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Foreclosure of Securitized Commercial Mortgage - A Model of the Special Servicer

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Keywords

Cornell, CMBS, special servicer, foreclosure, first-loss bond

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Abstract

The decision to foreclose on a CMBS mortgage is made by the special servicer. A loan is in special servicing when the mortgage is either delinquent or in a state of imminent default. The special servicer should represent the interests of the underlying CMBS bondholders by getting the most dollars back for the investors. In this paper, we show that the special servicer's compensation structure results in an incentive for him to extend the loan beyond the time desired by the bondholders. We develop a model of these conflicting incentives and demonstrate how compensation incentives interact and influence the special servicer's foreclosure decision. Our model takes into consideration the dynamic nature of this decision by viewing the foreclosure decision as a dynamic programming problem whereby foreclosure represents a discrete terminal state of an optimal stopping problem. This model thus captures the trade-off between continuation of the loan with its termination and we use this model to determine how the stopping rule changes under various compensation structures.

Keywords: CMBS, Special Servicer, Foreclosure, First-loss Bond.

1. Introduction

Following the recent collapse of the subprime mortgage market, there is widespread concern that the next wave of mortgage defaults will occur in the Commercial Mortgage-Backed Securities (CMBS) sector. With lax underwriting being the primary cause behind the high levels of subprime mortgage defaults, a similar claim can be made about commercial mortgages originated at the same time. Some practices include underwriting loans based on optimistic projections of future property cash flow as opposed to past practice of using her typical cash flows. This has led to the so-called "proforma loans." Furthermore, many of these loans were interest-only thus precluding the borrower from accumulating equity through amortization. These loans often have a short term balloon provision whereby balloon maturities were reduced dramatically, often within several years from origination. These effects, taken together, may explain the steady increase in the rate of loan delinquencies we're observing today.

Figure 1 here

With the shortened balloon maturity dates of recent issuances, combined with tighter credit markets, the inability of borrowers to refinance may also lead to defaults. Figure 1 plots the maturing balances of CMBS loans broken down by year of origination. We see that within the next two years, there will be approximately $35 Billion and $39 Billion of loans due respectively. In 2012, there will be an additional $50 Billion of loans due. If the present tight lending environment continues over the next three years, we may see a sizable number of such maturity defaults. Figure 2 shows that the CMBS loans that transferred into special servicers have been increasing since 2007. According to Trepp, as of July 31, 2010, the total distressed CMBS loans that are currently under special servicing have reached to 12.73%.

Figure 2 here

While figure 1 indicates a potential looming problem, it is important to note that the actual foreclosure decision in CMBS loans are made by an entity called the special servicer. The special servicer has considerable discretion in how she manages a distressed mortgage. Her actions can range from making advances for any debt service shortfalls to traditional loan workout strategies such as loan write-downs or loan modifications. Since the special servicer is compensated by a periodic fee along with other revenue sources for the period she is actively managing the loan, the actual foreclosure decision represents a terminal state for her compensation. This indicates that such a decision will likely involve a trade-off between retaining the compensation stream and the benefits associated from mortgage termination.

The ability to postpone the foreclosure date, sometimes by as much as two years, suggest that whether the future wave of anticipated foreclosures will occur will depend on the actions of the special servicer. Given the conflict between receiving income streams from postponing foreclosure and serving the needs of all bondholder, understanding this trade-off is an important precursor to assessing the potential severity of the CMBS loan defaults. Thus the analysis of the potential CMBS default problem hinges on understanding how the special service makes her foreclosure decision and how this decision is influenced by the various incentives that result from her various sources of compensation.

These relationships are further complicated by the fact that most special servicers retain the first loss bonds from the CMBS structure with loans that they are managing. Furthermore, the special servicers usually have the right of first refusal to purchase defaulted loans at market-value prices, which are determined by the special servicers. Gan and Mayer 2007 report that among the CMBS deals that the special servicers manage, 64% of them contain some portion of first-loss bonds held by special servicers. Holding the first loss security makes them essentially an equity investor thus their foreclosure decision may better align with the below investment grade CMBS bondholders rather than the senior bondholders. Senior bondholders in general prefer that the property is sold quickly since they are the first to receive any liquidation proceeds. In contrast, the below investment grade bond investors wish to postpone liquidation since any principal losses will immediately impact their bonds. With the special servicer holding the riskiest of the below investment grade bonds, this may skew her decision to postpone foreclosure at the expense of the senior bondholders.

In this paper, we provide a model of the special servicer and outline how these varying compensation structures influence her foreclosure decision. Our model captures the dynamic nature of this decision whereby the special servicer must continuously evaluate the trade-off between keeping loan alive with advances and extension provisions and foreclosing on the loan in an environment of changing and uncertain future market conditions. While there have been numerous empirical studies which have estimated the factors leading to CMBS loan default, there has been fewer studies which have modeled the actual foreclosure decision[1].

2. Loans in Special Servicing

As of the end of July, 2010, there are more than $89.14 billion of loans, or 12.70% of all conduit loans by balance, residing in special servicing. There are 16 companies who serve as special servicers with the largest special servicer, LNR Partners, managing 1,297 loans valued at more than $23 Billion. Table 1 contains information on the numbers and size of loans managed by each of the special servicers.

Table 1: CMBS Loans in Special Servicing by Servicers

Special Servicer	**# of Loans**	**Balance of Loans ($Mil.)**
LNR Partners, Inc.	1,297	23,021
CW Capital Asset Management	952	18,082
C-III Asset Management LLC	621	8,688
Midland	507	8,455
JE Roberts	310	5,119
Helios AMC, LLC	190	3,611
Berkadia	296	1,978
ING Clarion Partners, LLC	127	1,942
Orix	94	762
NCB,FSB	10	172
GMAC	23	64
Prudential	2	50
Wells Fargo	7	30
GE Capital	3	15
Lend Lease	7	11
KeyBank	1	5

[1]For empirical default studies, see Ambrose and Sanders (2003), Ciochetti, Deng, Gao and Yao (2002), Chen and Deng (2004), Vandell, et. al. (1993) and Lebret and Quan (2008). For models on special servicers, see Ambrose, Yavas and Sanders (2008) and Gan and Mayer (2007).

Source: JP Morgan CMBS Research, July 31, 2010

To get a sense of the characteristics of the loans in special servicing, Table 2 provides the number of loans and the percentage of the total loan balance by loan vintage. We see that 63.3% of loans held by special servicers were those originate in 2006 and 2007. This is consistent with the belief that underwriting quality for these loans were poor during this period, the same period where similar lax standards were used to originate subprime mortgages.

Table 2: CMBS Loans in Special Servicing by Vintage

Deal Vintage	**# of Loans**	**Balance**	**% by Balance**
1996	9	37,706,362	0.1%
1997	23	46,005,334	0.1%
1998	104	709,210,049	1.0%
1999	202	1,128,937,428	1.6%
2000	318	1,818,975,972	2.5%
2001	241	1,713,806,823	2.4%
2002	140	1,055,250,749	1.5%
2003	192	2,097,692,569	2.9%
2004	339	3,948,833,692	5.5%
2005	734	12,715,579,768	17.7%
2006	1,010	16,342,122,550	22.7%
2007	1,056	29,200,468,697	40.6%
2008	79	1,190,019,545	1.7%

Data as of July 31, 2010. Source: JP Morgan, CMBS Research

Table 3 categorizes the distressed mortgages under special servicing into groups according to their collateral property types. It shows that the biggest sector that has distressed loans is lodging (22%), followed by apartment sector (15.7%). This is not surprising as the revenues generated from hotels and motels (as well as apartments) are most risky due to the lack of long-term leases.

Table 3: CMBS Loans in Special Servicing by Property Types

Property Type	**Balance ($Mil.)**	**Portion of Balance in Special Servicing**	**Share of Special Servicing by Balance**
Retail	18,621.8	9.1%	21.0%
Multifamily	18,358.8	17.8%	20.6%
Office	21,744.1	10.4%	24.6%
Industrial	2,295.3	6.7%	2.6%
Lodging	17,074.7	24.2%	19.3%
Other	11,045.5	14.1%	12.5%
Total/Average	89,140.2	Average 11.3%	100%

Data as of July 31, 2010. Source: Commercial Mortgage Alert, August 6, 2010

2.1. Special Servicers' Decisions

When loans are delinquent in their payments or deemed in a state of imminent default, the master servicer transfers the mortgage to the special servicer who is responsible for managing and possibly modifying the troubled loan. Once the loan is in the hands of the special servicer, there are numerous actions she can take:

- Maturity Date Extensions - Although loan extensions were quite rare prior to 2008, recent turmoil in the credit markets have resulted in many borrowers unable to refinance their mortgages to meet looming loan payments. Typical extensions range from 12 to 36 months, depending on the special servicer's assessment of the property's income generating potential and the credit worthiness of the borrower.

- Payment Modification - If there is insufficient property income to meet the schedule debt service, the special servicer may reduce the payments for a defined period. This is a fairly popular type of restructuring.

- Reduction in Interest Rates - Similar to the payment modification, the loan rate may be reduced if such a reduction can lead to payments which are manageable given the property's income.

- Reduction in Principal Balance - This is the costliest to the special servicer who hold the first loss bond from the CMBS structure. This is used only when the other payment reduction strategies does not work. In some cases, the borrower will have to contribute additional funds to offset the principal reduction.

- Discounted Payoffs - This is used if the borrower has to ability to pay off the loan at the discounted value and it is not anticipated that property values will increase in the near future. This may have tax implications since such discounts may be viewed as discharge of debt. A more tax efficient approach would be for the borrower to purchase the note at the discounted value.

- Short Sales - This occurs when there is a potential buyer who is willing to purchase at a reduced price for the note. The loan is written down to a level acceptable to the new buyer who assumes the loan upon sale.

- Additional Capital Injection - The special servicer may require the borrower to contribute additional capital to avoid foreclosure.

- A/B Split Note - The loan is split into two notes, with the A note equalling the amount of the loan that can be supported by the current property income. The B note is the difference between the loan amount and the size of the A note. This note is due at the time of maturity thus there is a possibility that it may be paid.

2.2. Special Servicer's Compensation

Compensation structure of various participants in a CMBS deal is an important part of the Pooling and Servicing Agreement (PSA). Although the special servicer's role is to represent the interests of all CMBS bondholders, her sources of compensation may lead her to adopt foreclosure rules which conflict with the bondholders' interest. Special servicers are typically paid a fixed fee of 2 basis points of the balance for each month they are managing the troubled loan. Furthermore, originally proposed as a mechanism to ensure the special servicer would minimize losses from managing the loans, they often hold the first loss bonds from the CMBS structure which contains the loan under special servicing. The rationale being that any premature losses from poor loan management will directly result in losses incurred from holding the first loss bonds. If the loan returns to being a performing loan and is returned back to the master servicer, the special servicer will be rewarded 1% of the loan balance. The special servicer is also paid 1% of the proceeds from liquidation. In addition, the special servicer is paid a percentage of funds she is able to extract from the borrower. The special servicer should also have the ability to make advances to the bondholders if there is a shortfall in debt service payments. This advance is recovered from either the proceeds from a sale or from the borrower if the loan is cured and becomes current. These advances have the first priority to be reimbursed before even the most senior bond holders get paid.

3. The Model

Using models developed by Rust (1987), the special servicer's optimal servicing decision is modeled as a dynamic programming problem. These models capture the regenerative intertemporal trade-off decision faced by the servicer. At each point in time, she determines the value of continuing to service the loan and being compensated versus the decision to foreclose on the property. The regenerative nature of her decision reflects the fact that postponing will allow him to make the same decision the next period. What changes each period is the income generating capabilities of the property which we take to be a stochastic process. The solution to this problem which is captured by the Bellman equations yields a cut-off point of property income which determines her default decision.

Every month, the special servicer makes a decision of either to foreclose or continue to the next month. Foreclosing a loan terminates the option of working out the loan in next period. If the special servicer chooses to continue, it can conduct one or more workout strategies to modify the loan as previously outlined. The special servicer keeps the option to foreclose the loan in next or future periods if the loan continues to underperform. Figure 3 illustrates the special servicer's decision process.

Figure 3 here

The special servicer's optimal decision can be summarized as the critical cut-off level of a property's Net Operating Income (NOI) whereby she forecloses if the property's NOI is above this threshold level. We are interested in how this critical value differs if she holds a first loss bond. These decision rules discussed above are different for each loan and change over time according to market conditions and property characteristics.

Assume the borrower's NOI follows a first-order autoregressive AR(1) process:

$$NOI_{t+1} = \mu + \phi NOI_t + e_t \tag{3.1}$$

where μ is a constant mean; $\phi \in (0, 1)$ is autoregressive parameter; e_t is the error term, which follows a standard normal distribution with constant variance σ^2. Let the initial stabilized net operation income at loan origination be NOI_0, and the going-in capitalization rate be Cap_0. The lender's underwriting criteria can be summarized by two variables: maximum loan-to-value ratio (LTV_0) and the minimum debt service coverage ratio ($DSCR_0$). The CMBS deal contains two infinitely-lived tranches[2]: a senior tranche and a subordination tranche (first-loss bond) with the same coupon rate R_0[3]. Assuming the CMBS loan was issued at the binding constraints, the maximum loan amount at origination is determined by the periodic stabilized NOI that the underlying property generates. The advantage of this assumption is to make the commercial mortgage scalable, that is the loan amount is a constant multiple of stabilized NOI at origination.

$$L = \gamma NOI_0 \text{ where } \gamma = \min\left\{\frac{LTV_0}{Cap_0}, \frac{1}{DSCR_0 \times R_0}\right\} \tag{3.2}$$

The optimal stopping rule is the solution to a stochastic dynamic programming problem that formalizes the trade-off between the conflicting objectives of maximizing special servicer's income for continuation of workout versus maximizing the liquidation value of the property. The idea is to explain the joint stochastic processes $\{i, X_t\}$, where $\{i_t\}$ is a set of binary-valued process: $i_t = 1$ if special servicer forecloses the property, and 0 otherwise. $\{X_t\}$ is a vector of state variables observed by both the special servicer and us, the model builder. We choose the cumulative advances as the state variable X_t in our model. The cumulative advances, which is defined as total advances the servicer makes since the servicing transfer event, are determined by many factors such as macroeconomic conditions, loan performance history, loan terms and collateral information. The vector $\{\varepsilon_t\}$ represent the latent variables observed only by the servicer but not us[4]. The maintained hypothesis is that the special servicing follows an

[2]We later relax this assumption by assuming the holdings of the first-loss pieces decrease over time.

[3]Normally the coupon rate of a subordination bond is higher than that of senior tranche. However, making the interest rates of the two tranches the same does not affect the main result.

[4]The error term can be interpreted as special servicer's heterogeneity. For example, if a special servicer chooses to hedge their first-loss holdings by entering into swap contracts, her workout strategy will be different from those who have market exposure to first-bond price risks. For discussion about different interpretation and model techniques of the error terms, please see Rust 1992.

intertemporal optimal strategy.

It can be shown that the stochastic process governing $\{X_t, \varepsilon_t\}$ is the solution to the following value function:

$$V_\theta (X_t, \varepsilon_t) = \sup_\pi E \left\{ \sum_{j=1}^{\infty} \beta^{(j-t)} \left[u (x_j, f_j, \theta_1) + \varepsilon_j (f_j) \right] | x_{t,} \varepsilon_t, \theta_2, \theta_3 \right\} \tag{3.3}$$

where the servicer chooses a sequence of decision rules $f_t (x_t, \varepsilon_t, \theta)$ to maximize her expected discounted utility function over an infinite horizon, $\pi = \{f_t, f_{t+1}, f_{t+2}, ...\}$,with β being her intertemporal rate of time preference.

The optimal value function V_θ is the unique solution to following Bellman's equation:

$$V_\theta (x_t, \varepsilon_t) = \max_{i \in C(x_t)} \left[u (x_t, i, \theta_1) + \varepsilon_t (i) + \beta E V_\theta (x_t, \varepsilon_t, i) \right] \tag{3.4}$$

The realized single-period utility of decision i when state variable is (x_t, ε_t) can be written as:

$$\begin{aligned} & u (x_t, i, \theta_1) + \varepsilon_i (i) \\ = & \begin{cases} s_1 L + bLR_0 - Z_t + \varepsilon_t (0) , & i_t = 0 \text{ continue} \\ s_2 V_t + \sum_{j=1}^{t} Z_j (1 + R_1)^{t-j} + \max (0, V_t - (1-b) L) - Y (X_t) + \varepsilon_t (1) , & i_t = 1 \text{ foreclose} \end{cases} \end{aligned} \tag{3.5}$$

Each month, the servicer faces a discrete decision of whether continue to monitor and modify the loan or to foreclose the property. If the she chooses to continue, it receives a constant monthly servicing fee of s_1.He makes an advance if the realized NOI is smaller than scheduled monthly payment. The periodic advance including principal and interest payable to bond holder in addition to servicing advances is defined as the incremental changes in the observed state variable $\{X\}$, $Z_t = X_t - X_{t-1}$.

In addition to servicing income and expenses, the servicer receives payment from holding the subordination or first loss bond. The servicer receives an interest income bLR_0 where b is the proportion of all subordination bonds that she holds. When the loan becomes performing again (NOIs are higher than debt service for a certain periods), the loan is sent back to the master servicer. If the special servicer chooses to foreclose the loan, all advances the special servicer has made since the transfer event will be reimbursed with interests, $\sum_{j=1}^{t} Z_j (1 + R_1)^{t-j}$, before the proceeds are distributed to bond holders. In addition, the special servicer receives the liquidation fee $s_2 V_t$, expressed as a percentage of property liquidation value V_t and principal value after it pays out to other senior bond holders if its principal is not wiped out, $\max (0, V_t - (1-b) L)$.

The property liquidation value can be derived as the last period NOI capitalized at the terminal cap rate, R_T, i.e. $V_t = \frac{NOI_t}{R_T}$. Brown, Ciocheti and Riddiough (2006) suggest that depressed industry conditions will drive a wedge between fundamental asset value and the asset sale price. Therefore the terminal cap rate is assumed higher than going-in cap rate. In addition, $Y(X_t)$ captures the disutility (or penalty) a special servicer suffer if she has been working with the distressed loan for a significant long period. $Y(X_t)$ is modeled as negatively related to the cumulative advancement X_t. As for the same revenue incentive, longer the distressed loan has been in the special servicer's house, the bigger the reputational penalty it will incur if she does not make a successful workout.

The special servicer's utility for a successful workout is specified as follows:

$$u(x_t, i, \theta_1) = s_3 L + bLR_0 + \sum_{j=1}^{t} Z_j (1 + R_1)^{t-j} \tag{3.6}$$

A loan is sent back to the master servicer when its current NOI_t exceeds the stabilized NOI defined at the origination plus an extra amount, which is modeled increasing function of the cumulative advances, that is $NOI_t \geqslant NOI_0 + kX_t$.The proceeds a special servicer receives include a workout fee s_3L[5], interest payment bLR_0 from the first-loss bonds she holds and the reimbursement of total advances made with compounded interests[6].

4. The Result

We calibrate our model parameters and estimate any behavior biases as a consequence of the special servicer's compensation. We particularly focus on investigating the influence of the servicer holding the first loss bond. The data generating process can be regarded as realization of a controlled Markov process generated from the solution to the infinite horizon stochastic control problem. The estimation in this paper is based on simulations. The parameter values of base scenario are in table 3, value function is approximated using nested fixed point algorithm.

[5]Under the current industry practice of special servicing, the workout fee is the same as the amount of fees received if special servicer foreclose the loan.

[6]Note equation 3.6 does not have error term, because workout is one of the possible results from a decision of continue the special servicer made.

Table 3 Parameter Values of Base Scenario

Baseline Scenario	**Parameter Value**
Loan-to-Value Ratio (LTV_0)	70%
Debt Service Coverage Ratio ($DSCR_0$)	1.4
Capitalization Rate (Annual) (Cap_0)	9.0%
Reimbursement Interest Rate (Annual) (R_1)	7.0%
Intertemporal Rate of Substitution (β)	0.992
Stabilized NOI (Monthly) (NOI_0)	10.0
Volatility of NOI	3.0
Autoregressive Parameter (ϕ)	0.70
Portion of First-loss Bond Holding (b)	0.2% – 2.0%
Compensations of the Special Servicer	
Fixed (Monthly) Special Servicing Fee (s_1)	2 *bps*
Foreclose Fee (s_2)	1%
Workout Fee (s_3)	1%

The objective of this study is to quantify the size of workout bias in terms of NOI threshold. The foreclose NOI cut-off point is the result of optimal decision of special servicer based on current realization of cash flow (NOI_t) and cumulative advances made since servicing transfer event (X_t) .The special servicer is essentially making a optimal stopping (foreclose) decision to exercise the workout option. The option value of continued workout is the central feature of the model. By extending the specially serviced loan to next period, the servicer preserves the option of workout or liquidate the loan later. Holding a portion of the subordination bonds typically provides him a stronger incentive to postpone foreclosure.

We define the *foreclosure bias* as the percentage difference between foreclose thresholds between a special servicer who hold first-loss piece and who does not hold any first-loss pieces. Let NOI^{**} (NOI^{*}) be the foreclosure thresholds for the special servicer who holds (does not hold) the first-loss bond. We thus measure the foreclosure bias as the percentage difference between NOI^{**} and NOI^{*}, normalized by initial net operating income NOI_0[7].

$$\text{Foreclosure Bias} = \frac{NOI^{**} - NOI^{*}}{NOI_0} \tag{4.1}$$

[7]We choose the innitial NOI_0 level to normalized the foreclosure bias rather than NOI^*, because NOI itself is a random variable and it can vary dramatically according to state realizations, which makes the normalized bias unstable.

4.1. Foreclosure Bias When the Special Servicer Holds First-loss Bonds

Figure 4 demonstrates simulated regions for continuation, foreclosure and workout decisions of the special servicer. Vertical axis represents the NOI realization state and horizontal axis is state variable X_t, measured by the number of month after special servicing transfer event. These area plots can be interpreted as a map of optimal workout strategies resulted from special servicer's dynamic programming problem. Any point on the map, which gives the special servicer an optimal workout decision, is a combination of two state variables: 1) current NOI level, and 2) the special servicing severity (cumulative advances made by the special servicer measured in number of months in special servicing).

The four panels in figure 4 demonstrate four scenarios of different optimal workout strategies according to different first-loss bond holding percentages when the delinquent loan was transferred to the special servicer. The white region represents the workout region where sufficient NOIs make the loan performing and current. The NOI levels in the workout region reflect the fact that specially serviced loan has been returned to the master servicer. The criteria of successful workout is exogenously specified as NOI returns the stabilized NOI level, which is modeled as increasing function of special servicing severity to capture the fact that a deeply distressed loan should achieved a higher NOI before returning to the master servicer. The dark area represents the foreclosure region where the special servicer's optimal decision is to foreclose the property. The gray area on the bottom of the graph is the continuation region. The border line between foreclosure region and continuation region is the foreclosure thresholds (NOI^*).If the NOI is lower than the border line, the special servicer will choose to postpone the foreclosure. Because low net operating income means poor liquidation value, and the option of foreclosure is deeply out of money.

Figure 4 here

We are interested in how the special servicer's first-loss holdings bias her foreclosure decisions. It is apparent from figure 4 that continuation region (or number of states in extending the foreclosures) increases when the first-loss bond holding increases from no-holding to 0.2% holdings to 2% holdings. The marginal changes in foreclosing NOI levels reflect the discrepancy in foreclosure decisions for special servicer who holds first-loss bonds. In order to clearly identify the foreclosure bias, figure 5 summarizes the information from figure 4 and shows this foreclosure bias at various special servicing periods. The optimal foreclosure threshold can be 50% higher for servicers who hold the first loss bond than for those who do not hold this bond. The dotted line represents the case when the servicer holds only 0.2% of first-loss bonds. The dash line represents a first-loss bond holding of 0.5 percent while solid line represents the holding of 2 percent. Figure 5 shows significant bias ranging from zero to 50 percent. The gap is higher when the cumulative advances are larger. (More first-loss bond holding yields higher foreclosure bias.) Somewhat interesting is that after reaching the peak, the foreclosure bias declines. A prolonged period of advances correspond to a continually underperforming property not capable of generating sufficient income to make it's debt service payments. As this continues, the foreclosure bias decreases until the bias is eliminated. This result suggests that although in the early stages of making advances, the servicer realizes there is the possibility that she can recover such advances should the loan become performing. However, as more and more of these advances are made, the likelihood of recovering these advances diminishes and to the point where her foreclosure decision would be identical to that of a servicer who does not hold a first-loss bond.

Figure 5 here

4.2. Robust Checks

Our results are robust under various parameter specifications. The foreclosure biases are both statistically and economically significant under different NOI processes, different CMBS underwriting standards (LTV, DSCR, interest rate, etc.). In this section, we test two alternative explanations: the first is to test whether the current practices of "delay and pray" or "pretend and extend" are due to a dramatic change in market fundamentals; the second hypothesis deals with the argument that first-loss bond held by special servicers have been under water or deteriorating.

4.2.1. Foreclosure Bias When the Market Fundamentals Change

The record-high numbers of CMBS loan distress are coupled with dramatic changes in financial market fundamentals. Can market fundamental changes along explain the systematic biases of special servicer's foreclosure decision? How much foreclosure biases are due to changes in market fundamentals and how much attributable to special servicer's holding of first-loss bonds? This section investigates this question by assuming a structural change in market capitalization rate. In the base model, cap rates are market average rate used to capitalize the stabilized net operating incomes. The market cap rates are assumed to be under rational expectation and complete market information. Now let's assume there is a permanent shock to the economy and market is undergone a structural change on how market value cash flows[8]. In particular, we assume the expected average cap rate permanently increases from 9% to 12% after loan underwriting.

Figure 6 compares the excess delays in foreclosures after cap rate increases under various first-loss bond holdings ranging from zero to one percent. The percentage changes in foreclosure threshold are calculated as the percentage difference in NOI cutoff points, which are similar to the foreclose biases defined in equation 4.1. The dotted line of zero first-loss holding in figure 6 shows that the extended delays are expected to be high for distressed loans that are newly transferred and loans that have stayed in special servicing for longer periods. For those loans that are in special servicing for 15 to 28 months, the special servicer tends to foreclosure sooner. This reflects the situation that special servicer does not expect the market condition improves in the near future and forecloses soon to recover as much as possible. The U-shaped patterns remain true and more pronounced as the percentage first-loss holdings increases. To estimate the overall or cumulative effect of the cap rate change, we measure the likelihood of continuation region weighted by state probability. Because the distribution of NOI realization is not uniform (the realization probability of $NOI = 9$ is much higher than $NOI = 3$ for example. However correctly assign NOI probability distribution is non-trivial, as a loan is in a state of 10 month of special servicing is conditional on the fact that it has been with the special servicer for 9 months. To facilitate faster calibration, we use stationary distribution of AR(1) for NOI process. Therefore the resulting measure of excess delays in foreclosures under-estimates true extension bias.

Figure 6 here

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[8]This may be due to changes in people's perception of risk or valuation of risks.

Three curves in figure 7 confirm the intuition that under permanent shock in market fundamentals, special servicers tend to postpone foreclosure. However this effect produces only a limited bias of under 0.5% for loans that in special servicing for more than 8 months if special servicer holds no first-loss piece. The market fundamental effects play a much more important role when the special servicer holds first-loss pieces. If special servicer holds 0.5% and 1% of first-loss bonds, the excess delay could be as high as 75% and 30% respectively. We conclude that it is the first-loss holding that makes the special servicer makes a more pronounced foreclosure delays under a permanent change in market fundamentals.

Figure 7 here

4.2.2. Foreclosure Bias When the Special Servicer's First-loss Bond holdings Decrease

The results from the base model build on the assumption that the shares of first-loss pieces that special servicer holds remain constant during the special servicing periods. As the loan performance deteriorating, the positions in special servicer's first-loss holding may decrease or even wipe out entirely. To estimate the impact of such deteriorating effects, we compare the foreclosure biases with 0.5% initial first-loss bond holding of constant holding versus that of diminishing holding. Figure 8 shows the foreclosure bias remains significant. For the loans special serviced under 15 months, the biases are the same. It is only until the first-loss holdings reduced to almost zero, the foreclose bias stars to narrow.

Figure 8 here

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5. Conclusion and Implications to CMBS Contract Design

The conflict of interests between senior bond holders and junior bond holders as well as the "self-dealing" problem of special servicers raise a big question of optimal contract design of CMBS deals. The historical high level of defaults and the temporary suspension of CMBS insurance provide challenges as well as opportunities to optimal contract design. In the discussion above, we proxy the self-dealing problem of special servicer using the first-loss bond ownership and conflict of compensation structures. We demonstrates how a special servicer, when she is holding the first loss bond from the structure which contains the nonperforming loans she is managing, can lead to postpone the foreclosure decision. Thus our model provides a formal model of the present day industry practice of "Delay and Pray", and "Extend and Pretend." We show that the more subordination bonds she holds, the more she is inclined to postpone the foreclosure decision. This workout behavior only skews the decision up to a point after which the servicer reverts back to an unbiased foreclosure rule.

Governed by the pooling and servicing agreement, a special servicer should maximize the total recovery of all CMBS bond holders on a present value basis. This paper shows that since most special servicers are also the investors of or appointed by the controlling class (first-loss bond investors), their foreclose decision on a specially serviced loan might be biased. Our dynamic programming model attempts to quantify this bias, which can be as high as 50 percent, in terms of optimal NOI foreclosing threshold.

Based on the proposed model, the following recommendations[9] we could provide for optimal design of CMBS service contract: (1) Special servicers should not given the first-refusal option to purchase defaulted loans or they should buy the defaulted loans in a competitive market; (2) The re-appointment of special servicer should be made by an independent entity who will represent the whole trust; (3) Fees paid to the special servicing should be capped or shared by the trust.

[9]Some of the recommendations are consistent with the recent CMBS deal - the $788.5 million GS Mortgage Securities Trust 2010-C1, backed by commercial mortgages contributed by Goldman, Citi and Starwood Property. In this deal, where Wells Fargo was appointed master and special servicer, a cap was put on special servier fees for loan workout. The replacement fo special servicer will be dericted by the a majority vote; no single bond class will have the right to replace the special servicer. In addition, the deal eliminated the traditional option for the special servicer to buy defaulted loans. Instead, loans have to be marketed and sold to the highest bidders.

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Figure 1 Maturing CMBS Loan Balance by Issuing Vintage

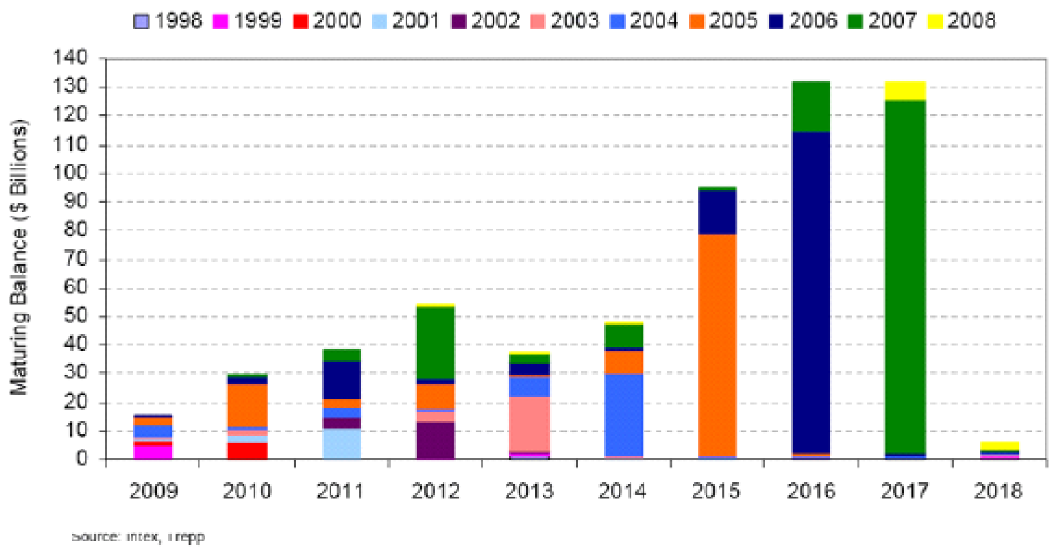


Figure 2 CMBS Loans in Special Servicing as of July 31, 2010

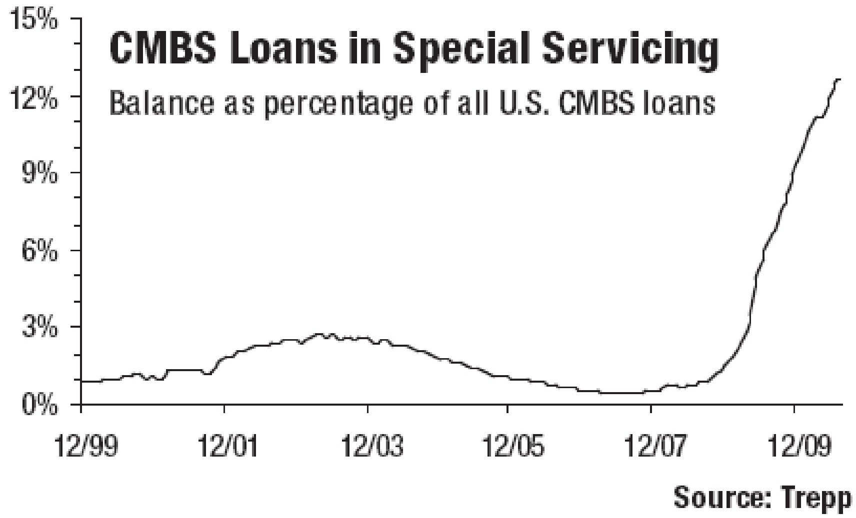


Figure 3 Decision Tree of a Typical Special Servicer

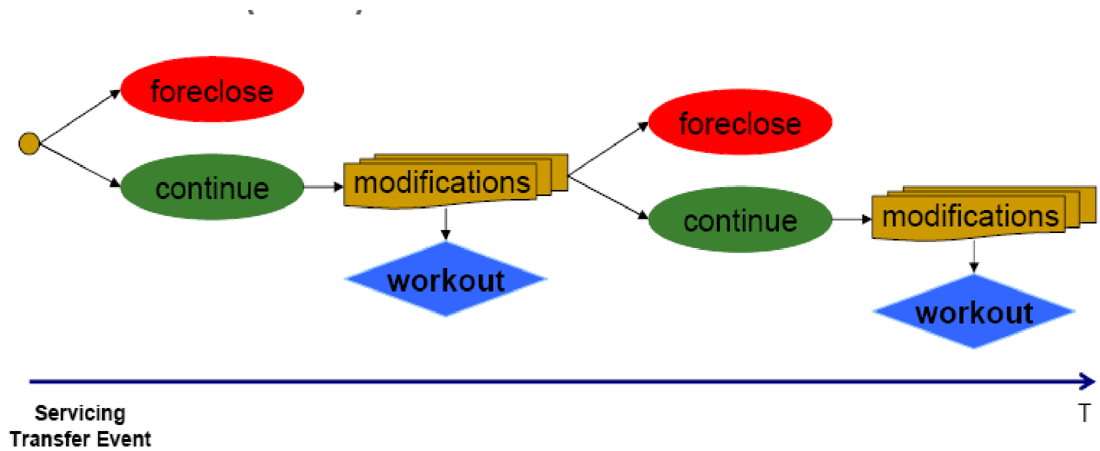


Figure 4

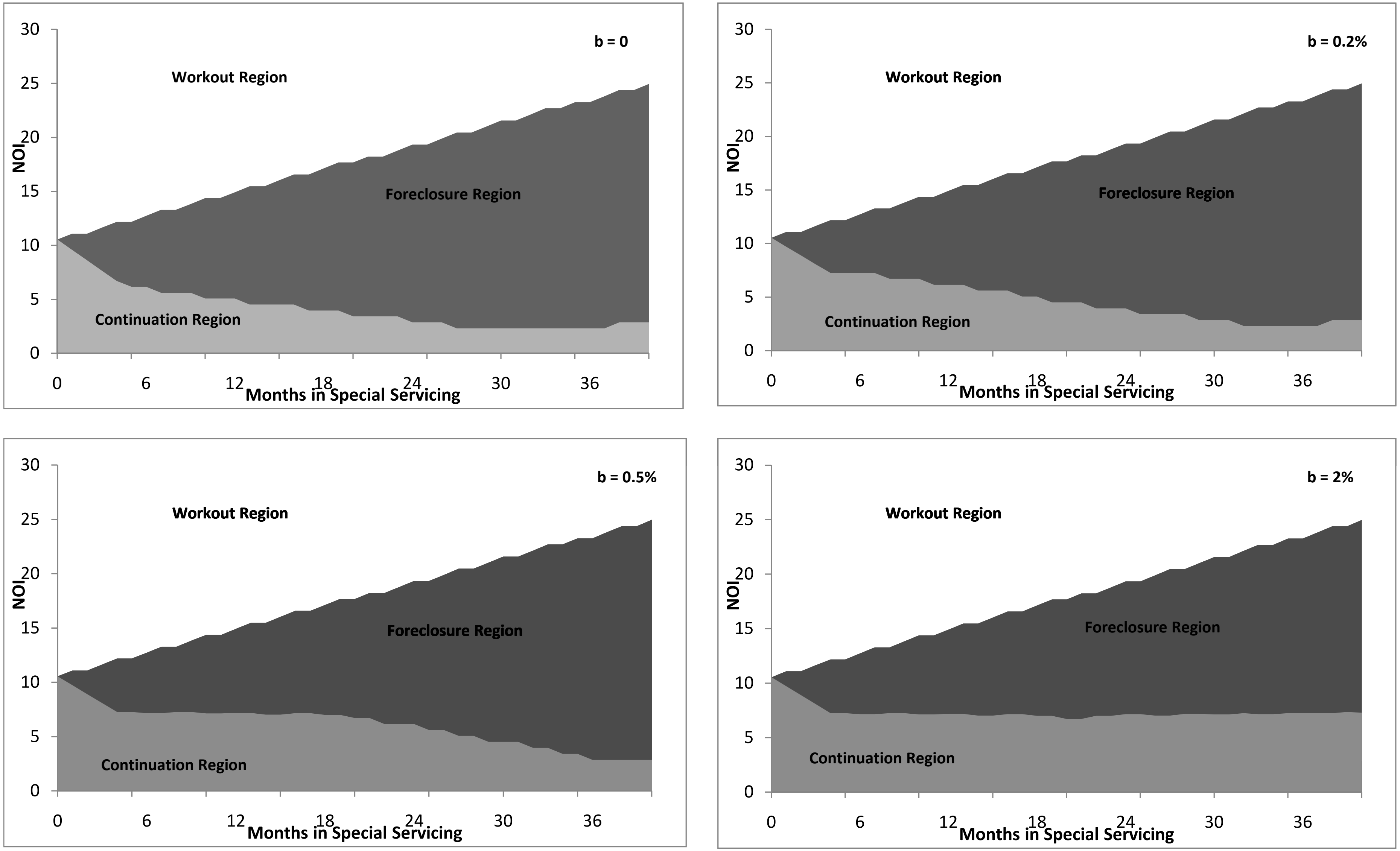
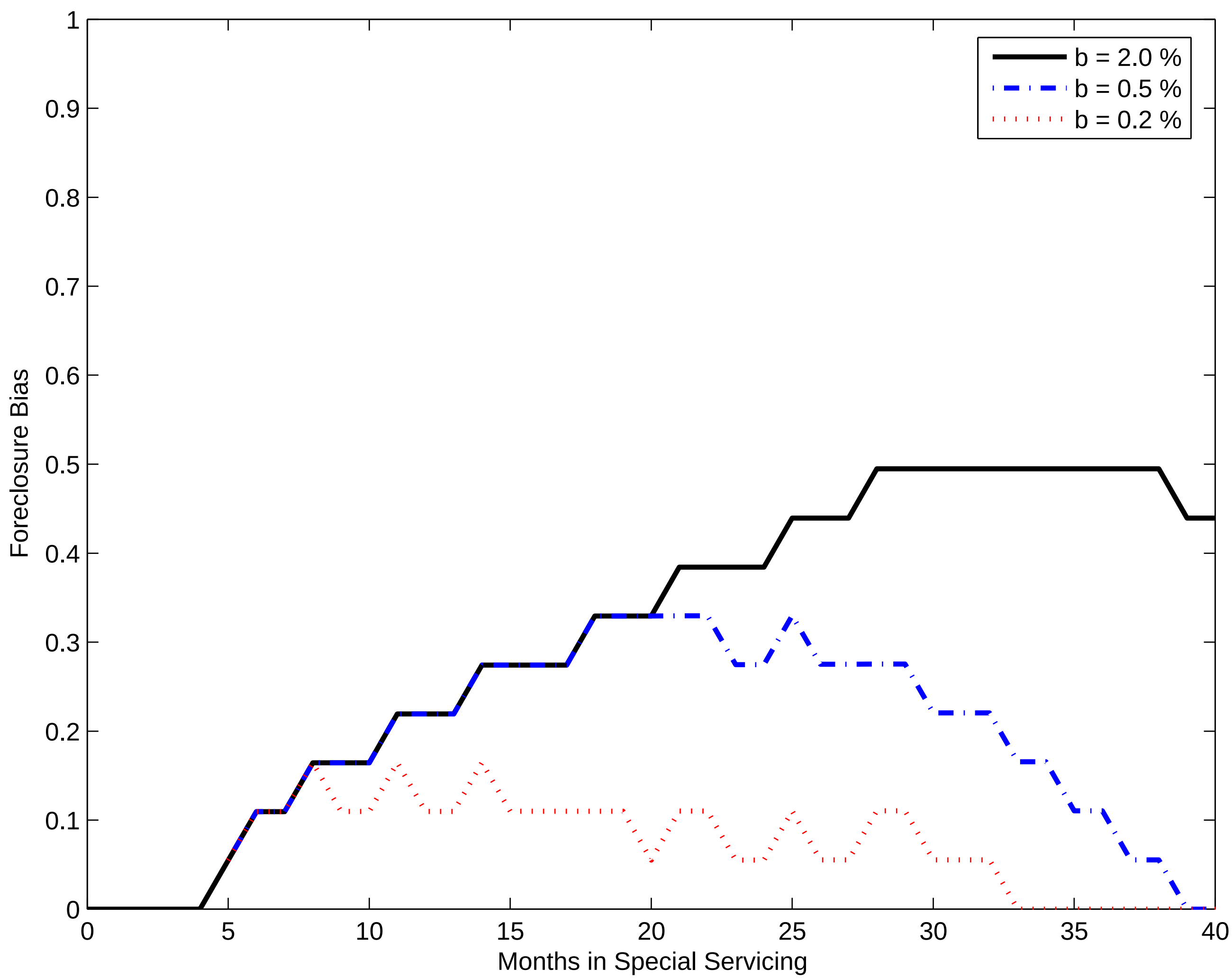
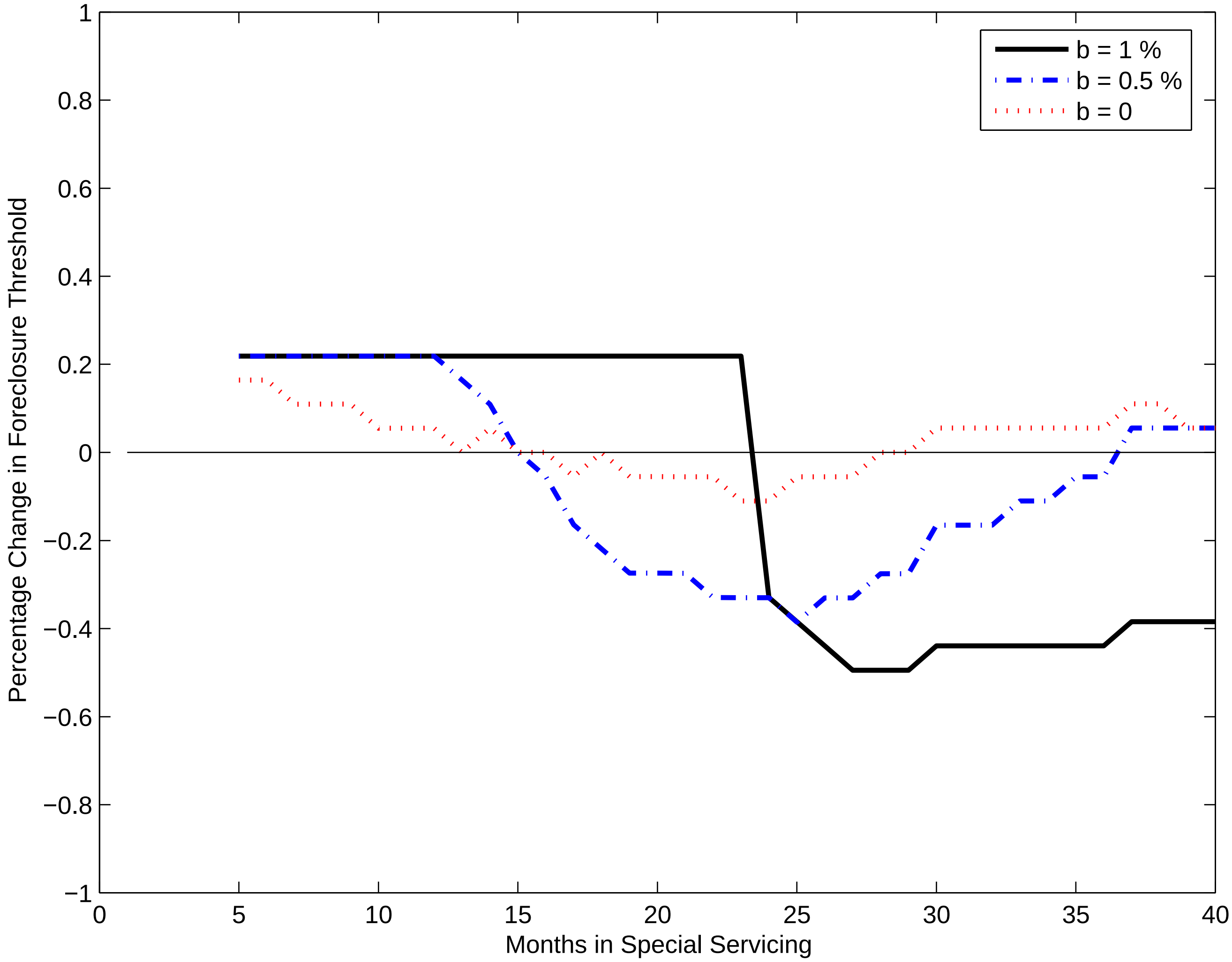

b = 0
Workout Region
Foreclosure Region
Continuation Region
NOI
Months in Special Servicing
b = 0.2%
Workout Region
Foreclosure Region
Continuation Region
NOI
Months in Special Servicing
b = 0.5%
Workout Region
Foreclosure Region
Continuation Region
NOI
Months in Special Servicing
b = 2%
Workout Region
Foreclosure Region
Continuation Region
NOI
Months in Special Servicing

Figure 5



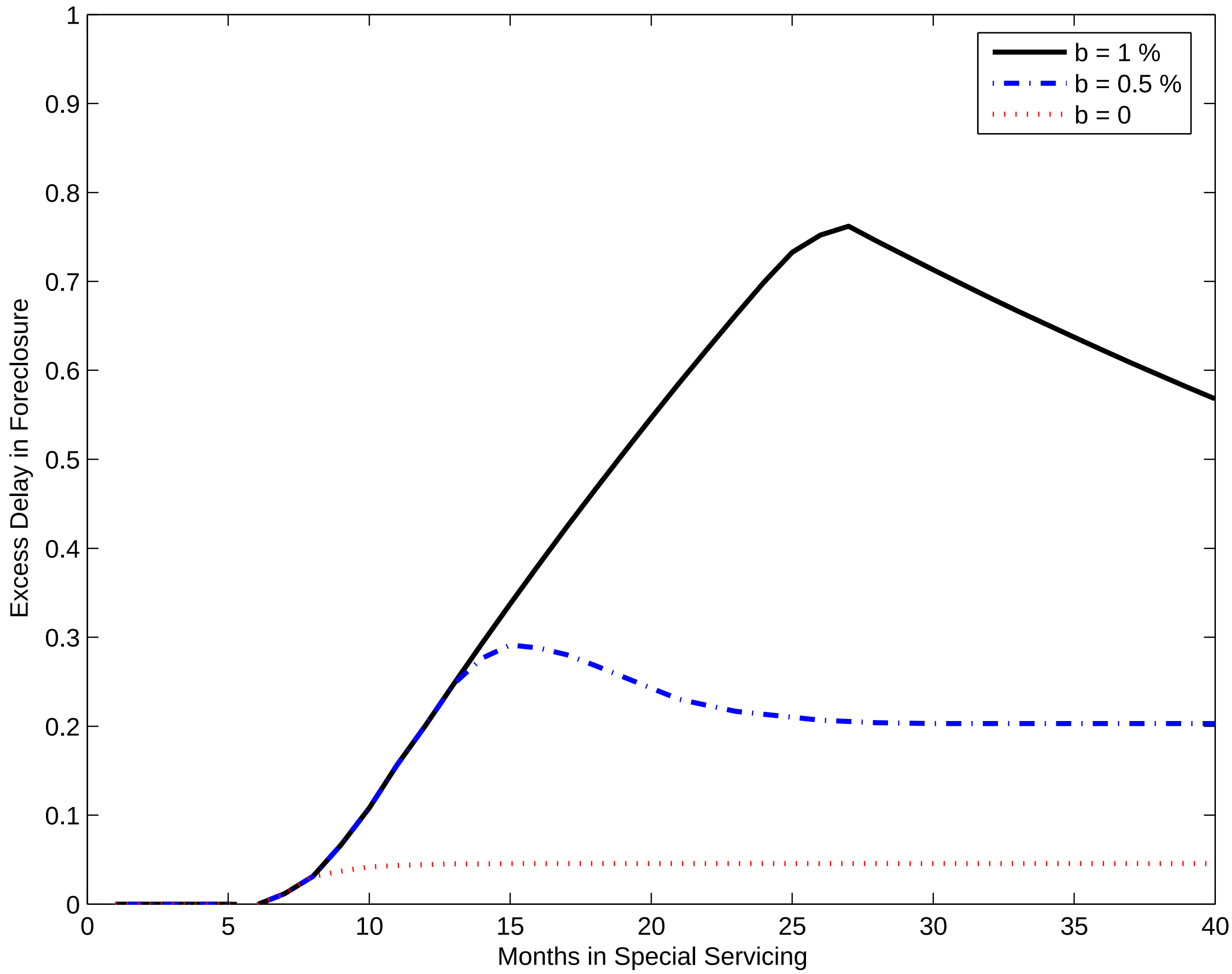
b = 2.0 %
b = 0.5 %
b = 0.2 %
Foreclosure Bias
Months in Special Servicing
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
5
10
15
20
25
30
35
40

Figure 6



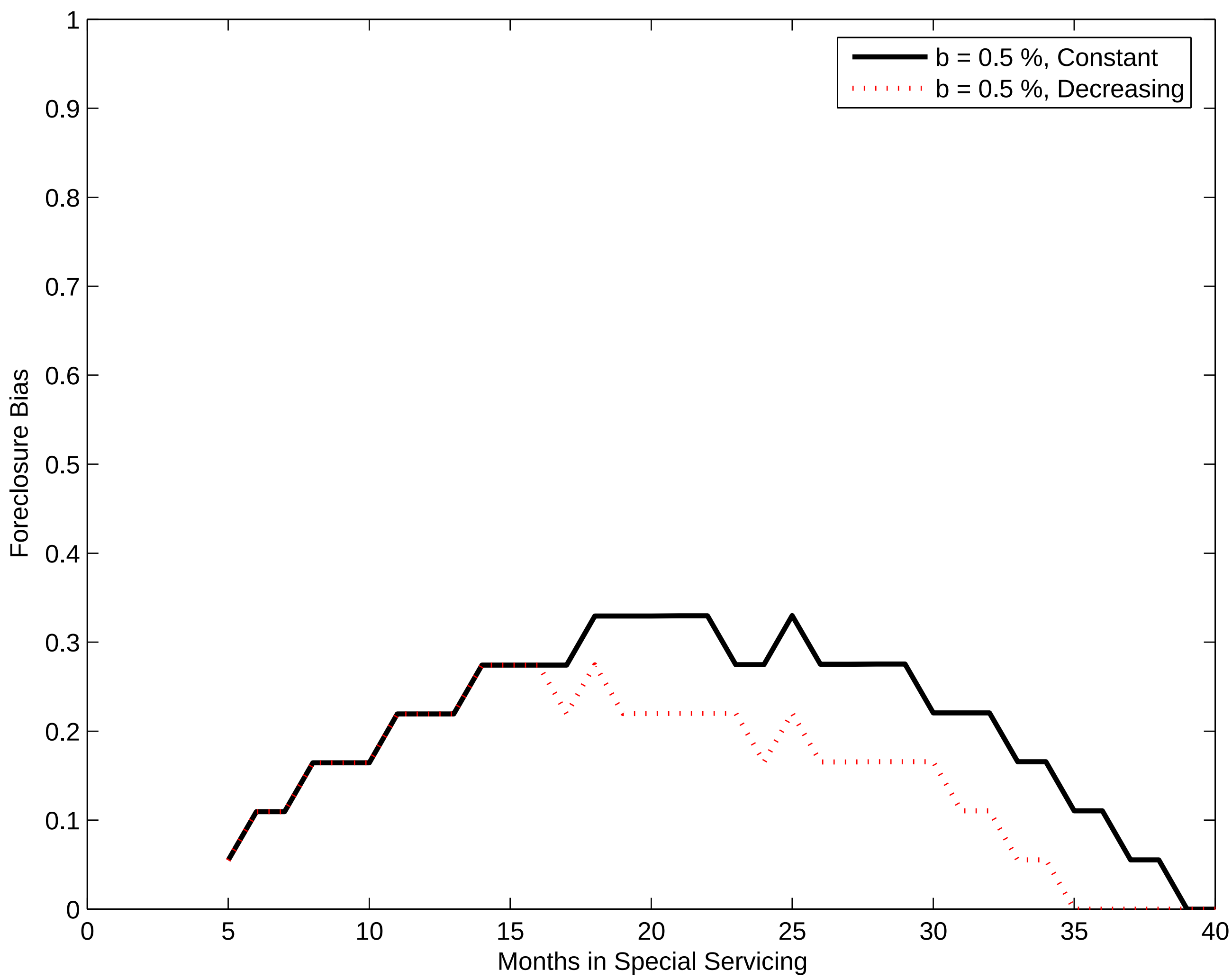
b = 1 %
b = 0.5 %
b = 0
Percentage Change in Foreclosure Threshold
Months in Special Servicing
1
0.8
0.6
0.4
0.2
0
−0.2
−0.4
−0.6
−0.8
−1
0
5
10
15
20
25
30
35
40

Figure 7



b = 1 %
b = 0.5 %
b = 0
Excess Delay in Foreclosure
Months in Special Servicing
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
5
10
15
20
25
30
35
40

Figure 8


b = 0.5 %, Constant
b = 0.5 %, Decreasing
Foreclosure Bias
Months in Special Servicing
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
5
10
15
20
25
30
35
40