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An Application of non-Parametric resampling interval analysis to Risk-Based Earned Value Management

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Abstract— Control in complex systems in uncertainty conditions is one of the significant challenges for project managers. Therefore, in this paper an integrated approach based on Earned value management and risk analysis methods proposed to decrease deviations in time and cost estimation at complete. Using the proposed performance indexes based on risk scores obtained by non-parametric resampling technique, namely bootstrap, calculating more accurate estimations of final cost and duration at lower and upper band with various confidence levels will be possible. Finally, an illustrative case study presented in a software project.

Keywords: Earned value management; risk analysis; Cost & Time Estimation at Complete; Software Engineering and Management; Non-Parametric Bootstrap Technique.

I. INTRODUCTION

Earned value management (EVM) is an efficient technique in analyzing and controlling the performance of a project in terms of cost and time performance. The EVM related researches in terms of schedule, cost and risk can be categorized as follow.

Following researches have been carried out in different branches. Boehm (1989) defined the risk management steps and the negative effect of risks on project development cost in software projects. Also, Ward (1999) considered the requirements for the efficiency of project risk management process. Four years later, Chapman and Ward(2003) discussed over insights of project risk management and its techniques and processes. Currently, new aspect of risk attention in a form of decision support system(DSS) in project risk management have been presented by Fang et al.(2012) for the modeling and management of project risk interactions. So many authors have tried to integrate risk and EVM techniques, among them, Hayashi and Kataoka (2008) applied a risk management method by using EVM data to developing software projects. In this aspect, Na Yin and Jinlin Li (2007) suggested the ratio of earned value over the budget to make EVM more efficient in pre-event exceeding cost risk recognition. Kim(2010) studied common risk performance indexes in the literature and proposed the new cost risk performance index to integrate cost/schedule and risk for mega projects. With regard to Kim's last research, kamyabniya et.al(2012) proposed new risk performance index to improve the