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Mortgage Curtailment and Default*

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We explore the effect of mortgage curtailment payments on subsequent default probabilities. Although curtailment is not popular in western countries, it is the dominant form of prepayment in Asia. Using more than 6 years of mortgage performance records from an Asian bank, we investigate the impact of curtailment payments on mortgage default risk. The results of logistic regressions reveal that the cumulative curtailment is the most significant factor in predicting the future default probabilities of a seasoned mortgage pool. Thus, mortgage modeling for Asian countries should be different from mortgage modeling for western countries.

Keywords

curtailment payment; default; cumulative curtailment; mortgage modeling

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Introduction

With a long period of time, the mortgage market in Taiwan is not very active. This can be reflected by the contract rates that are indexed to the bank's prime rate, which is not transparent and is fully controlled by the bank. That is, the borrowers have no idea as to how banks determine their borrowing rates. As of April 2002, the brand new rule has been in effective and the contract rates have been set according to the public underlying index plus margin. The range for the margin is between 100 and 300 basis points, which are dependent upon the borrower's credit characteristics. The factors being considered for underwriting purpose are sources of borrower's income, employment status, and other debt expenses, but without credit scores used. In addition, there is not much variation in initial loan-to-value ratio (LTV) and the maximum ratio was usually set equal to 70% at origination. However, this unusual industry practice has been changed since 2002. During the past three years, the commercial bank designed various kinds of initial LTVs to customize the needs of different borrowers. Currently, the 100% LTV mortgage product is one of alternatives.

Mortgage securitization is a brand new concept on the Taiwanese mortgage finance environment until the first mortgage-backed security (MBS) was issued in March 2004. Thus, prior to this issuance, there is no secondary mortgage market in local market and the lenders hold loans in portfolio and mortgage loans are non-recourse. Mortgage prepayment is allowed with prepayment penalties after the lockout period set by the bank.

When mortgagors obtain a loan, they agree to repay the loan using a predetermined amortization schedule. During this amortization period, borrowers can choose four payment alternatives: (1) making the scheduled payment, (2) paying off the loan entirely, (3) failing to make a payment and entering into default, or (4) making a payment that includes additional principal. Funds in excess of the required payment are termed curtailment.

Existing mortgage finance literature considers mortgage contracts to have embedded default (put) and prepayment (call) options that mortgagors can exercise at will (See Foster and Van Order, 1984, 1985; Kau et al., 1995; and Buist et al., 1998). Default occurs when the mortgagors exercise the put option by selling the house back to the mortgagee at a price equal to the unpaid principal balance and prepayment occurs when the mortgagors exercise the call option by buying the loan back at a price equal to unpaid principal balance. A key difference between these two options is that default can only occur on a payment due date, while a partial or complete prepayment can occur at any time before the final payment date.

In the United States, lenders have recourse rights and secondary market default sensitive investors often insist that principal of recoveries be pursued when defaults occur. We also understand that default is not a relevant risk to conforming MBS investors, but it is a significant risk to investors of the private-label MBSs and to the mortgage insurance and guarantee providers. Although the Taiwanese market has issued four MBS deals to date, the loans are still non-recourse and there are no mortgage insurance and guarantee providers. Due to these features, the MBSs are designed to be the type of credit tranching from which the creation of senior/subordinated structures provides investors with a choice of various exposures to default risk.

When default occurs, the lender receives the collateral house instead of the promised cash flows. If lenders hold the loans in portfolio, the lenders also suffer from loss of principal recovery. Without mortgage insurance provided, lenders do go after the borrowers' personal properties with deficient judgment. If loans were being securitized, the investors suffer different principal losses depending upon the seniority of the asset classes they hold. A typical borrower does not default simply because the house price decreases. Most mortgage defaults are triggered by two events: a borrower's income shock, making it difficult to continue the scheduled mortgage payments, and the decrease of the value of the house, making prepayment by selling the house not feasible (Busit et al., 1998).

Existing mortgage prepayment literature predominately focuses on the situation where a borrower chooses to pay off the entire balance of a mortgage by refinancing, or because of a due-on-sale clause. This literature documents an adverse impact of prepayment on the quality of the mortgages that remain in a pool following a major refinancing opportunity (See Foster and Van Order (1984), and FHA Mutual Mortgage Insurance Fund Actuarial Review for fiscal years of 1998 and 2004). This result occurs because the borrowers who can afford to refinance would have already done so; therefore, the borrowers that remain in the pool tend to be higher risk borrowers that were unable to refinance. Thus, the conclusion is that prepayment tends to have a negative impact on the quality of the loan pool.

Curtailment payments are a special case of prepayment that a mortgagor may make to shorten the horizon of the loan term. Curtailment prepayments of a mortgage pool have very different implications on subsequent default probabilities than full prepayments. With the reduction of the remaining balance of individual loans, the average loan-to-value ratio decreases, making the loans less likely to experience negative equity. Moreover, the fact that the borrower is able to pay an extra amount indicates an excess repayment coverage capacity, making an ability to pay problem less likely.

Because both situations lead to lower subsequent default rates, curtailment should tend to have a positive impact on the overall quality of a mortgage pool.

Curtailment is not popular in western countries, and it is typically ignored in modeling mortgage prepayment behavior. However, curtailment is a significant contributor to prepayments in Taiwan and other Asian countries and this behavior may have an influential impact on subsequent default probabilities of those loans. Despite the potential importance of curtailment, there has been little work done to examine this payment behavior. Moreover, the work that has been published is based on data extracted from the US mortgage market.

The literature on mortgage terminations using U.S. data is huge. Previous empirical studies have utilized financial option theory to analyze fixed-rate mortgage prepayment and default probabilities (See, for example, Dunn and McConnell, 1981; Brennan and Schwartz, 1985; Green and Shoven, 1986; Quigley and Van Order, 1990, 1995; and Deng, 1997). Schwartz and Torous (1989, 1993) use a Poisson regression with variations on proportional hazard model to incorporate prepayment into MBS valuation framework. Richard and Roll (1989) employ a four-factor model to estimate mortgage prepayment. Stanton (1995) and Deng et al. (2000) used advanced statistics tools to explain the heteroschadastic behavior among mortgage borrowers. LaCour-Little el al. (1999) use kernel regression to a large loan-level data set to investigate the borrower characteristics on mortgage prepayment. The above prior studies examine mortgage termination behavior either by default or prepayment, but no one focuses on the effect of curtailments on mortgage termination.[1]

Hayre and Lauterbach (1991) are the first to discuss curtailment behavior and its unique features. To capture the curtailment effect, they suggest adding an average constant dollar amount of curtailment every month when modeling prepayment. Chinloy (1993) presents a theoretical and empirical treatment of curtailment and the loan level analysis of mortgage and mortgage-related derivatives. Results of Chinloy's study suggest that analysis would be biased if full payments and curtailments were not specified separately. Budinger and Fan (1995) study the impact of curtailments on "jumbo" loans not eligible for Fannie Mae and Freddie Mac mortgage purchases. Their results suggest that curtailments are a tiny portion of total prepayment in the early life of the mortgage, but can be a significant contributor to prepayment as the mortgage pool ages. Finally, Abrahams (1997) discusses the effect of curtailment on prepayment

[1] Notice that our paper focuses on the discussion of the effect of curtailment on mortgage default.

modeling and formulates curtailments as a function of loan age. However, the results and the model specifications are not documented in the paper.

A major shortcoming of existing literature is that published studies use US data and curtailment is not a popular form of prepayment in the US. Therefore, we estimate the financial impact of curtailment rates on subsequent default probabilities in Taiwan where curtailment is popular. Curtailment is of critical importance in the valuation of a Taiwanese mortgage-backed security (MBS) because it is the dominant form of prepayment in Taiwan. Prepayment risks (extension and contraction risk) are one of the key components that must be considered to value an MBS and prepayment risks can arise from either mortgage termination or curtailment. If a mortgage termination occurs, MBS investors would not continue to receive the scheduled monthly payment in that the defaulted or completely prepaid loans are removed from the mortgage pool. When a curtailment payment occurs, MBS investors continue to receive the scheduled monthly payment because the loans still survive, but the remaining term is shortened. Our major contributions are (1) examining mortgage curtailment in a market where curtailment is a dominant form of prepayment, and (2) suggesting that the curtailment history should also supply important information regarding the future default of a seasoned MBS.

We use a sample of more than 6 years of individual loan performance records from a major bank in Taiwan. Results of logistic regressions indicate that the cumulative curtailment is the most significant factor in predicting the future default probabilities of a seasoned mortgage pool. Therefore, the curtailment history should be important in accurately estimating the cash flow of an MBS and to price the MBS more efficiently.

The remainder of the paper is organized as follows. The following section describes the data, the hypothesis of our study, and our model. The third section reports our empirical results and our interpretation of the outcome. The final section presents concluding remarks.

Data Descriptions and Sample Definitions

We extracted our data from a major bank in Taiwan. The original data set consisted of 81,172 records, of which 46,440 are loans to individual borrowers originated during the period from 1992 to 2003. Because the bank data only includes complete monthly transaction records for loans originated since 1997, we excluded loans originated prior to 1997. After deleting observations for which the defaulting loan records were not available, our final data set contained 25,784 observations. Among these loans, 269 or 1.04% loans defaulted and 9,280 or 35.99% loans were fully prepaid during the observation period. The average number of loans being curtailed in at least one month is around 202 loans.

The data is both time-series and cross-sectional. Each of the 25,784 loan records includes the current loan balance, termination, and default. Additionally, prepayment and curtailment events are recorded on a monthly basis from loan origination through the end of our sample period. For monthly payment transactions, the data record includes both the scheduled monthly payment and actual payment.

To compute a cumulative curtailment amount at the end of each exposure year, we define the cumulative curtailment variable as the ratio of the cumulative actual payment amount to the cumulative scheduled payment amount. If the ratio is greater than one, curtailment behavior is indicated; no curtailment is indicated if the ratio is equal to one. More important, a delinquency is indicated if the ratio is less than one.

After computing cumulative curtailment, we limit our sample size to observations of ages greater than 12 months in order to estimate the effect of the cumulative curtailment during the first 12 months. Following the same logic, we could estimate the default risk in terms of the cumulative curtailment at the end of a given exposure year (24 or 36 months), which allows us to measure the effect that cumulative curtailment will have on the probability of default for only that particular exposure year.

Our default model is designed to explain the default rates for cumulative curtailment at exposure t, Cumcurtail (t), and explanatory variables represented by X_i, which is a collection of factors that existed at origination that may influence the conditional probability of default. These other variables include the origination year, loan term, and contract rate. Equation (1) presents our model

$$P_D(t)=f_D(t, \text{Cumcurtail } (t), X_i) \quad (1)$$

where P_D is the probability of default, t is exposure year.

Our primary objective is to investigate the influence of curtailment behavior on subsequent loan default probability. In addition, we examine a number of relationships between other variables and default risk. The empirical model is specified in terms of the exposure year specific conditional probability of default. Our empirical model is:

$$\pi_{\mathrm{D}}(t)=\frac{\mathrm{e}^{\alpha_{\mathrm{D}}+X_{\mathrm{D}}\beta_{\mathrm{D}}+\mathrm{Curtail}(\tau)\gamma_{\mathrm{D}}}}{1+\mathrm{e}^{\alpha_{\mathrm{D}}+X_{\mathrm{D}}\beta_{\mathrm{D}}+\mathrm{Curtail}(\tau)\gamma_{\mathrm{D}}}} \tag{2}$$

where $\pi_D(t)$, is the single period default rates conditional on the loan being outstanding at the beginning of time period t. The explanatory variables X_D are associated with a particular loan at origination, and α_D and β_D, constant coefficients estimated by the regression. The Curtail(t) represents the cumulative curtailment that occurred up to age t. Below we discuss the variables utilized in our study.

Cumulative curtailment

Mortgage borrowers may review their liability value prior to making their mortgage current. If the house price is less than the unpaid principal balance, the optimal decision is to default. Of course, mortgagors have a stronger incentive to exercise the default option when that option is deep in the money. Because curtailment lowers both the market value of mortgages and the unpaid principal, it should also reduce the incentive to default. Therefore, we would expect default to be negatively related to curtailments.

Origination year

Origination year categories are defined for loans originated since 1997. This variable can be used as a proxy to distinguish changes in underwriting standards or in macroeconomic environments between two different origination years. For example, the origination year 1997 can be a proxy of the effect caused by Asia financial crisis. We would expect a negative relationship between the default rate and the origination year. This is because the economic conditions have improved and rigorous understanding standards were enforced after 1997.

Loan size

There is no theoretical support for a relationship between default risk and the dollar size of the loan. However, Ambrose, et al. (2001) indicate that house-price volatility is extremely high for the lowest-priced and the highest-priced properties, which suggests that house price volatility exhibits a U-shaped distribution. High house price volatility should result in an increase in the probability of default because it provides greater opportunities for house price to decline. However, no research has been published concerning the impact of house price volatility on mortgage default rates in Taiwan. Therefore, it would be interesting to learn if the same pattern exists in Taiwan. Therefore, by controlling for loan-to-value ratios, the effect that the house price might be expected to have on the default risk is captured by the effect of the dollar size of the loan.[2]

Loan Term

Loan term categories were based on 20-year and 30-year ranges. Shorter-term loans amortize more quickly than longer-term loans causing the loan-to-value ratio to decrease more quickly. Thus, shorter-term loans should have less default risk ceteris paribus and default should be positively related to the mortgage term. The loan term is individually negotiated, which is dependent upon the borrower's payment capability. Usually, borrowers with excess payment capability and with strong preference of repaying debt quickly are more likely to self-select into the shorter-term mortgages, further making the default risk lower.

Contract rate

The credit quality of the individual borrower has a material impact on default rates. Typically, the borrower with worse credit quality would be charged a higher interest rate than other borrowers under the same market condition. Also, the lender will charge a higher interest rate for non-owner occupied residences since that a non-home owner is more likely to forfeit a second home under financial hardship than his or her primary house. In the U.S., there are add-ons on the interest rates for the very high original LTV because the borrowers with high LTV are more likely to default than others with low original LTV. Unfortunately, there is no explicit information within our sample data to exactly delineate the credit quality of the loan records based on the original LTV. This is because the sample data do not record the original house price and also there is no original LTV recorded in the database.

Ceteris paribus, loans originated with higher contract rates have higher monthly mortgage payments. This creates a higher cash flow burden per original mortgage dollar for mortgagors. Therefore, mortgagors that contract at higher rates expose themselves to higher cash flow burdens per mortgage dollar and have a higher probability of default.

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[2] Industry practice in Taiwan requires a fixed loan-to-value ratio of 70% at origination. Information on the original house price is contained in the loan origination document instead of in the database. However, this unusual practice changed in 2002.

Empirical Results

Table 1 provides the summary statistics of our sample. Mortgage loans in Taiwan are predominately 20-year self-amortizing loans that have adjustable rates with no periodic or lifetime caps.

Table 1: Sample descriptive statistics

Explanatory variables	Mean	Std Dev.	Minimum	Maximum
Disbursement amount (New Taiwan dollar currency)	2470636.51	2120676.22	100000	45500000
Contract rate (%)	6.6137	1.7635	2.31	10.35
Loan term	246.0331	52.3113	120	360
Origination year	1999.0769	2.0829	1997	2003
180<term≤240	0.7470	0.4348	0	1
240<term≤360	0.1490	0.3561	0	1
1<lsize≤1.5	0.1172	0.3217	0	1
1.5<lsize≤2	0.2931	0.45519	0	1
2<lsize≤2.5	0.1221	0.32736	0	1
2.5<lsize≤3	0.0882	0.2836	0	1
3<lsize≤4	0.1038	0.3050	0	1
4<lsize≤5	0.0493	0.2164	0	1
5<lsize≤7.5	0.0431	0.2030	0	1
7.5<lsize≤10	0.0185	0.1346	0	1
10<lsize	0.0106	0.1025	0	1
Yr1997	0.0994	0.2992	0	1
Yr1998	0.1570	0.3638	0	1
Yr1999	0.1598	0.3664	0	1
Yr2000	0.1628	0.3692	0	1
Yr2001	0.1249	0.3306	0	1
Yr2002	0.0872	0.2822	0	1
Yr2003	0.1649	0.3711	0	1

Note: Disbursement amount is the loan amount. Variables supplementary: 1) Unit of loan size (lsize) is measured in millions of dollars (New Taiwan Dollar Currency). 2) The YrXXXX is the origination year, expressed of the loans originated that year 1997 through 2003. 3) Among these 25,784 observation loans, 269 loans were defaulted, 9,280 loans were prepaid, and 14,562 loans had curtailed record during the sample period.

Table 2 (panel A) reports that the relationship between default risk and the cumulative curtailment factor is significant at better than the 1% level and the coefficient estimate is negative. This result supports our theoretical expectation that people who make curtailment payments have a lower default rate. Additionally, both the contract rate and the origination year are significantly related to the probability of default and the coefficient estimates are in the expected direction. The origination year variable displays a strong negative relationship with the likelihood of default, which is consistent with an improvement in underwriting standards.

Table 2: Logit parameter estimates of the conditional probability of default

Panel A At the end of exposure year one

Explanatory variables	Estimate	Standard error	Chi-Square	Pr > ChiSq
Intercept	17.2238	4.6376	13.7932	0.0002
ccurt1	**–0.2356**	0.0526	**20.0217**	<.0001
Loan size	2.05E-08	2.76E–08	0.5532	0.457
Contract rate	0.1392	0.0465	8.9425	0.0028
Origination year	–0.2248	0.045	24.9297	<.0001
Loan term	–0.00118	0.00116	1.0426	0.3072

Panel B At the end of exposure year two

Explanatory variables	Estimate	Standard error	Chi-Square	Pr > ChiSq
Intercept	14.4394	4.9852	8.3895	0.0038
ccurt2	**–0.2305**	0.0457	**25.3908**	<.0001
Loan size	3.74E-08	2.66E–08	1.977	0.1597
Contract rate	0.1425	0.0471	9.1488	0.0025
Origination year	–0.1964	0.0488	16.1865	<.0001
Loan term	–0.00102	0.00118	0.7597	0.3834

Panel C At the end of exposure year three

Explanatory variables	Estimate	Standard error	Chi-Square	Pr > ChiSq
Intercept	13.8032	5.6635	5.94	0.0148
ccurt3	**–0.312**	0.0601	**26.9209**	<.0001
Loan size	3.63E-08	2.90E–08	1.5617	0.2114
Contract rate	0.1403	0.0478	8.6018	0.0034
Origination year	–0.1893	0.0562	11.3399	0.0008
Loan term	–0.00077	0.00122	0.3991	0.5276

Note: ccurt1, ccurt2, and ccurt3 are the cumulative curtailment observed at the end of exposure year one, two, and three, respectively.

Panels B and C in Table 2 present the logit models for the following exposure years. Results suggest that the initial pattern continues with cumulative curtailment, contract rates, and origination year variables remaining statistically significant. We conclude that the cumulative curtailment has a negative impact on probability of default.

To distinguish mortgage performance for different origination cohorts, we use dummy variables for origination years. Tables 3-5 show that the default coefficient estimates indicate a declining pattern in default rates (except for origination year 1998). Perhaps the declining default rate is due to continuously improving economic conditions since the mid-1997 Asian financial crisis or due to improved mortgage underwriting standards during this period.[3]

[3] Origination year 1998 results may be explained by a lagged impact of the Asian crisis. This crisis first occurred in Thailand and then spread out to Malaysia, Philippines, Indonesia, and South Korea.

Table 3: Logit parameter estimates of conditional default probabilities at the end of exposure year one

Explanatory variables	Estimate	Standard error	Chi-Square	Pr > ChiSq
Intercept	–6.3791	0.7677	69.0373	<0.0001
ccurt1	**–0.2596**	0.0559	**21.5821**	<0.0001
1<lsize≤1.5	–0.1328	0.2543	0.2727	0.6015
1.5<lsize≤2	0.2072	0.2160	0.9197	0.3376
2<lsize≤2.5	0.3180	0.2253	1.9917	0.1582
2.5<lsize≤3	0.0365	0.2547	0.0205	0.8860
3<lsize≤4	0.1443	0.2411	0.3582	0.5495
4<lsize≤5	0.2646	0.3020	0.7676	0.3810
5<lsize≤7.5	0.5032	0.3030	2.7589	0.0967
7.5<lsize≤10	0.2459	0.4818	0.2604	0.6098
10<lsize	–0.6822	1.0176	0.4494	0.5026
Yr1997	1.0254	0.4689	4.7815	0.0288
Yr1998	1.0945	0.4703	5.4167	0.0199
Yr1999	0.4354	0.4817	0.8172	0.3660
Yr2000	0.4204	0.4899	0.7365	0.3908
Yr2001	0.4803	0.5076	0.8956	0.3440
Yr2002	–0.4473	0.6189	0.5224	0.4698
Yr2003	–1.6667	1.1233	2.2016	0.1379
180<term≤240	0.3738	0.2894	1.6684	0.1965
240<term≤360	0.0270	0.3217	0.0071	0.9330
Intrat	0.1765	0.0552	10.2394	0.0014

Note: Unit of loan size (lsize) is million. The variable YrXX is the origination year. The variable intrat stands for contract rates at origination. The parameters in Tables 4 and 5 have the same meanings.

Table 4: Logit parameter estimates of conditional default probabilities at the end of exposure year two

Explanatory Variables	Estimate	Standard error	Chi-Square	Pr > ChiSq
Intercept	–6.4740	0.7818	68.5693	<.0001
ccurt2	**–0.2543**	0.0477	**28.3966**	<.0001
1<lsize≤1.5	–0.0462	0.2647	0.0304	0.8616
1.5<lsize≤2	0.2764	0.2280	1.4695	0.2254
2<lsize≤2.5	0.4121	0.2366	3.0353	0.0815
2.5<lsize≤3	0.1822	0.2623	0.4826	0.4872
3<lsize≤4	0.2952	0.2494	1.4008	0.2366
4<lsize≤5	0.3589	0.3155	1.2941	0.2553
5<lsize≤7.5	0.6854	0.3101	4.8851	0.0271
7.5<lsize≤10	0.4876	0.4875	1.0007	0.3171
10<lsize	–0.4692	1.0205	0.2114	0.6457
Yr1997	1.0328	0.4690	4.8505	0.0276
Yr1998	1.0982	0.4703	5.4520	0.0195
Yr1999	0.4388	0.4814	0.8309	0.3620
Yr2000	0.5083	0.4904	1.0741	0.3000
Yr2001	0.6102	0.5133	1.4133	0.2345
Yr2002	–13.9918	438.4	0.0010	0.9745
180<term≤240	0.3747	0.3009	1.5504	0.2131
240<term≤360	0.0586	0.3315	0.0313	0.8597
Intrat	0.1847	0.0563	10.7561	0.0010

Table 5: Logit parameter estimates of conditional default probabilities at the end of exposure year three

Explanatory variables	Estimate	Standard error	Chi-Square	Pr > ChiSq
Intercept	–6.5125	0.8125	64.2533	<.0001
ccurt3	**–0.3446**	0.0623	**30.5811**	<.0001
1<lsize≤1.5	–0.1292	0.2780	0.2159	0.6422
1.5<lsize≤2	0.2602	0.2371	1.2046	0.2724
2<lsize≤2.5	0.3793	0.2500	2.3010	0.1293
2.5<lsize≤3	0.1448	0.2752	0.2768	0.5988
3<lsize≤4	0.2059	0.2645	0.6062	0.4362
4<lsize≤5	0.5085	0.3197	2.5295	0.1117
5<lsize≤7.5	0.5333	0.3362	2.5164	0.1127
7.5<lsize≤10	0.3729	0.5399	0.4770	0.4898
10<lsize	–0.2359	1.0239	0.0531	0.8178
Yr1997	1.0345	0.4695	4.8556	0.0276
Yr1998	1.1152	0.4709	5.6087	0.0179
Yr1999	0.5182	0.4820	1.1557	0.2824
Yr2000	0.5843	0.4932	1.4037	0.2361
Yr2001	–0.3050	0.6561	0.2160	0.6421
180<term≤240	0.4949	0.3453	2.0545	0.1518
240<term≤360	0.2083	0.3728	0.3121	0.5764
Intrat	0.1907	0.0585	10.6117	0.0011

Dummy variables were also included to account for the loan size to recognize the potential impact of house price categories on the probability of default. The results (in Tables 3-5) for all years indicate the default probabilities are lowest for high-priced and low-priced properties. This is contrary to the results reported by Ambrose, et al. (2001) for the US. One possible explanation for our results is that house price volatility was small due to relatively strong liquidity in these two property markets. In Taiwan, living space is limited; thus, the demand for a high-priced house is high due to a plethora of potential wealthy buyers. Likewise, a huge need for low-priced houses exists for low- and middle-income buyers.

We included a dummy variable for loan term to distinguish the effect that the loan term will have on probability of default. Contrary to the industry practice in US, the effect of the loan term coefficient estimates for conditional default probabilities is greatest for 20-year loan. We believe that our result arises because the 30-year loan term is rare in Taiwan and the common mortgage term is 20 years.

Conclusion

Mortgage payment behavior is important for both lenders and investors in mortgage-backed securities because it impacts the risks and returns of mortgage pools. Motivated by this behavior, existing mortgage prepayment literature focuses primarily on full repayments. Empirical evidence suggests that prepayment has an adverse impact on the quality of the mortgages that still remain in a pool following major refinancing opportunities because affordable borrowers would have refinanced, leaving only the higher risk borrowers in the pool.

We extend mortgage repayment literature by examining the impact of curtailments payments on subsequent default probabilities. Our study of curtailment prepayments is motivated by their extensive use in Asian countries and because we also hypothesize that curtailment should increase the credit quality of a mortgage pool over time. The increase in the quality of the mortgage pool arises because (1) borrowers those make curtailment payments have demonstrated an excess repayment coverage capacity which mitigates the ability to pay problem, and (2) contemporaneous loan-to-value ratios decrease making default less likely to occur.

Using more than 25,000 mortgage records from a Taiwan's commercial bank during the 1997 to 2003 period, we employ logit regressions to investigate the impact of curtailment payments on subsequent mortgage default risk. Our most important empirical result is that a negative and highly significant relationship exists between default risk and cumulative curtailment. Moreover, cumulative curtailment has a more material impact on the quality of a loan pool than any other factors we study. We believe that this is a particularly important finding for several reasons. First, it confirms our hypothesis by revealing that it is inappropriate to generalize the conclusions from full prepayment literature (that prepayment decreases the quality of a loan pool). Secondly, this finding motivates serious study of cross-cultural and other differences in curtailment behavior to better understand determinants of curtailment. By understanding the determinants of curtailment behavior, curtailment could be forecasted for an existing mortgage pool. In addition, perhaps a borrower's past curtailment behavior should become part of their credit history. If borrowers that curtail mortgages have lower default rates, they should be rewarded for being low risk borrowers by receiving preferential treatment in terms of loan contract rates. Finally, our results also suggest that it may be beneficial to disclose the information of the curtailment behavior of seasoned mortgages to investors such that curtailment could be considered in the pricing of seasoned mortgage pools.

We also find that the origination year is significantly related to the probability of default. We believe that improved underwriting standards after the Asian financial crises have resulted in higher quality mortgage pools. Therefore, unsurprisingly, the composition of the mortgage underwriting standards is an important consideration in assessing default risk.

Our last finding is that default probabilities are lowest for high-priced and low-priced properties. This is contrary to the results reported by Ambrose, et al. (2000) for the US. One possible explanation for our results is that house price volatility was small in these two property markets due to relatively strong liquidity.

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