Simulation Methods for Finance Barrier and Look-back Options

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Introduction

Outline

- Random Variable Generation
- 2 European Call Option
- Barrier Option
- 4 Look-back Option
- **5** Using our Code

Random Variable Generation - Task

Random Variable Generation - Analysis

Random Variable Generation - Results

European Call Option - Task

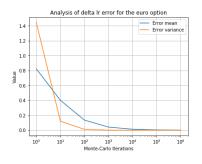
With the usual conventions, recall our model.

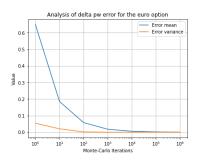
$$dS_t = rS_t dt + \sigma S_t dW_t, \ 0 \le t \le T$$

$$C_t = E[e^{-r(T-t)}(S_T - K)^+|F_t]$$

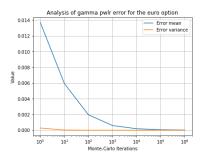
- Create a module to simulate the results for the European option.
- Compute the Greeks (delta, gamma, vega) using different methods.
- Analyse the error compared to the theoretical result.

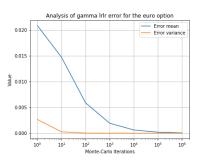
European Call Option - Analysis





European Call Option - Analysis





European Call Option - Results

- There is a significant accuracy gap beyond 1,000 simulations.
- We based our conclusions on the industry standard: 100,000 simulations.
- There is a trade-off computation time/accuracy.

	Error Mean	Error Variance	Time
Delta LR	Worst	Worst	Best
Delta PW	Best	Best	Worst
Gamma PWLR	Worst	Best	Best
Gamma LRPW	-	Worst	Best
Gamma LRLR	-	-	Worst
Vega LR	Worst	-	Worst
Vega PW	Best	-	Best

Barrier Option - Task

Barrier Option - Analysis

Barrier Option - Results

Look-back Option - Task

Look-back Option - Analysis

Look-back Option - Results

Using our Code

Using our Code

Conclusion

Thank you!

github.com/tjespel/barrier-and-look-back-options