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Larry Cordell
Federal Reserve Bank of Philadelphia

Liang Geng
Federal Reserve Bank of Philadelphia

Laurie Goodman
Amherst Securities Group, LP

Lidan Yang
Amherst Securities Group, LP

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RESEARCH DEPARTMENT, FEDERAL RESERVE BANK OF PHILADELPHIA
Ten Independence Mall, Philadelphia, PA 19106-1574 • www.philadelphiafed.org/research-and-data/

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Abstract

In this study, we make use of a massive database of mortgage defaults to estimate REO liquidation timelines and time-related costs resulting from the recent post-crisis interventions in the mortgage market and the freezing of foreclosures due to "robo-signing" revelations. The cost of delay, estimated by comparing today's time-related costs to those before the start of the financial crisis, is eight percentage points, with enormous variation among states. While costs are estimated to be four percentage points higher in statutory foreclosure states, they are estimated to be 13 percentage points higher in judicial foreclosure states and 19 percentage points higher in the highest-cost state, New York. We discuss the policy implications of these extraordinary increases in time-related costs, including recent actions by the GSEs to raise their guarantee fees 15-30 basis points in five high-cost judicial states. Combined with evidence that foreclosure delays do not improve outcomes for borrowers and that increased delays can have large negative externalities in neighborhoods, the weight of the evidence is that current foreclosure practices merit the urgent attention of policymakers.

1. Introduction

The myriad of state foreclosure laws and different remedies to the recent foreclosure crisis by U.S., state, and local governments gives us a unique opportunity to measure and assess the costs of different policies to combat the foreclosure crisis. What has proved most problematic with this task has been the availability of data and complications with measuring foreclosure-related costs. In this study, we make use of a massive database of some 3 million real estate owned (REO) liquidations and 1.3 million defaulted loans to estimate foreclosure timelines and the cost of delay. Our sample spans nearly 16 years, starting in 1998 and extending through September 2012. Using a loan-level database, we are able to compare liquidation performance under different foreclosure laws and policies across states, controlling for geography down to the zip code; present analysis across all major types of mortgages and investors; and control for a large array of borrower, property, and loan characteristics to get estimates of direct time-related costs. The combination of data used in our study represents the most comprehensive database ever developed to empirically examine the cost of delay.

This paper is organized as follows. In Section 2 we review the literature. In Section 3 we describe our data and three samples we use to estimate REO liquidation timelines and the cost of delay. In Section 4 we describe our method for computing REO timelines for our large sample of uncensored observations from 1998 to September 2012. With this long sweep of history, we show how significantly timelines have been affected by the extraordinary government interventions in the foreclosure process, the freezing of foreclosures after the improper practices at servicers had been uncovered (the "robo-signing" scandal) and, preliminarily, the aftermath of the attorneys general (AG) settlement and resulting actions at the major servicers. In Section 5 we include in our sample the large number of loans defaulted in September 2012 but not yet liquidated and estimate a survival model to get an unbiased estimate of these timelines. What we show is that timelines in judicial foreclosure states have increased by 18 months pre-crisis to today, from an average of 26 months to 44 months. In statutory foreclosure states, timelines have increased by 6 months, from 16 months to 22 months. In Section 6 we describe our model used to estimate time-related costs and measure how much costs have risen. Comparisons of today's estimated costs to those pre-crisis represent the increased costs of delay. Pre-crisis, average time-related costs were estimated at 11% across the U.S.; today those costs are estimated at 19%, an eight-percentage-point increase. While costs have only gone up four percentage points in statutory states (from 8% to 12%), they have gone up 13 percentage points (from 17% to 30%) in judicial foreclosure states. In the highest-cost state, New York, costs have gone up by 19 percentage points. In Section 7, we discuss the policy implications of these extraordinary increases in the cost of delay, including recent actions by the GSEs to raise their guarantee fees in five judicial states with the largest increases in time-related costs.

2. Previous Literature

While the literature on mortgage default is extensive, the literature on foreclosure timelines is quite limited. This is unfortunate because the myriad of state foreclosure laws and recent experiments with different foreclosure alternative programs provide opportunities to empirically examine a broad array of different laws and programs. We believe a major impediment has been the lack of information on losses outside the private-label MBS market and the complexities of gathering, cleaning, and compiling large amounts of data, which we describe below. In some of the very first studies of variation of timelines by states, Clauretie (1989) and Clauretie and Herzog (1990) looked at losses to primary mortgage insurance

(PMI) companies in the 1980s. They found that states with judicial foreclosure laws, laws that require judicial proceedings to execute foreclosure, lengthen the foreclosure process by some five months relative to statutory foreclosure states that do not require judicial intervention. Since they were using PMI data, they were limited largely to high loan to value (LTV) loans insured by Freddie Mac and Fannie Mae, the two government-sponsored enterprises (GSEs). Wood (1997) documented that states with judicial foreclosure proceedings took an average five months longer than the average foreclosure process in non-judicial states, and Wilson (1995) found that the judicial foreclosure process greatly increased costs to investors, implying the 5-month delay in judicial states raises time-dependent costs by 5% of the loan balance. Pennington-Cross (2003) found that houses in judicial foreclosure states sold for 4% less than those in statutory foreclosure states, driven in part by greater home price depreciation during the longer foreclosure process for judicial states. Pence (2006) investigated the costs of different state foreclosure laws on the availability of mortgage credit. She found that loan sizes are 3%-7% smaller in "defaulter-friendly" states, mainly judicial states, imposing material costs on borrowers at time of origination. These last two studies focused mainly on their effects on mortgage originations, not on the liquidation process.

More recently, the effects of the housing financial crisis have focused attention on timelines and costs of foreclosure. Hayre and Sharif (2008) used data on private-label securitizations to estimate differences in timelines and severities. They found that states that have a statutory, or "power-of-sale," foreclosure process take, on average, 11 months, while states requiring judicial foreclosure proceedings take, on average, 14 months. Their data are limited to the private-label mortgage-backed securities (MBS) market. Using data gathered at Freddie Mac, Cutts and Merrill (2008) find that the average foreclosure timeline nationwide, from last interest paid date to foreclosure sale, is 355 days, with substantial variation across states. They are most interested in finding an optimal foreclosure timeline policy to institute nationwide. They conclude that an optimal foreclosure timeline is 270 days, composed of 120 days in foreclosure and 150 days for pre-foreclosure referral loss mitigation activities.

In all of the above-mentioned studies, researchers were limited to a particular sector of the mortgage market at a particular point in time. Our study will draw from a very large representative sample from the largest mortgage servicers over a very long time period. Most important, we can examine the effects of delays caused by moratoria instituted since the onset of the financial crisis in 2007 and delays caused by the "robo-signing" revelations.

Another line of research related to foreclosure timelines has examined the factors that lead borrowers to cure mortgage defaults rather than lose their properties to foreclosure, focusing as we do on measuring variations in state foreclosure laws.[1] Since one type of cure is a loan modification, some recent papers in this literature also address important policy questions about the effects of differences in foreclosure timelines on borrowers' ability to have their loans modified.[2] This line of research can be interpreted broadly as attempting to assess the potential *benefits* associated with delaying foreclosures due to varying state foreclosure laws and various post-crisis foreclosure prevention programs. This literature generally agrees that borrowers are more likely to default the longer they are delinquent, the less equity they have in their properties, or if their loans are less seasoned. However, the evidence is mixed on whether and how mortgage outcomes differ with different state foreclosure laws or moratoria. In all but the Gerardi,

[1] See Phillips and Rosenblatt (1997) and Phillips and VanderHoff (2004).
[2] See Pennington-Cross (2010); Collins, Lam, and Herbert (2011); Mian, Sufi, and Trebbi (2011); and Gerardi, Lambie-Hanson, and Willen (2011).

Lambie-Hanson, and Willen (2011) study (henceforth GLW (2011)), however, researchers were limited to investigating behavior in one sector of the mortgage market, often at a particular point in time. GLW (2011) draw from the same large sample we do and conclude that the longer timelines associated with judicial intervention in the foreclosure process or with one moratorium law implemented in Massachusetts did not lead to either more cures or more modifications. However, they did lead to more persistently delinquent borrowers, as we will also show.

In contrast to all of these studies, we use our large national panel of mortgage loan data to estimate the *direct costs* associated with delays in the foreclosure process across the entire U.S. In this area, empirical work in the academic and trade literature is especially limited. Calomiris and Higgins (2010) examine the macroeconomic effects of the cost of delay, citing four potential costs. But since they do not have the data to estimate these costs directly, they instead cite a number of studies that estimate various parts of these costs. They conclude that the sum total of these costs is substantial, but they do not attempt to estimate what they are. Our study is the first to directly estimate these time-related costs of foreclosures across the entire U.S. mortgage market pre- and post-crisis. In so doing, we are able to assess costs across all manner of state foreclosure practices and a wide range of interventions in the mortgage market.

If one accepts the proposition in GLW (2011) that the benefits of delay are negligible, then our study in combination with theirs constitutes a full cost-benefit analysis of differing state foreclosure laws and various crisis-related interventions in the foreclosure process. These interventions include the national moratorium first implemented by Freddie Mac and Fannie Mae in November 2008; the Home Affordable Refinance Program (HAMP) in March 2009; delays caused by the "robo-signing" scandal; and, finally, the effects of the recent state attorneys general (AG) settlement that emanated from the flaws uncovered. Prospectively, we examine recent evidence to suggest what the cost of delay is likely to be with full implementation of new policies either in place or proposed.

3. Data and Sample Design

We use three samples of data from two sources in our analysis. For computing timelines for our first two samples, we use data from Lender Processor Services, Inc. (LPS), a loan-level database that covers approximately 60% of mortgages in the U.S. from the largest seller/servicers over a very long time period from 1992 to September 2012. This database contains over 140 million unique mortgage loans with around 4.9 billion records of monthly performance history through 2012. Since LPS includes the largest servicers, the database includes loans from all parts of the mortgage market, including those from Freddie Mac and Fannie Mae, the two government-sponsored enterprises (GSEs); government loans in, and out of, securities of the Government National Mortgage Association (GNMA); private label securities (including subprime, alt A, and prime jumbo loans); and portfolio loans.

Our first sample covers the period 1998-September 2012, where we examine the long history of timelines in the U.S., but only for the loans that have gone through REO liquidation.[3] In part, this is done to illustrate just how extraordinary recent history is.

[3] We did not go back even further only because sample sizes are much smaller before 1998. But results are still qualitatively similar for months with enough observations.

The main weakness of this part of the analysis done in Section 4 is that recent history suffers from severe *right censoring*—most of the observations that will reach REO liquidation are still delinquent and thus unobserved. To address this, our second LPS sample covers January 2005-September 2012, and we estimate a survival model to include censored observations in our database for loans that defaulted (i.e., were 180 or more days past due in September 2012).[4] We needed to use the shorter time series for our multivariate analysis due to data limitations with some of the independent variables used in our model.[5] Combining censored with uncensored observations gives us an unbiased estimate of REO timelines through the survival model. This analysis is conducted in Section 5.

One weakness with the LPS data is that, outside of REO liquidations, it is impossible to determine either the type of involuntary terminations or whether the servicer simply stopped reporting. Thus, a loan that does not voluntarily pay off or does not go to REO could either be a short sale, a charge-off, or a third-party sale, or the servicer could have simply stopped reporting the loan at that point. Because we cannot positively determine these types of involuntary terminations or reporting issues, our analysis focuses on loans that go through REO liquidation, where we are confident of the type of involuntary termination.[6] We note that these will overstate timelines with a fuller reporting of all terminations, since short sales and other types of liquidations circumvent the REO liquidation process.

Because the LPS data do not contain loss information, our third sample consists of liquidated loans from the CoreLogic (CL) database, which contains loss information from the private-label securities market so that we can estimate annualized timeline costs. While we do not believe severity rates from the CL database are representative of the entire market, we do believe that timeline costs, with adjustments, can be assumed to be representative, as we explain in Section 6. To estimate the annualized cost of delay, we use proprietary loss models developed by Amherst Group, LP (Amherst (2009, 2010)). Combining these costs with timeline estimates from the survival model using the second LPS sample gives us our loan-level cost estimates. Comparing pre-crisis costs against estimates of today's costs gives us our cost of delay.

All told, our first sample includes almost 3 million mortgage loans that went through the REO liquidation between 1998 and September 2012, by far the largest and most diverse set of REO liquidation data sample used in any study. Our second sample uses a subset of 1.8 million of these completed REO liquidations that occurred starting in 2005 and combines them with 1.3 million defaulted loans in September 2012. Our third sample using CL data includes 140,000 liquidations from private-label securitizations between June 2011 and November 2011.

Our final data sources are used to create additional variables to control for the economic and regulatory environment. First, we use the CL repeat sales index to compute mark-to-market LTVs for both the survival and severity models. We use the most granular level index available, zip-level indexes if available, county or state level if not. We compute a measure of house price growth the year before the loan defaults. We also collect county-level unemployment data by quarter from Haver Analytics to better capture market conditions in local areas.

[4] The 180 DPD time frame is chosen because that is the period when banks charge off loans and first recognize losses. For this sample, better estimates are possible, since, by that point, most loans are expected to be liquidated.
[5] As in GLW (2011), we had to limit our sample to start with 2005 due to data limitations in the LPS database.
[6] We did thoroughly examine the data to determine that there were no systematic biases in the reporting of REOs. The lack of reporting is therefore driven by what servicers report rather than anything systematic.

4. Measuring Timelines in Judicial, Statutory and Redemption States

As explained in GLW (2011), two main types of foreclosure laws emerged in the U.S. over time, with a third type allowing for additional rights post-foreclosure. The first type is termed *judicial* foreclosure, in which the lender must petition the court, which then executes the foreclosure by auctioning the property. The alternative foreclosure law is a *statutory* foreclosure, where the borrower at origination signs over the right to the lender to carry out a foreclosure auction in the event of default, effectively eliminating judicial intervention. While differences exist within these classifications, most researchers agree that the judicial versus statutory designation is the most critical in explaining variation in timelines across states, as we will show. We believe the most authoritative list is the one developed by Cutts and Merrill (2008). As shown in Appendix 1, their classification yields 29 statutory states (including the District of Columbia) and 22 judicial states. The third type of legal right is that some states provide for post-foreclosure rights of redemption, giving borrowers rights for a period of time to repossess their properties after foreclosure proceedings have been completed.[7] In Appendix 1 we identify the nine *redemption* states with shaded rows. Note that redemption states have either judicial or statutory foreclosure laws.

While the focus of our study is on the full timeline through REO liquidation, it is important to understand which parts of the process are causing variation in timelines among states and across time. As shown in Figure 1, timelines are split into several distinct events. The REO liquidation process begins the month borrowers stop paying on their mortgages as indicated by the due date. The next important date is the foreclosure (FC) referral date, starting the legal process by which the lender makes a claim on the mortgage collateral, continuing through foreclosure sale, when borrowers' rights of title are terminated. We also refer to this as the FC start date. The final timeline measured is from the REO start date (i.e., the month following the FC sale date or FC end date) to REO liquidation.

Before conducting our analysis, we needed to resolve significant issues with the data and devise a consistent methodology for computing timelines. The biggest challenge comes in developing a consistent methodology for assigning the foreclosure and REO start dates. A foreclosure event starts when a loan enters into foreclosure status, which, in practice, is the point at which the loan has been referred to foreclosure. The FC start date begins in the month a value of 'F' is recorded for the first time following a delinquency status other than "F."[8] We assign that month when this event occurs as the foreclosure start date. Once a loan enters foreclosure, we fix the date at that point until the foreclosure event ends when the loan proceeds to REO, liquidates, pays off, or becomes current. Loans that do not transition into one of these states do not move the foreclosure start month. This includes bankruptcy, which, in principle, should end the foreclosure (since loans in bankruptcy legally cannot be in foreclosure), but we keep the foreclosure date fixed until the loan is foreclosed, liquidates, pays off, or becomes current.[9] If the loan ends in a voluntary payoff, it is dropped from the sample. A foreclosure event could also end with the

[7] In states with a post-foreclosure-sale redemption period, the borrower retains the right of occupancy but loses title. The investor gains the title but has no rights of possession. See Cutts and Merrill (2008) for further details.
[8] In this case, these would come from values of current, 30, 60, or 90+ days past due.
[9] Per the LPS data, a loan cannot be in foreclosure and bankruptcy at the same time. If a loan in foreclosure also has a bankruptcy flag, then it no longer has "F" status but typically shows as non-foreclosure delinquency status. Making payments will also shorten the due date, but the foreclosure start date is not changed unless the payments result in a loan becoming current, at which point the loan is dropped from our database.

loan becoming current, in which case it is dropped from our sample. In our sample, the foreclosure process ends with the loan entering REO.

An REO event starts when a loan enters into an REO status ('R') from a status other than "R." We designate that month as the REO start date. A loan stays in REO as long as the loan does not become current (i.e., it is redeemed in a redemption state) or until it is liquidated. If a loan has been in REO and the servicer simply stops reporting it without the loan being liquidated or redeemed, we do not include it in the sample.

Very often, loan statuses change in ways that, if not accounted for, could significantly bias downward the foreclosure and REO timeline calculations. Some changes occur because of errors in reporting, where a loan is reported as being in FC or REO, then not in FC or REO for a month, then back in FC or REO the next month.[10] In these cases we maintain the original FC or REO start month. In other cases, borrowers file for bankruptcy while in foreclosure. Legally, borrowers in bankruptcy cannot be in foreclosure. LPS's coding rules do not allow this to occur. But if the loan eventually involuntarily terminates, the bankruptcy only delays the foreclosure; it does not end it. So we maintain the original FC start date. By footing the foreclosure and REO start dates and only removing them if loans pay off or fully recover to a current status, we calculate a consistent timeline methodology without excluding valuable information.[11]

As shown in Table 1, timelines vary by state laws in ways we expect, confirming the efficacy of our methodology. Judicial states show higher timelines compared to statutory states. From due date to foreclosure end, judicial states average 19 months versus 13 months for statutory states, an average difference of six months. Five months was the difference calculated by Clauretie (1989), Wood (1997) and Cutts and Merrill (2008). The five-month difference we show in our Period 1 (discussed below) most closely matches the time period of these earlier studies. Note that the differences in the timelines is explained entirely (and then some) by the foreclosure timeline (foreclosure start to end), which averages 14 months in judicial states and seven months in statutory states, an average difference of seven months. REO timelines, from REO start to end, average seven months in judicial states and seven months in statutory states. As expected, REO timelines are substantially longer in the redemption states at nine months. All told, what we label the REO liquidation timeline, the time from due date to REO liquidation, averages 25 months, more than two years, in judicial states, 19 months in statutory states, and 21 months in redemption states.[12] In Appendix 1 we summarize timelines by state and show some revealing rank correlation statistics at the bottom of the table. The range among states over the entire REO liquidation timeline (from due date to REO end date) is a full year, from 17 months in Missouri to 29 months in New Jersey. The Spearman rank correlation statistic between judicial states and the REO liquidation timeline is 73%.[13] But rank correlations vary across different segments of the timelines. The foreclosure timeline (FC

[10] This is because foreclosures and REOs are reported to LPS as flags, which are combined with delinquency or other information to determine the status. Sometimes, the delinquency won't change, but the FC or REO status is not reported. In these cases, we maintain the FC or REO start date.

[11] We thank Bill Merrill for corroborating this methodology with us. Cutts and Merrill (2008) developed comparable rules for their study while at Freddie Mac.

[12] Note that redemption states can be either judicial or statutory and are not mutually exclusive. In Appendixes 1 and 2 they are noted by shaded rows.

[13] The Spearman's rank correlation coefficient measures the correlation between judicial states and the REO liquidation timelines. A correlation of 1.0 means that timelines are always higher in judicial states than in statutory states.

start to FC end) rank statistic is 77%, while the REO timeline (REO start to REO end) is a much smaller 29%. But the timeline from due date to foreclosure start is a *negative* 50%, meaning that this part of the process is higher in statutory states. One interpretation of this is that since statutory states have much shorter timelines between foreclosure start and end, they are more deliberative in referring loans to foreclosure as they attempt to work them out.

Even more important is to examine the variation over time, which we divide into five distinct periods and report in Table 1 and illustrate in Figures 2 and 3. Period 1, which covers 1998 to the month before the start of the financial crisis in February 2007, is characterized by relatively stable liquidation timelines, save for some volatility in REO timelines (driven mainly by small sample counts). As shown in Table 1, timelines from due date to REO liquidation averaged 23 months in judicial states and 17 months in statutory states.

Period 2 encompasses the onset of the financial crisis in February 2007 through October 2008. Period 2 is characterized by the shortest timelines on record. Some contend that this is due to improper practices at servicers, as burgeoning numbers of foreclosures induced some of the major servicers to speed up foreclosure proceedings by forgoing attaining proper foreclosure documentation. REO liquidation timelines reached a record low of 21 months in judicial states and 16 in statutory states (Table 1).

Period 3 begins in November 2008, which marks the start of an extraordinary series of interventions in the housing markets. On November 26, 2008, both GSEs announced that they would suspend foreclosures of occupied homes until the newly elected Obama administration implemented its foreclosure alternative program.[14] The largest servicers announced moratoria in February 2009.[15] On March 4, 2009, the Home Affordable Modification Program (HAMP) was announced, and a major aim of the program was to delay foreclosures so borrowers could receive loan modifications as alternatives to foreclosure. What is clear from Table 1 and Figure 2 is that the effect of the moratoria and HAMP was to extend timelines significantly, to record highs by the end of the period. Part of the reason for these extended timelines was delays in instituting HAMP; other reasons include additional foreclosure moratoria instituted by state and local governments.[16] By the end of Period 3, timelines were 18 months in statutory states and 24 months in judicial (Figure 2).

Period 4 begins in September 2010 with a landmark series of announcements by the major servicers that they were suspending foreclosures after defects were uncovered in the foreclosure process. This period came to be characterized as the "robo-signing" scandal, so named because of the practice of signing off on foreclosures en masse before obtaining all of the appropriate documents.[17] These practices were likely driven by incentives at mortgage servicers to keep costs down for loans they don't own, especially the costs of foreclosures, which are large only during sporadic periods of mortgage downturns (Cordell, et al. 2009). These practices brought recriminations and lawsuits against the major servicers, and timelines

[14] See "Fannie Mae, Freddie Mac Suspend Some Foreclosures," Reuters.com, November 21, 2008: http://www.reuters.com/article/2008/11/21/us-fannie-freddie-idUSTRE4AJ90520081121.
[15] See "Banks Agree to Foreclosure Moratorium," *Wall Street Journal*, February 14, 2009.
[16] California, for example, instituted its own foreclosure moratorium in June 2009, as did several other states and even localities.
[17] See "Federal Agencies Dig Into Foreclosure Processing Problems, Suggest Servicing System is Flawed," *Inside Mortgage Finance*, October 28, 2010.

have extended ever since. By the end of Period 4, timelines had extended to 34 months in judicial states and 29 months in statutory states (Figure 2).

Finally, Period 5 covers the time from the attorneys general (AG) settlement resulting from the robo-signing revelations, starting in February 2012 to the end of our sample in September 2012. Timelines for these uncensored loans extended further, to 24 months in statutory states and 33 months in judicial states.

In Figures 3a and 3b, we plot the component parts of the REO liquidation process to see where delays are occurring. As shown in Figure 3a, in judicial states, the extraordinary increases in delays were heavily driven by the foreclosure timelines, which rose to 23 months by the end of the period. REO timelines also increased during the "robo-signing" scandal, but they also declined during the GSEs' moratorium. Note that the pre-foreclosure timelines remained remarkably stable at around 5 months, rising only at the end of the period.

This contrasts with the pre-foreclosure timelines for statutory states in Figure 3b. Note that these timelines rose steadily to over 8 months by the end of the period. Foreclosure timelines rose as well, to around 11 months at the end of the period, but not nearly as much as in judicial states. As mentioned, one interpretation of this difference is that since the statutory process resolves loans much more quickly post-foreclosure referral, statutory states are more deliberative in the pre-foreclosure process. Judicial states refer borrowers more quickly to foreclosure, as they understand that delays are much longer with judicial proceedings.

5. Timelines after Including Censored Observations

Remarkable as these figures are, they *understate* timelines because they do not include large amounts of loans currently in the foreclosure pipeline but not yet liquidated. Simply using the observed REO timeline data will produce downward biases due to data censoring: Some of the defaulted loans have still not been liquidated, making their REO timelines unobservable; so the observed data will underestimate the true REO timelines for these loans. In this section we describe a standard survival analysis approach we use to adjust our timelines for censoring.

The extent of the censoring problem is made clear in Figure 4, which shows the rate of seriously delinquent loans from 1998-September 2012 along with the share of seriously delinquent loans greater than one and two years past due. During Period 1, loans more than one year past due hovered fairly steadily at around 19% of all seriously delinquent loans; loans more than two years past due averaged 4%. Even though the share of seriously delinquent loans rose sharply during Period 2, the share of seriously delinquent loans one and two years past due decreased to 14% and 2%, possibly partly due to the "robo-signing" scandal. Since the start of Period 3, these shares have extended to unprecedented highs, rising most sharply during the "robo-signing" scandal in Period 4. By the end of our sample period, the share of seriously delinquent loans more than one year past due surpassed 60% for the first time ever, more than three times the share pre-crisis. The share more than two years' delinquent reached 35%, almost nine times its pre-crisis share! When these loans are liquidated, they will substantially extend the timelines reported thus far.

In order to overcome the data censoring problem, we use an *Accelerated Failure Time (AFT)* model from the survival analysis literature to estimate the length of time (in months) that elapses between the date on which a loan defaults and the REO liquidation date.[18] The AFT model assumes that liquidation time follows a particular parametric probability distribution (lognormal in our case).[19] We regress the log of event time on covariates. The functional form of the AFT model is described by

$$\log(T) = \mu + \sum (x_i \beta_i) + \sigma \cdot \epsilon$$

where $\boldsymbol{T}$ is the event or censoring time, $\boldsymbol{x_i}$ is the value of the *i*th covariate, $\boldsymbol{\beta_i}$ is the coefficient to be estimated for the *i*th covariate, and μ and σ are unknown parameters to be estimated from the baseline distribution.

For our study, the AFT model has several advantages compared with the more commonly used proportional hazards model in survival analysis. First, unlike the proportional hazards model where the hazard rate is modeled, our AFT specification models the liquidation time (in logarithm form) directly. It gives us the ability to compute time-dependent costs in the foreclosure process from the model outputs. Second, the AFT model coefficients are easy to interpret, as presented in Table 2. Third, the coefficient estimates are robust to the assumption on event time distribution and to omitting variables. Finally, the maximum likelihood (ML) estimation also enables the AFT model to incorporate censoring data that contain valuable information regarding the distribution of event time.[20]

The model is estimated using LPS data from 2005 to 2012.[21] The sample includes 1.8 million uncensored observations of loans that terminated with REO liquidations between 2005 and September 2012 and 1.3 million defaulted loans in September 2012. For a loan from the non-censored sample, $\boldsymbol{T}$ is calculated as the length of time (in months) from the default date to the REO liquidation date. For a loan from the censored sample, $\boldsymbol{T}$ is calculated as the length of time (in months) from the default date to September 2012. Model coefficients are listed in Table 2. All independent variables are dummy variables defining different cohorts. The combination of control categories constitutes the baseline case represented by estimates of the intercept term μ and scale factor σ. All covariates are significant at the 5% level or better except for one (1-Yr unemployment change < 50%). To provide some intuition as to the economic meaning of the covariates, the last column of Table 2 reports the marginal impact of covariates as percentage changes to timelines relative to the baseline.

The model results reported in Table 2 have expected signs for most all the covariates, offering important insights into the REO liquidation process. The first set of covariates relates to the legal and regulatory environment, and they are by far the most consequential. Whether a loan is in a judicial foreclosure state has the largest single effect of any variable, increasing expected timelines by 127%, after controlling for other factors. Redemption states have an estimated timeline 7% higher than that of non-redemption states,

[18] The 180 DPD time frame is chosen because that is the period when banks charge off loans and first recognize losses. Better estimates of timing are possible with this sample, since most loans are expected to be liquidated.
[19] We chose a lognormal distribution because it fit the data well and made the implementation of the model straightforward.
[20] More details about the AFT model can be found in Allison (1995).
[21] As mentioned, we had to limit our sample to start with 2005 due to data limitations with the covariates needed to estimate the model. Due to the relative stability of Period 1, we do not believe we give up anything in terms of model results by truncating the starting period to 2005.

which reflects delays in redeeming properties post-foreclosure. Deficiency judgment laws do not have much impact (2% higher) on timelines, even though the coefficient is positive and statistically significant.

The most profound finding is that the default period dummies show a monotonically increasing impact on timelines relative to the Period 1 baseline. Current (Period 5) timelines are 89% longer than the baseline pre-crisis timelines, reflecting the cumulative effects of moratoria, foreclosure prevention programs, and the suspensions of foreclosures following "robo-signing" revelations. Period 4 increases (81%) reflect the in-period effects of the "robo-signing" delays. Period 3 increases (60%) reflect the foreclosure moratoria and the HAMP implementation. Period 2 shows a small increase (14%) relative to the pre-crisis baseline, even though the unconditional results reported in Table 1 show a shorter timeline for Period 2. This suggests that other covariates were picking up the effects of the observed shorter timelines.

We have in our model nine additional covariates (with subgroups reflected by dummy variables). Portfolio loans have the longest timelines, suggesting that banks spend more time with borrowers on their own loans relative to other investors' loans. Shorter timelines likely reflect policies at the Agencies (GNMA and the GSEs) or in the "Other" category, dominated by loans in state affordable lending programs. Note that private securitized loans have effectively the same timelines as portfolio loans (only 1% shorter), which could reflect legal requirements in pooling and servicing agreements that loans are to be serviced as a bank services its own loans.

House price effects are important. First, the mark-to-market LTV (MLTV) of the property, measured using the CoreLogic Repeat Sales Index from origination up to the time of default (see Figure 1), shows a consistent pattern of increasingly negative equity resulting in faster timelines. Borrowers with MLTVs of 85% or less have timelines 21% longer than borrowers with MLTVs of 125% or more, with a monotonic pattern in between. One interpretation is that homeowners with substantial equity will try harder to keep their homes, while lenders are willing to more quickly liquidate deeply underwater properties. Second, substantial short-term house price depreciation, measured as the one-year price change the year before default, lengthens the liquidation process by up to 15%, likely reflecting the difficulties in selling properties in declining real estate markets.

As for loan and borrower attributes, loan size has an outsize effect: loans with balances over $400K get liquidated 48% slower than loans with balances of $100K or less. Fast liquidation timelines for very low balance loans reflects a tendency of servicers to write off small-balance loans quickly due to large fixed costs relative to loan size in foreclosing and liquidating properties. More recently, the REO-to-rental programs have absorbed distressed properties in the low price tier at a very fast pace. Large balance loans have the opposite effect; servicers are more likely to attempt to work out larger balance loans due to their much larger total costs. In addition, the housing market has less liquidity to absorb properties in the high price tier. This effect is captured in the monotonic pattern of the loan balance categories.

For loan product types, ARM loans tend to have shorter timelines, whereas option ARMs tend to have longer timelines relative to fixed-rate loans. Relative to purchase loans, cash-out refinance loans tend to have REO timelines that are 13% higher. Relative to single-family properties, 2- to 4-unit properties have longer timelines, while condos take a slightly shorter time to liquidate. Owner-occupied properties take longer to liquidate than second homes and investor properties, reflecting more difficulties in evicting borrowers from their own residences.

For our final set of regressors, borrowers with higher FICO credit scores tend to get liquidated sooner. Perhaps these borrowers suffer more from some "trigger event" such as loss of a job, while lower FICO borrowers tend to be slow payers who go in and out of delinquency status or tend to continue to make catch-up payments while in delinquency, which extends REO timelines. We do include dummies reflecting different levels of the one-year change in unemployment in the model, but we found no discernible pattern in this.

These results show many interesting patterns, but our main objective for developing this model is to develop unbiased estimates of timelines reflecting the effects of the large number of loans currently in the delinquency pipeline. Table 3 summarizes the sample data and compares the projected total timelines to the observed timelines from the uncensored data. In the tables and figures reported previously for the uncensored data, we had to foot our timelines to the liquidation date to reflect the upward trend. Now that we have included the censored observations, we switch to foot all of our timelines to the default date, prior to or at September 2012, to get an idea of when we expect loans to be liquidated. To get the total timelines, we add six months to each estimate to reflect the 180 DPD default date assumption.

When we present the same data by the time the loans defaulted in Table 3, the censoring issue becomes obvious. For example, liquidation timelines for uncensored loans that defaulted most recently (Period 5) only averaged nine months for judicial states and ten months for statutory states due to their short histories, reflecting positive selection for these loans. But 99% of the loans in judicial states and 95% in statutory states are censored and have not yet been liquidated. Including the censored loans via our survival model enables us to get a clearer picture as to how recent legal and regulatory policies will likely affect liquidation timelines.

The most relevant times are Periods 4 and 5, reflecting mainly defaults since the "robo-signing" revelations. When censored observations are included, the estimated liquidation timeline for statutory states increases to 22 months, a 3-month increase compared with its 19-month pre-crisis average (see the average of 19 months on the uncensored column in Period 1). For judicial states, the model estimated liquidation timelines increase to 44 months, an astounding 19-month increase over its 25-month pre-crisis historical average. This means that for the average borrower in a judicial foreclosure state, from the time he stops paying on his mortgage, it will take 3.7 years before the loan is liquidated.

An important qualification here is that censored loans account for a dominant share of loans in the later periods. So the model makes predictions on very limited information given the short history of the loans defaulted in this period, suggesting that there is a lot of uncertainty with the prediction. Note that the model shortens the timelines in Period 1 for statutory states, lengthens them for judicial states, even though all observations are uncensored. So Period 1 timelines for uncensored loans are calculated at 19 months actual for statutory states and 16 months estimated; judicial is 25 months actual and 26 months estimated. Over this long period (2005-2012), the extension of timelines was more significant for judicial states. Due to this more significant extension, the estimated timeline incorporates more of the increase for judicial states, creating an upward bias compared with statutory states. Given these limitations, the most appropriate way to interpret the estimates is to say that, given what we have observed so far, *if there are no changes in regulatory policies*, the average liquidation timeline would be 44 months in judicial states and 22 months in statutory states for recent defaults. The direct costs of these timeline extensions are considered next.

6. The Cost of Delay

Now that we have unbiased estimates of timelines, we complete our estimation by estimating direct time-related costs as a share of the loan balance and compare this to pre-crisis costs to estimate the cost of delay due to the extraordinary series of recent events described above. As mentioned, since the LPS database does not have loss information, we use the CoreLogic (CL) private-label MBS loan database, the only publicly available database with a large sample of loss data. While we do not believe severity rates from the CL data are representative of the entire market, we do believe that the timeline costs, with adjustments, can be assumed to be representative, as we explain below.

There are actually three sets of costs incorporated in the delay: property taxes, insurance, and excess depreciation. We consider each in turn. First, if the borrower is not paying, the servicer must continue to make tax payments. These can be quite sizeable. For California, we estimate property taxes at 2.01% per annum on appraisal value. Nationwide, property taxes range from a high of just over 3.0% per annum in New Jersey to a low of 0.54% in Arizona, averaging 1.54%.[22] Property taxes for all states are summarized in Appendix 2.

Second, the lender must also continue to make insurance payments; if force-placed insurance is used, the insurance payments can be quite large. Finally, there is an additional cost, one that we call "excess depreciation." Each day the home is occupied by a borrower not making his mortgage payments, that borrower is likely not taking care of the home, and it is likely the home will be sold for less at liquidation. Servicers pay for property maintenance costs after a property is in REO and the property is vacant (e.g., mowing the lawn, fixing the roof). In addition, there are servicer foreclosure costs that are time dependent.

How do we estimate insurance payments and excess depreciation? We cannot observe either of these costs directly. As shown in Figure 5, we see that the actual loss amount upon liquidation increases by the number of months in delinquency before the loan is liquidated. To estimate the timeline costs for each loan, we use the severity model developed by Amherst (2009, 2010) and apply it to loans from our LPS sample. The increase over time essentially represents the *carry cost*, which consists of:

(1) Principal and interest on the mortgage. For private-label securities, the servicer has to advance the principal and interest as long as it deems the advances recoverable. Amherst (2010) describes its method for estimating the percentage of principal and interest payments that are being advanced, which are then backed out of the costs.
(2) Property tax payments. As described above, we estimate the rates on the state level.
(3) Hazard insurance premiums; and
(4) Excess depreciation, encompassing the factors discussed above.

In the severity model estimation process, we first look to explain the increase in severity with the factors we can estimate: principal and interest payments and property tax payments. To the extent that we have an unexplained amount, and we will, we attribute this to insurance and excess depreciation.

Note that for this particular study, we are not including the advancing of principal and interest payments in the cost of delay. If those costs are advanced (as in private-label securitized loans), the servicer is able

[22] Property tax information is summarized from various publicly available sources such as taxfoundation.org.

to recover these monies when the loan is liquidated. Stated differently, when proceeds from liquidation are being distributed, the recovery of monies advanced by the servicer are at the top of the cash flow waterfall. Thus, the principal and interest advances, neglecting interest costs, are a zero sum event and are excluded from the costs. For our analysis, we ignore the cost to financing a non-performing mortgage.

Based on this analysis, we report in Table 4 a summary of our timeline costs by state for our full LPS sample. Overall, total timeline costs are estimated to be 11% of loan balance in Period 1, rising to 19% in Period 5, showing an eight-percentage-point increase in REO liquidation costs. By Period 5, timeline-related REO liquidation costs are estimated at 30% in judicial states, 12% in statutory states, and 27% in the subset of 9 redemption states (which can be either judicial or statutory states).

We also show an extraordinary variation of total estimated timelines among states in Period 5, from a low of 10% in Arkansas to a high of 39% in New Jersey and New York (see Appendix 2). While one can argue that these figures are inflated by loans stuck in foreclosure due to extraordinary events, we can safely conclude that the costs of delay are expected to be substantially higher in the future. These costs can, and will, get passed on to ALL homeowners, in the form of higher rates on their new mortgages. In fact, this is already starting to happen, as we explain in the next section.

7. Conclusions and Policy Implications

What few people recall is that when the GSEs implemented their foreclosure alternative programs in the 1990s, their goal was to substantially shorten what was viewed as excessively long liquidation timelines in judicial states and even some statutory states (Cutts and Merrill, 2008). Today, the public policy perspective is that longer timelines are good. If you can save one more borrower from defaulting, the additional delay is just an inevitable by-product. This essentially assumes that additional delay does not generate an additional cost that will get passed on to borrowers, either because they will be absorbed by investors or the costs are offset by saved defaults. We have shown in this paper that additional delay does generate substantial additional costs and, as we discuss below, these costs are starting to get passed on to borrowers.

GLW (2011) show that borrowers in judicial states are no more likely to cure and no more likely to renegotiate their loans, but the delays in these states lead to a build-up of persistently delinquent borrowers, the vast majority of whom eventually lose their homes. They also analyzed the right-to-cure law instituted in Massachusetts on May 1, 2008. By comparing Massachusetts with neighboring states, they found that the right-to-cure law lengthens the foreclosure timeline but does not lead to better outcomes for borrowers. Further work by Lambie-Hanson (2013) shows that foreclosure delays of a year or longer in Boston generated significant negative externalities: crime, constituent complaints, and property distress associated with deferred maintenance and abandoned homes.

The implication of these increased costs of delay is starting to manifest itself. The GSEs have announced that they plan to charge an additional premium in five states because of their long foreclosure timelines. On September 20, 2012, the FHFA announced that it had sent a notice to the *Federal Register* to adjust the guarantee fees that Fannie Mae and Freddie Mac charge on single-family mortgages in states where costs related to foreclosure practices are statistically higher than the average. The FHFA expects to make a final determination on this in 2013.

The FHFA considered factors very similar to those we have discussed in this article: (1) The length of time needed to secure marketable title to the property, and (2) property taxes and legal and operational costs during that period. Their approach was to focus on the small number of states that have average carrying costs that significantly exceed the national average and, hence, impose the greatest liquidation costs on the GSEs. Mortgages originated in these states would have a one-time upfront fee between 15 and 30 basis points (bps): New York would face a 30 bps upfront fee (820 days to obtain marketable title, with a cost per day that is 112% of the national average); New Jersey, Connecticut, and Florida would face a 20 bps fee, and Illinois would face a 15 bps fee. Note that their list of high-cost states correlates very highly with ours in Appendix 2, where New York, New Jersey, Connecticut, Illinois, and Florida rank first, second, third, fifth, and eighth, respectively, on our list. This certainly validates the methodology for our cost and timeline estimates.

One recommendation proposed by Cutts and Merrill (2008) is a national foreclosure process that incorporates best practices but minimizes the time necessary to foreclose. Their proposed standard is 270 days, composed of 120 days in foreclosure and 150 days for pre-foreclosure referral loss mitigation activities. This offers the advantages of lower foreclosure costs and more consistency in the foreclosure process. However, this does not appear to be in the cards. There are two channels through which this could conceptually occur: the Consumer Financial Protection Bureau (CFPB) and national banking laws. Let's look at each and see why neither is feasible:

- The CFPB is expressly not preemptive of state provisions. The CFPB serves as a floor on protections, but states are free to have additional protections. Section 1041 of Dodd-Frank provides that the CFPB provisions only preempt inconsistent state laws and expressly provides that state laws that offer stronger consumer protections are not inconsistent. So the CFPB does not have the power to establish a preemptive national standard on foreclosure laws.
- Most mortgage servicing is done through national banks or through state banks that have state parity laws that give them the same authority as national banks. Could the OCC mandate uniform servicing standards using its authority under the National Bank Act? Under legal precedents, national banks generally have to comply with state of general construction laws, in contrast to state laws that target specific banking activities. While the OCC has historically been very aggressive in its preemption claims, it has never claimed preemption of state foreclosure laws. Dodd-Frank has subsequently made it harder for the OCC to preempt state law, tightening both the standards that applies and the procedure the OCC has to follow to assert preemptions. Thus, it is very doubtful that the OCC would exert preemption over existing state foreclosure laws.

Given this, states would need to address these issues directly. For example, a look at redemption provisions would be useful. A redemption provision allows the borrower to redeem the house after foreclosure for a preset period of time by paying the full loan amount plus accrued interest. Very few borrowers do this, but, as we show, the provision ties up the resale of the house during that period, extending timelines. Some of the very long timeline states (New York, New Jersey) could add judicial capacity to process foreclosures more quickly, which could convince the GSEs to lower their guarantee fees on new loans.

There is one piece of good news: while timelines from delinquency to REO are extending, recent policy actions have made it easier to do short sales and deeds-in-lieu of foreclosure. The Home Affordable

Foreclosure Alternatives (HAFA) program was introduced in 2010 and has been revised several times since to streamline the short sale process. Similarly, in mid-2012, the GSEs announced that they have implemented new short sale guidelines as part of the FHFA's Servicers Alignment Initiative. Under the new guidelines, servicers will be permitted to approve a short sale for borrowers who have certain hardships but have not yet gone into default. The FHFA also reduced the amount of documentation required to complete a short sale. More recently, in early 2013, Fannie Mae introduced a new short sale escalation process. It is designed for issues such as valuation disputes, servicer delay, or uncooperative second lien lenders. While we cannot document this directly in the LPS data, short sale figures have reportedly increased and have been helpful in allowing many borrowers, lenders, and investors to circumvent the cumbersome foreclosure/ REO liquidation process. While these help in shortening timelines, large numbers of loans are still affected by the current REO liquidation process.

Assuming there is no public policy action to address the long delays and the attendant costs, here are the consequences:

- Timelines in judicial states will continue to stretch out as the adverse selection continues.
- The long timelines plus the recent moves to disallow dual tracking, under both the AG settlement and the new CFPB servicing standards, will make late-stage modifications less likely. Our discussions with servicers indicate that the combination of delays and the inability to dual track has made it less attractive in many cases to pursue late-stage modifications. That is, in the best case, without dual tracking, the borrower is frozen at the current state in the delinquency process, and the late-stage modification, which has a low probability of success, stretches out the process by many months. Worst case, in many states, the borrower is reset to the beginning of the process when the borrower re-defaults after a modification.

What state legislators in judicial states need to consider is whether their judicial foreclosure practices are worth imposing a cost of 15-30 bps on the average mortgagee. The weight of the evidence thus far is that longer timelines do not result in better outcomes for borrowers; we plausibly argue that they make late-stage modifications less likely. We show that the cost of delay has become extraordinarily high in all states and exceptionally high in judicial foreclosure states. And these are only the direct costs; indirect costs are also likely to be quite high. Resolving these public policy issues is critical to the smooth functioning of the mortgage finance industry going forward.

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Table 1. Average Foreclosure and REO Timelines by Foreclosure Laws and REO Liquidation Time Periods

State Foreclosure Laws	Counts	Due Date to FC Start	FC Start to FC End	REO Start to REO Liquidation	Due Date to FC End	Due Date to REO Liquidation
Overall (All States)	**2,995,480**	**6**	**9**	**7**	**15**	**21**
Judicial States	**867,635**	**5**	**14**	**7**	**19**	**25**
Period 1 (1998 -Jan07)	158,747	5	11	8	16	23
Period 2 (Feb07-Oct08)	93,195	5	9	8	14	21
Period 3 (Nov08-Aug10)	278,483	5	12	6	17	22
Period 4 (Sep10-Jan12)	235,658	6	15	8	21	29
Period 5 (Feb12-Sep12)	101,552	6	22	5	28	33
Statutory States	**2,127,845**	**6**	**7**	**7**	**13**	**19**
Period 1 (1998 -Jan07)	314,660	5	6	7	11	17
Period 2 (Feb07-Oct08)	241,849	5	4	8	9	16
Period 3 (Nov08-Aug10)	765,146	5	6	6	11	17
Period 4 (Sep10-Jan12)	590,969	6	9	7	15	22
Period 5 (Feb12-Sep12)	215,221	8	11	6	19	24
Redemption States	**402,619**	**5**	**7**	**9**	**12**	**21**

Note: This table presents the average number of months of various timeline components associated with the foreclosure process for loans that involuntarily terminated in the LPS data sample by the state foreclosure laws and by time period when the loans went to REO liquidation. Timelines are described in Figure 1. FC = Foreclosure, REO = real estate owned. Redemption states represent a subset of 9 states that can be either judicial or statutory states, as identified in Appendix 1.

Table 2. Estimation of Impacts of Various Drivers on REO Timelines from Survival Model

Drivers	Dummy Variables	Coefficient Estimates	Std Error of Estimates	Chi-Sqr Statistics	*P*-Value	Marginal Impacts on Timeline
	Intercept	1.7736	0.0048	136,727	<.0001	
Judicial States	Yes	0.8190	0.0012	432,288	<.0001	127%
Judicial States	No	(Control Category)				
Redemption States	Yes	0.0663	0.0017	1,611	<.0001	7%
Redemption States	No	(Control Category)				
Deficiency Judgment	Yes	0.0154	0.0016	98	<.0001	2%
Deficiency Judgment	No	(Control Category)				
Default Period	Period 5 (Feb12-Sep12)	0.6365	0.0052	15,064	<.0001	89%
Default Period	Period 4 (Sep10-Jan12)	0.5923	0.0040	21,447	<.0001	81%
Default Period	Period 3 (Nov08-Aug10)	0.4674	0.0041	13,228	<.0001	60%
Default Period	Period 2 (Feb07-Oct08)	0.1332	0.0040	1,092	<.0001	14%
Default Period	Period 1 (2005 -Jan07)	(Control Category)				
Investor	GNMA	-0.3885	0.0021	35,328	<.0001	-32%
Investor	GSEs	-0.1491	0.0016	9,131	<.0001	-14%
Investor	Private Securitization	-0.0081	0.0014	33	<.0001	-1%
Investor	Other	-0.3810	0.0085	2,004	<.0001	-32%
Investor	Portfolio Loans	(Control Category)				
Current LTV	<=85	0.1934	0.0019	10,025	<.0001	21%
Current LTV	86 - 95	0.1076	0.0019	3,122	<.0001	11%
Current LTV	96 -105	0.1062	0.0019	3,221	<.0001	11%
Current LTV	106 -125	0.0912	0.0016	3,093	<.0001	10%
Current LTV	>125	(Control Category)				
1-Yr HPI Chg.	<= -20%	0.1435	0.0026	3,101	<.0001	15%
1-Yr HPI Chg.	<= -10%	0.1227	0.0021	3,282	<.0001	13%
1-Yr HPI Chg.	<= -5%	0.1115	0.0019	3,369	<.0001	12%
1-Yr HPI Chg.	<= 0%	0.0473	0.0018	687	<.0001	5%
1-Yr HPI Chg.	> 0%	(Control Category)				
Loan Balance	> 400k	0.3929	0.0023	29,287	<.0001	48%
Loan Balance	<= 400k	0.2967	0.0019	25,035	<.0001	35%
Loan Balance	<= 250k	0.1516	0.0015	10,298	<.0001	16%
Loan Balance	<= 100k	(Control Category)				
Product Type	ARM	-0.1143	0.0013	7,469	<.0001	-11%
Product Type	Option ARM	0.0597	0.0020	871	<.0001	6%
Product Type	Fixed Rate	(Control Category)				
Loan Purpose	Refcash	0.1214	0.0016	5,673	<.0001	13%
Loan Purpose	Refother	-0.0064	0.0014	20	<.0001	-1%
Loan Purpose	Other	0.1565	0.0015	10,866	<.0001	17%
Loan Purpose	Purchase	(Control Category)				
Property Type	2-4 units	0.1361	0.0033	1,728	<.0001	15%
Property Type	Condo	-0.0267	0.0017	249	<.0001	-3%
Property Type	Unknwn	0.0156	0.002	61	<.0001	2%
Property Type	Single	(Control Category)				
Occupancy	Second	-0.2587	0.0032	6,666	<.0001	-23%
Occupancy	Investment	-0.1805	0.0019	8,791	<.0001	-17%
Occupancy	Other	-0.2496	0.0032	6,010	<.0001	-22%
Occupancy	Primary	(Control Category)				
Original FICO	<=680	0.2246	0.0015	21,935	<.0001	25%
Original FICO	681-720	0.1023	0.0017	3,579	<.0001	11%
Original FICO	Missing	0.1288	0.0019	4,648	<.0001	14%
Original FICO	>720	(Control Category)				
1-Yr Unemployment Ch	> 50%	-0.0467	0.0024	377	<.0001	-5%
1-Yr Unemployment Ch	< 50%	0.0029	0.0022	2	0.1846	0%
1-Yr Unemployment Ch	< 20%	0.0592	0.0019	1,008	<.0001	6%
1-Yr Unemployment Ch	<= 0	(Control Category)				
Scale		0.809	0.0004			

Note: This table presents the results of the survival model to estimate the length of time (in months) that elapses between the date a loan defaults (180DPD) and the date of REO liquidation, as described in Section 5. The model is estimated on LPS data, including 1.8 million uncensored observations of loans that terminated with REO liquidations between 2005 and September 2012 and 1.3 million defaulted loans (180+DPD) in September 2012. The combination of control categories constitutes the baseline case as represented by the shaded covariates. The last column reports the marginal impacts of covariates as percentage changes to timelines relative to the baseline.

Table 3. Actual and Modeled Total REO Liquidation Timelines by Time of Default

Judicial States	Uncensored Data		Censored Data		Combined Data	
Default Period	Counts	Avg REO Timeline (in months)	Loan Counts	Avg Duration as of 201209 (in months)	% Of Censored Loan	Estimated Timelines (in months)
Period 1 (2005 -Jan07)	18,941	25			0%	26
Period 2 (Feb07-Oct08)	196,539	27	34,683	57	15%	32
Period 3 (Nov08-Aug10)	248,894	26	240,756	40	49%	39
Period 4 (Sep10-Jan12)	44,647	18	280,660	21	86%	44
Period 5 (Feb12-Sep12)	1,238	9	165,820	10	99%	44

Statutory States	Uncensored Data		Censored Data		Combined Data	
Default Period	Counts	Avg REO Timeline (in months)	Loan Counts	Avg Duration as of 201209 (in months)	% Of Censored Loan	Estimated Timelines (in months)
Period 1 (2005 -Jan07)	31,585	19			0%	16
Period 2 (Feb07-Oct08)	388,476	20	10,610	57	3%	18
Period 3 (Nov08-Aug10)	674,307	20	116,308	39	15%	21
Period 4 (Sep10-Jan12)	210,087	15	245,636	21	54%	22
Period 5 (Feb12-Sep12)	12,040	10	217,672	10	95%	22

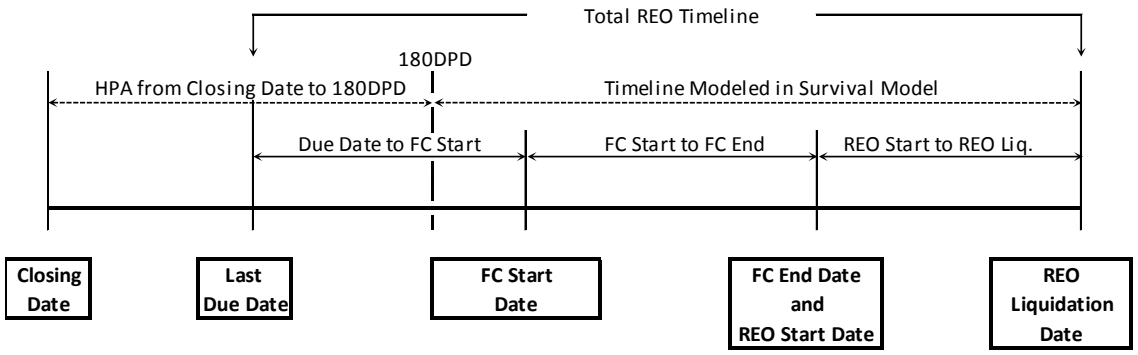
Note: For uncensored data, the REO timeline is defined as the number of months from last due date to REO liquidation; for censored data, duration is defined as the number of months from last due date to September 2012. The numbers listed in the last column are full timelines from last due date to REO liquidation by adding 6 months to the model estimated numbers. Defaulted loans are all those 180 or more days past due as of September 2012.

Table 4. Summary of Timeline Costs for Loans Defaulted in Different Time Periods

	Period 1 (2005 - 2007/01)			Period 2 (2007/02-2008/10)			Period 3 (2008/11-2010/08)			Period 4 (2010/09-2012/01)			Period 5 (2012/02-2012/09)			Total
Foreclosure Law	Tax	Ins. & Excess Dep.	Total Timeline Cost	Tax	Ins. & Excess Dep.	Total Timeline Cost	Tax	Ins. & Excess Dep.	Total Timeline Cost	Tax	Ins. & Excess Dep.	Total Timeline Cost	Tax	Ins. & Excess Dep.	Total Timeline Cost	Change Periods 1 to 5
Judicial States	6%	11%	17%	7%	13%	20%	9%	17%	26%	10%	19%	29%	11%	19%	30%	**13%**
Statutory States	3%	5%	8%	4%	5%	9%	4%	7%	10%	4%	8%	12%	4%	8%	12%	**4%**
Redemption States	5%	8%	12%	6%	10%	16%	9%	13%	21%	10%	15%	25%	11%	16%	27%	**14%**
Highest - NY	9%	12%	21%	11%	15%	26%	15%	20%	35%	16%	22%	37%	17%	23%	39%	**19%**
Lowest - AR	1%	5%	6%	1%	6%	7%	1%	8%	9%	1%	8%	9%	1%	8%	10%	**3%**
All States	**4%**	**7%**	**11%**	**4%**	**8%**	**12%**	**6%**	**10%**	**16%**	**6%**	**12%**	**18%**	**7%**	**12%**	**19%**	**8%**

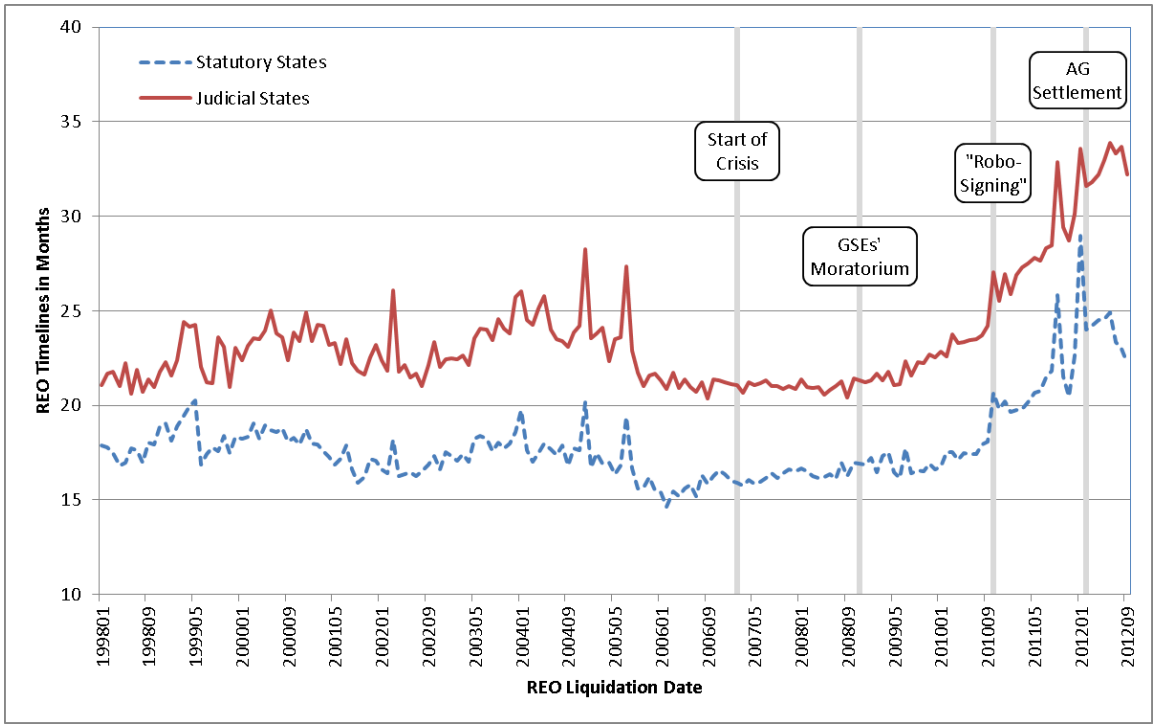
Note: This table presents the calculated timeline costs as percentage of unpaid balance (UPB) from full sample of the survival model described in Section 6, for loans defaulted in different time periods. Default periods are based on the date the loan enters default at 180 days past due. The numbers listed in the last column are the differences between the total timeline costs between period 5 and period 1. The highest state (NY) and the lowest state (AR) are based on the ranks of total timeline costs in period 5 (see Appendix 2 for the full list). Redemption states represent a subset of 9 states that can be either judicial or statutory, as identified in Appendix 2.

Figure 1. Illustration of Events and Timelines Along the Foreclosure and REO Processes



Note: This figure displays the various event dates as loans go through the foreclosure and REO process. It also displays various timeline measures during the foreclosure and REO process. The closing date is when the loan terms are finalized between borrowers and lenders. The last due date is the latest monthly due date of the mortgage and reflects the start date of the delinquency. The FC start date is the foreclosure referral date when the lender starts the legal process by making a claim on the mortgage collateral. FC end date is when borrowers' right of title is terminated by either foreclosure sale or liquidation. The REO start date is when the property becomes REO and the REO liquidation date is when the property is finally disposed of. The timeline modeled in our survival model is the length of time measured in months from the 180 DPD date to REO liquidation date, as discussed in Section 5. House price appreciation (HPA) from the closing date to the date of delinquency is used to compute our current loan to value ratios (LTVs) on the loans for our empirical analysis.

Figure 2. Average REO Timelines by REO Liquidation Dates



Note: This figure shows the average REO timelines by REO liquidation date for loans terminated with REO liquidation from 1998 to September 2012. The REO timeline is the length of time measured in months from last due date to REO liquidation date as described in Figure 1. Loans are grouped by the time period when loans went to REO liquidation as presented in Table 1. Period 1 (1998 –Jan 07) is the pre-crisis period; Period 2 (Feb 07-Oct 08) is the start of financial crisis up to the GSEs' moratorium; Period 3 (Nov 08-Aug 10) covers the GSEs' moratorium to "Robo-signing" scandal; Period 4 (Sep 10-Jan 12) covers the "robo-signing to the attorneys general (AG) settlement; Period 5 (Feb 12-Sep 12) follows the AG settlement to the end of the sample period in September 2012.

Figure 3a. Average Timelines of Component Parts of the REO Liquidation Process for Judicial States

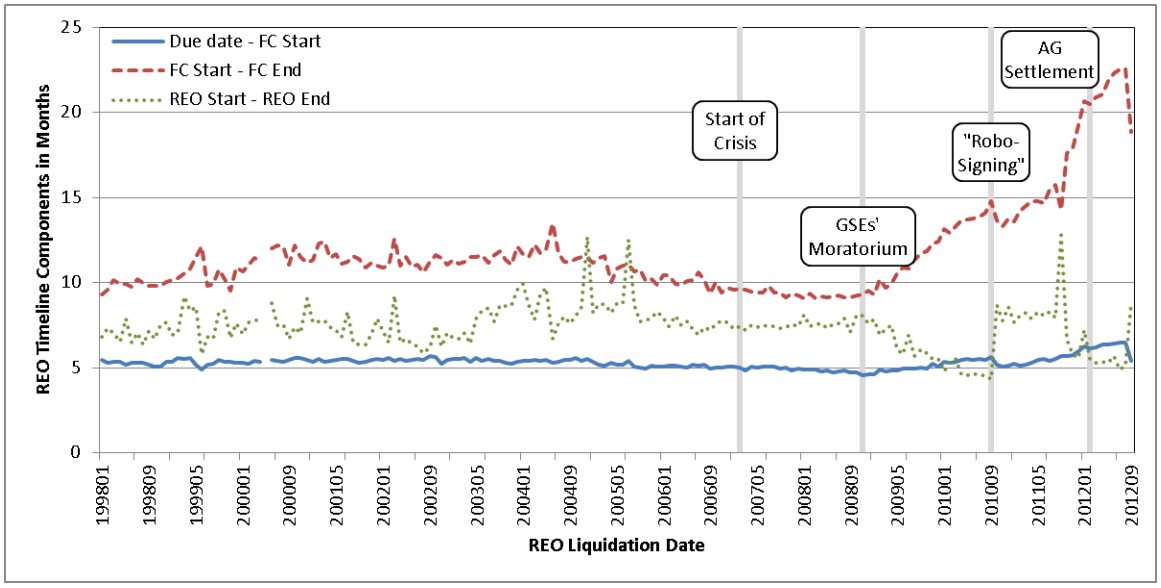
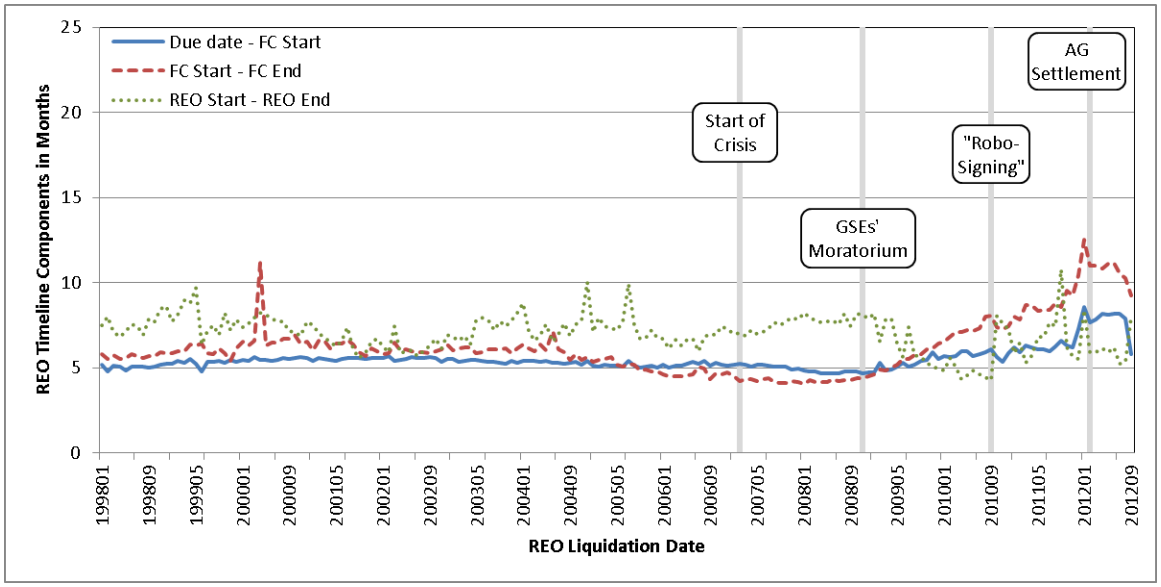
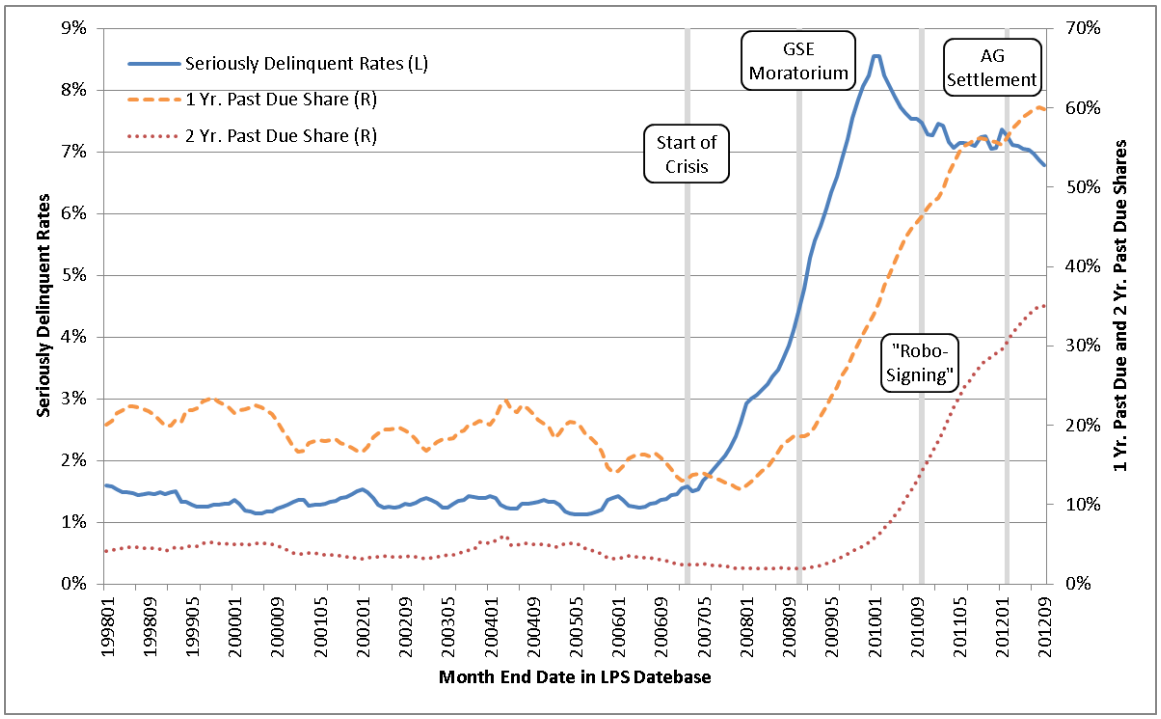


Figure 3b. Average Timelines of Component Parts of the REO Liquidation Process for Statutory States



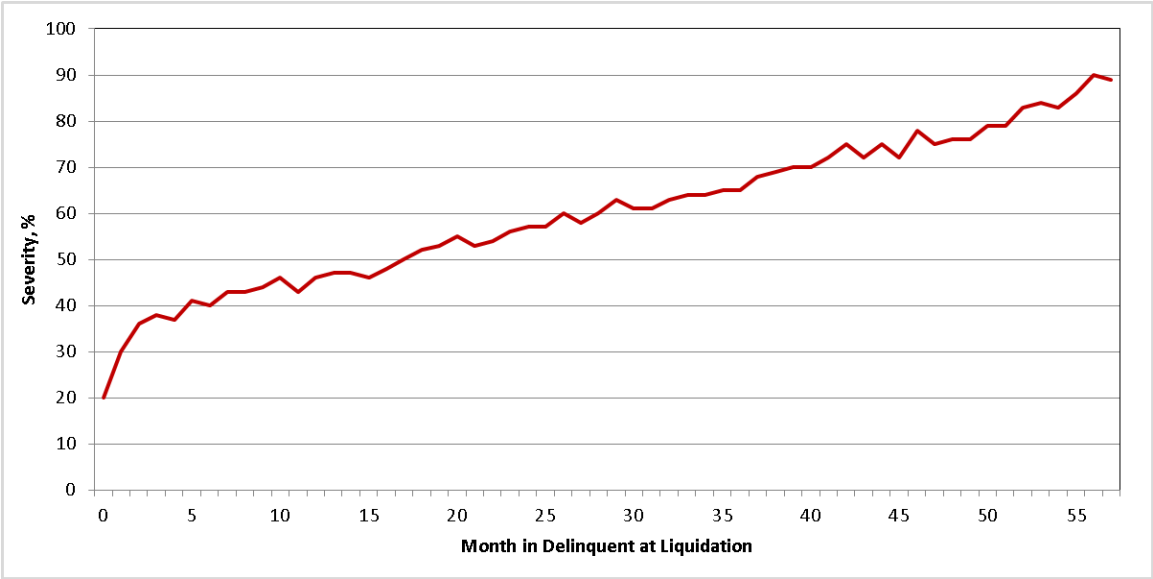
Note: These two figures show the component parts of the REO liquidation process for judicial and statutory states for loans that went through REO liquidation from 1998 to September 2012. The three REO timeline components are the length of time measured in months between different event dates along the REO liquidation process as described in Figure 1. Loans are grouped by the time period when loans went to REO liquidation as presented in Table 1. Period 1 (1998 –Jan 07) is the pre-crisis period; Period 2 (Feb 07-Oct 08) is the start of financial crisis up to the GSEs' moratorium; Period 3 (Nov 08-Aug 10) covers the GSEs' moratorium to "Robo-signing" scandal; Period 4 (Sep 10-Jan 12) covers the "robo-signing to the attorneys general (AG) settlement; Period 5 (Feb 12-Sep 12) follows the AG settlement to the end of the sample period in September 2012.

Figure 4. Seriously Delinquent Rates and 1 Yr. Past Due and 2 Yr. Past Due Shares Within Seriously Delinquent Loans



Note: This figure shows the 90+/foreclosure serious delinquency rates (left scale) for active loans in the LPS first lien mortgage database over the period 1998 to September 2012. The figure also shows the share of seriously delinquent loans one- and two-years past due (right scale).

Figure 5. Severity Rates by Number of Months Delinquent



Note: This figure computes the severity rate as a function of the number of months between delinquency and liquidation. The data are taken from CoreLogic databases of private-label securities.

Source: CoreLogic 1010data, Amherst Securities as of January 2013

Appendix 1. Foreclosure and REO Timelines by State

State	Counts	Foreclosure Type	Due Date to FC Start	FC Start to FC End	REO Start to REO Liquidation	Due Date to FC End	Due Date to REO Liquidation
MO	66,120	S	6	5	6	11	17
AZ	169,896	S	6	7	5	12	17
TX	196,726	S	6	6	6	12	17
VA	75,790	S	6	6	7	12	18
AK	3,233	S	5	7	6	12	18
AR	16,213	S	6	6	7	12	18
TN	59,140	S	6	6	6	13	18
AL	38,757	S	6	6	6	12	18
UT	27,215	S	6	8	5	14	18
NE	10,273	J	5	7	6	13	18
CO	78,137	S	5	7	6	12	18
GA	158,591	S	6	7	6	13	18
WY	2,758	S	6	6	7	12	19
NH	9,517	S	6	7	7	12	19
WV	6,879	S	6	7	7	13	19
NC	72,050	S	6	7	6	13	19
MS	16,309	S	7	7	6	14	19
ID	19,664	S	5	9	5	14	19
NV	101,515	S	6	9	5	14	19
OR	32,665	S	6	9	5	15	20
MI	190,587	S	6	5	9	11	20
CA	567,047	S	6	8	7	14	20
MT	4,986	S	6	9	6	15	20
WA	49,410	S	6	9	6	15	20
KS	19,570	J	6	8	7	14	20
RI	7,898	S	5	8	8	13	21
MN	69,397	S	5	7	9	12	21
OK	23,855	J	5	10	6	16	21
SC	32,625	J	5	10	7	16	22
ND	1,148	J	5	10	8	15	22
DC	3,384	S	5	7	10	12	22
IN	69,300	J	6	12	6	18	23
MA	29,169	S	6	10	8	16	23
SD	2,697	J	5	9	10	14	24
IA	15,608	J	5	13	6	18	24
MD	48,451	S	6	9	10	14	24
NM	10,483	J	5	12	7	17	24
KY	22,802	J	6	12	7	17	24
HI	6,341	S	5	12	8	17	24
LA	17,877	J	7	12	6	18	24
WI	33,297	J	5	13	6	19	24
CT	14,919	J	5	11	8	16	24
OH	102,062	J	5	13	8	18	25
IL	101,422	J	5	13	8	19	26
PA	48,167	J	6	14	8	19	26
FL	269,033	J	5	16	6	21	27
DE	4,505	J	5	15	7	21	27
ME	4,118	J	5	16	7	21	28
VT	971	J	5	16	7	21	28
NY	35,061	J	5	15	9	20	28
NJ	27,842	J	5	17	8	22	29
Total	**2,995,480**		**6**	**9**	**7**	**15**	**21**
Spearman Correlation			**-50%**	**77%**	**29%**		**73%**

Note: This table computes various average timelines for each state associated with the foreclosure process for loans that involuntarily terminated with REO liquidation between 1998 and September 2012 in the LPS data sample. Timelines are described in Figure 1 and are measured in number of months. FC = Foreclosure; REO = real estate owned; J= judicial foreclosure state, where a foreclosure sale needs be approved by a judicial proceeding; and S =

statutory foreclosure state, where it does not. Shaded areas are redemption states, where post-foreclosure-sale redemptions are allowed.

Appendix 2. Timeline Costs for Loans Defaulted in Different Time Periods by State

			Period 1 (2005 - 2007/01)			Period 2 (2007/02-2008/10)			Period 3 (2008/11-2010/08)			Period 4 (2010/09-2012/01)			Period 5 (2012/02-2012/09)			Total
				Ins. & Excess	Total Timeline		Ins. & Excess	Total Timeline		Ins. & Excess	Total Timeline		Ins. & Excess	Total Timeline		Ins. & Excess	Total Timeline	Change Periods
State	FC Type	Counts	Tax	Dep.	Cost	Tax	Dep.	Cost	Tax	Dep.	Cost	Tax	Dep.	Cost	Tax	Dep.	Cost	1 to 5
AR	S	16,173	1%	5%	6%	1%	6%	7%	1%	8%	9%	1%	8%	10%	1%	8%	10%	3%
MS	S	16,884	1%	5%	7%	1%	6%	8%	2%	8%	9%	2%	8%	10%	2%	8%	10%	4%
CA	S	520,980	4%	3%	7%	4%	3%	7%	5%	4%	9%	6%	4%	10%	6%	4%	10%	3%
WV	S	6,402	1%	6%	7%	2%	7%	8%	2%	8%	10%	2%	8%	10%	2%	8%	10%	3%
AZ	S	150,186	1%	7%	7%	1%	7%	8%	1%	8%	10%	1%	9%	11%	1%	9%	11%	3%
UT	S	24,353	1%	5%	7%	2%	8%	9%	2%	9%	11%	2%	9%	11%	2%	9%	11%	4%
GA	S	130,288	2%	6%	7%	2%	7%	9%	2%	8%	10%	2%	9%	11%	2%	9%	11%	4%
ID	S	18,932	2%	6%	7%	2%	7%	9%	3%	9%	11%	3%	10%	12%	3%	9%	12%	5%
WA	S	70,207	2%	6%	8%	2%	7%	10%	3%	9%	11%	3%	9%	12%	3%	9%	12%	4%
TN	S	48,231	2%	6%	8%	3%	6%	9%	3%	8%	11%	3%	8%	12%	3%	9%	12%	4%
TX	S	143,259	2%	6%	8%	3%	7%	9%	3%	8%	11%	3%	8%	12%	3%	9%	12%	4%
NC	S	68,523	2%	5%	7%	2%	7%	9%	3%	8%	11%	3%	9%	12%	3%	9%	12%	5%
AL	S	35,370	2%	5%	8%	3%	6%	9%	3%	8%	11%	3%	9%	12%	4%	9%	12%	5%
VA	S	71,277	2%	7%	9%	2%	8%	10%	3%	9%	11%	3%	9%	12%	3%	10%	13%	3%
WY	S	2,388	2%	7%	9%	2%	7%	9%	3%	9%	11%	3%	9%	12%	3%	10%	13%	4%
AK	S	2,691	3%	6%	9%	4%	7%	11%	4%	8%	12%	4%	8%	12%	5%	9%	13%	4%
MD	S	68,676	2%	7%	9%	3%	8%	10%	3%	9%	13%	4%	10%	13%	4%	10%	13%	4%
MO	S	51,105	3%	5%	8%	3%	7%	10%	4%	8%	12%	4%	8%	13%	4%	9%	13%	5%
OR	S	39,671	3%	6%	9%	3%	7%	11%	4%	9%	13%	4%	9%	14%	4%	9%	13%	5%
HI	S	9,888	1%	6%	8%	2%	8%	9%	2%	10%	12%	2%	11%	13%	3%	11%	13%	5%
DC	S	4,661	2%	7%	8%	2%	8%	9%	2%	10%	12%	2%	11%	13%	2%	11%	13%	5%
MI	S	141,688	3%	6%	10%	4%	7%	11%	4%	8%	13%	5%	9%	14%	5%	9%	14%	4%
MN	S	56,091	3%	6%	10%	4%	8%	11%	4%	9%	13%	5%	10%	14%	5%	10%	14%	5%
MT	S	4,592	3%	6%	10%	4%	8%	12%	5%	9%	14%	5%	9%	14%	5%	10%	15%	5%
MA	S	39,411	3%	7%	10%	3%	8%	11%	4%	9%	13%	4%	10%	15%	4%	11%	15%	5%
CO	S	54,498	3%	6%	9%	4%	7%	11%	5%	9%	14%	5%	10%	15%	5%	10%	15%	6%
NV	S	90,423	5%	7%	11%	5%	7%	12%	6%	8%	14%	7%	10%	17%	7%	10%	16%	5%
RI	S	10,070	4%	7%	10%	4%	7%	12%	5%	9%	14%	6%	10%	16%	6%	10%	16%	6%
NH	S	9,803	5%	7%	11%	6%	8%	13%	7%	9%	16%	7%	10%	17%	8%	10%	18%	6%
IN	J	55,498	3%	9%	11%	3%	11%	14%	4%	14%	18%	5%	15%	20%	5%	16%	20%	9%
NE	J	8,222	3%	8%	11%	4%	11%	15%	5%	14%	19%	5%	15%	20%	5%	15%	21%	9%
ND	J	903	3%	10%	13%	4%	11%	15%	5%	14%	19%	5%	16%	21%	5%	15%	21%	8%
SD	J	2,210	2%	9%	11%	3%	12%	15%	4%	15%	19%	4%	17%	21%	4%	17%	21%	10%
KY	J	23,411	3%	9%	12%	3%	11%	14%	4%	14%	18%	5%	16%	21%	5%	16%	21%	10%
KS	J	16,128	3%	10%	13%	4%	12%	15%	5%	15%	19%	5%	16%	21%	5%	16%	21%	8%
SC	J	37,079	2%	9%	12%	3%	12%	15%	4%	16%	20%	4%	18%	22%	4%	17%	21%	10%
DE	J	8,341	2%	10%	12%	3%	13%	16%	4%	16%	19%	4%	18%	22%	4%	17%	21%	9%
WI	J	38,409	3%	10%	13%	4%	12%	16%	5%	15%	20%	5%	17%	22%	5%	17%	22%	9%
LA	J	21,581	3%	10%	13%	4%	11%	15%	5%	15%	19%	5%	17%	22%	5%	17%	22%	9%
OK	J	22,324	4%	9%	13%	5%	11%	16%	6%	13%	20%	7%	15%	22%	7%	15%	22%	9%
OH	J	94,862	4%	9%	14%	5%	12%	17%	7%	14%	21%	7%	16%	23%	7%	16%	23%	10%
VT	J	2,268	3%	11%	14%	4%	14%	18%	5%	17%	23%	6%	18%	24%	6%	18%	24%	10%
IA	J	14,971	6%	9%	14%	7%	11%	18%	8%	13%	22%	9%	15%	25%	9%	15%	24%	10%
FL	J	435,059	5%	12%	17%	5%	14%	19%	6%	17%	24%	7%	19%	27%	7%	19%	26%	10%
ME	J	7,855	5%	11%	16%	6%	13%	20%	8%	17%	24%	9%	18%	26%	9%	19%	27%	11%
PA	J	63,120	6%	10%	16%	7%	12%	19%	9%	16%	25%	10%	17%	28%	10%	17%	28%	12%
IL	J	146,784	7%	11%	18%	8%	13%	21%	10%	16%	26%	11%	18%	29%	11%	18%	29%	11%
NM	J	13,358	8%	11%	19%	10%	14%	23%	12%	17%	29%	13%	18%	31%	13%	18%	31%	12%
CT	J	26,965	6%	12%	18%	8%	14%	22%	10%	19%	29%	11%	20%	31%	11%	21%	32%	14%
NJ	J	93,681	10%	13%	23%	12%	15%	28%	16%	19%	35%	17%	21%	38%	17%	21%	39%	16%
NY	J	99,149	9%	12%	21%	11%	15%	26%	15%	20%	35%	16%	22%	37%	17%	23%	39%	19%
All States		**3,138,899**	**4%**	**7%**	**11%**	**4%**	**8%**	**12%**	**6%**	**10%**	**16%**	**6%**	**12%**	**18%**	**7%**	**12%**	**19%**	**8%**

Note: This table presents the calculated timeline costs as percentage of unpaid balance (UPB) from full sample of the survival model as described in Section 6, by states for loans defaulted in different time periods. Default periods are based on 180 DPD dates. The numbers listed in the last column are the differences between the total timeline costs in period 5 and those in period 1. The table is ranked by the total timeline costs in period 5. Shaded areas are redemption states, where post-foreclosure-sale redemptions are allowed.