



The impact of the risk factors on the debt leverage of project financing initiatives in the Social & Health sector

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Abstract

Public–private partnerships (PPPs) have been utilized worldwide as an effective tool to fill the gap between the surging demand and supply of infrastructures in such type of project financing (PF). To be successful, large PPP projects require huge capital investments and face high uncertainties, at the majority of the times. Following that rationale, the research topic for dissertation is related the equity capital structure model for Public–Private Partnership (PPP) projects, with the aim of trying to understand the main factors influencing the capital structure of for the Special Purpose Vehicles (SPV) in PPP projects. That being said, to investigate the variables that may affect the amount of debt capital on the capital structure of a PF initiative, an empirical analysis is provided. The aim of such analysis is that a number of project risks associated with countries, financial indicators, revenues, the project itself, and SPVs are established together with their dimensions and corresponding numerical indicators. The findings demonstrate that nine of the initial eleven risk factors significantly affect the debt leverage. For a PF mechanism used to finance a Social and Health investment, the regulatory quality, geographical area, real long-term interest rate, the GDP growth rate volatility, the investment size of the project, a project owner's revenues, the number of partners involved in the PPP and the competitiveness of the project prove to be significant variables of the debt-to-capital ratio. As it was noticed, all the nine risk factors differently impact the parties involved in a PPP (Private Investors, Government Authorities, Financial Institutions, among others).

Key-words: Leverage, Indebtedness, Risk, Public-Private Partnerships

JEL-Codes: E31, E43, G34

Sumário

As parcerias público-privadas (PPPs) têm sido utilizadas globalmente como um instrumento eficaz para preencher a lacuna entre o aumento da procura e a oferta de infraestruturas neste tipo de financiamento de projetos (PF). Consequentemente, para serem bem-sucedidos, os grandes projetos de PPPs exigem enormes investimentos de capital e enfrentam grandes incertezas, na maioria das vezes. Seguindo este racional, o tema de investigação para esta dissertação relaciona-se com o modelo de estrutura de capital para projetos de Parcerias Público-Privadas (PPP), com o objetivo de tentar encontrar a capacidade de endividamento para os Special Purpose Vehicles (SPV), envolvidos nesses mesmos tipos de projetos. Consequentemente, com vista a investigar as variáveis que podem afetar estrutura de capital de uma PPP, é apresentada uma análise empírica. O objetivo desta análise é estudar um conjunto de fatores de risco que podem impactar o projeto. Riscos estes associados ao país do projeto, indicadores financeiros e de receitas, ao projeto em si e SPVs, juntamente com as suas dimensões e indicadores numéricos correspondentes. Os resultados demonstram que nove dos onze fatores de risco iniciais afetam significativamente o endividamento neste tipo de parcerias. Numa parceria destinada a financiar um investimento no setor Social e da Saúde, a qualidade reguladora, a área geográfica, a taxa de juro real de longo prazo, a volatilidade da taxa de crescimento do PIB, a dimensão do investimento do projeto, as receitas do proprietário do projeto, o número de parceiros envolvidos na PPP e a competitividade do projeto revelam-se variáveis significativas na estrutura de capitais do mesmo. Por fim, verificou-se que todos os nove fatores de risco têm um impacto diferente nas partes envolvidas numa PPP (investidores privados, autoridades governamentais, instituições financeiras, entre outros).

Palavras-chave: Alavancagem, Endividamento, Risco, Parcerias Público-Privadas

Códigos JEL: E31, E43, G34

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1. Introduction

Although it has always been noticeable that a regular involvement of a private party in public service delivery, Public-private partnerships (PPPs) became fashionable in the early 1990s in member countries of the Organization for Cooperation and Development (OECD). The concept in the United States and Europe has existed for centuries, but has become more prominent in the last decades in local economic development (Keating, 1998). According to Akintoye (2003), PPP program offer a long-term, sustainable approach to improving social infrastructure, enhancing the value of public assets and making a better use of taxpayer's money. It has been observed also that the domination of such partnership can vary essentially between the two main parties: the private and the public sector (Savitch, 1998).

In that way, PPPs may work as an effective tool to fill the gap between the required capital investments and the available funds to do so. However, the successful implementations of large PPP projects are hindered by multiple risks and uncertainties. According to Sainati et al. (2017, p.55, abstract), despite their relevance, particularly for governance, “*Special Purpose Vehicles are under-investigated*” and there is neither a “*widely accepted definition of SPVs nor a clear understanding of what it does*”.

Regarding its worldwide historical evolution, in the Western European hemisphere, the UK has taken a lead position in PFI procurement, although Spain, Portugal, Finland and Holland have been pointed-out by having, as well, advanced PFI-type arrangements (Ball, 1999). On the other side of the Atlantic, the US is also known as a country with a wide diversity of such partnerships, where the government strongly invests in sectors such as energy, water, transportation, among others. In developing countries, considering a hierarchical listing of the incidence of these PFI schemes, Latin America ranks itself above the South East Asia and the Sub-Saharan African countries are the ones who present less PPP projects, mainly due to their small-scale investments (Akintoye, 2003).

Therefore, in order to establish a relationship between the evidenced environment over PPPs and the research topic for this dissertation, the identification of the driving factors for the capital structure of PPPs, the aim is trying to find the debt capacity for the SPV in PPP projects. The rationale for such empirical study is to collect and understand the risk factors

that are responsible for influencing the debt leverage of project financing initiatives, achieving therefore the debt-to-capital ratio that maximizes either “project sponsors’ investment on return or project’s net present value” (Feng et al., 2017, p.144).

In addition, it is known that the majority of PPPs are intended to finance either public services or projects that, at the majority of the times, are related with an engineering component. However, and not finding that the nature of the aforementioned projects is worthy of any impediment in framing the dissertation in a master's degree in finance, during the process of trying to find variables that explain the formation of the $D/(D+E)$ of a PPP, the main financial research question is expected to be answered: should PPPs have more or less indebtedness?

2. Literature Review

2.1. Public-Private Partnership (PPP) and its motivation

The main goal of such tool of New Public Management (NPM), i.e., in the case of a “little if any difference between the public and private sectors in terms of the management resources” (Girard et al., 2009, p.371), is essentially to take advantage of two distinctive worlds. On the one hand, with the intention to satisfy the public interest and respective citizens’ needs, the public sector (in its essence, the government) is entrusted to rationally decide by means of its authority. On the other hand, it exploits the advanced technical skills of the private party, as it traditionally presents a higher performance when compared to the aforementioned counterparty (Silvestre & Araújo, 2012).

As such, Public–private partnerships (PPPs) are public infrastructure projects that use the participation of private sector entities in order to increase the supply of funds and hence the value for money (VFM) of those. According to Jackson, P. (2012, p.1), VFM of a project represents “the optimum combination of whole-life cost and quality (or fitness for purpose) to meet the user’s requirement” through the achievement of the best balance between the “three E’s” – economy, efficiency and effectiveness. To do so, a private company or a concessionaire of several companies is granted the responsibilities of financing, building, and operating a public project to provide products or services (Xiong and Zhang, 2014). However, the consistent and systematic negotiation between the two (or sometimes more) parties does not only rely on one possible role-division, but instead in an agreement about the best ways to conduct their activities at every stage of the process (Ham & Koppenjan, 2001).

Historical evidence has shown the adoption of PPPs has essentially covered a range of activities, including “construction, rehabilitation, development, and maintenance of infrastructures such as hospitals, highways, bridges, railroads and tram lines, schools, hospitals, and prisons” (Silvestre & Araújo, 2012, p.317). In turn, it is important to mention the implementation of such partnerships not only enhances the supply efficiency of public services but also saves public investments, meaning that the returns that result from such are capable to offset the initial investment (HM Treasury 2015). As a consequence, governments’ involvement in these co-operations have been the target of analysis by academics, where a

trend of their higher willingness to join and invest on these type of partnerships has been noted by distinct authors such as Burger and Tyson (2006).

The evidenced behaviour in some member countries of OECD is essentially justified by the several (potential or in theory) advantages in engaging in such operations. According to FHWA (2007), and scrutinizing the before mentioned skills and expertise derived from the private parties, the public sector is benefitted in the sense it can accelerate the project delivery, through its increased efficiency that results from the reduction of costs and quicker access to additional resource capability and capacity (e.g., innovative technology and techniques). In addition, OECD (2008) provides a significant group of reasons to support the creation of PPPs, such as the ease to properly deal with the individual departments budget not to succumb in the fallacy that government increases their ability to spend more; to ensure those same departments do not adopt a “free rider” behaviour as well as fulfil all the requirements regarding risk transfer, value for money and affordability. In its essence, these partnerships promote the separation between the practice and the policy. Akintoye (2003) adds other two motivations (for the public sector) to integrate in such projects related with the transfer of risks to the private sector in a large scale as well as the attraction of potentially more sophisticated bidders to the project, mainly due to the increase of the intensity of the competition.

2.2. Types of Public-Private Partnerships (PPPs)

Depending on the extent of involvement, risks and responsibilities of the private sector in a project, PPPs can necessarily take the following five different forms (Rebeiz, 2012). First, in the case of a procurement, the government, in spite of outsourcing procurement activities to the private sector, holds the overall control of the infrastructure. Second, distinguishing itself from the previous scenario, in a management contract, the government releases some control and operation of the asset to the private party. Third, when the private sponsor rents the infrastructure for a pre-determined time period and, at the same time, has the right to receive the cash flow resulting from operating with such asset, the lease contract is the one assigned to such situation. Then, being the most common type of contract, a concession results from the assignment (by the public sector) of the right to finance, build and operate an

infrastructure project to the private agent, over necessarily the concession period. By the end of such period, the private sponsor is required to transfer the control and assets' ownership back to the government. This type of contract will be a target of further detailed analysis once, as aforementioned, prevails the most in such type of partnership. Lastly, in a divestiture or privatization scenario, the government fully transfers the ownership and control of the assets to the private party.

In Table 1, more information can be assessed with respect to the various contract types and their respective forms.

Table 1: Different forms of each type of PPP [Source: Silvestre & Araújo, 2012]

Contract Type	Form	Definition
Lease	Lease-Build-Operate (LBO)	A private firm, with its own funds, builds and operates the public service but pays a fee to the government; its long-run return on the investment derives from user fees.
Concession	Build-Transfer-Operate (BTO)	A private firm builds and delivers certain public services at its own expense. Once completed, the firm transfers property rights to the government, which in turn awards the builder a contract to run the facility. The revenues come from user fees.
	Built-Own-Operate-Transfer (BOOT)	A private firm, using its own funds, sets up a public service. In contrast to the preceding arrangement, the private firm retains the right to operate the service and collects user fees to recover the return on its investment. After the firm's established concession period ends, property rights are transferred back to the government.
	Buy-Built-Operate (BBO)	A private firm purchases the property rights to an existing public entity and acquires the right to develop and manage it in the long term. Revenues derive from user fees, but a franchise payment to the government is expected.
Divesture	Build-Own-Operate (BOO)	A private firm is allowed to retain the ownership of the project indefinitely with no obligations to return it to the government.

2.3. Special Purpose Vehicles (SPVs)

According to Akintoye et al. (2001, p.361), in a Project Financing Initiative (PFI) the bulk of the project risks are transferred to the private sponsor, essentially through “a special purpose vehicle (SPV) which includes the main private sector companies engaged in particular project, namely a construction company, facilities management company (or operation company) and project financiers”.¹ As such, a SPV can assume two different types of a company, according to its nature: an intangible organization without employees or offices (also referred as mailbox companies) or a large organization with a considerable number of employees (Sainati et al., 2017).

The historical evidence shows this dichotomic definition has been considered as the main cause of three essential problems, such as the lack of transparency, tax optimization and ineffective policies. Regarding the first problem, that results from off- balance sheet financing operations, it was noticed that in some specific countries this type of vehicle is not reported on the financial statements or other official corporate documents (Schwarcz, 2006). Also, being the fiscal optimization one of the main purposes for the constitution of a SPV, can happen their operations take place in a different area than the one such company is fiscally registered, and hence benefiting from low tax jurisdictions (BCBS, 2009; Larson, 2008). In last, at a legislator level, SPVs are considered to be companies who are difficult to regulate and potential drivers of financial crisis and scandals, consequently leading to the reinforcement of the law (Smith, 2011)².

Therefore, as the majority of the instruments with a corporate or financial dimension, SPVs bring with them both advantages and disadvantages in their three knowledge domains of action: legal, management and financial³ (Sainati et al., 2017). An example of an advantage is related with the ability to attract external financial resources, i.e., being an external and self-fenced entity, all risks exogenous to the project are reduced, resulting essentially in the

¹ In Figure 2 (Appendices) more information can be assessed with respect to a typical set-up of a PFI scheme and the main participants.

² An example of such was the Portuguese recent case (2019) involving Chinese controlled EDP and French ENGIE firm in the construction of six hydroelectric power plants in the Douro, after opposition lawmakers claimed it used loopholes to avoid tax payments. More information in: <https://www.reuters.com/article/portugal-companies-edp-idUSL8N2LL57X> (Reuters, March 23, 2021)

³ In this dissertation, the focus of the investigation relies the most on the financial domain, in order to be in accordance with the nature of the master degree it is destined to.

increase of the SPV's debt leverage at a low cost (Finnerty, 2013). In addition, the findings of Clifton & Duffield (2006, p.573) support the idea of a “successful governance of PFI/PPP projects through structuring agreements to achieve improved value for money” that necessarily enables and contributes to a higher stakeholder integration during the life cycle of the project as well as in a better risk sharing between all the parties involved. As slightly mentioned before, according to BCBS (2009), the fiscal advantages in some countries seem evident and, as a last advantage of such entity, the SPV eases the transfer of assets among companies (Sainati et al., 2017). In turn, due to all the due diligence and negotiation process that is required to constitute such company (Finnerty, 2013) aligned with sometimes too long stakeholder commitment to the infrastructure can essentially result in a demotivation to engage in such type of operations. Finally, Demirag et al. (2011, p.1317) tried not to answer “what” risks are allocated and to “whom”, but instead “how” and “why” they should be, reaching the conclusion “risk aversion and diffusion and the consequent need for advice add cost to the projects”.

2.4. Financing methods in Public-Private Partnerships (PPPs)

In order to finance the aforementioned public sector facilities and large infrastructure investments, which overtime have been increasing in both frequency and size, capital must be raised once the project sponsors, in the majority of the times, cannot provide the required collateral for any bank loans. In result, project finance (PF) is a scheme fundamentally characterized by the repayment of the loan, destined to the implementation of the project, with its respective future cash flows. Thus, this type of loan follows a ‘limited or non-recourse’ basis (Zhang, 2005), i.e., the lender of such loan is not properly concerned about the associated credit risk (as the case of a traditional loan), but is instead, being limited to assess only the project's assets and consequent cash flows, concerned about “risks that may threaten the project completion and operation”, about to be presented in the next section (Akintoye et al., 2001, p.363).

As a consequence of the already mentioned (more precisely, in 2.3 section) low cost of debt issuance, SPVs are highly leveraged companies once their members benefit from several financial options for financing PFI schemes, such as the traditional bank debt (senior and

subordinated debt), bonds, leasing contracts, mortgage and mezzanine finance (Akintoye et al., 2001). Hence, only small amounts of equity (about 10 - 15%) remain to complete the company's capital structure and, therefore, the expected D/E is necessarily high, usually in the order of 70/30 (Cuttaree et al., 2009).

Going through all the mentioned financing instruments for PPP projects, it is noticeable the senior debt, due to this re-payment priority and the perceived security, is the one with the lowest cost-of capital (once it carries lower interest rates⁴ than the subordinated debt). However, it has more onerous covenants and limitations by restricting, for instance, the company's flexibility to raise additional debt or to pay dividends to the equity holders. On the other hand, the subordinated or high-yield debt carries a higher interest in order to compensate investors for their risk in holding such debt and elementally to increase their companies' leverage ratio in a reasonable amount.

In the case of issuing bonds, the project sponsors can opt between public or privately placed bonds. According to Akintoye et al. (2001), the latter ones are bonds which large financial institutions buy and hold and, as a consequence of that, the risk of issuing bonds is mainly noticeable in public issued ones (where it can actually vary, depending on which agent carries the risk). In a scenario where the bond issuer guarantees "the bond and the payment of the principle and the interest", the project specific risk of default is removed from the investor, as opposed to when the purchaser takes the direct risk if the project experiences any type of difficulties (Akintoye et al., 2001, p.367). The type of bonds in analysis are credit enhance and non-credit enhance bonds, respectively.

In Table 2, more information can be assessed with respect to the differences between traditional can debt and bond finance in Project Financing Initiatives (PFI).

⁴ Normally floating ones such as LIBOR/EURIBOR plus (or minus) a premium (or discount), according to the characteristics of the borrower.

Table 2: Comparison between traditional bank debt and bond finance in PFI [Source: Akintoye et al., 2001]

Bank debt	Bond finance
Flexible finance	Fixed regime finance
Low cost	Wrapped product with even lower cost
Low disclosure requirements	Public listing and high disclosure requirement
Quick to deliver	Need to involve third parties
Long-term finance	Can be extended even beyond bank debt
Refinancing ability is easy	More difficult to refinance

Regarding the equity portion normally present in the PFI deals, this can be divided in two different types: pure equity (that refers to market capitalization) and quasi equity (that refers to subordinated debt). In fact, the last one has attached to itself some tax related and legal efficiencies once the interest on this type of debt is tax deductible and thus enables the SPV to pay lower taxes, the so-called tax shield.

Furthermore, being less frequently used and hence representing a lower percentage of the SPV's capital structure, there can be found the other three financing methods. Also, with the aim of engaging in tax-optimized operations or even to take tax advantages of such, the large lease financial institutions that own the assets "retain the benefits of capital allowances and charge the SPV a series of lease payments" (Akintoye et al., 2001, p.368). In the case of a mortgage loan, where the asset is owned conditionally by the SPV, the borrower has the right to use the same during the mortgage payback period and is required to pay regularly the pre-determined principle and the interest. Lastly, mezzanine debt ranks last in the hierarchy of a company's outstanding debt and is often financed by a third party, such as private equity investors, hedge funds and investment banks. In interest-related terms it sits between the senior debt and the quasi equity but it often takes the form of high-yield debt coupled with warrants (i.e., options to purchase a stock at a predetermined price), working as an 'equity

kicker' that boosts the investors' returns to acceptable levels commensurate with risk⁵.

Moreover, as an added-value to the literature, Chen et al. (2013) introduced another party to the PPP project financing scheme, the local hosting governments as a minority equity holder of the created SPV. Offering financial subsidies to support the project, governments aim to mitigate the adverse effects on the project's creation, implementation and durability, making financially viable PPP projects attractive to private sectors. Consequently, government subsidies can be treated as an outside financing source for PPP projects besides equity and debt financing.

2.5. Risk factors influencing the debt leverage of Public-Private Partnerships (PPPs)

Through the reading of the previous academic literature, it is possible to reach the conclusion that risk plays an undeniable role in determining the financial leverage of a PF scheme. However, the optimal capital structure for a PPP and consequent risk allocation becomes a difficult issue, as the parties involved (debt holder, private sector and public sector) have different goals. As such, debtholders are usually concerned with the bankability of the project and hence require a minimum level of debt service coverage ratio (Zhang, 2005), i.e., "the ratio between the cash available before the debt repayment and the total amount of debt to be repaid in the same period" that needs to be greater than one (De Marco & Mangano, 2017).

From the private sector firms' point of view, Feng et al. (2017) highlight the attempt to reduce the utilization of private equity in order to raise the rate of return through the impact of financial leverage and the project must meet their requests for minimum internal rate of return (IRR) or net present value (NPV) in order to be accepted. In last, the public sector entities, with the offering of the aforementioned subsidies, are not only prone to alleviate the financial pressure for the private sponsors (Chang et al., 2013), but also require a minimum level of equity investment from them in order to fortify their long-term commitment to the

⁵ In Figure 3 (Appendices) more information can be assessed with respect to the relationship between the risk profile and the rate of return for the main financial components used in PFI financing.

project (Kurniawan 2010), increasing the operational transparency of the same.

Knowing the intentions and requirements of all the involved parties in the implementation of the project, it is necessary to understand what are the variables responsible and that actually condition those same goals and objectives. From a financial point of view of the risks associated to such partnership, Akintoye (2003) distinguishes these in six different categories: systematic or market risk, non-systematic or specific risk, credit risk, counterparty risk, operational risk and legal risk.

With respect to market risk, i.e., the one that cannot be diversifiable by the involved agents, changes in consumer spending, level of industrial output, inflation, interest and exchange rates are examples that clearly impact equities to some extent. In turn, related to the availability of an asset, and the continuity and quality of service delivery arises the specific risk, the one that can be mitigated by investors.

Furthermore, credit risk involves all the situations where the debtors fail to fulfil their contractual obligations (e.g., the principal and interest are not paid in the pre-determined time period) and, aligned with the latter, the counterparty risk emerges when one of the parties does not performs its obligations, as for instance the level of commitment of the project sponsors that can delay or even abort the PFI scheme (in the case of being considerably diminutive).

Operational risk necessarily grounds itself to the design, building cost overruns and the aforementioned project delays as a result of “human errors, inadequate control, systems failure, varying measurement units, inconsistent standards”, among others (Akintoye, 2003, p.38). Lastly, with the consistent and permanent change of the legislation to face fraudulent actions or non-compliance with security laws, the project sponsors might have to deal with adverse consequences on the course of the same.

3. Methodology

In this chapter we will present the methodology used for the research question formulation, more precisely, the model applied followed by the description of its variables.

3.1. The Model

Despite the panoply of risks that can impact the aforementioned partnerships, little available research has been carried out to quantify the relationship between those and the capital structure of the project itself. As such, and based on De Marco and Mangano (2017), in order to capture the relationship between the project risk profile and the debt-to-capital ratio (which represents the capital structure of a PF investment), a linear regression is expected to add value to the previous literature.

The first step consists essentially in the selection of a group of risks (covering all the risk categories in Table 3) and the association of these to a proxy parameter, which is in turn will be measured by a numerical indicator.

Table 3: Different risk categories and respective indicators that can impact the capital structure of a PFI

Risk Sources	Indicators
Country	Government Effectiveness
	Regulatory Quality
	Country Stability Index
	Geographical Area
Financial	Real Long-term Interest Rate
Revenue	GDP Growth Rate Volatility
Project	Investment Size
	Concession Period
SPV	Project Owner Revenues
	Number of Partners
	Herfindahl-Hirschman Index

Second, after analyzing the dimension of the available data, it was expected to focus such methodology in one sector (if the means to do so were reachable), otherwise the research would rely on a group of sectors. Although, due to the lack of an available repository of official data related to PF projects, a first-hand data collection process and an exploratory data analysis had to be carried out.

After the data analysis, the consequent conclusions provide insights to help in the definition of an efficient debt-to-capital ratio and give guidance for both involved parties to determine the level of each financing source (either debt or equity) that should compute the capital structure of a PF investment. By doing so, private sponsors may increase their profitability and lending agencies better mitigate their risks, i.e., always with the goal to find an appropriate balance between profitability and risk. Any other factors that are considered to impact the $D/(D+E)$ ratios of PPP projects, such as any agency explanation. As for instance, the presence of large amounts of debt may be explained by the desire of debtholders to monitor managers' actions better than external shareholders, perhaps due to the scope for expropriating minority shareholders wealth.

Finally, the impact of all the risks on the capital structure of the project will be analyzed through the following model, through the Ordinary Least Squares method:

$$DCR1_di = \alpha + \beta1 RQ1i + \beta2 GEO1i + \beta3 RIR1i + \beta4 GDP1i + \beta5 \log(INV1i) + \beta6 CP1i + \beta7 \log(POR1i) + \beta8 \log(NOP1i) + \beta9 HHI1i + \epsilon i \quad (1)$$

, a result of the below model:

$$DCR_di = \alpha + \beta1 GEi + \beta2 RQi + \beta3 CSIi + \beta4 GEOi + \beta5 RIRi + \beta6 GDPi + \beta7 \log(INVi) + \beta8 CPI + \beta9 \log(PORi) + \beta10 \log(NOPi) + \beta11 HHIi + \epsilon i \quad (2)$$

Where DCR_di is the debt-to-capital ratio of a PF investment. GEi , RQi and $CSIi$ are related with the government effectiveness, regulatory quality and country stability index (as an estimated value) at the signature year of the project, respectively. $GEOi$ represents the geographical area of where the project was implemented. $RIRi$ represents the real long-term interest rate of the country where the project takes place in, at the signature year of the

project. GDP_i relates itself to the GDP growth rate volatility of the country where the project takes place in, at the signature year of the project. $\log(INV_i)$ and CPI_i represent both the (log) investment size (in millions of \$) and the concession period of the project (in years), respectively. In addition, $\log(POR_i)$ and $\log(NOP_i)$ respect to one of the logs of project owner's revenues (in millions of \$) and the number of partners involved in the project, respectively. ε_i is the error term. Finally, as a dispersion measure, HHI_i respects to Herfindahl-Hirschman Index that measures the size of companies relative to the size of the industry they are in and the amount of competitiveness.

That being said, in order to analyse the impact of each risk factor on the capital structure of a PPP, two hypothesis were tested:

H0: The risk factors have no effect on the indebtedness of the PPP;

H1: The risk factors have a positive/negative effect on the indebtedness of the PPP

In general, it would be expected that riskiness could imply less usage of debt, but it is important to note that the impact of riskiness in the indebtedness of a project can vary depending on various factors, including the industry, project specifics, market conditions, and the overall financial health of the project. Proper risk assessment and management strategies are crucial to mitigate potential negative impacts and maximize the positive outcomes. Higher potential returns, competitive advantage, increased innovation and creativity and enhanced resource allocation are examples of the positive impacts of riskiness in the indebtedness of a project. On the other hand, financial instability, increased cost of capital, limited flexibility and increased pressure and stress could justify the negative impact on the indebtedness of the PPP.

Lastly, the Ordinary Least Squares method was the one chosen. Although OLS is sensitive to violations of assumptions such as outliers or heteroscedasticity, it can still perform well in many situations. If the violations are not severe or the sample size is sufficiently large, OLS estimates can still be reliable and robust. In such cases, OLS provides a computationally efficient and effective method for estimating the regression parameters. Its simplicity, efficient estimates, interpretable coefficients, statistical inference and comparability and standardization were crucial advantages for its choice.

3.2. Description of the variables

Each one of the aforementioned variables is expected to promote an impact on the response variable, either a positive or a negative one. As such, expected signs for each explanatory variable and the corresponding theoretical reasoning would follow as per below.

Regarding the country risk, the government effectiveness indicates the perception of the quality of public services and the quality of policy implantation, whereas the regulatory quality refers to the ability of a government to formulate regulations that promote the private sector development, from a range of -2.5 to 2.5, with 2.5 indicating high quality. The country stability index (CSI) measures perceptions of political instability and violence in the political environment. As such, the parameters associated with country risk are expected to positively impact the equity share in the sense that low risk environments are able to attract more private capital to develop PF initiatives, lowering the debt-to-capital ratio. That being said, considering no assumptions were made on whether European or American countries are highly/less risky environments, the impact on $D/(D+E)$ is expected to be uncertain. Note that, since the latter is a dummy variable, European countries would have a 1 estimator and American countries would have a 0 estimator.

Secondly, when looking at the financial risk, it is expected the higher the inflation, the higher the project costs and, consequently, the debt leverage tends to increase because the required funds are greater. On the other hand, it is expected the higher the long-term interest rates, the higher would be the cost of issuing debt and, therefore, the lower would be the debt to total capital employed. **However**, notice that inflation rate and interest rate may be correlated, which can be a problem for the model. As such, the expected sign for the long-term real interest rate (i.e., interest rate minus inflation) is ambiguous.

As a result of commercial success and potential changes in revenue streams, revenue risk can affect cash flow, that is used to evaluate projects. A positive or negative commercial spending environment is represented by the GDP growth rate volatility to measure revenue risk. Despite the idea that Infrastructures are less sensitive to the economic climate (as opposed to the Utilities, eg. Water and Energy), this indicator was considered not really a measure of risk but rather a measure of growth opportunities and perhaps optimism for the future, which can indeed impact the $D/(D+E)$. Therefore, the higher are the expected revenues, the more

willing are the lending institutions to inject debt in a project. Thus, the debt leverage can be increased and more exploited.

In regards to the project risk itself, considering the initial investment is large, the project would require borrowed funds in addition to sponsors' funds. Before granting borrowed funds, lenders and financial institutions thoroughly evaluate project characteristics and risks. They may stipulate that sponsors must proceed with a substantial investment in the project and ensure the government provides ongoing support throughout the project implementation phase. However, according to Hooks (2003) when a small- to medium-sized firm has a limited amount of discretionary spending, it tends to exhibit a high concentration of bank debt. On the other hand, in the case of a large firm, a high concentration of bank debt is typically associated with the difficulty for outsiders to observe its operations. Meaning that, both types of firms find bank debt advantageous under appropriate circumstances. In addition to the project risk itself, a short concession duration can bring much uncertainty to the project as opposed to a longer one, that can provide the private investors to achieve more profits. As such, regarding the concession period impact on the project's capital structure, it can be noticed some ambiguity.

Finally, the solidity of the SPV is measured by the size of one of the main project owners numerical indicator, which is defined as the logarithm of the revenues collected in the contract signature year. Because it is easier to raise funds for a project that has a reliable SPV, the associated level of risk decreases, and the debt leverage can increase. On the other hand, the greater the number of partners, the greater the capacity to inject equity capital into the project and, in turn, the lower the financial leverage. In addition, measuring the competitiveness of the companies in the sector, it is expected the higher the index of the project, the higher the amount of equity is invested in the same, as the sponsors will benefit from its higher competitiveness and performance when compared to other projects. Therefore, the expected signal for the dependent variable is the opposite one from this independent variable.

Table 4 summarizes the expected signs on the relation studied in this dissertation.

Table 4: Expected signs on the relation of each risk indicator with the capital structure of the project in the present work.

	Debt-to-capital Ratio
Government Effectiveness	-
Regulatory Quality	-
Country Stability Index	-
Geographical Area	+/-
Real Long-term Interest Rate	+/-
GDP Growth Rate Volatility	+
Investment Size	+
Concession Period	+/-
Project Owner Revenues	+
Number of Partners	-
Herfindahl-Hirschman Index	-

4. Sample

In this chapter, first it is described the sample used in this work and it ends with the descriptive statistics of all variables included in the two models previously presented.

4.1. Sample selection

This study uses a sample of worldwide financial closed public-private partnerships for a 11-year period, specifically from 2011 to 2022, collected from the InfraPPP database. The respective investment size, concession period, number of partners involved and the type and amount of financing of the project (that allowed the calculation of the debt-to-capital ratio) were all retrieved from that same database.

Regarding the political or country indicators, aligned with both the inflation and GDP growth rate were retrieved from the World Bank database. In the case of the interest rate indicator, the same was collected from OECD database⁶, government treasury websites⁷ and Trading Economics website.⁸

Lastly, regarding the revenues of one of the main project owners, the majority of them was retrieved from Eikon Refinitiv database, and the remaining from the companies' original website⁹.

As a result, from a sample of about 87 financially closed international projects from the Education and Student Housing sub-sectors, only 26 of them had information on the debt leverage of the project. Therefore, the solution found was to extend the sample to all subsectors of the main sector: Social & Health (Courthouses, Hospital & Healthcare, Police, Defence & Fire stations, Prison, Road, Railway, Other building & Urban Infrastructure,

⁶ OECD. (2019). Interest rates - Long-term interest rates - OECD Data. OECD. Retrieved August 23, 2022 from: <https://data.oecd.org/interest/long-term-interest-rates.html>

⁷ As for instance, the case of Interest Rates – Bank of Ghana. (n.d.). Retrieved August 23, 2022 from: <https://www.bog.gov.gh/economic-data/interest-rates/>

⁸ Trading Economics. (2019, December 8). Retrieved August 23, 2022 from: <https://tradingeconomics.com>

⁹ It is important to mention, the majority of the projects involved private companies, where the access to their financials was not always able to access. As such, in some partnerships, both Growjo and ZoomInfo websites were used to retrieve that same information.

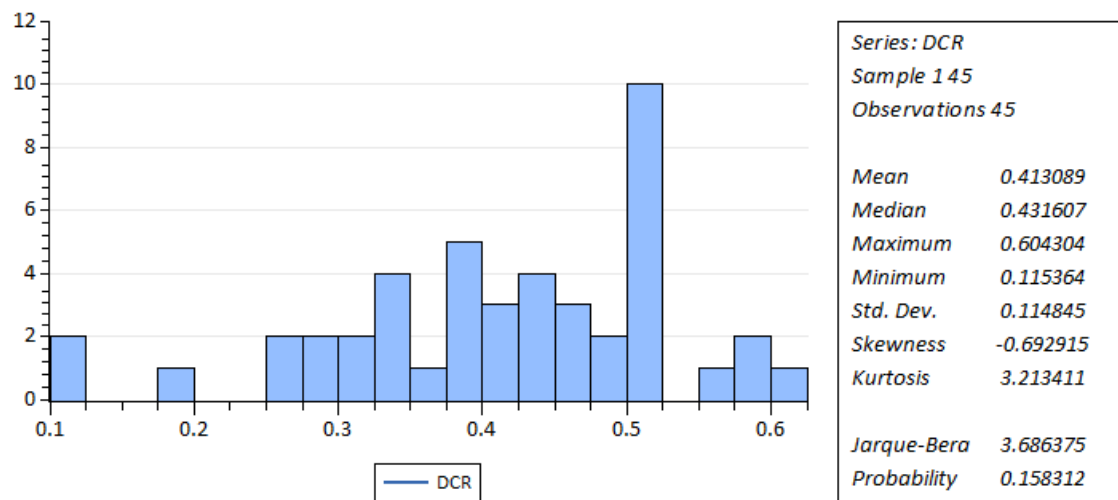
Water, Street Lighting, Education and Student Housing).

Consequently, the achieved final sample comprises 45 completed international projects, since, in similarity to the Education and Student Housing sub-sectors, projects in the remaining sub-sectors do not have full information on funding rounds, disabling the calculation of the dependent variable.

4.2. Descriptive statistics

A linear regression model is appropriate because the normal probability plot (Figure 1) demonstrates the normality of the records for the dependent variable. The purpose of the regression analysis is to determine if the independent variables under consideration are significant influences on the debt-to-equity ratio and whether they have a favorable or unfavorable effect on the corresponding response variable (Tuckey, 1977). Positive influences show that changes in the independent variable cause changes in the dependent variable, whereas negative influences show that changes in the independent and responsive variables change in the opposite directions.

Figure 1: Debt-to-capital ratio Descriptive Statistics



The goal of the regression analysis is to test if the independent variables not only have a positive or negative impact on the response variable¹⁰, but also if they are statistically significant. To do so, multicollinearity between the independent variables must be assessed. De Marco and Mangano (2017, p.451) have analyzed this potential problem through the computation of variance inflation factors (VIF). VIF evaluates the “relationship between an independent variable and all other independent ones within the model and it is calculated as $1/(1-R^2)$, where R^2 is the adjusted coefficient of determination”, i.e., the proportion of the variance in the dependent variable that can be explained by the independent variable. In other words, R^2 shows how well the data fit the regression model (the goodness of fit). Variables with VIF greater than 10 are discarded once they are considered to be poorly estimated (Hair et al., 1995) in order to have a model with the higher R^2 as possible.

As aforementioned, by estimating the model’s equation in EViews program, was possible to notice the variables with a VIF higher than 10. As such, and facing a near singular matrix error, the indicators Government Effectiveness (GE_i) and Country Stability Index (CSI_i) were excluded accordingly, considering they presented the highest VIF values. Consequently, in Table 5 it is still possible to notice a significant multicollinearity between the independent variables.

Table 5: Multicollinearity in the Model (2)

Variable	VIF
GE	110.877
RQ	45.851
CSI	96.450
GEO	18.702
RIR	10.687
GDP	52.752
LOG(INV)	3.869
CP	24.727
LOG(POR)	2.265
LOG(NOP)	1.816
HHI	40.629

¹⁰ The considered response variable is debt to total capital employed, i.e., $D/(D+E)$, as D/E may reach very high and extreme values, when E is very small and, necessarily, negative ones when E is negative.

Nevertheless, in Table 6, it is noticeable that, by excluding variables GE_i and CSI_i , the model faces a lower multicollinearity, noticeable by the fact no independent variable's VIF is higher than 10.

Table 6: Multicollinearity in Model (1), without GE_i and CSI_i

Variable	VIF
RQ	2.988
GEO	2.988
RIR	4.690
GDP	2.168
LOG(INV)	1.158
CP	3.715
LOG(POR)	1.720
LOG(NOP)	0.853
HHI	6.476

Lastly, based on the proposed risk model, Table 7 summarizes the independent parameters that are supposed to have a significant impact on the debt-to-equity ratio of a PF project. Columns report the mean and median, the minimum and maximum value, and the standard deviation of each one of the independent variables, respectively.

Table 7: Independent Variables Descriptive Statistics

Independent Variables	Acronym	Measure	Mean	Median	Maximum	Minimum	Std. Dev
Government Effectiveness	GE	%	1.169	1.416	2.007	-0.447	0.616
Regulatory Quality	RQ	%	1.265	1.497	1.976	-0.161	0.641
Country Stability Index	CSI	%	0.135	0.135	0.992	-1.789	0.732
Geographical Area	GEO	1 or 0	0.733	1.000	1.000	0.000	0.447
Real Long-term Interest Rate	RIR	%	0.904	0.297	8.241	-9.440	3.497
GDP Growth Rate Volatility	GDP	%	2.563	2.263	6.245	-3.879	1.661
Investment Size	INV	millions of \$	298.385	199.770	2750.000	11.000	420.783
Concession Period	CP	number of years	25.800	25.000	50.000	15.000	8.143
Project Owner Revenues	POR	millions of \$	10136.340	193.250	110137.000	5.000	25181.600
Number of Partners	NOP	units	3.978	4.000	13.000	1.000	2.554
Herfindahl-Hirschman Index	HHI	units	43.859	0.002	737.878	1.52E-06	163.109

Therefore, the regression analysis is started once multicollinearity is investigated. Applying a logarithm transformation to a variable is a type of data transformation that can be used to address issues such as skewness or heteroscedasticity in the data, as the case of variables INV_i , POR_i and $NOPI$. It can help in achieving a more linear relationship between the independent variable and the dependent variable, assuming that the relationship follows a logarithmic pattern. By taking the logarithm, we are essentially compressing the values and reducing the impact of extreme values. However, the regression must be performed using standardized variables once the variables in the dataset have different orders of magnitude, making it difficult to compare the results (Carroll Rovezzi and Carroll, 2002). In order to achieve this, the mean and standard deviation for each parameter are computed, and each observation is then normalized using equation:

$$z = \frac{x - \mu}{\sigma} \quad (3)$$

where x is the value to be standardized, μ is the mean of the population and σ is the standard deviation of the population.

5. Empirical Results

According to the findings in Table 8, all of the risk indicators have rejected the null hypothesis (considering for instance a level of significance, p-value, of 5%), i.e., are considered significantly relevant to describe how debt-heavy social and health PF efforts are. Therefore, when evaluating a PF contract and determining its capital structure, project stakeholders must take risks in the aforementioned areas into account. The results suggest the variables are likely to have a significant association with the dependent variable in the population from which the sample was drawn. This indicates that including these variables in the regression model provides valuable information for explaining and predicting the dependent variable. That can also be noticeable by the considerably high R^2 (0.819).

Table 5: Results of the regression analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.668	0.166	4.019	0.016
RQ1	0.105	0.0723	1.451	0.220
GEO1	-0.011	0.069	-0.156	0.884
RIR1	0.192	0.095	2.022	0.113
GDP1	0.056	0.041	1.356	0.246
Log(INV1)	0.071	0.045	1.570	0.191
CP1	-0.212	0.123	-1.719	0.161
Log(POR1)	-0.411	0.481	-0.854	0.441
Log(NOP1)	-0.037	0.0345	-1.067	0.346
HHI1	2.075	1.360	1.526	0.202
R-squared	0.819	Mean dependent var	0.409	
Adjusted R-squared	0.415	S.D. dependent var	0.119	
S.E. of regression	0.091	Akaike info criterion	-1.774	
Sum squared resid	0.033	Schwarz criterion	-1.317	
Log likelihood	22.415	Hannan-Quinn criter.	-1.816	
F-statistic	2.024	Durbin-Watson stat	4.013	
Prob(F-statistic)	0.259			

Regarding the country risk, the results do not seem to follow a clear path on the low or high debt levels/equity capital injections and, therefore, defying the predictions of the model. As

an example of it, as opposed to the believed encouragement of private investors in a good country's regulatory environment, we see our model highlights a positive correlation between the RE and the DCR. This might be exploited by the comfort and vast means of financing that can be provided by Government authorities in such type of environment. Perhaps, they may be willing to increase the opportunities and conditions for their citizens in such a crucial sector, as the Social & Health one. Additionally, as a negative coefficient for a dummy variable means the average value of the dependent variable is expected to decrease when the dummy variable takes a value of 1, we conclude that, in the European countries, the private sponsors are more prone to invest their capital in PFI schemes.

Regarding the financial risk, the results achieved prove to be in accordance with the model's expected sign since in high inflation rate scenarios and, consequently, high project costs, the debt leverage tends to increase. This can exploit the opportunities for the private investors leverage their investments with the contribution of Government authorities as well as financial institutions.

In accordance with De Marco et al. (2017), the revenue risk does appear indeed to have a positive impact in the project's debt leverage in this specific sector. Despite here is being studied a different sector and, consequently, a different type of financing activities, as well as different types of investors, it is indeed noticeable the higher are the expected revenues, the more willing are the lending institutions to inject debt in a project. However, the sectorial risk should impact the decision to have more or less indebtedness. In addition, this variable captures mainly future growth expectations and it may even be the case that a recent high GDP growth indicates there may be a reversal of that same growth in the future, leading to greater caution in defining a financing policy.

The project risk, represented by the Investment Size indicator appears to have indeed a positive correlation with the partnership capital structure, i.e., with the increase of the amount invested, the involved parties might exploit different sources of debt, under appropriate and advantageous circumstances, and in turn increasing the level of indebtedness of the project. In regards to the concession period, the longevity of the same may impact in a different way the indebtedness of the partnership (i.e., short concession duration potentiate uncertainty to the project as opposed to a longer one, that can provide the private investors to achieve more profits). Since our sample included concession periods from 15 to 30 years

(i.e., long duration ones) the impact on the DCR was negative.

Finally, in regards to the SPV solidity, which is represented here as the main project owners' annual revenue and the number of partners involved in the PPP, the latter indicator was in accordance with the expected sign as opposed to the first one. According to the findings, one of the project owners' revenues does not seem to have a positive impact in the dependent variable. That may be explained by the fact that same project owner is able and prefers to invest a higher amount of equity in the project than incur into a debt financing alternative. Regarding the negative impact of the number of partners, and aligned with the idea the main partner prefers to invest the higher amount of equity possible, an explanation may be reached. By increasing the number of partners in the project, the appearance of public parties (as Government and some Financial Institutions) is likely to enhance and encourage debt financing activities. Regarding the introduced competitiveness variable, Herfindahl-Hirschman Index, the result achieved from our model contradicts the expected negative correlation between the independent and dependent variables. Despite the higher competitiveness of a project owner in the sector, there is not a linear and clear relation between their willingness to invest their own capital or preference to rely on other financing activities.

6. Conclusions, Limitations and Future Research

An analysis of PF initiatives in the Social and Health sector is proposed to explore the relationship between risk and capital structure. There are both theoretical and practical implications to this work. It contributes to the literature on the subject from a theoretical perspective, which typically explains the topic from a qualitative perspective, focusing on issues related to risk allocation between public authorities and private investors. An example of how it can be used is to gain a better understanding of the sources of risk that can impact PF capital structure definitions. Research in this area has focused on classification and identification of risks. Nonetheless, this paper proposes an empirical method for assessing the impacts of such risks in the capital structure definition for Social and Health related projects, and it may be used as a foundation for refining PF debt leverage methodologies. Still at the theoretical point of view, this dissertation has also the goal to investigate how do SPVs work, as there is neither a widely accepted definition nor a clear understanding of what it does.

As a result of this work, decision criteria can be refined for determining debt leverage in PF projects. Lending institutions often require a large apportionment of equity capital as a way to demonstrate project promoter commitment, SPV reliability, and reduced debt service risk. Alternatively, private promoters attempt to increase debt levels in order to lower their private risk while maximizing their returns. In this regard, the proposed study can be viewed as assisting private investors in defining a more efficient debt leverage and in which projects should that same type of financing be allocated. In addition, it can also help with risk allocation among involved parties.

However, the model has some limitations. In the risk profile, for example, only a few macro-finance factors are considered. The study's goal is essentially to investigate the financing structure of PF initiatives in the aforementioned specific sector, independent of the positive or negative confluence of surrounding financial markets. To further understand how cyclical external sources of risk may affect the financial leverage of PF investments in the Social and Health sector, future research will focus on incorporating more external elements. The limitations of such model are not only present in the small sample of indicators, but majorly in the available information on the projects themselves. Since these type of partnerships necessarily involve private companies and investors, it is not always possible to retrieve all

the important corporate and financial information regarding those same parties. As such, the sample of observations is consequently reduced due to the impossibility of fulfilling the respective indicators' values.

Nevertheless, to investigate the variables that may affect the amount of debt capital on the capital structure of a PF initiative, an empirical analysis is provided. The aim of such analysis was that a number of project risks associated with countries, finances, revenues, projects, and SPVs have been established together with their dimensions and corresponding numerical indicators. The findings demonstrate that nine of the initial eleven risk factors significantly affect the debt leverage. For a PF mechanism used to finance a Social and Health investment, the regulatory quality, geographical area, real long-term interest rate, the GDP growth rate volatility, the investment size of the project, a project owner's revenues, the number of partners involved in the PPP and the competitiveness of the project prove to be significant variables of the debt-to-capital ratio. As it was noticed, all the risk factors differently impact the parties involved in a PPP (Private Investors, Government Authorities, Financial Institutions, among others).

For future research, it is expected that the research gap of some studies that have investigated the association between risk and some factors of a PF initiative (such as the concession duration or risk allocation between the private and the public sector) can now be mitigated with the start of research for the relationship that exist between risk and capital structure. It is also expected the available data to increase and, therefore, to better contribute to more actual, precise and statistically significant models.

7. References

Books and Papers

Akintoye, Al. 2003. *Public Private Partnerships: Managing Risks and Opportunities* Edited by Akintola Akintoye, Matthias Beck and Cliff Hardcastle. Blackwell Science. School of the Built and Natural Environment; Glasgow Caledonian University

Akintoye, A, Beck, M, Hardcastle, C, Chinyio, E A and Asenova, D (2001) The financial structure of private finance initiative projects. In: Akintoye, A (Ed.), 17th Annual ARCOM Conference, 5-7 September 2001, University of Salford. Association of Researchers in Construction Management, Vol. 1, 361-9.

Alberto, De Marco, and Giulio Mangano. 2017. “Risk Factors Influencing the Debt Leverage of Project Financing Initiatives in the Energy Industry.” *International Journal of Energy Sector Management* 11 (3): 444–62.

Ball, J. 1999. “Marketing a Concept Abroad.” *Project Finance* 193: 18–19.

Basel Committee on Banking Supervision (BCBS). (2009). *The Joint Forum–Report on Special Purpose Entities*. Basel, Switzerland.

Burger, P., and Tyson, J. (2006). “The effects of the financial crisis on public-private partnerships.” International Monetary Fund, Washington, DC.

Carroll, S. R., & Carroll, D. J. (2002). *Statistics made simple for school leaders : data-driven decision making*. Scarecrow Press.

Clifton, C., & Duffield, C. F. (2006). Improved PFI/PPP service outcomes through the integration of alliance principles. *International Journal of Project Management*, 24(7), 573–586.

Cuttaree, V., Humphreys, M., Muzira, S. and Strand, J.P. (2009), “Private participation in the transport sector: lessons from recent experience in Europe and central Asia”, World Bank, Washington, DC.

- Demirag, I., Khadaroo, I., Stapleton, P., & Stevenson, C. (2011). Risks and the financing of PPP: Perspectives from the financiers. *The British Accounting Review*, 43(4), 294–310.
- Finnerty, J. D. (2013). *Project financing: Asset-based financial engineering*. Hoboken, NJ: Wiley.
- Feng, Ke, Wei Xiong, Shouqing Wang, Chunlin Wu, and Yanguang Xue. 2017. “Optimizing an Equity Capital Structure Model for Public–private Partnership Projects Involved with Public Funds.” *Journal of Construction Engineering and Management* 143 (9): 04017067
- Girard, P., Mohr, R., Deller, S. & Halstead, J. (2009). Public-private partnerships and cooperative agreements in municipal service delivery. *International Journal of Public Administration*, 32, 370–392.
- Hair, J. F. Jr., Anderson, R. E., Tatham, R. L. & Black, W. C. (1995). *Multivariate Data Analysis* (3rd ed). New York: Macmillan.
- Ham, V.H., & Koppenjan, J. (2001). Building public-private partnerships: Assessing and managing risks in port development. *Public Management Review*, 3, 593–616.
- HM Treasury. (2015). “Efficient drive by government on PPPs nets 2.1 billion pounds.”
- Hooks, L. M. (2003). The impact of firm size on bank debt use. *Review of financial Economics*, 12(2), 173-189.
- Jackson, P. (2012). Value for money and international development: Deconstructing myths to promote a more constructive discussion. OECD Development Co-operation Directorate, 4.
- Kurniawan, F. (2010). “A review: Exploring stakeholders’ expectations from PFI financial modelling at different stages.” *Proc., Project Manage. Conf., Project Management Institute India, New Delhi, India*, 19–21.
- Keating, Michael. 1998. “Commentary: Public-Private Partnerships in the United States from a European Perspective.” In *Partnerships in Urban Governance: European and American Experiences*, edited by Jon Pierre, 163–74. London: Palgrave Macmillan UK.

- Larson, R. K. (2008). An examination of comment letters to the IASC: Special purpose entities. *Research in Accounting Regulation*, 20(C), 27–46
- OECD. (2008). *Public-Private Partnerships: In Pursuit of Risk Sharing and Value for Money*: OECD Publishing.
- Rebeiz, K. S. (2012). Public-Private Partnership Risk Factors in Emerging Countries: BOOT Illustrative Case Study, *Journal of Management in Engineering*, 28(4), 421-428.
- Sainati, Tristano, Naomi Brookes, and Giorgio Locatelli. 2017. “Special Purpose Entities in Megaprojects: Empty Boxes or Real Companies?” *Project Management Journal* 48 (2): 55–73.
- Savitch, H. V. 1998. “The Ecology of Public-Private Partnerships: Europe.” In *Partnerships in Urban Governance: European and American Experiences*, edited by Jon Pierre, 175–86. London: Palgrave Macmillan UK.
- Schwarcz, S. L. (2006). Enron and the use and abuse of special purpose entities in corporate structures. *University of Cincinnati Law Review*, 70(28), 1309.
- Silvestre, Hugo Consciência, and Joaquim Filipe Ferraz Esteves de Araújo. 2012. “Public-Private Partnerships/private Finance Initiatives in Portugal.” *Public Performance & Management Review* 36 (2): 316–39.
- Smith, D. (2011). Perspectives: Hidden debt: From Enron’s commodity prepaids to Lehman’s Repo 105s. *Financial Analysts Journal*, 67(5).
- Tabanick, B.G. and Fidell, L.S. (2001), *Using Multivariate Statistics*, 3rd ed., HarperCollins, New York, NY
- Xiong, W., and Zhang, X. Q. (2014). “Concession renegotiation models for projects developed through public-private partnerships.” *J. Constr. Eng. Manage.*, 140(5), 04014008.
- Zhang, X. (2005). “Financial viability analysis and capital structure optimization in privatized public infrastructure projects.” *J. Constr. Eng. Manage.*, 131(6), 656–668.

Databases and Websites

Belgium Interest Rate | 1998-2021 Data | 2022-2023 Forecast | Calendar | Historical. (n.d.). Tradingeconomics.com. Retrieved August 23, 2022 from: <https://tradingeconomics.com/belgium/interest-rate>

Deposit interest rate (%) - Türkiye | Data. (n.d.). Retrieved August 24, 2022, from [data.worldbank.org](https://data.worldbank.org/indicator/FR.INR.DPST?end=2021&locations=TR&start=2012) website: <https://data.worldbank.org/indicator/FR.INR.DPST?end=2021&locations=TR&start=2012>

Growjo (2022). Retrieved September 1, 2022 from Growjo.com website: <https://growjo.com/company>

Inflation, consumer prices (annual %) | Data. (n.d.). Data.worldbank.org. Retrieved August 24, 2022 from: <https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?view=chart>

Infrastructure Finance & Investment news | InfraPPP. (2022). [Www.infrappworld.com](http://www.infrappworld.com). Retrieved August, 2022, from <https://www.infrappworld.com/>

Interest Rates – Bank of Ghana. (n.d.). Retrieved August 23, 2022 from: <https://www.bog.gov.gh/economic-data/interest-rates/>

OECD. (2019). Interest rates - Long-term interest rates - OECD Data. OECD. Retrieved August 23, 2022 from: <https://data.oecd.org/interest/long-term-interest-rates.htm>

Refinitiv Eikon Datasets. (2022). Retrieved August, 2022, from www.refinitiv.com website: <https://www.refinitiv.com/en/financial-data/eikon-datasets>

The World Bank. (2022). Worldwide Governance Indicators | DataBank. Worldbank.org. Retrieved August 20, 2022 from: <https://databank.worldbank.org/source/worldwide-governance-indicators>

Trading Economics (2019, December 19). Tradingeconomics.com; Retrieved August 24, 2022 from: <https://tradingeconomics.com/belgium/inflation-cpi>

Trading Economics. (2019, December 8). Retrieved August 23, 2022 from: <https://tradingeconomics.com/saudi-arabia/interest-rate>

Trading Economics. (2019, November 11). Retrieved August 23, 2022 from: <https://tradingeconomics.com/united-arab-emirates/interest-rate>

United Arab Emirates GDP Annual Growth Rate | 2000-2019 Data | 2020-2022 Forecast. (n.d.). Tradingeconomics.com. Retrieved August 25, 2022 from: <https://tradingeconomics.com/united-arab-emirates/gdp-growth-annual>

World Bank. (2021). GDP growth (annual %) | Data. Worldbank.org. Retrieved August 25, 2022 from: <https://data.worldbank.org/indicator/ny.gdp.mktp.kd.zg>

ZoomInfo: B2B Database | Business Leads & Company Contacts. (2022). ZoomInfo. Retrieved September 1, 2022 from: <https://www.zoominfo.com>

8. Appendices

Figure 2: Typical set-up of a PFI scheme [Source: Akintoye et al., 2001]

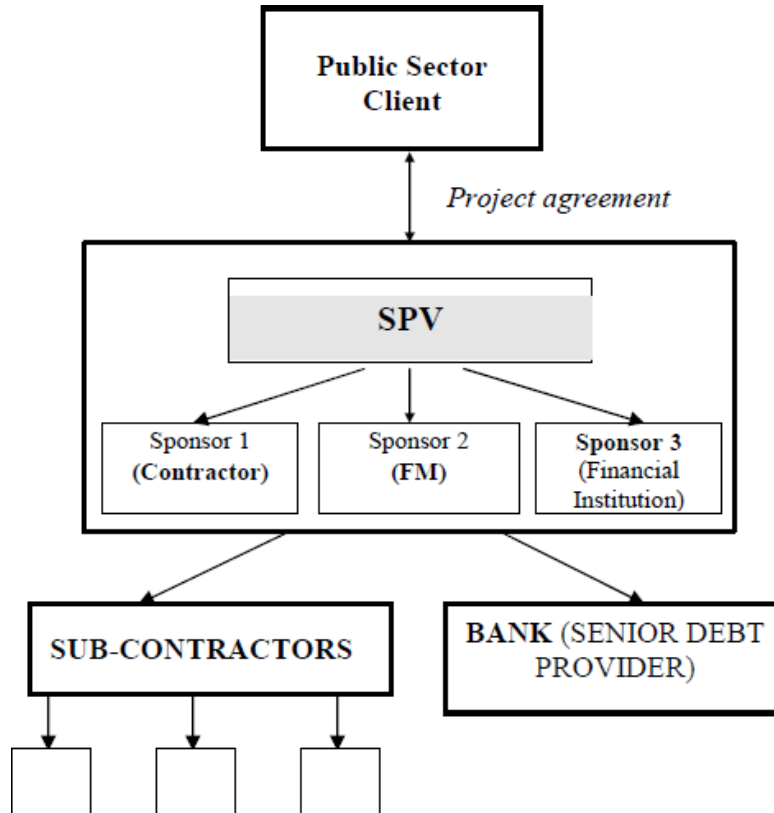


Figure 3: Relationship between the risk profile and the rate of return for the main financial components used in PFI financing [Source: Akintoye, 2003]

