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House prices, bank instability, and economic growth: Evidence from the threshold model

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ABSTRACT

This paper examines the effects of house prices on bank instability when gauged at various levels of income growth. Bank stability may respond differently to house price changes or deviations from fundamental values in an economic boom environment than in a bust circumstance. A threshold estimation technique developed by Hansen (1999) is applied to a panel of 286 U.S. Metropolitan Statistical Areas (MSAs) over the period 1990Q1–2010Q4. We consider two house price indicators: the house price changes and the house price deviations from long-run equilibrium. The results suggest the existence of income growth threshold effects in the relationship between house prices and bank instability. Specifically, there are two income growth thresholds when using the house price changes and one income growth threshold when the house price deviations are applied. Robustness results using the non-MSAs sample from 1995Q1 to 2010Q4 provide further evidence of income growth threshold effects.

1. Introduction

The role of the real estate market in the U.S. economy is undoubtedly important and conditions in the housing market signal the state of the economy as a whole. The U.S. economy has been sluggish for 4 years since the subprime mortgage crisis developed in 2007 and 2008, which was triggered by the 2005 housing bubble burst. The banking system, which functions as mortgage lenders and frequently uses real estate as collateral, is a link between the housing market and the macro-economy. Recent bank failures have been associated with the housing bubble burst. For example, over four hundred U.S. banks failed in 2008–2011.[1] This paper addresses the questions of whether and how house prices affect the stability of banks under different income growth levels using the house prices and bank variables of 286 U.S. Metropolitan Statistical Areas (MSAs) from 1990Q1 to 2010Q4. What distinguishes our work from the previous studies on the relationship between house prices and bank stability is that our work (1) takes into account the various levels of income growth and (2) uses disaggregated data[2] which better reveals the heterogeneity of regional real estate markets and commercial banks in the US.[3]

We define housing markets as MSAs, which correspond to labor market areas within which workers are willing to commute. MSAs can vary considerably from the national average of house prices. Despite the sizable boom-bust pattern in house prices at the national level, regional housing markets in the U.S. experience considerable heterogeneity in the amplitudes of their cycles or in the house price dynamics. Sinai (2012) documents different magnitudes in the booms and busts across MSAs in the US: the 75th percentile MSA experienced 111% trough-to-peak growth in real

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[1] The number is based on the Failed Bank List from the Federal Deposit Insurance Corporation.

[2] Details on the data sources and coverage can be found in Section 2.3 and Appendix.

[3] We focus on commercial banks rather than bank-holding companies due to data availability. Specifically, a bank-holding company is a company that controls one or more banks, but does not necessarily engage in banking itself. A commercial bank is a bank that lends money and provides transactional, savings, and money market accounts, etc. It grants secured loans in which the borrower pledges some assets as collateral for the loan, e.g. a car or property. It also grants unsecured loans that are not secured against the borrower's assets, e.g. bank overdrafts, corporate bonds, credit-related securities, etc. Changes in banking laws now allow commercial banks to make home mortgage loans on a more liberal basis than ever before. Commercial banks are active in home financing and have become a major source for residential and commercial mortgage loans.

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house prices in the 1990s and 2000s, whereas the 25th percentile MSA had only 32% trough-to-peak real house price growth. We thus take into account the heterogeneity of immobile real estate assets and the regional variation of house prices when measuring their dynamics and deviations from their fundamental values, using quarterly information on real estate prices in 286 U.S. MSAs. Housing markets vary across U.S. regions due to disparities in economic development and population growth, and they are likely to have different impacts on bank stability.

MSA-level data have been used to conduct various empirical studies related to the U.S. housing markets. For instance, Bhattacharya and Kim (2011) use a panel of 20 MSAs in the U.S. over the period 1990Q2–2009Q2 to study the impact of underlying economic factors on real house prices. In another study, Zabel (2012) investigates how the housing market affects the flow of workers across cities using house price indexes for 277 U.S. MSAs from 1990 to 2006.

In this study, we focus on residential property (one-to-four family residential property) markets in the US, which on average account for over 76% of mortgage debt outstanding for all holders (including major financial institutions, federal and related agencies, mortgage pools or trusts, individuals, and others). Commercial property (nonfarm, non residential) markets on average account for 17% of mortgage debt outstanding for all holders; multifamily residential property markets account for 6%; and farm land accounts for 1%.[4] Thus, residential property was and remains a key element in fueling the turmoil in financial markets in terms of their share as collateral in asset-backed securitization, as opposed to other real estate segments.[5]

Following the previous empirical work, we consider two measures of the house price indicator when assessing the impact of house prices on bank instability: percentage changes in house price index and house price deviations from fundamental values. The first of these is commonly used in the literature. However, researchers have recently argued that house price deviations from the long-run equilibrium should also be considered to study the relationship between house prices and bank stability (Koetter and Poghosyan, 2010). We apply the pooled mean-group (PMG) and mean-group (MG) estimators to estimate house price dynamics and deviations from fundamental values in 286 U.S. MSAs. Our results confirm a common long-run positive relationship among house prices, personal income, and labor force growth in the MSAs, and provide evidence of a house price adjustment to the long-run equilibrium.

To assess the impact of house prices on bank instability, we need to determine the state of the banking system. Non-performing loans[6] (NPLs) have been a popular indicator used in the literature (Nkusu, 2011; Kauko, 2012, among others). However, empirical studies using disaggregated bank-specific data for MSAs in the US remain scarce. In this paper, we use NPLs to gauge bank instability at the MSA level[7]: larger amounts of NPLs relative to total loans in banks indicate increasing bank instability. Other measures for bank instability in previous studies include bank failure rates (Cebula et al., 2011) and the probability of distress events (Koetter and Poghosyan, 2010). To our knowledge, NPLs are the best available measure of bank instability for commercial banks in U.S. MSAs.

In the literature, there are two competing theories about the effects of house prices on bank stability: the collateral value hypothesis (Daglish, 2009; Niinimaki, 2009) and the deviation hypothesis (Von Peter, 2009; Gerlach and Peng, 2005). The collateral value hypothesis argues that rising house prices promote bank stability by increasing the value of the houses owned by the bank and the value of the collateral pledged by borrowers; thus, it suggests a negative relationship between nominal house price changes and the bank's NPLs. In contrast, the deviation hypothesis contends that persistently rising house prices enhance larger exposure and the accumulation of risky assets in banks due to (1) a bank's excessive lending to risky borrowers at cheap rates and (2) risky borrowers' higher credit demand from banks who bet on further rises in house prices; consequently, it predicts a positive relationship between house price deviations from the fundamental values and the bank's NPLs. Koetter and Poghosyan (2010) find evidence using data on housing markets and banks in Germany during 1995–2004 to support the deviation hypothesis where bank instability is attributed to house price deviations instead of to changes in nominal house prices.

We conjecture that the responses of NPLs to house price changes or deviations could be different when gauged at various levels of income growth, and then apply the threshold model proposed by Hansen (1999) to test the above two hypotheses under different income growth levels. Banks' asymmetric responses to house price changes or deviations during booms and busts might be attributed to the bounded rationality of investors as described in Gennaioli and Shleifer (2010), Gennaioli et al. (2012), and Dieci and Westerhoff (2012). Ample empirical evidence shows that human agents generally act in a boundedly rational manner, and are subject to limited ability and the use of simple heuristics to predict prices or returns (Kahneman et al., 1986; Smith, 1991). Not all contingencies are represented in the investors' thought processes, and only the most likely events are retrieved (Gennaioli and Shleifer, 2010). This local thinking, or neglect of low probability risks, results in over-issuance of new securities and financial fragility (Gennaioli et al., 2012). A sharp decline in prices due to fire sales after a substantial surprise to the market can have especially adverse welfare consequences (Shleifer and Vishny, 2010; Stein, 2012). On the other hand, appreciation in prices would have a less severe impact. Other influential models include Day and Huang (1990), Chiarella (1992), De Grauwe et al. (1993), Chiarella et al. (2002), and De Grauwe and Grimaldi (2006), and Dieci and Westerhoff (2012).

To test our conjecture, we use the threshold model to examine the impact of house prices on bank instability under different income growth levels and estimate the income growth threshold endogenously, instead of imposing an exogenous criterion for splitting the sample by income growth levels. Personal income growth rate is the threshold variable which interacts with one of the house price indicators in the threshold model. We consider two model specifications depending on which house price indicator interacts with the threshold variable (personal income growth rate). Empirical results suggest the existence of income growth threshold effects in the relationship between house price and bank instability. In particular, two income growth thresholds are found when changes in house prices index are used, and one income growth threshold is reported when house price deviations from the fundamental values are applied.

First, there exist two income growth thresholds of −5.342% and 3.972% when changes in house price index interact with income growth. Changes in house price index have a significant negative effect on NPLs and the size of the impact depends on the thresholds. When income growth is below −5.342%, NPLs decrease by 0.466% if the changes in house price index increase by 1%, holding

[4] The averages are for the period of 2000–2010. Source of data: Federal Reserve Board.

[5] We thank the anonymous referee for this valuable comment.

[6] According to the definition by the IMF: "A loan is non-performing when payments of interest and principal are past due by 90 days or more, or at least 90 days of interest payments have been capitalized, refinanced or delayed by agreement, or payments are less than 90 days overdue, but there are other good reasons to doubt that payments will be made in full".

[7] We also consider *z*-score as an alternative measure of bank instability for commercial banks in U.S. MSAs. However, empirical results using *z*-score are not significant.