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Country Risk and its impact on Pretoria Portland Cement's (PPC) Valuation of its African Expansion Projects

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A consulting report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

Johannesburg, 2017

DECLARATION

I, Ronnel Rajkaran, declare that this consultancy report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.



Ronnel Rajkaran

Signed at Johannesburg

On the 8th day of January 2018

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EXECUTIVE SUMMARY

Investing in projects in Africa is generally a challenging venture as a result of the political, economic and social uncertainties and challenges faced by a potential investor. The expected rewards are however, high, due to natural commodities, untapped markets and availability of affordable resources. It is for this reason that in 2010 PPC decided to venture into Africa on the backdrop of a competitive and shrinking South African market.

In 2016, following the completion/near completion of its cement project in DRC, Ethiopia, Rwanda and Zimbabwe, PPC realised that the returns received were not in line with the expected returns as modelled at the start of the project. In light of this, PPC contracted an external consulting company to develop a premium for country risk (CRP), which it could apply to its valuation model to cater for additional risks expected in each African country. The CRP developed was modelled on Damodaran's melded approach model (MAM).

This consulting report set out to review the newly developed valuation model and more particularly, the CRP applied. The objectives of the report were to further test the PPC developed CRP against other suitable risk assessment models' scores to confirm its suitability and to determine if there exists a better model of determining country risk than the current PPC developed one.

The study commenced by conducting a literature review on the subject of country risk and identified the most reputable risk assessment models for determining country risk that could potentially be applied to PPC. In this respect, it was established that three categories of risk assessment models exist, namely, risk service agencies, credit rating agencies and sovereign default models. The risk service agency models that were considered as potential risk models for PPC were the WGI, PRS, WEF, EFW and F-HSE. Moody's rating and Damodaran's melded approach model was considered as part of the credit rating agency and sovereign default model, respectively.

The research design was based on identifying a suitable proxy for country risk which was to be used to test the PPC CRP and the risk assessment models' scores. The data collection for the risk models was based on secondary data spanning a 10-year period (2006 to 2015) for the respective African countries.

The BC-DSD which is a database that contains the actual sovereign defaults for all countries was identified as a suitable proxy for country risk and this was confirmed by testing its association against the risk assessment models. The PPC CRPs for the respective countries was then tested against the BC-DSD as well as against the risk assessment models. Based on the correlation analysis conducted, it was found that the results obtained were not statistically significant as a result of the high p-values. A determination of whether the PPC CRP was a true reflector of risks in the respective countries could therefore not be made.

The risk assessment models were then tested again the BC-DSD and amongst the risk assessment models themselves. Based on the correlation analysis, the WGI was found to be the best reflector of country risk, with PRS and EFW a close second and third respectively. Damodaran's melded approach model was found to be ineffective in the African countries and it stands to reason as the model relies on accurate financial market data which is non-existent or if it exists, is not very reliable.

In view of the findings, it is recommended that the PPC CRP model is reviewed and that Damodaran's MAM be replaced with a combination of the WGI, PRS and EFW respectively.

TABLE OF CONTENTS

DECLARATION ..... **I**

ACKNOWLEDGEMENTS ..... **II**

SUPPLEMENTARY INFORMATION ..... **III**

EXECUTIVE SUMMARY ..... **IV**

TABLE OF CONTENTS ..... **VI**

LIST OF TABLES ..... **VIII**

LIST OF FIGURES ..... **IX**

1. CHAPTER 1: INTRODUCTION **1**

1.1. THE PPC CASE 1
1.2. PURPOSE OF THE STUDY 3
1.3. OUTLINE OF THE STUDY 4
1.4. SIGNIFICANCE OF THE STUDY 5
1.5. DELIMITATIONS OF THE STUDY 5
1.6. ASSUMPTIONS 5

2. CHAPTER 2: LITERATURE REVIEW **6**

2.1. INTRODUCTION 6
2.2. COUNTRY RISK AND COUNTRY RISK PREMIUM 6
2.3. CLASSIFICATION OF COUNTRY RISK 8
2.4. COUNTRY RISK ASSESSMENT METHODOLOGY 9
2.5. CONCLUSION OF THE LITERATURE REVIEW 18

3. CHAPTER 3: PPC CRP AND PROJECT VALUATION **19**

3.1. INTRODUCTION 19
3.2. THE PPC PROJECT VALUATION METHODOLOGY 19
3.3. OBJECTIVE OF THIS STUDY 25

4. CHAPTER 4: RESEARCH METHODOLOGY 26

4.1. INTRODUCTION 26
4.2. PROXY FOR COUNTRY RISK 26
4.3. RISK ASSESSMENT MODELS 27
4.4. THE PPC CRP 28
4.5. RESEARCH STRATEGY 28
4.6. DATA ANALYSIS 30
4.7. VALIDITY AND RELIABILITY 32
4.8. ETHICAL CONSIDERATION 33

5. CHAPTER 5: PRESENTATION OF RESULTS 34

5.1. INTRODUCTION 34
5.2. TESTING THE PROXY FOR COUNTRY RISK 34
5.3. TESTING THE PPC CRP AGAINST THE BC-DSD 37
5.4. TESTING ALL RISK MODELS AGAINST EACH OTHER 39

6. CHAPTER 6: DISCUSSION OF THE RESULTS 45

6.1. INTRODUCTION 45
6.2. DISCUSSION PERTAINING TO MAIN OBJECTIVE 1 45
6.3. DISCUSSION PERTAINING TO MAIN OBJECTIVE 2 48
6.4. DISCUSSION PERTAINING TO MAIN OBJECTIVE 3 49
6.5. CONCLUSION 51

7. CHAPTER 7: CONCLUSIONS & RECOMMENDATIONS 53

7.1. INTRODUCTION 53
7.2. CONCLUSIONS OF THE STUDY 53
7.3. DAMODARAN'S MAM'S EFFECTIVENESS IN AFRICAN COUNTRIES 56
7.4. RECOMMENDATIONS 57
7.5. SUGGESTIONS FOR FUTURE RESEARCH 58

REFERENCES 60

LIST OF TABLES

Table 1. PRS Component points 11

Table 2. CRA's rating scale 15

Table 3. PPC calculated country risk rating 24

Table 4: Risk assessment models 28

Table 5: List of countries in the sample 29

Table 6: PPC CRP, debt defaults and risk model assessment scores 35

Table 7: Correlation and p-values between the BC-DSD and risk assessment models 37

Table 8: Regression Statistics output for the analysis of BC-DSD and PPC CRP 38

Table 9: ANOVA output for the analysis of BC-DSD and PPC CRP 38

Table 10: Regression coefficients output for the analysis of BC-DSD and PPC CRP 39

Table 11: Correlation analysis of all the risk models 40

Table 12: Regression Statistics for analysis of BC-DSD and WGI 41

Table 13: ANOVA for analysis of BC-DSD and WGI 42

Table 14: Regression coefficient outputs for analysis of BC-DSD and WGI 42

Table 15: Regression Statistics for analysis between BC-DSD and risk agent's models 43

Table 16: ANOVA for analysis between BC-DSD and risk agent's models 43

Table 17: Regression coefficient outputs for analysis between BC-DSD and risk agent's models 44

LIST OF FIGURES

Figure 1: GCI pillars and sub-index 12

Figure 2: PPC CRP versus the proxy for country risk 38

Figure 3: BC-DSD and WGI regression 41

1. CHAPTER 1: INTRODUCTION

1.1. The PPC Case

PPC LTD (previously known as PPC Cement) is a fully fledged South African cement company with a 124-year history and is one of the pioneering companies that has been listed on the JSE since 1910 (PPC 2016d). Having operations in South Africa, Zimbabwe and Botswana, PPC is the leading supplier of cement in Southern Africa.

After the 2010 World Cup in South Africa and as a result of a decline in Government spending and infrastructure projects, the demand for cement started to slowly decline. Coupled with stiffer competition, new players entering the market and cheap imports being brought in from the Far East, meant that PPC's market share was also being affected (Tarrant, 2013; Cokayne, 2014). As a result, PPC decided to look for new markets elsewhere in order to sustain its business. In 2010, in line with its newly formed vision, "to grow PPC into a leading emerging market business", (PPC, 2010, p. 5), PPC embarked on a drive to establish potential markets across South Africa's borders.

1.1.1. PPC's African Expansion

Africa is the second largest continent in the world with a total of 54 sovereign countries and is being termed the "next investment destination hot spot" (Achour et al., 2015, p. 1). The continent is home to seven of the top ten fastest growing economies in the world and has a population of over a billion people. According to Ernst & Young (2016), Africa is now the second most attractive investment destination in the world. This attractiveness is as a result of the availability of natural resources, improving business conditions, improving political conditions and an increase in economic growth.

But, as Viljoen (2009, p. 5) put it, “Africa is really not for sissies”. Many global companies in the past which have looked to Africa to expand their operations failed to succeed because they underestimated the level of risk and the diversity of the African continent. According to Montiel (2006), some of the high-level risks associated with investing in Africa include corruption, governance issues, high taxation for multinational firms, restriction on remittances and property rights issues. The Transparency International report (2015) and the Economic Freedom of World (EFW) report (2016) which measures perceived levels of corruption and the extent to which property rights are protected respectively, places the majority of the African countries at the bottom of the list with the worst levels of corruption and property rights issues.

With the high levels of risk, however, comes high rewards. In PPC’s case, for example, the average price for a tonne of cement in 2012 sold for US $100 in South Africa, US $180 in Zimbabwe and US $240 in the DRC. Furthermore, with the ever-improving economy, it means that high demand for cement will be sustained for a long time.

It is for this reason that PPC looked to Africa to expand its business operations. In 2013, PPC announced its first major project: a construction of a US $260m cement plant and mining operation in Kimpese, Western DRC (PPC 2013). The project has to date been commissioned and completed. In 2014, PPC announced a construction of a US $85m cement plant in Harare, Zimbabwe. The project has since been completed in October 2016 in record time, and to the highest quality (Sharara 2016).

Further projects that commenced included a 51% acquisition by PPC of a cement plant in Rwanda for $69m in 2013. A further $170m has been spent to upgrade the plant’s capacity from 100 000 tonnes to 600 000 tonnes (PPC 2016b). In 2012, PPC acquired a 27% stake in Ethiopian based Habesha Cement and in 2014, upgraded its stake to 51%. A project to the value of US $ 135m is underway to upgrade the plant’s capacity (PPC 2016c).

1.1.2. The PPC Problem

Despite the successful completion of their African projects, PPC faced several issues, such as political instability, internal ethnic conflicts, sabotage, corruption, taxation issues, limitation on remittance, and cross-border import restrictions. As a result, the returns realised now that the projects are in the operational phase differ quite drastically from what was expected during the initial feasibility stages.

In early 2016, the PPC share price dropped by a record 27% for the year following the news of a potential rating downgrade (Bowker 2016). The rating agencies reported concern over the high levels of spending related to the PPC Africa projects and particularly, the low levels of returns realised versus the returns that were forecast.

In 2016, on the back of the ratings downgrade, PPC enlisted the services of an external consulting company to review its valuation model and develop a premium for country risk for the specific countries in which it was interested in investing. The country risk premium (CRP) was to be reflective of the risk of the particular country and was to be included in PPC's valuation modelling.

1.2. Purpose of the study

The purpose of this study is to review and evaluate the new valuation model that has been developed for PPC, to investigate other globally recognised risk assessment models that can be applied to PPC, and to determine whether the country risk modelled is reflective of the risks experienced in the respective countries. In doing so, this study attempts to achieve the following three main objectives:

1) Identify a suitable proxy for country risk that best reflects the level of risk in a country and measure its suitability by testing it against other globally renowned risk models.

2) Test the PPC developed country risk premiums for the respective African countries against the proxy for country risk to determine the level of association.
3) Investigate other reputable risk models and test the models against the proxy for country risk, as well as against each other to determine if there exists a risk model or combination of risk models that indicates a better reflection of a country's risk than the current PPC developed country risk.

1.3. Outline of the study

This consulting study report is presented with the following structure:

Chapter 1 Introduction: This chapter introduces the PPC case in terms of the background, the PPC problem and the proposed study.

Chapter 2 Literature Review: This chapter explores the theory and literature on the concept of country risk as well as identifies relevant risk assessment models which can be applicable to PPC.

Chapter 3 PPC CRP and Valuation: An analysis of the PPC project valuation methodology and its newly developed CRP model is undertaken.

Chapter 4 Research Methodology: Chapter 4 illustrates the methodology and procedure followed in terms of the research strategy and data analysis.

Chapter 5 Presentation of results: Based on the research methodology, the data is analysed and the results are presented.

Chapter 6 Discussion of the results: In this chapter, the results are analysed and discussed.

Chapter 7 Conclusion and Recommendations: The findings in the report are discussed, recommendations are proposed and a future research topic is discussed.

1.4. Significance of the study

The importance of this study is that it shall not only provide guidance to PPC, but to other global companies wishing to expand its business into Africa. Also, having reviewed much of the relevant literature, it was found that there are limited articles that address CRP as applied to project valuations in Africa.

1.5. Delimitations of the Study

The study is restricted to only the risk models as explored in Chapter 2 of this report. The 10-year data used, was from the period 2006 to 2015. Data for the later years was not available at the time of the study.

1.6. Assumptions

A significant assumption is that the Bank of Canada's database of sovereign default (BC-DSD), which is used in this study as a proxy for country risk, represents a true reflection of the level of risk in a country.

2. CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

The aim of this literature review is to explore the vast literature on country risk and establish an understanding of the various models that exist in determining country risk. The chapter also defines what country risk is, the classification of the risks and its application in project or investment valuation.

2.2. Country Risk and Country Risk Premium

The key to a foreign company's ability to succeed in Africa depends on its ability to correctly assess, predict, and price the associated risks that exist in the specific target country. Overstating the risks could be just as detrimental as potential opportunities could be missed.

The uncertainty and challenges that a company faces when it decides to expand into a foreign country is defined as country risk. According to Bouchet, et al. (2003, p. 4), country risk encompasses the risk faced by the potential investor that ranges from "political, social to macro and micro economic risks". The better definition of country risk is by Meldrum (2000), who defined country risk as the additional risk that companies face when investing in foreign countries, and these are risks that are not presented in its domestic markets. In the literature on country risk, country risk is interchangeably referred to as country political risk, sovereign risk or cross-border risk.

As cited by Dempsey (2013), the benchmark model which is most widely used for computing the valuation of a particular company in its primary market is the Capital Asset Pricing Model (CAPM). The CAPM, as described in the textbook, determines the expected return on an asset or investment (Firer, Ross,

Westerfield, & Jordan, 2012). In other words, the model prices the companies risk-return based on its domestic equity market premium in addition to a risk-free bond interest rate earned in the country. When the company decides to invest in a foreign country or separate market, an additional risk premium is included in the CAPM to compensate the stakeholders for the additional country specific risk the company faces in the foreign country. This additional risk premium is termed the country risk premium (CRP) and is applicable only when the investor is external to the domestic market. The risk-reward return on the domestic market as experienced by an internal investor in the domestic market is determined solely by the CAPM with the CRP = 0. In this respect, the required return demanded by a shareholder in the domestic market is better known as the discount rate and is indicated as below. It is assumed that no debt financing is considered at this stage.

$$R_h = R_{f0(DM)} + \beta_{DC}\left(Rm_{DM} - R_{f0(DM)}\right) \ldots \textit{Equation 1}$$

Where:

R_h = discount rate

$R_{f0(DM)}$= risk free rate of domestic government bond

β_{DC} = market risk of company in the domestic market

Rm_{DM}= expected return on the domestic equity market

Many researchers, including Damodaran (2016) and Bekaert, et al., (2016), however, propose to use the world CAPM as the model to determine the expected return when the investment is in a foreign country. In this regard, the project beta is associated with the world market instead of the domestic market, as follows:

$$R_h = R_{f0(US)} + \beta_{DC-US}\left(R_{M(US)} - R_{f0(US)}\right) + CRP \quad \ldots \textit{Equation 2}$$

Where:

The United States of America (U.S.) market shall be used as a proxy for world market

β_{DC-US}= project beta with respect to the US market

$R_{f0(US)}$= risk free rate of Treasury bond in the US.

$R_{M(US)}$ = return on equity market in US

CRP= country risk premium

As cautioned by Harvey (1995), using the world CAPM model, in emerging markets where the markets are not fully integrated with the world markets, could lead to a situation where the betas of the emerging market are much lower than the world market, resulting in a very low but distorted expected returns.

Despite the variations in the CAPM and the empirical shortcoming as the basis for investment decision, as pointed out in various studies (Pillay 2014), the CAPM itself does not form the basis of this study. This study explores the country risk, CRP and its effect on the required returns.

2.3. Classification of Country Risk

Country risk can be classified into three types, political, socio-political and economic risks (Marshall 2003). Political risk arises from actions of Governments that interfere with or prevent business transactions. Political risk is by far the biggest risk facing investors and is particularly prevalent on the African continent where government actions or interference in the business sector has in the past resulted in many foreign companies reconsidering Africa as their choice of investment. Many businesses have cited Government action in the form of policy

changes, Government changes and corruption as the greatest contributor to political risk. Policy change risks are related to land expropriation/nationalisation, restrictions on repatriation and remittances, taxation changes, foreign exchange controls, trade restrictions and other regulation changes (Marshall, 2003; Bouchet, et al., 2003).

Socio-political factors that impact potential investors include poverty, unemployment and human rights issues. The recent incidents of Sudan expelling humanitarian organisations in Darfur, the South African Government targeting the group that obtained a court ruling against welcoming Sudanese President Omar al-Bashir in the country, Kenyan Officials attacking civil society organisations for supporting prosecution by the International Criminal Court (ICC), and intimidation tactics by the DRC Government on civilians for speaking out against the possible extension of President Joseph Kabila's term, are human rights issues that have put the African Continent at the bottom of the human rights list (HRW 2016). Other social factors that have an impact on foreign investments include conflicts between ethnic or religious groups, regional conflicts and secessionist movements (Marshall 2003).

Economic risks refer to risk related to a country's economic environment such as its GDP, interest rates, foreign exchange rates, terms of trade, sovereign debt, the level of unemployment, etc. (Marshall, 2003; Bouchet, et al., 2003). For instance, hyperinflation in Zimbabwe in 2008, brought the country's economic outlook to a standstill, resulting in a total devaluation of its sovereign currency.

2.4. Country Risk Assessment Methodology

Assessing the risk of a country may not be an easy task, especially for an investor who has no prior knowledge of the related risks. Fortunately, there are several services that do exist that specialise in monitoring and assessing the level of risk in a country.

2.4.1. Risk Service Agencies

Risk service agencies are firms that specialise in country risk analysis. They evaluate the degree of risk based on the political, economic and social factors and establish a risk score for each country. There are many risk services agents that exist, however the more prominent and reputable agents that are explored in this study includes the Worldwide Governance Index (WGI), Political Risk Services (PRS), World Economic Forum (WEF), Economic Freedom of the World (EFW) and Freedom House (F-HSE).

2.4.1.1. Worldwide Governance Indicator (WGI)

The WGI is an index based on the research conducted by Daniel Kaufmann and Aart Kraay from the Natural Resource Governance Institute (NRGI) and the World Bank Development Research Group respectively (Kaufmann et al., 2011). The index provides an indication of the quality of governance in a country and it is based on data obtained from a number of survey institutes, non-governmental organisations (NGO's), international organisations and private sector firms. It measures governance in six broad dimensions, namely: [1] voice and accountability; [2] political stability and absence of violence; [3] government effectiveness; [4] regulatory quality; [5] rule of law; and [6] control of corruption. The index records data from 1996 to the present and covers 200 countries around the world.

2.4.1.2. Political Risk Services (PRS)

The PRS Group was founded in New York in 1979 and was the earliest provider for assessing political and country risk (PRS Group 2016). The ratings provide an assessment of the political stability of a country and measures against the risk components in accordance to points weighing as illustrated in Table 1. The PRS ratings include 140 countries in its database and it is updated on a monthly basis.

Erb, Harvey, and Viskanta (1999); Qi et al. (2010); Butler et al. (2009) have all found a strong relationship between the sovereign bond spread and the PRS

rating, implying that PRS can be used as an effective tool in evaluating country risk.

In analysing the relationship between the PRS rating and bond prices, Duyvesteyn et al. (2016) found that there is a delay in the change of the bond prices when the PRS rating changes. Duyvesten explained that this could be because the PRS ratings are not public information and therefore the information is not immediately reflected in the bond prices.

Table 1. PRS Component points - extract from PRS Group (2016)

POLITICAL RISK COMPONENTS		
Sequence	**Component**	**Points *(max.)***
* A	Government Stability	12
* B	Socioeconomic Conditions	12
* C	Investment Profile	12
* D	Internal Conflict	12
* E	External Conflict	12
F	Corruption	6
G	Military in Politics	6
H	Religious Tensions	6
I	Law and Order	6
J	Ethnic Tensions	6
K	Democratic Accountability	6
L	Bureaucracy Quality	4
Total		100

2.4.1.3. Global Competitive Index (GCI)

The GCI, also known as the World Economic Forum index (WEF), illustrates a rating and ranking of a country in terms of its competitiveness or ease of doing business (Horne 2017). The index which is the proprietary capital of the WEF is updated on a yearly basis and represents 138 countries (WEF 2016). Each index is composed of 12 pillars and is represented in three sub-indexes namely: [1]

basic requirements; [2] efficiency enhancer; and [3] sophistication and innovation, as illustrated in figure 1 below. The three sub-indexes are given different weights depending on the nature of the markets. The GCI is based on statistical data obtained from internationally recognised organisations, notably the IMF, the World Bank, United Nations, UNESCO and the World Health Organisation.

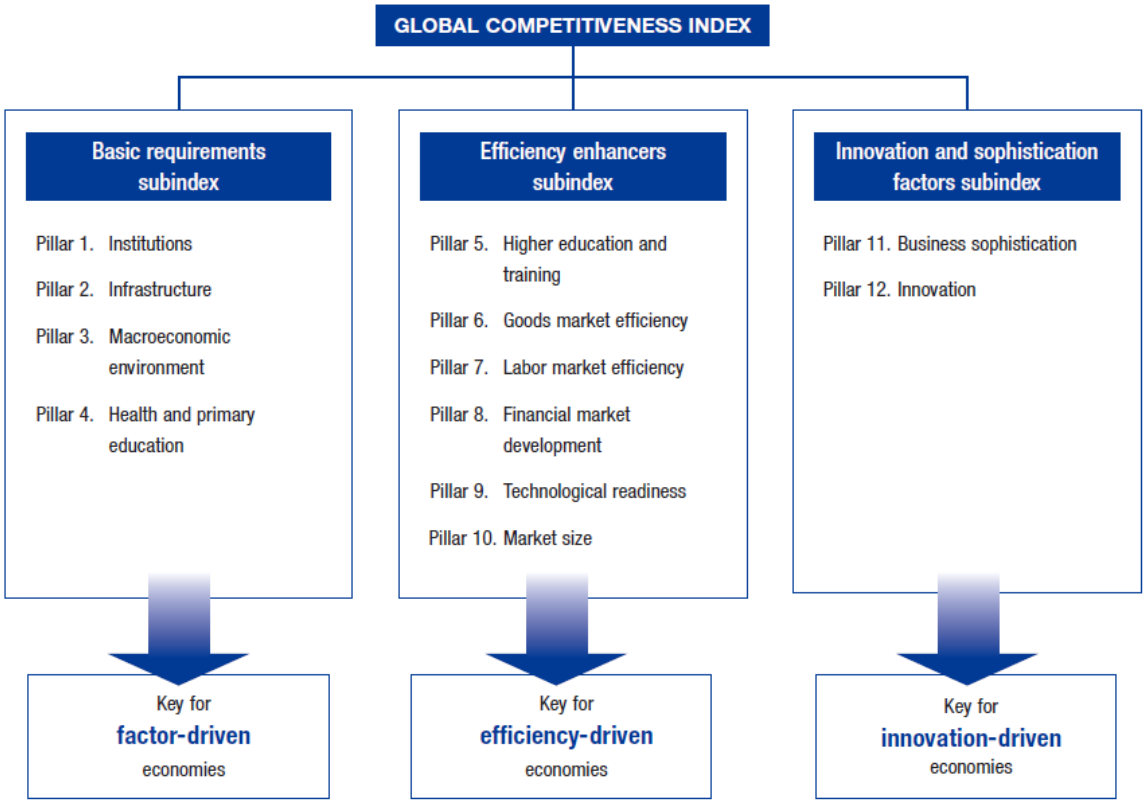


Figure 1: GCI pillars and sub-index – extract from WEF (2016)

2.4.1.4. Economic Freedom of the World (EFW)

The EFW report was initially conceived in 1986 by a group of leading economists whose aim was to measure the degree to which the policies and institutions of a country are supportive of the country's economic freedom (Gwartney, Lawson, & Hill, 2016). The index measures the degree of economic freedom in five areas,

namely: [1] size of Government; [2] legal system and security of property rights; [3] access to sound money; [4] freedom to trade internationally; and [5] regulation of credit, labour and business. The index uses objective components and data from external sources, such as the IMF, World Bank and WEF. It represents 159 countries and contains data as far back as 1970. The index is updated on a yearly basis.

2.4.1.5. Freedom in the World report

Freedom House (F-HSE) is a US based NGO that was founded in 1941 and conducts research on democracy, political freedom and human rights. The organisation produces an annual freedom in the world report which assesses the state of freedom in each country by determining the level of political rights and civil liberties. The report analyses 195 countries and contains data for each country as far back as 1973.

2.4.2. Country Credit Ratings

As an alternative to the risk services agencies' analysis of country risk, the extent of a country's risk can be determined by the sovereign ratings assigned to it by the credit rating agencies (CRA's). According to Opoku Mensah et al.(2017), sovereign rating is an indicator of the ability of governments to meet their financial debts owed to their international creditors. CRA's such as Standard & Poor (S&P), Moody's and Fitch collect information about a country and issue ratings based on the country's potential to default in honouring of its financial obligations. Fitch's and S&P credit ratings express risk only in terms of countries probability to default. Moody's, on the other hand, expresses credit rating in terms of probability of default as well as the severity of the default (Damodaran 2016b). Moody's rating scale is expressed on a scale of letters and figures whereas as S&P and Fitch express their ratings with letters and pluses or minuses as per Table 2.

A countries sovereign rating is a popular tool used by investors when making investment decisions in a foreign country (Martell 2005). According to Opoku

Mensah et al.(2017), when it comes to Africa, the majority of companies are not credit rated and therefore a greater reliance is placed on the country's sovereign rating when making investment decisions. The importance of sovereign ratings as an investment tool was further supported by a study conducted Reinhart and Rogoff (2004), where they showed a strong relation existing between investments flowing into developing countries and the countries sovereign ratings.

However, since the failure of the CRA's to predict the financial crisis in 2008, many researchers and academics have questioned the credibility of the CRAs' ratings (Ashcraft, Goldsmith-Pinkham & Vickery, 2010). Kisgen, Osborn, and Reuter (2016), in their study of analysts' promotion within Moody's, found that Moody's are less likely to promote analysts who are down-graders as opposed to analysts who are up-graders. Kisgen, et al. (2016) denote that rating agencies are traditionally paid for by the bond issuers and therefore there could be some bias toward the bond issuer. Damodaran (2016) has criticised CRAs in that they tend to exhibit "herd behaviour" in the sense that when one CRA changes its ratings, the other agencies immediately follow suit. Damodaran, (2016) further criticised CRAs in that they react too late in changing rating scores when events or crises occur.

Table 2. CRA's rating scale (Source: Bloomberg)

Moody's	S&P	Fitch	Rating Description
Aaa	AAA	AAA	Prime
Aa1	AA+	AA+	High grade
Aa2	AA	AA	
Aa3	AA−	AA−	
A1	A+	A+	Upper medium grade
A2	A	A	
A3	A−	A−	
Baa1	BBB+	BBB+	Lower medium grade
Baa2	BBB	BBB	
Baa3	BBB−	BBB−	
Ba1	BB+	BB+	Non-investment grade
Ba2	BB	BB	speculative
Ba3	BB−	BB−	
B1	B+	B+	
B2	B	B	
B3	B−	B−	
Caa1	CCC+	CCC+	Substantial risks
Caa2	CCC	CCC	
Caa3	CCC−	CCC−	
Ca	CC	CC	Extremely speculative
	C	C	Default imminent
C	D	DDD	In default

2.4.3. Sovereign Spread Models

The information, as supplied by risk services and CRAs, is rather subjective as it is based very much on qualitative information such as surveys and feedback. A more empirical way of determining country risk is by calculating the country's sovereign spread (Posner, Choi & Gulati, 2011). The sovereign spread (SS), as defined by Bekaert, et al. (2016) is the difference between a yield on a risk-free rate in a mature market (e.g. the US Treasury bond) and the yield on an equivalent maturity US denominated sovereign bond issued by the target country. Sovereign bonds are a major source of funding for emerging markets and a high-risk bond is generally compensated for in terms of high bond yields (Tebaldi et al., 2017).

The simplest form of determining country risk as proposed by Mariscal and Lee, (1993) is by determining the SS as follows:

$$CRP = Sovereign\ Spread\ (SS) = R_{sb(TC)} - R_{tb(US)} \quad \textit{...Equation 3}$$

Where:

$R_{sb(TC)}$ = target country's dollar-denominated sovereign bond yield

$R_{tb(US)}$= US Treasury bond yield

The advantage of the SS approach is that it is more granular than the CRAs rating score in that countries can have the same credit rating score, but not necessarily have the same level of default or risk. Furthermore, they are more dynamic and can capture changes in the market much quicker than CRAs (Damodaran 2016b).

Mariscal and Dutra (1996) postulated that if the World CAPM model is used to determine the risk premium and if the target market under investigation is not integrated with the world market, then there is a possibility that the project beta shall reflect a risk lower than that of a mature market, resulting in lower returns and making the CRP invalid. To alleviate this problem, they proposed to replace the beta with the standard deviation of the country's equity market in relation to that of the US market as follows:

$$CRP = \left(\frac{\sigma_{TC}}{\sigma_{US}}\right) \times MRP_{US} + SS \quad \textit{...Equation 4}$$

Where:

σ_{TC} = target country's equity market standard deviation

σ_{US} = US equity market standard deviation

MRP_{US} = US equity market risk premium

SS = Sovereign spread

Godfrey and Espinosa (1996) reviewed Mariscal and Dutra's model and found that the adjusted country beta used could also include country risk just as the sovereign spread which already includes country risk and therefore this meant that there could be a "double counting" of the risk. Erb, Harvey and Viskanta (1995), as cited in Godfrey and Espinosa (1996) revealed that, based on a recent study, 40% of the variation in the volatility of the equity markets is as a result of country risk factors. In this regard, Godfrey and Espinosa removed the 40% of the adjusted country beta and represented their risk premium as follows:

$$CRP = 0.6\left(\frac{\sigma_{TC}}{\sigma_{US}}\right) \times MRP_{US} + SS \quad \textit{...Equation 5}$$

By far the most popular SS model, as cited in most studies, is that of Professor of Finance at Stern Business School, Professor Aswath Damodaran's "melded approach" model (MAM). The MAM expands on Mariscal and Lee's (1993) SS model by including a measure of the volatility in the target country's equity market to the volatility of its sovereign bond market (Damodaran 2003). As the equity market returns are generally higher than the bond market returns, there is intuitively a higher premium for country risk than the SS model. This higher premium is to compensate for a situation where the target market's beta is lower than the world market beta. The melded approach CRP is as follows:

$$CRP = SS \times \left(\frac{\sigma_e}{\sigma_b}\right) \textit{...Equation 6}$$

Where:

σ_e= target country's equity market standard deviation

σ_b= target country's bond market standard deviation

There are a number of other versions of the CRP models proposed by various studies, however, they are not much different from the models discussed. The problem with the sovereign spread model is that it depends on credible and efficient market data that is reflective of the economic and risk conditions in the country. In the emerging African markets, the market data do not easily exist and even if they do exist, due to the maturity and relative size of the markets in terms of both number of listed stocks and market capitalisation, the market tends not to be very reliable or reflective of the economic conditions (Mlambo, C., & Biekpe 2007). Based on studies conducted, apart from South Africa, the rest of the African markets can be considered to be non-efficient and segmented from the rest of the world markets (Agyei-Ampomah, 2011; Mlambo & Biekpe, 2007).

Damodaran realised the shortfall in his model when it comes to emerging markets and so in his 2015 edition of his annually published country risk premium database, he replaced the sovereign spreads (SS) with Moody's rating default spread and the volatility in the markets with a multiplier of 1.5. This was applicable only for emerging markets without credible market information and the application was left to the discretion of the user to adjust the multiplier based on their perception of the country's risk (Damodaran 2015).

2.5. Conclusion of the Literature Review

This literature review explored the concept of country risk, the CRP as applied to valuations, the classification of country risk and the various models for assessing country risk. Damodaran's meld approach model for determining CRP was found to be the most popular with the majority of studies citing the model. It was no surprise that the PPC model was based on the MAM.

3. CHAPTER 3: PPC CRP AND PROJECT VALUATION

3.1. Introduction

Based on the information and theory obtained from the literature review, it is now possible to conduct an analysis of the PPC project valuation methodology. This is followed by the analysis of the CRP as developed by the PPC consultant for inclusion in the PPC valuation model for its African expansion projects.

3.2. The PPC Project Valuation Methodology

The PPC project funding structure is based on a combination of equity and debt funding in line with the company's debt to equity (D/E) policy (PPC 2016a). The cost of equity is determined by the standard capital asset pricing model (CAPM), whereas the cost of debt is based on the yield of the PPC domestic bond in issue. The project valuation model is therefore aligned to the funding structure and is based on achieving a minimal accepted discount rate, termed the hurdle rate, which the PPC shareholders expect on the investment. For projects expected to be conducted across the borders of South Africa, an additional premium is added to the hurdle rate and this additional premium is termed the CRP. The PPC hurdle rate is as follows:

$$Hurdle\ Rate = \frac{E}{V}R_e + \frac{D}{V}R_d + CRP \quad \text{...}\textit{Equation 7}\ \text{(PPC 2016a)}$$

Where:

R_e = expected return on equity in SA

R_d = expected return on debt funding in SA

CRP = country risk premium

$\frac{E}{V}$ = proportion of equity to equity plus debt

$\frac{D}{V}$ = proportion of debt to equity plus debt

The expected PPC equity return in South Africa is as follows:

$$R_e = R_{f0\,(SA)} + \beta_{PPC}(R_M - R_{f0\,(SA)}) \quad \textit{...Equation 8}$$

Where:

$R_{f0\,(SA)}$ = risk free rate of South African Government bond

β_{PPC} = volatility of PPC in relation to the JSE Equity market

R_M = return on the JSE equity market

For purposes of this independent study, however, our aim is to explore only the CRP. Prior to 2016, the PPC valuation model did not include a structured CRP when evaluating its African projects. In 2016, following the misalignment of the expected earnings from the projects to that modelled at the start of the projects, a review of the PPC hurdle rate and specifically its method of calculating CRP was conducted. PPC enlisted the services of an external consulting company to review its valuation model and develop a premium for country risk for specific countries in which it was interested in investing. In line with achieving a more reflective expected return, the PPC CRP model was changed to Damodaran's MAM (Damodaran 2016b). The MAM relied on reliable bond market and equity market information, however, in the absence of credible market information, the model relied on Moody's default rating score. In most African countries, however, an actively trading market is non-existent, and in such cases, the PPC Consultant developed a model that used the EFW index together with an inflationary differential to that of the closest African country with an actively traded bond market (Gwartney, Lawson, & Hill, 2016; PPC, 2016). The PPC consultant then

compared it to Damodaran's equity risk premium (ERP) model that incorporated the U.S markets risk-free rate, Moody's default rating as well as a volatility factor, and where the scores were significantly different, defaulted back to Damodaran's ERP model.

This culminated in a revised PPC model of determining the CRP (PPC 2016a).

The PPC CRP as applied to a country with an actively traded bond market in line with the MAM with an actively trading market can be written as:

$$CRP_{TM} = (R_{f0(AC)} - R_{f0(US)})(\frac{\delta_{equity(AC)}}{\delta_{bond\,(AC)}}) \quad \textit{...Equation 9}$$

Where:

CRP_{TM} = CRP of a country with an actively trading market

$R_{f0(AC)}$ = risk free Government bond rate of target African country

$R_{f0(US)}$ = risk free rate of US Treasury bond

$\delta_{equity\,(AC)}$ = volatility of African country equity market

$\delta_{bond\,(AC)}$ = volatility of African country bond market

The PPC calculated CRP as applied to a country without a trading bond market is as follows:

$CRP_{TC} = (h_{TC} - h_{AC})(R_{f0(AC)} - R_{f0(US)}) + (1 + x\%)(EFW_{AC} - EFW_{TC})$...*Equation 10*

Where:

CRP_{TC} = CRP of a target country with no actively trading market

h_{TC} = Inflation of target country

h_{AC} = Inflation of comparative African country with active bond market

$R_{f0(AC)}$ = Risk free rate of comparative African country Government bond

$R_{f0(US)}$ = Risk free rate of US Treasury bond

EFW_{AC} = Index of Economic Freedom rating for comparative African Country with bond market

EFW_{TC} = Index of Economic Freedom of World rating for target country

x = adjustment factor based variability in the EFW index

The MAM as applied to a country without an actively trading market is as follows:

$CRP_{NTM} = (Moody's\ rating\ based\ default\ spread) \times (risk\ factor)$…*Equation 11*

Where:

CRP_{NTM} = CRP using Moody's ratings for non-trading markets

$Risk\ factor$ = estimate of the level of risk in a country. Defaulted at 1.5 for emerging markets.

Damodaran's equity return premium as applied to a country without an actively trading market:

$$ERP_{NTM} = R_{f0(US)} + CRP_{NTM}$$ …*Equation 12*

Where:

ERP_{NTM} = Equity risk premium for non-trading markets

$R_{f0(US)}$ = Risk free rate of US Treasury bond

Based on the above methodology, the final PPC CRP was developed for its targeted African countries and is illustrated in Table 3. With reference to Table 3, only Egypt has an actively trading market and therefore equation 9 was used in calculating its CRP. Apart from Egypt, the CRP's for the other African countries was calculated using the PPC CRP for non-trading markets and Damodaran's ERP as per equation 10 and equation 12 respectively. The final PPC CRP reflected the PPC calculated CRP, however where there was a significant difference between the PPC calculated CRP and Damodaran's ERP, Damodaran's ERP was used as the final PPC CRP.

Table 3. PPC modelled country risk rating

Country Name	Economic Freedom Index	Moody's Rating	PPC's Calculated CRP (%)	Damodaran's ERP (%)	Final PPC CRP (%)
Algeria	50.1	N/A	12.73	7.47	12.73
Botswana	71.1	A2	7.49	8.02	8.02
DRC	46.4	B3	19.80	19.80	19.8
Egypt	56	B3	19.80	19.80	19.8
Ethiopia	51.5	B1	16.38	15.63	16.38
Ghana	63	B3	8.32	19.80	19.8
Kenya	57.5	B1	15.45	15.63	15.45
Mali	56.5	N/A	8.06	12.71	12.71
Mozambique	53.2	B2	10.71	17.72	17.72
Niger	54.3	N/A	8.27	17.17	17.17
Nigeria	57.5	Ba3	8.19	13.75	13.75
Rep Congo	42.8	Ba3	16.9	13.75	13.75
Rwanda	63.1	B1	15.23	15.63	15.23
Uganda	59.3	B1	29.28	15.63	15.63
Zambia	58.8	B2	34.28	17.72	17.72
Zimbabwe	38.2	N/A	12.34	17.17	17.17
Angola	48.9	Ba2	9.34	12.51	12.51

Source: PPC Country Risk Presentation February 2016 (PPC 2016a)

3.2.1.1. Update to the Melded Approach Model

In his latest July 2016 edition of his annually published country risk premium database, Damodaran acknowledged that the risk factor applied to his MAM in the absence of credible market information was rather subjective and so he changed this risk factor to reflect the volatility in the emerging market equity and bond market index respectively (Damodaran, 2016a). The PPC model has since not been updated to include this latest change.

3.3. Objective of this study

The main objectives of this study are:

- To test the chosen proxy for country risk against the other risk assessment models identified.
- To test the PPC modelled CRP against the proxy for country risk, and
- to test the risk models against each other to determine whether the risk models reflect a better indication of country risk than the PPC CRP.

4. CHAPTER 4: RESEARCH METHODOLOGY

4.1. Introduction

In line with the objective of this study, this chapter describes the methodology adopted in testing the PPC modelled CRP for its African countries as well as the other risk assessment models discussed in Chapter 2 against a suitable and credible proxy for country risk.

In doing so, this chapter first commences by defining and identifying the proxy for country risk. This is followed by a discussion on the risk assessment models and the PPC CRP which together forms the variables considered in the research analysis. The research strategy section defines the research methodology used, the samples, variables and data used in the analysis. This is then followed by the data analysis section that describes in detail the steps involving in testing the PPC CRP and risk assessment models. The validity and reliability of the data used in the analysis are discussed and the chapter then ends with a note on the ethical consideration of this study.

4.2. Proxy for Country Risk

According to the (BusinessDictionary n.d.), a proxy is defined as an “indirect measure that approximates or represents a phenomenon in the absence of a direct measure”. In the case of country risk, there is no direct measure that can be used to assess country risk because the country risk is very much based on an individual’s or firm's perception of the level of risk in a country which is not always easily quantifiable. In order to test the PPC CRP and the other risk assessment models discussed in section 2.4, it was necessary to choose a suitable proxy for country risk, and one against which the PPC CRP and risk models can be measured.

Most researchers agree that the best proxy for country risk is a country's sovereign default on its debt payment. As the defaulting country cannot print foreign currency to meet its obligations, this then represents the actual tangible consequence of the risk experienced in the country (Damodaran 2016b). This default in payment is in the form of sovereign bond defaults, default on bank loans and defaults on payment to its other institutional creditors. Until recently, there have been few attempts to consolidate and portray a country's aggregate sovereign debt default.

In 2015, the Bank of Canada developed a comprehensive database of sovereign defaults for each country based on information obtained from the IMF, World Bank, Paris Club and other creditors (Beers & Mavalwalla, 2016). The database contains information about each country's debt defaults as far back as 1970 and is free to download from the Bank of Canada website (BOC 2016).

This study therefore, uses the Bank of Canada's Database of Sovereign Default (BC-DSD) as a suitable proxy for country risk in testing the PPC CRP and the various risk models discussed. In order to ensure that the BC-DSD is indeed a suitable and credible proxy for country risk, and an appropriate tool to measure the CRP, the BC-DSD is tested against the risk assessment models as listed in Table 4 below.

4.3. Risk Assessment Models

The three groups of risk assessment models as discussed in section 2.4 is tabulated in Table 4. Each of the risk models in itself provides a good indication of a level of risk in a country. In this regard, the risk models are tested against the proxy for country risk and against each other to determine whether they indicate a better reflection of country risk that the PPC CRP.

Table 4: Risk assessment models

Risk Service Agencies	Credit Rating Agency (CRA)	Sovereign Default Model
WGI	Moody's Ratings	Damodaran's MAM
PRS		
WEF		
EFW		

4.4. The PPC CRP

The PPC modelled CRP for the 17 African countries that it had targeted as potential investment destinations is as per Table 3 in Chapter 3. As illustrated in section 3.2, the PPC CRP to a large extent uses Damodaran's MAM in determining its country risk. In the absence of sound market data as is the case in the majority of African countries, the melded approach uses a factor of Moody's rating score in its modelling of country risk. PPC's calculated CRP for the non-trading countries was also used.

4.5. Research strategy

This research study adopts a quantitative research methodology which is best suited for achieving this research objective. Quantitative research methodology, according to Leedy and Ormrod (2010), requires the evaluation of data of one or more relevant variables.

4.5.1. Sampling

The sample size considered in the analysis was 25 African countries which are representative of the 54 countries in the Africa continent. The sample consisted of the 17 countries targeted and considered by PPC as their potential investment destinations (PPC 2016a) as well as an additional eight neighbouring countries, as listed in Table 5.

Table 5: List of countries in the sample

Sample Countries		
PPC Target Countries		**Add Countries**
Algeria	Niger	Burkina Faso
Botswana	Nigeria	Cameroon
DRC	Rep of Congo	Cape Verde
Egypt	Rwanda	Gabon
Ethiopia	Uganda	Namibia
Ghana	Zambia	Senegal
Kenya	Zimbabwe	Tunisia
Mali	Angola	Benin
Mozambique		
Sample Number: 25		

4.5.2. Variables

The variables used to test the PPC CRP were the BC-DSD as the proxy for country risk and the various risk assessment models as discussed in section 4.2 and section 4.3 respectively.

4.5.3. Data and Data Collection:

The data used was exclusively secondary data.

The data for the WGI was obtained from the WGI published database available on the company's website (Kaufmann et al., 2011). The scoring for each of the seven components that make up the index was equally weighted and then averaged over a 10-year period from 2006 to 2015 to give a 10-year average index for each country.

The PRS data was obtained from the annually published PRS database (PRS Group 2016). The 12 components that make up the PRS index per country were equally weighted and similarly averaged over a 10-year period from 2006 to 2015.

The global competitiveness index data for each sample country was obtained from the WEF annual report (WEF 2016). The average index for the past 10 years from 2006 to 2015 for each country was used as the variable.

The EFW index per country was obtained from the EFW annual report for the period 2006 to 2015. The average 10-year index was used for each country's variable.

In terms of the CRA assessment, only Moody's ratings are considered in the research. This is because the rating for the other two major CRA reflects a similar score per country. The default spread points as provided by Damodaran, in his widely publicised annual country risk database, were used to convert the ratings into a numerical risk score (Damodaran 2016a). The ratings used were based on the ratings score as of July 2016.

In terms of the sovereign defaults models, only Damodaran's meld approach model was used and the data for each country was obtained from the 2016 annually published country risk database (Damodaran 2016a).

4.6. Data Analysis

According to Lee (2015), the most common way to determine whether a relationship exists between continuous variables is to do a Pearson correlation analysis. In testing the credibility of the country risk proxy, (BC-DSD), a correlation analysis was conducted between the country risk proxy and the risk assessment models to determine if there existed a relationship between them.

The main objective of this study was to determine whether the PPC CRP represented a true reflection of the country risk experienced in the respective African countries. In testing the PPC CRP, a linear regression analysis was conducted with the BC-DSD as the dependent variable and the PPC CRP as the independent variable. The BC-DSD was used as the dependent variable because

based on the literature, it was the best reflector of country risk before the analysis was conducted and it was important to compare the independent variables to a dependent variable in which the level of risk was known. The PPC CRP was treated as the independent variable because its ability as a reflector of country risk was not known before the analysis was conducted. In defining linear regression, Lee (2015) advises that linear regression is a technique of mapping the association between two variables into a linear relationship where one variable is assumed to be dependent on the other.

The final objective of the study was to determine whether there existed a particular risk model or a combination of risk models that reflected a better measurement of risk in the African countries than the PPC calculated CRP. In determining if there existed a particular model that indicated a better reflection of country risk, a correlation analysis was performed on all the risk models to determine if there existed a better association to the country risk proxy as well as the other risk models. In determining if there existed a combination of models that indicated a better reflection of country risk, a multiple regression analysis was conducted on all combinations of risk models. In this case, the BC-DSD was used as the dependent variable and the individual risk models were used as the independent variables.

The simple Pearson correlation, linear regression and the multiple regression analysis were performed in Microsoft Excel. The formula for the linear regression used is (Nau 2014):

$$Y = \beta_0 + \beta_1.X_1 + \beta_2.X_2 + \cdots + \beta_k.X_k + \varepsilon \quad \textit{...Equation 13}$$

Where:

Y = dependent variable

X_1, X_2, X_k = independent variables

β_0 = intercept

$\beta_1, \beta_2, \beta_k$ = multiplier of the variables

ε = standard error

4.7. Validity and reliability

A study is considered to be valid and reliable if the objective of the study can be successfully analysed, a statistical significance obtained and meaningful conclusions can be drawn (Leedy & Ormrod, 2010).

The data used in the study was obtained from risk services agencies, Moody's rating agencies and Damodaran's annual Country Risk Premium Database. The risk service agencies used are world renowned agencies whose indices are based on statistical data received from reputable organisations such as the World Bank, United Nations, UNESCO, WHO and WEF.

In terms of the data used for the BC-DSD and the risk services agencies, the latest average 10-year data was used for each country as opposed to using just a single year's data. The reason for this is that the 10-year average data gives a more accurate reflection of the risk in a country as opposed to a single year's data which could reflect an abnormal year for that particular country.

The outcome of the data analysis was not only based on the association to the country risk proxy (which was used as the primary test instrument), but also with its association to the other variables as indicated in Table 4. The data analysis was achieved by using the statistically accepted Pearson correlation and linear regression models. The accuracy of the analysis was improved by increasing the sample size by including an additional eight countries over and above the PPC interested countries as recommended by Raudys and Jain (1991).

The analysis of the data was only considered when the statistical significance was greater than 95% or when the probability of randomness in the correlation (P-Value) was less than 5%.

4.8. Ethical Consideration

Apart from the PPC modelled CRP data utilised, the rest of the data collection and data itself is already publicly available and in this regard, no legal or ethical issues are expected from the study.

In terms of the PPC data, PPC has given approval for the CRP data to be used in the study.

5. CHAPTER 5: PRESENTATION OF RESULTS

5.1. Introduction

This chapter presents the results of the findings related to the main objectives of this study, namely: [1] to test the chosen proxy for country risk against the other risk assessment models, [2] to test the PPC modelled CRP against the proxy for country risk, and [3] to test the risk models against each other to determine whether the risk models reflect a better indication of country risk than the PPC CRP.

5.2. Testing the proxy for country risk

The proxy for country risk used was the Bank of Canada's database of sovereign defaults (BC-DSD). In testing the proxy for country risk, the objective was to determine whether the country risk proxy showed an association with the risk assessment models identified. In this regard, a Pearson correlation analysis was conducted between the BC-DSD and the various risk models. The data used is as indicated in Table 6.

The results of the analysis are illustrated as the correlation coefficient and corresponding probability values, (commonly called p-values) that reflected the level of association and statistical significance respectively. The results of the analysis are as reflected in Table 7.

Table 6: PPC CRP and risk assessment model scores

Countries	CRP	BC-DSD	WGI	F-HSE	WEF	EFW	PRS	Moody's Rating Score	Damo Meld CRP
Algeria	12.73	8	-0.80396	5.5	3.9	5.35	0.53138	5.34	7.47
Botswana	8.02	3	0.68447	2.3	4.12	7.8	0.69198	0.95	1.33
DRC	19.8	1445	-1.59851	5.9	3.29	4.71	0.24394	7.29	10.21
Egypt	19.8	2	-0.64867	5.45	3.82	6.42	0.49034	7.29	10.21
Ethiopia	16.38	914	-0.93845	5.36	3.56	5.61	0.47191	5.05	7.07
Ghana	19.8	650	0.05829	1.5	3.64	6.7	0.56578	7.29	10.21
Kenya	15.45	76	-0.68743	3.45	3.79	7.06	0.51392	5.05	7.07
Mali	12.71	325	-0.46545	3.15	3.38	6.02	0.43033	5.46	7.65
Mozambique	17.72	906	-0.35481	3.4	3.2	5.7	0.54268	8.41	11.77
Niger	17.17	249	-0.64091	3.6	3.4	5.83	0.43396	7.85	10.99
Nigeria	13.75	4099	-1.12993	4.14	3.55	6.27	0.38782	5.05	7.07

Rep Congo	13.75	1968	-1.08852	5.45	3.55	5.35	0.43037	6.17	8.64
Rwanda	15.23	164	-0.37399	6	4.23	6.93	0.35	5.05	7.07
Uganda	15.63	462	-0.58942	4.65	3.52	7.21	0.50158	5.05	7.07
Zambia	17.72	1013	-0.33397	3.5	3.65	7.05	0.56578	7.29	10.21
Zimbabwe	17.17	3874	-1.48097	6.1	3.2	4.32	0.32746	7.85	10.99
Angola	12.51	674	-1.06947	5.5	3.02	4.84	0.46604	5.05	7.07
Benin		163	-0.29177	2	3.57	6.09	0.4	1.79	3
Burkina Faso		172	-0.36329	4	3.28	5.93	0.49	7.29	10.21
Cameroon		663	-0.90106	6	3.58	6.07	0.51	6.17	8.64
Cape Verde		4	0.47812	1	3.62	6.7	0.68	6.17	8.64
Gabon		260	-0.55587	5.35	3.78	5.77	0.48	5.05	7.07
Namibia		3	0.3185	2	3.97	6.68	0.69	2.47	3.46
Senegal		300	-0.26843	2.55	3.7	6.1	0.48	5.05	7.07
Tunisia		1	-0.16716	4.35	4.3	6.72	0.61	4.04	5.66

Table 7: Correlation (R) and p-values between the BC-DSD and risk assessment models

	WGI	PRS	WEF	EFW	F-HSE	Moody's Ratings	Damo MAM
R	-0.612	-0.509	-0.416	-0.458	0.325	0.298	0.299
p-value	0.001	0.009	0.039	0.021	0.113	0.147	0.099

5.3. Testing the PPC CRP against the BC-DSD

The PPC modelled CRP was tested against the proxy for country risk to determine the level of association that exist between the two models. A linear regression analysis modelling was used to determine the association. The PPC CRP was modelled as the independent variable and the BC-DSD was modelled as the dependent variable. The sample countries were reduced to the 17 countries in which the PPC CRP was modelled on, as listed in Table 6. The outcome of the regression analysis is graphically represented in figure 2.

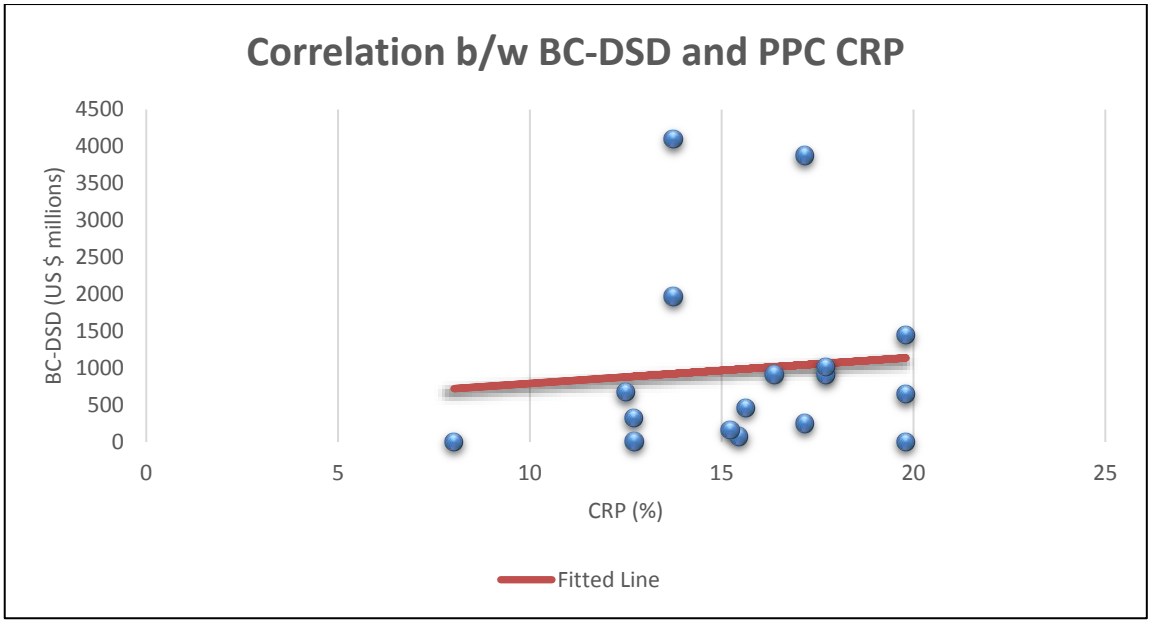


Figure 2: PPC CRP versus the proxy for country risk

The regression analysis output is presented in the following tables:

Table 8: Regression Statistics output for the analysis of BC-DSD and PPC CRP

Multiple R	0.08853
R Square	0.00784
Adjusted R Square	-0.0583
Standard Error	1287.93
Observations	17

Table 9: ANOVA output for the analysis of BC-DSD and PPC CRP

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	196538.284	196538	0.11848	0.735462169
Residual	15	24881523.5	1658768		
Total	16	25078061.8			

Table 10: Regression coefficients output for the analysis of BC-DSD and PPC CRP

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95.0%*
Intercept	439.706	1629.255	0.27	0.79	-3032.9	3912.4
CRP	35.264	102.448	0.34	0.73	183.09	253.627

5.4. Testing all risk models against each other

In order to determine whether there existed a particular risk model that indicated a better reflection of risk in the African countries than the PPC modelled CRP, a Pearson correlation analysis was conducted on all the risk models. Table 11 reflects the correlation coefficients and p-values of the correlation analysis between the risk models.

Table 11: Correlation analysis of all the risk models

	PPC CRP	BC-DSD	WGI	PRS	WEF	EFW	F-HSE	Moody's Ratings	Damo Meld CRP
PPC CRP	1.000	0.089	-0.307	-0.350	-0.268	-0.210	0.110	0.844	0.844
		0.735	*0.230*	*0.168*	*0.299*	*0.419*	*0.673*	*0.027*	*0.000*
BC-DSD	0.089	1.000	-0.612	-0.509	-0.416	-0.458	0.325	*0.298*	0.299
	0.344		0.001	0.009	0.039	0.021	0.113	*0.147*	0.099
WGI	-0.307	-0.612	1.000	0.817	0.522	0.751	-0.791	-0.450	-0.453
	0.230	*0.001*		*0.000*	*0.007*	*0.000*	*0.000*	*0.024*	*0.022*
PRS	-0.350	-0.509	0.817	1.000	0.439	0.622	-0.594	-0.343	-0.355
	0.168	*0.009*	*0.000*		*0.028*	*0.001*	*0.002*	*0.000*	*0.104*
WEF	-0.268	-0.416	0.522	0.439	1.000	0.659	-0.129	-0.544	-0.554
	0.299	*0.039*	*0.007*	*0.028*		*0.000*	*0.538*	*0.005*	*0.007*
EFW	-0.210	-0.458	0.751	0.622	0.659	1.000	-0.529	-0.436	-0.443
	0.419	*0.021*	*0.000*	*0.001*	*0.000*		*0.007*	*0.030*	*0.030*
F-HSE	0.110	0.325	-0.791	-0.594	-0.129	-0.529	1.000	0.302	0.296
	0.673	*0.113*	*0.000*	*0.002*	*0.538*	*0.007*		0.142	*0.112*
Moody's Ratings	0.844	*0.298*	-0.450	-0.343	-0.544	-0.436	0.302	1.000	0.999
	0.027	*0.147*	*0.024*	*0.000*	*0.005*	*0.030*	0.142		*0.000*
Damo Meld CRP	0.844	0.299	-0.453	-0.355	-0.554	-0.443	0.296	0.999	1.000
	0.000	*0.099*	*0.022*	*0.081*	*0.007*	*0.030*	*0.112*	*0.000*	

Based on the above analysis, a further linear regression analysis was conducted between the country risk proxy as the dependent variable and WGI as the independent variable. The graphical representation of the regression analysis is shown in figure 3 while the statistical results are tabulated in Tables 12, 13 and 14.

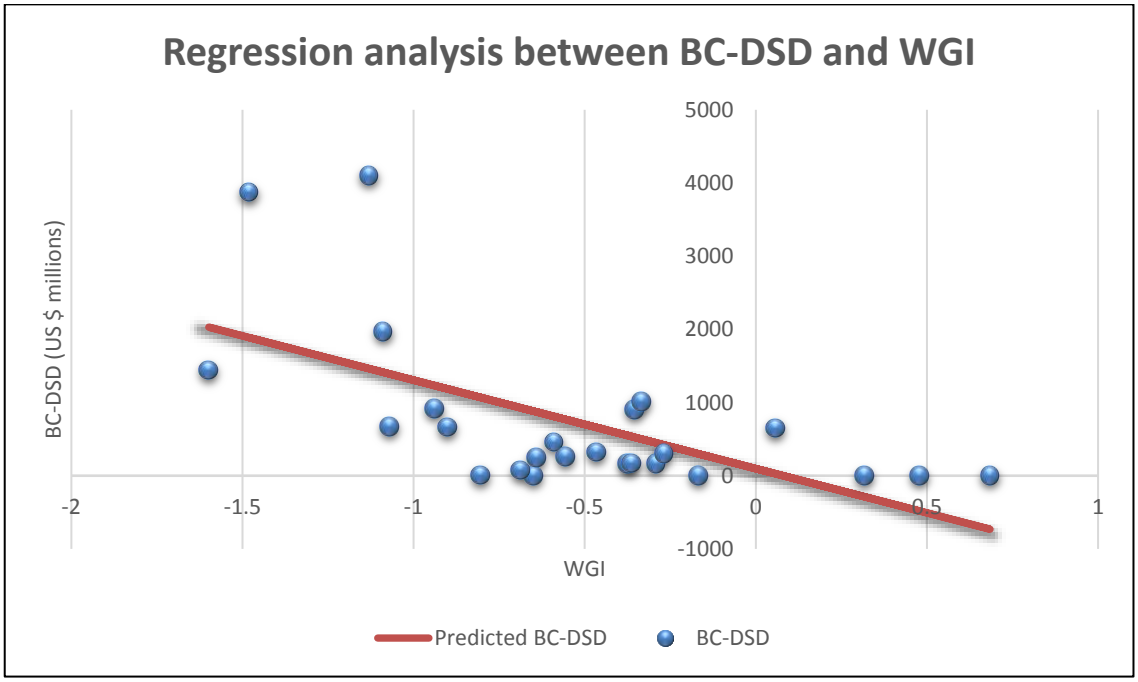


Figure 3: BC-DSD and WGI regression

Table 12: Regression Statistics for analysis of BC-DSD and WGI

Multiple R	0.6117879
R Square	0.3742844
Adjusted R Square	0.3470794
Standard Error	886.04293
Observations	25

Table 13: ANOVA for analysis of BC-DSD and WGI

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	96.69383	247.1899	0.391172	0.699270	-414.657	608.0452
WGI	-1209.495	326.0827	-3.70916	0.001154	-1884.04	-534.941

Table 14: Regression coefficient outputs for analysis of BC-DSD and WGI

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	10800956	10800956	13.75791	0.0011549
Residual	23	1805665	785072.0		
Total	24	28857614			

In order to determine whether there existed a combination of risk models that indicated a better reflection of risk than the PPC modelled CRP, a multiple linear regression analysis was conducted on all combinations of risk models as the independent variables with the BC-DSD as the dependent variable. While all the results of the analysis between the various combinations are available, in order to keep the length of this study tractable, only the combination that includes all the risk services agencies models are included in this report and the results are illustrated in Tables 15, 16 and 17.

Table 15: Regression Statistics for analysis between BC-DSD and risk agent's models

Multiple R	0.66693
R Square	0.444795
Adjusted R Square	0.298689
Standard Error	918.2902
Observations	25

Table 16: ANOVA for analysis between BC-DSD and risk agent's models

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	12835733	2567147	3.044323	0.034865
Residual	19	16021881	843256.9		
Total	24	28857614			

Table 17: Regression coefficient outputs for analysis between BC-DSD and risk agent's models

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-29.0588	3498.995	-0.0083	0.99346	-7352.54	7294.422	-7352.54	7294.422
WGI	-2105.31	988.8063	-2.12914	0.046542	-4174.9	-35.7098	-4174.9	-35.7098
F-HSE	-322.378	238.4023	-1.35224	0.192175	-821.36	176.6037	-821.36	176.6037
WEF	85.90033	926.6867	0.092696	0.927115	-1853.68	2025.478	-1853.68	2025.478
EFW	74.44978	391.1874	0.190317	0.851079	-744.315	893.2144	-744.315	893.2144
PRS	412.0856	3024.238	0.136261	0.893048	-5917.72	6741.889	-5917.72	6741.889

6. CHAPTER 6: DISCUSSION OF THE RESULTS

6.1. Introduction

This chapter discusses the results of the findings related to the main objectives of this study, namely: [1] to test the chosen proxy for country risk against the other risk models, [2] to test the PPC modelled CRP against the proxy for country risk, and [3] to test the risk models or combination of risk models against each other to determine whether the risk models reflect a better indication of country risk than the PPC CRP.

6.2. Discussion pertaining to Main Objective 1

Based on the literature review, it was established that there is no better proxy for the level of risk in a country than a country's actual default on its sovereign debt obligations. As a country cannot print foreign currency to meet its sovereign debt, a default on its debt payment would indicate that the country is experiencing political and economic difficulties. It was, therefore, appropriate to use the sovereign debt as a suitable proxy for the country risk. In this regard, the Bank of Canada's database of each country's actual sovereign default (BC-DSD) was used as the proxy for country risk.

The purpose of objective 1, was therefore, to test the BC-DSD against the three types of risk assessment models namely, risk service agencies, CRA's and sovereign default models, to confirm its suitability as a proxy for country risk. The WGI, PRS, WEF, EFW and F-HSE represented the risk service agencies whereas Moody's credit rating and Damodaran's MAM represented the credit rating agencies and sovereign default models respectively.

6.2.1. Discussion of the results of the Risk Service Agencies

The results of the correlation analysis modelling as per Table 7 in chapter 5, revealed that there exist a large correlation[1] between the country risk proxy and WGI (of -0.612[2]) and between the country risk proxy and PRS (of 0.509) respectively. The p-values of 0.1% and 0.9% provided further indication that the correlation was unlikely due to sheer randomness. The EFW and WEF showed a moderate correlation with good evidence of association (with a correlation of -0.458 and -0.416) between itself and the country risk proxy respectively. The p-values although slightly higher than the WGI and PRS respectively, were under the 5% benchmark thereby ruling out the possibility of randomness in the analysis. The correlation analysis between the country risk proxy and F-HSE returned a moderate correlation result of 0.325, however it is not considered as the p-value was recorded at a very high 11.3%.

As per the literature review, the WGI and PRS risk scores are focused on a country's political stability, level of corruption and law and order. Similarly, the WEF and EFW scores are focused mainly on the macroeconomic conditions, property rights, infrastructure and education. Having these risk scores well correlated to the BC-DSD seems therefore obvious as the ability of a country to pay its debts depends on the political stability, level of corruption experienced and the macroeconomic conditions in the country. F-HSE on the other hand, primarily focuses on risks related to political rights and civil rights of the citizens in a country. Although it poses a risk to investors in the country, the risk does not necessarily translate to unfavourable macroeconomic conditions or high levels of

[1] In interpreting the results of the correlation, the commonly held interpretations and terminologies based on the level of correlation score as described by Lee (2015) was used in the description of the analysis.

[2] Negative correlation implies that when comparing the association of two risk models, the one model rates risk with the lowest score indicating a high risk whereas the second model rates risk with the lowest score indicating low risk.

corruption in the country and therefore it stands to reason why its correlation to the BC-DSD was not conclusive.

Based on the above analysis, it is evident that apart from the F-HSE risk assessment model, the rest of the risk service agencies' model shows good correlation to the country risk proxy of the BC-DSD.

6.2.2. Discussion of the results of the CRA

Being the longest standing credit rating agency that measures both probability of default as well as the severity of the default, Moody's credit rating was considered as a representation of the CRAs (Damodaran 2016b). As per Table 7, the correlation analysis of Moody's rating revealed a correlation of 0.298, indicating no real evidence of association. The results support those researchers and academics who have criticised rating agencies as not being very accurate when assessing the level of risk in a country.

The correlation analysis conducted, however, returned a very high p-value of 14.7% implying a high probability of an error in the analysis. The analysis shall therefore not be considered.

6.2.3. Discussion of the results of Damodaran's MAM

Damodaran's meld approach model was chosen as the representative sovereign default model due to its popularity with researchers and academics as well as being the chosen model by PPC for determining its CRP. The results of the correlation analysis as per Table 7 revealed a correlation of 0.299 or a very low level of association. As per chapter 2, it was established that the MAM for non-trading market countries utilises Moody's default rating in its model when calculating the country's risk premium and therefore it stands to reason the similarity in the level of correlation to that of Moody's credit rating. Despite the correlation results, the analysis is not considered as the p-value returned a value of 9.9%.

In summary, based on the above correlation analysis of the BC-DSD to the risk service agencies, Moody's rating and Damodaran's MAM, it can be concluded that the BC-DSD is a suitable proxy for country risk.

6.3. Discussion pertaining to Main Objective 2

The second objective of this study was to test the PPC modelled CRP against the proxy for country risk, as well as the other risk assessment models identified, and to thereby conclude on the CRP's suitability as a reflector of country risk.

In this regard, a linear regression analysis was conducted to determine the level of association between the PPC CRP and the country risk proxy. The BC-DSD was modelled as the dependent variable whereas the PPC CRP was modelled as the independent variable. Based on the regression analysis results in figure 2, Table 8, Table 9 and Table 10 in chapter 5, there exist only an 8.9% association between the two variables and the PPC CRP explains only 0.78% of the variations in the dependent variable of the BC-DSD. This implies that there is a very small association between the two variables and the two variables can thereby be classified as unrelated. The significance F of the ANOVA output, however, returned a value of 73.5% which implies that there is only a 26.5% confidence that this association is correct and therefore the analysis is not considered.

Table 11 shows the correlation analysis of the PPC CRP to the rest of the risk assessments. The correlation between the PPC CRP, WGI and PRS showed moderate levels of associations whereas the correlation between the PPC CRP, WEF, EFW and F-HSE showed no real association. These associations, however, returned a p-value in excess of 5% indicating a high probability that the association is due to other factors, such as randomness. It is therefore not possible to conclusively make a determination on the PPC CRP association with the risk models.

Table 11 further shows that there is a very strong correlation between the PPC CRP, Moody's rating and Damodaran's MAM with a high statistical significance as reflected by the low p-values. This stands to reason as the PPC CRP is modelled on Damodaran's MAM, which in turn, uses Moody's rating scores for the African countries without a financial trading market. It is, however, interesting to note that based on the correlation between Damodarans MAM and the risk models as per Table 11, Damodaran's melded approach shows moderate to large correlation to the WGI, WEF and EFW with p-values relatively low, indicating statistical significance despite the PPC CRP association being inconclusive. The reason for this is that the PPC CRP association to the risk models was based on 17 observations as per Table 3, whereas Damodarans MAM was based on a sample size of 25 African countries. In addition, the PPC calculated CRP, in the absence of credible market data, was based on the EFW score and an adjusted inflationary differential as denoted in chapter 3 of this report. Furthermore, in the development of the PPC CRP, the PPC calculated CRP was compared to Damodaran's ERP which incorporated the U.S. risk-free treasury bond rate and where there was a significant difference, the ERP was used as the PPC CRP.

With the exception to that of Damodaran's MAM and Moody's rating score, the association between the PPC CRP, the BC-DSD and the rest of the risk models are inconclusive as the results showed that the analysis was not statistically significant.

6.4. Discussion pertaining to Main Objective 3

The final objective of this study was to conduct an analysis of all the risk models in relation to each other in order to establish the risk model that reflected the best association to the country risk proxy as well as to the other risk models identified. In addition, the objective was to determine if there existed a combination of risk models that reflected a better association with the country risk proxy.

6.4.1. Risk Model that reflects the best association

A Pearson correlation analysis was conducted on all the risk models, including the BC-DSD. Based on the results of the analysis as contained in Table 11, the World Governance Index (WGI) showed the best association to the country risk proxy than any of the other risk assessment models analysed. At a correlation of -0.612 with the BC-DSD, the correlation is significantly larger than any of the other risk models. Furthermore, with the lowest p-value of 0.1%, the association is also statistically significant.

When compared to the risk service agencies models, the WGI showed the best association with a correlation of 0.817, 0.522, 0.751 and -0.791 with the PRS, WEF, EFW and F-HSE respectively. These indicate an extremely strong evidence of association with a p-value of 0, implying virtually no possibility of randomness in the association. PRS and EFW also showed a strong correlation to the risk service agencies models and based on the correlation scores are ranked just behind the WGI in second and third place respectively.

When compared to Moody's default ratings and Damodaran's MAM, the WEF showed the best association, however, only marginally better than that of the WGI.

Based on the above analysis, it can be concluded that the WGI shows the best association with the proxy for country risk, as well as to the other risk measurement models. PRS and EFW returned the second and third best association overall.

6.4.2. Combination of risk models that reflect the best association

A multiple linear regression analysis was conducted on all combinations of risk models as the independent variable with the BC-DSD as the dependent variable. Table 15, 16 and 17 shows the results of just the relationship between all risk service agency models and the BC-DSD. The association as per the tables, as

well as the association with the various combinations all returned a p-value in excess of 5%, making the analysis insignificant.

The decision of whether there exists a combination of risk models that reflect a better reflection of country risk is therefore inconclusive.

6.5. Conclusion

In determining whether the BC-DSD was a suitable proxy for country risk, the BC-DSD was tested against all the risk models identified. The analysis showed a strong correlation to the WGI and PRS respectively. The analysis also showed a moderate level of correlation to the EFW and WEF respectively. The analysis between the BC-DSD, Moody's rating score and Damodaran's MAM returned p-values greater than 5% and the results were therefore not considered. In summary, based on the correlation results, the BC-DSD was considered a suitable proxy for country risk.

In determining whether the PPC calculated CRP reflected the true level of risk in a country, a regression analysis and correlation analysis was conducted with all the risk assessment models. With the exception of Moody's rating score and Damodaran's MAM, the rest of the risk models returned p-values in excess of 5%, thereby making the results invalid. In summary, as a result of the high p-values, a determination on whether the PPC CRP was a good reflector of the country risk could not be made.

The final objective of this study was to determine whether there existed a risk model that reflected the best reflection of risk in a country. By conducting a correlation analysis between all the models, it was established that the WGI showed the best association with all the risk assessment models and therefore was the best reflector of country risk. A further analysis was conducted to establish if there existed combinations of risk assessment models that resulted in

better reflectors of country risk, but the analysis returned results that were inconclusive.

7. CHAPTER 7: CONCLUSIONS & RECOMMENDATIONS

7.1. Introduction

The purpose of this chapter is to summarise the finding of the consultancy report and to provide recommendations to PPC and other stakeholders who have a vested interest in the topic, and who are wishing to invest in the African continent.

The chapter also provides a summary on the suitability of Damodaran's model in determining the level of risk in the Africa continent and finally, the chapter ends with suggestions for future research.

7.2. Conclusions of the study

The following were the objectives of the consultancy report and the respective findings and conclusion.

The first objective was to investigate the PPC valuation model and particularly, the PPC CRP used for making project investment decisions in the wider African continent following the recent spate of PPC projects that did not realise the expected returns envisaged.

The study found that the PPC valuation model used was based on Damodaran's MAM for determining country risk and the model in its primary form was applicable to only one African country of the several considered by PPC (and that being Egypt) as the model relied on credible financial market data. In the rest of the African countries considered by PPC, where trading markets did not exist, PPC developed its own model that used the Economic Freedom of the World (EFW) index and applied an inflationary differential to that of the closest African country with an actively trading bond market. Damodaran in his 2015 edition of his annually published country risk premium database, acknowledged that many

emerging markets may not have an actively trading financial market and therefore proposed using Moody's default ratings in the absence of market data. PPC compared its country risk score from its model to that of Damodaran's emerging market model and where the variation was substantially large, replaced its calculated country risk with Damodaran's risk score.

In replacing the PPC calculated CRP for a non-trading market, the PPC Consultant replaced it with Damodaran's ERP that incorporated the U.S. risk free interest rate as well as the CRP. This meant that there was an additional rate added to the CRP and, when added to the expected returns in South Africa, made the hurdle rate much higher than the perceived risk in the country.

The second objective of the study was to investigate and identify other globally renowned risk models that could be used by PPC.

Based on the literature review, three groups of risk assessment models namely: [1] risk service agencies, [2] credit rating agencies and, [3] sovereign default models were identified. Risk service agencies are firms that specialise in country risk analysis and base their analysis on surveys and data obtained from institutions and other relevant bodies. The risk services models that were identified as suitable models for PPC were the WGI, PRS, WEF, EFW and F-HSE.

Of the three biggest credit rating agencies (S&P, Moody's and Fitch) that issue country risk rating by determining the likelihood of a country to default on its debt obligations, only Moody's rating was identified as a potential risk model for PPC. This was because Moody's is the longest standing rating agency and measures both the severity and probability of a country defaulting, whereas rating agencies such as S&P consider only the probability of the default.

Various sovereign spread models were identified in the literature review that empirically determines a country's risk by using economic and financial data. Due to its popularity in the academic fraternity, the Damodaran MAM was the only sovereign spread model considered as a potential risk model for PPC.

The third objective (or Main Objective 1) was to identify a suitable and credible proxy for country risk so as to compare and contrast the PPC calculated CRP against.

The BC-DSD, which is a database of records of all countries actual defaults on its sovereign debt, was identified as the best proxy for country risk. This was confirmed by testing its association to the risk models identified. The correlation analysis conducted showed fair to good association with all the risk assessment models with the exception of F-HSE, Moody's rating and Damodaran's MAM whose association was considered non-significant as a result of the high p-values returned.

The fourth objective (or Main Objective 2), was to test the PPC modelled CRP against the proxy for country risk as well as the other risk models identified to determine its suitability as a reflector of country risk.

Based on the regression and correlation analysis conducted, the results of all the analysis returned a p-value in excess of 5%, thereby making the analysis invalid. It was therefore not possible to make a determination on the PPC CRP.

The fifth objective (or Main Objective 3) was to determine the risk model or combination of risk models that showed the best reflection of country risk.

A correlation analysis was conducted on all the risk models including combinations of risk models to determine the risk model or combined risk models that showed the best association with each other and hence the best reflector of country risk. Based on the analysis, the WGI showed the best association with each other, showing strong to extremely strong evidence of association. The PRS and EFW also returned strong association but were ranked second and third best behind the WGI. It was therefore concluded that WGI is the best reflector of country risk followed by PRS and EFW.

7.3. Damodaran's MAM’s effectiveness in African Countries

Damodaran's MAM is very popular in the academic and research fraternity, yet based on this study, the model failed to truly reflect the level of risk in the African countries identified. The question, though, is why?

The answer lies in the fact that Damodaran’s model relies on equity and bond market data which in most African countries are nonexistent, however, if they do exist due to the nature and size of the market are not reflective of the risk conditions in the country. In countries that do not have equity and bond markets, Damodaran proposes using Moody’s default score but as discussed in chapter 2, there is some bias with regards to credit rating agencies’ scores in general, rating agencies exhibit herd behaviour and rating scores do take time to react to events taking place in a country. CRA ratings are therefore not the best reflector of risk.

In his 2016 edition of his annually published country risk premium database, Damodaran included a volatility factor in his MAM for non-trading market countries and this factor was based on the emerging market index. In Africa, however, only two countries (South Africa and Egypt) are considered as emerging markets while the rest are still frontier markets.

Damodaran’s model is highly effective in countries with a well-developed and efficient trading market such as in developed countries and many emerging markets, however, for investment decisions in the African countries the model is not ideal and should therefore not be used.

A discussion was held with Professor Damodaran at Stern Business School in New York, regarding the use of his model in PPC and the applicability in the African context. Professor Damodaran acknowledged that his model as adapted by PPC may not be best suited for the African countries and agreed that other models should be used to supplement his model.

7.4. Recommendations

Based on the findings above, the PPC CRP and valuation model for project investment in Africa should be reviewed.

Firstly, the PPC CRP should not be based on Damodaran's model because of the lack of financial data in the African market. Even in the case of African countries with market data, the model may not be ideally suited because of the nature and size of the markets.

In calculating CRP, PPC should rather use the WGI, as based on the findings above, the WGI is the best reflection of country risk. Relying solely on one risk assessment model, however, could be risky as in the unlikely event of errors in the WGI assessment model, it could result in a poor investment decision.

To mitigate against such occurrences a better method is to diversify the country risk by choosing the top three best risk assessment model scores and summing them up in the proportions based on its level of association to the country risk proxy. As the top three risk models were WGI, PRS and EFW at the correlation of 0.64, 0.51 and 0.46 respectively to the country risk proxy, the respective correlation weighting should be applied to each of the models' risk score and added up to give the aggregate risk score as below:

$$ACR_{Country\ A} = W_{WGI}\ (WGI\ Score) + W_{PRS}\ (PRS\ \ Score) + W_{EFW}\ (EFW\ Score)$$

$$= 40\%\ (WGI\ Score) + 32\%(PRS\ \ Score) + 28\%(EFW\ Score)$$

Where

ACR = Aggregate country risk score

W_{WGI} = correlation weighting of WGI to all three risk models

W_{PRS} = correlation weighting of PRS to all three risk models

W_{EFW} = correlation weighting of EFW to all three risk models

In determine the premium to be applied to the PPC valuation model, the WGI, PRS and EFW risk score for South Africa should be used as the base score and the difference between the base score and the respective risk model scores for the African country where the investment is to be made shall be the country risk premium applied to the investment valuation such as below:

$$CRP_A = 40\%(WGI_A - WGI_{SA}) + 32\%(PRS_A - PRS_{SA}) + 28\%(EFW_A - EFW_{SA})$$

Where

CRP_A = Country risk premium for African country

WGI_A = WGI for African country

WGI_{SA} = WGI for South Africa

7.5. Suggestions for future research

In PPC's valuation of its African Projects, the CRP was included in its discount rate. The question of whether the CRP should be included in the discount rate or cash flow has been quite extensively debated in the literature. Lessard(1996); Bekaert, et al. (2016) advised that CRP should only be included in the discount rate if it is systematic and is correlated with the world markets. Bekaert et al. (2016) advised that a major part of political risk experienced by a globally diversified company in a target country is not correlated to the world market and as such, it should be included in the cash flows instead of the discount rate. Furthermore, as the risk is non-systematic, there is a tendency for it to increase or reduce over time and therefore it is easier to model it as part of the cash flows rather than the discount rate. Lessard (1996) suggested that country risks can be separated into "symmetric risk" and "asymmetric" risk. Symmetric risks are risks such as GDP, exchange rates or interest rates that fluctuate over time and as such will have an impact on the volatility of the market and the company's portfolio. As such, it should command a premium and be included as part of the

discount rate. Asymmetric risks do not fluctuate with the market and generally have a largely “downside effect” such as civil disorder and expropriation. As such, these risks will not have a major bearing on the company’s diversified portfolio and should, therefore, be included in the expected cash flows. Sabali (2008), however, argues that CRP should not be included in the discount rate at all but proposes that it be included in the expected cash flows. He advises that incorporating CRP in the discount rate is flawed because not all projects are equally exposed to country risk, one cannot assume that the risk premium is related to countries’ risk of default, country risk is not necessarily constant over time and by incorporating country risk in the discount rate, the assumption is that it is fully systematic. Damodaran (2016, p. 50) advises that the argument of the CRP being part of the cash flow is “alluring but is wrong.” He advises that taking into account possibilities of differing outcomes in the cash flows is not risk adjusted.

The debate on whether the CRP should be included in the discount rate or cash flows is a rather interesting discussion and should be a topic for a future research investigation.

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