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Access the code, data, and analysis at https://github.com/zacichan/ECOM184-appraisal

ECOM184: Economic Appraisal Group Project*

Monte Carlo Simulations for CBA

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ABSTRACT This research evaluates the impact of Monte Carlo simulations on Cost-Benefit Analysis (CBA) outcomes in business cases. Traditional CBA methods often fail to account for the inherent uncertainties in real-world scenarios, potentially leading to suboptimal decision-making. By integrating Monte Carlo simulations, which model uncertainty and variability, this study aims to determine whether applying such simulations to existing CBAs would alter past business decisions. The research draws on a comprehensive literature review and addresses the lack of empirical studies applying Monte Carlo methods to historical business cases, the insufficient understanding of their influence on decision-making, and the need for a standardized methodology to incorporate these simulations into CBA practices. Using previously published business cases from various industries and time periods, the study conducts a comparative analysis between traditional and Monte Carlo-enhanced CBAs. The findings will offer insights into the benefits of probabilistic approaches in project appraisals, potentially establishing a more robust framework for evaluating project outcomes.

KEYWORDS CBA; Economic Appraisal; Monte Carlo

> Anyone who attempts to generate random numbers by deterministic means is, of course, living in a state of sin.
>
> —Jon von Neumann

*Here is where you can say thanks
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> **Definition**
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> - Sensitivity analysis explores how the expected outcomes of an intervention are sensitive to variations in key input variables.
> - It helps understand the impact of changing assumptions on project feasibility and preferred options.

A key concept is the Switching Value - the value at which a key input variable would need to change to switch from a recommended option to another or for a proposal not to receive funding. Identifying switching values is crucial to decision-making.

> **Definition**
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> Optimism bias is the demonstrated systematic tendency for appraisers to be over-optimistic about key project parameters, including capital costs, operating costs, project duration and benefits delivery.

- Adjust for optimism bias to provide a realistic assessment of project estimates.
- Adjustments should align with risk avoidance and mitigation measures, with robust evidence required before reductions.
- Apply optimism bias adjustments to operating and capital costs. Use confidence intervals for key input variables when typical bias measurements are unavailable.