Research on the Application of PPP + EPC Mode in Financing of Intercity Railway Projects

Renxu\textsuperscript{1,a}, Yaping Li\textsuperscript{1,b,*}

\textsuperscript{1} School of Economics and Management, Beijing Jiaotong University, Beijing, China
\textsuperscript{a}email: 8148@bjtu.edu.cn
\textsuperscript{b}* Corresponding author: \textsuperscript{b}email: 19120641@bjtu.edu.cn

Abstract: Through the analysis of the current situation of intercity railway project financing, this paper concludes that the demand of funds for intercity railway construction is huge, and it is still mainly debt financing, which leads to the huge financial pressure of local government. In order to alleviate the financial pressure and realize the real equity financing of intercity railway projects, this paper proposes to use "PPP + EPC" mode to finance. On the one hand, this mode can optimize the whole process management of the project; on the other hand, it can optimize the risk management and control in the project cooperation period, meet the risk return requirements of stakeholders, and promote the sustainable development of intercity railway projects.

1. Introduction

At present, China has entered the era dominated by the metropolitan area, and the central city and city circle have become the main spatial forms of carrying the development elements. Intercity railway has the characteristics of high efficiency, comfort and large traffic volume, so it plays an increasingly important role in strengthening the organic connection between central cities and urban agglomerations, as well as in promoting regional economic integration \cite{1}. In August 2020, the State Railway Group issued the "railway development plan for a new era of transportation power", which attaches great importance to the construction of intercity railway. It is proposed that by 2035, cities with a population of more than 200000 will be covered by railways, of which cities with a population of more than 500000 will be accessible by high-speed rail. The construction of Intercity Railway still has a huge development space in the future, and the capital demand is huge. Thus, the government introduces PPP mode to absorb private enterprise capital through deep cooperation with private enterprises to alleviate financial pressure and improve the service quality and operation efficiency of the project \cite{2}. However, due to the huge investment, long payback period and low return on investment of intercity railway projects, the participation enthusiasm of social capital is not high. Therefore, it is urgent to establish appropriate PPP financing mode to improve the participation enthusiasm in intercity railway projects of social capital.

The financing mode of intercity railway project is highly valued by scholars. Miao Changwei (2015) carried out SWOT analysis on three typical investment and financing modes of Intercity Railway: BOT, TOT and PPP, and concluded that different investment and financing modes should be applied in different development stages of intercity railway \cite{3}. Li Jianguang (2018) concluded that PPP mode could take into account the profitability and public welfare of intercity railway projects, and the maximization of social benefits could be easier achieved throughout the analysis of the application scope, financing
cost, financing risk, operation complexity and government control of five financing modes of PPP, BOT, BT, TOT and ABS [4]. Zhang Qingyun (2016) found that it is feasible to carry out the construction of intercity railway projects by "PPP + VGF" and "PPP + TOD"[4]. Hu Hao (2017) believed that the PPP mode should be adopted in the construction of intercity passenger railway. He proposed an improved PPP mode which could attract more social capital by combining the characteristics of intercity passenger railway and the defects of existing railway financing mode [5].

It can be seen from the above literature that although most scholars have shown that PPP financing mode is suitable for intercity railway project, the research on its specific operation mode is relatively deficient. Therefore, through the analysis of the financing status and financing difficulties of intercity railway project, combined with the characteristics of intercity railway, this paper puts forward the financing mode suitable for intercity railway project, so as to makes up for the deficiency of existing research on the financing mode of intercity railway, and provides practical reference for the financing of Intercity Railway.

2. The Present and Difficulty

2.1. The Present

For a long time, China's railway construction mainly relies on the investment of central and local governments. With the rapid growth of railway investment in recent years, the debt ratio of China Railway Corporation has also risen sharply, and the financial pressure has increased sharply. Therefore, it is urgent to change the railway investment and financing system and attract social capital [5]. Since 2013, the State Council has issued several documents which clearly indicate that the ownership and operation rights of Railways should be devolved to local governments and social capital. At the same time, it proposes to promote the development of Railways by means of comprehensive development policies of railway and land, supporting the Railway Corporation to activate Railway Assets through capital operation, and encouraging social capital to invest in railways through innovative financing modes. Although the government has provided sufficient policy support, due to the low investment return and long payback period of intercity railway project, it is difficult to meet the income demand of social capital. So the participation enthusiasm of social capital is not high. Most of the capital ratios of the intercity railways projects built early are relatively high. And there is no social capital involved. The funds are basically borne by the railway department and the local government. The financing situation of several intercity railways are presented in table 1. This undoubtedly aggravates the local government's financing responsibility, which makes the local government face huge capital pressure.

| The Project                  | Total Investment (Unit: million) | Proportion of capital (%) | Investment from Local Government (%) | Investment from China Railway (%) |
|-----------------------------|----------------------------------|--------------------------|-------------------------------------|----------------------------------|
| Beijing-Tianjin Intercity Railway | 123.4                            | 57                       | 61                                  | 39                               |
| Nanchang-Jiujiang Intercity Railway | 58.32                            | 50                       | 30                                  | 70                               |
| Changchun-Jilin Intercity Railway | 86                               | 50                       | 49                                  | 51                               |
| Guangzhou-Zhuhai Intercity Railway | 195                              | 50                       | 50                                  | 50                               |
| Shanghai-Nanjing Intercity Railway | 427                              | 50                       | 57.5                                | 42.5                             |

The reason why the social capital does not invest to establish the project company is that the equity investment period of the project company is long and the investment return is low or uncertain. The social capital also needs to bear the operational risk. In order to attract the participation of social capital,
the local government guarantees the return on investment of social capital side of PPP project through various ways [6], among which the most commonly used one is "Debt in the Name of Equity". "Debt in the Name of Equity" means that the social capital side introduces financial institutions, which invest in most of the project capital in the form of equity in nominal terms, but the return on investment is not linked with the operating performance of the project company, but signs a repurchase agreement with the capital demander and obtains a fixed return. In essence, it is a kind of structural debt financing [7].

Generally speaking, now the capital of intercity railway is the debt in the name of equity and project loan is originally debt financing, so the overall financing of Intercity Railway PPP project is still mainly debt financing.

2.2. The difficulty
Due to the long term of intercity railway PPP project, the investment content includes multi-stage and different types of business activities, such as construction and project operation, which will exist project design scheme change, construction scheme change, construction period extension and force majeure risk and other different operational risks. Financial institutions and non-financial institutions do not have sufficient post investment management and risk prevention ability, so they can only transfer the risk to the government through "debt in the name of equity", which means that the government is required to provide buy back, make up the difference and cover the bottom guarantee. Since November 2017, a series of regulatory policies of "de channeling, reducing leverage, eliminating non-standard and breaking rigid exchange" have had an important impact on the financial capital of intercity railway PPP projects, especially "debt in the name of equity". For example, on November 10, 2017, the notice on standardizing the management of project base of government and social capital cooperation (PPP) comprehensive information platform (CBJ [2017] No. 92) forbids the government to provide minimum guarantee for social capital, and does not allow "using debt capital as capital".

In addition, although the government encourages the introduction of social capital by PPP mode and encourages social capital to participate in the investment, financing and construction of intercity railway projects, there is no effective mode with the essence of PPP mode in the practice. There is no reasonable risk sharing and benefit sharing mechanism between government and social capital. The government undertakes most of the risks and the interests of the social capital are guaranteed by the government by providing viability gap funding.

The financing mode for intercity railway projects need to be innovated to realize real equity financing and to ensure the realization of the essence of PPP mode.

3. The Existing financing mode
PPP (public private partnership) mode is the public-private partnership mode. It is a financing mode for the government and the private sector to jointly invest and share risks in the construction of public infrastructure [8]. Under the PPP mode, the intercity railway introduces social capital through bidding, and the public sector grants franchisees 15-25 years of franchise rights for the whole project by signing franchise agreement. The government and social capital parties jointly contribute to establish the project company. During the franchise period, the project company is responsible for the operation and management of intercity railway projects. After the franchise period, the project company will hand over all project facilities of intercity railway project in good condition to the government or the designated department. However, due to the large investment amount and low investment income of intercity railway PPP projects, there are not many PPP projects that really realize the essence of PPP mode. Most of them adopt the form of "debt in the name of equity", that is, social capital introduces financial institutions to act as financial investors to realize equity financing. The general operation mode is shown in the figure 1.
Figure 1. The mode of "debt in the name of equity"

In this model, the industrial fund is composed of financial capital (priority limited partner) and social capital (inferior limited partner). The fund management company, as a general partner, exercises management rights and assumes unlimited joint and several liability. As for the withdrawal of capital, financial capital has the priority to get paid back while social capital as an inferior limited partner get paid back later, which reflects the role of financial capital as a safety cushion.

The core of debt in the name of equity" is repurchase. According to different repurchaser, it can be divided into three types: social capital side repurchase, project company repurchase (Type A) and government buyback (Type B). Then social capital side repurchase can be further divided into fund internal repurchase (Type C) and fund external repurchase (Type D).

4. the “PPP+EPC” mode

The government encourages the construction of intercity railway projects in PPP mode, aiming to attract social capital to invest in intercity railway projects. The two sides of the company carry out market-oriented, transparent and long-term cooperation \(^7\), so as to change the old mechanism that the government is fully responsible for the investment, construction and operation of Intercity Railway Construction, reduce the investment cost and increase the investment cost. However, the debt financing mode of project capital deviates from the essence of PPP mode. Under the real PPP mode, social capital should carry out real equity financing. The core of attracting social capital into intercity railway project construction is to guarantee its interests. Intercity Railway constructed in economically developed, densely populated urban agglomerations, aims to ease the increasingly saturated passenger pressure brought by the rapid development of urbanization. Therefore, it can ensure that it has sufficient passenger traffic volume and strong profitability, so it is a good target to attract social capital. Therefore, combined with the characteristics of intercity railway and China's railway management system, this paper proposes to use "PPP + EPC" mode to finance to construct intercity railway. The "PPP + EPC" mode is shown in figure 2.
Figure 2. The financing of PPP+EPC mode

4.1. The basic principles
During the construction, the principle of "station separation" is adopted, that is, the station is separated from the project, and the local government is responsible for its construction alone. Referring to the airport use payment mode, the station is rented to the project company to collect the rent. Using the comprehensive development mode, the stripped station and surrounding land are packaged into asset pool for commercial operation, and the revenue is shared with the project company according to the agreed proportion.

The principle of separation is "separation of assets and no separation of transportation and production".

4.2. The basic content
Construction stage: the government and the social capital side jointly contribute to establish the intercity railway project company. The project company and the social capital party sign the Engineering Procurement Construction contract, and the social capital is responsible for the construction, operation and maintenance of the line. Under the condition of no competition, the social capital side can obtain sufficient construction profits. The local government is responsible for the part of the station, which is packaged with the surrounding land for comprehensive development, and the revenue is divided according to the agreed proportion.

Operation stage: according to the characteristics of intercity railway operation, such as relatively independent operation and no interference from unified dispatching, the project company can rely on franchise rights to operate independently. The station is used by paying rent to the government in the form of user payment.

Exit stage: when the operation of intercity railway project reaches a relatively mature stage, it can be realized through asset securitization or direct sale of equity.

In this mode, the "PPP + EPC" mode is adopted, that is, the social capital side is the general contractor of construction at the same time, which makes the investment shareholders of the project tend to be consistent in pursuit of investment income, cost control, quality and construction period, so as to meet the risk return requirements of various stakeholders.

4.3. The essence of operation
The essential reason why intercity railway cannot attract social capital is that intercity railway has the characteristics of large investment, high risk, long period and low return on investment. "PPP + EPC" mode is a hybrid mode of PPP and EPC. Its essence is to broaden the income channels of social capital side through the way of social capital as general contractor, and establish interest compensation
mechanism based on the incentive compatibility theory that rail transit battlefield affects the extremely poor rent of surrounding land and the return of land value-added benefits [9], so as to form a reasonable risk and benefit sharing mechanism between the government and the social capital side.

The interest compensation mechanism is that the government, relying on its information and resource advantages, collects the land around the station at a low price, and then integrates the station and the surrounding land to make the land appreciate. Then the government can obtain the price difference between "raw land" and "mature land" and share the benefits with the social capital side. And this can promote the sustainable development of intercity railway and its hub exhibition.

4.4. The advantages of "PPP + EPC" mode

Optimize the whole process management of the project. The project adopts the general contracting mode, and the general contractor is responsible for the whole process of intercity railway project line construction, including design, procurement, construction, etc., so as to avoid the mutual restriction and disconnection between various links of the project. It can give full play to the integrated management advantages of the general contractor and investors, and integrate the investment and financing strength, design ability, construction ability, mature procurement network and other professional models To make overall arrangement [10].

Optimize the whole process management of the project and meet the risk return requirements of stakeholders. As the line builders (social capital) and station builders (the government) are consistent with other stakeholders in pursuit of project investment income, cost control, quality and construction period objectives, they will actively bear the risk of cost control, generate cost saving motivation, and control the project quality, progress, capital use, etc. Therefore, it can ensure that the project is completed with high quality within the deadline, and the financing risk of stakeholders can also be reduced.

4.5. The feasibility analysis of "PPP + EPC" mode

"PPP + EPC" compliance analysis. According to Article 9 of the regulations for the implementation of the bidding law of the people's Republic of China (hereinafter referred to as the regulations), "if the franchised project investors selected by the bid inviting party are able to carry out construction, production or supply according to law, no bidding is required" and Article 9 of the notice of the Ministry of Finance on in-depth recommendation of cooperation between government and social capital in the field of public services (CJ [2016] No. 90) stipulates that "for PPP projects involving engineering construction, equipment procurement or service outsourcing, social capital partners have been selected in accordance with the government law, and the partners are able to construct, produce or provide services on their own in accordance with the regulations Article 9 stipulates that the partner may not invite tenders any more. "It can be seen that when the social investors have the corresponding design and construction qualifications, it is in compliance to confirm that the PPP project of intercity railway is the EPC general contractor of the intercity railway project while confirming that it is the investor.

"PPP + EPC" practical feasibility analysis. The existing construction units have strong capital strength and comprehensive qualification advantages. On the one hand, through long-term construction, today construction enterprises have a relatively strong financial strength to invest in intercity railway PPP projects; on the other hand, many large-scale construction central enterprises generally have comprehensive top-level qualification and experience in the construction field, and are qualified to be general contractors. Therefore, "PPP + EPC" mode is realizable in reality.

5. Conclusion

This paper analyzes the financing defects of existing intercity railway and the characteristics of intercity railway, and concludes that "PPP + EPC" mode can effectively improve the enthusiasm of social capital to participate in intercity railway project construction. Under the "EPC + PPP" mode, the intercity railway project can realize real equity financing, and ensure that the government and social capital can truly realize "risk sharing and income sharing". Also, it can be sure that Intercity railway project has the essence of PPP. With the continuous development of urbanization in China, the construction demand for
intercity railway projects will continue to increase. Coupled with the vigorous promotion of EPC mode by the state, "PPP + EPC" mode will play an increasingly important role.

Acknowledgments
This paper is one of the phased achievements of the general project of National Social Science Fund "Research and development project of science and technology of China Railway Corporation" (2017 T002-A).

References
[1] Li, J.G. (2018) Discussion on the Financing Mode for Intercity Railway Construction in China. Urban Mass Transit, 21(12):1-4.
[2] Li, Y., Ren, X. (2020) Operational Risk Evaluation of PPP Project in Urban Rail Transit. Railway Standard Design,26(10):1-10.
[3] Miao, C.W. (2015) Research on Investment and Financing Model of Interurban Railway. TianJin University.
[4] Zhang, Q.Y., Wang, J.M. (2016) Construction of Intercity Railway by PPP Mode. Construction Enterprise Management, 02:109-110.
[5] Hu, H. (2017) Application of Improved PPP Mode in Intercity Passenger Railway Project Financing. Gansu Social Sciences, 02:240-244.
[6] Wang, F., Xiong, W., Zhang, M.Y., Zhong, N.H. (2020) The Alienation of PPP Financing under Strict Control of Local Government Debt ——Analysis Based on Promotion Incentive. China Economic Quarterly, 19:1103-1122.
[7] Li, Y., Xing, W.J., Wei, C.F. (2018) Introspection and Reconstruction of Capital Financing for PPP Projects in the Background of Standardized Operations. On Economic Problems, 08:32-39.
[8] Ren, B.J., Li, Y.Y., Wang, Z.J. (2019) A Tentative Study on PPP Investment and Financing Model of Urban Rail Transit. Railway Transport and Economy, 41:106-111.
[9] Yin, H.J., Guo, J.E., Zhao, X.W. (2012) Analysis of High-speed Railway Earning Level and Optimization of Investment and Financing Mode. East China Economic Management, 26(02):74-78.
[10] Zhao, Z.J. (2018) Realization Path and Related Thinking of PPP + EPC Mode. Chinese Consulting Engineers, 02:78-82.