Risk Analysis Using Simulation Software Applied on a Road Infrastructure Project

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ABSTRACT

Risk management in infrastructure projects has been a very important process to achieve the project objectives, namely: time, cost, quality, safety and environmental sustainability. Huge investments are made in infrastructure construction projects like roads, railways, ports, airports, electricity, telecommunication, oil gas pipelines and irrigation. This growing increase in investment in infrastructure investment projects demands requires close monitoring of costs to ensure a net return. The evaluation of returns on investment at the conceptual stage plays a vital role in this phase. Software tools help in bringing out near accurate analysis of returns on investments and to support project viability under multiple circumstances. The paper presents an analysis of how software was applied to evaluate and mitigate risk during the case of a six lane road infrastructure project. The unit of analysis was the impact of cost of construction cost, interest rates for loans, methods of depreciation, revenue sharing on various financial indices: IRR, MIRR, DSCR and payback period. The interpretation was that software tools can be used to perform risk analysis, sensitivity analysis and scenario analysis. The case study makes a contribution to the body of knowledge by developing guidelines for using software tools in risk management.

Keywords: @Risk Software Tool, DSCR, Financial Analysis, Financial Indices, Infrastructure Projects, IRR, MIRR, Payback Period, Project Viability, Risk Management

INTRODUCTION

Infrastructure projects are getting bigger and complex due to increase in innovation and scope. Thus its development requires huge investments which attract domestic as well as foreign investments to have sustainable growth (Anurag N, Mugdha P & Nikhil N, 2014).

Investments in projects are from various sources and every investor invests in a project with the only aim of getting returns. Returns can be assured if projects are successfully completed which is a combined achievement of project cost, quality, time and scope. Many times project cost is compromised in achieving time and scope thus affecting the expected returns.

According to the Economic Survey 2013 by Ministry of Finance – Government of India, the overall cost overrun amounted to 16.8% of the original cost, and till September 2012 only 45.5% of the anticipated cost of the projects had been incurred. The current status of infrastructure projects in India shows that out of 566 infrastructure projects, only 5 are ahead of

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schedule, 226 are on schedule and remaining lag behind (IDFC Foundation, 2013). Therefore it is crucial for investors to identify and manage the critical risk associated with investments in infrastructure projects.

Critical risks in a typical infrastructure project include delay in approval, change in law, cost overrun, dispatch constraints, land acquisition and compensation, enforceability of contracts, construction schedule, financial, tariff adjustment and environmental risk. Of these, financial risks are more critical from the private or public investor’s point of view. Thus analysis of financial risk associated with the infrastructure project at the conceptual stage improves the confidence in investors and support near accurate decision making based on different scenarios. The integration of various business factors, and complex computing capabilities of software tools have been a great help in carrying out what-if analysis for all sectors of business fraternity.

This paper presents a case to show how a software tool can help in carrying out financial analysis of an infrastructure project and help the investor/stakeholder in decision making with different scenarios.

LITERATURE REVIEW

The risk can be defined as generic risk or project risk. The generic risk can be defined as the exposure to an uncertain situation that could have an effect which is a deviation from the expected. Risk is calculated as the socio-economic or other cost multiplied by the probability of quantified uncertain future events (Goodwin & Strang, 2012).

In general, project risk is defined as an uncertain event or set of circumstances that should occur, will have an effect on the achievement of one or more of the project’s objectives (Christine, 2008). Project risks may also be classified as external or internal, the former usually being uncontrollable and the latter referring to the team resource capability (Strang, 2012). Risk may be a positive as well as a negative impact on the project. Typical internal positive risks would include expected project duration with low task time standard duration that is earlier than the required deadline (Strang & Symonds, 2012), while a common external negative project risk would be delays caused by political events (Strang, 2010).

Financial risk analysis is carried out using various financial models which monitor cost as well as revenue from the project. Financial models can provide public sectors and private partners with an analysis tool to evaluate the potential returns of investments and financial feasibility of the projects (Weiyuan Yuwen & Zhanmin Zhang, 2013). It allows business options and risks to be evaluated in a cost-effective manner against a range of assumptions. It helps in identifying optimal solutions and evaluating financial returns.

Financial Modelling Software

Financial modelling can be carried out using a range of software tools (Das, 2012). Excel has a number of in-built functions such as NPV, XNPV, IRR, MIRR, and FORECAST, that are used for financial modelling (Strang & Nersesian, 2014). ReadyRatio is an application used to calculate and analyse the financial health of small business, including liquidity, profitability, and capital structure or debt level.

Ariba, an SAP company, offers a software package that electronically manages the relationship between vendor and client to calculate and prorate discounts to targeted suppliers, maximizing the return. Oracle’s PeopleSoft offers solution that optimizes enterprise-wide liquidity and cash control. Quorum Capital Budgeting maintains an “actual-to-forecasted” analysis of ongoing project. (BusinessBee, 2014).

BlackSwan Financial Platform accurately models financial instruments by taking into consideration extreme behaviours to recommend the best trade-off between risk and return. iBalance offers compliance management, modelling, scenario simulation, portfolio rebalancing, workflow automation. Cura Assessor enables collect and organize risk, controls and
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