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House price risk and the hedging benefits of home ownership ☆

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ABSTRACT

Using a repeat-sales methodology, this paper finds that estimates of house price risk based on aggregate house price indices substantially underestimate the true size of house price risk. This is the result of the fact that aggregate house price indices average away the idiosyncratic volatility in house prices. Additional results show that the idiosyncratic risk exceeds the hedging benefits of home ownership. These results imply that for many home owners, owning a house may well add more price risk than it hedges away. These findings are based on a detailed dataset of individual housing transactions in the Netherlands.

1. Introduction

The current financial crisis has demonstrated that house price changes can exhibit substantial volatility over short periods. Given the welfare implications of such changes, there has been considerable interest in measuring the size of house price volatility (house price risk) and its implications for the decisions of home owners (e.g. Sinai and Souleles, 2005, 2009; Han, 2008, 2010; Banks et al., 2010).

Aggregate national or regional house price indices are commonly used to measure house price risk. This is mainly the result of the ease of access to such indices in most developed countries. In the US, for instance, the Federal Housing Finance Agency (FHFA) provides house price indices for each Metropolitan Statistical Area (MSA). The Case-Shiller MSA indices are also widely used. Although these indices certainly have their merits, the use of such aggregate indices to measure house price risk leads to an underestimation of this risk.

To better understand this issue of underestimation and its implications, it is important to highlight two aspects of house price risk. First, home owners can use the house as a hedge against future housing costs (Sinai and Souleles, 2005, 2009). The hedging benefits of home ownership are especially high when the change in house prices between the current and future residence are positively correlated over time. More precisely, a positive correlation reduces house price risk. Second, house price risk is determined by market risk – as a result of national, regional, or even local, housing market shocks – but also by idiosyncratic risk. The idiosyncratic component of house price risk is an important part of the (price) risk of owning a home, because the typical home owner cannot perfectly diversify their housing investment across locations (Hilber, 2005).

All of the aforementioned components of house price risk – hedging through home ownership, market risk, and

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idiosyncratic risk – are essential to estimate the size of house price risk. The issue is that, aggregate house price indices can be used to measure market risk, and possibly the correlation across markets, but such indices average away idiosyncratic risk, which will lead to an underestimation of the true size of house price risk. In addition, if the idiosyncratic risk component is large, owning a house may well add more risk than it hedges away.

The aim of this article is to measure the size of the idiosyncratic risk component in house price risk relative to the market risk and hedging benefits of owning a home. From an empirical perspective, idiosyncratic risk is hard to measure, because it requires data on individual housing transactions. In this paper, we use a dataset that consists of all transaction prices of existing homes that were sold in the Netherlands over the period 1995–2008. We use a repeat-sales methodology to estimate house price risk. It is important to note that the Netherlands is comparable in terms of population (16.5 million in 2009) and land size (13,000 square miles) to a large Metropolitan Statistical Area.[2] As such, our study can be interpreted as a within-MSA analysis. Since most households (about four-fifths) move within MSAs conditional on moving within a five-year window (see Sinai and Souleles, 2009), it is the individual variation in housing capital gains within those particular areas that makes owning a home risky. This makes our findings especially interesting.

The estimation results in this paper show that about 89.4% of the individual variation in (annual) housing capital gains in the Netherlands remains unexplained after filtering out aggregate market trends (market risk). This result supports the idea that house price risk estimates based on aggregate house price indices ignore most of the individual heterogeneity in housing capital gains. In addition, we find that even if a home owner could perfectly hedge against the differences in average house price changes across *all* local housing markets (municipalities in the Netherlands), they could only reduce the total variation in housing capital gains by 1%. This increases to 2.8% if we control for the hedging opportunities across neighborhoods. If we control for the effect of local market trends and the hedging opportunities across municipalities, the unexplained idiosyncratic variation is still 85.1%. These results suggest that both the hedging benefits of home ownership and market risk are relatively small in comparison to the idiosyncratic risk within the Dutch housing market.

These findings have several implications for the existing literature. First, our estimates show that excluding idiosyncratic risk leads to a severe underestimate of house price risk. Second, our results suggest that simply owning a house is unlikely to provide an effective hedge against house price risk. This result does not imply that there are no hedging benefits of home ownership within or across regions (e.g. across MSAs, see Sinai and Souleles, 2009), but that those benefits most likely get outweighed by the idiosyncratic risk within those regions. Third, it has been suggested that house price futures could hedge home owners against house price risk (Case et al., 1991; Englund et al., 2002; Iacoviello and Ortalo-Magné, 2003; Quigley, 2006; Shiller, 2008). Our empirical results imply that house price futures, if they are based on aggregate house price indices, only hedge the home owner against a relatively small (market risk) portion of overall house price risk. This result is in accordance with De Jong et al. (2008) and it may explain why most home owners currently do not use house price futures to hedge themselves against house price risk.

The remainder of this paper is organized as follows. Section 2 highlights several important aspects of house price risk and the hedging benefits of home ownership from a theoretical point of view. This is designed to provide some useful guidelines for the empirical analysis of house price risk reported in Sections 4 and 5. Section 3 discusses the data. Section 4 describes the empirical methodology. In Section 5 the regression results are reported. Section 6 outlines possibilities for future research. Section 7 provides a conclusion.

2. Some important aspects of house price risk

Assume that a home owner pays a price $-P_t^A$ when he buys a home at location A at time t. The home owner sells the house for price $\tilde{P}_{t+s}^A$ at time $t+s$. Hence, s is the expected length of stay at time t, where $s > t$. The tilde indicates that the sale price of the house is uncertain at time t. Also assume that a home owner stays in the owner-occupied housing sector after selling their house.[3] The home owner pays $\tilde{P}_{t+s}^B$ for his next house at time $t+s$. This house is at location B. Since both the sale price $\tilde{P}_{t+s}^A$ and purchase price $\tilde{P}_{t+s}^B$ are future pay-offs, they are discounted by δ^{t+s}, with $\delta \leqslant 1$. The home owner's current value position in housing is

$$Total_{A,B,T,s} = -P_t^A + \delta^{t+s}(\tilde{P}_{t+s}^A - \tilde{P}_{t+s}^B). \quad (1)$$

Eq. (1) resembles, in simplified form, the cost of owning a house as defined by Sinai and Souleles (2005).[4] Eq. (1) shows that a typical home owner has a long position in current housing and a short position in future housing.[5]

We use the variance of the home owner's value position in owner-occupied housing (Eq. (1)) to measure house price risk.[6] We assume that $VAR(\tilde{P}_{t+s}^A) = \sigma_A^2$, $VAR(\tilde{P}_{t+s}^B) = \sigma_B^2$, and that house prices at location A and B are allowed to be correlated ($COV(\tilde{P}_{t+s}^A, \tilde{P}_{t+s}^B) \neq 0$). In this case, house price risk equals

$$VAR(Total_{A,B,t,s}) = \delta^{2(t+s)}[\sigma_A^2 + \sigma_B^2 - 2COV(\tilde{P}_{t+s}^A, \tilde{P}_{t+s}^B)]. \quad (2)$$

[2] The Netherlands also has a clear urban core and a surrounding periphery, which accords with the definition of a MSA.

[3] Most home owners, after selling their house, will typically choose to own (buy) their next house as well (i.e. due to taxation, other institutional factors, personal preferences, etc.). As such, in this paper, we do not focus on the effect of the tenure choice on house price risk (see Sinai and Souleles, 2005, for a discussion of the tenure choice, rent risk, and house price risk).

[4] The cost of owning is equation (1) multiplied by minus 1. Sinai and Souleles (2005) also incorporate the sale price of the home at location *B*.

[5] Note that equation (1) does not include other factors such as transaction costs, ownership of multiple houses, the mortgage, or other assets.

[6] Of course, the exact welfare economic implications of house price risk also depend on the (risk) preferences/specific portfolio of the home owner (also see Ortalo-Magné and Prat, 2010).