

# Mortgage Defaults

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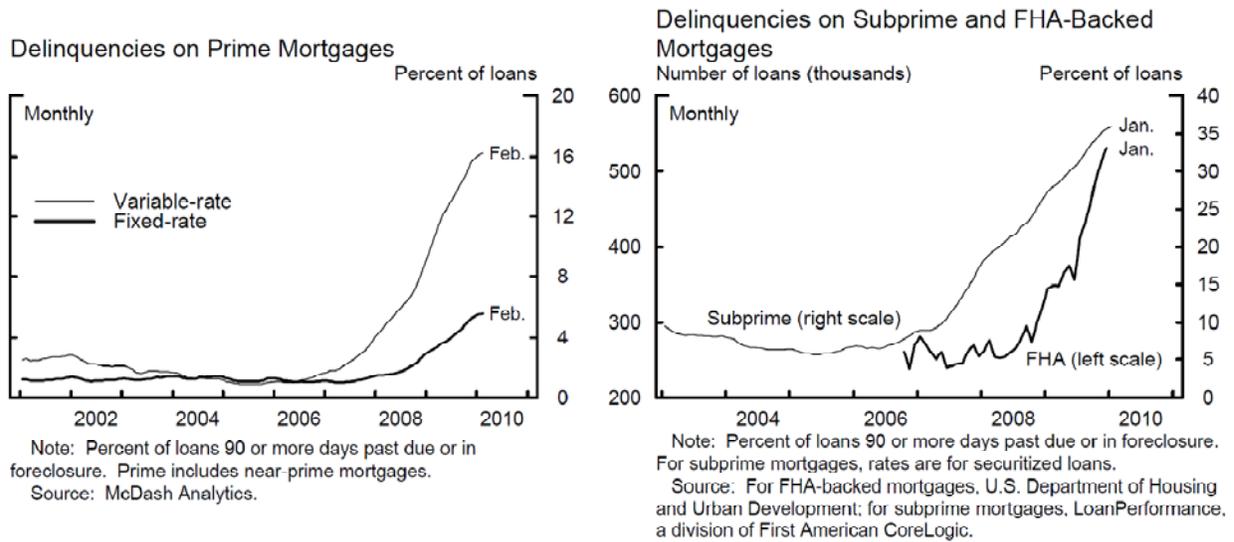
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## Introduction

The first hints of trouble in the mortgage market surfaced as early as mid-2005, and conditions subsequently deteriorated rapidly. According to data from the Mortgage Bankers Association's National Delinquency Survey, the share of mortgage loans that were "seriously delinquent" (90 days or more past due or in the process of foreclosure) averaged 1.7 percent from 1979 to 2006, with a low of about 0.7 percent (in 1979) and a high of about 2.4 percent (in 2002). But by the end of 2009, the share of seriously delinquent mortgages had surged to 9.7 percent. These delinquencies coincided with a sharp rise in the number of foreclosures started: Roughly 2.8 million foreclosures were started in 2009, an increase of 24 percent from the 2.2 million foreclosures started in 2008, an increase of 81 percent from the 1.5 million foreclosures started in 2007, and an increase of 179 percent from the 1.0 million foreclosures started in 2006 (Federal Reserve estimates based on data from the Mortgage Bankers Association).

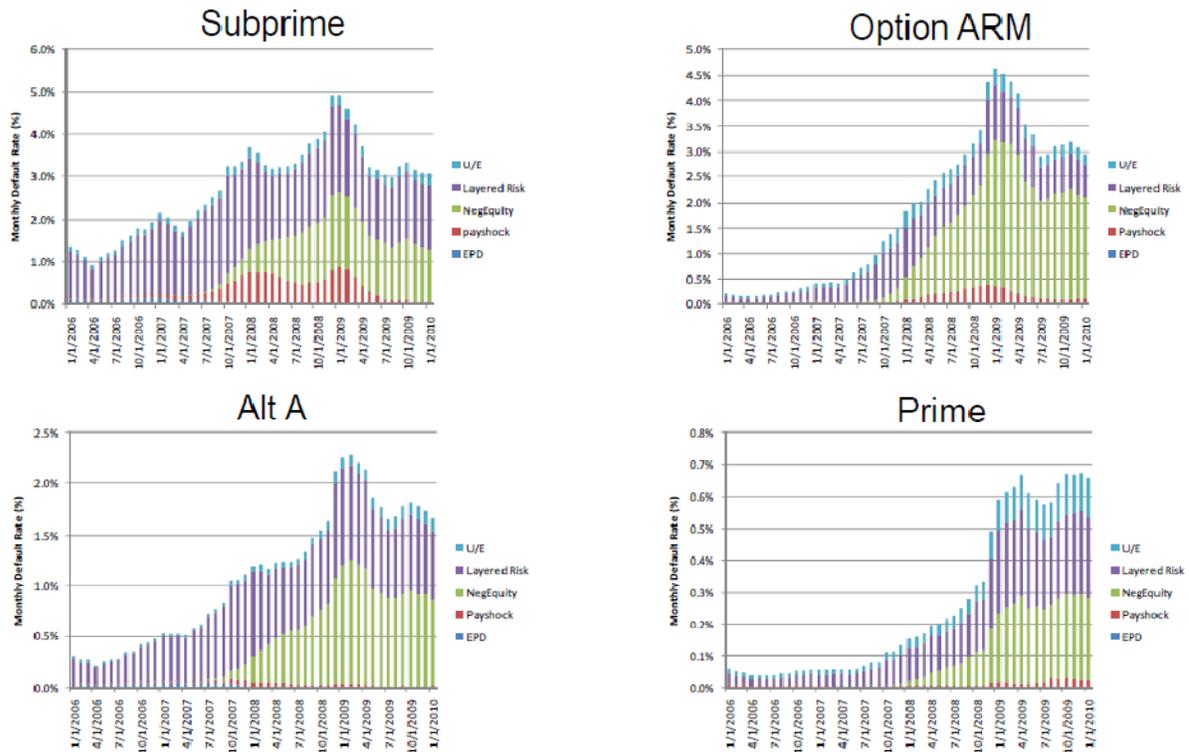
Toward the onset of the crisis, delinquencies and defaults were concentrated primarily among subprime mortgages—loans made to borrowers who have blemished credit histories and/or little savings available for down payments. Given what little equity these borrowers held in their homes, subprime borrowers were most susceptible to house price declines. Subprime borrowers, in particular, bet on continued gains in house prices in order to increase their equity positions in their homes. As house prices continued to fall, delinquencies and defaults also increased significantly among Alt-A (or near-prime) mortgage loans. Alt-A borrowers generally had more of an equity cushion than subprime borrowers, so house price declines had to be somewhat larger before their home equity began to erode. Finally, as the economy took a turn for the worse and house prices continued to plummet, delinquencies and defaults began to increase among FHA and prime borrowers.

**Figure 1: Serious Delinquencies on Mortgages**



The literature to date has pointed to various factors leading to the rise in mortgage defaults. Among these, the large decline in house prices (and ensuing negative equity positions) seems to be the most widely held. Other factors include the general decline in underwriting standards, including risk layering; certain features of mortgage products themselves, such as mortgage rate resets or recasts and their associated payment shocks; unemployment; and early payment defaults (borrowers who never make a single mortgage payment). In a report prepared for the Securities and Exchange Commission, Amherst Securities broke out defaults resulting from unemployment, layering of risk, negative equity, payment shock, and early payment default for subprime, option-ARM, Alt-A, and prime mortgages. Negative equity and the layering of risk are the largest components of default across mortgage products, with unemployment contributing a meaningful share to prime defaults, and payment shock contributing some to subprime defaults. Among each loan type, negative equity has become an ever-larger contributor of mortgage default.

**Figure 2: Components of Mortgage Default**



## Loan-Level Models of Default

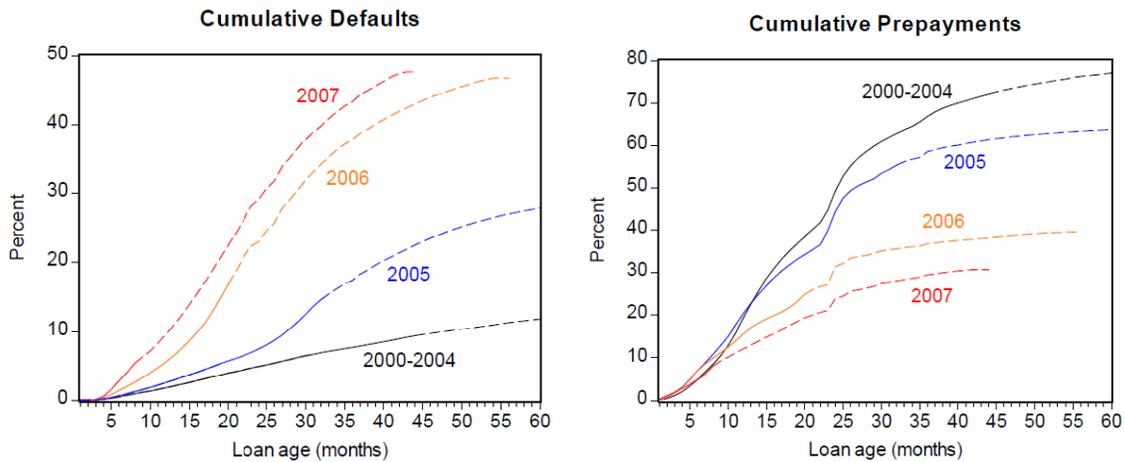
State-of-the-art models of mortgage prepayment and default typically follow the competing hazards approach described by Deng, Quigley, and Van Order (2000) and elaborated upon in Pennington-Cross and Ho (2006). The conditional probability of default (or prepayment) is a function of some baseline hazard function and various characteristics of the borrower, his or her mortgage, and local and broader economic conditions. The beauty of loan-level data is the ability to estimate the particular effects of negative equity, mortgage payment shocks, unemployment, and borrower and mortgage characteristics on the probabilities of default and prepayment.

The cost, however, is that these models are very computationally intensive. Further, forecasting with loan-level models requires ad hoc assumptions. For example, does a loan default when its estimated conditional probability of default reaches 0.1 or 0.2? Sherlund (2008), shows how loan-level models can be employed to forecast prepayments and defaults for three types of subprime mortgages (2/28s, 3/27s, and fixed-rate mortgages) in the LoanPerformance ABS data. Conditional on assumed paths for interest rates, unemployment, and house prices, the estimated hazard functions imply average estimated probabilities for both prepayment and default. For example, the average might imply that 1 percent of loans default that month and another 1 percent prepay. Loans are then assigned default and prepayment based upon their estimated probability of prepayment or default *rankings*, with the highest probabilities prepaying and defaulting first, until the number of prepayments and defaults implied by the average is reached. So in a sample of 1,000 loans, average estimated probabilities of prepayment and default of 1 percent would mean taking the 10 highest estimated loan-level probabilities of default and assigning them a default event, and the 10 highest estimated loan-level probabilities of prepayment and assigning them a prepayment event. The remaining 980 loans survive to the next month. Additional structure can be applied to the assignment of prepayment and default events to capture the perceived difficulty of refinancing or prepaying loans with negative equity as well as assumptions about defaulting on a positive equity mortgage.

One further complication of loan-level modeling is how to forecast the effects of refinance and modification programs on the probability of prepayment or default in the absence of hard data, especially at the loan level. One could theoretically figure out precisely which loans would qualify for individual programs, but borrower contact, take-up rates, and other qualification requirements (documentation) complicate matters tremendously.

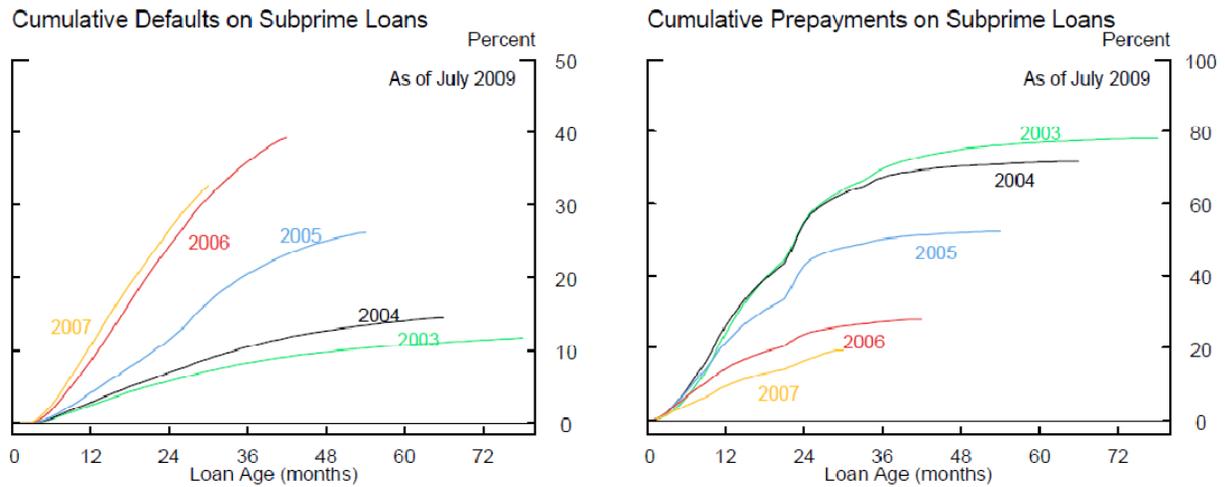
Using a loan-level model estimated in early 2008 (see Sherlund, 2008, for details), the following cumulative prepayment and default functions were forecasted. As shown, over 75 percent of the 2000-2004 vintages prepaid, while around 10 percent defaulted. These numbers moved to around 60 percent prepaid versus 25 percent defaulted for the 2005 vintage, 40 percent prepaid versus 45 percent defaulted for the 2006 vintage, and 30 percent prepaid versus 48 percent defaulted for the 2007 vintage.

**Figure 3: Cumulative Default and Prepayment Forecasts**



Comparing these to actual cumulative default and prepayment functions shows that the loan-level forecasts have done a decent job describing what actually occurred. Through mid-2009, a little over 25 percent of the 2005 vintage had defaulted, while over 40 percent of the 2006 vintage and 35 percent of the 2007 vintage had defaulted. Likewise, around 55 percent of the 2005 vintage had prepaid, compared to around 30 percent of the 2006 vintage and 20 percent of the 2007 vintage.

**Figure 4: Actual Cumulative Defaults and Prepayments**



### State-Level Models of Default

A much simpler model of mortgage default is one at the state (or some other geographic) level. The model described here is at the state level and separates borrowers into prime, subprime, FHA, and VA groups. Thus, this model really envelopes 4 separate models for each state (plus Washington, DC). Data on mortgage default and delinquency status is drawn from the Mortgage Bankers Association's National Delinquency Survey, including the number of loans outstanding, the proportion of loans 90 or more days past due, the proportion of loans entering the foreclosure process (foreclosure starts), and the proportion of loans in the foreclosure process (foreclosure inventory). As predictors of state-level delinquencies and defaults, state-level house prices are used from First American LoanPerformance, state-level unemployment rates from Bureau of Labor Statistics, 30-year fixed-rate mortgage rates from Freddie Mac's Primary Mortgage Market Survey, and the federal funds rates from the Federal Reserve Board.

## **State-Level Unemployment Rates and House Prices**

To forecast state-level delinquencies and defaults, state-level forecasts for unemployment and house prices are formulated. Each state-level model is based on the historical relationship between the unemployment rate or four-quarter state-level house price appreciation rate and the corresponding national rate. Forecasts for the national rate are then translated into state-level rates based on the state-level estimated historical relationships. Adjustments are made so that the forecasts jump off the last data point (assume an error term of zero for the last data period).

## **State-Level Delinquency and Default Rates**

The proportion of loans 90 days or more past due, the foreclosure start rate, the foreclosure completion rate, and the number of loans are each modeled as a function of the four-quarter house price appreciation rate, the unemployment rate, the 30-year fixed-rate mortgage rate, and the federal funds rate. In addition, the foreclosure start rate model includes the proportion of loans 90 days or more past due (lagged one quarter) and the foreclosure completion model includes the foreclosure start rate.

## **State-Level Delinquencies and Defaults**

The proportion of loans 90 days or more past due, the foreclosure start rate, and the foreclosure completion rate are each multiplied by the number of loans to derive the number of loan 90 days or more past due, the number of loans entering the foreclosure process, and the number of loans exiting the foreclosure process. These numbers are adjusted to reflect the Mortgage Bankers Association's National Delinquency Survey sample coverage (roughly 85 percent of all first-lien mortgages). The foreclosure inventory is calculated as the previous period's foreclosure inventory, plus foreclosure starts, less foreclosure completions.

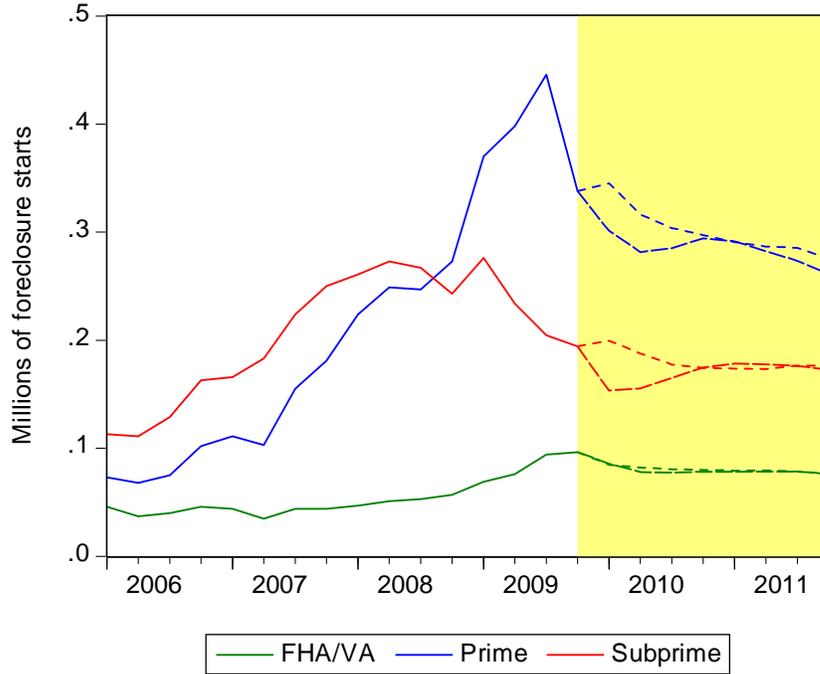
## Forecast Assumptions

For illustrative purposes, we use the Mortgage Bankers Association's March 2010 forecasts of house prices, unemployment, and interest rates (from their Mortgage Finance and Economic Forecasts). MBA projects that the four-quarter rate of house price appreciation (as estimated by the FHFA house price index) will increase from -3.8 percent at the beginning of 2010 to 2.5 percent by the end of 2011, while the unemployment rate will decrease from 9.7 percent to 8.8 percent over the same period. Mortgage rates are projected to rise from 5.1 percent at the beginning of 2010 to 6.3 percent by the end of 2011; the fed funds rate is expected to remain near 0.2 percent throughout 2010 before increasing to 1.0 percent by the end of 2011. The Federal Reserve Board (FRB) forecasts for these variables cannot be made public, but the resulting forecasts for mortgage delinquency and defaults will be shown for comparison to those resulting from the MBA assumptions. Further, the number of mortgage defaults is adjusted to capture the effects of refinance and modification programs on foreclosures. These adjustments are largest during 2010 and tail off toward the end of 2011.

## Mortgage Default Forecasts

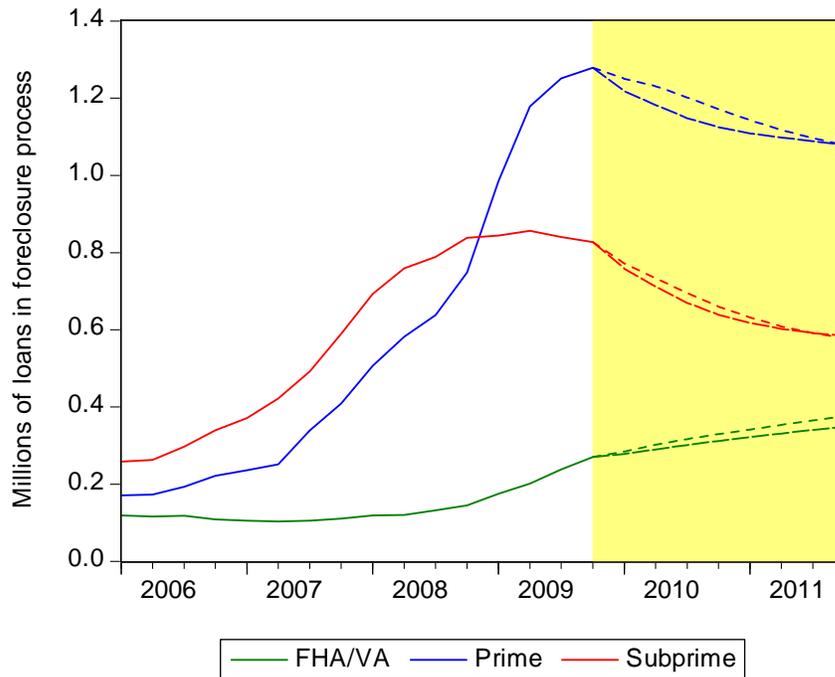
The following figure shows the foreclosure starts forecasts for prime, subprime, and FHA/VA mortgages under the MBA (dotted) and FRB (dashed) assumptions. Under each set of assumptions, the number of foreclosure starts appears to have peaked already: 2009:Q3 for prime mortgages, 2009:Q1 for subprime mortgages, and 2009:Q4 for FHA/VA mortgages. The number of foreclosure starts under the MBA assumptions is expected to be somewhat higher than under the FRB assumptions. All said, one would expect a total of around 2.3 million foreclosure starts in 2010 (another 2.1 million in 2011) under the MBA forecast assumptions—2.1 million foreclosure starts in 2010 and 2.1 million in 2011 under the FRB assumptions.

**Figure 5: Foreclosure Starts Forecast**



In terms of the foreclosure inventory, the peaks may have already occurred among prime and subprime loans. The foreclosure inventory under the MBA assumptions (dotted) is again expected to be somewhat higher than under the FRB assumptions (dashed). All said, one would expect the total foreclosure inventory to decline to around 2.2 million loans by the end of 2010, and to 2.0 million mortgages by the end of 2011 under the MBA assumptions—2.1 million by the end of 2010 and 2.0 million by the end of 2011 under the FRB assumptions.

**Figure 6: Foreclosure Inventory Forecast**



### Summary

Mortgage defaults have garnered much interest over the past few years. Foreclosure starts have increased from around 1.5 million during 2007 to 2.8 million during 2009. Despite improving economic conditions and stabilizing house prices of late, model projections suggest that foreclosure starts will run around 2.1 million per year for the next two years, as many homeowners remain in a position of negative equity and unemployment rates remain high. The inventory of homes in the process of foreclosure is also likely to remain high, decreasing from 2.4 million in 2009 to 2.2 million in 2010 to 2.1 million in 2011.

## References

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