Default Losses and Commercial Mortgages

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Abstract

We exploit loan level data combining foreclosure histories with information about the revenues and expenses associated with the ongoing management and eventual sale of financially distressed loans to estimate the magnitude and temporal pattern of default losses on commercial mortgages. We find that financially distressed commercial mortgages suffer default losses (including foregone interest) averaging 66.1 percent of the outstanding balance on the mortgage obligation as of the foreclosure start date. In addition, we find that default losses on commercial mortgages: (1) are not limited to a few property types, (2) depend slightly on type of foreclosure proceeding, (3) depend more on region of the country, year of mortgage foreclosure, and equity ownership periods, and (4) are large even for loans foreclosed in the early to mid-1990s. The magnitude and sources of the losses realized in these and future foreclosures have important pricing implications for commercial mortgages.

1. INTRODUCTION

Our understanding of "what is the payoff on a commercial mortgage after default?" has advanced only a trifle from the time that Wall Street investors first began asking the question in earnest ten years ago. The prevailing opinion appears to be that the losses are temperate (see, e.g., a recent study by Parkus and Tierney (1999)). The purpose of this paper is to belie this notion. Using a richer specification of default losses than previous authors and a heretofore unexploited data set, this paper offers alternative estimates of the payoff and default loss on commercial mortgages after default.

Most prior empirical research on commercial mortgages has been conducted in an attempt to understand the mortgage default process (e.g., Vandell [1992], Vandell et al. [1993], Snyderman [1994], Episcopos et al. [1998], Archer et al. [1999], Follain and Ondrich [1999], Goldberg and Capone [1999]). While these studies have provided many insights into the factors associated with mortgage default, they provide little information on the financial performance associated with the default process. Research on the financial impact of mortgage default has been extremely limited due to the aggregate nature of the data employed in the analysis, restricted definitions of mortgage default or loss recovery, severe censoring problems associated with the time frame of the study, or, in most instances, some combination of these factors.

Prior research on the financial performance of commercial mortgages that have gone through the foreclosure process has been limited due to the aggregate nature of the data employed, the time frame of the study, or both. Curry et al.

[1991] examine loss recoveries on a small portfolio of distressed properties held in receivership by FSLIC and sold during 1988.[1] Snyderman [1994] investigates the loss severity associated with a portfolio of foreclosed life insurance company loans originated over the period 1973 through 1986 and foreclosed prior to 1991.[2] Ciochetti [1997] investigates the losses associated with foreclosure on a large group of insurance company loans over the period 1985 through 1996.[3] Ciochetti and Riddiough [1998] examine the mortgage-specific foreclosure characteristics of a portfolio of life company loans foreclosed over the period 1985 through 1995.[4] While each of these studies enhances our understanding of the mortgage foreclosure process, we know little about the post-foreclosure performance of the underlying properties that secure these debt contracts. This component of analysis is important in order to fully understand the "cradle-to-grave" performance of these assets.

Our study differs from the previous work of Ciochetti [1997] and Ciochetti and Riddiough [1998] in that we track individual loan performance of foreclosed loans through transfer to equity and ultimate sale of the asset. This allows us to examine the total investment performance associated with the loan. Our study is similar to that of Curry et al. [1991] and Snyderman [1994] in that we track loans

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[1] The study examines 236 sales, of which 55 are land transactions. Recoveries are found to average slightly greater than 62% of net takeover value. Presumably, some form of write down was taken prior to takeover by FSLIC, thus lowering the overall recovery as a percent of outstanding loan balance at onset of foreclosure.

[2] Snyderman employs accounting data to estimate the losses on a portfolio of 187 foreclosed loans. Loss recovery is found to average 64% of principal owed at initial default. This figure may understate loan performance, as the majority of these loans were foreclosed and sold over the period 1975 through 1984, prior to the most recent real estate recession.

[3] Losses on 2,013 foreclosed loans were examined over the most recent real estate recession, but only while classified as real estate debt. Recoveries were found to average slightly greater than 69% of outstanding loan balance.

[4] The authors examine loan specific cash flow histories on a sample of 480 foreclosed mortgages. Losses were tracked through foreclosure and recoveries were found to average 69.9% of mortgage balance.

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through disposition. What distinguishes the present study from their work is that we examine loans over the period 1985 through 1996, arguably the worst real estate recession since the depression of the 1930's.

More specifically, in this study we examine the post-foreclosure performance of a sample of approximately 300 commercial mortgages that were originated over the period 1974 through 1990. These loans were foreclosed over the period 1985 through 1995, and sold as real estate equity over the period 1986 through 1996. Our basic results indicate that the average combined foreclosure and equity ownership period is approximately 36 months. Combined gross loss recovery is found to average slightly greater than 65% of outstanding loan balance as of foreclosure start date, while recovery net of foreclosure and operational costs, including accrued interest, is found to average slightly under 40%. Yield degradation, defined as the difference between promised yield and realized yield, is found to average 10.6%, implying that overall realized returns to mortgages in the sample are only slightly positive. We find significant variation in these results by region of country, property type, year in which the loan was foreclosed, and size of loan.

These findings help to clarify a puzzling aspect of commercial mortgage pricing, which is observed in lending operations. By this we refer to the situation where commercial mortgages trade at a significant yield premium -- as large as 40 to 60 basis points at times -- to supposedly comparable-rated corporate bonds. A big source of risk to commercial mortgage investors is the average rate of loan recovery in case of default. This risk tends to mount in periods of prosperity, when banks relax their lending criteria, only to become apparent when recession

strikes. Combined with the possibility that liquidity might suddenly disappear more so from commercial real estate markets than from corporate capital markets, and thus not be available when it is needed, a strong argument can be made that commercial mortgage investors should legitimately be rewarded with relatively higher returns.

The remainder of the paper is organized as follows. In Section 2 we discuss the data employed in the study and provide summary statistics for the sample as stratified by selected categories. In Section 3 we discuss the methodology employed to estimate net cash flows, recovery estimates, and performance yield degradation. In Section 4 we present mean outcomes by selected categories. Regression results are also presented in Section 4. This brings us to the whole issue of pricing implications, which we briefly discuss in Section 5. Conclusions of the study are provided in Section 6.

2. DATA

The data employed in this study include 308 financially distressed loans that have completed the foreclosure process, been transferred from debt to equity, and ultimately disposed of through the process of an equity sale. These loans are a subset of a much larger pool of 2,592 loan originated by a large life insurance company over the period 1974 through 1990. All loans in the sample completed the foreclosure process and were transferred to equity over the period 1985 through 1995. Each property was operated and subsequently sold over the period 1986 through 1996.

For each loan we have a vector of underwriting information known at the time of mortgage origination, including original debt service coverage ratio, loan-to-value ratio, property location, property type, and year of loan origination. For each mortgage we construct a complete cash flow history. This includes all cash flows associated with the loan while classified as debt; the loan disbursement, periodic loan payments, and all inflows and outflows associated with the foreclosure process. The final cash flow employed in the mortgage analysis is the transfer value; the value at which the property is transferred to equity. We also construct cash flow histories for each of these properties while managed as equity. These data include the transfer value from debt, all revenues and expenses associated with the ongoing management and operations of the property, capital improvements made to the property during ownership, and the final proceeds associated with the sale of each property.

Table 1 provides a count of loans by year of loan origination and year in which foreclosure or equity sale occurs. For each year, 1985 through 1996, two counts are provided. The first is the total number of foreclosures in a particular year, while the second is the number of equity properties sold in that year. For example, the cohort of loans originated in 1985 experienced 9 foreclosures in 1989 and three equity sales in the same year.[5] Totals for all categories are provided in the bottom row as well as the right column. As evidenced in Table 1, foreclosure activity is found to peak in 1991 and 1992, the period generally associated with the bottom of the recent recession, while equity sales activity is found to reach its highest levels in 1993 and 1994.

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[5] Note that properties foreclosed in a year are not necessarily the same as those sold as equity in that year as the average equity holding period is slightly greater than two years.

TABLE 1 HERE

Table 2 displays equity sales activity by both region of country and property type. We also provide in this table a breakdown of these data by foreclosure process outcome, i.e., foreclosure and modified-foreclosure. Properties classified as foreclosure represent those for which the contract terms of the mortgage were not modified prior to foreclosure. In the sample, 252 properties meet this criterion. Those classified as modified foreclosure represent loans that were modified at some point prior to foreclosure action. This category is represented by 56 properties. Note that the majority of foreclosure and sale activity is shown to have occurred in the Southwest region of the country and represented primarily by office and apartment properties. These statistics reflect both the concentration of mortgage lending to this region and by these property types over the study period.[6]

TABLE 2 HERE

Table 3 provides a breakdown of equity sales by region in which the property is located and year of sale. Of interest is the bi-modal nature of sales activity in the Southwest region of the country over the study period as well as the increase in sales activity in all regions of the country over the period 1993 and 1994.[7]

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[6] Foreclosure activity peaked in the Southwest region of the country in the mid-1980's, allowing sufficient time for loans foreclosed in this region to not only complete the foreclosure process, but the equity sale process as well.

[7] Conversations with company officials indicate that beginning in 1993, efforts were made to dispose of equity real estate in a more timely fashion than had been conducted in prior years.

3. MEASURING PROPERTY PERFORMANCE

In order to estimate the performance of each property while owned as real estate, monthly operating data are collected. Revenue categories include gross rents, percentage rents, allocation for bad debts, reimbursable expenses, and a category for other income. All sources of revenue are netted to create a total revenue component. Separate expense categories were created and include cleaning, repairs and maintenance, security, grounds maintenance, administration, utilities, insurance, marketing, and a category for other expenses. Expense categories are also netted. Total revenues and expenses are then netted over the equity ownership period to generate net income statistics. Capital expenditures, tenant improvements and leasing commissions are then deducted from net income to generate net cash flow numbers.[8] These net cash flows are used to gauge the performance of properties while owned as equity real estate.

We next estimate a series of equity recovery estimates, the first of which is gross recovery. Gross recovery is defined as

$$(3.1) \qquad\qquad GR^{EQ} = \frac{ESP}{TV}$$

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[8] Note that capital expenditures, leasing commissions and tenant improvements are summed to a single statistic.

where ESP represents the net equity sales proceeds on disposition, and TV represents the transfer value from debt. We also estimate net recovery without interest as:

$$(3.2) \qquad NR^{EQ} = \frac{ESP + NCF}{TV} \qquad .$$

where NCF represents the sum of all net cash flows earned over the ownership period.

Our final equity measure of recovery is net recovery including interest, and is represented as:

$$(3.3) \qquad NR_{int}^{EQ} = \frac{ESP + NCF + INT^{EQ}}{TV}$$

where INT^{EQ} is defined as the foregone accrued interest on the mortgage during the equity ownership period.[9]

We next combine the performance of the mortgage while held as debt with the performance of the property while in equity ownership to derive the overall economic impact of the foreclosure process on the initial investment.[10] We first provide an estimate of the combined total number of months the mortgage is in

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[9] Foregone accrued interest is estimated by multiplying the outstanding loan balance at onset of foreclosure by the monthly contractual mortgage interest rate times the number of months each property is held as equity real estate.

[10] See Ciochetti and Riddiough [1998] for a discussion of the performance of these assets while held as mortgage debt.

foreclosure and owned as real estate equity. Next, a combined gross recovery statistic is estimated as:

$$(3.4) \qquad GR^{CMB} = \frac{ESP}{OSB}$$

where OSB is the outstanding balance on the mortgage obligation as of the foreclosure start date. Combined net recovery without interest is estimated as:

$$(3.5) \qquad NR^{CMB} = \frac{ESP - FCL + NCF}{OSB}$$

where FCL represent all costs associated with foreclosure of the borrower's interest in the mortgage.

Two forms of net recovery with interest are estimated. The first is the combined net recovery including mortgage interest and is represented as:

$$(3.6) \qquad NR^{CMB}_{int(a)} = \frac{ESP - FCL + NCF - INT^{DBT}}{OSB}$$

where INT^{DBT} is the foregone accrued interest on the mortgage over the foreclosure period.[11] In order to derive an estimate of the overall economic

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[11] This is estimated as the product of the outstanding loan balance at the onset of foreclosure and the monthly contractual mortgage interest rate times the number of months associated with the foreclosure process.

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impact of foreclosure and equity ownership, we also estimate the combined net recovery with both foregone mortgage and equity interest as:

$$(3.7) \qquad NR_{int(b)}^{CMB} = \frac{ESP - FCL + NCF - INT^{DBT} - INT^{EQ}}{OSB}$$

where INT^{EQ} is as described earlier.

Finally, we estimate the yield degradation associated with both the mortgage foreclosure process and for the overall combined period of mortgage and equity ownership. Yield degradation on the mortgage is defined as the differential between the contractual cash flows and those realized through the completion of the foreclosure process.[12] The overall combined yield degradation is the differential between contractual cash flows and those actually received through the operations and sale of the equity real estate.[13]

4. PERFORMANCE CHARACTERISTICS

In Table 4 we examine the performance characteristics of equity real estate owned. We stratify performance by foreclosure process outcome across the top of the table and by selected variables in the first column. The number of

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[12] These cash flows include the disbursed loan proceeds at origination, all mortgage payments received, all inflows and/or outflows which occurred during the foreclosure process, and as the final cash flow, the value of the property as transferred to equity.

[13] The same cash flows are used for the mortgage holding period with the exception of the transfer value, which is dropped. These are appended with the net cash flows associated with the ownership of the equity property and the net proceeds on sale of the equity real estate.

observations associated with each category is provided in the last column for each grouping.

TABLE 4 HERE

We first consider the equity ownership period, determined as the number of months from transfer to real estate until sale of the asset. Notice that for all equities the average ownership period is slightly greater than two years, at 27.6 months. We find significant variation by region in which the property is located. Properties located in the Mountain and Southwest regions are found to have experienced the longest average ownership periods, at 33.4 and 32.4 months, respectively. At the other extreme, properties located in the Northeast and Pacific regions are found to have had the shortest equity ownership periods, at 18.6 and 19.9 months, respectively. These results suggest that loans foreclosed early in the cycle may experience longer holding periods as a result of the continued downward trend in property values, while those foreclosed late in the cycle may be disposed of more quickly as the market for real estate improves at the end of the recession.

We also find a significant difference in the average equity holding period between foreclosure and modified foreclosure loans, at 28.6 months and 23.1 months. This may suggest that lenders take a more aggressive stance to dispose of properties that have already demonstrated inferior performance as debt.[14]

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[14] Ciochetti and Riddiough [1998] show that losses on modified foreclosed loans are significantly higher than for straight foreclosures. This may suggest that lenders wish to also "cut their losses" with respect to the period of equity ownership for modified foreclosed loans.

When examined by property type, hotels are found to have had the longest ownership period, while apartments are found to be held for the shortest period of time. This may reflect the lack of liquidity for hotel properties as well as the fungibility of apartment properties in terms of marketability. We also find little distinction in equity ownership period between loans foreclosed judicially and those foreclosed through power of sale.

When examined by year of mortgage foreclosure, equity ownership periods are found to be inversely related to how recently the mortgage was foreclosed. Loans foreclosed in the mid to late-1980's are found to have been owned for nearly three years, while those foreclosed in the early to mid-1990's were held, on average, approximately one year. We also report equity ownership periods by loan size, although it appears that loan size has little systematic influence on the period of ownership.

We next consider the operating performance of the properties in the sample. Reported in Table 4 are total revenues, total expenses, net income, and net cash flows; each as a percent of the total acquisition cost or transfer value from debt. For all properties we find that total revenues represent approximately 37% of transfer value, while total expenses average slightly greater than 28%. The resulting net income is found to average 8.6% of transfer value, or slightly greater than 3.7% per year. Net cash flows are found to average -.2%, implying that capital expenses, tenant improvements, and leasing commissions average 8.8% of transfer value over the period of equity ownership. Given the nature of deferred maintenance and occupancy levels typically associated with foreclosed

properties, these results are deemed reasonable.[15] As measured by operating net cash flows, we conclude that equity ownership of these properties, on average, results in negative returns on asset value.

Operating performance is found to vary by region, with properties in the Southwest and Mountain regions shown to be the poorest performers, while those located in the West North Central, Southeast and Mideast are the best performers. We also note a difference in performance between foreclosed loans and those modified prior to foreclosure, although the economic impact of this difference over the total holding period is questionable. When examined by year of mortgage foreclosure, mean operating cash flows again suggest that properties acquired later in the cycle perform slightly better than those acquired earlier.

From an operating perspective, larger properties, as proxied by loan size, appear to have out-performed small properties.[16] This may in part be explained by the fact that smaller properties generally have fewer tenants, or in many cases, are occupied by a single tenant. Moreover, the credit quality of tenants occupying smaller buildings may be lower than those occupying larger properties, given the local nature of smaller tenants. Tenants occupying larger properties are generally regional or national in scope and may be less affected by changes in local economic conditions.

We next examine loss recoveries over the period of equity ownership. As provided in Table 5, we estimate three forms of recovery as described earlier:

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[15] In general, foreclosed properties suffer from either a declining tenant base, deferred maintenance of the property, functional obsolescence, or any combination of these. In order to lease or re-lease space, it is not uncommon for lenders to make substantive capital and/or tenant improvements to the property.

[16] Loan size categories are based on outstanding loan balance at onset of foreclosure.

gross recovery, net recovery without interest and net recovery with interest. As reported, gross recovery for all equities if found to average 77.1% of transfer value from debt. Thus, not only does the lender experience diminution in asset value over the foreclosure period, but on average, also over the period that the property is held as equity.

TABLE 5 HERE

Net recovery without interest is found to average 77.0% of transfer value, indicating again, the negative nature of average net cash flows over the period of equity ownership. By imputing foregone mortgage interest over the period of property operations, mean recovery drops to 51.5%. This significant drop in loss recovery confirms the findings of Snyderman's [1994] earlier work: foregone interest is a major component to the overall performance of foreclosed commercial mortgage debt.

When examined by region, we find net recovery performance to be superior in regions where foreclosure and sale activity occurred late in the recession; specifically properties located in the Northeast and Pacific regions of the country. Properties located in the Mountain, East North Central, and Southwest regions are shown to have suffered the greatest losses. Net loss recovery is found to vary by property type as well, with apartment properties exhibiting the greatest net loss recovery at 74%, and office properties exhibiting the poorest performance, with a mean net recovery of slightly less than 38%.

Somewhat surprisingly, we find modified loans to have outperformed

straight foreclosed debt, with a mean net recovery of 62% as opposed to 49.1%. A reason for this result may be attributed to the high concentration of apartment properties in the modified category, equities that performed well in relation to other property types.

Consider next year of mortgage foreclosure. While a strong trend does not appear to exist for gross recovery or net recovery without interest, a clear pattern is evident when examined by net recovery including interest. Loans foreclosed early in the recession were, on average, held longer as equities, which in turn resulted in higher levels of foregone accrued interest. This results in lower net loss recoveries. With respect to loan size, it appears that small loans and large loans exhibit slightly lower recoveries than loans in the $2 million to $7.5 million range.

In order to examine the overall performance of these assets, we next combine the cash flows and operating performance of the mortgage while classified as debt with the performance while owned as equity real estate. Results of the combined debt and equity analysis are presented in Table 6.

We first examine the total time period associated with both debt and equity ownership. We find the average ownership period to be slightly longer than three years, which when added to a typical 3 to 4 month delinquency period associated with pre-foreclosure distress, results in a total period of approximately 40 months. These results are slightly higher than reported in the Snyderman [1994] study, although the time periods under examination differ.

TABLE 6 HERE

When examined by region of country, we again see that loans originated in the Mountain region exhibited the longest total holding periods. Note that the overall period for properties located in the East North Central and West North Central regions are also high, while those located in the Southwest region of the country are shown to be slightly lower. This reflects the differences in foreclosure time period for loans located in these regions. Loans foreclosed in the Southwest region of the country were typically foreclosed through the power-of-sale, a process which typically takes from six to seven months. In contrast, many loans foreclosed in the East North Central and West North Central regions of the country were required to go through a court-regulated judicial foreclosure process, which can take up to two years or more.

Property type securing the loan appears to be related to the overall holding period of these assets. Apartments are found to have the lowest combined period, at 29.4 months, while hotels are found to have the longest hold period, at 47 months. The total period associated with retail and industrial properties are nearly identical, while office properties are found to be slightly longer, at just under 40 months. We find that loans foreclosed judicially have a three month longer holding period as compared to those foreclosed by power-of-sale.

Loans foreclosed early in the recession are again found to have the longest combined holding periods, while those foreclosed late are shown to have the shortest. Given the impact of foregone interest associated with mortgage foreclosure and equity ownership, this

suggests that it may be in the lender's best interest to foreclose and dispose of distressed debt quickly, at least as evidenced by the present analysis.[17]

Gross recovery of combined performance is also provided in Table 6. Recall that gross recovery is measured as the final sales proceeds as a proportion of the outstanding loan balance at onset of foreclosure. For all loans in the sample, gross recovery is found to average 65.1%. This result is significantly lower than reported by Snyderman [1994] who finds gross recovery to average 99% of outstanding loan balance. Combined net recovery is found to average 64.4%, implying a combined foreclosure and operational loss of approximately .7% of outstanding loan balance over the entire period. Adding accrued interest over the mortgage foreclosure period lowers the average recovery to 56.5%. Inclusion of accrued interest over both the debt and equity ownership period lowers the combined net recovery to 33.9% of outstanding loan balance, suggesting that the overall magnitude of loss associated with mortgage foreclosure may indeed be quite large. This mean recovery statistic is also significantly lower than reported in previous studies, confirming not only the impact the recent recession had on the overall performance of commercial mortgage debt, but also the economic impact associated with lost interest income over the period that these properties are held.

Regional variation in combined net recovery confirms our prior discussion; regions in which the foreclosure period was lengthy, and/or loans foreclosed early in the recession and held for long periods, are shown to have experienced the

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[17] We should note that censoring bias precludes our ability to estimate the impact of loans foreclosed, but not sold as of the end of the study period. Conversations with company officials indicate that very few loans from this study period are still held as equities.

greatest losses. This is also true when combined net recoveries are examined by property type. Apartment properties are found to have average recoveries of slightly over 60%, while hotels and office properties are found to average approximately 19% and 22%, respectively.

Somewhat surprisingly, state foreclosure law appears to impact the performance of these assets, as measured by combined net loss recovery. Loans foreclosed judicially are found to have average recoveries of 27%, while those foreclosed through power-of-sale are found to have nearly 10% higher average recoveries, at 36.8%.

A review of combined recovery by year of foreclosure confirms that lost interest is the driving factor for the results as reported by this category. Note that in general, gross recoveries, while variable, do not exhibit extreme volatility. When examined by net recovery including mortgage interest, note that loans foreclosed in the early years of the recession performed relatively well. This is attributable to the short foreclosure period, and hence low levels of lost accrued interest, associated with loans located in the Southwest and Mountain regions of the country, where power-of-sale is the predominant method of foreclosure. Yet, when examined by net recovery including both debt and equity accrued interest, the familiar patterns re-emerges: length of ownership period matters. On the debt side this is driven in large part by the foreclosure laws in the state where the property is located, while on the equity side, it is driven to a large degree by when in the cycle the mortgage is foreclosed. When examined by loan size, there is some evidence to suggest that small loans perform somewhat better than large loans.

The final statistics provided in Table 6 are a breakdown of yield degradation for both mortgage ownership, and combined debt and equity ownership. This allows for an examination of the impact of the timing of cash flows as opposed to the magnitude of losses as discussed earlier. Both degradation statistics are estimated as the difference between the contractual yield and realized yield.[18] The average yield degradation for all loans in the sample while owned as debt is shown to be 6.5%, or 650 basis points. By extending the analysis through the period of equity ownership, average yield degradation increases to 10.6%. Given that the average contractual yield for all loans is the sample is 10.9%, this suggests that, on average, the impact of combined foreclosure and equity ownership results in only slightly positive returns to holders of these distressed assets. When examined by region, performance of loans in the East North Central and Mountain regions are found to have experienced the poorest performance, while those in the Southwest are found to have performed best, as measured by combined yield degradation.[19]

Loans secured by apartment and retail properties posted the best results for debt as well as combined debt and equity. Those secured by office and hotel properties posted the poorest performance, a trend noted earlier. The impact of foreclosure law on yield degradation does not appear to be as pronounced as for the combined net recovery estimates, although the performance of loans foreclosed through power-of-sale appears to be slightly better than for those foreclosed judicially.

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[18] As measured by the internal rate of return.

[19] Overall yield results for the Southwest region are interesting, and may in part be explained by the fact that the portfolio of distressed loans in this region have a high concentration of apartment properties, whose overall performance was significantly better than other property types.

Note the differential between debt and combined yield degradation when stratified by year of foreclosure. While no clear pattern emerges for debt yield degradation a very pronounced pattern is observed for combined yield degradation, confirming our earlier discussion in regards to length of ownership. Finally, when examined by loan size we see a clear pattern to suggest that larger loans performed more poorly than smaller loans.

In the foregoing analysis we discussed mean statistics as stratified by region, property type, foreclosure law, year of foreclosure, and loan size. While this is useful to gain a sense of the relationship between these variables and selected performance measures, it is also instructive to control for the simultaneous interaction of factors that may affect the performance statics as discussed herein. In order to examine further the relationship between underwriting and location variables on the performance of foreclosed loans, we specify the following general model:

$$(4.1) \qquad\qquad T_i = bX_i + \varepsilon_i$$

where T_i is the length of time, in months, between start of foreclosure and ultimate equity sale date associated with the *ith* loan, b is a row vector of coefficients, X_i is a vector of location, property, and underwriting characteristics thought to influence the time period associated with foreclosure and sale, and ε_i is the random error term. We estimate this model using ordinary least square techniques for all loans in the sample. We also estimate an additional series of models, where net loss recovery (including accrued interest for both debt and equity) and yield degradation are substituted for total time period as the

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