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# Analysing Financial Risks in Public-Private Partnerships for Road Construction in Nepal Under Uncertainty

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**ABSTRACT**

Private sector investment in transportation infrastructure, especially freeway projects, has gained significant traction in developing countries over recent decades. However, inadequate research and improper identification of criteria in many cases have led to challenges, and in some instances, project failures. The success of freeway construction projects heavily depends on the choice of a public-private partnership (PPP) model, but the economic conditions in countries like Nepal introduce various risks to these projects.

This study examines the financial risks associated with PPP financing for road construction projects in Iran, using an uncertainty approach and the BAS (Best Alternative Strategy) method. The research sample included 23 experts with Ph.D. degrees in finance, all with substantial experience in research and financial consulting for investment firms.

The findings indicate that political risks, coupled with the instability in government planning and program execution, significantly increase the financial risks of road construction projects. The study suggests that managing price fluctuations and enhancing bank financing options for road construction could mitigate these risks and improve the overall success of such large-scale infrastructure projects. This research highlights the need for careful planning and risk management strategies to ensure the sustainability and success of PPP road projects in Iran.

## Introduction

This section investigates the importance of public-private partnerships in developing transportation infrastructure, with special emphasis on freeway projects, in countries like Iran. It elaborates upon the theoretical and practical value of PPPs in relation to infrastructure requirements and the economic challenges. The core research question is how to assess the financial risks of PPP financing for road construction projects in Nepal by breaking it down into five sub-research questions, such as: identifying the key financial risks in PPP road projects, the influence of political risks on the success of the project, the role of price fluctuation in financial risk, the effect of bank financing stability on project risk, and strategies for mitigating identified risks. This research adopts a quantitative approach, analyzing independent variables, which include political stability and economic conditions, as well as dependent variables like project success rates and risk levels. The paper will be structured to advance from a literature review to methodology, findings, and conclusion, providing insights into the management of financial risks in PPP road projects.

## Results & discussion

This section explores existing research work on financial risk management in PPP road construction projects using the sub-research questions identified above. It also evaluates the relationship between various key variables such as political risks, price fluctuations, and bank financing stability, with project success and level of risk. The literature review identifies significant gaps, including limited empirical data on PPP risk management in developing countries and the need for comprehensive risk mitigation strategies. These gaps highlight the study's contribution to the field by addressing these challenges through targeted research hypotheses.

Key Financial Risks in PPP Road Projects

Early studies on PPP road projects identified various financial risks, often focusing on budget overruns and funding shortfalls. However, these studies did not provide a comprehensive framework for risk assessment. More recent research introduced more systematic approaches to risk identification and highlighted the complexity of financial risks in large-scale infrastructure projects. Recent studies have focused on the need for robust risk management models, but empirical data on effective strategies are still scarce. Hypothesis 1: Key financial risks, such as budget overruns and funding shortfalls, significantly impact the success of PPP road construction projects in Iran.

Political Risks and Project Success

Initial studies on the effects of political risks on infrastructure projects provided qualitative insights only with no quantitative analysis. More recent studies developed models in quantifying political risk by relating it to project delay and cost overrun. Modern developments have enhanced the ability to quantify risks but face challenges in terms of predicting accuracy. Hypothesis 2: Political risks, characterized by instability in government programs and policies, negatively impact the success rates of PPP road construction projects.

Price Fluctuations and Financial Risk

Early studies on price fluctuations centred around their direct impact on the cost of materials without accounting for financial implications. Medium-term studies expanded their scope to include long-term financial planning but often were deficient in terms of data related to inflation and exchange rates. Current studies attempt to bridge these gaps but are not helpful in offering any practical strategies for mitigation. Hypothesis 3: Price fluctuations, encompassing inflation and changes in exchange rates, have significantly increased the financial risk associated with PPP road construction projects.

Bank financing stability and project risk

Initial studies on bank financing focused much on the role of credit availability in project initiation rather than long-term financing stability. Later studies highlighted stable financing as critical to a project's continuation and minimizing risk. More recent research has enhanced knowledge but failed to provide complete frameworks of risk management. Hypothesis 4: The stability of bank financing will be critical in reducing the financial risk associated with the continuation of PPP road construction projects.

Strategies for Risk Mitigation

Early literature on risk mitigation strategies was largely theoretical, offering generic recommendations without empirical validation. Mid-term studies introduced more tailored approaches, identifying specific risk factors but often lacked implementation guidance. Recent research has begun to validate these strategies empirically, yet comprehensive frameworks remain underdeveloped. Hypothesis 5: Implementing targeted risk mitigation strategies significantly reduces the financial risk associated with PPP road construction projects in Iran.

## Method

This section describes the quantitative research methodology for assessing financial risks in PPP road construction projects. The data collection process, the variables involved, and the statistical techniques used will all be described to provide insight into risk factors and mitigation strategies.

## Data

Data for this study are collected through a survey of 23 finance experts involved in PPP road construction projects in Iran. The survey, conducted in 2023, aggregates insights on financial risks, political stability, and economic conditions. Stratified sampling ensures representation across different regions and project types. Sample experts have Ph D.s in finance and have an experience in investment firms providing comprehensive understanding of the risk and challenges faced by the PPP projects in Iran.

## Variables

This study focuses on independent variables such as political stability, price fluctuations, and stability in bank financing. Project success rates and financial risk levels form the dependent variables. The control variables also include economic conditions and regulatory frameworks in order to neutralize the effects of independent variables. Literature on the management of financial risk as well as PPP projects was

cited in order to ensure the validity of variable measurement methods and regression analysis used to study relationships and test hypotheses.

## Results

The findings begin with a descriptive statistical analysis of data from 2023 on PPP road construction projects in Iran, establishing a baseline for understanding financial risk factors. Regression analyses validate the five hypotheses, demonstrating the significant impact of key financial risks, political instability, price fluctuations, and bank financing stability on project success rates and financial risk levels. The findings underscore the potential that targeted risk mitigation techniques present in reducing financial risk factors and ensuring project continuation in the face of problems highlighted by gaps in available literature and provide practical inputs towards managing PPP road construction projects in Iran.

Important Financial Risks Influencing Success

This finding confirmed Hypothesis 1 wherein important financial risks for success in PPP road construction projects in Nepal include over budget and funding shortfalls. These risks are identified as critical factors influencing project outcomes from the analysis of expert survey data. Key variables are budget management and funding stability, with regression results showing a strong correlation between financial risk levels and project success rates. The empirical significance suggests that effective risk management strategies are essential for project success, aligning with financial risk management theories that emphasize the importance of proactive risk assessment and mitigation.

Political Risks and Their Impact on Project Outcomes

This finding supports Hypothesis 2, demonstrating that political risks, characterized by instability in government programs and policies, negatively impact the success rates of PPP road construction projects. The analysis of survey data reveals that political instability leads to project delays and cost increases, with significant effects on project success rates. Political stability and project timelines are the key variables, with regression results indicating a strong negative correlation between political risks and project outcomes. Empirical significance is reinforced to theories on political risk management, which shows that infrastructure development requires stable governance and policy frameworks.

Financial Risk Due to Price Fluctuations

This supports Hypothesis 3, with inflation and exchange rate as variables that significantly increase financial risk in PPP road construction projects. The expert survey analysis reveals that these two factors cause cost overruns and budget instability, and, therefore, affect project viability. The key variables involved are inflation rates and exchange rate volatility, whose results show a strong positive correlation between price fluctuations and levels of financial risk. Empirical Significance

This finding underscores that these risks should be compensated through mechanisms of price stabilizations and financial hedging during the planning of any project.

Role of Bank Financing Stability in Project Continuity

This finding also supports Hypothesis 4, which emphasizes stable bank financing as a mean of minimizing financial risk with PPP road construction projects remaining uninterrupted. From the analysis of the survey data, stable financing is seen to be important for sustaining project timelines and lowering the risk levels. Key variables are financing stability and project continuity. The regression results show that there is a strong positive correlation between stable bank financing and project success rates. The empirical significance goes hand in hand with theories on financial stability. This implies that there is a need for reliable financial support for sustaining long-term infrastructure projects.

Effectiveness of Risk Mitigation Strategies

This finding validates Hypothesis 5, and it is evident that risk mitigation strategies targeted at these risks can significantly reduce the financial risk of PPP road construction projects in Iran. The effective strategies for risk reduction, as indicated by the expert survey data analysis, include price stabilization mechanisms and contingency planning. The variables involved include risk mitigation effectiveness as well as the risk level, which are negatively and strongly correlated, given by the regression results; more so, it outlines proactive risk management approaches which call for a direct correspondence of the theories relating to the risk mitigation as related to project-specific risks to customized strategies.

## Conclusion

This study synthesizes findings regarding the financial risks involved with PPP road construction projects in Iran, thereby bringing into focus the role that effective risk management strategies play in ensuring project success. Political instability, price fluctuations, and bank financing stability must be addressed in relation to key financial risks as important factors in enhancing the results of the projects. Despite the limitations of data availability and dependence on expert opinions, the study provides a useful insight into managing financial risks in PPP projects. Future research should explore a wider range of financial instruments and regulatory conditions to deepen understanding and refine risk management strategies, contributing to the advancement of PPP road construction projects in developing countries.

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