



Conditional Expected Loss (CEL): a new metric to estimate potential financial losses in investment project

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Abstract. Inadequate investment decision-making can compromise an organization's financial health. Various methods, techniques, and methodologies exist for analyzing the economic and financial viability of an Investment Project (IP) involving real assets. The finance literature strongly emphasizes the importance of formally considering risks in investment analysis. IPs with limited managerial flexibility and significant uncertainties are often assessed using Monte Carlo Simulation (MCS). Key sources of uncertainty in an IP, such as revenues, discount rates, costs and expenses, taxes, and depreciation, can be used as input variables for the MCS. A more in-depth examination of MCS-generated results can provide valuable insights to enhance decision-making processes. One crucial aspect overlooked in the literature is the absence of an indicator that estimates the expected value in case of financial insufficiency. This paper proposes the introduction of the Conditional Expected Loss (CEL) metric to fill this gap. CEL aims to estimate the expected value of a financial deficit during IP execution offering a comprehensive summary of potential losses in case of financial deficit. The CEL metric is particularly relevant for IPs characterized by limited managerial flexibility and a higher probability of financial deficit. When the probability of the NPV falling below zero approaches zero, the CEL metric also tends toward zero, distinguishing it from previous research primarily focusing on computing Conditional Value at Risk (CVaR) at 95% or 99% confidence levels. In contrast, CEL considers the probability of NPV being < 0 , representing the average of losses beyond this threshold. Through a simulated case study and extensive numerical modelling, we demonstrate the applicability of CEL. This novel metric enhances risk analysis and decision-making by evaluating financial insufficiency in investment projects with limited managerial flexibility and a higher likelihood of financial deficits. The major contributions of this study include: (i) the development of an additional indicator useful to evaluate financial deficits in IPs, along with its application in a simulated case study to demonstrate the utility of the CEL indicator, and (ii) extensive numerical modelling of CEL, including mathematical proof and implementation of the developed indicator in a free web tool named \$AVEPI® (System for Economic Viability of Investment Projects). Future research can explore CEL's application in other IPs and compare it with alternative risk measures.

Keywords: Capital Investment, Monte Carlo Simulation, Value at Risk, Conditional Value at Risk, Conditional Expected Loss.

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