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Volume 2017, 2017 - [Issue 3](#)

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# A lattice-based model to evaluate variable annuities with guaranteed minimum withdrawal benefits under a regime-switching model

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Pages 231-244 | Accepted 01 Nov 2015, Published online: 14 Dec 2015

Cite this article <https://doi.org/10.1080/03461238.2015.1119716>



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## Abstract

We consider the problem of evaluating variable annuities with a guaranteed minimum withdrawal benefit under a regime-switching model. We propose a trinomial lattice model to approximate the evolution of the investment fund value and the policy value at inception is computed through a backward induction scheme. Finally, the insurance fee is computed as the solution of the equation that makes the contract actuarially fair. Numerical results are reported to illustrate the consistency of the proposed model.

Keywords:

minimum guaranteed withdrawal benefit

variable annuities

regime-switching models

## Acknowledgements

The author wishes to thank two anonymous referees for helpful comments and suggestions. All remaining errors are the sole responsibility of the author.

## Notes

No potential conflict of interest was reported by the author.

- 1 In the case of  $\beta < 1$ , we set  $\beta = 1$ , hence  $\beta = 1$ . In other words, once the reference fund reaches zero it stays trapped there until maturity.
- 2 The existence of the solution is shown in the Appendix [4](#).

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