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The effect of mortgage interest deduction and mortgage characteristics on house prices

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ABSTRACT

In many countries, house prices are overvalued according to price-to-income ratios. We propose that the borrower's ability to pay (ATP) through a mortgage is a long-run house price fundamental and find convincing evidence by means of cointegration tests, granger causality, and an elasticity of house prices with respect to ATP close to one. ATP incorporates the effect of a decreasing trend in interest rates, changes in mortgage interest deduction and mortgage characteristics. We apply the model to the United States of America, United Kingdom, Belgium, the Netherlands, Sweden, Norway, Finland and Denmark. The results provide an intuitive alternative to standard house price models.

1. Introduction

From the mid-1990s until the recent financial crisis, house prices have increased at an astonishing growth rate in almost every developed country. This sharp increase raised concern about housing bubbles and strong overvaluation in the housing market. Assessing the possibility of overvaluation with price-to-income ratios or price-to-rent ratios would indeed suggest that many housing markets were overvalued. Even after the crisis, The Economist (November 26th, 2011; January 4th, 2014) and various policy institutions argue that many property markets "are still looking uncomfortably overvalued" based on price-to-income ratios.

There are, however, several reasons why a price-to-income ratio fails to reflect the true cost of housing. The metric does not incorporate the interest rate and therefore has ignored the effect of the decreasing long-term interest rates on house prices since the 1980s. Moreover, the maximum rate at which mortgage interest is deductible differs between countries and over time. This can lead to differences in the amount that households are able to pay that a simple price-to-income ratio ignores. Finally, in this low interest-rate environment, the standard annuity mortgage with fixed periodic mortgage payments that clear the mortgage at the end of the term has been losing popularity recently in favor of interest-only alternatives (Scanlon et al., 2008). Mortgage product innovation can lead to higher amounts that people are able to pay such that income alone is insufficient in explaining house prices.

To gain further insight in the evolution of house prices in the long run, we develop a model in which households maximize their lifetime utility. The optimal solution results in a relationship between house prices and a variable that can be interpreted as the ability to pay (ATP) of the average household. In a first extension we augment the model to allow for mortgage interest deduction (MID) where the fiscal deduction of mortgage interest payments leads to higher house prices through a higher amount that households are able to pay. A second extension will be mortgage product innovations. Besides the standard annuity mortgage, we model two groups of mortgages. The first are the interest-only loans with repayment vehicle, such as endowment or savings mortgages. The borrower is able to make maximum use of the MID as the principal is only repaid at the end of the mortgage term through a repayment vehicle. The second group contains pure interest-only loans where the borrower has no repayment vehicle. The borrower does not accumulate equity as he only makes interest payments and hopes to refinance or pay off the mortgage through the sale of the house at the end of the term.

The model indicates that there is a constant fraction of income that goes to housing payments, which results in an amount that people are able to pay based on the possibility to deduct mortgage

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interest payments and innovative mortgage products. Changes in the MID or mortgage characteristics can be interpreted as regime shifts such that standard cointegration tests are unable to reject the null hypothesis of no cointegration (Gregory and Hansen, 1996) between house prices and income alone. Conventional and panel cointegration tests are, however, able to reject the null hypothesis of no cointegration between house prices and the measure of ATP that incorporates the MID and mortgage characteristics. We apply the model to a selection of 8 OECD countries in which the tax rate at which mortgage interest is deductible or mortgage characteristics have changed over time. ATP Granger causes nominal house prices, while evidence in the other direction is much weaker. The elasticity of house prices, with respect to our measure of ATP adjusted for MID and mortgage product innovation, is furthermore close to one, which indicates that ATP has an important economic role.

We contribute to the existing literature in multiple ways. A first contribution of the paper is that we propose a new long-run fundamental of house prices that incorporates the MID and mortgage characteristics. Therefore, the model provides an alternative toolbox to assess overheating in the housing market and study price forming for a whole range of scenarios. An important insight is that under reasonable assumptions, full capitalization of the MID into house prices is larger than the net present value of all future net tax benefits. The economic intuition from the model is that impatient households want to transfer future wealth to the present, but a borrowing constraint prevents this. Therefore, the borrower increases housing consumption as if the initial net tax benefits of the MID would not decrease over time even if interest deductions do decrease over time due to amortization. This may be of interest to policy makers who want to study the impact of changes in tax rules on house prices. Moreover, the model can be used for stress tests of mortgage lenders as the framework allows us to study the effect of changes in interest rates on house prices, which varies across countries depending on tax rules and the shares of the different mortgage products. As an example, we calculate the predicted effects on house prices from changes in the interest rate and the fiscal deductibility of mortgage interest. Finally, whereas other studies often focus on a single country, we examine the housing markets in a sample of 8 OECD countries, which makes the results of interest to a large readership.

The paper proceeds as follows. We start with an overview of the existing literature which is followed by a description of the theoretical model. The subsequent sections describe extension to the baseline model that include the mortgage interest deduction and different mortgage characteristics. Section 3 describes the data that we use in the empirical exercise The empirical results are presented in Section 6 and include cointegration analyses, the estimation of a VECM model, an analysis of the economic importance of ATP and its components, Granger causality tests and a comparison with conventional user cost models. Section 6.5 describes some sensitivity analyses and we conclude in the final section.

2. Can fundamentals explain house prices? An overview of the literature

The question whether fundamentals can explain house price movements has initiated a whole debate in the literature. A variable is a long-run fundamental if a cointegration test can indicate that the residuals from a regression of house prices on that variable (and possibly other explanatory variables) are stationary. Using national data, Meen (2002) reports test statistics that are unable to reject the null hypothesis of no cointegration between house prices and fundamentals. Individual time-series cointegration tests are, however, known to have low power when the time span of the data is small. Other studies use panel cointegration tests in the hope for more variation in the data that will increase the power of the test (Baltagi, 2008). Malpezzi (1999) is able to reject the null hypothesis of no cointegration in a panel of 133 metropolitan areas from 1979 through 1996 using panel unit root tests described in Levin and Lin (1992). Gallin (2006) , however, pointed out that the critical values of the unit root test are incorrect when they are applied to residuals from the first-stage estimation such that the null hypothesis is rejected too often. The unit root tests have also been criticized as they assume cross-sectional independence. Gallin (2006) adopts a bootstrap approach that allows for cross-sectional dependence and shows that none of the tests rejects the null hypothesis of no cointegration in the USA. Using Australian data, Costello et al. (2011) provide evidence of "sustained deviations of house prices from values warranted by income" and Ambrose et al. (2013) find evidence that the correction of deviations from fundamentals can take decades using a unique data set for houses in Amsterdam from 1650 through 2005. Holly et al. (2010) are able to reject the null hypothesis of no cointegration between house prices and income in the USA using the CIPS panel unit root test described in Pesaran (2007).[1]

A crucial element that deserves more attention is, however, the difference in null hypothesis between cointegration tests that use individual time-series and panel tests. The null in panel unit root tests says that *all* the series are integrated of order one. Rejection, therefore, does not mean that *all* the series are stationary, as a rejection of the null hypothesis only indicates that a significant fraction of the series is stationary. The results of panel unit root tests should therefore be careful interpreted (Maddala, 1999; Pesaran, 2012). So far, panel tests are introduced as a solution for the low power of individual time-series cointegration tests whereas the difference in null hypothesis is ignored. In this paper, we also present individual time-series cointegration tests in addition to panel tests to make sure that a rejection of the null hypothesis of no cointegration is not driven by a small proportion of the countries in the study, but due to our house price fundamental itself.

Therefore, we augment income as a long-run house price fundamental as most households finance their house purchase through a mortgage loan. The housing market indeed depends critically on credit market conditions (Case, 2008) and the link between house prices and credit lending has recently attracted considerable interest in empirical papers (Anundsen and Jansen, 2013; Brissimis and Vlassopoulos, 2009; De Haas and de Greef, 2000; Fitzpatrick and McQuinn, 2007; Gerlach and Peng, 2005; Gimeno and Martinez-Carrascal, 2010; Hofmann, 2004; Oikarinen, 2009 among others). Most studies find a bi-directional relationship between credit and house prices and offer support for the view that both markets are dependent on each other. McQuinn and O'Reilly (2006) propose an intuitive theoretical model of the housing market based on the observation that most house purchases are mortgage-financed. Hence the amount that households are able to borrow depends on their income and interest rates – given plausible assumptions of the fraction of income that goes to mortgage repayments and the duration of the mortgage terms. Madsen (2012) proposes a model that explains house prices by demand in the short run and supply in the long run. In the short run, house prices are driven by the maximum obtainable loan and the number of house buyers. In the long run, the housing stock is unlikely to remain constant such that the most important determinant of housing will be the replacement cost. His model is able to explain the 1995–2007 house price run-up in the OECD countries with declining interest rates as one of the important factors. The

[1] Other papers that study the relationship between house prices and fundamentals are Gallin (2008), Mikhed and Zemcik (2009a), Mikhed and Zemcik (2009b), Duca et al. (2011b), Duca et al. (2011a), Muellbauer (2012), André et al. (2014), and Anundsen (2015) among others.