Critical risk factors of the project finance loan spread in the infrastructure sector: Experience from the ASEAN countries

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C H R O N I C L E	A B S T R A C T
	This paper finds that in ASEAN-4, the micro loan characteristics: loan amount and LIBOR whilst the macro characteristics: inflation, net export and GDP growth influence the loan spread in the project finance. However, simultaneously at the country level, the determinants of the loan spread are distinctive to each country's infrastructure industry characteristic. The paper's main contribution relates to the determinants of the project finance loan spread at the country level and regional level, ASEAN-4. The purpose of this paper is to fathom the critical risk factors behind the project finance loan pricing differential across the ASEAN-4 countries. Hence, the policy makers, project developers and lenders can have a better understanding of the drivers behind the project finance loan spread pricing. The study adopted an ordinary least square (OLS) regression methodology and collected data from ASEAN-4 countries consisting of Indonesia, Malaysia, Philippines, and Thailand.

1. Introduction

The debt capital market consists of the corporate bonds and the syndicated loans whereas the syndicated loans comprising at least two financial institutions are the major substitute to corporate bonds in terms of financing decisions. In 2005, global syndicated lending reached $ 2.3 trillion. In 2014 syndicated deals reached $3 trillion and US$ 4.6 trillion in 2017. In the first half of 2018, in the Asia Pacific excluding Japan's capital market alone, the syndicated lending achieved a level of US$ 212 billion. 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. The deregulation of the infrastructure sector: electricity, water, telecommunication, and others in the ASEAN four countries of Indonesia, Malaysia, Philippines and Thailand, prompts many international investors simultaneously with expansion of the global banks to the developing countries; searching for the new market prospect and a higher yield on their infrastructure project loan. Global banking's pursuit in the developing countries for the return represented by the loan spread over the risk-free yield represented

by the London Interbank Offered Rate (LIBOR). LIBOR is defined by Hou and Skeie (2014) as the benchmark rate in which major banks reveal their ability to borrow at short term wholesale funds from one another on an unsecured basis within the inter-banking. Furthermore, the expected return and country risks derive from the sovereign and political risk importantly has to be well-mitigated. As certain factors of political risk faced by the international investor are not plausible to be addressed by the investors themselves, specific risk of the political risk insurance in the form of third-party guarantee from the host government and multilateral agency are required. The host country government has the best interest to promote the investment in their country's infrastructure program given the role being the public good. Thierie and Moor (2018) insinuate the prominence of the project financing as its financing affiliation of infrastructure as the public good such as electricity, water, toll road and others which are ultimately forfeited by the taxpayers. Further, infrastructure through private sector participation (PSP) takes a part in easing the public sector fiscal space thus assisting the government pressure to deliver the infrastructure service. Hence, in order to attract private sector participation in infrastructure, the host country government typically provides a guarantee in the form of the explicit or implicit government guarantee for the private sector to mitigate a number of risks that is difficult to address by the private sector.

The requirement of infrastructure in Asia is vast, $ 26 trillion is requisite from 2016 to 2030 according to the ADB infrastructure report (2017), while the South East Asian countries require an investment of US$ 145 billion annually to attain its growth momentum, poverty eradication and climate change mitigation challenges. A commonly called group of five ASEAN (Association of South-East Asian Nations) countries which make up the major economies within ASEAN economic community, which are composed of Indonesia, Malaysia, Philippines, Singapore and Thailand. However, this paper will focus solely on the ASEAN-4 excluding Singapore, amid its economic structure and high level of GDP per capita today. In the aftermath of the Asian crisis in 1997, Singapore has managed to strengthen and liberalize its economy through "liberal market opening with active preparation of domestic financial sector and reformed regulatory framework" (ASEAN Integration report, 2015). Furthermore, level of infrastructure service delivery and the infrastructure industry structure; the utility sector, power sector, as the prominent project finance loan recipients in Singapore is distinct which adopts the limited retail competition market model relative to the other ASEAN-5 countries which still embrace the single buyer model (Yokota and Kutani, 2017). Hence, it would be discordant to include Singapore in the study of comparison.
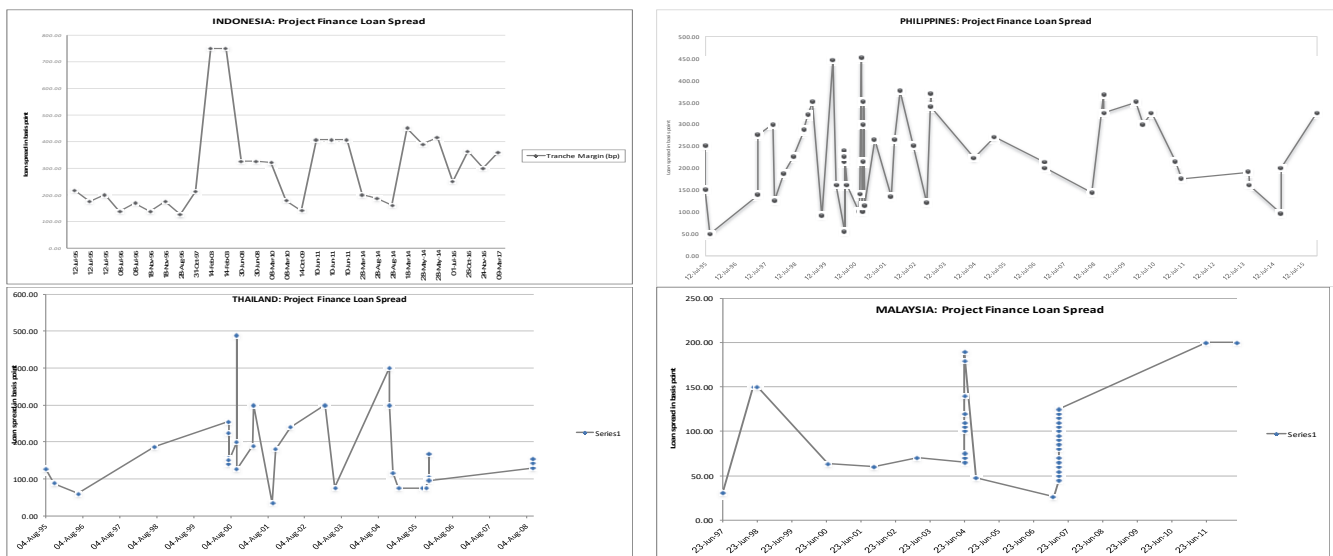

Fig. 1. Project finance loan spread over LIBOR in the ASEAN four countries for selected project financings

This paper will investigate the determinants of the project finance loan spread charged in the infrastructure project, as the relevant topic that generates great interest among the investors, general public and policy makers globally. Previous studies have explored the determinants of the project finance loan spread; however, it fails to attend the analysis at the specific country as well as the regional level. The objective of this paper is to conduct an empirical investigation into the drivers of the loan margin differential across the ASEAN-4 countries, deploying the micro loan characteristics, and the critical risk factors: political risk, sovereign risk and third-party guarantee, while also incorporating the macroeconomic variables, to be treated as the control variables. This paper attempts to investigate the critical risk factors as well as other determining factors behind the loan margin differential across ASEAN-4. In the next section, the literature review will be discussed to be followed by the results, interpretation and conclusion section. The investigation will be undertaken and elaborated by drawing on the existing literatures of the determinants of the project finance loan pricing spread (Kleimeier & Megginson, 2001; Sorge & Gadanecz, 2008; Thierry & Moor, 2019) and its relationship with the sets of micro characteristics of loan and macroeconomics variables, political risks

at the disaggregated level (Girardone & Snaith, 2011). The existing literatures also attempt to explicate the determinants of the project finance loan spread as well as how the project finance loan is distinct from other type of loans (Kleimeier & Megginson, 2000; Sorge & Gadanecz, 2008; Girrardone & Snaith, 2011). Looking at the statistical results of the previous literatures' regression outcome of the level of R-squared produced by the previous literatures, encourage this research paper to enquire within the micro and macro loan characteristics, to incorporate new explanatory variables relevant to the ASEAN-4 countries. The investigation will be conducted by the analysing the data obtained on the syndicated project finance loan transactions by performing the OLS regression on the determinants of the project finance loan spread drawing on from the previous literatures' model on the syndicated loan in the infrastructure sector; obtained from the Dealogic projectware and other data sources at the individual country level and then compare the four ASEAN countries with the time series data of 1996-2018. The syndicated project finance loan data set consists of the project name, signing date, maturity date, guarantor, loan fee and others and is organized into ASEAN-4 countries. Previous literature has 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 investigate the extent of relationship of the project finance loan spread over the London Interbank Offered Rate (LIBOR) arisen from the critical risk characteristics, micro loan characteristics and macroeconomics characteristics in the infrastructure sector in the ASEAN four countries. Gaining insight from the previous literatures on the determinants of the project finance loan spread, this paper strives to address the posed research question: "what are the cross-countries' determining factors behind project finance pricing: the project finance loan spread over the London Interbank Offered Rate (LIBOR) in the ASEAN-4?"

2. Literature review

2.1 Overview

The pricing of the project finance loan is considered to be the loan spread, despite the total interest rate for the project finance loan is typically London Interbank Offered Rate (LIBOR) as the fixed component plus the loan spread as the variable component; given the LIBOR is treated as the risk-free yield. The cost of project finance loan debt is driven by the margin or spread over the fixed component of LIBOR (Thierie & Moor, 2018). While on the theoretical aspect, there are various academic literatures pertaining mainly to the corporate loan pricing study based on bank loans and publicly traded debt (Merton, 1974; Booth 1992; Moody, 2000) The classical loan pricing model is based on the Merton/ Black-Scholes (MBS) option pricing framework for the pricing of default risk on corporate debt (Merton, 1974). However, according to Blanc-Brude and Strange (2007), the MBS model is not wholly applicable for the project finance; based on the empirical evidence; Sorge and Gadanecz (2004) find the non-significant and non-linear relationship between the loan margin and loan tenor or maturity. Moreover, on the credit risk matter, the non-financial contract (NFC) acts as the medium to ring fence a number of risks; defined as " contracts that generate cash inflows or outflows that affect the unlevered free cash flows of the SPV" (Corielli, Gatti and Steffanoni, 2010), while the by-product of the non-financial contract of the project finance transactions shall imply that the credit risk premium to be imposed by the lenders shall lessen, as it is asserted by Esty (2003) that the NFC is the mean of "institutional risk management".

2.2 Determinants of the project finance loan spread

Micro Characteristics

A number of previous academic literatures have examined the loan spread determinants. The literatures authored by Esty and Megginson (2000), Kleimeier and Megginson (2000), Sorge and Gadanecz (2004), Altunbaş and Gadanecz (2004), Blanc-Brude and Strange (2007), Girrardone and Snaith (2011), Bouzguenda (2014), Thierie and De Moor (2018). In general, no consensus has been reached on the main drivers of the project finance while the precedent literatures have identified the significant variables grouped into loan micro and macro characteristics variables.

Kleimeier and Megginson (2000) 's investigation suggests: (i) the loan spread, and the maturity is inversely related; (ii) the third-party guarantee and the currency risk reduce the loan spread whilst the loan size as well. Sorge and Gadanecz (2008) expand on the finding of a non-significant relationship between loan spread and maturity, yet they discover a non-linear curve, a hump shaped relationship between the spread and maturity explicated by other factors such as political risk guarantee, time varying project advancement and leverage. Also, given the economics/ bankability of the project finance with the long tenor, this is seen as the source of long-term capital. 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. Furthermore, "given that the cost of debt capital is lower than the cost of equity capital, a higher level of debt funding in the project would reduce overall project costs, which in turn could lower the project tariffs. Thus, the level of project debt also plays an important role in project economics" (Esty, 2003) p.256. In contrary to the theoretical prediction and consistent with Esty (2003), the empirical study results by Kleimeier and Megginson (2001), find that the project finance loan is not more expensive and determined by the different factors than the other types of syndicated loans such as corporate finance by performing an Ordinary Least Squares (OLS) regression analyses of the influencing factors of loan pricing spreads for project finance and non-project finance loan. In the OLS regression, the loan

spread over LIBOR (London Interbank Overnight Rate) in basis points as dependent variable while deploying the maturity, loan size, currency risk, country risk rank and collateralized assets as the explanatory variables.

Sorge and Gadanecz (2004) define the microeconomic explanatory variables as the maturity, loan size, risk mitigant presence and business specific factor. Kleimeier and Megginson (2000) hypothesize the microeconomic determinants of the project finance loan pricing are the loan size, maturity, guarantee, currency risk and collateralizable assets. The unique nature of project finance defies the convention of the term structure of credit of the positive relationship between the loan spread and maturity. Kleimeier and Megginson (2000) find that a project finance differs from other types of syndicated loans in which the relationship between the loan and maturity is not significant. Sorge and Gadanecz (2007) expand on the finding of a non-significant relationship between loan spread and maturity, yet they discover a non-linear curve, a hump shaped relationship between the spread and maturity explicated by other factors such as political risk guarantee, time varying project advancement and leverage. Also, given the economics/ bankability of the project finance with the long tenor, this is seen as the source of long-term capital. 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 pertains to the corruption of the political system and the inclusion of the US treasury yield curve and JP Morgan Emerging Market Sovereign Bond Index.

2.3 Critical risk factors

Political risk and sovereign risk

In the context of international investment, the political risk's main areas relating to government actions which impact: (i) regulatory or change in law risks which affect all projects; (ii) investment risks which comprises of currency of convertibility and transfer, expropriation and political violence, affects mainly cross border project investment primarily in developing countries. The currency convertibility and transfer, expropriation, political violence and breach of contract are insurable through the public and private insurers while the other elements of the political risks, changes in laws or governments, legal or regulatory changes are typically not insurable and have to assumed by the private sector (Sachs, Tiong and Wagner, 2007). 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 the empirical investigations to assess the linkage between the existence of country's political risk and project finance (Annamalai and Jain, 2012; Hainz & Kleimeier, 2012; Girrardone & Snaith, 2011; Sawant, 2010.). Next, based on the empirical study that the project finance loan margin pricing, relative to the best rated country, is indicated to be 63 basis points (bps) higher in the speculative-grade country and 105 bps higher in the poor rated country (Corrieli, Gatti & Steffanoni, 2010).

Girrardone and Snaith (2011) analyze the influencing factors of the project finance loan spread 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. Girrardone and Snaith (2011), observe that in the developing countries, the project finance loan spread, and the political risk factors have significant relationships. These authors have provided a new contribution to the literature by including the disaggregated factors of political risks: (i) effectiveness; (ii) quality and strength of a country's legal and institutional systems; (iii) government stability; (iv) government accountability. The results of the ordinary least squares (OLS) implies that the loan spread is inversely related to the effectiveness of the quality and strength of a country's legal and institutional systems, and simultaneously the lower level of government stability and democratic accountability are more likely to be associated with lower loan spreads.

Sachs, Rosa and Tiong (2008) undertake a risk exposure quantification analysis using the power purchase agreement (PPA); in which an extended study is carried out to evaluate the political risks linked with the public private partnership (PPP) power projects in Indonesia and the potential risk mitigation factors based on the stakeholder perceptions (Voelker, Permana, Sachs and Tiong, 2008). Sachs (2006) conducts a survey on the public private partnerships (PPP) opportunities in Asia in which he finds an adverse relationship between the perceived level of political risk and PPP opportunities as well as investment appetites. For an application to Indonesian power projects is still relatively high, due to its legal and regulatory risk and breach of contract risk (Volker, Permana, Sachs and Tiong, 2008).

Third party guarantee

Given the commitment of the long-term foreign direct investment and finance, hence a host government sustained political support is required to provide assurance to the foreign direct investment (FDI) in the developing countries (Chen, 2009; Huang & Chou, 2006; Ke et al., 2010) to ensure the successful infrastructure service delivery. The host government typically gives a

guarantee or credit enhancement to compensate the risk in order to attract private participation in the infrastructure sector. Voelker, Permana, Sachs and Tiong (2008) undertake an empirical investigation in the Indonesia electricity sector and identify that given the relatively high political risk perception in the electricity sector, a viable government support from the host government is still preferable than the political risk insurance. Sorge and Gadanecz (2008) suggest that with the presence of the risk mitigation provided by the multilateral or export credit agency, implicit or explicit form could lower the loan spread by 50 basis points. For instance, the multilateral such as the Multilateral Investment Guarantee Agency (MIGA) provides the political risk coverage for the: (i)currency inconvertibility and transfer restriction cover; (ii) expropriation cover; (iii) war and civil disturbance cover and breach of contract cover.

Table 1
Literature review on the loan spread determinants

Author(s)	Research Objective	Methodology	Variables
(i) Kleimeier and Megginson (2001)	Analyze the non- project finance and project finance loan spread determinants.	- OLS regression	- Dependent variable: Loan spread - Independent variables: loan size, maturity, guarantee, currency risk, country risk rank and collateralizable assets. - **Adjusted R-squared of 0.17**
(ii) Esty and Megginson, 2000	- Assessing the relationship between the with the syndicate structure, political risk and loanprice	- Panel regression analysis	- Variables: syndicate size, political risk, loan pricing - **Adjusted R-squared of 0.27**
(iii) Sorge and Gadanecz (2008)	- Investigate the term structure of credit spreads in PF; focusing on the spread and maturity relationship.	- OLS regression	- Dependent Variable: loan spread - Independent Variables: micro (maturity, size, guarantee, bilateral deal) and macro (investment/GDP, Bank credit/GDP, corruption index, US Treasury yield curve) - **Adjusted R-squared of 0.216**
(iii)Girrardone and Snaith (2011)	- Explore the determinants of project finance loan spreads by using the disaggregated approach to the PF	- OLS regression	- ICRG political risk index - WB governance index - Dealogic syndicated loan transaction - Variables on loan spread - **Adjusted R-squared of 0.151**
(iv)Thierie and Moor (2019)	-Loan spread analysis on the project loan, bank characteristics, economic environment	-OLS regression	-Variables consist of project loan, bank and macroeconomics characteristics -Transaction database of Inframation Group

Source: Author (2021)

Hypotheses development

Summarizing the previous literatures' econometric regression framework, applied by the main authors of Kleimeier and Megginson (2000), Sorge and Gadanecz (2008) and Girrardone and Snaith (2011), are modelled as followed:

Kleimeier and Megginson (2010)

(i)   Loan Spread = $\alpha + \beta_1$ Size+ β_2 Maturity+ β_3 Guarantee+ β_4 Currency Risk+β_5 Country Risk +β_6 Collateralizeable Assets+ε

Sorge and Gadanecz (2008)

(ii)   Loan Spread = α_1 Micro+ β_1 Macro+ ε

Girrardone and Snaith (2011)

(iii)   Loan Spread = α_1+ β_1 Maturity + β_2 Deal Value + β_3Guarantee + β_4 Banks + β_5 Currency risk + β_6 Club + β_7 Environment risk+ δ_1 Reserves + δ_2 investment + δ_3 private credit +δ_4 GDP growth + δ_5 account balance + δ_6 inflation + δ_7 net export + δ_8 PPP share+ δ_9 world trade+ δ_{10} US treasury yield + ψ political risk +ε

Thierie and Moor (2019)

(iv)   Loan Spread = α_1+ β_1 Tenor + β_2 Volume + β_3D/E ratio + β_4 PPP + β_5 Greenfield project + β_6 Syndicate size + β_7 Availability payment+δ_1 Economic growth + δ_2 Central bank policy + δ_3 ROE +δ_4 Inflation + δ_5 Country dummies + δ_6 Subsector dummies + δ_7 Year dummies+ε

There are many variables that have been employed by the previous academic literature, however there are a number of variables that have been consistently utilized by the previous authors.

Table 2

Overview of the literatures: explanatory variables

DEPENDENT VARIABLE (Y): PF LOAN CREDIT SPREAD	AUTHORS			
EXPLANATORY VARIABLES	GIRRARDONE AND SNAITH	SORGE AND GADANECZ	ESTY AND MEGGINSON	KLEIMEIR AND MEGGINSON
MICRO				
Maturity:	YES	YES**		YES*
Deal value	YES*	YES*	YES*	YES
Loan type	-	YES		-
Guarantee	YES*	YES*		YES*
Asset Rich Industry	-			YES*
Bank	YES		YES*	
Covenant	-			YES*
Club:	YES*			
MACRO	-			
Reserves	YES			
Investment ratio	YES*	YES		
Private credit to GDP	YES*	YES		
GDP growth	YES*	YES*		
Current account balance to GDP	YES	YES*		
Inflation	YES	YES		
net export	YES*			
PPP share	YES*			
World trade share	YES*			
Debt service to export	-	YES*		
US treasure yield	YES*	YES		
Political risk	YES*	YES*		
Country risk				YES*
Currency risk	YES			YES*

NOTE: ** = indicate a non- linear model
NOTE: * = indicates significance at 5%orl%level
Source: (Kleimeir & Megginson, 2000; Esty & Megginson, 2003; Sorge & Gadanecz, 2008; Girrardone & Snaith, 2011)

Consequently, the testable hypotheses are said below:

- Critical risk and mitigation factors

Hypothesis 1: The project finance loan spread is positively impacted by the political risk and sovereign risk factors.

Hypothesis 2: The project finance loan spread is negatively impacted by the guarantee presence.

- Loan characteristic factors

Hypothesis 3: The project finance loan spread is negatively impacted by the loan size, positively impacted by the number of banks, negatively impacted by the loan maturity.

- Macro characteristic factors

Hypothesis 4: The project finance loan spread is negatively impacted by the GDP growth, deregulation effect and net export whilst positively impacted by the country solvency measure and inflation rate.

Table 3

Definition of variables and its prediction

EXPLANATORY VARIABLES	DEFINITION	PREDICTION Loan Margin
Loan Maturity	Tenor or duration of the loan	-
Loan Size	Value of the loan	-
Number of Banks	Syndicated bank participants number	+
Guarantee / Political risk insurance	Political risk mitigation presence	-
Country solvency measure	Ratio of external debt to GDP	+
Net Export	The level of balance of trade	-
GDP growth	GDP growth is the proxy of the real GDP growth.	-
Inflation	Rate of increase of average price level of basket of goods	+
Political risk	Unanticipated change in the business environment rules	+
Sovereign risk	Credit risk associated with the operation of a country	+
Government dependence onprivate debt	The level of private sector infrastructure loan to the government	+
Deregulation effect	The private sector participation in the infra sector	-

Source: Author (2021)

3. Methodology

3.1 Empirical Analysis

The previous literature by Kleimeier and Megginson (2000), Sorge and Gadanecz (2008) Girrardone and Snaith (2011) and Thieirie and Moor (2018) deploy the ordinary least squares (OLS) estimators. The previous empirical analyses on the loan spread variable are measured on the basis 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 ordinary least squares (OLS). The syndicated loan data on the margin over London Interbank Offered Rate (LIBOR) is obtained from the Dealogic projectware database, a leading market information provider on the syndicated credit facilities particularly on the micro characteristics of the loan. The historical data on the population of the international syndicated loans including project finance are recorded. (Kleimeier & Megginson, 2000; Girrardone & Snaith, 2011). 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 dollars, declared by the Bank of England at the end of each business day. LIBOR consists of a set of rates for 1-, 3-, 6- and 12-months deposits terms 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, loan spread, fee and others, whilst the loan data is organized into four countries: Indonesia, Malaysia, 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, World Bank Development indicators statistics, the IMF's international financial statistics, the IMF's world economic debt and the IMF's international financial statistics.

3.2 Empirical model

The econometrics regression of a number of empirical research models to be performed in this chapter are as followed:

A.   Country level and ASEAN-4 deploying the ordinary least square (OLS) methodology

  I.   Country Level: Single equation of *separate regression analysis of each ASEAN-4* using Ordinary Least Square (OLS) of the dependent variable of the loan spread.

  II.   ASEAN-4 countries: furthermore, a regression analysis will be undertaken for the aggregated ASEAN-4 countries of the dependent variable of the loan spread.

Loan spread $= \alpha_0 + \gamma_1 LIBOR + \alpha_1 Maturity_p + \alpha_2 Loan\ size_p + \alpha_3\ Guarantee_p + \alpha_4\ Banks_p + \alpha_5\ Country\ Solvency_p + \alpha_6\ FDI\ growth_p + \alpha_6\ FDI\ growth_p + \alpha_7\ GDP\ growth_p + \alpha_8\ Inflation_p\ \alpha_9\ Liberalization_p + \alpha_{10}\ Government\ Dependence_p + \alpha_{11}\ Soverign\ credit\ risk_p + \alpha_{12}\ Political\ risk_p + \varepsilon$

3.3 Independent Variables

Microeconomic Characteristics

Loan maturity

Maturity represents the tenor or duration of the loan, measured in years. Previous research has investigated the linkage between maturity and loan spread (Kleimeier & Megginson, 2000) which find significant relationship between these variables for non-project finance loans. However, this empirical result is challenged by the empirical study outcome that the maturity and loan spread variables have a nonlinear 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 loan spread, 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 a number of previous literatures (Kleimeier & Megginson, 2000; Sorge and Gadanecz, 2008; Girrardone & Snaith, 2011). The previous literature suggested that the loan size reduces the loan spread, as the creditworthy debtor is likely 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) 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, Girrardone and Snaith (2011) find a non-significant relationship between loan spread and the number of banks.

Critical Risk Factors

Political risk

Worldwide Governance Indicators (WGI) will be utilized as a proxy to the political risk factors as the explanatory variable. Worldwide Governance indicators consist of six composite indicators which the data on perception-based on a wide array of sources are drawn since 1996 from 200 countries. Previous research has demonstrated a negative relationship between the loan spread and political risk perception index (Sorge & Gadanecz, 2008; Girrardone & Snaith, 2011).

Sovereign Credit Risk

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

Guarantee

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

Macroeconomic characteristics

Economic 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 economic is the country's growth prospect, the lender would price the loan at a lower premium.

Foreign Direct Investment

Based on the IMF and OECD definitions, foreign direct investment (FDI) is an investment lasting interest by the foreign entity in another economy.

Inflation

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

Sector deregulation

A number of previous papers such as Megginson and Netter (2001) argue that a company would attain profitability and efficiency enhancements in the eve of privatization. This research question is then expanded by Borisova and Megginson (2011) to analyze the impact of the government's ownership level on the cost of borrowing. Thus, it is expected that the more liberalized the sector, the lower premium is the loan priced charged by the lender. The proxy to be used for the sector liberalization is the private sector participation in the infrastructure sector.

4. Results and discussion

4.1 Descriptive statistics

Looking at the descriptive statistics outcome, the mean and maximum in the ASEAN-4 countries vary. The mean of the loan margin in Indonesia is 270 basis point while the maximum is 750 basis point; in Malaysia the mean is 98 basis point while the

maximum is 200; in the Philippines the mean is 216 and the maximum is 445 basis point; in Thailand the mean is 127 bases, and the maximum is 487 basis point.

Regression results

The regression results are summarized in table IV below. The empirical model I is based on the single equation for the individual country deploying a single equation of a regression analysis of each of the ASEAN-4 w countries using the Ordinary Least Square (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.

Table 4
Regression Results

Loan Margin	Indonesia	Malaysia	Philippines	Thailand
MICRO CHARACTERISTICS				
LOAN AMOUNT	-0.210029 (-2.35)*	-0.058075 (-0.92)	-0.253564 (-1.96)*	-0.046916 (-1.19)
MATURITY	0.140677 (0.66)	0.74672 (9.31)*	-0.019218 (-0.14)	
NUMBER OF BANKS	-0.009216 (-0.08)		0.049551 (0.32)	
MACRO CHARACTERISTICS				
LIBOR	-0.306277 (-1.10)	-0.185241 (-2.03)*		
SOVEREIGN CREDIT RATING	1.130393 (0.47)	-3.370328 (-3.33)*	2.298707 (1.08)	
STOCK MARKET CAPITALIZATION	0.334577 (0.37)	-5.93905 (-6.00)*	-0.198192 (-0.60)	
NET EXPORT	-1.07437 (-1.13)	0.719697 (2.93)*	0.725818 (1.29)	11.45063 (5.21)*
INFLATION	-2.450113 (-1.23)	-8.70505 (-0.87)	4.742392 (0.58)	0.080933 (1.44)
CRITICAL RISK FACTORS				
GUARANTEE	-0.703978 (-2.14)*	0.314056 (1.69)	-0.355319 -1.27)	
POLITICAL STABILITY	0.640338 (0.51)		0.365019 (0.94)	2.404208 (3.82)*
REGULATORY QUALITY	-1.077731 (-0.47)	8.114701 (2.81)	-0.535406 (-0.36)	-9.544583 (-4.53)
Constant	9.97815	-1262441.000000	-10.62076	-126.0726*
R-Square	0.580064	0.932306	0.319751	0.689379
Prob (F-statistic)	0.001877	0.0000	0.20000	0.000583
n	42	42	42	32

Note: *The coressponding p-value is smaller than 0.05

Indonesia:

(i)   Loan Margin = 9.9781 – 0.2100 Loan amount* – 0.7039 Guarantee*
          (Adjusted R-squared: 0.426)

Based on empirical regression findings in Indonesia, loan margin will negatively influence the loan amount and negatively influence the guarantee. The OLS regression result depicts the explanatory power of the loan amount and guarantee which negatively influenced the loan margin at the 5% significance level. As it is suggested by the previous empirical study that the presence of guarantee inversely affect the loan margin (Kleimeier & Megginson ,2000; Sorge & Gadanecz, 2008) and negates the empirical investigation finding loan maturity will affect the loan spread (Kleimeier and Megginson, 2000). While on the Indonesia regression result posits that the loan maturity does not have the explanatory power to influence the loan margin, consistent with Sorge and Gadanecz (2008) that the hump-shaped relationship between maturity and loan spread for the project finance loan. On another note, the presence of guarantee has the significant explanatory power ; given the majority of the data set encompasses the power sector syndicated loan transactions, the findings are greatly influenced by the characteristics of the power industry structure; considering the risk of the long-term investment, 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 et al., 2013; Hellowell & Vechhi, 2013). Further, as it is explicated by Yokota and Kutani (2017) on the overview of the electricity of ASEAN-4 countries suggest the dissimilar nature of Indonesia's power generation sector which has not gone through the liberalization relative to other ASEAN-4 countries. The electricity industry has evolved from the government monopolies originally planned, owned and controlled institutions (Nagayama,2008). "The adoption of a liberalization model affects electric power prices and electric power prices affect the selection of liberalization models." (Nagayama, 2008). Whilst the non-significant deregulation effect variable may be enlightened by the fact that Indonesia has not gone through the evolution of liberalization (Yokota & Kutani, 2017). Furthermore, in converse to the expectation based on the literature review (Girrardone and Snaith, 2011), the disaggregated political risk indicators appear to be non-significant. This can be explained by the fact that the non-liberated power generation sector in Indonesia, hence the third-party guarantee presence provides the required political

risks covered which is normally reflected in the political risk or sovereign risk indicator (Volker, Permana, Sachs and Tiong, 2008).

Malaysia:

    (i)   Loan Margin = -12.6244 + 0.7467 Maturity* – 3.3703 Sovereign credit rating* – 5.9390 Stock market cap to GDP* + 0.7196 Net Export* + 8.1147 Regulatory quality* – 0.1852 LIBOR*
    (Adjusted R-squared: 0.913)

In Malaysia, the loan margin is positively influenced by the loan maturity, negatively influenced the sovereign credit rating, negatively influenced by the stock market capitalization, positively influenced the net export, positively influenced the regulatory quality and negatively influenced by the 6-month LIBOR. The regression results are different from Indonesia in which the independent variables of maturity, sovereign credit rate, stock market capitalization to GDP, net export, regulatory quality and 6-month LIBOR have significant explanatory power. In contrast to Sorge and Gadanecz (2008), that the tenor or maturity affects the loan spread. The outcome of the significant explanatory power of loan maturity may be enlighten by the fact that the depth of the capital market of Malaysia, 3.5 times larger relative of Indonesia (World Bank Development Indicator Report, 2013) as well as it is justified by the explanatory power of the stock market capitalization variable.

Thailand:

    (i)   Loan Margin = -126.073 + 11.451 net export*+ 14.802 government effectiveness* + 9.371 control corruption*+ 2.404 political stability*-9.544 regulatory quality* + 10.460 rule of law* + 1.513 trade growth
    (Adjusted R-squared: 0.562)

In Thailand, the loan margin will positively be positively influenced by the net export, positively influenced by WGI index at the disaggregate level: the government effectiveness index, positively influenced the control corruption index, positively influenced by the political stability index, negatively influenced by the regulatory quality index, positively influenced by the rule of law index, and positively influenced by the trade growth index. The regression results are depicting that the independent variables of net export and various political risk indicators have significant explanatory powers for the loan margin, as the dependent variable. Only in Malaysia, the independent variable of maturity has the explanatory power, this is partially due to the depth and participation of the capital market to finance the infrastructure; Malaysia stock market capitalization is about 3.5 times size of Indonesia, about 2.5 times of Thailand and 2.3 times of the Philippines (World Bank development indicator report, 2012). As a matter of fact, the national electric utility company, Tenaga National Berhad is listed in the Malaysia stock exchange, the most liberalized relative to the other ASEAN-4 (Yokota & Kutani, 2017).

Philippines:

    (i)   Loan Margin = -10.621-0.253 Loan Amount*
    (Adjusted R-squared:0.1003)

In the Philippines, the loan margin will negatively be influenced by the loan amount.
Lastly, loan amount is the independent variable with the significant explanatory power across countries the ASEAN-4 countries.

Table 5
OLS Regression Results Overview

	Indonesia	Malaysia	Thailand	Philippines
Loan Amount	Yes*			Yes*
Guarantee	Yes*			
Maturity		Yes**		
Sovereign Credit Rate		Yes**		
Stock Market Capital		Yes**		
Net Export		Yes**	Yes**	
GDP Growth				
Political Stability			Yes**	
Regulatory Quality		Yes**	Yes**	
LIBOR		Yes*		
Government Effectiveness			Yes**	
Control Corruption			Yes**	
Rule of Law			Yes**	
Trade of Growth			Yes*	
R^2	0.4260	0.9132	0.5623	0.1003

Source: Author (2021)　　　　　　**= 5% Signifinance Level: *= 1% Significance Level

The empirical model II: which aggregate ASEAN-4 countries data together, is represented in the regression equation below through the regression results for the aggregated ASEAN-4 countries regression with the dependent variable of loan spread. In addition, dummy variables are used to reflect the differential at the specific Country level within the ASEAN-4 countries.

Full countries regression of the ASEAN-4

Loan Margin= 0.0899 - 0.222 loan amount *- 4.2787 inflation *– 0.2952 net export * - 0.2902 LIBOR* – 6.069 GDP growth*

Table 6
OLS Regression Results and the Overview

Loan Margin	ASEAN-4
MICRO CHARACTERISTICS	
LOAN AMOUNT	-0.222 (-5.07)*
MATURITY	0.074 (1.05)
NUMBER OF BANKS	0.005 (0.08)
MACRO CHARACTERISTICS	
LIBOR	-0.290(-3.62)*
SOVEREIGN CREDIT RATING	0.3205 (0.77)
STOCK MARKET CAPITALIZATION	0.019 (0.10)
NET EXPORT	-0.295(-1.83)*
INFLATION	-4.279(-3.32)*
GDP GROWTH	-6.069(-3.09)*
CRITICAL RISK FACTORS	
GUARANTEE	-0.222(-1.04)
POLITICAL STABILITY	-0.127(-1.16)
REGULATORY QUALITY	0.359(0.87)
Constant	0.089(0.038)
Adjusted R-Square	0.438
Prob (F-statistic)	0.0000
n	168

Note: *The corresponding p-value is smaller than 0.05

Variable	Prediction	Result	Prob	Hypotheses
Loan Amount	-	-	Significant	Accept
Guarantee	-	-	Non-Significant	Reject
Maturity	-	+	Non-Significant	Reject
Number of Banks	+	+	Non-Significant	Reject
Sovereign Credit Rating	+	+	Non-Significant	Reject
Stock Market Cap	-	+	Non-Significant	Reject
Inflation	+	-	Significant	Reject
Net Export	-	-	Significant	Accept
LIBOR	-	-	Significant	Accept
GDP Growth	-	-	Significant	Accept
Political Stability	+	-	Non-Significant	Reject
Regulatory Quality	+	+	Non-Significant	Reject

The OLS regression results using all the ASEAN-4 aggregate data while incorporating the country characteristics using the dummy variables; loan margin is negatively influenced by the loan micro characteristic of loan amount and macro characteristics of inflation, net export and GDP growth whilst the dummy country variables have significant explanatory power. As predicted by the previous literature. That loan amount variable has the explanatory power and loan maturity is not significant, in contrast to the empirical evidence found by Kleimeier and Megginson (2000) and in harmony with the finding of Sorge and Gadanecz (2008). Deploying the OLS regression for all ASEAN-4 countries, the empirical regression analysis of the determinants of the loan spread taking into account the differential characteristics in various countries relative to the previous literatures 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 micro and macro variables of loan spread and total 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 including the dummy variables representing the difference among the ASEAN-4. Furthermore, the adjusted R-squared outcomes from the previous literature are varying from the range of 0.15- 0.27 shown by the table below.

Table 7

Previous literatures R-squared outcomes

Previous Literature	Adjusted R-Square
Kleimeier and Megginson (2001)	0.17
Esty and Megginson (2000)	0.27
Sorge and Gadanecz (2008)	0.216
Girrardone and Snaith (2011)	0.151
Thierie and Moor (2018)	NA

Source: Author (2021)

Table 8

Credit enhancement factors comparison in Indonesia, Thailand, and the Philippines

No	Credit Enhancement factors comparison	Indonesia: Palton Project (Schaufelberger and Wipadapisut, 2003)	Philippines: Casenan Power Project	Thailand: BLCP Power project (ADB, 2009)
1	Contingent equity by sponsors	√		
2	Standby letter of credit	√		
3	Shareholder's retention		√	
4	Ability to exit sales of share from SPV			
5	Shareholder's agreement that SPV reserves maintenance account	√	√	√
6	Clawbacks guarantee by the sponsors	√		
7	Letter of credit by government	√		
8	Establishment of government funded debt service reserve account of			
9	Presence of government grant			
10	Presence of government equity			
11	Presence of subordinated debt by the government			
12	Involvement of MDB	√		
13	Involvement of ECA			√
14	Involvement of security trustees	√	√	√
15	Involvement of insurances companies	√	√	√
16	Presences of subordinated debt by the multilateral development agency (MDB)			
17	Financing with the political risk insurance from MDBs, ECAs or insurance co.			
18	Establishment of specialized intermediary w/gov't and domestic financial institution			
19	Unconditional payment obligation/guarantee by the host government			
20	Creation of debt service reserve account	√	√	√
21	A trust that grants SPV a priority interest in portion of off-taker's cash collection in case of default		√	
22	Indexation formula that adjusts the local currency tariffs from inflation and charge in tax		√	√
23	Establish an escrow agreement between SPV and off-taker to capture the revenues			
24	Establish a lender managed escrow account for deposit revenues	√		
25	Commercial papers from banks			√
26	A standby letter of credit backing contractor's performance to fulfil its obligation	√	√	√
27	Senior lender's acceptance of back-ended payment profile (i.e. flexible payment schedule)	√		
28	A subordination agreement among government, SPV and lenders for short term cash flow projects	√		

Source: Chowdury, Chen and Tiong (2015)

Overall, relative to the previous literatures which aggregate the syndicated project finance loan globally and then segregate the data into developed and developing countries group, the regression results of this paper arrive at the higher adjusted R-squared outcomes whereas this paper's results in which the variation in the dependent variables: the loan margin and total interest rate are well explained by the variation in the independent variables. The results disparity among ASEAN-4 countries are denoted by the different micro and macro characteristics of the syndicated project finance loan. However, it is worthy to note that the

independent variable of maturity has a 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 guarantee presence may explain dominance of the multilateral loans in the infrastructure sector, ADB and the WB had provided official development assistance (ODA) or concessional loan to the state- owned electricity company since the 70's (ADB report on Indonesia, 2020). Given the experience of Asian crisis and historical or legacy dependence of the World Bank (WB) 's led Consultative Group International (CGI)'s dominance particularly for the Indonesian economy, the third-party guarantee presence is a crucial determinant of the loan margin. In the case of Indonesia, although the political risk factor does not have an 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 (Volker et al., 2008). Table 8 provides detailed credit enhancement factors which some of the factors are representing the way to mitigate political and sovereign factors.

Next as it has been hypothesized by the previous empirical papers, the loan tenor or maturity does not influence the loan margin, as it is asserted by Sorge and Gadanecz (2008). The non-positive relationship between loan margin and loan maturity may be explained by credit risk's exogenous nature of project finance (Blanc-Brude & Strange, 2007). Comparing the Indonesia power project to the Philippines and Thailand, the presence of credit enhancement factors required are more comprehensive than the Philippines and Thailand. The results of the adjusted R-squared are provided below, which are variant in the range of 0.1- 0.91 while most of the adjusted R-squared results in this paper are considerably higher than the previous literatures except for the Philippines' loan margin as the dependent variable. Hence, aside from taking into account the country level differential, the new variables appended and single country regression in this paper have likely improved the adjusted R-squared outcomes.

4. Conclusion

The objective of this paper is to acquire a better understanding of the critical risk factors as well as the micro and macro characteristics influencing the project finance loan pricing at the specific country and the regional level, at the ASEAN-4 countries. This paper undertakes the investigation by deploying the OLS regression methodology of the loan margin as the dependent variables against a set of explanatory variables, grouped into: (i) critical risk factors; (ii) microeconomic; (iii) macroeconomic variables. Utilizing the data set collected from: (i) the Dealogic projectware database, a leading market information provider on the whole population of international syndicated credit facilities particularly on the micro characteristics of the loan; (ii) the historical LIBOR data is obtained from the financial data provider, Bloomberg L.P.; (iii) historical macroeconomic data in this paper is to be sourced from BIS-IMF-World bank Joint Statistics on external debt. This paper finds that in ASEAN-4, the micro loan characteristics: loan amount and LIBOR whilst the macro characteristics: inflation, net export and GDP growth influence the loan spread in the project finance. However, simultaneously at the country level, the determinants of the loan spread are distinctive to each country's infrastructure industry characteristic. previous studies mainly analyze the determinants at the aggregate level between developed and developing as well as the global economies, hence it is difficult to deduce the main drivers of the loan spread across different countries. By dissecting the analysis at the country level, the distinctive characteristics at the country level relative to the aggregated level endow new insights to policy makers on ways to reduce the loan pricing shall emerge, consequently the total infrastructure project cost. However, this paper comes with limitations which shall be addressed in the future research to include more sample countries as well as longer time series data set.

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