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Default and prepayment options pricing and default probability valuation under VG model.

Summary: In this paper, a new approach, the Variance Gamma (VG) model, which is used to capture unexpected shocks (e.g., Covid-19) in housing markets, is proposed to contribute to the standard option-based mortgage valuation methods. Based on the VG model, the closed-form solutions are performed for pricing mortgage default and prepayment options. It solves the options pricing equations explicitly and illustrates numerical results for both mortgage default and prepayment options’ prices. Furthermore, the study enables researchers to monitor the default probability of mortgagors. Analyzing the effect of risks on default and prepayment options using simulations shows that the VG model captures the systematic and systemic (idiosyncratic) risks of default and prepayment options prices with closed-form solutions and computes the mortgage default probabilities. Therefore, it allows lenders a more advanced decision process compared to the standard option-based mortgage valuation method.

MSC:
91G20 Derivative securities (option pricing, hedging, etc.)

Keywords:
prepayment option; default option; default probability; variance gamma process; Fourier transformation; characteristic function

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