第 IV 部門 Role of Multilateral Financial Institutions in Public-Private Partnership Projects

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1 Introduction

This research deals with sovereign risk allocation in Public-Private Partnership (PPP) projects. Often, the local government is financially incapable of providing for risk management costs, and the government faces *sovereign risk*. Sovereign risk occurs upon a shortage of the government's domestic liquidity required to finance project continuation. The most optimal way to mitigate sovereign risks is via the provision of outside liquidity. Liquidity provision can be incorporated in PPP projects by adopting the Liquidity Asset Pricing Model (LAPM) developed by Holmström and Tirole [?].

2 LAPM for PPP Projects

The LAPM for PPP projects develops a utility maximization problem of the government's utility subject to budget and liquidity constraints. It considers the demand and supply of liquidity in PPP projects to ensure project continuation in the case of sovereign risks. The LAPM for PPP Projects will verify the hypothesis that the role of multilateral financial institutions is to mitigate sovereign risks. (Multilateral financial institutions (MFIs) are nonprivate, international financial institutions with access to readily available international liquidity, e.g. World Bank (WB), etc.)

2.1 Framework of PPP Projects

A simplified of framework PPP projects is adopted in this model. Here, three parties are involved: the government, the project sponsor, and the MFI. The government creates the organizational scheme that invites the project sponsor and the MFI into the PPP project. The project sponsor provides a portion of the initial investment scale, and the MFI supplies the remaining total initial investment scale to establish the Special Purpose Vehicle (SPV) and launch the PPP project:



Fig. 1: Simplified Framework of PPP Projects

2.2 Utility Maximization Problem of the LAPM for PPP Projects

The following is the utility maximization problem of the government's utility subject to budget and liquidity constraints:

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$$\max_{\{I,i(\cdot),t^{\$}(\cdot)\}} E_{\rho} \bigg[\big(\rho_1 - \rho_0 - \rho_0^{\$}\big) i(\rho) \bigg] \qquad (1)$$

$$(I - A) + E_{\rho} \left[\beta(\rho)i(\rho)(\rho - \rho_0)s(\rho) + (1 - \beta(\rho))i(\rho)(\rho - \rho_0^{\$})s^{\$}(\rho) - t^{\$}(\rho) \right] \le 0$$
(2)

$$A + E_{\rho}[\rho_0^{\$}i(\rho) + L^{\$}] \ge E_{\rho}[t^{\$}(\rho)] \qquad (3)$$

$$(\rho - \rho_0)i(\rho) - t^{\$}(\rho) \le L \text{ for all } \rho \qquad (4)$$

The objective function (1) corresponds to the government's utility. Its maximization will solve for the initial investment scale I, continuation scale $i(\rho)$, and outside international liquidity $t^{\$}(\rho)$ needed for project continuation. The budget constraint (2) models liquidity demand and supply as to guarantee nonnegative project returns to all parties. The international liquidity constraint (3) ensures a sufficient amount of international liquidity provided by the MFI to the PPP project. The domestic liquidity constraint (4) enables the government to utilize the international liquidity from the MFI to mitigate sovereign risk and finance project continuation.

2.3 Graphical Solution of the LAPM for PPP Projects



Fig. 2: Graphical Solution of the LAPM for PPP Projects

The graphical solution is divided into 4 regions. The x-axis corresponds to the shortage of inside liquidity ρ and the y-axis denotes the continuation scale of the PPP project. Region *I* corresponds to the case where there is no shortage of the government's domestic liquidity. The government alone can provide risk management costs to ensure full continuation of the PPP project.

As shown in Region II, maximum continuation scale $i(\rho) = I$ is possible only if the shortage of the government's domestic liquidity is satisfied by outside international liquidity from the MFI. This ensures maximum project returns to all parties. Therefore, region II justifies that the role of MFIs is to mitigate sovereign risks in PPP projects by providing a supply of outside international liquidity.

In Region III, ρ is so great that not even the MFI's international liquidity can enable full continuation of the project. Accordingly, Region IV corresponds to values of ρ in which it is infeasible to continue the project at all.

3 Conclusion

The LAPM for PPP projects tackled the issue of sovereign risk allocation is PPP projects. Liquidity demand and supply was considered to model sovereign risk management via outside liquidity provision. It was proven that project continuation scale ensuring maximum project returns for all parties is achieved if the MFI satisfies the shortage of the government's domestic liquidity. Since the MFIs are the only party left with a source of readily available outside liquidity, they can mitigate sovereign risks at the highest efficiency. From a broader perspective, the LAPM for PPP projects implies that the role of MFIs is to capacitate governments to attain infrastructure development goals.

References

[1] Holmström, B. and Tirole, J. : *Inside and Outside Liquidity*, The MIT Press, 2013