Mortgage Default, Foreclosures and Bankruptcy

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I.   Introduction

The financial crisis of 2008 and the current recession were triggered by the bursting of the housing bubble and the subprime mortgage crisis that began in late 2006/early 2007.   In this paper, we investigate whether personal bankruptcy law also played a role in creating the mortgage crisis or in making it worse.   In particular, we show that there is a strong and previously unnoticed relationship between homeowners' decisions to default on their mortgages and their decisions to file for bankruptcy.   In theory, bankruptcy and default could be either substitutes or complements.   They would be substitutes if homeowners use bankruptcy to save their homes, assuming that they succeed in avoiding default. Alternately, they would be complements if homeowners use bankruptcy to reduce the cost of defaulting on their mortgages, in which case they would be observed to do both or neither.   In fact we show that the bankruptcy/default relationship is complementary for most homeowners. We also show that the relationship between foreclosure and bankruptcy is also complementary. But we find that homeowners responded to the 2005 bankruptcy reform by treating bankruptcy as a substitute for default and foreclosure.

The paper argues that these relationships have important public policy implications.   In particular, foreclosures have very high social costs, and some of these costs are external to both borrowers and lenders. As a result, there is a social gain from discouraging bankruptcy filings, since fewer bankruptcies would also mean fewer defaults and foreclosures.   We show that these considerations shift optimal bankruptcy law in a pro-creditor direction and shift other policies that affect the number of bankruptcy filings in a pro-debtor direction.

To give some background on why the bankruptcy/mortgage default relationship has not been recognized, figure 1 shows the bankruptcy filing and mortgage default rates from 1980 to 2008. Both are scaled to equal one in 1980. The diagram suggests that the mortgage default rate was fairly steady over the period—the fraction of mortgage debt that defaulted was around 5% in the 1980s, dropped to 4.5% in the 1990s and early 2000s, and did not begin rising until 2007. In contrast, the bankruptcy filing rate has risen steadily: between 1980 and 2004, it increased from 3.5 to 14 per 1,000 households.   A major bankruptcy reform went into effect in late 2005 that made bankruptcy law more pro-creditor and the filing rate responded by jumping to 18 per 1,000

households in 2005, as debtors rushed to file under the old rules. It then dropped sharply to 5.2 in 2006, but since then has resumed its upward trend in 2007, rising to 9.2 per 1,000 households in 2008. [1] If we run a regression explaining the bankruptcy filing rate as a function of the mortgage default rate, the coefficient of the default rate is negative and not statistically significant. Thus aggregate data over a long time period suggest little relationship between bankruptcy and mortgage default.

But the picture changes if we examine micro data over a more recent time period. We use the LPS data, a large dataset of mortgages that are followed every month. Our sample consists of prime and subprime mortgages that originated in 2004 or 2005 and are followed monthly from origin until they are paid off, go into foreclosure, or until the end of our sample period in October 2008. [2] Mortgage default is defined to occur when homeowners are delinquent on their payments by one month or more. We also know when homeowners file for bankruptcy and when lenders begin the foreclosure process. Figure 2 shows monthly default rates, foreclosure rates, and bankruptcy filing rates, with prime and subprime mortgages shown separately. The period covered includes both the October 2005 bankruptcy reform and the start of the mortgage crisis. Using this data, the correlation coefficients between bankruptcy and mortgage default and between bankruptcy and foreclosure are .62 and .87, respectively. For subprime mortgages, the correlations are .86 and .87, respectively. Thus recent data suggest that homeowners' default and bankruptcy decisions are closely related and that homeowners' bankruptcy decisions are closely related to the start of foreclosure.

To examine these relationships further, consider the timing of homeowners' bankruptcy decisions relative to when they default. For all homeowners in the sample who default, we set the month of default to zero and calculate the cumulative probability that homeowners file for bankruptcy each month before and after default. The results are shown in figure 3, with separate curves for prime and subprime mortgages. Homeowners tend to file for bankruptcy after they default rather than before, with most homeowners filing within a year after default. Eventually,

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[1] Table 1 gives these data and data sources. We have not been able to locate any historical data on foreclosures.
[2] If homeowners default, then become current and then default again, we include both defaults for purposes of computing the average monthly default rates.

around 6% of homeowners with prime mortgages and 9% of homeowners with subprime mortgages who default also file for bankruptcy.

Now consider the default decisions of homeowners who file for bankruptcy. For all homeowners who file for bankruptcy, we set the month of bankruptcy to zero and calculate the cumulative probability of default each month before and after bankruptcy. The results are shown in figure 4. The timing pattern in both figures is similar—homeowners tend to default before they file for bankruptcy. But homeowners who file for bankruptcy are much more likely to default than the reverse—eventually, 77% of homeowners with prime mortgages and 94% of homeowners with subprime mortgages default if they have filed for bankruptcy. This suggests that homeowners are generally not filing for bankruptcy in order to save their homes or, if they do, then most do not succeed. Instead, they are filing for bankruptcy to reduce the cost of losing their homes.

We also examine the timing of the bankruptcy-foreclosure relationship. We set the date when lenders start the foreclosure process at zero and calculate the probability that homeowners file for bankruptcy each month before and after. The sample consists of all mortgages in which foreclosure starts. Figure 5 shows that nearly all homeowners file for bankruptcy right around the time lenders start foreclosure. Eventually, 18% and 72% of homeowners with prime and subprime mortgages who experience foreclosure also file for bankruptcy, respectively. Similarly, figure 6 shows the cumulative probability of foreclosure conditional on homeowners filing for bankruptcy. Lenders begin foreclosure for 44% and 72% of prime and subprime mortgages, respectively, conditional on homeowners' filing for bankruptcy.

The paper proceeds as follows. In the next section, we examine homeowners' incentives to default and file for bankruptcy in the context of the U.S. legal environment. We also examine the various ways in which homeowners in financial distress gain from coordinating their default and bankruptcy decisions and develop testable hypotheses concerning how their default and bankruptcy decisions are related. We also consider how homeowners can reduce their losses from foreclosure by filing for bankruptcy. In section III, we discuss our mortgage dataset in greater detail. In section IV, we give the results of hazard models that examine the relationships between bankruptcy and mortgage default and between bankruptcy and foreclosure. In section V, we discuss policy implications.

II.   Homeowners' Decisions to Default and File for Bankruptcy under U.S. Law

In this section, we consider homeowners' incentives to default and file for bankruptcy in the U.S. legal environment. We also consider how the 2005 bankruptcy reform and the start of the mortgage crisis changed homeowners' incentives.

Suppose homeowners default on their mortgage payments.   Lenders generally begin the foreclosure process once homeowners are delinquent by two or three months. States vary in how long and how formal the foreclosure process is. In some states mortgage lenders can proceed without going to court, while in other states they must obtain a court order. Eventually the lender obtains legal title to the property and sells it. The proceeds after expenses are used, first, to repay the first mortgage in full, including principal, interest, fees, and penalties. Next, the second mortgage and home equity loans, if any, are repaid in full in order. Third, homeowners receive an amount up the state's homestead exemption.   Homestead exemptions vary widely across states, from zero in a few states to unlimited in seven states.   If anything is left, it goes to unsecured creditors.   In most foreclosures, the sale price of the house is insufficient to repay the mortgage(s)—otherwise homeowners would have sold the house themselves. Some states allow mortgage lenders to obtain a "deficiency judgment" against the former owner, which is an unsecured claim for the difference between the amount of the mortgage and the sale price of the house.[3] Most states also allow homeowners to reclaim their houses for a period after foreclosure by repaying their mortgages in full. These periods can last up to a year.

Homeowners who default can remain in their homes for varying periods. Some states force them to leave before the transfer of title to the lender. Others allow them to stay, which means that they become tenants and the new owner must go through an eviction procedure to force them to leave. During this process, homeowners/former homeowners are not obliged to make any mortgage or rent payments. The period from default to eviction ranges from a few months to more than a year—and homeowners can extend it by filing for bankruptcy.

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[3] To prevent mortgage lenders from selling foreclosed homes for less than market value, many states allow deficiency judgments only if the foreclosure process has gone through the courts. See Elias (2009) for discussion of foreclosure law.

Now suppose homeowners default on non-mortgage debt. Credit card lenders use aggressive collection techniques, including frequently calling the debtor at home and at work and sending threatening letters. Lenders may also obtain a court order to garnish debtors' wages if they can determine where debtors work and to seize debtors' bank accounts if they can locate these accounts. Federal law prevents lenders from garnishing more than 25% of debtors' wages. Some states restrict garnishment further and a few states prohibit it entirely.[4]

Now consider homeowners' decisions to default on their mortgages. Homeowners may default because their ability-to-pay falls or they may default strategically, because doing so makes them better off. Suppose *PVCO* denotes the net present value of the cost of owning a home, including the value of home equity, expected future capital gains or losses on the house, and the cost of paying the mortgage. *PVCR* denotes the net present value of the cost of alternative housing, which we assumed is rented. Homeowners gain from defaulting if *PVCO < PVCR*. They are less likely to default if they have positive home equity, if they expect home values to rise in the future and/or if they have particularly favorable mortgage terms (such as below-market interest rates).

Now turn to bankruptcy and consider how filing for bankruptcy affects homeowners' gain from defaulting on their mortgages.[5] There are two separate personal bankruptcy procedures in the U.S., called Chapter 7 and Chapter 13, and most homeowners are allowed to choose between them. Filing for bankruptcy under either chapter stops creditors' collection efforts, prevents or ends wage garnishment, and stops the foreclosure process—at least temporarily. Some or all unsecured debts—including credit card debts, installment loans, medical bills, and unpaid rent—are discharged.

Consider Chapter 7 first. In Chapter 7, unsecured debts are quickly discharged,[6] but mortgage debt cannot be changed or discharged.[7] Debtors are obliged to use assets above their

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[4] See Mann (2006) for discussion of collection practices by credit card lenders.
[5] See White and Zhu (2010) and Lin and White (2001) for detailed discussions of the relationship between homeowners' default and bankruptcy decisions. Fay, Hurst, and White (2003) show empirically that debtors are more likely to file for bankruptcy when their financial gain from filing is higher.
[6] Not all unsecured debts are discharged in bankruptcy—debts that are not discharged include unpaid child support, taxes, debts incurred by fraud, and student loans (the latter can occasionally be discharged under a hardship procedure).

state's exemption level to repay unsecured debt, but they are not obliged to repay from their future incomes—even if their earnings are high. States have separate exemptions for different types of assets, but the homestead exemption is generally the largest. In states with high homestead exemptions, even debtors with high assets do not have to repay any of their unsecured debt in bankruptcy, as long as they convert their assets into exempt home equity before filing.[8]

Chapter 7 can help financially distressed homeowners save their homes by discharging some of their unsecured debts, thus making additional funds available to pay the mortgage. Because foreclosure is stopped during the bankruptcy proceeding, homeowners also get several extra months to repay mortgage arrears.[9] They are allowed to keep their homes in Chapter 7 as long as their home equity is less than their state's homestead exemption and they repay the arrears within a few months. In terms of the bankruptcy-default relationship, this discussion suggests that homeowners who wish to save their homes and succeed may be observed in bankruptcy only or in bankruptcy and in default. But they will not be observed in foreclosure.

However, homeowners also gain from filing under Chapter 7 if they do not intend to save their homes. If they have positive home equity, then using bankruptcy to delay foreclosure gives them more time to sell their homes privately, which may bring a higher price. If homeowners do not have positive home equity, then filing for bankruptcy allows them to live in their homes cost-free for longer. Homeowners who default also have an incentive to file for bankruptcy because default lowers their credit scores and this means that the cost of filing for bankruptcy is low. In addition, homeowners who have already lost their homes and are subject to deficiency judgments

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[7] The prohibition on changing mortgage terms in bankruptcy is based on the Supreme Court's decision in Nobleman v. American Savings Bank, 508 US 324 (1993) and on 11 U.S.C. § 1322(b)(2), which prevents bankruptcy judges from discharging mortgage debt that is secured only by a primary residence that is a single-family house, even if the value of the house is below the mortgage principle. But second mortgages are sometimes discharged in bankruptcy—see below. For discussion, see Bourguignon (2007) and Levitin and Goodman (2008).

[8] Bankruptcy law in the U.S. is Federal law, so that it is uniform all over the country. But U.S. bankruptcy law allows states to set their own asset exemptions.
[9] Berkowitz and Hynes (1999) first suggested that filing for bankruptcy increases debtors' ability to repay their mortgages by discharging unsecured debt. But see Carroll and Li (2008) for data showing that homeowners who file for bankruptcy to save their homes often fail.

gain from filing under Chapter 7 in order to have the deficiency judgments discharged. Thus homeowners who do not try to save their homes are likely to be observed in default, in bankruptcy, and in foreclosure.

Homeowners' gain from filing under Chapter 7 can be expressed as:

$$GainChapter7 = U_7 + H_7 - R_7 - \max[A - X_A, 0] - C_7$$

U_7 is the value of unsecured debt discharged in Chapter 7. Homeowners receive this subsidy in bankruptcy regardless of whether they keep their homes or not. H_7 is the change in the present value of future housing costs when homeowners file under Chapter 7. If homeowners save their homes in Chapter 7, then $H_7 = 0$. But if they give up their homes in Chapter 7, then H_7 equals the reduction in housing costs from becoming renters, or $(PVCO_7 - PVCR_7)$. This may include the gain from having cost-free housing for several months by delaying foreclosure, the gain from having a deficiency judgment discharged, and/or the gain from moving to rental housing that costs less. If homeowners make efficient housing choices, then $H_7 = \max[0, (PVCO_7 - PVCR_7)]$. $\max[A - X_A, 0]$ is the value of non-exempt assets that homeowners must use to repay unsecured debt in bankruptcy, where A is the value of homeowners' assets and X_A is the asset exemption (equal to the homestead exemption in most states). C_7 is homeowners' cost of filing for bankruptcy under Chapter 7.

Overall, the discussion of Chapter 7 bankruptcy suggests that financially distressed homeowners are likely both to file for bankruptcy and to default. If they fail to save their homes, then they will also be observed in foreclosure. But homeowners who prefer to give up their homes are also likely to be observed in default, in bankruptcy and in foreclosure. This suggests that bankruptcy and default tend to be complements for financially distressed homeowners, regardless of whether they attempt to save their homes or not, and that bankruptcy and foreclosure are also complements for homeowners who do not attempt to save their homes or who try but fail.

Now turn to Chapter 13. It is intended as a procedure for financially distressed homeowners to save their homes, even if they have large mortgage arrears that they cannot repay in a lump

sum. Homeowners must have regular earnings and they must follow a court-supervised repayment plan for 3 to 5 years. If they succeed in repay their mortgage arrears as part of the plan and also keep current on their normal mortgage payments, then the original mortgage contract will be reinstated.[10] The terms of first mortgages cannot otherwise be changed in Chapter 13. But second mortgages and home equity loans can be discharged in Chapter 13 if the loan is underwater and some car loans can also be reduced in Chapter 13. Bankruptcy trustees also may challenge fees and penalties that lenders add to mortgages following default.[11] Prior to the 2005 bankruptcy reform, homeowners were generally not required to repay any of their unsecured debt in Chapter 13, as long as their assets were entirely exempt.[12]

To illustrate a Chapter 13 plan, suppose a homeowner owes $8,000 in past due mortgage payments, plus $2,000 in penalties and late fees. The homeowner's normal monthly mortgage payment is $800 per month. The homeowner cannot repay the $10,000 in full immediately. But under Chapter 13, she is allowed to repay the arrears over 3 to 5 years as part of her repayment plan. At an interest rate of 6% and with the bankruptcy trustee adding a 10% fee, the cost of repaying the mortgage arrears over 5 years is $203 per month.   She must also make her normal mortgage payments of $800/month.   Thus during the plan, her monthly mortgage costs are $1,003 per month.

Homeowners' gain from filing under Chapter 13 can be expressed as:

$$GainChapter13 = U_{13} + S_{13} + H_{13} - E_{13} - \max[A - X_A, 0] - C_{13}.$$

Here U_{13} is the value of unsecured debt discharged in Chapter 13. S_{13} is the value of non-housing secured debt (car loans) discharged in Chapter 13. H_{13} is the reduction in the cost of

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[10] 11 U.S.C. § 1322(c)(1) allows debtors to cure defaults on their mortgages in Chapter 13.
[11] See Porter (2009) and Elias (2009) for discussion.
[12] Prior to 2005, bankruptcy judges generally approved repayment plans that did not require homeowners to repay any unsecured debt, as long as all of their assets would be exempt in Chapter 7. The justification was that these homeowners could otherwise file under Chapter 7, where their unsecured debts would be completely discharged. If homeowners' home equity was not completely exempt, then they were also obliged to use their non-exempt home equity to repay unsecured debt. This is because bankruptcy law requires that unsecured creditors receive at least as much in Chapter 13 as they would in Chapter 7.

housing when homeowners file under Chapter 13. If homeowners keep their homes, then $H_{13} = \Delta PVCO_{13}$, where $\Delta PVCO_{13}$ equals the value of second mortgage loans, home equity loans, and/or fees and penalties that are discharged in Chapter 13. If homeowners shift to rental housing, then $H_{13} = PVCO_{13} - PVCR_{13}$, or the reduction in housing costs when homeowners shift to rental housing. E_{13} is the present value of future earnings that must be used to repay unsecured debt in Chapter 13 (if any) and $\max[A - X_A, 0]$ is again the value of non-exempt assets (if any) that must be used to repay unsecured debt. C_{13} is the cost of filing for bankruptcy under Chapter 13.

Comparing homeowners' gain from filing for bankruptcy under Chapters 7 versus 13, both the costs and benefits of filing are generally higher under Chapter 13. Under Chapter 13, more types of unsecured debt are discharged than in Chapter 7, some car loans are also discharged, and the reduction in the cost of owning is larger than in Chapter 7. Thus $U_{13} > U_7$, $H_{13} > H_7$, and $S_{13} > 0$. Prior to the 2005 bankruptcy reform, Chapter 13 filers generally repaid only a token amount of unsecured debt, so that E_{13} was small. And prior to bankruptcy reform, debtors generally did not repay any of their debts from non-exempt assets, so that $\max[A - X_A, 0] = 0$. But the costs of filing for bankruptcy are higher in Chapter 13, so that $C_{13} > C_7$. Thus both the benefits and costs of filing for bankruptcy are larger under Chapter 13 than Chapter 7.

This discussion suggests that our predictions concerning the bankruptcy/default and bankruptcy/foreclosure associations are similar for homeowners who file under Chapter 7 and under Chapter 13. Because few debtors choose Chapter 13 unless they are homeowners trying to save their homes, the discussion suggests that Chapter 13 filers are also likely to be observed both in bankruptcy and in default. As in Chapter 7, they will not be observed in foreclosure if they succeed in saving their homes. Thus bankruptcy and default are predicted to be complements for financially distressed homeowners, but bankruptcy and foreclosure are predicted to be less strongly complementary as long as some homeowners successfully use bankruptcy to save their homes. If we find the bankruptcy/foreclosure relationship to be as strongly complementary as the bankruptcy/default relationship, then this will suggest that homeowners do not use bankruptcy to save their homes.

Now consider the 2005 bankruptcy reform and how it changed homeowners' gain from filing for bankruptcy. First, bankruptcy costs C_7 and C_{13} increased substantially, thus discouraging all homeowners from filing for bankruptcy. Second, a new means test was introduced that prevents some homeowners with incomes above the median level in their states from filing for bankruptcy under Chapter 7. Third, Chapter 13 became less attractive because a new procedure requires some filers with above-median incomes to repay part of their unsecured debt, thus increasing E_{13}. Also the criterion for discharging car loans in Chapter 13 was tightened, thus reducing S_{13}. Finally, a cap of \$125,000 on the homestead exemption was introduced for homeowners who live in states with high homestead exemptions and have lived in their homes for less than 3½ years. This raises $\max[A - X_A, 0]$ and discourages some high-asset homeowners from filing. [13]

Overall, the 2005 bankruptcy reform is predicted to reduce the number of homeowners who file for bankruptcy. And because financially distressed homeowners who do not file for bankruptcy do not receive the debt discharge and mortgage payment delay that bankruptcy provides, the reform is also predicted to increase default and foreclosure.

The mortgage crisis also affected homeowners' incentives to default and to file for bankruptcy, mainly by reducing home values and therefore wiping out many homeowners' home equity. The reduction in home equity raises the cost of continuing to own, while leaving unaffected the cost of renting. It therefore encourages homeowners to default on their mortgages and give up their homes. But if bankruptcy and mortgage default are complements, then the reduction in home equity could also cause bankruptcy filings to rise. In the empirical section, we examine whether more default and foreclosure occur when home equity is negative, which is more likely after the beginning of the mortgage crisis. We also examine whether homeowners are more likely to file for bankruptcy when their home equity is completely exempt, which is also more likely after the beginning of the mortgage crisis. With no non-exempt home equity, homeowners are more likely to file for bankruptcy because they are allowed to keep their homes.

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[13] Ten states plus the District of Columbia have homestead exemptions greater than \$125,000. See Elias (2007) and earlier editions.

In the next section, we estimate regressions explaining default and foreclosure as a function of past bankruptcy and regressions explaining bankruptcy as a function of past default and past foreclosure. These regressions allow us to examine whether default and bankruptcy and foreclosure and bankruptcy are complements or substitutes when we add control variables and they also allow us to determine how strong the relationships are. We also examine how the 2005 bankruptcy reform and the mortgage crisis affected default rates, bankruptcy filings, and foreclosures.[14] Finally we test whether default, foreclosure and bankruptcy are more likely in neighborhoods where more defaults, more foreclosures and more bankruptcies have occurred in the past.

III.   Data and Summary Statistics

Our data, from LPS Applied Analytics, Inc., consist of a large sample of prime and subprime mortgages that originated in 2004-2005. All mortgages are first liens and have 30 year terms. We follow them monthly until they are repaid in full (including being transferred to a different mortgage servicer), the mortgage terminates with foreclosure or a short sale, or until October 2008. We take a 2% random draw of prime mortgages and a 15% random draw of subprime mortgages. This gives us between 90,000 and 100,000 mortgages of each type and between 2.5 and 3.0 million monthly mortgage observations of each type.[15] All regressions use the Cox proportional hazard model and we run all regressions separately for prime and subprime mortgages. Summary statistics are shown in table 2.

It should be noted that we do not interpret these regressions as causal, since homeowners presumably make both their default and bankruptcy decisions as part of an overall plan to save or give up their homes, thus raising endogeneity issues. Similarly, although lenders decide whether to start foreclosure, homeowners anticipate that the start of foreclosure will follow default in a predictable way. But the regressions indicate the significance and the strength of the

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[14] See Morgan et al (2008) and Li, White, and Zhu (2009) for discussion of whether bankruptcy reform contributed to the mortgage crisis.

[15] We take a larger sample of subprime mortgages because they are underrepresented in the LPS data. The size of the sample is limited by our use of the hazard model, which can handle only smaller samples than models such as probit or OLS. See below for further discussion.

default/bankruptcy and foreclosure/bankruptcy relationships and whether these relationships remain complementary when we introduce controls.

Control variables used in the regressions include the homeowner's FICO score in bins (the highest category is omitted), the homeowner's debt-to-income ratio, a dummy variable for missing debt-to-income ratio, whether the homeowner provided full documentation of assets and income at the time the mortgage originated, whether the property is single-family, whether the loan is a jumbo, whether the interest rate is fixed or adjustable, whether the loan is for purchase or refinance, whether the lender is private or is one of the U.S. government agencies, and whether the loan was securitized in the private market (versus securitized by one of the U.S. government agencies or held by lenders in their portfolios). All of these variables are given at the time of mortgage origination and are not updated. Variables that are updated each month include a dummy variable that equals one if the homeowner has negative home equity or a dummy variable that equals one if the homeowner has no non-exempt home equity,[16] the age of the loan in months, age squared, and a measure of the benefit of refinancing (a higher value indicates a larger benefit from refinancing).[17] We also include the unemployment rate in the county during the previous month, the rate of growth of house prices in the metropolitan area during the previous month, the rate of growth of income in the state during the previous month, a dummy variable for whether the state allows deficiency judgments, and either the average mortgage default rate, bankruptcy rate or foreclosure rate in the homeowner's zipcode during the

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[16] The negative home equity dummy equals one if the market value of the home at the time of origination, corrected by the change in average housing values in the metropolitan area since origination, minus the current mortgage principal is negative. This variable is used in the regressions explaining default and foreclosure. The no non-exempt home equity dummy equals one if home equity minus the homestead exemption is negative. This variable is used in the regressions explaining bankruptcy. Note that we do not have information on second mortgages or home equity loans. This means that our negative home equity and negative non-exempt home equity are both biased downward.

[17] Following the literature, we use Principal/Value (PV_t) as a measure of the benefit of refinancing (Richard and Roll, 1989). PV_t measures the present value of future payments on the existing mortgage relative to the present value of future payments on an alternate mortgage having the currently-available interest rate. $PV_t = \{r_t[1-(1+r_0)^{t-M}]\}/\{r_0[1-(1+r_t)^{t-M}]\}$, where r_t and r_0 are the currently-available interest rate and the current mortgage interest rate, and M is the number of months to maturity. The mortgage principal and the number of months to maturity are assumed to remain the same over time.

previous month.[18] We include state and year dummies in all regressions.   Standard errors are clustered by mortgage.

IV.   Results

Table 3 shows the results of estimating hazard regressions that explain homeowners' bankruptcy decisions as a function of whether they previously defaulted on their mortgages and other variables.   Results that are greater than/less than one are interpreted as percentage increases/decreases in the probability of bankruptcy when right-hand-side dummy variables change from zero to one or when right-hand-side continuous variables increase by one in value. Results are shown separately for prime versus subprime mortgages. Only some of the control variables are shown.

The main result is that defaulting on a mortgage is associated with a statistically significant increase in homeowners' probability of filing for bankruptcy.   For homeowners with prime mortgages, the probability of filing for bankruptcy increases 16-fold in the period 1-3 months after default, or from an average value of .00046 per month to .0074 per month. Their probability of filing for bankruptcy also increases 4-fold in the period 4-6 months after default and by 50% in the period 7-24 months after default. For homeowners with subprime mortgages, the increase in the period 1-3 months after default is 14-fold, or from an average value of .0018 per month to .026 per month. The increases in the periods 4-6 months and 7-24 months after default are nearly 2-fold, and 42%, respectively. All of these results are strongly statistically significant.   Thus default and bankruptcy are complementary even when control variables are introduced. We also find that homeowners with prime and subprime mortgages are about half as likely to file for bankruptcy after the 2005 bankruptcy reform went into effect. Homeowners who have no non-exempt home equity are 92% more likely to file for bankruptcy if they have prime mortgages and 39% more likely to file for bankruptcy if they have subprime mortgages. These relationships are also statistically significant.

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[18] The lagged mortgage default rates, bankruptcy rates and foreclosure rates by zipcode are calculated from our data.   The deficiency judgment is taken from Pence (2006).

Among the control variables, homeowners are also more likely to file for bankruptcy if the lagged bankruptcy filing rate in the zipcode is higher: an increase of one percent in the lagged bankruptcy filing rate doubles homeowners' probability of filing for bankruptcy if they have prime mortgages and raises their probability of filing by 33% if they have subprime mortgages. Macroeconomic influences also have the predicted effects: both types of homeowners are more likely to file for bankruptcy if the local unemployment rate is higher, subprime mortgage-holders are less likely to file for bankruptcy if the rate of house price increase in the local area is higher, and prime mortgage-holders are less likely to file for bankruptcy if the growth rate of income in the area is higher. Subprime mortgage-holders are 22% more likely to file for bankruptcy if their mortgages are investor-owned, i.e., have been securitized, which suggests that these homeowners are in worse financial condition even after controlling for credit score and other financial indicators. [19]

Table 4 gives the results explaining homeowners' decisions to default on their mortgages. Again the results show a strong positive relationship between homeowners' default decisions and whether they previously filed for bankruptcy. Filing for bankruptcy is associated with a 4-fold increase in the homeowners' default rate in the next 1-3 months if they have prime mortgages, or an increase from an average rate of .0055 to .022 per month. The increase for homeowners with subprime mortgages is two-fold, or from an average rate of .025 to .052 per month. After 3 months, the relationships are still positive, but insignificant. These results also suggest that bankruptcy and default are complements. The adoption of bankruptcy reform caused homeowners to default on their mortgages 19% more often if they have prime mortgages and 24% more often if they have subprime mortgages. Together with the results in table 3, these results support our predictions that bankruptcy reform caused homeowners both to file for bankruptcy less often and to default more often. Homeowners with subprime mortgages are also 69% more likely to default if they have negative home equity, but the relationship is not significant for prime mortgages.

Among the control variables, homeowners are also slightly more likely to default if they live in an area with a higher unemployment rate and much less likely to default if they live in an area

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[19] This supports the view that investor-owned mortgages are less likely to be renegotiated. See Piskorski et al (2009).

with higher house price growth. The lagged default rate is also a significant determinant of whether homeowners default. An increase of one percent in the lagged default rate in the zipcode increases homeowners' probability of defaulting by 17% if they have prime mortgages and 21% if they have subprime mortgages. Thus default causes more default for both types of mortgages.

Now turn to the bankruptcy/foreclosure relationship. Table 5 gives the results of regressions explaining homeowners' bankruptcy decisions as a function of whether lenders have already started foreclosure proceedings. The results show a surprisingly strong relationship. Homeowners with prime and subprime mortgages are 28 times and 22 times as likely to file for bankruptcy, respectively, if lenders began foreclosure within the previous three months. After three months, the relationship is either insignificant or has the wrong sign. This compares with 16-fold and 22-fold increases in homeowners' probabilities of filing for bankruptcy in the same period after default, respectively. The fact that the bankruptcy/foreclosure relationship is stronger than the bankruptcy/default relationship for prime mortgage-holders is surprising, since we predicted the opposite. These results suggest that many homeowners often begin to plan whether to save versus abandon their homes only when lenders start foreclosure—perhaps because they consult lawyers at this point.

Finally, table 6 gives the results of regressions explaining the foreclosure/bankruptcy relationship. The results show again that the two are strongly positively related. The probability of foreclosure increases 7-fold for prime mortgages and 2- to 4-fold for subprime mortgages if homeowners filed for bankruptcy one to six months earlier. At the average values, the increase in the probability of foreclosure when bankruptcy occurs is from .001 to .007 per month for prime mortgages and from .0068 to .024 per month for subprime mortgages. The adoption of bankruptcy reform also caused foreclosures to increase, by 48% for prime mortgages and by 17% for subprime mortgages. Foreclosure is also more likely when homeowners have negative home equity, although the relationship is only statistically significant for subprime mortgage-holders. The increase is 44% for this group. Lastly, the results suggest that foreclosures cause more foreclosures. The probability of foreclosure rises by 160% for prime mortgages when the lagged foreclosure rate in the zipcode rises by one percent, or from an average foreclosure rate of

.001 to .0016 per month. The increase for subprime mortgages is nearly six-fold, or from an average of .0068 to .040 per month.

Overall, these results provide strong evidence that mortgage default and bankruptcy are complements and that bankruptcy and foreclosure are also complements, even when we add control variables. But they suggest that homeowners responded to the 2005 bankruptcy reform by treating bankruptcy as a substitute for default and foreclosure. We also found that homeowners reacted to the mortgage crisis and the fall in housing prices by both defaulting and filing for bankruptcy more often. Finally we found evidence that default, bankruptcy, and particularly foreclosure all tend to spread.

V.   Policy Implications

Our results suggest that bankruptcy and default are closely related, as are bankruptcy and foreclosure. Both relationships are complementary, although the 2005 bankruptcy reform caused bankruptcy filings to drop and defaults and foreclosures to increase—suggesting that homeowners treated bankruptcy as a substitute for default and foreclosure in responding to the reform. We also found that the drop in home prices that occurred in 2007 and 2008 caused homeowners both to default and to file for bankruptcy more often, which suggests that they treated bankruptcy and default as complements. Finally we found evidence that default, bankruptcy and foreclosure all spread, i.e., they rise when the lagged default, bankruptcy and foreclosure rates in the neighborhood are higher.

The fact that bankruptcy is closely related to mortgage default and foreclosure is important for policy purposes, because foreclosures have very high and negative social costs. Mortgage lenders lose when foreclosures occur, because by the time foreclosed houses are sold, around one-third of the value of the loan is lost (Campbell et al, 2008). Nonetheless, lenders bear only part of the costs of foreclosure. Homeowners who experience foreclosure also lose because they are forced to move, which destroys their neighborhood ties, leaves some of them homeless, and

increases their children's chance of dropping out of school before graduating.[20] Foreclosures also reduce the value of nearby homes, harming other homeowners and their mortgage lenders. Sale prices of homes fall by 7-9% when foreclosures occur within one-tenth of a mile and by 1-2% when foreclosures occur within one-quarter mile (Campbell et al, 2008).[21] Renters are also harmed when landlords default and rental housing units are foreclosed, because leases are abruptly terminated and renters are forced to bear the costs of unexpected moves. Foreclosures also harm neighborhoods because vacant homes deteriorate, causing neighborhoods to become blighted. Foreclosures also harm local governments, because property taxes are their main source of revenue. When property values fall, tax revenues fall, and local governments are forced to cut expenditures on schools, police and other local public services. Finally, our regression results show that defaults lead to more defaults and foreclosures lead to more foreclosures. Since mortgage lenders bear only a part of these costs, they tend to foreclose too often.[22]

The relationship between bankruptcy and mortgage default/foreclosure has a number of policy implications. First, consider the 2005 bankruptcy reform. Our results suggest that homeowners responded to the reform by filing for bankruptcy less often and lenders responded to the reform by foreclosing more often. These results imply that the 2005 reform led to about 250,000 extra foreclosures per year during the past few years.[23] Congress is considering new legislation that would offset some of the pro-creditor changes made in 2005, such as dropping

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[20] Green and White (1997) show that children are less likely to graduate from high school and more likely to have children as teenagers when their parents move more frequently.

[21] See Campbell et al (2008) and Immergluck and Smith (2006).

[22] Bankruptcy filings also have some external costs that are not borne by the debtor and the debtor's lenders, but these costs are mainly borne by debtors' families. But we expect debtors to internalize the cost of bankruptcy to the extent that these costs fall on their families.

[23] This figure is based on 32,000,000 mortgage originations in 2004-06, of which approximately 18% were subprime. Using our foreclosure rates of .001 per month for prime mortgages and .0068 per month for subprime mortgages and our estimates that bankruptcy reform was associated with increases in the foreclosure rate of 48% for prime mortgages and 17% for subprime mortgages, this gives us a figure of 32,000,000*(.82*.0011*.48 + .18*.0074*.17)*12 months = 250,000 additional foreclosures due to bankruptcy reform. The number of mortgages originated in 2004-06 and the breakdown of mortgage originations between prime and subprime are taken from Mayer and Pence (2008). Note that Mayer and Pence give a range of figures for the breakdown of mortgages between prime versus subprime, based on different definitions of subprime mortgages. We use the average of their high versus low figures.

the means test for debtors who have substantial medical debt.[24]   To the extent that this change

would increase the number of bankruptcy filings, our results suggest that they would cause

foreclosures to drop.

Now turn to the implications of the foreclosure/bankruptcy nexus for optimal bankruptcy

policy.   Bankruptcy policy can be thought of as a set of punishments imposed on debtors for

defaulting and filing for bankruptcy. Sanctions in the past have included enslaving and

imprisoning bankrupts; current sanctions include humiliating them and imposing harsher or more

lenient repayment requirements. U.S. bankruptcy law uses humiliation as a punishment for

bankruptcy by making filers' names public information, but it has very lenient repayment

requirements since few bankrupts are required to repay from their future incomes. Other

countries have harsher punishments and more onerous repayment requirements than the U.S.—

British law bars bankrupts from managing a business or holding some public offices for three

years and France requires that they use all of their future incomes above a poverty-level

exemption for 8-10 years to repay. Other countries do not allow discharge of debt until the

debtor dies.[25] When punishments and repayment requirements in bankruptcy are low, risk-

averse debtors benefit from having partial wealth insurance, since they can file for bankruptcy

and avoid repaying their debts when their ability-to-pay turns out to be low. The lower the

punishments and repayment requirements in bankruptcy, the more wealth insurance bankruptcy

provides to debtors, the more often they file, and the more lenders reduce the supply of credit.[26]

Optimal bankruptcy law is determined by this trade-off between the debtors' gain from having

additional wealth insurance and debtors' losses from having reduced access to credit.[27]

Introducing the connection between bankruptcy and foreclosure changes optimal

bankruptcy law, since we have shown that bankruptcy law affects both the number of

bankruptcies and the number of foreclosures. And because foreclosures have high external costs,

bankruptcy law should be set so as to take into account its effect on foreclosures. But deriving

prescriptions for how optimal bankruptcy law should change because of the

bankruptcy/foreclosure relationship is tricky because the two are substitutes in some contexts and

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[24] The bill is H.R. 901, "Medical Bankruptcy Fairness Act."

[25] See White (2007) for comparison of bankruptcy laws across countries.
[26] See, for example, Gropp, Scholz, and White (1997) and Lin and White (2003).
[27] See Livshits et al (2007) for a calibration model of optimal bankruptcy.

complements in others.   We showed in general that they are complements. This suggests that optimal bankruptcy law shifts in a pro-creditor direction, because higher repayment requirements and harsher punishments in bankruptcy reduce bankruptcies and therefore reduce foreclosures. But in responding to the 2005 bankruptcy reform, homeowners treated bankruptcy and foreclosure as complements and this suggests that making bankruptcy law more pro-debtor would reduce foreclosures.   Thus the policy implications of the bankruptcy-foreclosure nexus vary depending on context.

The bankruptcy/foreclosure relationship also has implications for other policies that influence the number of bankruptcy filings and therefore the number of foreclosures.   One such policy is that of protecting debtors' wages from garnishment by creditors outside of bankruptcy. Under U.S. law, a minimum of 75% of wages is protected from garnishment in all states, but some states have higher protection levels and five states prohibit garnishment entirely. Dawsey and Ausubel (2002) show that protecting more wages from garnishment reduces the number of bankruptcy filings.[28] Assuming that bankruptcy and foreclosure are complements, a policy of protecting additional wages from garnishment will therefore also reduce the number of foreclosures.   Thus the optimal level of protection of debtors' wages from garnishment is higher because of the bankruptcy/foreclosure relationship. Congress also recently adopted changes in credit card regulations that prevent lenders from raising interest rates on existing loans. These changes are likely to reduce the number of bankruptcy filings and therefore reduce foreclosures, at least in the short run. Other policies that influence the number of bankruptcy filings should also be set in a way that reduces foreclosures.

The fact that mortgage lenders lose a large fraction of their loans when they foreclose suggests that they often would be better off if they voluntarily reduced homeowners' mortgage payments and allowed homeowners to remain in their homes, rather than foreclosing. However lenders have resisted reducing mortgage payments and mainly chose foreclosure when default occurs. Two explanations have been proposed for lenders' unwillingness to change the terms of mortgages. One is that when mortgages are securitized, a mortgage servicer acts for the lenders and most mortgage servicing agreements give servicers strong economic incentives to foreclose

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[28] We did not test the effect of garnishment law in our regressions, because garnishment laws did not change during our period and therefore their effect is captured by our state dummies.

rather than to modify mortgage terms. (Mortgage servicing agreements sometimes explicitly prohibit servicers from making modifications.) The other explanation is that lenders are better off if they foreclose. This is because many homeowners who default will "self-cure" if their mortgage terms remain unchanged and many of those whose mortgage payments are reduced end up re-defaulting quickly, so that foreclosure is only delayed rather than prevented.[29] Both factors mean that mortgage lenders are better off foreclosing. But even lenders are better off foreclosing, it may be more economically efficient to modify mortgages so as to avoid the high external costs of foreclosures.

Both the Bush and Obama Administrations have initiated programs to reduce the number of foreclosures by encouraging mortgage lenders to lower homeowners' mortgage payments. The Bush Administration programs were completely unsuccessful. The Obama Administration's programs have been somewhat more successful and the Administration recently announced that 500,000 homeowners have had their mortgage payments reduced (Goodman, 2009). This, however, is just a small fraction of the number of foreclosures. A problem with both the Bush and the Obama Administration programs is that while homeowners apply to have their mortgage payments reduced, mortgage lenders have the right to veto any changes. Lenders obviously have an interest in approving only a small number of reductions in order to discourage applications by homeowners who can afford to pay. Because lenders have the right to veto and they ignore the external costs of foreclosures, these programs prevent too few foreclosures.

An alternative approach would be to allow bankruptcy judges to modify or "cram down" mortgages. Under current U.S. law, bankruptcy judges are not allowed to change the terms of residential mortgage contracts if the mortgage is secured by the debtor's primary residence. But if bankruptcy judges were given the power to change the terms of residential mortgages, then additional foreclosures could be prevented. This is because, unlike non-bankruptcy foreclosure-avoidance programs, mortgage lenders would not have the right to veto changes in mortgage terms. Legislation making this change was proposed by the Obama campaign in the fall of 2008, but heavy lobbying by mortgage lenders caused it to be rejected by Congress.[30]

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[29] See Piskorski et al (2009) and Adelino et al (2009) for arguments on both sides.

[30] See Levitin and Goodman (2008) for discussion of the cramdown proposal.

Introducing cram-down of mortgages in bankruptcy would clearly be an additional way of preventing foreclosures. But would it be economically efficient? Zhu and White (2010) examined a sample of financially distressed homeowners in Chapter 13 and found that the average present value of debt reduction if mortgages were reduced to the current market value of the house would be around $150,000 per homeowner, including reduced mortgage payments of $140,000 and unsecured debt discharge of $10,000. Because this figure is so large, adopting cram-down is likely to cause many additional homeowners to file for bankruptcy, including many who file only to have their mortgages crammed down. The study predicted that five mortgages would be crammed down in bankruptcy for each foreclosure prevented, so that the total cost to lenders would be around $750,000 per foreclosure prevented. With so many mortgage modifications, the supply of mortgage credit would almost certainly fall. Overall, allowing cram-down in bankruptcy would be very effective, but would probably prevent too many—rather than too few—foreclosures.
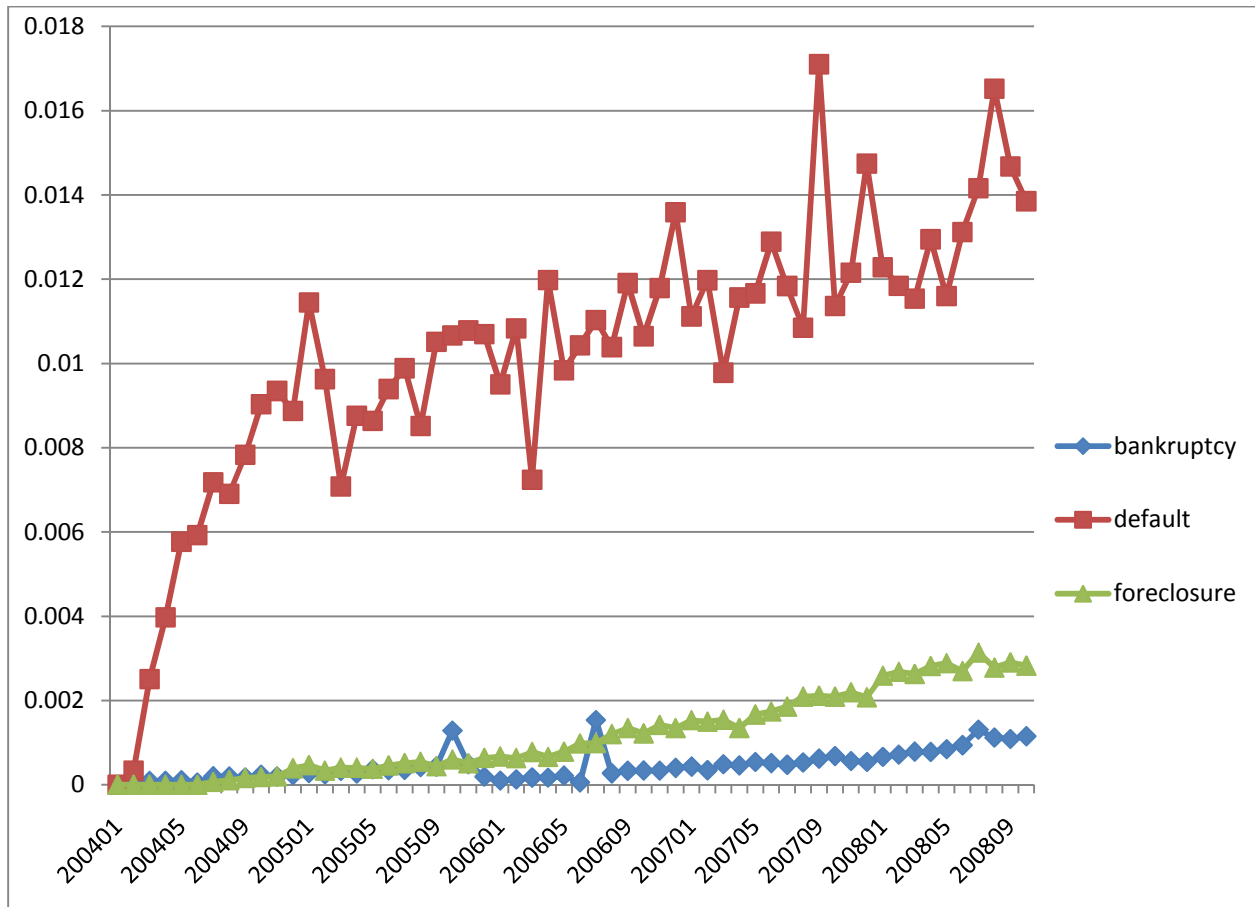
Figure 1:

Bankruptcy Filings and Mortgage Default Rates,

Yearly Data, 1980-2008
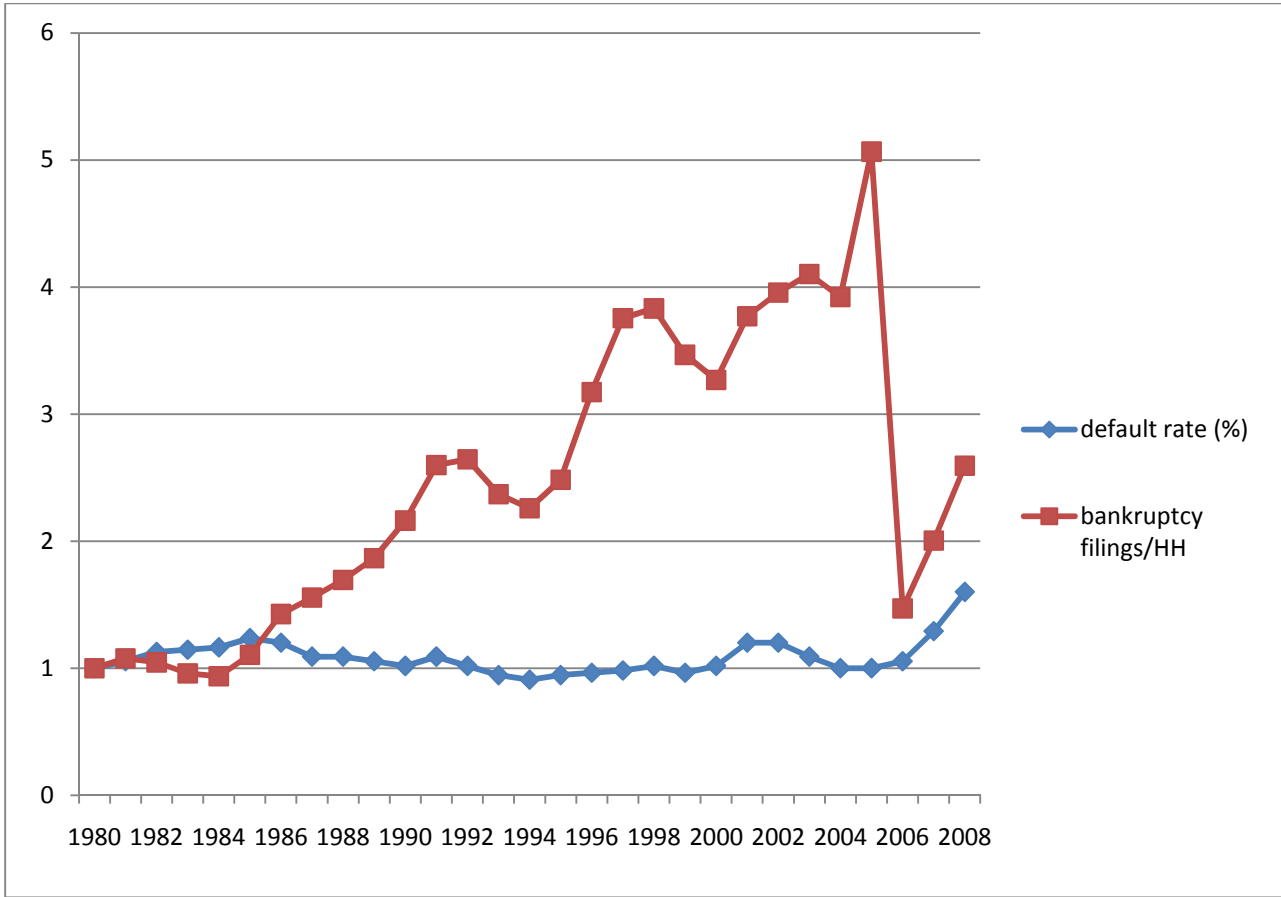
Notes: See table 1 for definitions and data sources.

Figure 2:

Mortgage Default, Bankruptcy, and Foreclosure Rates for Homeowners

Monthly Household Data, January 2004 to October 2008

(Mortgages Originated January 2004 – October 2005)

Prime Mortgages
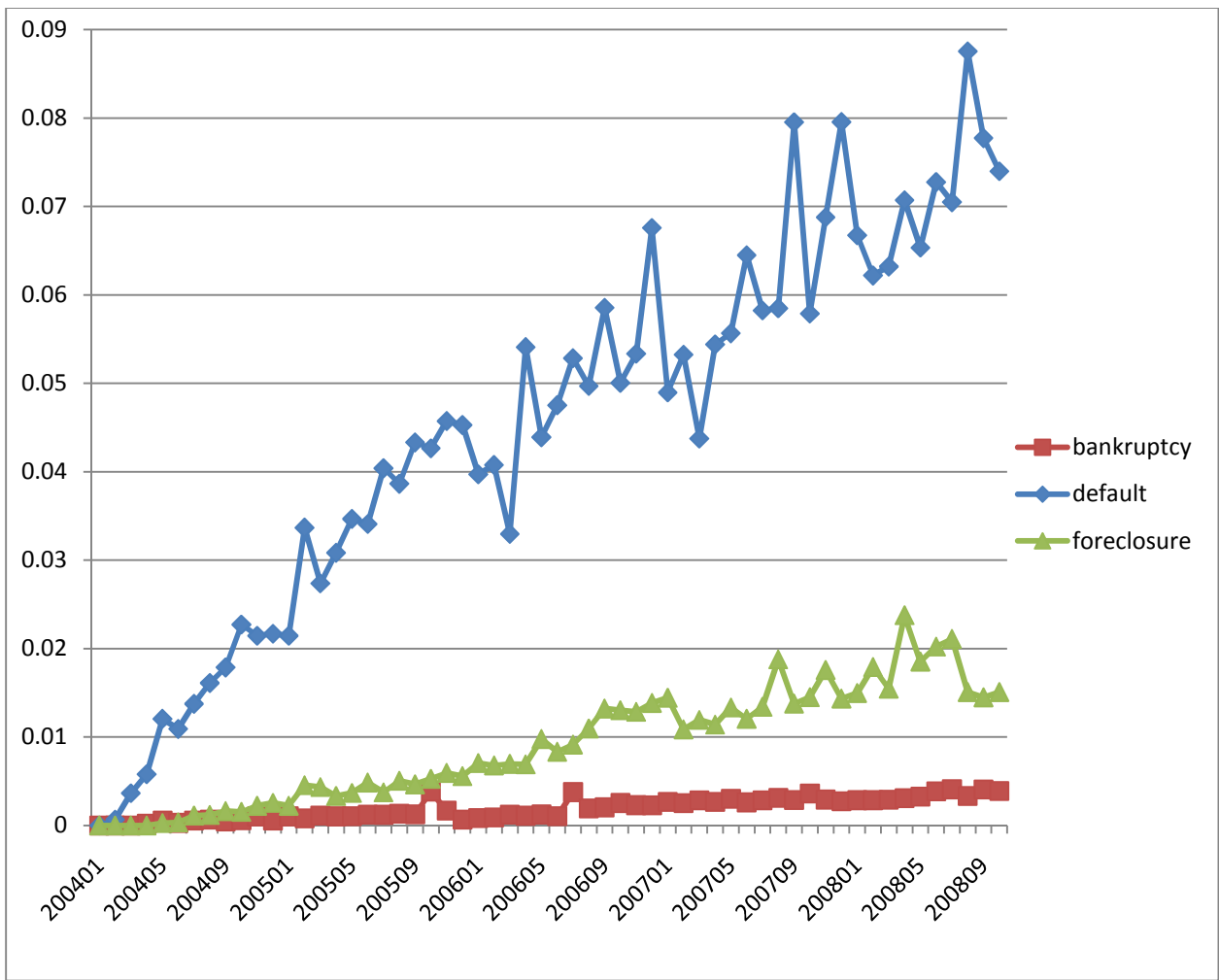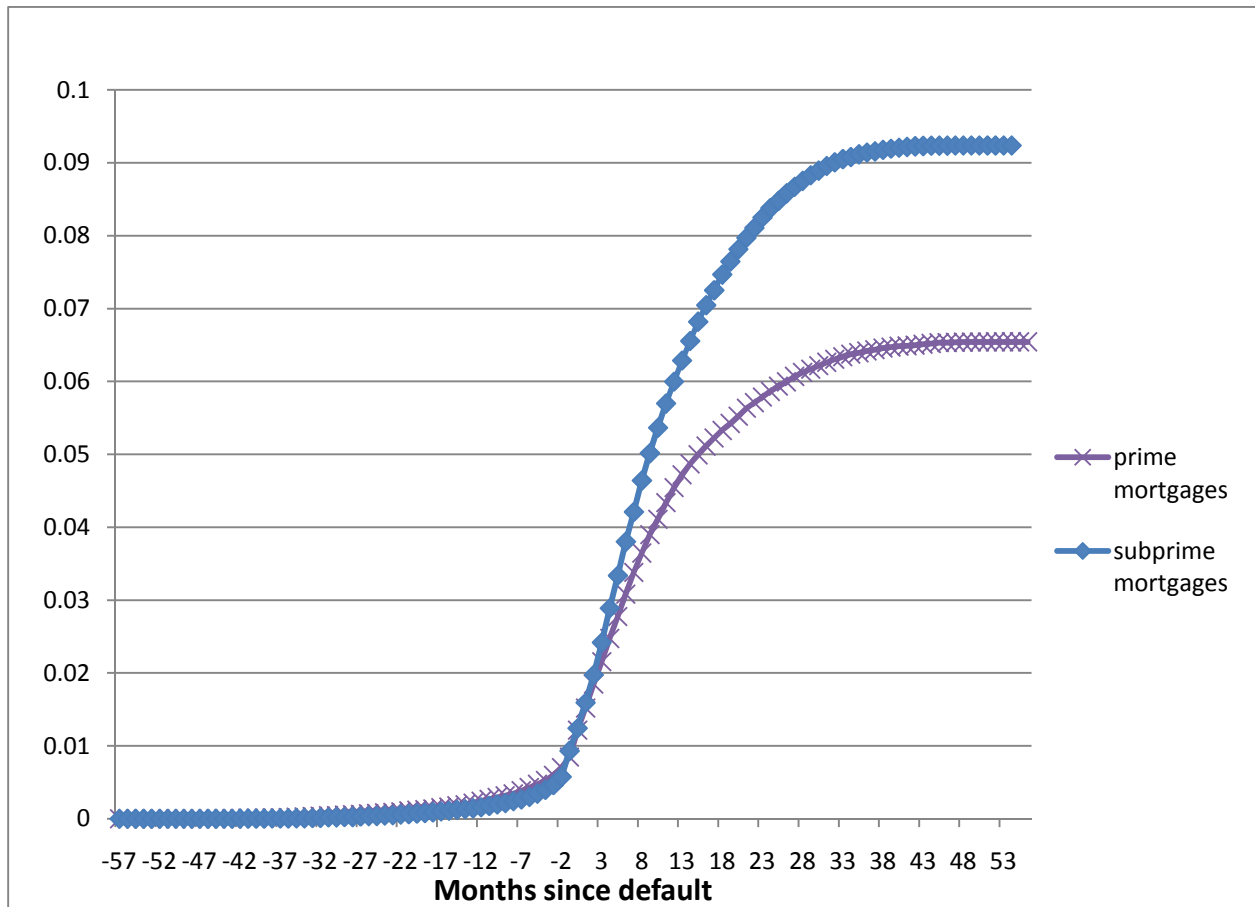
Subprime Mortgages

Figure 3:

Homeowners' Cumulative Bankruptcy Filing Rate Conditional on Default

Note: The figure gives the cumulative probability of bankruptcy depending on months before/since default. Default is defined to occur when mortgage payments are at least one month delinquent. The sample is all mortgages in which default occurs.
Default_bankruptcy_092409.xls

Figure 4:

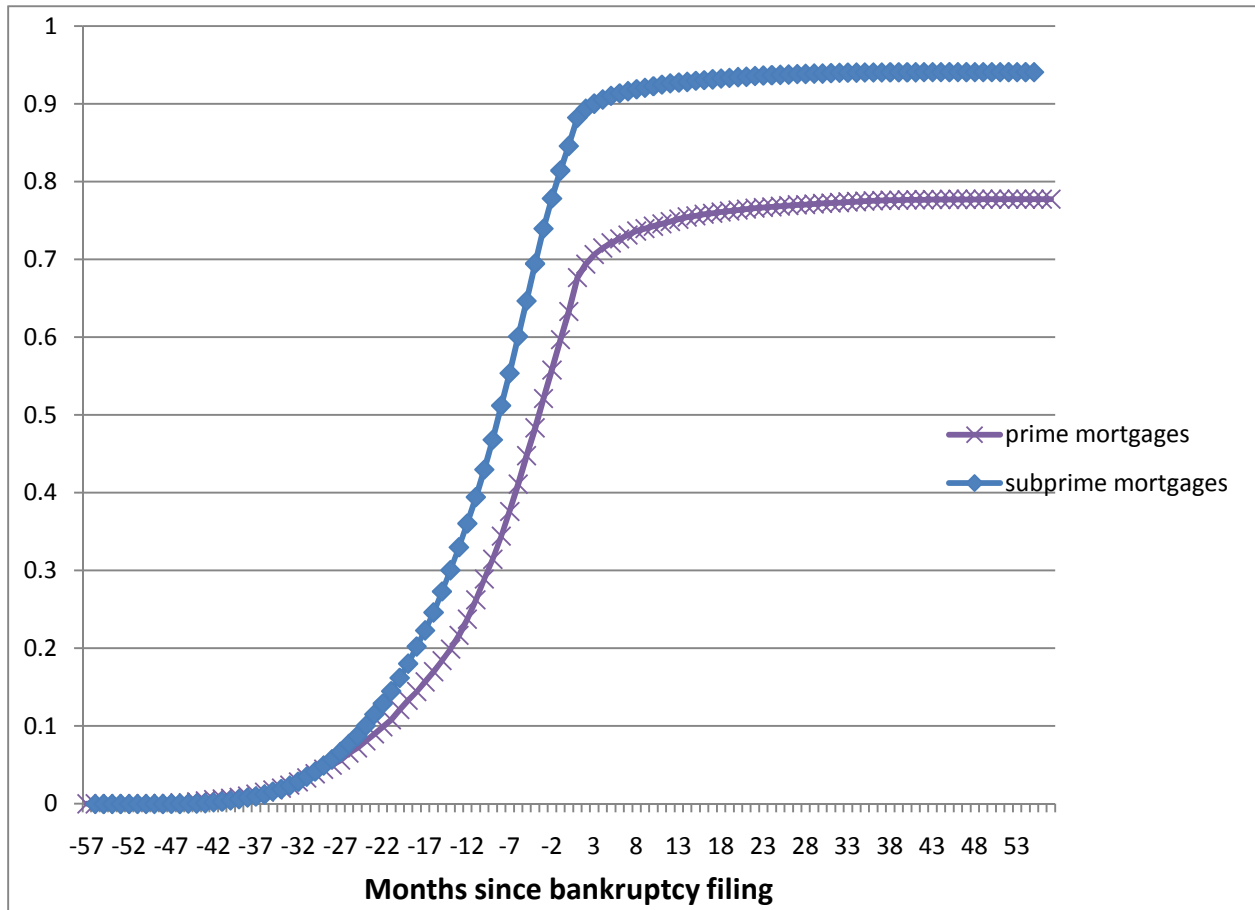**Homeowners' Cumulative Default Rate Conditional on Bankruptcy**

Note: The figure gives the cumulative probability of default depending on months before/since bankruptcy. Default is defined to occur when mortgage payments are at least one month delinquent. The sample is all mortgages in which households file for bankruptcy. Uses bankrupt_default_3_092409.xls.

Figure 5:

Homeowners' Cumulative Bankruptcy Filing Rate Conditional on Foreclosure

Note: The figure gives the cumulative probability of bankruptcy depending on months before/since foreclosure. The sample is all mortgages in which foreclosure starts. Uses foreclosure_bankruptcy_092409.xls.
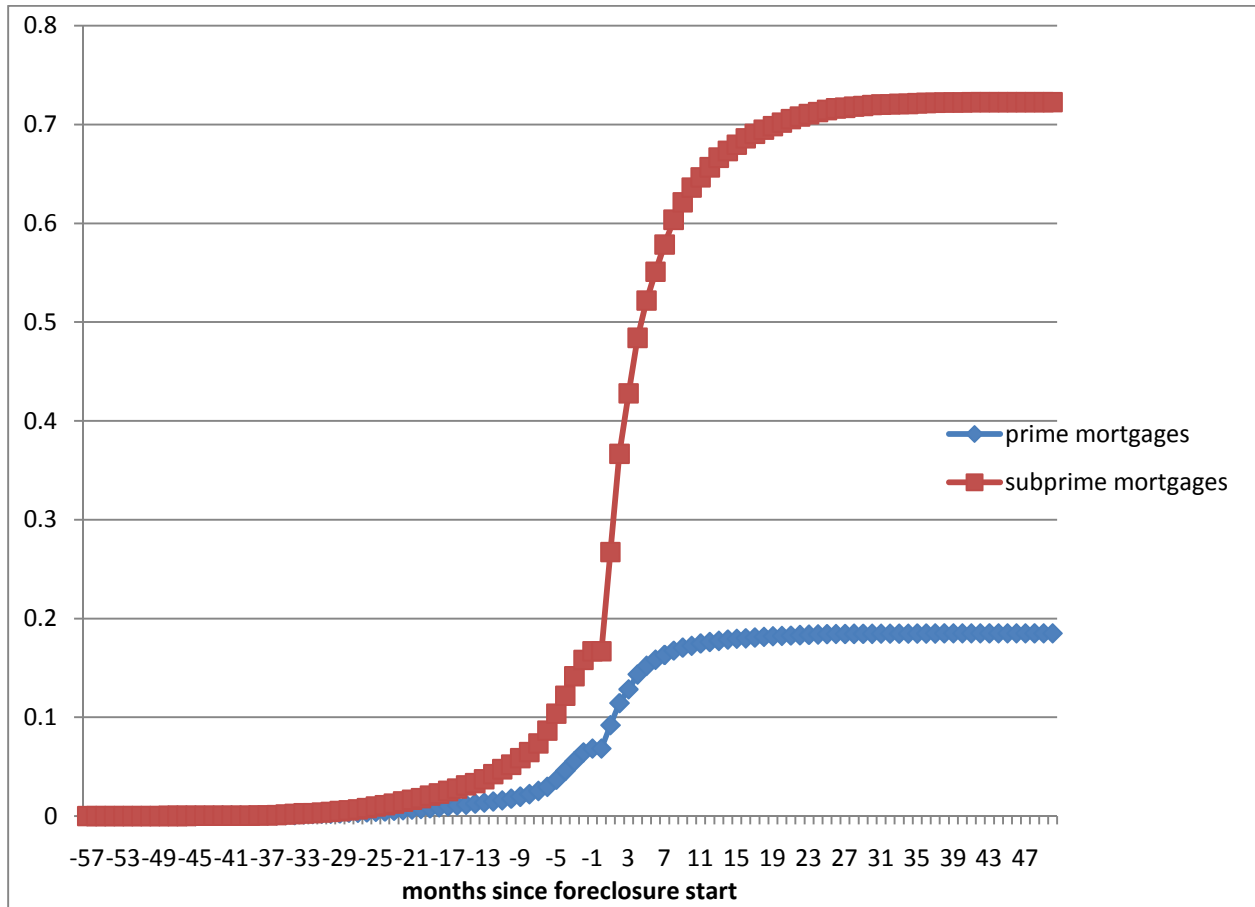
Figure 6:

Homeowners' Cumulative Foreclosure Rate Conditional on Bankruptcy
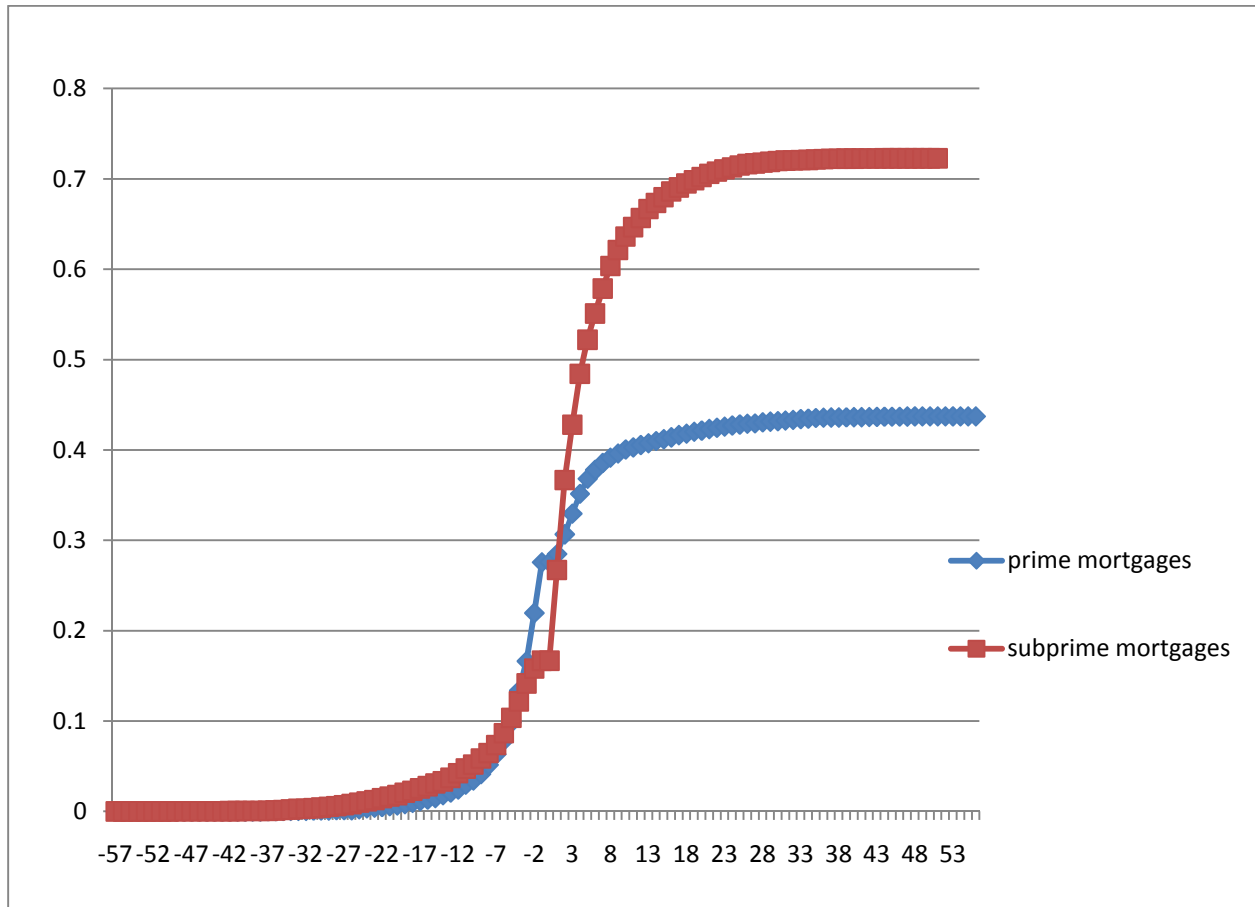
Note: The figure gives the cumulative probability of foreclosure depending on months before/since bankruptcy. The sample is all mortgages in which households file for bankruptcy. Uses prime_bank_foreclosure_092009.xlsx.

Table 1: Trends in Bankruptcy Filings, Mortgage Default and Consumer and Mortgage Debt

	Bankruptcy filings per 1,000 HH	Residential mortgage default rate
1980	3.56	.055
1981	3.83	.058
1982	3.72	.062
1983	3.41	.063
1984	3.33	.064
1985	3.93	.068
1986	5.08	.066
1987	5.53	.060
1988	6.03	.060
1989	6.64	.058
1990	7.69	.056
1991	9.25	.060
1992	9.41	.056
1993	8.43	.052
1994	8.03	.050
1995	8.84	.052
1996	11.3	.053
1997	13.3	.054
1998	13.6	.056
1999	12.3	.053
2000	11.6	.056
2001	13.4	.066
2002	14.1	.066
2003	14.6	.060
2004	14.0	.055
2005	18.0	.055
2006	5.24	.058
2007	7.13	.071
2008	9.20	.088

Notes: The mortgage default rate is the dollar value of 1-4 family mortgages that are delinquent by 30 days or more or are in foreclosure, divided by the dollar value of all 1-4 family mortgages. Data are taken from the *Statistical Abstract of the U.S.*, various editions, but are produced by the Mortgage Bankers Association, *National Delinquency Survey*.   The number of bankruptcy filings is produced by the Administrative Office of the U.S. Courts; data are available at http://www.abiworld.org/AM/AMTemplate.cfm?Section=Home&TEMPLATE=/CM/ContentDisplay.cfm&CONTENTID=57826.

Table 2: Summary Statistics

	Bankruptcy Sample		Default Sample		Foreclosure Sample	
	Prime	Subprime	Prime	Subprime	Prime	Subprime
Average bankruptcy/default/foreclosure rate per month	0.00046	0.00185	0.0060	0.0274	0.0011	0.0074
State allows deficiency judgments	0.7263	0.7393	0.7206	0.7229	0.7264	0.7391
FICO (at origination) between 350 and 550	0.0092	0.1236	0.0055	0.0964	0.0089	0.1181
FICO (at origination) between 550 and 650	0.1374	0.6215	0.1157	0.5966	0.1357	0.6178
FICO (at origination) between 650 and 750	0.5139	0.2319	0.5164	0.2761	0.5146	0.24397
Houses with negative equity	0.0019	0.0013	0.0018	0.0006	0.0018	0.0009
If non-exempt home equity is positive	0.7238	0.6396	0.7303	0.6404	0.7265	0.6404
Debt-to-income ratio (%,at origination)	21.8910	19.2501	21.7224	18.5816	21.9049	0.1919
Missing debt-to-income ratio at origination	0.3946	0.5129	0.3946	0.5301	0.3942	0.5143
If full documentation	0.3531	0.5555	0.3556	0.5292	0.3537	0.5508
Missing documentation	0.1696	0.1193	0.1700	0.1386	0.1702	0.1239
If single-family house	0.7531	0.8136	0.7506	0.8067	0.7535	0.8125
If fixed rate mortgage	0.6416	0.2861	0.6443	0.3106	0.6431	0.2962
If jumbo loan	0.1388	0.0948	0.1408	0.1001	0.1384	0.0948
If loan was for purchase	0.5615	0.4418	0.5598	0.4356	0.5609	0.4357
If loan was privately securitized	0.2550	0.8586	0.2499	0.8371	0.2530	0.8533
If loan originated by retail	0.5059	0.4374	0.5173	0.4600	0.5071	0.4433
If loan originated by wholesale	0.1874	0.1815	0.1853	0.1816	0.1872	0.1804
If loan originated by correspondent	0.2203	0.1034	0.2172	0.1041	0.2207	0.1037
Lagged local bankruptcy rate/delinquency /foreclosure rate (zipcode)	0.0004	0.0016	0.0055	0.0247	0.0010	0.0068
Lagged local unemployment rate (%,county)	4.7636	4.9514	4.7458	4.8894	4.7601	4.9233
Lagged local income growth rate (state)	0.0013	0.0012	0.0012	0.0010	0.0013	0.0011
Lagged local house price growth rate (msa)	0.0014	0.0014	0.0016	0.0016	0.0010	0.0015
Benefit of refinancing (value of existing mortgage / value of new mortgage at current interest rate)	1.0801	0.8456	1.0859	0.8647	1.0811	0.8501
Age of loan (months)	21.4998	18.0530	20.7656	15.0354	21.4490	17.2725
Number of observations	3,054,564	2,540,699	2,754,555	1,743,846	3,039,341	2,367,860

Table 3:
Hazard Model Results Explaining Bankruptcy as a Function of Past Mortgage Default

	Prime mortgages	Subprime mortgages
Default 1-3 months before	16.57***	14.17***
Default 4-6 months before	4.50***	1.92***
Default 7-24 months before	1.50*	1.42**
Bankruptcy reform dummy	0.50***	0.52***
If no non-exempt home equity	1.92***	1.39***
FICO 350-450	3.89***	2.32***
FICO 550-650	4.40***	2.28***
FICO 650-750	4.60***	2.71***
If full documentation	0.79***	0.77***
Benefit of refinancing	0.45**	0.99
If mortgage securitized	1.08	1.22**
Lagged growth of house prices (zipcode)	0.002	0.008**
Lagged unemployment rate (county)	1.08**	1.03*
Lagged income growth (state)	0.40*	0.98
Lagged avg bankruptcy rate (zipcode)	224**	32.85***
Deficiency judgments allowed	4.79	1.39
State and year dummies?	Y	Y

Notes: The dependent variable is whether homeowners filed for bankruptcy. *, **, and *** indicate statistical significance at the 5%, 1% and 0.1% levels, respectively.

Table 4:

Hazard Model Explaining Mortgage Default as a Function of Past Bankruptcy

	Prime mortgages	Subprime mortgages
Bankruptcy 1-3 months before	3.94***	2.12***
Bankruptcy 4-6 months before	1.97	1.12
Bankruptcy 7-24 months before	1.70*	0.96
Bankruptcy reform dummy	1.19***	1.24***
If negative home equity	1.13	1.69***
FICO 350-550	13.15**	4.75***
FICO 550-650	6.60***	3.32***
FICO 650-750	2.63***	1.88***
If full documentation	0.87***	0.95***
If mortgage securitized	1.15***	1.02
Benefit of refinancing	0.35***	0.20***
Lagged growth of house prices (zipcode)	0.003***	0.007***
Lagged unemployment rate (county)	1.07***	1.01***
Lagged income growth (state)	0.76	0.99
Lagged avg default rate (zipcode)	16.61***	20.68***
Deficiency judgments allowed	0.88	0.83
State and year dummies?	Y	Y

Notes: The dependent variable is whether foreclosure started. *, **, and *** indicate statistical significance at the 5%, 1% and 0.1% levels, respectively. Results given are given as marginal effects, with percentage changes given for variables that are statistically significant.

Table 5:

Hazard Model Results Explaining Bankruptcy as a Function of Past Foreclosure

	Prime mortgages	Subprime mortgages
Foreclosure 1-3 months before	27.77***	22.15***
Foreclosure 4-6 months before	0.99	1.03
Foreclosure 7-24 months before	0.67*	0.86***
Bankruptcy reform dummy	0.52***	0.57***
If no nonexempt home equity	1.92***	1.32***
FICO 350-550	10.80***	3.78***
FICO 550-650	8.89***	3.39***
FICO 650-750	6.11***	3.25***
If full documentation	0.78***	0.82***
Benefit of refinancing	0.33***	0.98
If mortgage securitized	1.05	1.08
Lagged growth of house prices (zipcode)	0.006	0.02**
Lagged unemployment rate (county)	1.08***	1.02
Lagged income growth (state)	0.54	0.96
Lagged avg bankruptcy rate (zipcode)	155**	12.99**
Deficiency judgments allowed	6.33*	1.36
State and year dummies?	Y	Y

Notes: The dependent variable is whether homeowners filed for bankruptcy. *, **, and *** indicate statistical significance at the 5%, 1% and 0.1% levels, respectively.

Table 6:
Hazard Model Results Explaining Foreclosure as a Function of Past Bankruptcy

	Prime mortgages	Subprime mortgages
Bankruptcy 1-3 months before	7.14***	2.61***
Bankruptcy 4-6 months before	7.39***	4.68***
Bankruptcy 7-24 months before	1.89*	1.56***
Bankruptcy reform dummy	1.48*	1.17*
If negative home equity	1.59	1.44**
If mortgage securitized	1.36***	0.98
FICO 350-550	13.05***	3.98***
FICO 550-650	10.25***	3.05***
FICO 650-750	3.98***	1.89***
If full documentation	0.80***	0.87***
Benefit of refinancing	0.04***	0.17***
Lagged growth of house prices (zipcode)	0.00***	0.003***
Lagged unemployment rate (county)	1.10***	1.04***
Lagged income growth (state)	0.02***	0.86
Lagged avg foreclosure rate (zipcode)	164***	592***
Deficiency judgments allowed	1.59	1.19
State and year dummies?	Y	Y

Notes: The dependent variable is whether foreclosure started. *, **, and *** indicate statistical significance at the 5%, 1% and 0.1% levels, respectively.

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