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Household leverage, housing markets, and macroeconomic fluctuations

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ABSTRACT

This paper examines implications of housing and household leverage on macroeconomic fluctuations under credit shocks in the presence of the zero lower bound (ZLB) on nominal interest rates. To this end, I build a housing model by incorporating houses into a standard deleveraging model and allow debt limits to be endogenous. I find that, under an adverse credit shock, only with high leverage can the housing model generate more macroeconomic fluctuations with the nominal interest rate being more likely to hit the ZLB, compared to the standard deleveraging model without housing. In addition, the relative amplification is more pronounced under a shock that causes the ZLB to bind in both the models. Importantly, the ZLB plays a key role in generating a significant decline in the housing price under a particularly adverse credit shock.

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1. Introduction

Mian and Sufi (2011) document two striking stylized facts from the last recession. First, there was a surge in household leverage, defined as a debt-to-income ratio, during the 2002–2006 period. Second, the recession was worse and housing prices fell more in regions where household leverage had increased more. In addition, the nominal interest rate reached the zero lower bound (ZLB) in December 2008, worsening the recession because conventional monetary policy became ineffective in reducing short-term nominal interest rates to stimulate the economy.

Apparently, the household leverage, the housing market, and the ZLB played an important role in causing the worst recession that the U.S. has ever observed since the Great Depression. However, the standard deleveraging and ZLB literature that models debt limits exogenously, including Eggertsson and Krugman (2012) and Guerrieri and Lorenzoni (2011), has no implications of housing, household leverage, and the ZLB on asset prices and macroeconomic fluctuations under a credit shock.

This paper aims to fill the gap. Specifically, I am going to answer the following questions: How does the economy respond to a credit shock in a deleveraging model with housing and endogenous debt limits? How different is the response compared

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to that from the standard deleveraging model without housing? How sensitive is the response with respect to household leverage? Will the nominal interest rate hit the ZLB more or less frequently in the housing model, compared to the model without housing? Is the housing model able to amplify house prices under a credit shock? If yes, under what condition?

To this end, I extend the standard deleveraging and ZLB model by incorporating houses and allowing debt limits to be endogenous. Specifically, the debt limit of borrowers is tied to both exogenous credit market conditions and the endogenous market value of collateral assets, which are houses. To see the impact of household leverage, I then consider two cases, high leverage and normal leverage, with more focus on the former. In the case of high leverage, the housing model is calibrated to match the high debt-to-income ratio in the U.S. at the onset of the last recession. In the case of normal leverage, the model is calibrated to match the normal debt-to-income ratio in 2002, right before the housing boom.

Solving the models with and without housing, I am able to show that, under an adverse credit shock, only with high leverage can the housing model amplify macroeconomic fluctuations with the nominal interest rate being more likely to hit the ZLB, compared to the standard deleveraging model without housing. This finding contradicts the widely held belief that incorporating houses and allowing endogenous debt limits will *always* amplify output and inflation fluctuations under an adverse credit shock because people believe that cutting housing goods under the initial shock would cause output and the debt limit to fall more, creating another round of deleveraging and so on.

The intuition for the results is as follows: An initial adverse shock to the credit market lowers the debt limit and makes the borrowing constraint tighter, given the other factors, so borrowers have to cut nondurable goods or sell some durable housing goods. If the initial debt-to-value ratio is small, selling a dollar of durable goods helps free up much of home equity that can be used to reduce pressure on cutting back more necessary non-durable goods. So the interest rate declines less in the housing model than in the model without housing. In this case, even though the level of debt is lower due to the reduction in collateral assets, the pressure on borrowing tightness can be reduced substantially.

However, in a world with high leverage, the initial debt-to-value ratio is very high. The home equity of borrowers is substantially low, even negative. Therefore, selling durable housing goods is not helpful in reducing the pressure on the borrowing tightness. Together with the fact that houses provide utility and adjusting houses is costly, the borrowers do not want to cut back their durable housing goods. However, because durable and non-durable goods are not perfectly substitutable, durable goods must be reduced when nondurable goods consumption is cut back.

In both cases, with normal leverage and with high leverage, we see the debt level declines due to two reasons. First, the adverse shock to the credit market lowers the debt limit and tightens the borrowing constraint. Second, the initial decline in the debt limit will lead to lower durable goods consumption that makes the debt limit fall more, and so on. This reinforcement generates a spiral decline in both durable goods consumption and the debt limit. However, only in the case of high leverage can the housing model generate a tighter borrowing constraint and a larger cut in the nominal interest rate, compared to the model without housing.

When the ZLB binds in the two models, macroeconomic fluctuations are more pronounced in the housing model with high leverage than in the model without housing. Apparently, in this case, housing is very important factor in transmitting the credit shock and amplifying macroeconomic fluctuations. As explained previously, in the case of high leverage, selling houses does more harm than good because it induces the budget and collateral constraints of borrowers to be even tighter. Therefore, it makes the ZLB problem more serious.

Another important contribution of this paper is about the role of a binding ZLB condition in amplifying housing price fluctuations under a particularly adverse credit shock. Without the presence of the ZLB, the credit shock is not able to generate significant declines in the housing price. This result is in line with the common finding in the existing literature of housing and macroeconomic fluctuations. The reason is that the housing price is the expected present discounted value of housing utility flows. The credit shock is not able to alter the flows significantly without the presence of the ZLB because the central bank has some power to stabilize the economy, including the borrowers' housing consumption and the marginal utility of houses. As a result, the housing price does not move much under a credit shock, see Liu et al. (2013) for more detailed discussion.

However, this is not the case when the ZLB is present. In a deep recession with binding ZLB, the housing price falls sharply. Specifically, under an adverse credit shock that causes the debt-to-value ratio to fall about 10% permanently, the decline in the housing price is three times greater in the model with the ZLB than in the model without the ZLB. Intuitively, due to the ZLB effect, the borrowers have to scale back their durable housing goods more, affecting the flow of housing services more. As a result, the housing price falls more when the ZLB condition is imposed.

The related literature on the ZLB has been inspired by the seminal work by Krugman (1998). After his work, extensive research related to the ZLB has been conducted, including Eggertsson and Krugman (2012) and Guerrieri and Lorenzoni (2011) among others.[1]

Guerrieri and Lorenzoni (2011) model a debt limit and household heterogeneity in labor productivity. They show that a decline in the exogenous debt limit causes future consumption to be more volatile because with a lower debt limit, it will be more difficulty for households to insure their consumption risks. Therefore, savers will save more and borrowers will borrow less due to precautionary savings, resulting in a sharp decrease in the nominal interest rate and a binding ZLB.

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[1] A more extensive list includes Eggertsson and Woodford (2003), Adam and Billi (2006), Adam and Billi (2007), Nakov (2008), Levin et al. (2010), Bodenstein et al. (2010), Werning (2011), Ngo (2014), Fernandez-Villaverde et al. (2012), Hall (2011), and Judd et al. (2011).