Modeling Investment Decision under Uncertainties in Indian Electricity Sector

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Abstract

Traditional investment theories have shown limitations in assessing the role of uncertainty, irreversibility and timing of any large and complex investments. This thesis attempts to build a comprehensive investment decision framework that can investigate the uncertainties influencing any investment. The model evaluates the effect of these uncertainties by incorporating the value of waiting for such irreversible investments. While the context used for this thesis is electricity generation investments in Indian Electricity Sector, the purpose is not to make any predictions specific to this context. The purpose of this thesis is to build a financial valuation framework using real option theory that can be used for investment decision making. The first part of this research takes a structured approach for qualitative analysis of the uncertainties based on standard typology, which identifies key uncertainties in the form of cash flow variables. The second part of this thesis uses real option modeling framework to quantify the impact of these uncertainties in the form uncertainty premium. This uncertainty premium is the additional cost that an investment decision maker has to take into account in order to make the investment at present instead of delaying it. It calculates the uncertainty premium in the form of electricity price per unit over and above the baseline wholesale electricity price calculated under deterministic assumptions.

The model gives a common view of uncertainties to all the stakeholders in any given investment environment. For a firm, this model can improve the predictability of investment decision by giving a futuristic view of the uncertainties. This analysis can also guide the policy makers to provide a reliable policy environment. The insights gained from the methodology adopted in this thesis in the form of real option model have important implications for other sectors and investment theory in general.

Key Words: Real Option, Uncertainties, Electricity Generation, Investment Decision, Monte Carlo Simulation

Table of Contents

List of Tables

List of Figures