# Estimating the Causal Relationship Between Foreclosures and Unemployment During the Great Recession*

Ghulam Awais Rana† Bates College

Paul Shea‡ Bates College

May 15, 2015

**Abstract**

Using a local projection method that utilizes U.S. state level data (2003-2013), we estimate a system that includes unemployment, mortgage foreclosures, mortgage interest rates, and housing prices. We find that higher levels of foreclosures cause major increases in unemployment and large decreases in housing prices. In contrast, innovations to housing prices have only small effects on unemployment or foreclosures. We thus conclude that rising foreclosures as opposed to falling housing prices are the more likely channel by which the recent housing crises propagated into the general economy. We also find that while higher unemployment causes a significant and rapid increase in foreclosures, the effect on housing prices is not significant.

*Keywords*: housing, local projection, foreclosures, U.S. state data.

*JEL Classification*: C32, C33, E32, E51.

*We thank Daniel Riera-Crichton for helpful comments.

†E-mail: grana@bates.edu

‡Email: pshea@bates.edu

# 1 Introduction

The Great Recession is associated with several striking trends in the U.S. data, including dramatic declines in housing prices, increased foreclosures, and rising unemployment. Although there is broad agreement that the decline of the housing sector was the major cause of the recession, the exact channel by which this occurred is less clear. This uncertainty is especially prominent when examining whether increased foreclosures contributed to the recession, or whether they were largely an effect of lower housing prices and higher unemployment. Many policy makers appear to have adopted the former position. When introducing the Home Affordable Modification Program on February 18, 2009, President Barack Obama stated that:[1]

> Through this plan, we will help between 7 and 9 million families restructure or refinance their mortgages so they can avoid foreclosure. And we are not just helping homeowners at risk of falling over the edge; we are preventing their neighbors from being pulled over that edge too as defaults and foreclosures contribute to sinking home values, failing local businesses, and lost jobs.

Extensive theoretical and empirical work examines the effects of foreclosures on the local level.[2] The evidence strongly suggests that a shock to foreclosures causes both additional foreclosures and lower housing prices. The macroeconomic theoretical literature that includes housing, however, largely abstracts away from mortgage default. In Iacoviello (2005), for example, an adverse demand shock typically lowers housing prices which then tightens credit constraints and results in reduced economic activity. While the threat of mortgage default is important to motivate a credit constraint, default itself never occurs. An exception is Marshall and Shea (2015) which shows that by subsequently limiting access to credit and creating a misallocation of housing, mortgage default itself causes a large drop in housing prices and aggregate output. Our results support this latter mechanism. We find that foreclosures, and not declining housing prices, account for much of the Great Recession's increase in unemployment.

We collect state level data in the period surrounding the recession to estimate a system that includes unemployment, foreclosures, housing prices, and mortgage interest rates. We find that increases in foreclosures have a large causal effect on higher unemployment while lower housing prices do not have a significant effect on unemployment. The closest empirical paper to ours is Calomiris, Longhofer, and Miles (2013) who also use state level data to estimate a similar system. There are three main differences between our papers and theirs. First, their focus is

[1] Remarks taken from speech in Mesa, Arizona.

[2] See, for example, Lin *et. al*, (2009), Towe and Ladd (2013), and Mian *et. al* (2014).

to examine the feedback between foreclosures and housing prices; they do not report the effect of shocks to either variable on unemployment. Second, their paper uses a panel VAR approach whereas this paper employs the more efficient local projection method of Jorda (2005). Finally, to focus on the Great Recession, we limit our analysis to the period encompassing the housing bubble and burst whereas their paper mostly relies on older data.

Our major finding is that an innovation to foreclosures that causes them to eventually rise by one standard deviation leads to an increase in unemployment of 6.4% after 3 years. In contrast, the effect of an innovation to housing prices that causes them to eventually fall by one standard deviation only raises unemployment by 0.4%, and in most periods the effect is not statistically significant. If we assume that shocks to the housing sector caused the Great Recession, then these results suggest that the dramatic decline in U.S. housing prices after 2007 was not a direct cause of the higher unemployment that followed. Instead, the foreclosure crisis itself was the most likely catalyst for the ensuing decline in housing prices and rise in unemployment.

# 2 Data

Our system includes four state level variables: the U-3 unemployment rate as reported by the Federal Reserve Bank of St. Louis, the fraction of existing residential mortgages that become new foreclosures in each quarter as reported by the Federal Reserve Bank of New York's Household Credit Survey, the change in housing prices as reported by the Federal Housing Finance Agency, and the effective mortgage rate as reported by the U.S. Federal Housing Finance Agency. The data are quarterly running from 2003-2013 and cover 11 states.[3] Simple descriptive statistics, averaged over all states, are reported below:

Table 1: Descriptive Statistics

| | Mean | St. Dev. | Minimum | Maximum |
|---|---|---|---|---|
| Foreclosures | 0.13% | 0.12% | 0.03% | 0.88% |
| U-3 Unemployment | 6.68% | 2.35% | 3.30% | 14.10% |
| $\Delta$Housing | 3.25% | 9.01% | -25.40% | 37.00% |
| Effective Mortgage Rate | 6.08% | 1.00% | 3.63% | 8.17% |

The Harris-Tzavalis test finds a single unit root for foreclosures, unemployment, and the change in housing prices. We thus rely on the first difference of these variables, noting that we

[3]Arizona, California, Florida, Illinois, Michigan, New Jersey, Nevada, New York, Ohio, Pennsylvania, and Texas.

are now working with the second difference of housing prices.[4] We find no unit root for the effective mortgage rate.

# 3 Estimation and Results

We estimate the model and construct IRFs using the linear local projection method advocated by Jorda (2005), and Stock and Watson (2007) instead of the more common panel VAR (PVAR) method of Arellano and Bond (1991). The local projection method runs a regression for each period in the impulse response function for each variable in the system. For unemployment, as an example, the first period of the IRF is obtained by regressing unemployment in time $t$ on a set of contemporaneous variables and lags selected using an information criterion. The second period in the IRF is then obtained by regressing unemployment in $t+1$ on the same (not re-dated) set of regressors. This method has numerous advantages. First, as shown by Jorda (2005), it is more robust to misspecification than a PVAR. Specifically, because it does not simply iterate the system's parameters as with a PVAR, specification errors are not compounded over time. Second, it is more efficient because the response in each period comes from a unique regression. Third, it eliminates the need for dynamic restrictions which in classical VARs often causing the ordering of the variables to matter. Finally, it allows us to better capture non-linearities in the data generating process because each period's response is calculated separately.

We fit our specification using the adjusted-$R^2$ criterion.[5] We calculate Driscoll-Kraay standard errors which are robust to heteroskedasticity, autocorrelation among lag lengths, and spatial autocorrelation to compute 90% confidence bands.

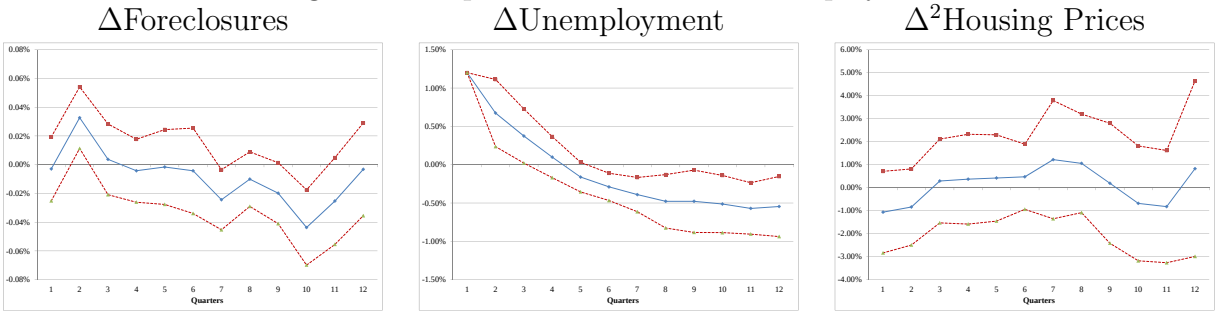
We begin by reporting the response of foreclosures, unemployment, and housing prices to an impulse to unemployment. Because foreclosures and unemployment are first differenced, we must integrate to estimate level effects. Likewise, we must integrate twice to obtain the level effect on housing prices because they are twice differenced. The impulse is set so that the peak effect on the level of unemployment, after 4 quarters is a one standard deviation (2.35%) increase.

Higher unemployment does significantly increase foreclosures, but only in the second period.

[4] We also use the Helmert transformation and obtain very similar results.

[5] All equations include the contemporaneous values of all other variables and no lags of the mortgage interest rate. For unemployment, we also include 1 lag of unemployment and housing, and two for foreclosures. For foreclosures, we include 1 lag of foreclosures, 2 of housing, and 3 of unemployment. For housing, we include 1 lag of housing and unemployment, and two of foreclosures. Our results are generally robust to including additional (up to 4) lags of all variables

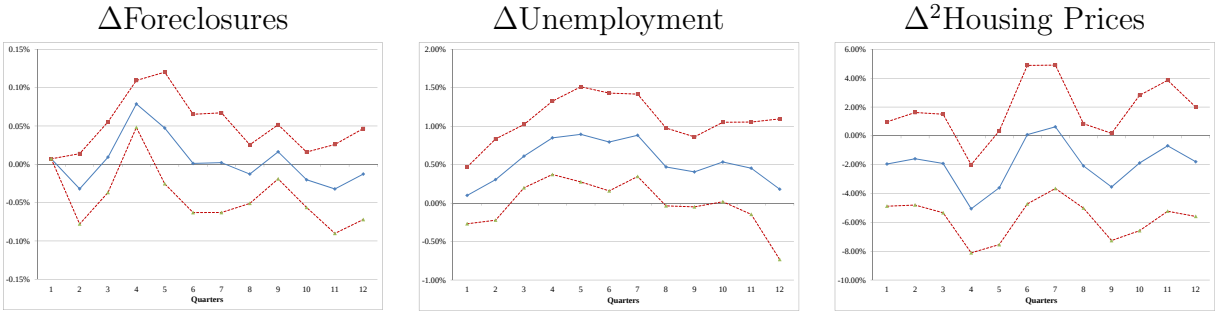
Figure 1: Response to a Shock to Unemployment




The effect on housing prices is never significant.

Figure 2 shows the response of each variable to an impulse to foreclosures. We set the size of the impulse so that the peak effect on foreclosures is a one standard deviation (0.118%) increase after 9 quarters.

Figure 2: Response to a Shock to Foreclosures

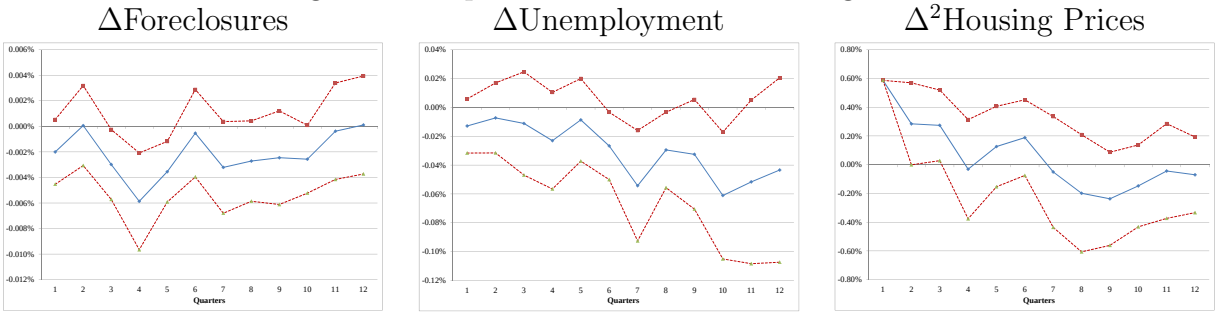



The second column shows that higher foreclosures have a large, positive, and statistically significant effect on the U-3 unemployment rate. Integrating, the effect on the level of unemployment is a 6.4% increase after 3 years. This result supports the result of Marshall and Shea (2015) where mortgage default amplifies the business cycle. The third column shows that higher foreclosures also cause large declines in housing prices. Integrating twice, the decline is very large, eventually approaching 100%. The magnitude of this effect suggests the presence of an important non-linearity that our specification does not capture.

Finally, Figure 3 reports the effects of an impulse to housing. Integrating twice, the peak effect occurring after 3 years when housing prices have risen by one standard deviation (9.01%).

The second column shows that higher housing prices have only small effects on unemployment. The effect is only statistically significant in 3 of 12 periods, and integrating, we find only a cumulative decline in the unemployment rate of 0.36% after 3 years. This result shows that some of the rise in unemployment from a shock to foreclosures (from Figure 2) occurs because

Figure 3: Response to a Shock to Housing Prices




more foreclosures cause lower housing prices which then causes more unemployment.

Most macroeconomists believe that trouble in the housing sector was the biggest cause of the Great Recession. Figures 2 and 3 suggest that exogenous increases in foreclosures are a much better candidate than exogenous declines in housing prices for explaining the subsequent rise in unemployment. This is in contrast to the bulk of the macroeconomic theoretical literature on housing which typically abstracts away from foreclosure and instead focuses on declining asset prices as a source of business cycle amplification.

The third column of Figure 3 shows that higher housing prices do cause fewer foreclosures. The effect, however, is not nearly as dramatic as that from Figure 2. It is only occasionally significant and the cumulative effect on foreclosures is only about $\frac{1}{4}$ of a standard deviation. Again, shocks to foreclosures have much more important effects than shocks to housing prices.

# 4 Robustness

To check robustness, we run our specification using the dataset of Calomiris, *et al.* (2013). Their data does not include all of the recessionary period but does include all states. Now, the system consists of the first differences of logged employment (as opposed to unemployment) and a housing price index, and the levels of foreclosure starts and the effective mortgage rate. As before, we choose the impulse so that the peak level effect of the variable equals one standard deviation. Figures 4 and 5 show the effects of innovations to foreclosures and housing prices.

As with our main results, higher foreclosures have adverse effects on the labor market. Here, the decline in employment is 4.8% after 12 quarters. Over the same period, housing prices fall by 14.7%. These results are similar, but somewhat weaker, than those of Figure 2. For the shock to housing prices, the effect on employment is only significant in the first period. Integrating does, however, lead to a larger effect than from Figure 3 with employment rising by 2.4% after 12 quarters. Higher housing prices do lower foreclosures, but the effect is usually insignificant.

Figure 4: Response to a Shock to Foreclosures, Alternate Data

Foreclosures ΔEmployment ΔHousing Prices

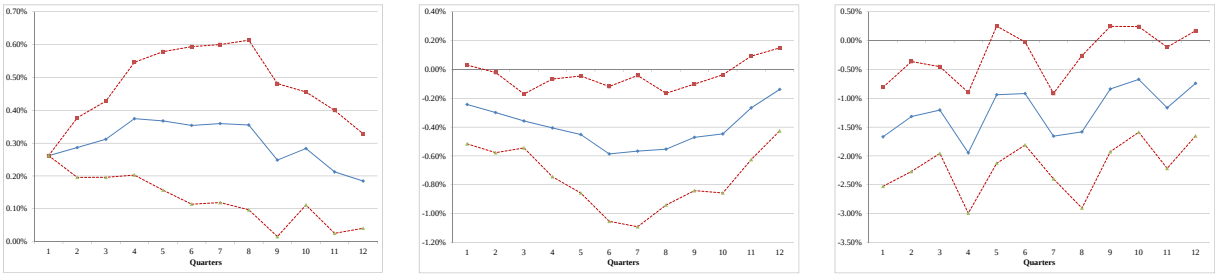
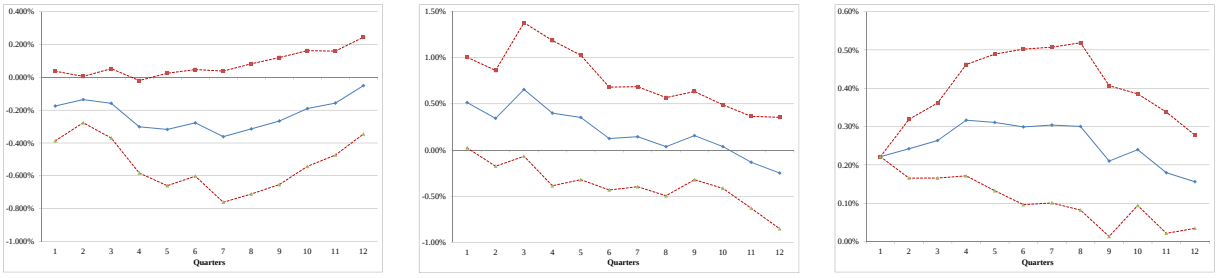



Figure 5: Response to a Shock to Housing Prices, Alternate Data

Foreclosures ΔEmployment ΔHousing Prices




Overall, however, these results are similar to those from the previous section.[6]

# 5 Conclusion

The Great Recession included striking changes to unemployment, foreclosures, and housing prices. This paper uses state level data to estimate how these variables interacted. The most result is that foreclosures are not simply a symptom of a depressed economy but rather that shocks to foreclosures cause large increases in unemployment and large decreases in housing prices.These results run contrary to most macroeconomic theory which predicts that falling housing prices, and not foreclosures, are the key mechanism whereby a weak housing sector affects the general economy.

# References

Arellano, M. and S. Bond. 1991. "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations." *Review of Economic Studies*, Vol.

[6]One additional difference, however, is that higher unemployment now has significant effects, causing higher foreclosures and lower housing prices.

58: 277-297.

Calomiris, C., Longhofer, S. and W. Miles. 2013. "The Foreclosure-House Price Nexus: A Panel VAR Model for U.S. States, 1981-2009." *Real Estate Economics*, Vol. 41(4): 709-746.

Iacoviello, M. 2005. "House Prices, Borrowing Constraints, and Monetary Policy in the Business Cycle." *American Economic Review*, 95(3): 739-764.

Jorda, O. 2005. "Estimation and Inference of Impulse Responses by Local Projections." *American Economic Review,* Vol. 95(3): 161-182.

Lin, Z., E. Rosenblatt, and Y. Vincent. 2009. "Spillover Effects of Foreclosures on Neighborhood Property Values." *The Journal of Real Estate Finance and economics,* Vol. 38(4): 387-407.

Mian, A, Sufi, A. and F. Trebbi. 2014. "Foreclosures, House Prices, and the Real Economy." *Kreisman Working Paper Series in Housing Law and Policy No. 6, 2014.*

Marshall, E. and P. Shea. 2015. "Housing and Endogenous Default." Working Paper.

Stock, J. and M. Watson. 2007. "Why Has U.S. Inflation Become Harder to Forecast?" *Journal of Money, Credit, and Banking,* Vol. 39(1): 3-33.

Towe, C. and C. Lawley. 2013. "The Contagion Effects of Neighboring Foreclosure." *American Economic Journal: Economic Policy,* Vol. 5(2): 313-335.