll over the funding of the mortgage lenders..

Without any investor appetite for new mortgage backed bond issues, governments in both Europe and the United States had to resort to various interventions – in Europe by issuing guarantees and in the United States by nationalizing Fannie Mae and Freddie Mac in order to make credit available to households.

It is interesting to observe that there were a few exceptions to this government intervention in the mortgage funding arena. Both Denmark and Sweden avoided bailing out its mortgage lenders. When Fannie Mae and Freddie Mac had to rely on explicit backing by the federal government and a very large proportion of covered bond issuers in Europe had to resort to Government Guaranteed Bank Debt in order to attract funding both the Danish and the Swedish covered bond market remained open for both new issuance and trading without government sponsorship, cf. chart 21. The market for senior unsecured debt for banks saw similar developments putting pressure on banks’ balance sheets and ability to extend credit to households and businesses.

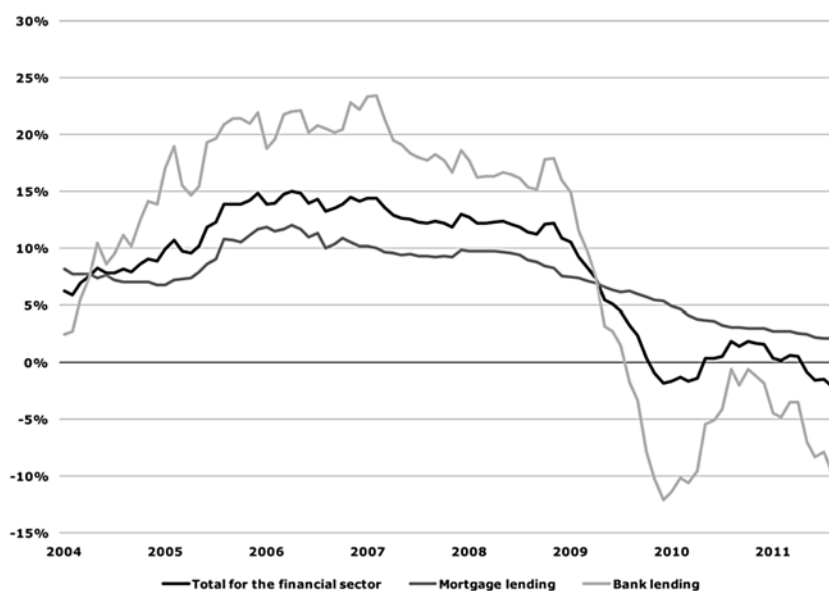
Chart 21. Issuance of Covered Bonds and Government Guaranteed Bank Debt



Source: Nykredit Markets.

The effect on the real economy of this pressure on the funding markets is not trivial. It is therefore crucial to secure access to funding for the lenders. The Danish experience show that the banks stopped lending because of lack of funding and that the mortgage banks on the other hand kept extending mortgage secured credit to both retail and corporate clients because they had ample access to funding via the Danish covered bond market, cf. chart 22.

Chart 22. Growth in Mortgage Bank Lending and Bank Lending in Denmark



Source: Danmarks Nationalbank.

As can be seen from the earlier shown data, growth in mortgage lending in Europe did slow down after the collapse of Lehman. With Belgium and Ireland as significant exceptions all other countries maintained positive growth rates in mortgage lending indicating that the housing finance systems was indeed robust in times of stress. Even in countries that experienced significant drops in house prices and/or GDP like Denmark and Spain the total amount of mortgage loans outstanding kept growing during and after the crisis.

8.5.4. Government Intervention

The US housing finance system has for many years been characterized by a high degree of government intervention. Even before the government had to step in and nationalize Fannie Mae and Freddie Mac and thereby de facto putting most of the housing finance system under government control there were a number of

government schemes in place to support the housing finance system. The US has socialized the cost of residential mortgages, while excluding most existing borrowers from the system. Denmark has socialized mortgage credit availability, while keeping mortgage credit risk taking in the private sector. Looking only at owner-occupied housing it is striking that the Nordic countries with its welfare state models seems to have taken a much more market oriented approach to housing finance than the United States.

Governments have implicitly supported mortgage systems through deposit insured funding. Recent experience show that the support extended well beyond the insured deposits. In the EU most bank creditors have been bailed out, with the prominent exception of two Danish cases. In fact even subordinated creditors have suffered losses only in Denmark, Ireland and recently Holland¹⁷.

If we take the explicit government support into consideration, there is a strong case for specialized mortgage banks that do not use deposits as funding.

Furthermore, given the preferential status of covered bonds, covered bond systems with extensive overcollateralization poses a potential greater risk to other creditors with implications for calls for bail out. It was earlier shown that overcollateralization is to a very large extent driven by market risk in covered bond systems. Covered bond systems that limit market risk therefore deserves promotion.

8.6. CONCLUDING REMARKS

We have moved from a financial crisis, where banks have been saved by government, but on occasions have caused the fall of sovereigns, to a government debt crisis, where governments are pulling down banks. In the discussion of regulatory policies, the focus is still on how to avoid the repercussions of the financial system on the sovereign and the economy at large.

The last decades have seen a series of financial crisis that offers different lessons for policy makers. The Savings and Loan crisis in the US was driven by the interest mismatch of financial intermediaries. The Scandinavian banking crisis in the early 1990ties was a classical cycle in the Reinhart-Rogoff mode, where real estate prices went through a boom and a subsequent bust. However, as opposed to the Japanese banking crisis, the problems in the banking sector in Scandinavia were swiftly addressed, and the banking sector was quickly able to serve the real economy. The Asian banking crisis in the late 1990ties showed the danger of short term external financing and exchange rate mismatches. The recent financial

¹⁷ Here we exclude a small British savings bank.

crisis has had elements of both a liquidity induced crisis in the spirit of Diamond and Dybvig, but more complex given the long intermediation chains cf. Shin(2010)¹⁸, and a boom bust cycle. The financial crisis has also shown that the costs to the economy is not just a question of bail out costs, but also of the costs to the real economy of a financial system that is hampered in its ability to provide finance to the real economy.

The regulatory response has been one of reducing the risks in financial intermediaries. The primary measures has been increases in capital and liquidity requirements, but also structural measures are being considered, cf. the recent Liikanen report. There are ways to structure financial intermediation so that risks are removed from the financial intermediaries. However, this leaves the question of where in the economy the risk should then be allocated.

In this paper, we have looked narrowly on mortgage finance and recent developments in that area. Mortgage finance matters; it is by far the biggest liability of households and mortgages account for a significant share of MFI assets in the EU. We have shown that developments in mortgage finance in the EU has been influenced by the financial crisis, but that there has also been differences across countries. We have shown that mortgage finance can be structured in an almost infinite amount of combinations and that there is a very diverse set of models operating across the EU. One major difference is whether interest rate are variable or fixed. A similarity is that mortgage finance is long term finance; really long term. We have shown the rating agencies assessment of the various covered bond systems that finance a large part of the mortgages. A notable lesson here is that credit risk play a lesser and more stable role than market risks.

We have finally assessed how the various systems have performed against four performance criteria. The good news for Europe is that we are doing a lot better than the US, although that is a low benchmark. Other observations are that the German system is on the restrictive side in terms of making housing finance available, whereas the Spanish system seems to have been too accommodating resulting in too little resilience towards falling property prices. European mortgage systems have generally done well in terms of maintaining the capacity to lend during the crisis, with the Swedish and Danish system performing at the upper end in terms of ability to sell covered bonds. The European mortgage finance systems were fortunately less entangled in government support than in the US. However, in most deposit taking banks there is an implicit subsidy that is amplified, if covered bonds are used as a financing instrument and where overcollateralization in relation to covered bond issuance is substantial. The

¹⁸ H. S. SHIN, *Financial intermediation and the post-crisis financial system*, BIS Working Papers, No. 304, March 2010.

latter is particularly apparent in systems, where there is substantial market risk embedded in the covered bond construction. Thus, there is a case for specialized mortgage institutions that are not deposit funded, and where market risk is relatively limited.

The risks in financial intermediation include credit risk, market risk, liquidity risk and operational risk. Credit and operational risk are characterized by being more opaque than market risk, which suggest that they should not be outsourced, given potential principal agent problems, whereas outsourcing of market risk may make more sense. Given the long maturity of mortgage loans, the potential size of market risk is also large, which is a further argument for outsourcing, as also indicated by the importance of market risk for rating agencies. The long maturity of mortgage loans also increase the potential of liquidity risks to create havoc.

The challenge is then to find investors that are willing to pick up market risk and liquidity risk. The obvious candidate is pension funds and other forms of long term savings. This raises at least two questions that deserves further analysis. One, can we match the parameters that borrowers desire with the parameters that investors want. Two, do we have enough long term savings to cater for long term borrowing needs.

A big issue in relation to matching borrowers and investors preferences are the choice between variable and fixed rates. Miles(2004)¹⁹ suggested that many borrowers in the UK would be better off with fixed rate loans instead of the prevalent variable rate loans. This would create a better match to the historical preferences of pension funds. However, One could query, whether fixed rate investments is the sensible instrument for pensions or rather reflects the prevalence of nominally defined benefit schemes that may not deliver the best return characteristics for pensions, including real certainty.

There is a lot of emphasis on the need to move from a microprudential focus, where the objective is the stability of a single institution, to a macroprudential focus, where the objective is the stability of the financial system as a whole. Still most regulatory initiatives at best aim at a segment of the financial system. In the EU the two biggest regulatory initiatives are CRDIV/CRR for credit institutions and Solvency 2 for life insurance companies, and soon to be used also in relation to pension funds. Both reflect a goal of reducing risks for institutions in the respective sectors, but few thoughts have been given to the interaction among the two sectors and the implications for the overall economy.

¹⁹ D. MILES, *The UK Mortgage Market: Taking a Longer-Term View, Final Report and Recommendations*, March 2004, HM Treasury.

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9. THE CASE FOR ACCELERATED AMORTIZATION

Alan Boyce, R. Glenn Hubbard, Christopher Mayer and James Witkin¹

9.1. BACKGROUND

A recent Zillow report² estimates that almost one-third of homeowners with a mortgage are underwater, with an average negative equity of over \$70,000. Despite facing daunting personal financial circumstances, about 90 percent of these underwater homeowners remain current on their mortgage. With house prices not expected to rise for years, these borrowers face an extended period of time in which they will need to continue making regular payments just to get back to even, let alone to a position from which they might be able to sell their home to move for a better job or trade up to a new property to make room for an expanding family. Underwater borrowers are at much greater risk of delinquency leading to foreclosure if they experience a negative economic, family, or health shock (death, disability, divorce, or unemployment). Such a shock not only leads to the tragic loss of a home, but it also imposes large losses on taxpayers and lenders who hold or guarantee the underwater mortgage.

Recently a number of policymakers have proposed that the government encourage underwater borrowers to take advantage of low interest rates to shorten the amortization periods on their mortgages (and in many cases also reducing their monthly payments). Such a plan would enable these borrowers to pay down their debt more quickly by taking advantage of mortgage rates that are even lower for 15-year and 20-year mortgages (currently about 3 percent and 3.5 percent respectively) than for 30-year mortgages (currently about 3.8 percent)³. Many borrowers can decrease the term of their loan by five years or more, saving money on their monthly payments while simultaneously getting out from being underwater much more quickly.

¹ The authors would like to thank Daniel Hubbard for excellent research support. All opinions are those of the authors and do not represent the views of the Federal Reserve Bank of New York, BlackBox Logic, Equifax, Knowledge Decision Sciences, and Zillow provided crucial data for our analysis.

² www.zillow.com/blog/research/2012/05/24/despite-home-value-gains-underwater-homeowners-owe-1-2-trillion-more-than-homes-worth/.

³ The Rebuilding Equity Act of 2012, recently introduced by Senator Merkley, proposes that Fannie Mae and Freddie Mac (the GSEs) incentivize underwater borrowers with mortgages guaranteed by the GSEs to refinance into mortgages with reduced loan terms. For these borrowers, the bill would have the GSEs pay the closing costs on HARP refinancings with a loan term of 20 years or less; see the full text of bill online at thomas.loc.gov/cgi-bin/query/z?c112:S.2909.

We analyze the costs and benefits of a government policy that would offer to pay the closing costs for underwater homeowners who choose a shorter amortization period for their refinanced mortgage. It is important to note that the benefits of such a plan require that government sponsored entities Fannie Mae and Freddie Mac (the GSEs) allow underwater borrowers to refinance their mortgages without constraints. We have called for the implementation of unrestricted refinancing in the past, but the GSEs have not yet allowed this refinancing to take place. As we have argued, an unrestricted refinancing program for GSE borrowers would allow up to 12 million borrowers to access low rates⁴.

When implemented in conjunction with a widespread refinancing program, we show that a proposal to encourage shorter amortization would save American taxpayers up to USD 6.7 billion through lower default rates and smaller losses on foreclosed homes for mortgages guaranteed by Fannie Mae and Freddie Mac⁵. As well, homeowners would be able to emerge from the indebtedness sooner, enabling them to avoid housing lock-in and costly foreclosures. The broader economy benefits as well, as potential workers are more flexible to move to locations where jobs are more prevalent and home prices stabilize with fewer foreclosures.

9.2. AN EXAMPLE

To understand this plan better, consider its impact on a particular group of underwater borrowers where there are clear benefits from its adoption. We have extensive data on GSE-guaranteed mortgages grouped by origination year, mortgage rate, and current loan-to-value (LTV) ratios⁶. In this section, we examine the approximately 25,000 American homeowners who have GSE-guaranteed mortgages originated in 2007, with interest rates between 6.5 percent and 6.99 percent and current LTV ratios between 110 percent and 125 percent. These mortgages have weighted average characteristics as follows: an outstanding balance of USD 176,000, a mortgage note rate of 6.66 percent, a LTV ratio of 116.8 percent, and 306 months until maturity with a monthly payment of USD 1,088.

⁴ See www4.gsb.columbia.edu/realestate/research/housingcrisis. Senators Boxer and Menendez have sponsored a bill to allow unrestricted refinancing that is similar to the plan above.

⁵ All results are based on scaling up the statistics from our initial sample of 9.1 million 30-year GSE-guaranteed FRMs with an aggregate balance of USD 1.7 trillion, of which 1.57 million (USD 292 billion) are underwater. The initial sample represents 56.4 percent of the total universe of 30-year GSE-guaranteed FRMs in terms of loan count and 62.9 percent of the outstanding balance. This imbalance is a result of restricting our data to zip codes in which we have Zillow HPI data to accurately calculate LTV. Our sample is thus more concentrated around MSAs and is likely to underrepresent rural areas that generally experienced lower home value depreciation and therefore have fewer underwater borrowers. As such, we scale up our results assuming we have captured three quarters of the universe of underwater GSE-guaranteed borrowers.

⁶ Source: Lender Processing Services (formerly McDash). Current LTV ratios calculated using Zillow zipcode-level HPI indices.

If these borrowers do not refinance and house prices remain constant, they will be, on average, underwater until late 2019. If there are defaults, the government must absorb the entire balance of the negative equity plus the large costs of managing a default and foreclosing on a property. Evidence shows that underwater borrowers are at heightened risk of default and foreclosure if they are subsequently hit with a negative economic or health shock (the so-called ‘double trigger’ theory of mortgage default)⁷.

If these underwater borrowers are able to refinance, they can choose among new 30-, 25-, 20-, or 15-year mortgages⁸. Table 1 below summarizes the borrowers’ potential choices using the respective prevailing market rates:

Table 1. Borrower Statistics for Potential Refinancings

	Mortgage Term				
	Current	30-Year	25-Year	20-Year	15-Year
Mortgage Rate	6.66%	3.81%	3.81%	3.45%	3.09%
Months to Maturity	306	360	300	240	180
Monthly Payment	\$1,088	\$746	\$828	\$924	\$1,112
Monthly Savings (%)	NA	31%	24%	15%	-2%
LTV in 5 Years	106.45%	105.31%	101.39%	94.65%	83.69%
Months Until Positive Equity w/o Home Appreciation	89	84	65	46	32

Clearly, these borrowers have a large incentive to refinance, as their current mortgage rate greatly exceeds today’s much lower rates⁹. However, these borrowers will remain underwater for the next seven years if they choose the most commonly originated 30-year fixed rate mortgage and house prices remain at today’s levels. By contrast, if such borrowers chose a 20-year mortgage, they would reduce their current monthly payments by 15 percent, while also achieving positive equity in less than four years. If they chose a 15-year mortgage, their payments would increase only slightly, while they would obtain positive equity by 2015 (that is, less than three years hence).

⁷ See, for example, N. BHUTTA, J. DOKKO and H. SHAN (2010), *The Depth of Negative Equity and Mortgage Default Decisions*, Finance and Economics Discussion Series 2010-35, Board of Governors of the Federal Reserve System. The authors present evidence in favor of the ‘double trigger’ theory in which negative equity combined with a bad economic shock lead to a high probability of default. For additional evidence, see K. GERARDI, A. H. SHAPIRO and P. S. WILLEN, *Decomposing the Foreclosure Crisis: House Price Depreciation versus Bad Underwriting*, Federal Reserve Bank Working Paper 2009-25, September 2009.

⁸ See www.freddiemac.com/pmms/ and www.mortgagenewsdaily.com/mortgage_rates/ for prevailing interest rates. Our program is slightly different than the Merkley bill in that we also allow borrowers to choose 25-Year mortgages and model the closing-cost payment as dependent on term reduction vis-à-vis the current mortgage, with larger reductions rewarded with higher reimbursements for closing costs.

⁹ As we have written before, many of these borrowers have been unable to refinance due to frictions in the refinancing market. We believe that the combination of opening up refinancing for all GSE borrowers without any qualification requirements as well as proving incentives to shorten amortization will offer the strongest benefits for taxpayers. See www4.gsb.columbia.edu/realestate/research/housingcrisis.

From the taxpayers' perspective, the GSEs save substantial funds if the borrowers can be convinced to choose a shorter amortization term. To calculate the GSEs' savings from these refinancings, we project the losses from default under each scenario. We estimate borrower default probabilities by applying the commonly used HAMP NPV Default model¹⁰. One of the primary implications of this model, used by servicers participating in HAMP to evaluate potential modifications, is that it shows that the LTV ratio has a large quantitative impact on predicting defaults relative to other variables such as the monthly mortgage payment or borrower credit. Therefore policies that reduce LTVs can have an especially large impact on reducing default rates relative to policies that reduce monthly payments alone. The HAMP NPV model is particularly sensitive to LTV reductions that get borrowers back to positive equity. LTV reductions that leave the borrower with LTVs in excess of 125 have much lower impact. Table 2 shows the predicted default probability and government savings under each scenario:

Table 2. Government Impact by Potential Refinancings

	Mortgage Term				
	Current	30-Year	25-Year	20-Year	15-Year
Default Rate	15.78%	14.14%	12.13%	9.17%	5.76%
Delinquency Severity	55%	55%	50%	50%	50%
Projected Losses	\$13,884	\$12,440	\$9,702	\$7,339	\$4,611
Government Savings (per borrower)		\$1,444	\$4,182	\$6,545	\$9,273

The potentially large government savings from borrowers refinancing to a shorter mortgage term come as a result of lower default probabilities for lower LTV borrowers and a lower loss severity conditional on default since borrowers pay down their mortgage more quickly under the program. Given these results, the government has a strong incentive to encourage borrowers to reduce their amortization term when refinancing as long as the cost of encouraging borrowers to take a shorter amortization exceeds the estimated savings. In the subsequent sections, we will evaluate whether a government payment is a cost-effective means to achieve this goal when applied to all GSE borrowers.

¹⁰ The primary inputs for this model are LTV, debt-to-income ratio (DTI), and FICO score. For DTI, we assume that the initial mortgage balance was three times the borrower's income and that home payments make up 65 percent of total debt service. For FICO scores, we use the average FICO scores for April 2012 rejected GSE refinancing applications, as reported by Ellie Mae (See www.elliemae.com/aboutus/about_reports.asp). For LTV ratios, we use the Year-5 LTV, as this allows default rates to vary with loan term. Even using Year-3 LTVs yields a positive government NPV. For more information on the HAMP NPV model, see hmpadmin.com/portal/programs/docs/hamp_servicer/npvmodeldocumentationv403.pdf.

9.3. NET IMPACT TO TAXPAYERS

To understand the aggregate impact of an upfront government subsidy, we expand the above analysis to cover the universe of underwater borrowers with GSE-backed mortgages¹¹. In order to be eligible for the simulated program, borrowers must be underwater on their mortgage and current on their payments with no more than one late payment in the past 12 months¹². Under our simulated program, the GSEs would pay between \$1,000 and \$3,000 in closing costs associated with a refinancing, with higher payments for borrowers who choose to take shorter amortization mortgages¹³. We evaluate the program based on a matrix of take-up rates, in which borrowers prefer shorter amortization mortgages, but only if a shorter amortization period comes with lower mortgage payments. In the earlier example, our take-up matrix would predict that a borrower would likely choose to refinance into a 20-year mortgage, instead of the 15-year mortgage, because the payments for the 15-year mortgage would be higher than their current mortgage payments on the existing high-interest rate 30-year mortgage. However, an appropriate incentive payment would encourage the borrowers to choose the 20-year mortgage instead of the traditional 30-year mortgage when these borrowers refinance. Finally, we assume that house prices depreciate another 5 percent from today's levels before bottoming out.

The analysis shows that there are 1.68 million eligible underwater mortgages guaranteed by the GSEs. Of that group, we estimate that 1.44 million would choose to refinance in a streamlined refinancing plan, a very high take-up rate, but consistent with the view that many of the underwater borrowers receive strong benefits from refinancing but have been locked out from doing so up to now¹⁴. With our incentives, about 151,000 borrowers would still choose a 30-year term, while the remainder would choose a shorter amortization schedule. Overall monthly payments would decrease by more than 10 percent relative to their current mortgages. Weighted-average LTVs in the fifth year would decrease by 8 percent, and borrowers would achieve positive equity nearly three years faster than in the baseline.

Next, we quantify the government's financial costs and benefits from implementing such a program. The direct costs of the closing-cost subsidy are approximately USD 3.35 billion, which we compute by summing the individually

¹¹ The simulations are available in an Excel spreadsheet at www4.gsb.columbia.edu/realestate/research/housingcrisis.

¹² We do not impose a cut-off date restriction. This makes our estimated benefits slightly larger than would apply with the Merkley bill.

¹³ This is similar to the Merkley bill, which pays \$3,000 toward closing of any loan with a term of 20 years or less. Our simulations give borrowers a \$1,000 credit for reducing amortization by up to 24 months, \$2,000 for reducing amortization 24 to 48 months, and \$3,000 for reducing the term more than 48 months. Based on MBS pricing and the average loan balance, we impute the implied interest rate reduction per government dollar paid.

¹⁴ See Appendix Figure 1 for a complete breakdown of refinancings by new term length.

calculated government payments for each cohort of refinancings. Next, we turn to benefits. Using the HAMP NPV Default Model, we predict a decrease in the overall default rate of approximately 7.1 percent off a baseline predicted default rate of approximately 27 percent¹⁵. The estimated default rate is very high for this group of borrowers because many are appreciably underwater. The lower default rate combined with a smaller estimated loss severity for those who take up the program generates savings of about USD 12.8 billion. However, this figure provides an overestimate of the program's benefits because some portion of the borrowers would have refinanced into a shorter-term mortgage even without the government subsidy. These borrowers represent a pure cost to the government, as the incentive payment has no impact on their behavior. So we reduce this figure by the percentage of borrowers that already would have refinanced into an accelerated amortization mortgage. Using data from January to April of 2012, we estimate that 21.5 percent of underwater borrowers who refinanced their mortgage (likely using a HARP refinancing) would have taken out a mortgage with less than a 30-year term even without government intervention¹⁶. Reducing the previous default savings by 21.5 percent yields a government savings of USD 10 billion over the baseline default calculations. Combining the savings with the direct costs of the subsidy, the plan would have a net positive impact on the government of USD 6.67 billion. Thus, the program would generate substantial savings for taxpayers even before considering potential benefits for the housing market in terms of lower defaults and for the economy as workers become more mobile.

9.4. DISCUSSION OF THE RESULTS

We now consider the reasonableness and robustness of the assumptions used for our computations. One possible critique is that the HAMP model overstates the impact of negative equity on losses going forward. For example, some might wonder whether negative equity will really have a large impact on default probabilities going forward for a group of borrowers who have been making their mortgage payments on time throughout the crisis. We examine more recent data from LPS/McDash to evaluate this possibility. Looking at the first quarter of 2012, we observe that 17.3 percent of underwater mortgages are delinquent compared to a 3.8 percent delinquency rate for borrowers with a current LTV of 80-99 percent, a relative increase in default rate of more than 350 percent. Of

¹⁵ To be conservative in our estimates, we define the baseline default rate as the lower of the current default probability and the default probability of a new 30-year mortgage.

¹⁶ See the Appendix Figure 2 for a breakdown of underwater originations by term length. This figure represents the percentage of underwater borrowers refinancing into mortgages with terms of 25 years or less. It is almost certainly too high (leading to more conservative government savings), as borrowers who have been able to refinance are likely less financially constrained and more likely to select a non-traditional mortgage product.

course, the GSEs should only care about newly delinquent borrowers. We then limit our analysis to mortgages that were current in December 2011. In the following quarter, on average, 1.5 percent of underwater mortgages became newly delinquent per month, compared to 0.62 percent of mortgages that had an LTV of 80-99 percent, a relative increase in the default rate of 140 percent¹⁷. Our preliminary analysis considers any type of delinquency, not just serious defaults, and does not condition on other factors that lead to default such as credit score or monthly payments. Nonetheless, the data support the view that LTV remains an important factor in predicting mortgage defaults and that a program that lowered LTV would likely generate appreciable savings through lower defaults.

Another possible area of concern is what borrowers might have chosen absent a government payment. As mentioned earlier, nearly 80 percent of underwater borrowers currently refinance into new 30-year mortgages. In our analysis, we estimate that this option is the right one for only about 6 percent of underwater refinancings. These two statistics appear contradictory, but the answer lies in the products that are currently marketed to consumers. If we eliminate the 25-year and 20-year options, our model predicts that 94.5 percent of refinancings would be 30-year mortgages. Such a scenario is clearly a simplification, but it sheds light on the real issue: why do more borrowers not choose 25- and 20-year mortgage terms when the economics are so appealing?

The answer is that these are unconventional products that are not readily available to borrowers in the market today. Only one of the 'Big Four' banks posts mortgage rates for 20-year fixed-rate mortgages on its website's refinancing section, and no big bank posts 25-year mortgage rates¹⁸. Because lenders do not openly offer them, borrowers may be unaware of these options¹⁹. This proposal would go a long way toward opening up the market for 20- and 25-year mortgages by spurring demand and thus creating liquidity for this new product.

9.5. CONCLUSION

We expect that a program to pay the closing costs of borrowers who choose to pay off their mortgage more quickly would lead over one million underwater borrowers to choose a shorter amortization mortgage, enabling these homeowners to get out of debt more quickly and lowering their estimated

¹⁷ On an annualized basis, this suggests that 17.3 percent underwater borrowers will become delinquent, while only 7.7 percent of borrowers in the lower LTV category are delinquent. See Appendix Table 1 and Appendix Table 2 for delinquency statistics by LTV ratio.

¹⁸ Bank of America, JP Morgan Chase, Citi, Wells Fargo. Websites accessed June 11, 2012. Only Bank of America posted 20-year rates, and those rates had to be manually added.

¹⁹ When these 20 or 25-year loans are made, they are separately pooled and sold to the bond market at a big premium to 30-year TBAs, which shows that lenders face no difficulty securitizing them.

likelihood of default. Such a program would help stabilize the housing market and benefit the overall economy through greater labor mobility and lower indebtedness without cost to taxpayers.

APPENDIX TABLES

Appendix Table 1

Overall weighted-average delinquency rates (defined as non-Current) by LTV, as of March 2012

LTV	Weighted Average Current Delinquency Rate	Relative Change in Total Delinquency Rate as Compared to LTV 80-99.99
0-59.99	2.09%	N/A
60-79.99	3.37%	N/A
80-99.99	5.47%	N/A
100-109.99	10.89%	99.00%
110-124.99	15.14%	176.70%
125 and above	26.08%	376.83%
Missing	5.61%	N/A

Note: The denominator for '% Delinquent' is all GSE first mortgages that were active both in December 2011 and March 2012, with no missing payment statuses in the past four

Source: Lender Processing Services/McDash.

Appendix Table 2

Monthly and annualized weighted-average new delinquency rates from January to March 2012 by LTV for loans current the prior month

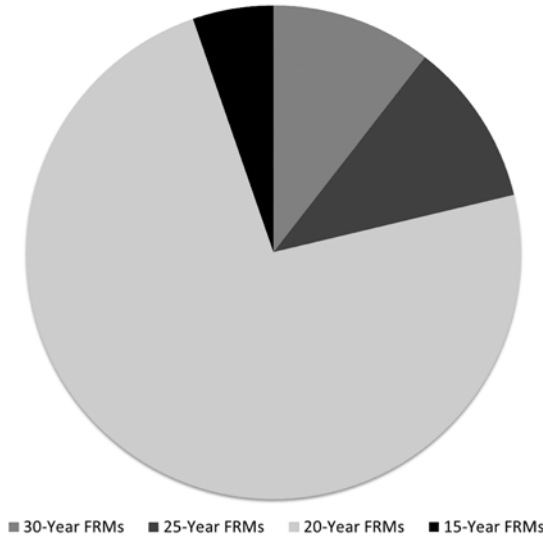
LTV	Monthly Percent Going From Current to Delinquent	Increase Relative to LTV 80-99.99	Annualized Rate	Increase Relative to LTV 80-99.99
0-59.99	0.47%	N/A	5.78%	N/A
60-79.99	0.59%	N/A	7.36%	N/A
80-99.99	0.76%	N/A	9.47%	N/A
100-109.99	1.18%	55.97%	15.12%	59.69%
110-124.99	1.44%	90.21%	18.71%	97.58%
125 and above	1.97%	160.41%	26.39%	178.68%
Missing	0.93%	N/A	11.77%	N/A

Note: The denominator for '% Becoming Delinquent' is a subset of the data explained above, restricted to loans that were not delinquent in the previous months.

Source: Lender Processing Services/McDash.

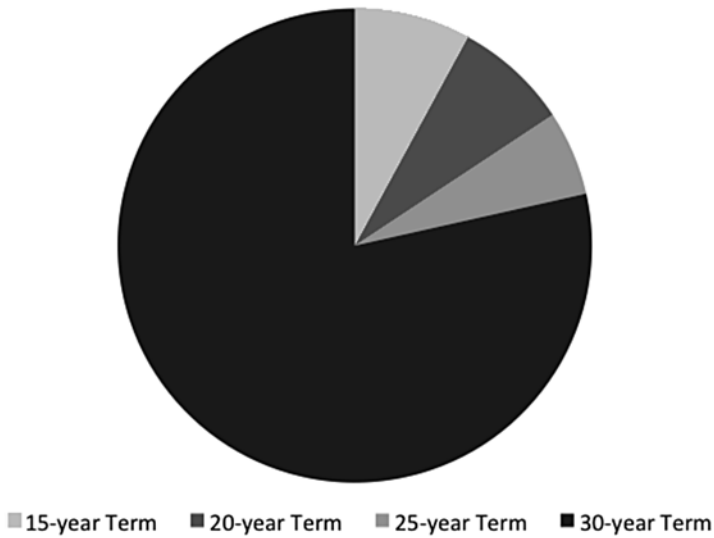
APPENDIX FIGURES

Appendix Figure 1
Projected Term Length for Refinancings of Underwater GSE-Guaranteed Mortgages,
with Government Amortization Incentive Program



Source: Authors' calculations using data from Lender Processing Services/McDash.

Appendix Figure 2
Refinancings of Underwater Borrowers by Term Length, January-April 2012



Source: Lender Processing Services/McDash.

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