

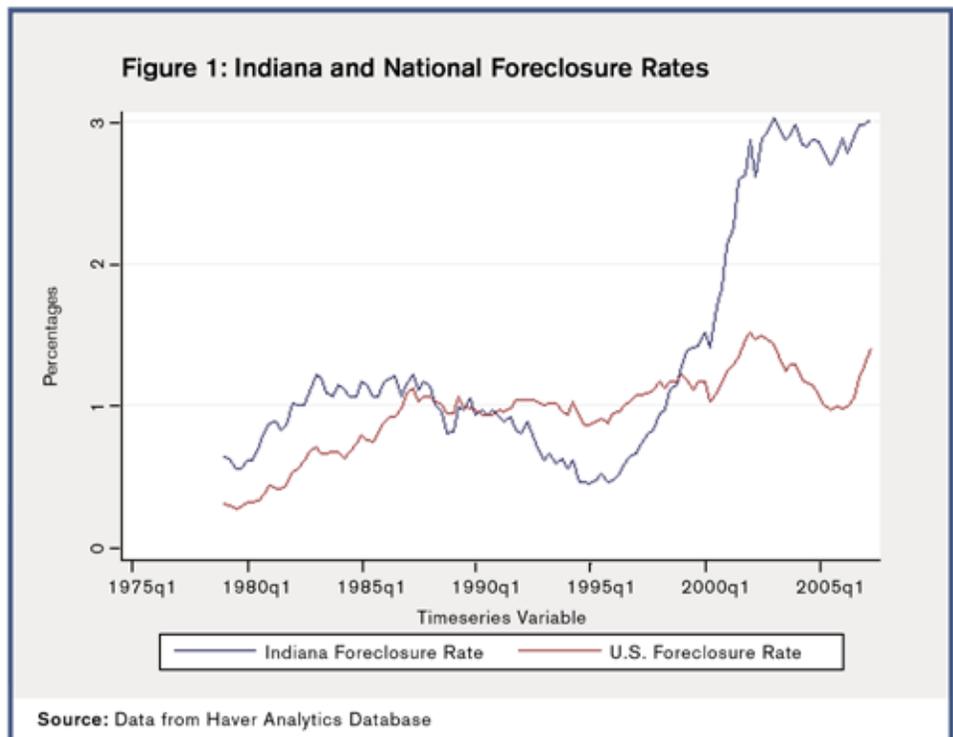
# The Determinants of State Foreclosure Rates: Investigating the Case of Indiana

by Leslie McGranahan

Foreclosure rates are defined as mortgages in the foreclosure process as a percentage of all mortgages. These rates vary fairly dramatically across states. While the average foreclosure rate in the 50 states and the District of Columbia in the second quarter of 2007 was 1.25 percent, these rates ranged from a high of 3.60 percent in Ohio to a low of 0.44 percent in Wyoming. One state that has exhibited high foreclosure rates over the past decade is Indiana. Indiana ranked second highest after Ohio in the second quarter of 2007 with a foreclosure rate of 3.01 percent. The goal of this article is to look at the determinants of state foreclosure rates with particular attention to the set of factors referred to in discussions of Indiana's high rates. Three primary factors have been responsible for Indiana's high foreclosure rates: the poor performance of the housing market and economy, the high levels of subprime and FHA borrowing in the state, and the relatively long duration of Indiana foreclosures. However, even after taking these factors into account, Indiana's foreclosure rates are higher than would be anticipated.

## Indiana Foreclosures

In every quarter since the first quarter of 1991, the foreclosure rate in Indiana has exceeded that in the nation as a whole. Since the end of



2004, Indiana's foreclosure rate has been more than double the national level. In conjunction with this, mortgages 30, 60, and 90 days past due have also vastly exceeded the national level. Figure 1 depicts the Indiana and national foreclosure rates from 1979 to 2007. The number of properties beginning the foreclosure process, foreclosure starts, has followed a similar pattern, with foreclosure starts exceeding the national level in every quarter since the third quarter of 1998.

## Introducing Regression

To investigate the high levels of foreclosure in Indiana, the determinants of foreclosure rates are examined across the 50 states and Washington, DC, between 1989 and 2006 using regression analysis. This time frame was chosen because of issues of data availability. The means and standard deviations of the variables included in the regressions as potential factors influencing foreclosure rates, and

**Table 1: Variables Related to State Foreclosure Rates and Starts**

	Mean	St. Dev	Source	Notes	Indiana Mean
Foreclosure Rates (% of Loans)	1.024	0.587	Mortgage Bankers Association	Annual value set at fourth quarter value.	1.553
Foreclosure Starts (% of Loans)	1.379	0.644	Mortgage Bankers Association	Annual value is sum of four quarterly values.	1.860
5 Year % Change in OFHEO	27.389	22.151	Office of Federal Housing Enterprise Oversight	Annual value is calculated from average index in four quarters	21.924
State Unemployment Rate	5.173	1.412	Bureau of Labor Statistics	Annual value is average of 12 monthly values	4.525
Manufacturing Employment as a Percent of Total	10.413	4.504	Bureau of Economic Analysis	Data on manufacturing employment missing in 2002 for WY & DC, estimated by averaging adjacent years.	18.441
5 Year % Change in Median Income	3.650	8.615	U.S. Bureau of the Census	2006 CPI-U-RS adjusted dollars	3.659
Homeownership Rate (% of Households)	67.670	6.678	U.S. Bureau of the Census		71.972
Percent of Population with BA or More	24.052	5.447	U.S. Bureau of the Census	Percent of population 25 years and over	17.867
ARM Percent (% of Conventional Loans with Adjustable Rates)	21.049	12.762	Federal Housing Finance Board	Conventional loans only	22.833
Loan to Price (Average Loan)	77.462	3.735	Federal Housing Finance Board	Conventional loans only	78.317
Percent of Mortgages that are FHA (as a Percent of All Mortgages Serviced)	21.190	12.292	Mortgage Bankers Association	Annual value is based on average quarterly mortgage numbers	25.042
Percent of Mortgages that are Subprime (as a Percent of All Mortgages Serviced)	5.803	4.546	Mortgage Bankers Association	Annual value is based on average quarterly mortgage numbers	7.565
Dummy=1 if Foreclosures are Primarily or Exclusively Judicial	0.490	0.500	Comparison between www.realtytrac.com, and www.bargain.com	Assumed constant over time	1.000
Foreclosure Process days	136.863	83.237	Comparison between www.realtytrac.com, and www.bargain.com	Assumed constant over time	260.000
State and Local Per Capita Property Tax Revenue (1000s of Current \$)	0.791	0.416	U.S. Bureau of the Census	Revenue data for 2001 & 2003 estimated by averaging adjacent years	0.762

foreclosure starts are presented in Table 1. The final column of the table shows the mean for the state of Indiana over the time period.

Five sets of variables are analyzed: measures of the state economy; attributes of the state population; measures of features of the portfolio of mortgage loans in the state; classifications of the legal foreclosure environment; and a measure of state property tax revenues. Each of the variable groups is evaluated in detail below.

All of the variables are available for 1989 through 2006 with two exceptions: property tax data is not available after 2004, and data on percentages of subprime loans are only available starting in 1998.

Regression results are presented in Table 2. Each column represents the results for a different regression. The different regressions cover different time periods. The first column includes the entire data set from 1989 to 2006. The second column adds property tax

divided into two separate time periods, 1989-1997 and 1998-2006. The final column adds a variable on subprime mortgages that is only available for the later dates. The coefficients indicate how a one-unit change in the underlying variable influences the

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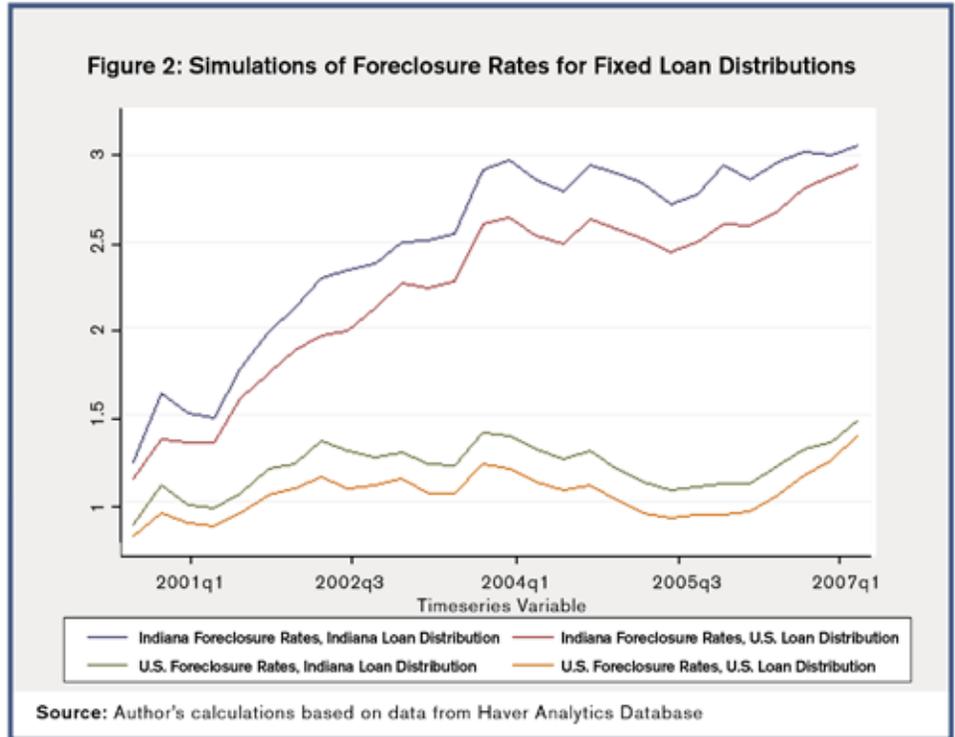
information excluding 2005 and 2006 as local property tax – data has not been released for those years. In the third and fourth columns, the sample is

foreclosure rate. An asterisk on a coefficient demonstrates whether the estimated coefficient is statistically significantly different from zero. All of

the regressions include year fixed effects, which control for differences over time in the national economy and other factors. In addition, standard errors are clustered by state, which assumes that unmeasured attributes of a state are similar over time.

## Economic Variables

To measure the effect of the state economy on foreclosures, four measures of the economic situation are included – house price appreciation (as measured by the Office of Federal Housing Enterprise Oversight) and growth in median income over the previous five years, the state unemployment rate, and the percent of the workforce in manufacturing. These measures capture the ability of homeowners to earn enough money to pay their mortgages. Low home price appreciation may limit the ability of



homeowners to take out additional equity from their homes in order to

make a mortgage payment during a difficult period.<sup>1</sup> Individuals may have bought more costly houses than they could afford in hopes that their income would grow sufficiently to cover payments, especially once teaser rates had expired. Measures of median income growth capture the likelihood that income growth kept up with these mortgage obligations. A bad labor market, as measured by the unemployment rate, may influence the ability of a homeowner to find a new job following job loss. The ability to find a job with a comparable wage following job loss may be particularly challenging in states with a high concentration in manufacturing. To capture this, a measure of the percent of the workforce in manufacturing is included.

The regressions indicate that states with higher unemployment, lower median income growth, and lower home price appreciation have experienced higher foreclosure rates. Also, a greater job concentration in manufacturing increased foreclosures between 1989 and 2006. Overall, these measures of the economy have had a substantial influence on state foreclosure rates.

**Table 2: Regressions Predicting State Foreclosure Rates**

	1989-2006	1989-2004 Adding Property Tax Info	1989-1997	1998-2006	1998-2006 Adding Sub Prime
5 Year % Change in OFHEO	-0.014*** (0.002)	-0.015*** (0.002)	-0.015*** (0.002)	-0.013*** (0.002)	-0.015*** (0.002)
State Unemployment Rate	0.127*** (0.027)	0.123*** (0.026)	0.093*** (0.024)	0.178*** (0.050)	0.144*** (0.051)
Manufacturing Employment (as a % of Total)	0.006 (0.006)	0.006 (0.007)	-0.008 (0.010)	0.025* (0.015)	0.020 (0.013)
5 Year % Change in Median Income	-0.006*** (0.002)	-0.005** (0.002)	-0.004*** (0.002)	-0.002** (0.004)	-0.002 (0.004)
Homeownership Rate (%)	-0.002 (0.005)	-0.002 (0.005)	-0.001 (0.005)	-0.001 (0.009)	-0.001 (0.008)
Percent of Population with B.A. or More	0.022*** (0.006)	0.027*** (0.006)	0.029*** (0.009)	0.013 (0.009)	0.018** (0.008)
ARM Percent	0.002 (0.002)	0.001 (0.002)	0.000 (0.002)	0.007 (0.002)	0.005 (0.004)
Loan to Price	0.017* (0.009)	0.017* (0.010)	0.011 (0.016)	0.011 (0.010)	0.005 (0.009)
Percent of Mortgages that are FHA	0.004 (0.003)	0.004 (0.003)	0.000 (0.005)	0.018** (0.008)	0.018*** (0.007)
Percent of Mortgages that are Subprime					0.055* (0.029)
Dummy=1 if Foreclosures Primarily or Exclusively Judicial	0.142** (0.067)	0.130* (0.068)	0.060** (0.089)	0.230** (0.098)	0.224*** (0.082)
Days to Process Foreclosures	0.001*** (0.000)	0.001*** (0.000)	0.001** (0.000)	0.002** (0.001)	0.002*** (0.001)
Per Capita State and Local Prop. Tax Revenue (\$1000s)		-0.024 (0.059)			
Constant	-0.807 (0.817)	-1.110 (0.879)	-0.817 (1.090)	-1.506 (1.096)	-0.962 (0.923)
Observations	918	816	459	459	459
R-squared	0.59	0.59	0.63	0.58	0.62

Standard errors clustered by state in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%  
Year Fixed Effects Included in All Specifications

**Table 3: Loans by Type and Associated Foreclosure Rates: Indiana vs. United States, 2007:Q1**

	Number of Loans	Percent of Loans	Foreclosure Rate
<i>Indiana</i>			
<b>PRIME</b>			
-FRM	458,404	61.3%	1.15
-ARM	56,058	7.5%	3.19
<b>SUBPRIME</b>			
-FRM	53,793	7.2%	6.37
-ARM	58,572	7.8%	12.93
<b>FHA</b>			
-FRM	90,828	12.1%	3.63
-ARM	8,111	1.1%	5.23
<b>VA</b>	22,032	2.9%	2.82
<b>TOTAL</b>	747,798	100.0%	3.00
<i>U.S.A.</i>			
<b>PRIME</b>			
-FRM	23,694,889	61.6%	0.38
-ARM	6,079,823	15.8%	1.09
<b>SUBPRIME</b>			
-FRM	2,130,443	5.5%	3.29
-ARM	2,901,511	7.5%	6.46
<b>FHA</b>			
-FRM	2,371,167	6.2%	1.85
-ARM	192,924	0.5%	2.73
<b>VA</b>	1,110,281	2.9%	1.05
<b>TOTAL</b>	38,481,038	100.0%	1.23
<b>Source: Data from Haver Analytics database</b>			

These measures have had mixed effects in Indiana. As can be seen in Table 1, while Indiana has experienced lower house price appreciation and has higher manufacturing employment than the nation as a whole, Indiana has had lower unemployment than the nation and median income growth in line with national levels. Based on these factors and year fixed effects alone, one would

estimate an average foreclosure rate of 1.03 percent in Indiana between 1989 and 2006, compared to 1.02 percent for the nation as a whole.<sup>2</sup>

### Population Characteristics

Two population characteristics that have been discussed potentially contribute to foreclosures – the education of the state population and

the homeownership rate. Education is measured as the percent of the population with at least a BA. It has been hypothesized that states with a more educated workforce would have lower foreclosures because workers with more education and who earn high incomes have an easier time finding jobs and sustaining their income. Additionally, more educated individuals may be more informed about the functioning of the mortgage market and less likely to select mortgage products poorly suited to their needs. High homeownership rates are thought to contribute to foreclosures because the marginal borrowers in areas with high levels of homeownership are more fragile and may be more prone to economic dislocations. Neither of these variables behaves as predicted. Controlling for the other variables, homeownership rates are uncorrelated with foreclosures, while states with a higher proportion of college educated residents have experienced higher foreclosure rates. Based on this result, Indiana's low proportion of college educated workers has served to reduce foreclosures. However, it seems likely that the percent of workers with a BA is picking up an omitted characteristic of the population that is correlated with both foreclosures and educational attainment. Individual level data would be useful to fully investigate the link between education and foreclosures.

### Loan Attributes

The next set of variables captures attributes of mortgage loans. They include measuring the percent of conventional loans with adjustable rates, the loan to price ratio of the average loan, the percent of mortgages insured by the FHA, and (in 1998-2006) percent of mortgages that are subprime. ARMs, FHA, and subprime loans all have higher foreclosure rates than conventional fixed rate prime loans, so higher percents of these loans should increase foreclosures. Similarly, loans with a higher loan to price ratio indicate

**Table 4: Regressions Predicting State Foreclosure Starts**

	1989-2006	1989-2004 Adding Property Tax Info	1989-1997	1998-2006	1998-2006 Adding Sub Prime
5 Year % Change in OFHEO	-0.017*** (0.002)	-0.017*** (0.002)	-0.017*** (0.002)	-0.016*** (0.002)	-0.019*** (0.002)
State Unemployment Rate	0.125*** (0.030)	0.116*** (0.027)	0.083*** (0.030)	0.185*** (0.049)	0.144*** (0.044)
Manufacturing Employment (as a % of Total)	0.012 (0.008)	0.011 (0.008)	-0.001 (0.010)	0.030* (0.015)	0.024* (0.013)
5 Year % Change in Median Income	-0.006*** (0.002)	-0.006*** (0.002)	-0.006* (0.003)	-0.000 (0.003)	0.001 (0.003)
Homeownership Rate (%)	-0.005 (0.005)	-0.007 (0.005)	-0.007 (0.006)	0.001 (0.009)	-0.001 (0.007)
Percent of Population with B.A. or More	0.020*** (0.007)	0.024*** (0.007)	0.026*** (0.010)	0.010 (0.010)	0.016* (0.008)
ARM Percent	0.004 (0.002)	0.003 (0.002)	0.001 (0.002)	0.012** (0.005)	0.010** (0.005)
Loan to Price	0.021** (0.010)	0.020* (0.011)	0.017 (0.019)	0.011 (0.009)	0.004 (0.009)
Percent of Mortgages that are FHA	0.009** (0.004)	0.007** (0.003)	0.003 (0.005)	0.029*** (0.008)	0.030*** (0.006)
Dummy=1 if Foreclosures Primarily or Exclusively Judicial	0.022 (0.079)	0.010 (0.081)	-0.062 (0.103)	0.117 (0.103)	0.109 (0.081)
Days to Process Foreclosures	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.001 (0.001)	0.001 (0.001)
Per Capita State and Local Prop. Tax Revenue (\$1000s)		-0.080 (0.054)			
Percent of Mortgages that are Subprime					0.068** (0.026)
Constant	-0.860 (0.820)	-0.188 (0.967)	-0.423 (1.359)	-0.959 (1.091)	-0.177 (0.895)
Observations	918	816	459	459	459
R-squared	0.60	0.59	0.59	0.63	0.68

Standard errors clustered by state in parentheses, \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%  
Year Fixed Effects Included in All Specifications

that the borrower has less equity in the home and is less able to sell the house to payoff an existing loan and therefore more likely to default. All of these variables have the predicted signs and the loan to price ratio for the entire sample and the FHA percent and percent subprime in 1998-2006 have statistically significant effects on foreclosures. Indiana has had higher levels of all of these variables during the time period under investigation. Table 3 shows the number and percent of loans by type for Indiana relative to the U.S., as well as associated foreclosure rates for first quarter of 2007. These patterns have been relatively consistent over time. A lower percentage of Indiana's loans are in the categories with the lowest foreclosure rates, particularly in prime ARMs.

These loan-based variables combined with year-fixed effects lead

to a prediction of a foreclosure rate of 1.05 percent for Indiana from 1989 to 2006 as compared to a national

**In general, judicial foreclosures are more cumbersome than nonjudicial foreclosures. As a result it may be more costly for lenders to initiate foreclosure in judicial foreclosure states.**

average of 1.02 percent, and a foreclosure rate of 1.40 percent from 1998 to 2006 as compared to a national average of 1.17 percent.

Another way to investigate the contributions of greater numbers of subprime and FHA loans on the aggregate state foreclosure rate is to predict what Indiana's overall foreclosure

rate would be if Indiana's foreclosure rates within loan category were fixed, but Indiana mimicked the national distribution of loans by type.

Alternatively we could explore what Indiana's foreclosure rate would be if we take Indiana's distribution of loans, but apply national foreclosure rates. These numbers are graphed in Figure 2 (for the years where data is available). This graph shows that the higher foreclosure rates within category are the primary drivers of the high foreclosure rate, because foreclosures remain high when the U.S. loan distribution is used.

## Foreclosure Process

The next two variables measure attributes of the legal foreclosure process. The first variable measures whether foreclosures in the state are primarily judicial or nonjudicial. The second variable measures the average number of days to process a foreclosure. In general, judicial foreclosures are more cumbersome than nonjudicial foreclosures. As a result it may be more costly for lenders to initiate foreclosure in judicial foreclosure states. Judicial foreclosures may take longer than nonjudicial foreclosures. According to realtytrac.com, Indiana's process period

is twice as long as the 51 jurisdiction average. The regression results show that both of these variables serve to increase the level of foreclosures. Indiana has a relatively long judicial foreclosure process, so these legal attributes partially explain the high foreclosure rate in Indiana. The foreclosure outcome measure used is

the stock of foreclosures at a given time, so the longer foreclosure process means that each foreclosure contributes to the stock for a longer period. One may be concerned both about the number of homes in the foreclosure process at a given point and the number of homes entering foreclosure (the flow). Table 4 reflects the same regression analysis as Table 2, but with foreclosure starts as the dependent variable. These results are broadly similar to the previous results with the exception that the variables measuring the foreclosure process are no longer statistically significant. This pattern would occur if the legal conditions extend the duration of foreclosures rather than increase the number of homes entering into foreclosure.

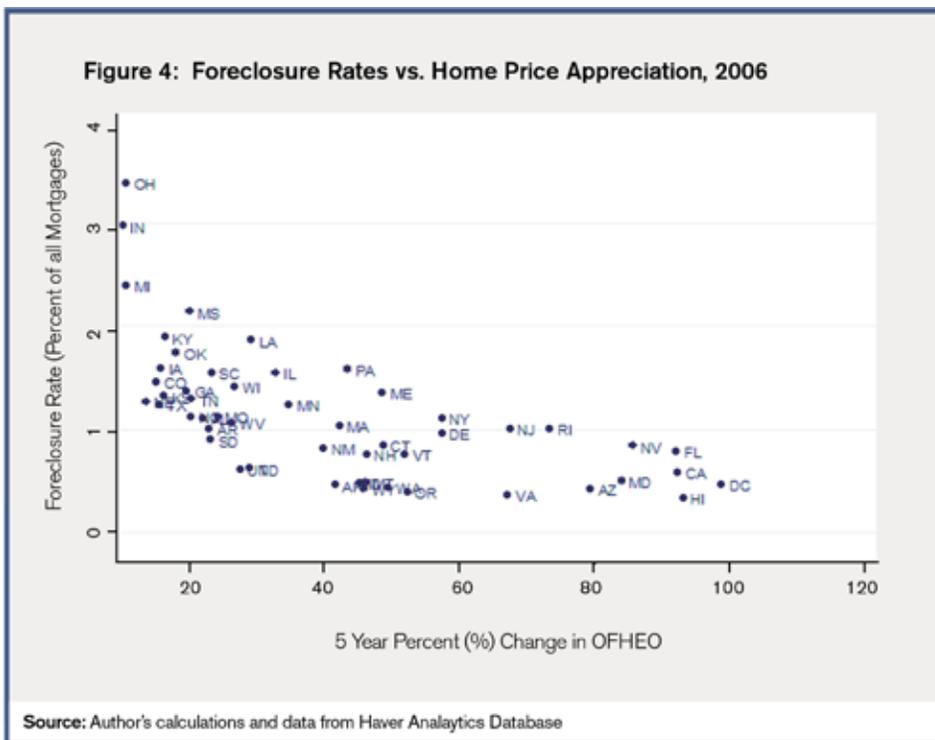
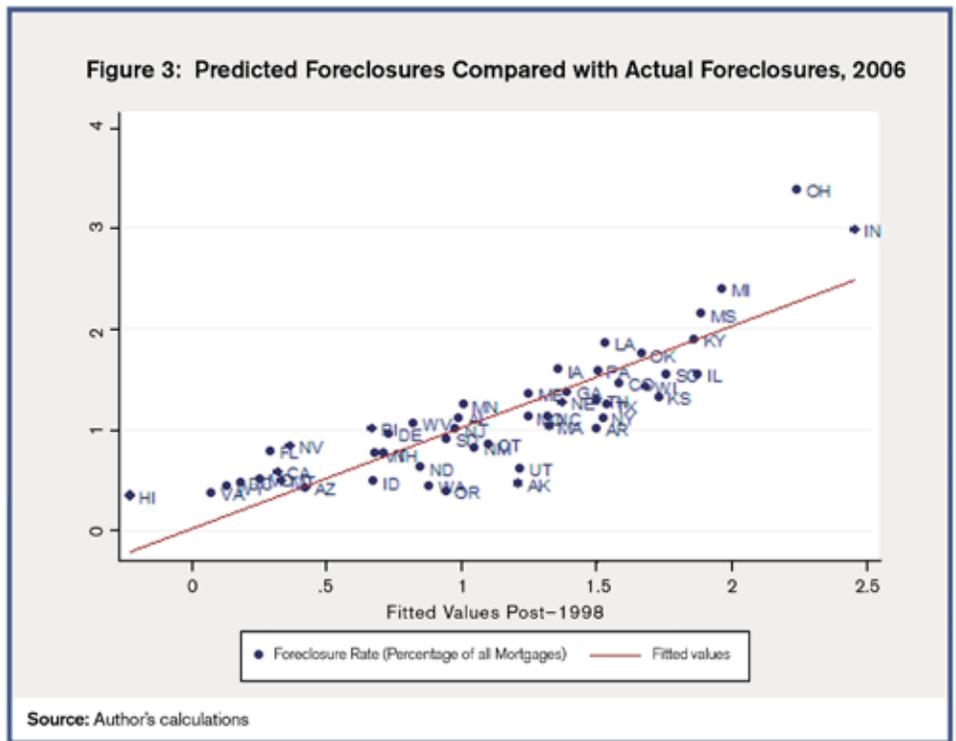
## Property Taxes

The final variable in the regressions measures combined state and local per capita property tax revenue in the state. High property taxes may divert homeowner resources away from mortgage payments leading to higher levels of default. State and local property tax revenue data is only available through 2004, so the

regression including property tax information covers a shorter span of time. The regression shows that property tax revenues have no effect on foreclosures. In addition, the point estimate has the opposite sign from that predicted, with higher property taxes correlated with lower levels of

foreclosure. If we substitute the percent change in per capita property taxes to capture unanticipated property tax increased, there is still a statistically insignificant effect on foreclosures (with a negative coefficient). Property taxes have been getting a great deal of press in Indiana as a result of a court ordered reassessment of property. While the regression does not point to a large role for property taxes by state, changes within the state may be influencing foreclosures in certain markets. Property tax rates have gone up dramatically in some areas in Indiana.<sup>3</sup> Further analysis at the county or individual loan level may find a relationship between property taxes and foreclosures.

Based on all of the variables included in the regressions, Indiana's estimated average foreclosure rate is 1.19 percent. This is higher than the national average, but substantially lower than Indiana's actual average value of 1.55 percent. Figure 3 is a graph of the forecast levels of foreclosures based on the regression in Column 5 of Table 2 compared to the data on foreclosures for 2006. States



listed above the 45 degree line have experienced foreclosures higher than are predicted by the regression model while states below this line have experienced lower foreclosures. The model does a very good job predicting foreclosure rates for most states except for Indiana and Ohio, which are substantially above the 45 degree line.

Two factors not adequately controlled for in the model may be influencing this outcome. First, mortgage fraud may be higher in these markets. It is very difficult to measure the incidence of mortgage fraud and, therefore, no measure is included in the regressions. The Mortgage Asset Research Institute does develop some state rankings of fraudulent activities based on lender reports. Indiana was ranked second in the Mortgage Fraud Index in 2003 and 2004, but dropped out of the top 10 in 2006. Ohio was also not in the top 10 in 2006. Both Indiana and Ohio were in the top 10 for subprime fraud in 2006 (Sharick et al. 2007). The FBI's measure of "Mortgage Fraud Hot Spots" for 2006 includes Indiana and Ohio, but neither state was on the FBI's list in 2003 or 2004 (FBI 2005; 2006). It is difficult to rule out mortgage fraud as part of the issue in Indiana, but it is likely to be a small contributor. Tatom (2007) calculates that the total number of "suspicious" reports is less than 5 percent of total foreclosures.

The second factor that may be influencing high foreclosure rates in Indiana and Ohio are nonlinearities in the effects of house prices on foreclosure rates. The effect of particularly low home price appreciation may be especially large. The linear regression framework assumes that the difference between 5 and 10 percent home price appreciation on foreclosures is the same as the difference between 25 and 30 percent home price appreciation. This assumption may be incorrect. Figure 4 graphs foreclosure rates versus five-year home price

appreciation for 2006. The three states with the lowest house price appreciation – Indiana, Ohio, and Michigan, had the highest foreclosure rates.

## Conclusion

In this article, variation in foreclosure rates were investigated across states over the past 18 years, to attempt to explain reasons for the high rate of foreclosures in the state of Indiana. Economic conditions, foreclosure processes, and loan characteristics all explain some of the differences in foreclosure rates. In addition, some variables hypothesized to contribute to foreclosure rates do not appear to do so, including high homeownership rates, low levels of educational attainment, and property taxes. Based on the factors that impact foreclosures nationally, Indiana is predicted to have higher foreclosure rates than the national average, but not levels as high as those experienced.

## NOTES

- 1 Causality may also be reversed with higher foreclosure rates affecting house price appreciation.
- 2 Another potential culprit is the role of the auto sector in the state economy. Auto employment is not included in the regressions, because data is only available for half of the states. In addition, as is discussed in Tatom (2007), the problems with foreclosures in Indiana predate the declines in the auto sector.
- 3 Desiree Hatcher and Harry Ford provided useful insight into property tax patterns across the state of Indiana.

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