RISK ANALYSIS AND CONTINGENCY DETERMINATION USING EXPECTED VALUE
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RISK ANALYSIS AND CONTINGENCY DETERMINATION
USING EXPECTED VALUE

TCM Framework: 16 – Risk Management

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INTRODUCTION

Scope

This recommended practice (RP) of AACE International (AACE) defines general practices and considerations for risk analysis and estimating cost contingency using expected value methods. This RP applies specifically to using the expected value method for contingency estimating in the risk management “control” step (i.e., after the risk mitigation step), not in the earlier risk assessment step where it is used in a somewhat different manner for risk screening. This RP is limited to estimating cost contingency; RP 65R-11, Integrated Cost and Schedule Risk Analysis and Contingency Determination Using Expected Value is an extension of this RP covering integrated cost and schedule risk analysis and contingency determination using expected value.

Purpose

This RP is intended to provide guidelines, not standards, for contingency estimating that most practitioners would consider to be good practices that can be relied on and that they would recommend be considered for use where applicable. There is a range of useful contingency estimating methodologies; this RP will help guide practitioners in developing or selecting appropriate methods for their situation. While integrated cost and schedule methods are generally recommended (e.g., 65R-11, Integrated Cost and Schedule Risk Analysis and Contingency Determination Using Expected Value or 57R-09, Integrated Cost and Schedule Risk Analysis Using Monte-Carlo Simulation of a CPM Model), this RP is limited to estimating cost contingency for those situations where a different method will be applied for schedule contingency determination (for example, the schedule aspects of CPM-based methods as in 57R-09).

Background

This RP is based on a method that has been in common use for both decision and risk management for many decades. Expected value in its most basic form can be expressed as follows:

\[ \text{Expected Value} = \text{Probability of Risk Occurring} \times \text{Impact If It Occurs} \]

Figure 1 shows a more specific example of the concept; in this case, $1,000 would be included in contingency for this particular risk[^6]:
Risk Analysis and Contingency Determination Using Expected Value

**Figure 1 — Example of Expected Value Calculation**

This calculation has long been a fundamental method used in decision tree analysis and risk screening \[^{[3,4,5]}\]. Its use is common because it is quantitative, simple to understand, simple to calculate, and it explicitly links risk drivers with their impacts so that the risks can be managed. However, its use for contingency estimating has not been as common. References by Dey\[^{[4]}\], Hollmann\[^{[6]}\], and Mak et al. report on applications employing expected value concepts.

While it is advantageous for risk management to use methods that explicitly link risk drivers with their impacts, the effort involved in expected value methods for contingency estimating can be seen as a challenge. At screening, minimal cost competency is needed (e.g., impacts are often addressed as high/low or major/minor or other loosely quantified measures) so expected value usage is common. However, for contingency estimating, expected value requires cost estimating competency (particularly conceptual estimating) to explicitly scope and estimate the risk impacts. Range estimating on the other hand\[^{[2]}\] does not require the preparation of explicit impact estimates; this can be seen as either an advantage or disadvantage.

Expected value has two other significant advantages; it does not require that the team change its basic risk quantification methods between decision analysis, risk screening and control, and it can provide a contingency estimate without using Monte-Carlo (however, its use is recommended).

It is AACE’s recommended practice that whenever the term *risk* is used, that the term’s meaning be clearly defined for the purposes at hand. In expected value practice as described in this RP, *risk* means “an uncertain event or condition that could affect a project objective or business goal”.

**Background-Risk Types**

Because the expected value method of contingency estimating explicitly links risk drivers with their impacts, it requires more explicit understanding and treatment of the risk types than less explicit methods such as range estimating. In respect to expected value, as with parametric contingency estimating methods\[^{[1]}\], risk types fall into one of two categories; risks that have systematically predictable relationships to overall project cost growth outcome and those that don’t. These categories have been labeled as *systemic* and *project-specific* risks for...