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Articles

On the valuation of reverse mortgage insurance

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Abstract

This article presents a closed-form formula for calculating the loan-to-value (LTV) ratio in an adjusted-rate reverse mortgage (RM) with a lump sum payment. Previous literatures consider the pricing of RM in a constant interest rate assumption and price it on fixed-rate loans. This paper successfully considers the dynamic of interest rate and the adjustable-rate RM simultaneously. This paper also considers the housing price shock into the valuation model. Assuming that house prices follow a jump diffusion process with a stochastic interest rate and that the loan interest rate is adjusted instantaneously according to the short rate, we demonstrate that the LTV ratio is independent of the term structure of interest rates. This argument holds even when housing prices follow a general process: an exponential Lévy process. In addition, the HECM (Home Equity Conversion Mortgage) program may be not sustainable, especially for a higher level of housing price volatility. Finally, when the loan interest rate is

adjusted periodically according to the LIBOR rate, our finding reveals that the LTV ratio is insensitive to the parameters characterizing the CIR model.

Keyword:

reverse mortgage | option pricing | jump diffusion process | exponential Lévy process

Notes

[1] For more detail, please refer to 'RMs–Report to Congress' published by the Consumer Financial Protection Bureau on 28 June 2012.

[2] In FHA's (Federal Housing Administration) HECM program, borrower can choose an adjustable interest rate or a fixed-rate RM. If one chooses an adjustable interest rate, one may choose to have the interest rate adjust monthly or annually. Lenders may not adjust annually adjusted HECMs by more than two percentage points per year and not by more than five total percentage points over the life of the loan. FHA does not require interest rate caps on monthly adjusted HECMs. (For more details, please refer to http://portal.hud.gov/hudportal/HUD?src=/program_offices/housing/sfh/hecm/hecmabou).

[3] In this study, the valuation date is t_0. We use 0 instead of t_0 sometimes for simplicity without ambiguousity.

[4] See http://www.mortality.org/.

[5] Denuit et al. (2007) measure the market price of mortality risk for a 65-year-old individual based on the Belgian data. We apply the approach proposed by Denuit et al. (2007) to introduce a way to consider the market price of mortality risk. Since the predicting of the market price of mortality risk is not our purpose, it is set exogenously and is assumed to be constant at various ages.

[6] V(0) and R(0) are NRP (non-recourse provision) and MIP (mortgage insurance premiums) defined in Chen, Cox, et al. (2010), respectively.

[7] Each simulated result is based on 10,000 simulation paths. The time partition (dt) is one month.

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