

WORKING PAPER

Explaining the boom-bust cycle in the U.S. housing market: A reverse-engineering approach

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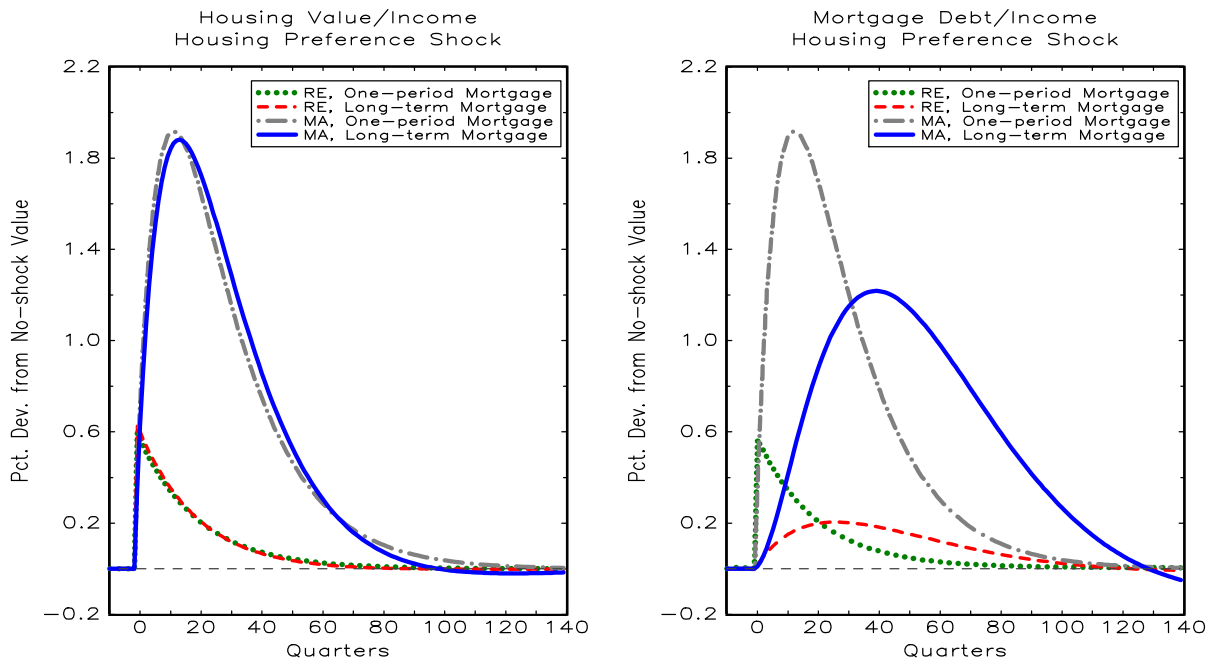


Figure 5: When all models are subjected to the same housing preference shock, the moving average model exhibits substantially more volatility in housing value. All else equal, the models with long-term mortgage debt exhibit more persistent debt dynamics than the models with one-period debt. With long-term mortgage debt, housing value peaks before debt, as in the data.

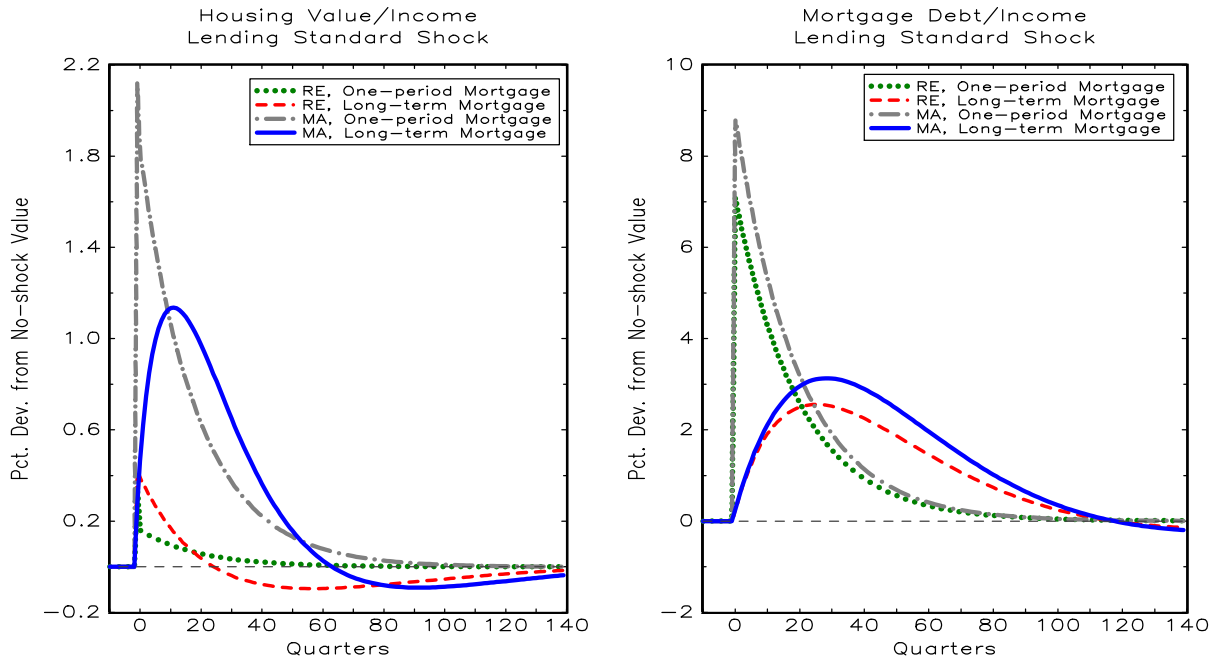


Figure 6: When all models are subjected to the same lending standard shock, the moving average model exhibits substantially more volatility in housing value. All else equal, the models with long-term mortgage debt exhibit more persistent debt dynamics than the models with one-period debt. With long-term mortgage debt, housing value peaks before debt, as in the data.

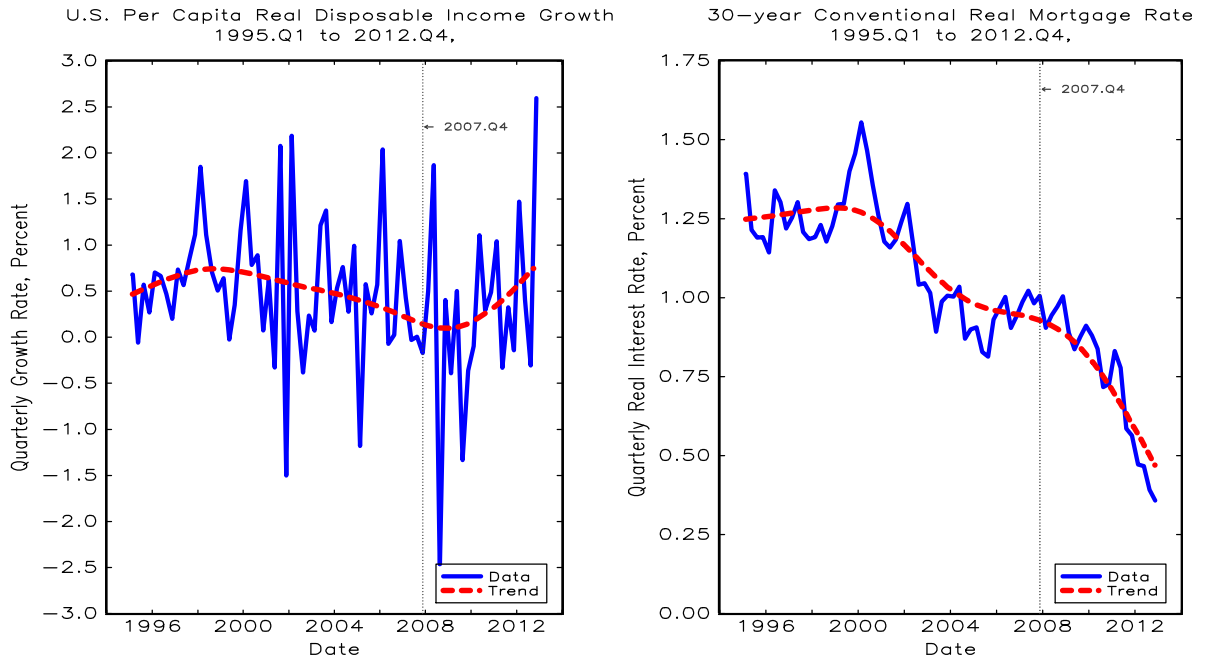


Figure 7: Inputs to the reverse-engineering exercise. Smoothed versions of the U.S. quarterly growth rate of per capita real disposable income and the U.S. quarterly real mortgage interest rate are used to identify the sequences for $x_t - \bar{x}$ and τ_t that appear in the household decision rules as state variables.

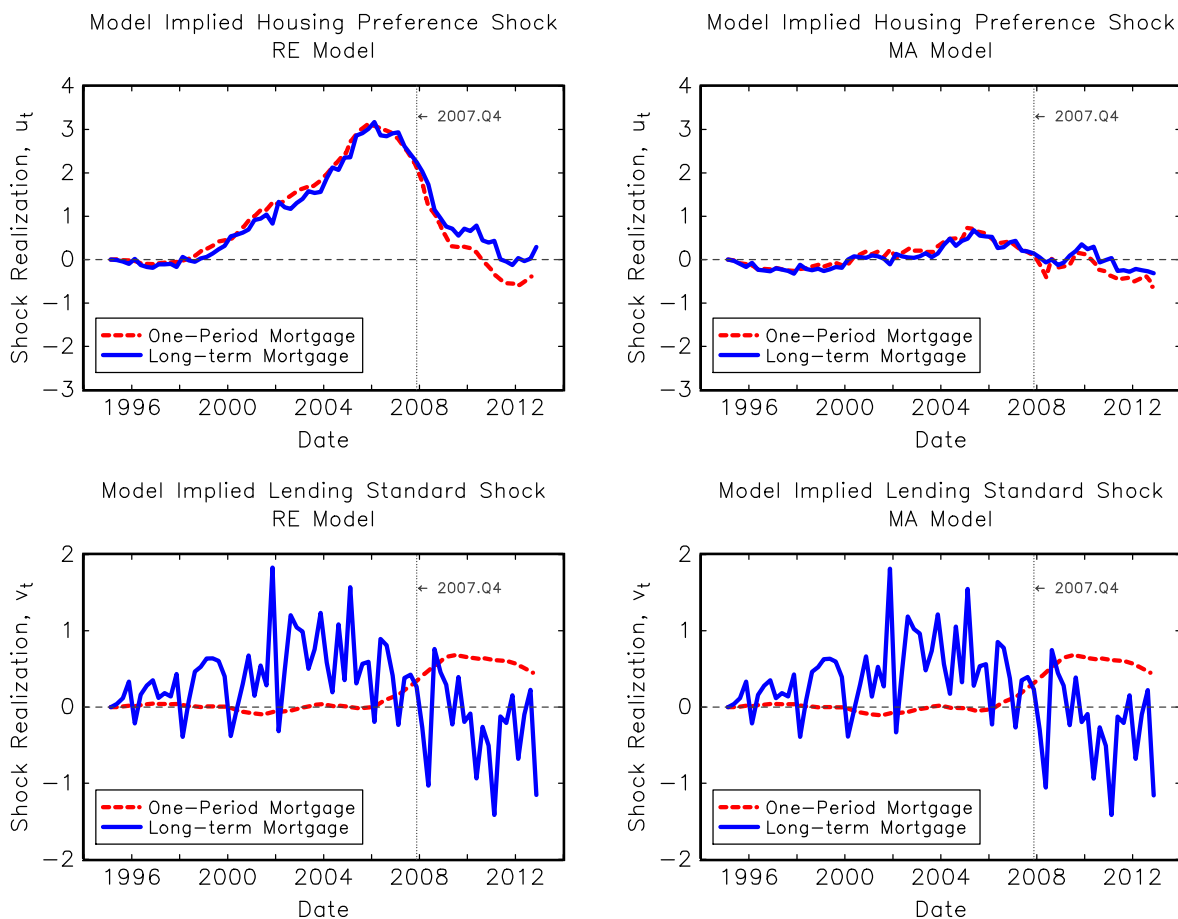


Figure 8: The left panels show the reverse-engineered shocks in the RE model. The right panels show the reverse-engineered shocks in the MA model. The MA model with long-term mortgage debt can match the boom-bust patterns in the data with smaller housing preference shocks and plausible lending standard shocks.

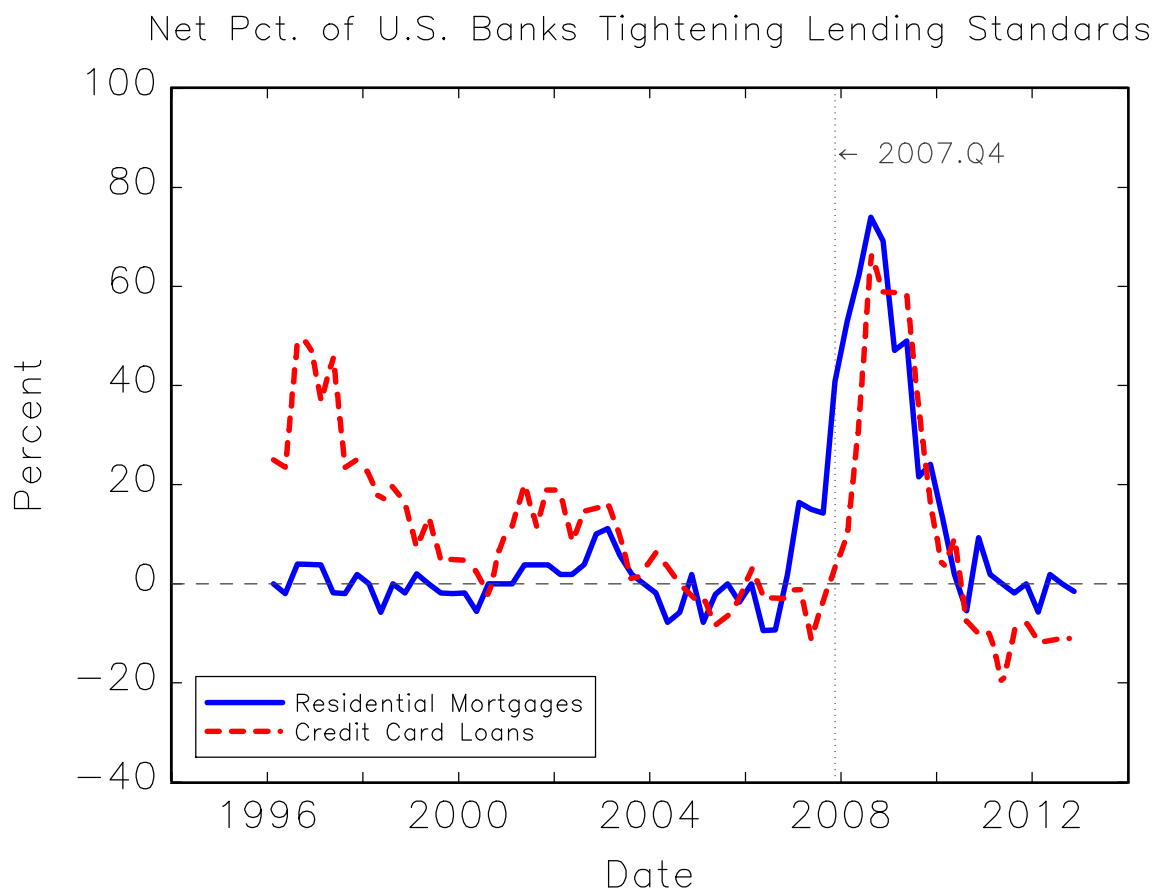


Figure 9: Two indicators of lending standard tightness from the Federal Reserve’s Senior Loan Officer Opinion Survey (SLOOS). Both series show that banks started to tighten lending standards before the onset of the Great Recession in 2007.Q4. Moreover, a substantial percentage of banks continued to tighten standards even after the recession ended in 2009.Q2.

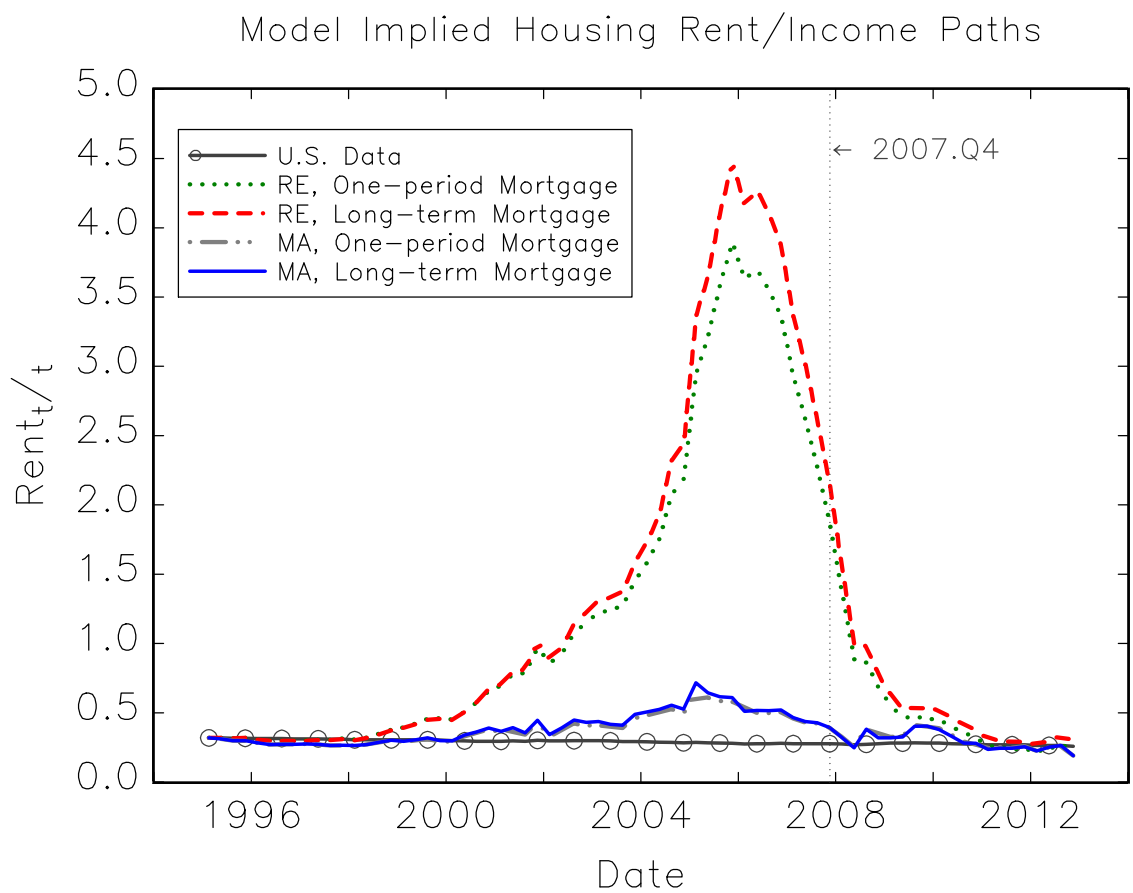


Figure 10: The large reverse-engineered housing preference shocks in the RE models generate a counterfactual boom-bust cycle in the rent-income ratio. The much smaller reverse-engineered housing preference shocks in the MA models generate less movement in the rent-income ratio, which is closer to the pattern observed in the data.

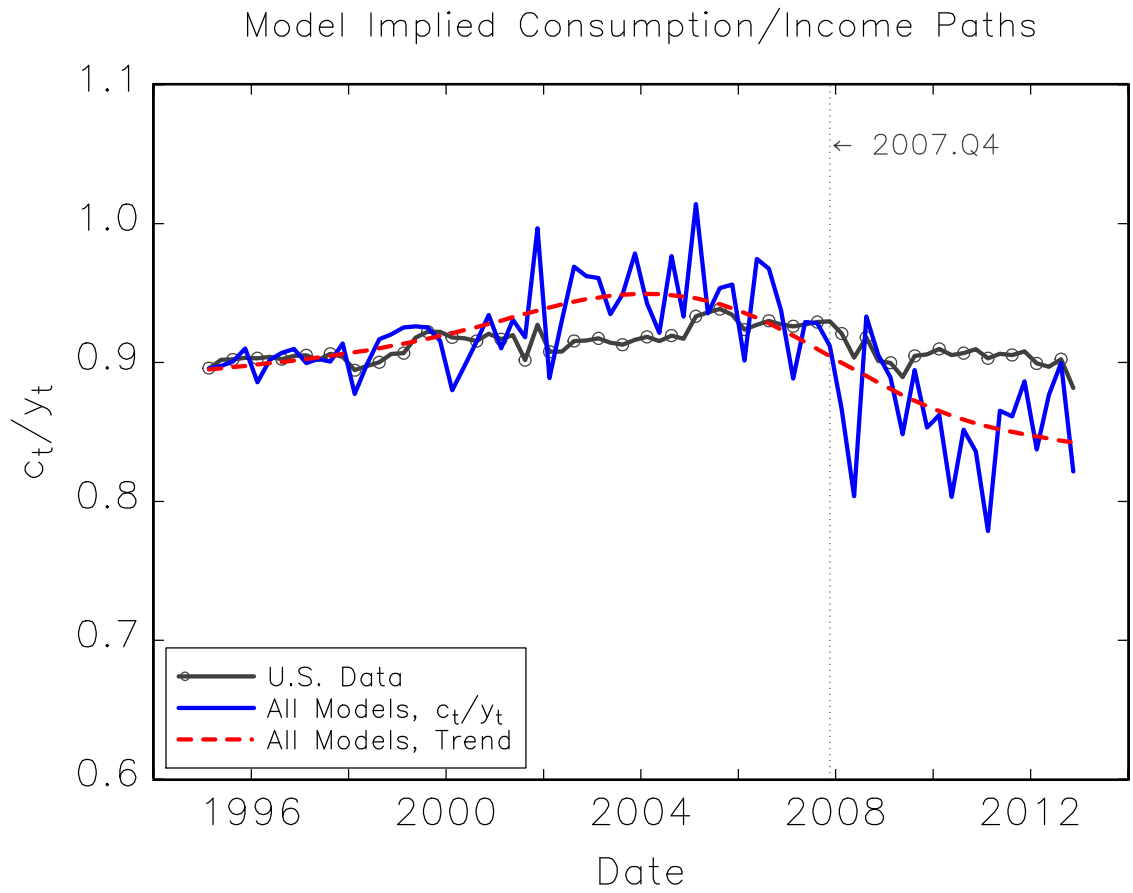


Figure 11: By construction of the reverse-engineered shocks, all models imply identical hump-shaped paths for the consumption-income ratio. A smoothed version of the model-implied path roughly resembles the hump-shaped pattern observed in the data.

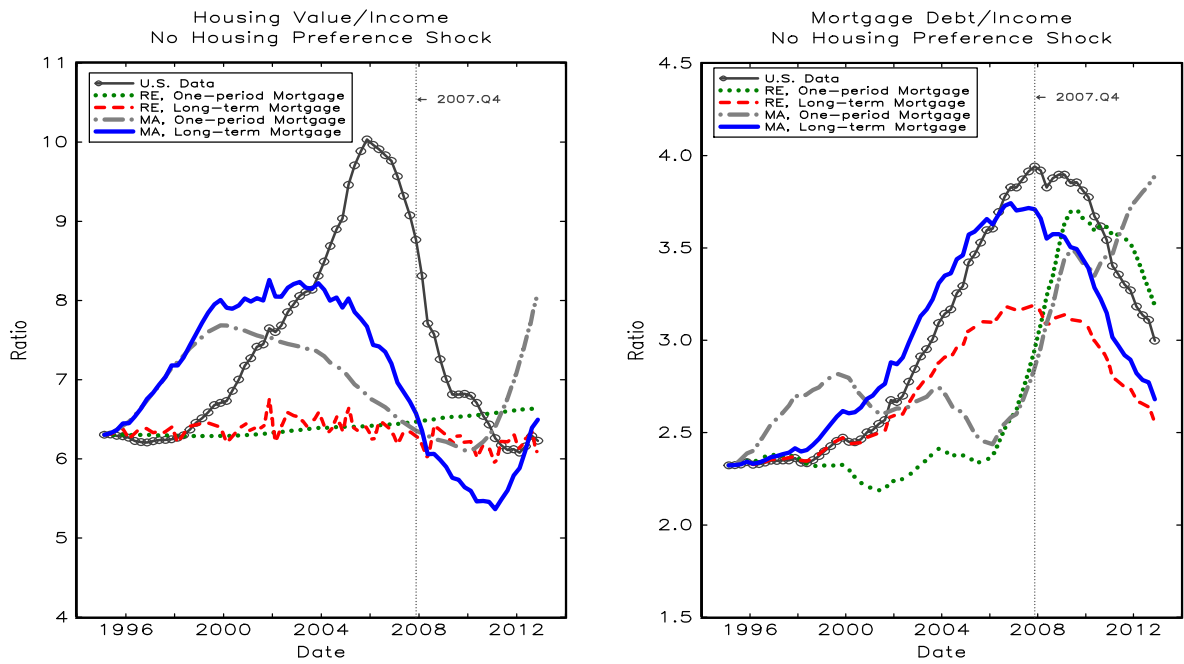


Figure 12: Counterfactual scenario 1: No housing preference shock. The RE models now exhibit no significant run-up in housing value. The MA models still exhibits a sizeable run-up in housing value, particularly in the version with long-term mortgage debt which continues to be hit by positive income growth shocks and loosening lending standards during the run-up. This result illustrates the ability of our preferred model to generate an income- and credit-fueled boom in housing value.

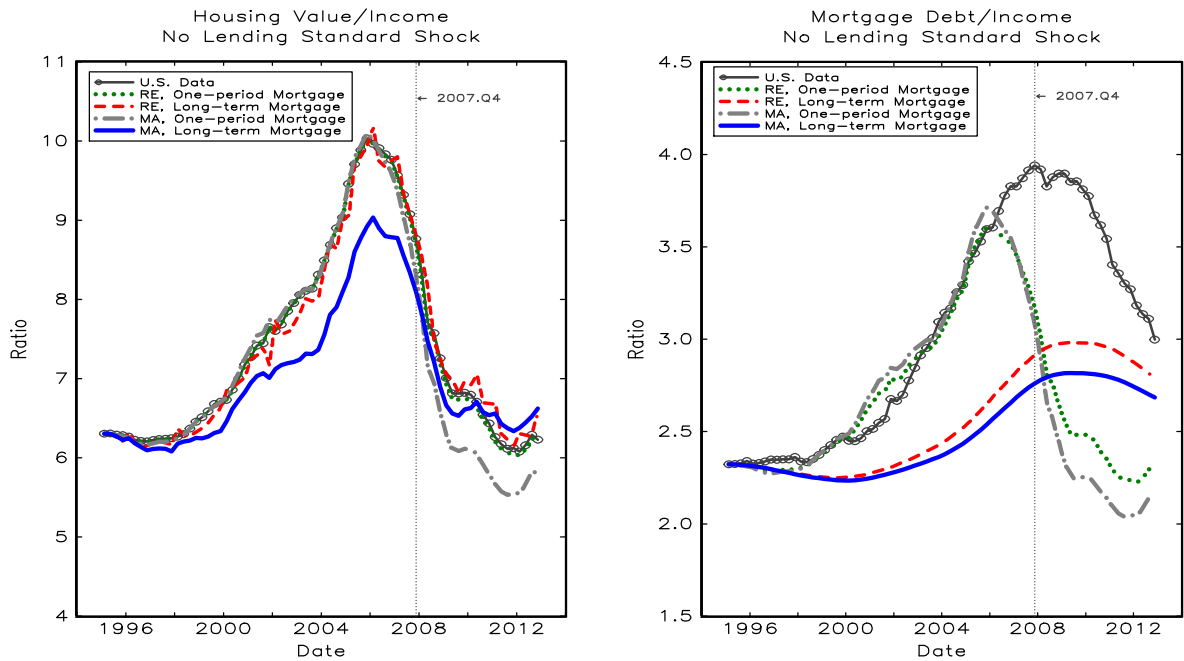


Figure 13: Counterfactual scenario 2: No lending standard shock. Models with one-period mortgage debt now imply a rapid deleveraging that coincides with the rapid decline in housing value. Models with long-term mortgage debt now exhibit much smaller run-ups in debt, suggesting that shifting lending standards were an important driver of the episode. The MA model with long-term mortgage debt is the only one to show smaller boom-bust cycles in both housing value and debt when the lending standard shock is turned off.

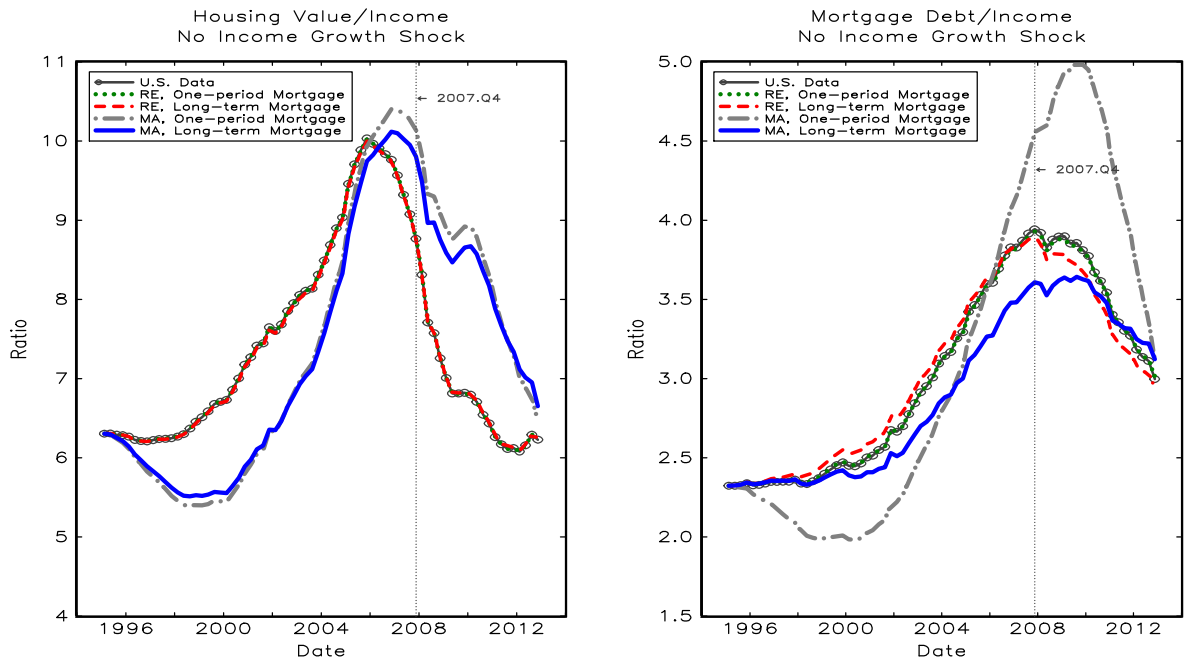


Figure 14: Counterfactual scenario 3: No income growth shock. There is little noticeable effect in the RE models. In contrast, turning off the positive income growth shocks of the late 1990s causes the MA models to exhibit a somewhat delayed boom-bust cycle in housing value relative to the data. This result implies that movements in income growth did contribute to the magnitude and timing of episode. The MA model with one-period mortgage debt exhibits a larger boom-bust cycle in debt in response to the implausible post-2007 lending standard shocks implied by this version of the model.

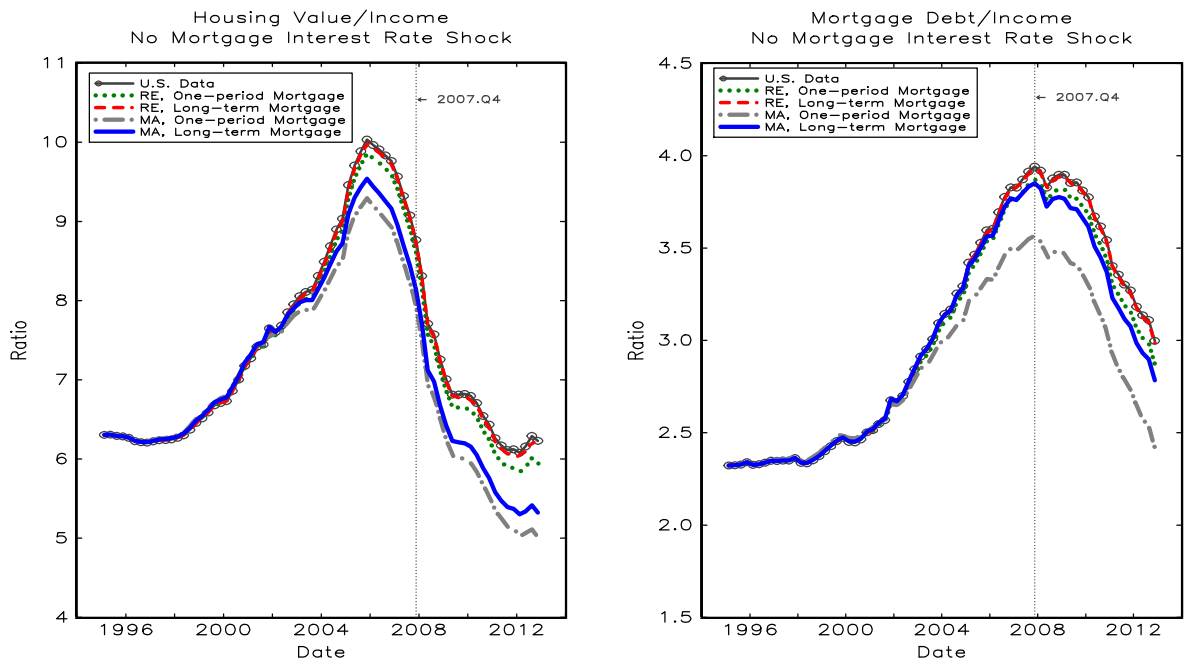


Figure 15: Counterfactual scenario 4: No mortgage interest rate shock. All models continue to exhibit significant boom-bust cycles in both housing value and debt, suggesting that the decline in the U.S. mortgage interest rate was not a major driver of the episode.