THE DRIVERS OF THE PROJECT OF FINANCE INTEREST RATE IN THE ASEAN-4 COUNTRIES

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Abstract

This paper highlights the significant aspects of the project finance theme in terms of the prospective return of the infrastructure project, the risk mitigation feature of project finance in addressing various risks, and future stability requirements in achieving the future country growth target through infrastructure investment. This paper attempts to investigate the determinants of the total interest rate charged on project finance. We found that the critical risk factor does not affect the interest rate, because the critical risk factor with the proxy of political stability and government effectiveness does not affect the interest of project financing loans due to the characteristics of ASEAN-4 countries.

Keywords: Interest Rate, IPP, LIBOR, Loan Margin, Private Sector Participation, Project Finance

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1. INTRODUCTION

Project finance is "the most common technique for the financing for infrastructure" (Thierie & De Moor, 2018, p. 1). The future infrastructure investment requirements are primarily in the electricity, transport, telecommunication, water supply, and sanitation sectors. The "population growth, urbanization, and industrialization are spurring demand in the infrastructure investments in developing countries" (Thierie & De Moor, 2018, p. 2). The requirement of infrastructure in Asia is vast; $26 trillion is requisite from 2016 to 2030 according to the Asia Development Bank infrastructure report (Asia Development Bank [ADB], 2017), while the Southeast Asian countries require an investment of US$145 billion annually to attain its growth momentum, poverty eradication, and climate change mitigation challenges. Provided that project finance is the typical finance technique for infrastructure investment, given the vast investment requirement

with a constrained public sector fiscal space, private sector participation in the infrastructure investment is vital.

Given its unique features, the vast investment requirement in the infrastructure sector as the capital-intensive sector, places the dominating debt market on the pedestal, specifically on the project finance loan (PF) to fill the investment gap requirement from the fiscal space sourced from the government budget. It is hypothesized by Kleimeier and Versteeg (2010) that project finance plays a developmental impact role through its financing availability to the least developed economies in which it substitutes the deficiency in the domestic financial development.

Regarding the data source, various works of literature use different financial data providers on the syndicated loan. For example, Rajan Annamalai and Jain (2013) apply the Project Finance International (PFI) database, Esty and Megginson (2003) apply the Loanware database, Kleimeier and

Megginson (2000) apply the Loanware database, Sorge and Gadanecz (2008) as well as Girardone and Snaith (2011) with the Dealogic ProjectWare. Moreover, on the country risks, typically the data is obtained from the International Country Risk Guide (ICRG), Euromoney Country Risk survey, and World Bank Governance Indicators (WBGI). While the macroeconomics data is obtained from the International Monetary Fund (IMF) world economic outlook and Institute of International Finance developing a country database.

Despite the dramatic improvement in the Asian countries' development, developing Asia still requires vast infrastructure investment as over 400 million Asians still lack electricity; roughly, 300 million have no access to clean water, and 1.5 billion with inadequate basic sanitation (ADB, 2017). Analogous to another infrastructure sector, the surging electricity demand in order to meet its GDP growth target, the electricity industry embarked on a liberalization transformation, started in Chile then extended to many developing countries in the 1990s (Nagayama, 2008), as these countries are grappled with their public service obligation to meet the electricity supply requirement amid the surging electricity demand, the limited fiscal space and the subsidy rationalization (Victor & Heller, 2007). As one of the private sector participation schemes, a public-private partnership (PPP) has been adopted in many developing countries including Asia, particularly within the energy, telecommunication, transportation, and water facilities. According to the ADB infrastructure report (ADB, 2017), private sector investment has been pronounced in the telecom and power sector within the infrastructure space. The PPP scheme is seen as an effective means to reduce the government financial burden while generating an improvement in the service quality, efficiency, and well-balanced risk-sharing allocation (World Bank, 2011; Yuan, Skibniewski, Li, & Shan, 2010). The ASEAN-4 countries of Indonesia, Malaysia, the Philippines, and Thailand's electricity sector model has transformed from the pure monopoly to the single buyer model with some private sector participation allowing the independent power producers (IPPs) to produce electricity and to be off-take by the state-owned utility company; as part of the deregulation effort in the generation sector. The electricity industry has evolved from the government monopolies originally planned, owned and controlled institution, to the deregulated industry that is postulated to reach electricity price efficiency (Nagayama, 2008); as well as profitability, efficiency, and resource allocation (Megginson & Netter, 2001). The government-controlled political institution impacts the risk premium of the sector, particularly on the eve of expropriation and contract disputes (Jensen, 2005). In contrast, the deregulation and privatization with the private sector participation in the power sector tend to have a positive prominent effect on the developing countries' economic development, as it typically correlates with the improvement of the political risk perception. Countries with deregulated utility industries have experienced a rise in private sector participation (Owusu-Manu et al., 2017). A study on how political risk affects foreign direct investment was undertaken by Araya, Schwartz, and Andres (2013) in which an analysis of

a country's risk rating including political, economic, credit, and financial conditions, explicates a part of the differences among countries to attract investments. Borisova and Megginson (2011), attempt to seek an understanding of the state-owned divestiture effort's consequences on their credit profile. The investigation of the impact of the government ownership on the cost of debt in which the result seems to suggest that the improvement of political risk hinges on the level of government ownership.

Further research on project finance is urged for further investigation amid the growth of project finance worldwide and wide usage in the infrastructure sector with its high development impact (Esty, 2004; Kleimeier & Megginson, 2001; Sorge & Gadanecz, 2008), while a limited study on the Asia-Pacific countries specifically given the significant size of project finance in this region (Kleimeier & Versteeg, 2010). Byoun and Xu (2014) urge further research to understand the effect of political risk on project cash flows given the importance of viability of PF as the non-recourse financing, in contrast to the subject of the ability of project finance structure to address project-specific risk. Limited previous empirical research on the project finance's features, which mitigate the risks that the multinational company faces in the eve that host country possesses a considerable level of political risk and weak investor protection (Hainz & Kleimeier, 2012; Sawant, 2010; Rajan Annamalai & Jain, 2013). Moreover, despite the lack of available data, an understanding of the study of the credit risk of the project finance shall be undertaken further, while taking into account the development aspect of the project finance availability; the developing country's access to the affordable long-term fund is vital (Sorge & Gadanecz, 2008), as well as the developed countries low-interest-rate factor environment as the capital flow incentive to the developing countries. The research question of this paper is: *What are the determinants of the project finance loan total interest rate charged on the project?* This paper will try to learn the comprehensive depiction of the total interest rate charged. Previous studies have explored the determinants of the project finance loan spread; however, it fails to attend the analysis at the country-specific level and the total interest rate charged. The objective of the study is to address the total interest rate charged arising from the country's political risks, macroeconomics characteristics, and return attribute factors in the infrastructure sector in the ASEAN-4 countries. This paper tries to learn the comprehensive depiction of the total interest rate charged on project finance.

The rest of the paper is structured as follows. Section 2 reviews the previous literature. Section 3 presents the research methodology. Section 4 discusses the results of the research and Section 5 concludes.

2. LITERATURE REVIEW

Project finance is a specialized and unique branch of finance that is defined by Gatti (2008) as the structured financing of a particular economic unit in a special purpose vehicle (SPV) or project

company produced by the project developer through equity or mezzanine debt in which the lender is content with the cash flows and earnings of SPV as the main source of debt repayment for the project finance loan and the assets of the SPV as the collateral for the loans. While the project sponsor's financial balance sheet is not affected by the new debt acquired for the project finance. Through the invention of the legally separated project, company was financed mainly by the lender of around 70% of the project value on a non-recourse basis, with the objective to invest in an asset (Esty, 2004). Project finance can be seen as the means to address the risk allocation in the best way to invest in the large project typically infrastructure in developing countries. Despite the typical high transaction cost involving several advisors including the legal, technical, insurance advisor for the sponsors as well as the lender's process side, as well as the project monitoring cost during and post-construction. Next, the sizeable cost to the project cost and risk, risk management is the hallmark of the project financing technique, as it

is a vital part of the project financing, envisaged by Gatti (2008) in four steps: 1) risk identification; 2) risk analysis; 3) risk transfer and allocation of risks to the actors best suited to ensure coverage against risks; 4) residual risk management. Hence, from the project developer perspective, investing in the costly and tangible-rich asset industry such as infrastructure, the valuable benefits of project finance over corporate finance include: 1) enlarges the amount of the financing availability; 2) minimizes the overall risk to the project participants while the various risks are allocated to the party that could best manage the risks, reducing the overall risk to the acceptable level. Moreover, project finance provides a compelling financing alternative for the company as it is included in their balanced sheet thus enabling them to increase their leverage level and simultaneously develop their business. Project finance technique serves to address the governance matter in the developing countries, through its contractual based approach, which safeguards the transparency as well as the well-balanced risk allocation.

Figure 1. Web of contracts of an SPV in project finance
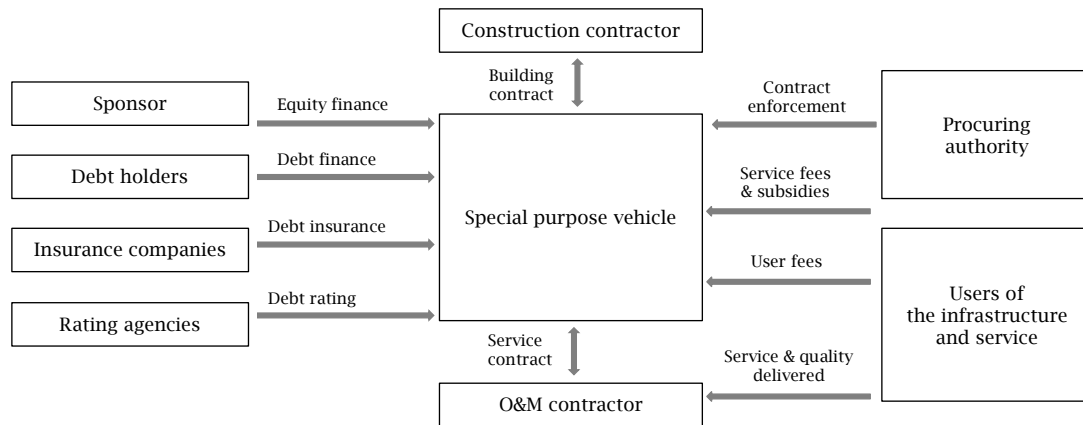
Source: Ehlers (2014).

Developing a country's penchant for long-term funds to support its infrastructure development is a development challenge for private sector investment and growth (Demirgüç-Kunt & Maksimovic, 1999). Project finance with its attributes of long tenor, high leverage and collateral, non-recourse debt, an extensive network of contacts, and third-party guarantee, has performed a vital role in attaining the investment requirement target in the developing countries (Sorge & Gadanecz, 2008). In this regard, Kleimeier and Versteeg (2010) research the role of project finance as a catalyst of economic growth, in which the result of their hypothesis is supported by the outcome of the empirical investigation.

Concurrently, the international company explores opportunities in the countries whose comparative advantages would reward the company with the optimal return, given the associated investment risks (Touchon, 2016). Motivated by the diminishing return in their home countries, a wave of US and European independent power producers (IPP) expanded their investments to the developing countries which started in the 1990s (Gratwick & Eberhard, 2008). These IPPs encounter various risks in the new markets, confronted with

the complex business reality to manage and mitigate the newfound risks appropriately. The project finance technique offers a compelling method to address the political risk (Kleimeier & Megginson, 2001, 2000; Esty & Megginson, 2003; Esty, 2004; Sawant, 2010; Tulung, Saerang, & Pandia, 2018) amid the new market prospect with a higher yield and inherent country risk. Hence, the topics of the political risk premium and how to address the potential risk at the investment host country are critical matters for many international companies.

Project finance given its inherent features has peculiar characteristics compared to other syndicated loans including corporate finance (Kleimeier & Megginson, 2000; Sorge & Gadanecz, 2008; Karamoy & Tulung, 2020), which is reflected in the term structure of the credit spreads. The project finance characteristics will be discussed in the first section, then the syndicated interest rate determinants: return attributes factors, the country risk, and macro characteristics of the loan in the infrastructure sector in the ASEAN-4 countries.

However, despite these advantages, the rigorous financial structuring, as well as the economic, financial, environmental, and technical viabilities, is the complexities attached to

this financing. Additionally, the immense scale of a typical project finance size which exceeds $1 billion, combined with the required multifaceted effective coordination among related parties including the construction company to the input supplier, from the host government to off-taker who buy the project output under the long-term purchase (or off-take or concession agreement) create challenges to the project financing (Sorge, 2004).

2.1. Theoretical perspective on the determinant of the interest rate margin

There are various academic works of literature pertaining mainly to the corporate loan pricing study based on bank loans and publicly traded debt (Merton, 1974; Booth 1992) The classical loan pricing model is based on the Merton/Black-Scholes option pricing framework for the pricing of default risk on corporate debt (Merton, 1974). In the applications, a corporate bank loan is typically priced based on a larger number of variables relative to the bond (Booth, 1992) the variables that are utilized include the log of loan size, the log of duration, the collateral, whether the rate is floating or fixed, log borrower sales, log of loan size, fees, benchmark option, and others, log of the relationship length, whether the borrower is a non-subchapter S corporation, whether the loan is floating or fixed, log borrower assets, the rate of borrower sales growth, its coverage of interest by profits, and the mean gross-profits to assets ratio for the industry as well as others. Moreover, Ho and Stoll (1981) have been a reference point on the determining factors behind the variations between the interest rate margins; in which they provide the model that the margin is a function of four components: 1) risk-aversion; 2) competition level; 3) interest rate specific risk; 4) transaction size. Ho and Stoll (1981) is an expansion of the precedent literature on "the hedging and expected utility maximization" (Pyle & Turnovsky, 1970, p. 76) and "bid-ask price for securities" (Ho & Stoll, 1981, p. 49). While the precedent empirical research papers have implied the determining factors of the interest rate wedge are the "bank-specific factors, market structure, regulation, institutional environment, and the macro economy" (Almarzoqi & Ben Naceur, 2015).

2.2. Propensity to project finance in the developing countries

According to Kleimeier and Megginson's (2000) empirical investigation on syndicated credit lending, project finance has several distinctive features relative to other types of financing of corporate control loans, capital structure loans, fixed asset-based loans, and general corporate purpose loans. These features include the long maturity, third guarantee presence, the likelihood of non-US borrowers, and tangible-asset-rich industries loan extension. Furthermore, other distinctive features of project finance include SPV creation, the balance risk allocation, high debt level, and no recourse to the project sponsors (Girardone & Snaith, 2011). Further characteristics of project finance include the size of the transactions with a typical size of $500 million upward amid the project lead time and the transaction costs, the longer loan tenor, and

the presence of the third-party guarantees (Rajan Annamalai & Jain, 2013). The significance of the long-term finance availability to the development of the developing countries has been analysed by previous studies (Demirgüç-Kunt & Maksimovic, 1999).

The project finance technique alleviates some investment risk elements through its structured features, with the major proponent being the development financial institution (DFI) such as the International Finance Corporation (IFC). The IFC has financed made many landmark projects since decades ago in the developing countries, contributed significantly to the countries' development impact. Furthermore, the emergence of the project financing is in parallel and linked with the deregulation drive that has taken place in the various utilities, including the electricity since the 1980s (IFC, 1999).

Private sector participation is an attractive business case as the private sector is motivated by a diminishing return in their home countries, a wave of US and European international companies, the likes of the independent power producer (IPP), expanded their investments to the developing countries started in the 1990s (Gratwick & Eberhard, 2008). Furthermore, the rise of capital flows to the Southeast Asian countries, as a consequence of the domestic economic reform through the liberalization of the state-owned enterprise to invite the private sector participation in the infrastructure sector with the developing countries' motive to leverage their existing fiscal space in order to meet their infrastructure investment prerequisite with a set of attractive incentives, such as a government guarantee (Dailami & Leipziger, 1998). As suggested by Fedderke and Bogetic (2009), the development literature refers to infrastructure investment to be an important factor of economic growth; directly via capital accumulation and indirectly via total factor productivity (TFP) gain. This is consistent with the early Schumpeter (2011) of the view that finance is the driver of growth through a more efficient saving allocation and a rise in TFP such as the quality of capital improvement. Kleimeier and Versteeg (2010) undertake an empirical examination of 90 countries from 1991 to 2005 of the contribution of project finance to economic growth that is found to be statistically significant, particularly in the low-income countries with have high transaction costs. The model is based on assumption that countries' growth is based on important factors such as financial development as well as a select number of controlled variables, government expenditure, population growth, schooling, economics, institutional characteristics, and others. Kleimeier and Versteeg (2010) estimate that a rise of annual growth of 2.0 percentage points could be produced by a shift from the 25th to the 75th percentile in project finance.

Moreover, it is indicated that the Asia-Pacific region has been the main beneficiary of the project finance primarily for the infrastructure sector. With the large investment requirement in the infrastructure space, a project finance scheme is an ideal type of financing scheme for most project sponsors, given the limited equity contribution and project non-recourse nature while the lenders carry much of the infrastructure project's business risk.

Furthermore, Rajan Annamalai and Jain (2013) undertake an empirical investigation to analyze

the extent of the political risk influence on the choice between project finance, full-recourse finance, and the syndicate structure of the project finance transaction, with the outcomes that projects in countries with higher levels of political risk are more likely to be structured as project finance loans and that development banks, are more likely to participate in the syndicates. Project finance transactions have a higher level of debt percentage as compared to traditional corporate finance (Esty, 2004). In short, a number of authors undertake empirical investigations to assess the linkage between the existence of a country's political risk and project finance (Rajan Annamalai & Jain, 2013; Hainz & Kleimeier, 2012; Girardone & Snaith, 2011; Sawant, 2010).

2.3. Hypotheses development

2.3.1. Risk factors

Girardone and Snaith (2011) analyze the influencing factors of the project finance interest rate utilizing the economic and political risk determinants using the disaggregated factors employing 1190 project loans from the developed and developing countries dataset from the Loan Analytics database from Dealogic. Girardone and Snaith (2011) observe that in the developing countries, the project finance interest rate, and the political risk factors have a significant relationship. These authors have provided a new contribution to the literature by including the disaggregated factors of political risks: 1) effectiveness; 2) quality and strength of a country's legal and institutional systems; 3) government stability; 4) government accountability.

Next, Byoun, Kim, and Yoo (2013) examine project finance investments in 124 countries from 1997–2006 by looking at their capital structure, who find that leverage tends to be opted as the project risk increases. While the lenders have preferences to lend to riskier projects given that, they have significant control over the future cash flow to ensure payment securement (Kleimeier & Megginson, 2000). Next, the expected return and country risk derived from the Beta coefficient of the capital asset pricing model (CAPM) such as political or sovereign risk has too well mitigated.

How the foreign government act impacts the cash flow of its international business is a vexing matter, thus the central component of the company's valuation (Damodaran, 2003); moreover, on the company's financing requirement outlook, as how much the country risk premium is to be commanded on the cost of financing for the international investment as well as how the project finance becomes an optimum financing technique in a developing country with sub-optimal corporate governance (Kleimeier & Megginson, 2007). According to the World Bank Group's Multilateral Investment Guarantee Fund (MIGA), political risk is comprised of war, revolutions, property seizure by the government, and the restriction of profits and other revenues movement to leave the country. As mentioned above, political risk refers to the unanticipated change in the "rule of the game" of the business environment (Butler & Joaquin, 1998).

2.3.2. Return factors

Project finance loan (PF) is typically provided to the creditor in developing countries, while the interest rate does not seem to be influenced by maturity and loan size (Kleimeier & Megginson, 2000). Moreover, the syndicated loan transaction is typically led by the relationship bank, referred to as the mandated lead arranger while further the explanatory variables relevant to the CAPM do not convey the full picture of the syndicated loan-pricing premium.

2.3.3. Macroeconomics

According to Sorge and Gadanecz (2004), loan pricing is affected by a number of macro variables as well as the global trend in investors' aversion. These authors' macro variables include the elements relate to the country of the borrower (real GDP growth, inflation, investment to GDP, credit to GDP, current account balance to GDP, and debt service to exports) as well as the structural risk that pertains to the corruption of the political system and the inclusion of the US treasury yield curve and J.P. Morgan Emerging Market Sovereign Bond Index.

This paper will develop the investigation further, with the dependent variable of the total interest rate charged on the project finance loan as the summation of the loan spread and the London Interbank Offered Rate (LIBOR). According to Hou and Skeie (2014), LIBOR is composed of term and risk spreads including overnight risk rate over the term, term premium, bank term credit risk, term liquidity risk, and term risk premium. Hence, in the view of the second, testable hypotheses are as followed:

H1: The project finance interest rate is positively influenced by the political risk, sovereign risk factors and negatively influenced by the third-party guaranteed presence.

H2: The project finance interest rate is negatively influenced by the loan size and loan maturity, while positively influenced by the number of banks.

H3: The project finance interest rate is influenced by the macro variables.

3. RESEARCH DESIGN AND METHODOLOGY

The previous studies by Kleimeier and Megginson (2000), Sorge and Gadanecz (2008), Girardone and Snaith (2011), and Thieirie and De Moor (2018) deploy the ordinary least squares (OLS) estimators. The previous empirical analyses on the interest rate variable are measured based on points over the LIBOR as the dependent variable and the analysis is conducted by employing the econometric model of the estimation of the regression parameters through the OLS. The OLS regression framework analysis is to be extended based on the model by White (1980) in which the authors demonstrate that OLS is a consistent estimator despite the presence of heteroskedasticity in the disturbances of the linear regression model. However, the precision of the OLS estimation procedure is based on a number of strict assumptions to be satisfied (Hayashi, 2000). The recapitulation of the OLS assumptions are as follows: 1) linear relationship between the dependent

variable and regressors; 2) full rank property, implying that each column of regressor is linearly independent (multi-collinear relations is non-existence presumption); 3) strictly exogenous error term; 4) the error term satisfies conditional homoscedasticity; 5) the error terms are not dependent- that is error is not spatially or serially auto-correlated. Furthermore, the relevant definitions are described next; "time series" is defined as a data set containing observations on a single phenomenon observed over multiple time periods. "Cross-sectional" is a data set containing observations on multiple phenomena observed on multiple phenomena. Whilst the dataset containing observations on multiple phenomena observed over multiple time periods is known as "panel data". The time-series and cross-sectional data feature the single dimensionality, whereas the panel data is two-dimensional. As stated above, the model proposed in this paper is stated below, whereas the selected macro variables of solvency measure, economic growth, and political risk while the return variables of loan maturity, loan size, banks, and guarantee variables are to be utilized for the research.

The syndicated project finance interest rate price will be deployed as the dependent variable in the examination, with the selected return attribute factors and the loan macro characteristics relevant to the infrastructure sector as the independent or explanatory variable.

After much consideration, given the research question in this paper and the nature of the data set of time series and cross-sections, the empirical investigation will be performed using the panel data analysis framework. Firstly, before going beyond the methodology from the previous literature, the OLS methodology framework will be also be initially utilized prior to the introduction of the panel data statistical technique on the determinants of project finance loan pricing spread over LIBOR as the dependent variable with the explanatory variables of the selected macro characteristics, the disaggregate country risks factors from World Bank Governance Indicators (WBGI) with new variable contributions, and government

infrastructure loan from the debt market as a bid to fathom how the deregulation level and government fiscal space level in the infrastructure sector in the ASEAN-4 countries impact the project finance interest rate.

3.1. Data sample

The syndicated loan data on the margin over the LIBOR is obtained from the Dealogic ProjectWare database, a leading market information provider on the syndicated credit facilities particularly on the return characteristics of the loan. Whereas the historical LIBOR data is to be obtained from the financial data provider, Bloomberg L.P., LIBOR is the universal benchmark used for floating-rate loans in multiple currencies including in US dollar, declared by the Bank of England at the end of each business day. LIBOR is consisted of a set of rates for 1-, 3-, 6- and 12-months deposits term and a US dollar-based loan is generally priced against a 3-month LIBOR due to its quarterly interest payment. The syndicated loan data is comprised of the project name, signing date, maturity date, guarantor, interest rate, fee, and others, whilst the loan data is organized into four countries: Indonesia, Malaysia, the Philippines, and Thailand, as well as the industry subsector electricity, and non-electricity infrastructure sector. The macroeconomic data in this paper is to be sourced from BIS-IMF-World Bank Joint Statistics on external debt, the IMF's international financial statistics, and the IMF's world economic debt. The political risk data is obtained from the World Bank Worldwide Governance Indicators (WGI).

For the partial consideration detailed above, panel data analysis will be utilized to examine the above-posed research question. The above data of the project finance interest rate is extracted from the syndicated loan data provider Dealogic, while other data for the return attributed factors and macro loan characteristics data are to be obtained from the IMF, World Bank, and the Central Bank database. The data sample from the ASEAN-4 countries over the period of 1996–2016.

Table 1. Explanatory variables under examination and predictions

Explanatory variables	Definition	Prediction Interest rate
Political stability	Perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional	+
Regulatory quality	The extent to which agents have confidence in and abide by the rules of society	+
Sovereign risk	Credit risk associated with the operation of a country	+
Guarantee/Political risk insurance	Political risk mitigation presence	-
Loan maturity	Tenor or duration of the loan	-
Loan size	Value of the loan	-
Number of banks	Syndicated bank participants number	+
GDP growth	GDP growth is the proxy of real GDP growth	Sig.
Net export	Difference between the value of a country's exports versus its imports	Sig.
US treasury rate	The interest rate that the US government pays to borrow money for different lengths of time	Sig.
Inflation	Rate of increase of average price level of a basket of goods	Sig.

Note: Authors' proposed variables.
Source: Kleimeier and Megginson (2000), Sorge and Gadanecz (2008), and Girardone and Snaith (2011).

The empirical test of this paper is focused on the determinants of the project finance interest rate on the ASEAN-4 cross-countries with a balanced panel on the following explanatory variables

represented by the table below to test the stated hypotheses at the 1% and 5 % significance level.

The empirical model analysis of this paper is formulated in the regression equation:

$$Total\ interest\ rate\ p,c = \beta_0 + \beta_1 Political\ sustainability_c + \beta_2 Sovereign\ risk_c + \beta_3 Guarantee_c +$$
$$+\beta_4 Regulatory\ quality_c + \beta_5 Loan\ size_c + \beta_6 Number\ of\ banks_c + \beta_7 Loan\ maturity_c + \beta_8 Inflation_c + \quad (1)$$
$$+\beta_9 GDP\ growth_c + \beta_{10} Net\ export_c + \beta_{11} US\ treasury\ rate_c + \varepsilon$$

where, the $p = 1...., 30$: p is the number of project observations at specific period t in the balanced panel of a minimum of 30 observations and c represents each of the countries within ASEAN-4 countries, c = Indonesia, Malaysia, Thailand, and the Philippines. The equation on the project finance total interest rate charged above will apply both the fixed and random effects as well as common effects and will undertake relevant testing for the suitability, in which the panel data framework analysis will be processed using EViews software package, whereas the balanced panels of a minimum 30 observations among the ASEAN-4 countries are constructed. As a rule of thumb for the testing suitability, many said that the random-effects model is a more suitable approach when entities in the sample are said to be randomly selected from the population, while the fixed model is more appropriate when the data in the sample effectively represent the whole population. After setting up the data in the appropriate number of cross-sectional observations, the appropriate time period and frequency, to ensure a balanced panel. Next, the fixed effects testing and random effects regression testing will both be undertaken, while the Hausman test for the random effects being uncorrelated with the explanatory variables, as well as the Chow, and LM test to be undertaken.

The summation between LIBOR and project finance loan spread forms the simultaneous structural form of the total interest rate. Given the notion that LIBOR is non-exogenous as the simultaneous, equations framework is more appropriate than the single equation. Under the classical linear regression model (CLRM) in which the explanatory variables are non-stochastic, the X matrix is assumed to be exogenous. This is a very simplistic assumption, particularly on the variable under this paper's examination of the total project finance loan interest rate.

3.2. Variables

3.2.1. Dependent variables

The dependent variable in the empirical investigation in this paper is the interest rate priced to the borrower. The sample data in this paper is contained of the syndicated project finance loan, the spread priced to the borrower (over LIBOR, Euro Interbank Offered Rate (EURIBOR), or other loan pricing benchmark) published by Dealogic of all the infrastructure projects in the ASEAN-4 countries from the year of 1996 until 2016. Several works of literature have examined the said loan-pricing variable (Kamin & von Kleist, 1999; Kleimeier & Megginson, 2000; Sorge & Gadanecz, 2008; Girardone & Snaith, 2011). Hou and Skeie (2014) express the LIBOR components consist of 1) the overnight risk as to the traditional overnight interest rate at which the riskless institution would be charged over the LIBOR term period; 2) term premium as the intertemporal rate of substitution for the term of the loan; 3) credit risk as to the borrower's counterparty risk; 4) term liquidity risk; 5) term risk premium.

3.2.2. Independent variables

Critical risk factors

Sovereign credit risk: Sovereign credit risk is defined by the main rating agencies as the assessment of the probability of default by the sovereign debt holder. Sovereign risk can be defined as the risk that the central bank will impose a foreign exchange rule and the non-repayment risk of the sovereign loan.

Political stability: Political stability capturing perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional. An attempt to define political stability must begin by clarifying the concepts of politics and political structure. Political behavior is any act by any member of a society that affects the distribution of the power to make decisions for that society. Political behavior is ubiquitous. Members of society behave politically insofar as, in obeying or disobeying the laws of the society, they support or undermine the power stratification system (Ake, 1975).

Guarantee: Political risk mitigation is a vital concern in infrastructure project financing. A lender typically resorts to the political risk cover through the implicit or explicit guarantees from the multilateral development banks such as MIGA, Partial Risk Guarantee (PRG), and others or export credit agencies (ECA). Previous research has examined this variable and has suggested the significance of the negative relationship between the guarantee and interest rate (Sorge & Gadanecz, 2008; Girardone & Snaith, 2011). Then, the guaranteed role in alleviating the political risk as the critical risk factor in project finance is implied to be the partial motive behind the implied hump-shaped curve of the interest rate and maturity relationship (Girardone & Snaith, 2011). It is estimated by Sorge and Gadanecz (2008) that the project finance interest rate seems to be reduced by one-third on average by the guaranteed presence.

Regulatory quality: Capturing perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular, the quality of contract enforcement, property rights, the police, and the courts as well as the likelihood of crime and violence.

Return attributed factors

Loan maturity: Maturity represents the tenor or duration of the loan, measured in years. Previous research has investigated the linkage between maturity and interest rate (Kleimeier & Megginson, 2000) which find a significant relationship between these variables for non-project finance loan. However, this empirical result is challenged by the empirical study outcome that the maturity and interest rate variables have a non-linear relationship, hump shape curve (Sorge & Gadanecz, 2008). Based on the previous research, it is anticipated that the maturity will have no significant relationship with the interest rate, thus a further analysis to investigate a non- linear relationship is to be

employed based on the paper by Sorge and Gadanecz (2008).

Loan size: The loan size variable has been deployed by previous literature (Kleimeier & Megginson, 2000; Sorge & Gadanecz, 2008; Girardone & Snaith, 2011). The previous literature suggested that the loan size reduces the interest rate, as the creditworthy debtor is like to be extended a larger loan size by the lender, thus the average cost is lower for a larger size loan.

Banks: The number of banks variable has been examined by Esty and Megginson (2003), who suggest a positive relationship between the syndicate size and loan credit risk, this is a function of syndicates' resource and time spent on transaction time on valuable monitoring, deterrence, and recontracting time. However, Girardone and Snaith (2011) find a non-significant relationship between interest rate and the number of banks.

Control variables: Macroeconomics factors

GDP growth: Real GDP growth is a measurement of the country's level of development as well as the growth in the economic and standard of living improvements (Parkin, 2004). The more positive economy is the country's growth prospect; the lender would price the loan at a lower premium.

Inflation: It is based on the quantitative measure of the basket consisting of a consumer price index (CPI) consisting of goods and services.

Net export: Net export is the difference between the values of a country's exports versus its imports. The net export value can be either positive (trade surplus) or negative (trade deficit). The net export variable is used to compute the GDP of a country.

US treasury rate: Treasury yield is the return on investment, expressed as a percentage, on the US government's debt obligations. Looking at another way, the Treasury yield is the effective interest rate that the US government pays to borrow money for different lengths of time.

3.3. Data sources

The Dealogic ProjectWare database is used to gather syndicated loan data on the margin over the LIBOR. The LIBOR is the universal benchmark used for floating-rate loans in multiple currencies, including the US dollar, declared by the Bank of England at the end of each business day. Historical LIBOR data, as well as the determining factors of LIBOR explanatory variables, are to be obtained from the financial data provider, Bloomberg L.P. A US dollar-based loan is often priced against a 3-month LIBOR due to its quarterly interest payment. The LIBOR is made up of a series of rates for 1-, 3-, 6-, and 12-month deposits. The project name, signing date, maturity date, guarantor, interest rate, fee, and other information are included in the syndicated loan data, which is divided into four countries: Indonesia, Malaysia, the Philippines, and Thailand, as well as the industry sub-sectors of electricity and non-electricity infrastructure. The political risk data is obtained from the WGI, with six dimensions of governance including 1) voice and accountability; 2) political stability and absence of violence/terrorism; 3) government effectiveness; 4) regulatory quality; 5) rule of law; 6) control of corruption.

Table 2. Explanatory variables under examination and data sources

Explanatory variables	Definition	Data source
Political stability	Unanticipated charge in the business environment rules	WGI: World Bank
Regulatory quality	Confidence in and abide by the rules of society	WGI: World Bank
Sovereign credit risk	Credit risk associated with the operation of a country	IMG
Guarantee	Political risk mitigation presence	Dealogic
Loan maturity	Tenor or duration of loan	Dealogic
Loan size	Value of the loan	Dealogic
Number of banks	Syndicated bank participants number	Dealogic
GDP growth	GDP growth is the proxy of the real GDP growth	IMF
Inflation	Rate of increase of average price level of basket of goods	IMF
Net export	Difference between the value of a country's exports and its imports	IMF
US treasury rate	Interest rate that the US government pays to borrow money	IMF
LIBOR	Risk-free yield	Dealogic

Note: Authors' proposed variables.
Source: Kleimeier and Megginson (2000), Sorge and Gadanecz (2008), and Girardone and Snaith (2011).

The WGI data source is represented by the widely diverse group of stakeholders which include: 1) the surveys of individuals/companies with the deep knowledge of the country's governance such as the World Economic Forum's global completeness report, World Bank Business Environment and Enterprise Performance surveys, Gallup World Poll, country analysts at the major multilateral development agencies, and many others. The distribution of the data source is well-balanced as of the 31 data providers used in 2009, 5 are from commercial business information sources; 9 from surveys and NGOs each; while the rest 8 data providers are from the public sector (Kaufmann, Kraay, & Mastruzzi, 2010); in which six dimensions of governance are described as:

The process by which governments are selected, monitored, and replaced:

• Voice and accountability-capturing perceptions of the extent to which a country's citizens are able to participate in selecting their government as well as freedom of expression, freedom of association, and free media.

• Political stability and absence of violence/terrorism-capturing perceptions of the likelihood-capturing perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means including politically motivated violence and terrorism.

The capacity of the government to effectively formulate and implement sound policies:

• Government effectiveness-capturing perceptions of the quality of public services, the quality of the civil service and degree of independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

• Regulatory quality-capturing perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts as well as the likelihood of crime and violence.

The respect of citizens and state for institutions that govern economic and social interactions among them:

• Rule of law-capturing perceptions of the extent to which agents have confidence in and abide by the rules of society and in particular the quality of contract enforcement, property rights, the police, and the courts as well as the likelihood of crime and violence.

• Control of corruption-capturing perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the states by elites and private interests.

Table 3. Explanatory data of political risk

No.	Political risk data from WGI
1	Voice and accountability
2	Political stability and absence of violence/terrorism
3	Government effectiveness
4	Regulatory quality
5	Rule of law
6	Control of corruption

Source: Authors' elaboration.

The construction of the aggregate measures of the WGI combining the many individual data sources corresponding to the above six dimensions of governance, utilizing a statistical tool of an "unobserved component model" (UCM) known to provide a signal extraction problem.

4. RESULTS

As previously stated, the research scope of this paper is to investigate the total interest rate charged with the set of risk, return, and macro variables while simultaneously undertaking a cross-section analysis among the ASEAN-4 countries to gain

insight into the cross-countries differential determinants. Hence, this paper will analyze the total interest rate in concurrent making the cross-countries comparison analysis. The econometric methodology in this paper is drawn from the previous literature by Kleimeier and Megginson (2000), Sorge and Gadanecz (2008), Girardone and Snaith (2011), and Thieirie and De Moor (2018) deploying the OLS estimators. The previous empirical analyses on the interest rate variable are measured on the basis of points over the LIBOR as the dependent variable and the analysis is conducted by employing the econometric model of the estimation of the regression parameters through the OLS.

Country-level and ASEAN-4 countries using OLS:

1. *Country level:* Single equation of separate regression analysis of each ASEAN-4 country using OLS for the dependent variable, project interest rate.

2. *ASEAN-4 countries:* Whole countries regression analysis will be undertaken for the aggregated ASEAN-4 countries for the dependent variable, project interest rate.

4.1. Summary statistics

The complete data set of 637 observations in ASEAN-4 countries from the years 1995 and 2018 of all project finance loan transactions amounts to approximately \$96.381 billion. While the individual size of a project finance loan tranche ranges from \$250,000 to over \$1 billion. Next, the number of participants in the loan syndication ranges from 2 to 26 banks; while the third-party guaranteed providers include the government, export credit agencies (ECA), and private insurance companies.

4.2. Econometrics regression results

Results are provided in the section below in which the outcomes are segregated into the loan margin and total interest rate column as the dependent variable.

4.2.1. The empirical model I

Single equation for the individual country deploying single equation of a regression analysis of each of the ASEAN-4 countries using the OLS. The equations below are provided showing the significant explanatory variables at the (*) 5% level. Based on the empirical analysis, each country within the ASEAN-4 countries has distinctive determinants of the loan margin and total interest rate charged for the project finance depicted by the equations below.

Indonesia

$$Interest\ rate = -0.159048 - 0.022031\ Loan\ size + 0.018934\ Loan\ maturity - 0.044605\ Number\ of\ banks$$
$$+ 0.171698\ US\ treasury\ rate^* + 0.370310\ Inflation - 0.174070 Guarantee^*$$
$$+\ 0.048821\ Political\ stability - 0.870232\ Sovereign\ credit\ rating^* \qquad (2)$$

(Adjusted R-squared: 0.876507)

Based on empirical regression findings in Indonesia, guarantee inversely affect the interest rate and negates the empirical investigation finding loan maturity will affect the interest rate (Kleimeier & Megginson, 2000). While the Indonesia regression result posits that the loan maturity does not have

the explanatory power to influence the interest rate, consistent with Sorge and Gadanecz (2008) suggest that the hump-shaped relationship between maturity and interest rate for the project finance loan. The presence of guarantee has the significant explanatory power; given the majority of the data set

encompass the power sector syndicated loan data, the finding can be influenced by the characteristics of the power industry structure; considering the risk of the long-term investment, the sustained government supports from the host Asian countries

are provided in the form of credit enhancement, to attract private participation in the electricity sector (Chowdury, Chen, & Tiong, 2013; Vecchi, Hellowell, & Gatti, 2013).

Malaysia

$$\begin{aligned}
Interest\ rate = {}& 2.719268 + 1.455623\ Sovereign\ credit\ rating^* + 0.178263\ Loan\ maturity^* \\
& - 0.167804\ Number\ of\ banks * + 0.004820\ Loan\ size - 0.021299\ Guarantee \\
& + 0.062337\ GDP\ growth + 0.216560\ US\ treasury\ rate^* - 2.611515\ Political\ stability^* \\
& - 0.219526\ Regulatory\ quality
\end{aligned} \tag{3}$$

(Adjusted R-squared: 0.975825)

Malaysia's regression results are different from Indonesia in which the independent variables of

third-party guarantee, sovereign credit rating, US treasury rate have significant explanatory power.

Thailand

$$\begin{aligned}
Interest\ rate = {}& -1.718300 - 0.041108\ Loan\ size - 0.037273\ Net\ export + 0.156890 Loan\ maturity^* \\
& + 0.027664\ Number\ of\ banks + 0.005582\ GDP\ growth + 0.037273\ Net\ export \\
& + 0.240240\ US\ treasury\ rate^* - 0.432116\ Inflation - 0.000346\ Guarantee \\
& + 0.238096\ Regulatory\ quality
\end{aligned} \tag{4}$$

(Adjusted R-squared: 0.436056)

The regression results are depicting that the independent variables of loan maturity have significant explanatory power for the interest rate, as the dependent variable. For the project interest rate as the dependent variable, loan maturity, loan size, and US treasury rate have significant

explanatory power. Only in Malaysia and Thailand, the independent variable of maturity has the explanatory power, perhaps due to the corporate finance or the name lending, depth, and participation of the capital market to finance the infrastructure.

The Philippines

$$\begin{aligned}
Interest\ rate = {}& -8.047893 - 0.076415\ Loan\ size^* + 2.544210\ Sovereign\ credit\ rating \\
& + 0.006404\ Loan\ maturity + 0.057795\ Number\ of\ banks \\
& + 0.211189\ GDP\ growth - 0.028045\ Net\ export \\
& + 0.102903\ US\ treasury\ rate - 0.604842\ Inflation - 0.001078\ Guarantee \\
& + 2.875802\ Regulatory\ quality
\end{aligned} \tag{5}$$

(Adjusted R-squared: 0.855921)

The independent variables of loan size, sovereign credit rating, and US treasury rate have significant explanatory power. For the loan return characteristics, loan size is the independent variable with the significant explanatory power across ASEAN-4 except for Indonesia. Furthermore, Indonesia is the only country whereby the independent variable, the third-party guarantee has explanatory power, while at the same time in Thailand and Malaysia, the independent variable maturity has significant explanatory power. This can be explained by the buoyant domestic credit liquidity and deep capital market and conversely to Sorge and Gadanecz's (2008) finding. On the regression finding of Indonesia, the explanatory power of the third-party guarantee

is envisaged by the table on the credit enhancement support comparison in Indonesia, the Philippines, and Thailand; whereas power project in Indonesia is obliged to have the most credit enhancement supports relative to other countries.

4.2.2. The empirical model II

ASEAN-4 countries are represented in the regression equation below through the regression results for the aggregated ASEAN-4 countries for the dependent variables: total interest rate. In addition, dummy variables are used to reflect the differential at the specific country-level within the ASEAN-4 countries.

$$\begin{aligned}
Interest\ rate = {}& -0.93 - 0.048\ Loan\ size^* \\
& + 0.0.011\ Loan\ Maturity - 0.037\ Number\ of\ Banks - 0.5\ Inflation^* \\
& + 0.175\ Sovereign\ Credit\ Rating - 0.089\ Net\ export \\
& + 0.456\ LIBOR^* - 0.594\ GDP\ growth - 0.014\ Guarantee \\
& + 0.622\ Political\ Stability - 0.085\ Regulatory\ Quality + 0.292\ D_1{}^* + 0.242\ D_2{}^* \\
& + 0.134\ D_3{}^*
\end{aligned} \tag{6}$$

Table 4. Results overview for the dependent variable of interest rate

Explanatory variables	Project interest rate		Prob.	Hypothesis
	Prediction	Result		
Political stability	+	+	Not Sig.	Reject
Regulatory quality	+	-	Not Sig.	Reject
Sovereign credit rating	+	+	Not Sig.	Reject
Guarantee/Political risk insurance	-	-	Not Sig.	Reject
Loan maturity	-	+	Not Sig.	Reject
Loan size	-	-	Sig.	Do not Reject
Number of banks	+	-	Not Sig.	Reject
GDP growth	Sig.	Not Sig.	Not Sig.	Reject
Inflation	Sig.	Sig.	Sig.	Do not Reject
LIBOR	Sig.	Sig.	Sig.	Do not Reject
Net export	Sig.	Not Sig.	Not Sig.	Reject

Source: Authors' elaboration.

The project interest rate charged on project finance is negatively influenced by the loan size, inflation, and 6-month LIBOR, whilst the dummy country variables have significant explanatory power. Deploying the OLS regression for all ASEAN-4 countries, the empirical regression analysis of the determinants of the loan spread and project interest rate considering the differential characteristics in various countries relative to the previous literature which have mainly aggregate the empirical analysis segregated at the developing, emerging versus developed level; evident in the results shown in the table. It is important to understand the transmission mechanism reflected in the explanatory power of the various return and macro variables of loan spread and project interest rates' determinants. The above single country OLS regression and all ASEAN-4 countries results explicate the different characteristics possessed by each country in the ASEAN-4 represented by the different significant explanatory variables.

Table 5. Result findings adjusted R-square

The findings	Adjusted R-square
Interest rate	
Indonesia	0.87
Malaysia	0.97
The Philippines	0.85
Thailand	0.43
The Asean-4	0.73

Source: Authors' elaboration.

The results disparity among ASEAN-4 countries is denoted by the different return and macro characteristics of the syndicated project finance loan. However, it is worthy to note that the independent variable of maturity has significant explanatory power in Malaysia of maturity, the result may suggest that the lender's view on the borrower as the corporate loan as well as the depth of the capital market, bond market.

While simultaneously, in Indonesia the significant explanatory power of the guaranteed presence may explain the dominance of the multilateral loans in the infrastructure sector, ADB and the World Bank had provided official development assistance (ODA) or concessional loan to the state-owned electricity company since the '70s (ADB, 2020). Given the experience of the Asian crisis and historical or legacy dependence of World Bank-led Consultative Group International (CGI)'s dominance particularly for the Indonesian economy, the third party guaranteed presence is a crucial determinant of the interest rate. In the case of Indonesia, although the political risk factor does not

have explanatory power, not statistically significant, however, the political risk issue may be reflected by the transmission mechanism of the explanatory variable of guarantee. As it is asserted that Indonesian power projects the perceived political risk is still seen high, due to its legal and regulatory risk and breach of contract risk (Voelker, Permana, Sachs, & Tiong, 2008).

5. CONCLUSION

At the country level, the determinants of the interest rate are distinctive to each country's infrastructure industry characteristic. In Indonesia, the guarantee is a significant determinant of dependent variables of the project interest rate. In Malaysia, political risk, loan characteristics, and control or macro characteristics are the significant determinants. In the Philippines, the political risk and loan characteristics are the significant determinants, relative to the macro characteristics. Lastly, in Thailand loan characteristics of maturity and macro characteristic of the US treasury rate, have significant explanatory power.

On the critical risk factors, different variables have significant explanatory power, distinctive to each country. It is important to note for individual country regression, only in Indonesia, the third-party guarantee has significant explanatory power, as it may be explicated by the legacy of the multilateral loan to the infrastructure sector particularly.

At the level of ASEAN-4 countries, the interest rate side, macro variables such as inflation and LIBOR also influence interest rate. Other than macro variables, size of loans also influences the interest rate in the ASEAN-4 countries. The significance of LIBOR obviously is that there is a relationship in the formula for the formation of the loan spread and LIBOR is the benchmark interest rate at which major global banks lend to one another. Sorge and Gadanecz (2004) also find that the non-linear relationship explicates the relationship between the interest rate over LIBOR.

We also find that the critical risk factor does not affect the interest rate, because the critical risk factor with the proxy of political stability and government effectiveness does not affect the interest of project financing loans due to the characteristics of ASEAN-4 countries.

For the recommendation for future research is to obtain a larger data set or groups of countries, for possibly deploying a panel data analysis or econometrics methodology to gain a better insight into the different countries' differential. Next,

the study on the non-financial contract on risk mitigation is also a critical subject to explore. A number of challenges has been encountered in collecting the secondary data. Due to the nature of the data set of the project finance transactions or irregular interval of the project finance loans' financial closing dates as well as the interest rate data.

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