A Study on “Impact of Investment Impeding Factors on Equity Rate of Return” In Power Projects

Dr. K.S.Sekhara Rao
Assistant Professor, KLU Business School, K L University, Andhra Pradesh, India.

Abstract
Investors reluctant to invest funds in the power sector, due to the high level of risks involved in the projects. Presently, the Indian power sector requires an additional power generation capacity of 100,000 MW. And also it requires an investment of USD665 billion up to the year 2030. In this scenario, the government have only the way to balance “demand and supply” of the funds in this sector is, inviting private sector investment. The private investors mainly consider the level of risk involved in the projects. If the risk of the project is less, they put funds in the sector. Based on this fact, the study undertake to identify various investment impeding factors and measure the impact of these factors on internal rate of return on equity, by using categorical regression analysis (CATREG). This statistical technique shows that, the result of $R^2$ is 0.741. It clearly shows that, there is a significant impact of investment impeding factors on internal rate of return on equity. Based on this, the study suggested various ways and means to reduce the risk of these factors in power projects.

Key words: Power Sector, Equity, Risk, Allocation of risk, Investment, Impact of risk, India.

1.0 INTRODUCTION
The power sector in India has grown from nascent stage to developing stage; it requires investment of huge funds for a long-period of time, which involve high amount of risks. But Indian power sector has the potential for development. At present, over 43,600 MW of power plants are in a starting stage. To complete these projects huge amount of funds required. For this private parties invited as a part of reforms to speed up the investment in the sector. But, the problem of the promoting companies is the amount of risk involved in projects due to investment impeding factors. Even to raise the funds to the required level from the domestic market, the Indian domestic debt market is not developed. Thus, the risks of the power project are the key factors that influence the level of investment in the sector, so, it should be reduced. The present study mainly focused on the identification of the investment impeding factors, and identifies various factors such as: 1 Many requirements to obtain project approval. 2. Accusations of corruption and corrupt tendencies 3. Poor credit worthiness of power off-takers 4. High Risks involved in project 5. Strong political opposition to investor friendly reforms 6. Lengthy legal process for settlement of loan agreements etc. 7. Resistance from Environmental groups (due to hazards, such as: carbon emission) 8. Frequent changes in government policies 9. Frequent increases in interest rates by commercial banks and financial institutions 10. Financial Risk 11. Construction Risk 12. Operating Risk 13. Technology Risk 14. Legal Risk 15. Political Risk 16. Environmental Risk 17. Regulatory Risk.

Review of literature
Factors impeding Investments
Some factors negatively influence the investment of power projects those factors are similar in all developing countries. Political influence is a major factor among those factors. Regarding political influence, Sullivan (1990) described, “Subsidized electricity prices and undue political influences over technical and financial decisions making are producing a financial crisis in developing country utilities”.

The credibility of the off-takers majorly influences the investor’s investment decisions to invest funds in power projects. The most important factor to attract funds from investors’ is the financial ability/capable of off-takers to make payments to the project in time. Unfortunately, the poor credit
rating of the state electricity boards is one of the reasons for not improving the investment level in power projects in India (Gupta et al, 1998).

The private sector participation in power projects is less and it occupies only 30 percent in the total investment in India. There are several reasons for declining the interest of private participants such as, so many requirement have to be satisfied to get the approval for establishing power project, lengthy bureaucratic processes (i.e. administrative hurdles and hierarchal elements) and non-transparent project approval processes, etc. Regarding this, the well known researchers in the field of public private partnership, Akampurira, Root, & Shakantu: described that, the factors as major constraints to private sector participation in power projects, are: “the predictability of the investment environment as a significant consideration for investors, the clarity surrounding regulatory and legislative processes, the willingness of all participants to adhere and respect the outcomes of these processes”.

Institutional related challenges e.g. lengthy bureaucratic processes coupled with poor coordination between government departments non-transparent project approval processes are also restricting the investment of power sector (Blackman et al, 1999). “Chege” (2003) identified some barriers for the private sector involvement such as (i) policy and regulatory concerns (ii) weak domestic capital markets and (iii) high transaction and bidding cost. According to Morris (1999) the reasons, for private investment could not have raised are: “the policy, legal, and price reform necessary for private sector entry into infrastructure on a large scale had not come”.

Corruption is one determinant factor for investment in power projects. In Thailand, Mahitthirook (2000) estimated that 10 percent of the project cost is lost to corruption. Jamison et.all, (2005) identified the factors in countries that increased risk for commerce and direct investments are:

1. Corruption
2. Efficiency of the legal system

In view of private investment Klingebiel & Ruster (2000) in a study pointed out, Lack of conducive environment for private participation in infrastructure (due to underprivileged sector policies, unstable political environment, a poor macro-framework and inadequate financial sector) is the major road block for investment.

**Project Risks**

According to Tinsley (2000) Grimsey & Lewis (2002), Akintoye, et.al (2005) risk is an integral part of every project. They mentioned that, the level of risk in a project influences the level of investment. They classified risks as: project completion risk, material and fuel supply risk, operative (technology, cost-based and management-based risks), environmental, political risk, force majeure, interest and legal risk, technical risk, construction risk, operative risk, financial risk.

Yescombe (2002) also mentioned various kinds of risks have the influence on investment of projects in his book “principles of project finance” they are: commercial risks (consideration of appropriateness of the project, project completion risk, environmental risk, operational risk, income risk, supply of raw materials and energy, force majeure risk and project contracts compliance risk), financial risks (inflation risk, interest rate risk and exchange rate risk) and political risks (investment risk, risks of changes in legal system and quasi-political risks).

Wibowo et.all (2005) classified the risks into project-specific risks (e.g., lengthy right-of-way acquisition process, construction cost, and time overruns) and sector-specific risks (e.g., unpredictable future tariffs, change in legislation). Matsukawa & Habeck (2007) said that, project risks may include construction risks (engineering feasibility, cost overruns, costs of delay, for example), operating risks (demand or revenue risks, tariff mechanisms, operating cost overruns, equipment performance). Risk is therefore a key driver of the cost of debt. Creditworthy companies or projects pose less risk and will pay lower interest rates than high-risk projects (UKERC, 2007).

Financial risk is a major influencing factor for choosing the financing alternatives of the project. The research of Rao & Rao (2010) on power projects financing, observed “political risk and financial risk involved in all power projects, the financial risk arises due to the inefficient strategies which are used to design the capital structure of the project”.

The degree of political risk may affect infrastructure investments. Gupta et al (1998) identified “the country/political risk, rates very high in the mind of the investors”. Due to this risk investors are not
interested to invest more funds. To mitigate this risk, Hainz & Kleimeier (2006) provide a of loan contract, i.e., “through the inclusion of multilateral or national development banks in the syndicate”. To prove it they developed double moral hazard problem model. This study provides empirical support for the notion that multilateral development banks act as “political umbrellas”.

Regarding the regulatory risks Chowdhury et.al (2009) said that, a consistent regulatory policy is required even with multiple changes of government parties, which can reduce regulatory risk.

In power projects, it is important to identify the risk factors which cause various kinds of risks. If the risk factors are found in the project, the further measures can be taken to minimize the risks in the project. In the recent study of Vaaler, James, & Aguilera (2008) found that, risk factors at multiple levels substantially affected the capital structure of project firms. Project firms located in countries with common law legal systems, stronger creditor rights, and wealthier economies generally had higher leverage, indicative of lower project risk.

However, the literature says that, risk is common in every project, but the question is how to reduce it? The answer can be suggested in several ways. So many risk mitigation techniques are available to moderate the risk. Dorian, suggested ways to reduce the risks, such as: “seeking managerial control during the initial stages, ensuring that the local partners have a significant equity interest, adopting a two-tier negotiation policy (i.e. work with the central government both the local and the central government had some influence on the project and the revenue distribution), explicitly defining the terminology used in all contracts”.

Need for the study

Power is an essential commodity for the development of country economy. The government of India has taken several measures for the development of power sector but it couldn’t achieve the targets, because of the investment impeding factors, which changes the perception of the investors to invest funds in the power projects. In India the share of private participation in tenth five year plan for power sector is 31.47 percent, in eleventh plan the government estimated 27.83 percent, it is 3.64 percent less. In this scenario, the study undertaken to analyse the impact of investment impeding factors on the investment of power projects, and to make suggestions to reduce the impact and increase investment in power projects.

Objective of the study

To analyise the impact of investment impeding factors on internal rate of return on equity.

RESEARCH DESIGN

Methodology

For this study a structured questionnaire has been used to collect the primary data from CFO’s, project finance managers, finance directors, and other top management people who are looking after the financing aspects of different power projects in India. The total number of power projects in India is 3073. The study selects 400 as a sample based on Krejcie, Robert V. & Morgan, Daryle W. (1970) table of study sample selection. The study obtained a total of 379 responses from both public and private sector projects. Among these, the total responses from the public sector projects are 129 and private sector projects are 250.

Survey Process

Various methods of financing and risks of the power projects are identified from the review of literature and incorporated into a questionnaire. The questions designed by using a five point “Likert” scale. The target population consisted of managerial level staff in public and private sector power companies. Questionnaires executed to 379 power companies which are located in different states in India.

Data Analysis

Return on equity is one of the variables to appraise the project in infrastructure. Return to equity depends upon the risk of cost flows from the project and the financial structure (Siddhartha Sinha). The return on equity is also depends on the financial viability of the project. Again the viability of the projects depends on the free flow of the investment. There are several factors that influence the investment of the projects those are positive factors and negative factors. Positive factors helps the
projects to increase its investment, whereas, negative factors restrict the investment. This study attempt to analyse the impact of negative factors on return on equity. The respondents were asked to indicate the level of restriction by the negative investment factors, the detailed list of opinions given in Annexure: and the level of return on equity for their projects indicated by the total respondents is given below.

Table 1: Internal rate of return on equity (IRRE)

<table>
<thead>
<tr>
<th>Factors</th>
<th>Very low</th>
<th>Low</th>
<th>Neither low nor high</th>
<th>High</th>
<th>Very high</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal rate of return on equity (IRRE)</td>
<td>Count</td>
<td>7</td>
<td>86</td>
<td>95</td>
<td>162</td>
</tr>
<tr>
<td></td>
<td>Percent</td>
<td>1.8</td>
<td>22.7</td>
<td>25.1</td>
<td>42.7</td>
</tr>
</tbody>
</table>

For these data first CATREG (Categorical regression with optimal scaling) is used to obtain quantifications of the qualitative variables. CATREG is equivalent to a standard linear regression when the qualitative predictors are substituted by the transformed values (optimal scaling). The formulated hypothesis is:

**H:** Internal rate of return on equity affect by the investment factors

**H0:** Internal rate of return on equity does not affect by the investment factors

**CATREG - Regression for Categorical Data**

Statistical techniques are the most popular for modeling purposes in infrastructure financing. But applicable techniques need to be explored to fit the data and establish a model. Some problems have to be solved for building the regression model. The form of the regression model should be decided first. The internal rate of return on equity is regarded as the dependent variable for the estimation task, which may have various forms of relationships with the selected predictors.

Then certain regression technique should be chosen to derive the parameters in the function. Although the function can take a linear form, ordinary linear regression is not applicable here because many predictors (independent variables) are categorical. Usually dummy binary variables have to be designed to apply traditional linear regression, but the results would be hard for interpretation and impossible for further recalibration. A special approach named CATREG (Categorical regression with optimal scaling using alternating least squares) is suitable to assign numerical values to those categorical variables and obtain the final regression formula (L. Angelis, I. Stamelo and M. Morisio 2001). Categorical multiple regression is a nonlinear technique, where the nonlinearity is in the transformation of the variables. CATREG requires the data to be categorical, thus consisting of integer values. CATREG is a program for categorical multiple regression, applying optimal scaling methodology to quantify categorical variables, including the response variable, simultaneously optimizing the multiple regression coefficient. The scaling levels that can be applied are nominal, nonmonotonic spline, ordinal, monotonic spline or numerical. With numerical data multiple regression is the most often used method to predict a dependent or response variable from a set of predictor variables. CATREG is a nonparametric method to perform multiple regression when data are categorical or a mix of numerical and categorical variables. CATREG allows for nonlinear transformations of the variables, including the response variable. CATREG can also be used with numerical data to explore the existence of nonlinear relationships. Transformation of variables has become an important tool in data analysis. The rationale behind it is transforming the categorical variables according to the optimal scaling levels (nominal or ordinal) and optimizing the quantifications following the least square criterion (A.J. Van der Kooij and J.J. Meulman 1997). Using CATREG, the quantifications are achieved at the same time the regression is done (Jie Xu et all 2010). CATREG applies the optimal scaling methodology as developed in the Gifi system (Gifi 1990) to quantify categorical variables, simultaneously optimizing the multiple regression coefficients. In the quantification process, information in the observed variable is retained in the quantified variable. The
kind of information that is retained, and thereby the form of the transformation, depends upon the scaling level. The numerical scaling level results in a linear transformation, that is, the data are treated as numerical, and are only transformed into standardized variables. The non-numerical scaling levels allow for nonlinear transformations: the nominal and nonmonotonic spline scaling levels allow for nonmonotonic transformations; the ordinal and monotonic spline scaling levels allow for monotonic transformations. The scaling level can be chosen for each variable separately.

The CATREG model is the classical linear regression model, applied to transformed variables:

$$\varphi_r(y) = \sum_{j=1}^{J} \beta_j \varphi_j(x_j) + e,$$

With loss function:

$$L(\varphi_r; \varphi_1, ..., \varphi_J; \beta_1, ..., \beta_J) = \| \varphi_r(y) - \sum_{j=1}^{J} \beta_j \varphi_j(x_j) \|_2^2$$

With J the number of predictor variables, y the observed or discretized response variable, X_j the observed or discretized predictor variables, \( \beta_1 \) the regression coefficients, \( \varphi_r \) the transformation for the response variable, \( \varphi_j \) the transformations for predictor variables, and e the error vector. All transformed variables are centered and normalized to have sum of squares equal to N, and \( \| \cdot \|_2 \) denotes the squared Euclidean norm. (An alternative formulation of multiple regression with optimal scaling was given in Van der Kooij and Meulman (1997)) The form of the transformations depends upon the optimal scaling level, which can be chosen for each variable separately, and is independent of the measurement level. The scaling level defines which part of the information that is in an observed or discretized variable (depending upon the measurement level), is retained in the transformed variable. With the nonnumerical scaling levels, the category values are treated as qualitative, and are transformed into quantitative values. In this case, some part of the information in the observed or discretized variable is dropped, allowing for nonlinear transformations. With the ordinal or monotonic spline scaling level, the interval information is dropped and only grouping and ordering information has to be retained, allowing for a monotonic transformation. With the nominal and nonmonotonic spline scaling level only grouping information has to be retained, resulting in nonmonotonic transformations. By applying nonlinear scaling levels, nonlinear relationships between the response variable and the predictor variables are linearized, hence, the term linear regression model is still applicable.

### Model fit and coefficients

The categorical regression procedure yields an \( R^2 \) of 0.741, and adjusted \( R^2 \) of 0.717, indicating that almost 71.7% of the variance in the transformed internal rate of return on equity (IRRE) rankings is explained by the regression on the optimally transformed predictors. It means the independent variables are explains the variance of dependent variable of internal rate of return on equity. Transforming the predictors improves the fit over the standard approach.

### Table 2: Regression between internal rate of return on equity and investment factors (negative)

<table>
<thead>
<tr>
<th>Model summary</th>
<th>Multiple R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Apparent Prediction Error</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.861</td>
<td>0.741</td>
<td>0.717</td>
<td>0.259</td>
</tr>
</tbody>
</table>

Dependent Variable: Q16_2 Internal Rate of Return on Equity(IRRE)
Predictors: Q9_1 Many requirements to obtain project approval. Q9_2 Accusations of corruption and corrupt tendencies Q9_3 Poor credit worthiness of power off-takers Q9_4 High Risks involved in project Q9_5 Strong political opposition to investor friendly reforms Q9_6 Lengthy legal process for settlement of loan agreements etc. Q9_7 Resistance from Environmental groups (due to hazards, such as carbon emission Q9_8 Frequent changes in government policies Q9_9 Frequent increases in interest rates by commercial banks and financial institutions Q14_1 Financial Risk Q14_2 Construction Risk Q14_3 Operating Risk Q14_4 Technology Risk Q14_5 Legal Risk Q14_6 Political Risk Q14_7 Environmental Risk Q14_8 Regulatory Risk

The below table of analysis of variance (ANOVA) shows the various sums of squares and the degree of freedom associated with each. From these two values, the average sums of squares (mean squares) can be calculated by dividing the sums of squares by the associated degrees of freedom. The most important part of the table is the F-ratio. For these data, F is 30.866 which is significant at p<.001. This result tells us that there is less than a 0.1 percent chance that an F-ratio this large would happen if the null hypothesis were true. The table shows sig: value is 0.000, the null hypothesis is rejected.

Table 3: ANOVA of between internal rate of return on equity and investment factors

<table>
<thead>
<tr>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>280.678</td>
<td>32</td>
<td>8.771</td>
<td>30.866</td>
</tr>
<tr>
<td>Residual</td>
<td>98.322</td>
<td>346</td>
<td>0.284</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>379</td>
<td>378</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dependent Variable: Q16_2 Internal Rate of Return on Equity (IRRE)

Predictors: Q9_1 Many requirements to obtain project approval. Q9_2 Accusations of corruption and corrupt tendencies Q9_3 Poor credit worthiness of power off-takers Q9_4 High Risks involved in project Q9_5 Strong political opposition to investor friendly reforms Q9_6 Lengthy legal process for settlement of loan agreements etc. Q9_7 Resistance from Environmental groups (due to hazards, such as carbon emission Q9_8 Frequent changes in government policies Q9_9 Frequent increases in interest rates by commercial banks and financial institutions Q14_1 Financial Risk Q14_2 Construction Risk Q14_3 Operating Risk Q14_4 Technology Risk Q14_5 Legal Risk Q14_6 Political Risk Q14_7 Environmental Risk Q14_8 Regulatory Risk

The following table shows the standardized regression coefficients. Categorical regression standardizes the variables, so only standardized coefficients are reported. These values are divided by their corresponding standard errors, yielding an F-test for each variable. However, the test for each variable is contingent upon the other predictors being in the model. In other words, the test determines if omission of a predictor variable from the model with all other predictors present significantly worsens the predictive capabilities of the model. These values should not be used to omit several variables at one time for a subsequent model. Moreover, alternating least squares optimizes the quantifications, implying that these tests must be interpreted conservatively.

Table 4: Coefficients of between internal rate of return on equity and investment factors

<table>
<thead>
<tr>
<th>Investment Factors</th>
<th>Standardized Coefficients</th>
<th>Bootstrap (1000) Estimate of Std. Error</th>
<th>df</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q9_1 Many requirements to obtain project approval.</td>
<td>0.398</td>
<td>0.086</td>
<td>3</td>
<td>21.244</td>
<td>0</td>
</tr>
<tr>
<td>Q9_2 Accusations of corruption and corrupt tendencies</td>
<td>0.137</td>
<td>0.076</td>
<td>1</td>
<td>3.281</td>
<td>0.071</td>
</tr>
<tr>
<td>Q9_3 Poor credit worthiness of power off-takers</td>
<td>-0.362</td>
<td>0.222</td>
<td>2</td>
<td>2.655</td>
<td>0.072</td>
</tr>
</tbody>
</table>
Standardized coefficients are often interpreted as reflecting the importance of each predictor. However, regression coefficients cannot fully describe the impact of a predictor or the relationships between the predictors. The largest coefficient occurs for many requirements to obtain project approval. A one standard deviation increase in many requirements to obtain project approval yields a 0.39 standard deviation decrease in predicted internal rate of return on equity ranking. However, many requirements to obtain project approval is treated nominally, so an increase in the quantifications need not correspond to an increase in the original category codes. The above table shows the b- values which indicate the individual contribution of each predictor to the model. The b- values tells us about the relationship between internal rate of return on equity and each predictor. If the value is positive the relationship between predictor and the outcome is positive, where as a negative coefficient represents a negative relationship.

Table 5: Correlations and Tolerance

<table>
<thead>
<tr>
<th></th>
<th>Correlations</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Zero-Order</td>
<td>Partial</td>
</tr>
<tr>
<td>Q9_1 Many requirements to obtain project approval.</td>
<td>0.57</td>
<td>0.519</td>
</tr>
<tr>
<td>Q9_2 Accusations of corruption and corrupt tendencies</td>
<td>0.133</td>
<td>0.231</td>
</tr>
<tr>
<td>Q9_3 Poor credit worthiness of power off-takers</td>
<td>-0.417</td>
<td>-0.233</td>
</tr>
<tr>
<td>Q9_4 High Risks involved in project</td>
<td>-0.125</td>
<td>-0.064</td>
</tr>
<tr>
<td>Q9_5 Strong political opposition to investor friendly reforms</td>
<td>-0.254</td>
<td>-0.134</td>
</tr>
</tbody>
</table>
Q9_6 Lengthy legal process for settlement of loan agreements etc. 0.074 0.212 0.11 -0.017 0.416 0.415
Q9_7 Resistance from Environmental groups (due to hazards, such as carbon emission 0.152 0.265 0.14 0.034 0.718 0.693
Q9_8 Frequent changes in government policies 0.272 -0.226 -0.118 0.081 0.287 0.305
Q9_9 Frequent increases in interest rates by commercial banks and financial institutions 0.082 0.355 0.194 -0.029 0.525 0.448
Q14_1 Financial Risk -0.2 0.063 0.032 -0.011 0.604 0.539
Q14_2 Construction Risk 0.021 0.011 -0.004 0.603 0.631
Q14_3 Operating Risk -0.139 -0.072 0.068 0.432 0.358
Q14_4 Technology Risk -0.46 -0.128 0.066 0.386 0.322
Q14_5 Legal Risk 0.351 0.131 0.067 0.045 0.488 0.504
Q14_6 Political Risk -0.16 -0.054 -0.028 0.008 0.599 0.693
Q14_7 Environmental Risk 0.009 0.14 0.072 -0.001 0.777 0.707
Q14_8 Regulatory Risk 0.187 -0.252 0.133 0.04 0.709 0.546
Dependent Variable: Q16_2 Internal Rate of Return on Equity (IRRE)

Other variables in the model can confound the performance of a given predictor in predicting the response. The partial correlation coefficient removes the linear effects of other predictors from both the predictor and the response. This measure equals the correlation between the residuals from regressing the predictor on the other predictors and the residuals from regressing the response on the other predictors. The squared partial correlation corresponds to the proportion of the variance explained relative to the residual variance of the response remaining after removing the effects of the other variables. For example, many requirements to obtain project approval have a partial correlation of 0.519. Removing the effects of the other variables, many requirements to obtain project approval explains \((0.519)^2 = 0.269 = 27\) percent of the variation in the internal rate of return on equity (IRRE) rankings. So each predictor can also explain a large portion of variance if the effects of the other variables are removed.

**Conclusion**

The study clearly shows that the unfavorable investment environment restricts the investors to invest funds in projects. From this it can be understood that, the government is not taking proper measures to create an “investors friendly environment”. Key factors that constitute the investment climate for private investment in the power sector are: (i) strong public finances (ii) viability of the sector (iii) efficiency of fuel markets (iv) political climate including the role of civil society and (v) the legal framework.

The other dimension of reducing the risks of the project is by using suitable method of financing. Project finance is one of the means for mitigating or spreading risk among different partners. Project finance is emerged as a main financial instrument for bringing private capitals into the provision of power projects. But the projects should take care of the risk areas of the projects such as: The off-take...
arrangement, supply arrangement, environmental laws, force majeure, and high development costs. However, to mitigate political risk, Political Risk Insurance (PRI) and partial risk guarantees and partial credit guarantees offered by multilaterals can play an important role for investments in developing countries. Financial risk is reduced through government loan guarantees, and demand risk is reduced by minimum off take guarantee.

In risk management, identifying the risk mitigating instruments is very important. The risk mitigating instruments may be in the form of project securities or government securities, contractual agreements and risk insurance etc.

References

2. Akampurira, E., Root, D. & Shakantu, S.: “Factors constraining the implementation of public private partnerships in the electricity sector in Uganda”


### Annexure

Table 1: Factors restrict the investment of power projects (in percent)

<table>
<thead>
<tr>
<th>Sl:no</th>
<th>Factors restrict investment</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Many requirements to obtain project approval.</td>
<td>1.8</td>
<td>22.4</td>
<td>20.6</td>
<td>40.4</td>
<td>14.8</td>
</tr>
<tr>
<td>2.</td>
<td>Accusations of corruption and corrupt tendencies</td>
<td>11.1</td>
<td>40.4</td>
<td>19.3</td>
<td>26.4</td>
<td>2.9</td>
</tr>
<tr>
<td>3.</td>
<td>Poor credit worthiness of power off-takers</td>
<td>3.7</td>
<td>26.1</td>
<td>47.2</td>
<td>12.9</td>
<td>10.0</td>
</tr>
<tr>
<td>4.</td>
<td>High risks involved in project</td>
<td>7.4</td>
<td>25.6</td>
<td>16.4</td>
<td>40.6</td>
<td>10.0</td>
</tr>
<tr>
<td>5.</td>
<td>Strong political opposition to investor friendly reforms</td>
<td>8.4</td>
<td>35.6</td>
<td>30.1</td>
<td>18.2</td>
<td>7.7</td>
</tr>
<tr>
<td>6.</td>
<td>Lengthy legal process for settlement of loan agreements etc.</td>
<td>21.6</td>
<td>49.9</td>
<td>16.6</td>
<td>5.3</td>
<td>6.6</td>
</tr>
<tr>
<td>7.</td>
<td>Resistance from environmental groups (due to hazards, such as carbon emission)</td>
<td>5.0</td>
<td>1.6</td>
<td>20.8</td>
<td>40.1</td>
<td>32.5</td>
</tr>
<tr>
<td>8.</td>
<td>Frequent changes in government policies.</td>
<td>9.8</td>
<td>45.6</td>
<td>17.4</td>
<td>25.3</td>
<td>1.8</td>
</tr>
<tr>
<td>9.</td>
<td>Frequent increases in interest rates by commercial banks and financial institutions</td>
<td>9.0</td>
<td>37.5</td>
<td>30.9</td>
<td>21.4</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Note: 1 = “very low”, 2 = “low”, 3 = neither low nor high”, 4 = “high”, and 5 = “very high”.

Table 2: Mean scores of factors restrict the investment of power projects

<table>
<thead>
<tr>
<th>Sl:no</th>
<th>Factors restrict investment</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Many requirements to obtain project approval.</td>
<td>3.44</td>
<td>1.051</td>
<td>1.104</td>
</tr>
<tr>
<td>2.</td>
<td>Accusations of corruption and corrupt tendencies</td>
<td>2.70</td>
<td>1.067</td>
<td>1.138</td>
</tr>
<tr>
<td>3.</td>
<td>Poor credit worthiness of power off-takers</td>
<td>2.99</td>
<td>0.970</td>
<td>0.942</td>
</tr>
</tbody>
</table>
4. High risks involved in project & 3.20 & 1.149 & 1.321 \\
5. Strong political opposition to investor friendly reforms & 2.81 & 1.072 & 1.149 \\
6. Lengthy legal process for settlement of loan agreements etc. & 2.25 & 1.061 & 1.126 \\
7. Resistance from environmental groups (due to hazards, such as carbon emission) & 3.93 & 1.023 & 1.046 \\
8. Frequent changes in government policies & 2.64 & 1.023 & 1.046 \\
9. Frequent increases in interest rates by commercial banks and financial institutions & 2.69 & 0.951 & 0.904 \\

Table 3: The degree of project risks in power projects in India (in percent)

<table>
<thead>
<tr>
<th>Sl:no</th>
<th>Risk</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Financial Risk</td>
<td>8.7</td>
<td>18.7</td>
<td>22.7</td>
<td>48.8</td>
<td>1.1</td>
</tr>
<tr>
<td>2</td>
<td>Construction Risk</td>
<td>6.3</td>
<td>16.9</td>
<td>12.4</td>
<td>42.7</td>
<td>21.6</td>
</tr>
<tr>
<td>3</td>
<td>Operating Risk</td>
<td>17.7</td>
<td>36.4</td>
<td>21.6</td>
<td>16.4</td>
<td>7.9</td>
</tr>
<tr>
<td>4</td>
<td>Technology Risk</td>
<td>17.7</td>
<td>31.9</td>
<td>23.0</td>
<td>26.9</td>
<td>0.5</td>
</tr>
<tr>
<td>5</td>
<td>Legal Risk</td>
<td>3.2</td>
<td>32.7</td>
<td>23.2</td>
<td>23.0</td>
<td>17.9</td>
</tr>
<tr>
<td>6</td>
<td>Political Risk</td>
<td>11.6</td>
<td>35.4</td>
<td>22.4</td>
<td>25.1</td>
<td>5.5</td>
</tr>
<tr>
<td>7</td>
<td>Environmental Risk</td>
<td>23.7</td>
<td>26.1</td>
<td>14.2</td>
<td>29.3</td>
<td>6.6</td>
</tr>
<tr>
<td>8</td>
<td>Regulatory Risk</td>
<td>15.6</td>
<td>28.8</td>
<td>24.0</td>
<td>31.1</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Note: 1 = “very low”, 2 = “low”, 3 = neither low nor high”, 4 = “high”, and 5 = “very high”. 

*****