Assessing Excel VBA Suitability for Monte Carlo Simulation

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Abstract

Monte Carlo (MC) simulation includes a wide range of stochastic techniques used to quantitatively evaluate the behavior of complex systems or processes. Microsoft Excel spreadsheets with Visual Basic for Applications (VBA) software is, arguably, the most commonly employed general purpose tool for MC simulation. Despite the popularity of the Excel in many industries and educational institutions, it has been repeatedly criticized for its flaws and often described as questionable, if not completely unsuitable, for statistical problems. The purpose of this study is to assess suitability of the Excel (specifically its 2010 and 2013 versions) with VBA programming as a tool for MC simulation. The results of the study indicate that Microsoft Excel (versions 2010 and 2013) is a strong Monte Carlo simulation application offering a solid framework of core simulation components including spreadsheets for data input and output, VBA development environment and summary statistics functions. This framework should be complemented with an external high-quality pseudo-random number generator added as a VBA module. A large and diverse category of Excel's incidental simulation components that includes statistical distributions, linear and non-linear regression and other statistical, engineering and business functions require execution of due diligence to determine their suitability for a specific MC project.

Keywords: simulation, Monte Carlo, Excel, VBA, spreadsheets, suitability, errors, limitations

1. Introduction

Monte Carlo (MC) methods [1, 2, 3] denote a wide range of stochastic techniques based on generating probability distributions as inputs to model uncertainty and randomly sampling through multiple repeated runs (simulations) to quantitatively evaluate the characteristics and behavior of complex systems or processes. Examples of applications include sensitivity analysis, error propagation, numerical integration, etc. MC methods are widely used by scientists, engineers, mathematicians, statisticians to solve problems in engineering [4], physics [5], applied statistics [6], medicine [7], nanobiotechnology [8], economics [9, 10], finance [11], manufacturing and business [12] and many other fields.

Computer realization of the Monte Carlo method can be achieved through several approaches [10, 13].