

# A dimension reduction method for option pricing

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We present a robust and highly efficient Shannon-wavelet based dimension reduction method for computing plain-vanilla European option prices under general jump-diffusion models with stochastic variance and multi-factor Gaussian interest rates. Using the conditional Monte Carlo technique applied to the variance factor, the option price can be expressed as a two-level nested conditional expectation. The inner expectation is then evaluated analytically, with the variances associated with all the interest rates factors completely removed from the analytical solution. The outer expectation is approximated very efficiently by means of the Shannon Wavelets Inverse Fourier Technique (SWIFT) via evaluating a single integral that involves only the variance factor. Central to this process is a highly efficient recovery of the conditional density of the time-integrated variance process using the SWIFT method. Furthermore, the SWIFT method also allows us to develop sharp approximation error bounds for the option price. Numerical experiments confirm the robustness and efficiency of the proposed pricing method.

## References

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