## Summary

**Title**: Pricing Default and Prepayment Risks and Insurance Premium of Commercial Mortgages
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**Related Topic**: Multifamily Mortgages, Real Estate Finance

## General Description of the Research

The purpose of this project is to provide more information about the FHA-insured multifamily mortgage performance. The HUD's F47 data of FHA insured multifamily mortgages are used. A hazard model is employed to estimate the conditional prepayment and claim rates for multifamily mortgages. The author of this article attempts to: 1) explain what factors contribute to the prepayment and default behavior of borrowers; 2) examine the impact of local housing market variables, namely, the rental price growth rate, vacancy rate, and the unexpected household population growth, on the termination of multifamily loans; 3) evaluate the quantitative significance of the geographical variables and policy variables (specially, the Section8 and Tandem program of late 70s) on the termination of mortgage loans; 4) evaluate the present value of mortgage insurance premiums for a variety of scenarios under assumptions of different interest rate and rental price growth rate volatilities.

Due to data limitations, one area of the mortgage market, the multifamily sector, has yet to be fully explored. The computerized portion of the information on FHA-insured multifamily mortgages is limited. However, these data offer one of the best available opportunities to study multifamily loan performance over the past 30 years. A number of specific conclusions emerge from the estimation: 1) the estimates confirm the option pricing theory of prepayment behavior. Contrary to Boyer, et al. (1998), in which the magnitude of prepayment response seems implausibly small, borrowers respond positively and significantly to positive prepayment incentive; 2) the books of business in the 1981-1986 period were significantly riskier than the other books of business in terms of credit loss; 3) the proxies employed for the asset price of multifamily housing – unexpected household growth rates above trend, cumulative growth in the residential rent component of the U.S. consumer price index, and vacancy rate in the market where the property is located – produce plausible results; 4) default loss becomes extremely small when the prepayment option is "deeply in the money".

## Description of Data and Methodology

The majority of the loan record data is obtained from HUD's F47 database. We examine one of the largest FHA multifamily mortgage insurance programs, the market rate 221(d) (4) New Constructions and Substantial Rehabilitation program (OMI). The program is associated with mortgages issued at market mortgage rates, with the exception of the Tandem program in the late 1970's. The database used in this project includes information on OMI loans with amortization start dates between 1965 and 1995. The data

set includes 6472 loans - 5142 active, 614 claims, and 716 prepayments. There are 91029 loan year observations in total.

A hazard model is used to estimate the prepayment and claim rates. The prepayment hazard is defined as the probability that a mortgage will be prepaid in year t (t less than the maturity date) given that it has survived (meaning the loan has neither been prepaid nor defaulted) until year t. Similarly, a hazard claim rate is defined as the probability that a mortgage will result in an insurance claim in year t given that the loan has survived until year t. A complete hazard model indicates the conditional probability of prepayment and default for all policy years of a mortgage. These two pieces of information are critical to the pricing of commercial mortgages and the associated financial risks. Maximum likelihood estimation is used to estimate the hazard model.

**Application to Investors**

The lack of information on multifamily loans has several consequences: One possible consequence is that the development of secondary market for multifamily mortgages falls far behind that of single-family mortgages. The lack of information could also affect the ability of Federal Housing Association (FHA) to price its products. FHA has greatly reduced its financing of multifamily housing in the 1990s. One major reason for the decline in FHA activity is believed to be the huge loss of FHA's co-insurance program. The study under this project examines the impact of economic, policy and geographical variables on the termination of multifamily loans. This information is essential to investors planning to explore multifamily mortgage-backed security market.

**Caveats**

The OMI data used in the estimation is limited on several counts. Since there is no loan-level information regarding the initial loan-to-value ratio (LTV) and debt-coverage-ratio (DCR), local housing market variables are used as proxies for the missing information. There is no information regarding prepayment penalty and balloon payment at the loan level. As a result, this article attempts to provide some "baseline" information on the performance of multifamily loans.