

# ICRAMCS 2026

THE EIGHTH EDITION OF THE INTERNATIONAL CONFERENCE ON  
RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE  
April 23-24-25, 2026 | Marrakech, Morocco



## A Novel Closed-Form Approximation for the Pricing of Arithmetic Asian Options

### Communication Info

#### Authors:

Abderrahmane MOUSSI<sup>1</sup>  
Ahmed OUAZZA<sup>2</sup>

<sup>1</sup> FSJES, Oujda, Morocco

<sup>2</sup> INSEA, Rabat, Morocco

#### Keywords:

- (1) Asian option
- (2) Log-normal distribution
- (3) Pricing
- (4) Simulation

### Abstract

We consider the classical Black and Scholes model, with only one risky asset whose price  $S_t$  evolves according to the following linear Stochastic Differential Equation (SDE) [3]:

$$dS_t = S_t(rdt + \sigma dW_t), \quad t \geq 0,$$

where  $(W_t)_{(t \geq 0)}$  is a standard Brownian motion,  $\sigma \geq 0$  the constant volatility and  $r \geq 0$  the constant risk-free rate.

We propose a simple and explicit formula for pricing discretely averaged arithmetic Asian options [1]. The proposed approach relies on direct computation based on an approximation of the sum of log-normal variables [2] [5]. The accuracy and performance of the proposed formula are assessed through numerical experiments and benchmarked against Monte Carlo simulation results [4].

Besides the implementation ease of our formula, the numerical experiments provide strong and consistent evidence supporting the robustness of the proposed approximation.

© ICRAMCS 2026 Proceedings ISSN: 2605-7700

### References

- [1] A. P. Leung, "The lognormal characteristic function in several dimensions, with application to asian options", *Journal of Mathematical Finance*, Vol.10, 2020, pp. 399-411.
- [2] D. Dufresne, "The log-normal approximation in financial and other computations ", *Advances in applied probability*, 36(3), 2004, pp. 747-773.
- [3] M. Alghalith, "The distribution of the average of log-normal variables and exact pricing of the Arithmetic Asian options: A Simple, closed-forme Formula", 2019.
- [4] P. Boyle, M. Broadie, and P. Glasserman, "Monte Carlo methods for security pricing", *Journal of Economic Dynamics and Control*, Vol.21, no.8-9, 1997, pp. 1267-1321.
- [5] S. C. Schwartz and Y. S. Yeh, "On the distribution function and moments of power sums log-normal components", *Bell system Technical Journal*, Vol. 61, no. 7, 1982, pp. 1441-1462.