POLITICAL RISK REINSURANCE PRICING - A METHODOLOGY PROPOSAL

Prepared by Eric Dal Moro and Géraud Hubinois

Presented to the Actuaries Institute
ASTIN, AFIR/ERM and IACA Colloquia
23-27 August 2015
Sydney

Institute of Actuaries of Australia
ABN 69 000 423 656
Level 2, 50 Carrington Street, Sydney NSW Australia 2000
t +61 (0) 2 9233 3466 **f** +61 (0) 2 9233 3446
e actuaries@actuaries.asn.au **w** www.actuaries.asn.au

POLITICAL RISK REINSURANCE PRICING - A METHODOLOGY PROPOSAL

By Eric Dal Moro and Géraud Hubinois

ABSTRACT

Following the recent political events which occurred in different countries (e.g. Arab spring started in 2010), the Political Risk Insurance (and Reinsurance) market continues to grow rapidly. However, when looking at the available scientific literature related to the pricing of such products, it is striking to see that very few models have been developed and proposed. The aim of this paper is therefore to propose a methodological approach for the pricing of Single Risks - Political Risk Insurance and Reinsurance - which can be easily implemented in standard IT tools.

KEYWORDS

Clayton copula; Aggregation tree; Political Risk Insurance; Country rating; Probability of Default; Loss Given Default; Obligor

1. INTRODUCTION

The recent political events which occurred in different countries has increased the awareness for the need of political insurance covers among many major companies exposed to this risk. Even though the demand for such cover is sizeable, little has been developed by non-life actuaries to provide for a methodological pricing approach for this niche market. The major developments were often linked to specialized insurance companies (see Rolfini 2010), brokers (see Alwis et al 2006) or specialized agencies (see Miga 2004) developing a model for their own purpose. In contrast, main stream insurance product pricing such as motor insurance is based on reliable and easily available data: This has resulted in pricing models such as Generalized Linear Model (see Merz-Wüthrich 2008) to become a standard and a very abundant literature on such model is available.

For such main stream pricing models, the following elements are estimated at contract level:

- The pure premium corresponding to the expected loss for one unit of risk;
- The cost of capital: It can be measured according to difference risk measures, e.g. expected shortfall or value at risk;
- The commissions paid to intermediaries (if any);
- The internal company expenses allocated to each contract;
- The cost of retrocession (if any);
- The tax rate;
- The allocated return on invested assets reducing the overall price paid by the customer.

From the above list of pricing elements, this paper will only focus on the pure premium and on the cost of capital, the other elements depending very much on the risk transfer structure (for commissions and cost of retrocession), the company structure (for internal company expenses and return on invested assets) and the jurisdiction in which it operates (for the tax rate). Obviously in the case of the Political Risk Insurance pricing, the scarcity of data and the fact that this is still a niche market have resulted in little research in this field for the estimation of pure premium and cost of capital. The purpose of this paper is to introduce the different covers provided by this type of product, to explain how a single risk can be described and priced and how the aggregation of all single risks being covered by the (re)insurance contract can be priced.

This paper is divided into the following sections:

- Section 2 provides the definitions of the difference classes of risk of Single Risks - Political Risk Insurance contract;
- Section 3 describes the methodology adopted to price a single risk;
- Section 4 describes the aggregation tree used to aggregate the Single Risks going into the (re)insurance cover;
- Section 5 provides a numerical example.

2. Definitions of the difference classes of Political Risk Insurance

We define hereinafter the main types of risk classes in the area of Political Risk Insurance. It is important to note that the following list is not exhaustive.

First of all, a distinction has to be made between the Trade (export / import) Transactions and the Direct Investments. Generally speaking:

- **Trade Transactions** are covered against Non Honouring, and Contract Frustration;
- **Direct Investments** are covered against Currency Inconvertibility, Confiscation – Expropriation - Nationalization – Deprivation and Political Violence.

➢ **<u>Political Risks (PR)</u>**

Political Risks can be defined as the company's exposure to the risk of a political event that would diminish the value of an investment or a loan. The major political risk covers (classes) are listed hereinafter.

- **Currency Inconvertibility and Exchange Transfer (CI):**
    - Inability of an investor/lender to convert profits, investment returns and debt service from local currency to hard currency ($ € £);
    - Inability of an investor/lender to transfer hard currency out of the country of risk.

- **Confiscation, Expropriation, Nationalization, Deprivation (CEND):**
    - Loss of funds or assets due to confiscation, expropriation or nationalization by the host government of the country of risk;
    - Any unlawful action by the host government depriving the investor of fundamental rights in a project (creeping expropriation).

- **Political Violence (PV) or War (including revolution, insurrection, politically motivated civil strife, terrorism)**
    - Loss of funds or assets due to political violence or war.

- **Contract Frustration (CF)**
    - Loss of funds due to breach of contract by a private business entity due to an arbitrary act of a foreign government;
    - Loss of funds due to non-payment of a loan or guarantee ;
    - CF includes all type of PR described here-above. It corresponds to the PR cover attached to an export transaction policy.

- **Non Honouring (NH):**
    - Loss of funds or assets due to arbitrary non-honoring of a contract by a foreign government (or a semi government entity).

Please note that a specific category Miscellaneous (MISC) is defined to consider political risk covers that don't match with the definitions given here-above.

3. SINGLE RISK PRICING

After the description of the risks covered in the former section, this section will focus on the pricing framework.

3.1 Single risk description

The **"single risk"** concept has been developed as a way to differentiate from the short term whole turnover or portfolio business that historically represented the bulk of activity of the credit insurance. Unlike short term whole turnover/multi buyers business which focuses mainly on consumption goods, single risk insurance focus on sales of capital equipment or building/infrastructure construction or commodity trading operated in a different way, frequently with commercial contracts written on a case-by-case basis, and exhibiting longer payment terms (e.g. tenors up to 15 years and above for investment risk). In Single Risks Treaties, both Trade transactions and Direct investment can be covered; where Trade transactions might be covered against NH, CF and Direct Investments against CI, CEND, PV.

For this kind of cover, the policyholders are exporters, importers, banks or investors and insured transactions are:

- Trade receivables of exporters;
- Financing of export transaction by banks & financial institutions;
- Pre-financing of import transaction by banks & financial institutions;
- Project financing, investment financing, general purpose loans (to corporate) by banks & financial institutions;
- Investment in physical or monetary assets.

3.2 Single risks pricing – Problematic and general comments

When pricing a Single Risks treaty/contract, the details of all the transactions T_i covered in the portfolio P are provided. Each transaction T is characterized by:

- A debtor (or obligor) and country when NH and CF are covered;
- Country(ies) when PV, CEND, CI, MISC are covered;
- Limit per peril.
- A maximum limit for all the perils;
- A duration.

We have, for each Transaction T_i of the portfolio, the following information:

Transaction	Obligor	Country	CF	NH	PV	CEND	CI	MISC	Maximum Limit
Transaction T_i	Obligor $O(T_i)$	Country $C(T_i)$	$L(CF, T_i)$	$L(NH, T_i)$	$L(PV, T_i)$	$L(CEND, T_i)$	$L(CI, T_i)$	$L(MISC, T_i)$	$L(T_i)$

We now define for the risk $j \in \{CF, NH, PV, CEND, CI, MISC\}$:

- $L(j, T_i)$, the limit of the transaction T_i for the risk j;
- $PoD(j, T_i)$, the probability that the risk j in the country(ies) happens where T_i is realized (frequency trigger);
- $LGD(j, T_i)$, the Loss Given Default of the risk j in the country(ies) where T_i is realized (severity trigger).

Then, as the treaties/contracts work per transaction, we first need to determine, for each transaction T_i, the loss distribution (T_i) denoted $D(T_i)$. Once all loss distributions are defined, in order to get the loss distribution, all $D(T_i)_{1 \le i \le N}$ will be aggregated to determine the overall portfolio distribution denoted D(P) (see next section). From this loss distribution, the pure premium and the cost of capital can then be derived.

We can define $D(T_i)$ as follows:

$$D(T_i) = \min[\max(0;\ \min(\sum_j 1_{PoD(j,T_i)} LGD(j,T_i)\, L(j,T_i);\ L(T_i)) - P);\ C],\ j \epsilon \{CF, NH, PV, CEND, CI, MISC\}$$

knowing that:

- P and C are the Priority and the Capacity of the treaty;
- The drivers of each risk are:
  - Obligor for NH. However, for NH, as we have public entities, the country can be considered as being the driver when no relevant information on the obligor exists;
  - Country(ies) for CF, PV, CEND, CI, and MISC.
- Each risk $j \epsilon \{CF, NH, PV, CEND, CI, WCG\}$ of each country / obligor has its own limit $L(j, T_i)$, its own $PoD(j, T_i)$, and its own $LGD(j, T_i)$, where:
  - The limits $L(j, T_i)$ can be cumulated, but cannot be higher than the maximum limit of the transaction $L(T_i)$. In others words, we have:
    $\sum_{j \epsilon \{CF,NH,PV,CEND,CI,WCG\}} L(j,T_i) \leq L(T_i)$
  - $PoD(T_i)$ is linked to $PoD(j, T_i)$, $j \epsilon \{CF, NH, PV, CEND, CI, MISC\}$
  - $LGD(T_i)$ is linked to $LGD(j, T_i)$, $j \epsilon \{CF, NH, PV, CEND, CI, MISC\}$
    with $LGD(j, T_i) \sim beta(\alpha_{j,Ti} ; \beta_{j,Ti})$
  - For a given risk j, $L(j, T_i)$, $PoD(j, T_i)$ and $LGD(j, T_i)$ are linked and have to be applied together.
- This definition of $D(T_i)$ supposes that there is full dependencies for the risks in a given country. This assumption is certainly strong but necessary to simplify this first step of the model. Indeed if we want to introduce "real" dependencies at this level, we have to determine dependency parameters between all risks in more than 200 countries, which is almost impossible.

Based on Monte Carlo simulations, we simulate $D(T_i)$ using:

- Bernouilli distributions for the $PoD(j, T_i)$;
- and Beta distributions for the $LGD(j, T_i)$.

However, in order to simplify the implementation of the model, we have decided to fix the α parameter of the Beta distribution. Then, as the average is given for each Loss Given Default (sourced from credit risk providers), we can deduce the β parameter thanks to the following formula:

$$E(LGD(j,T_i)) = \frac{\alpha_{j,T_i}}{\alpha_{j,T_i} + \beta_{j,T_i}}$$

4. AGGREGATION TREE

Due to the nature of the Political Risk Insurance, the aggregation of single risks will be done in 2 steps: A first step will aggregate risks within one country and a second step will aggregate all the resulting country distributions. The idea behind this 2-step aggregation is the following:

- Within one country, the "spreading" effect of one political event is consistent. In general, in unstable countries, this "spreading" effect is high and in stable countries, this "spreading" effect is low. For example, if a nationalization is decided in unstable country, the model will consider that other nationalizations are very likely while the model will consider that other nationalizations are unlikely in stable countries.
- The model currently considers that there is little cross-country effects, this is why the second aggregation is done in one step. However, an intermediary aggregation step should be added in order to consider cross-country effects (e.g Arab Spring)

Overall for the aggregation, the mirrored Clayton copula is used. In the next chapter, a quick description of the mirrored Clayton copula is provided.

4.1 Mirrored Clayton copula

Theorem:
Let φ be a continuous, strictly decreasing function from $[0,1]$ to $[0,\infty]$ such that $\varphi(1)=0$ and $\varphi(0)=\infty$
Let C be the function from $[0,1]^2$ to $[0,1]$ given by:

$$C(u,v)=\varphi^{-1}(\varphi(u)+\varphi(v))$$

Then C is a copula if and only if φ is convex.

For a proof, see Nelsen (1999).

Copulas of the above form are called Archimedean copulas and the function φ is called the generator of the copula.

One way of extending the bivariate copula to higher dimensions is to use the construction below:

$$C(u_1,...,u_d)=\varphi^{-1}(\varphi(u_1)+...+\varphi(u_d))$$

Kimberling (1974) showed that this gives a copula in any dimension d if and only if the generator φ is a completely monotonic function, so that it satisfies:

$$(-1)^k \frac{d^k}{dt^k}\left[\varphi^{-1}(t)\right] \geq 0,\ \mathrm{k} \in \mathbb{N},\ t>0.$$

In order to define a Mirrored Clayton copula, we start with the definition of the standard Clayton copula:

Clayton copula:
Let $\varphi(t)=\frac{1}{\theta}\left(t^{-\theta}-1\right)$ where $\theta \in]0,\infty[$. This gives the strict Clayton family:

$$C(u_1,...,u_d)=\left(u_1^{-\theta}+...+u_d^{-\theta}-1\right)^{-\frac{1}{\theta}}$$

Properties of the strict Clayton copula:
It can be shown that the strict Clayton family has lower tail dependence. If C is such that $\lim_{u\to 0}\frac{C(u,u)}{u}=\lambda_l$ exists, then C has lower tail dependence (resp. independence) if $\lambda_l \in (0,1]$ (resp. $\lambda_l=0$). For a strict Clayton copula, the lower tail dependence is:

$$\lambda_l = 2^{-\frac{1}{\theta}}$$

In addition, it can be demonstrated that the strict Clayton copula does not have upper tail dependence.

Definition: Kendall Tau for the random vector *(X,Y)*^{T} is defined as

$$\rho_\tau = P\left[\left(X-\tilde{X}\right)\left(Y-\tilde{Y}\right)>0\right]-P\left[\left(X-\tilde{X}\right)\left(Y-\tilde{Y}\right)<0\right]$$

where $\left(\tilde{X},\tilde{Y}\right)$ is an independent copy of *(X,Y)*.

Hence, Kendall Tau for *(X,Y)* is simply the probability of concordance minus the probability of discordance. This measure provides the perhaps best alternative to the linear correlation coefficient as a measure of dependence for non-elliptical distributions, for which the linear correlation coefficient is inappropriate and often misleading.

It can be shown that the Kendall Tau for a strict Clayton copula is:

$$\rho_\tau = \frac{\theta}{\theta+2}$$

Simulating a strict Clayton copula:
To simulate random variates from the Clayton copula, we can use the following algorithm:

- generate independent exponential variates $(\mu=1), v_1,...,v_d$
- generate a gamma variate z (for the gamma probability distribution function $f(x;\alpha;\beta)=\frac{1}{\beta^\alpha\Gamma(\alpha)}\mathrm{x}^{\alpha\text{-}1}\exp\left(-\frac{\mathrm{x}}{\beta}\right)\text{ where }\alpha=\frac{1}{\theta},\beta=1$) independent of the exponential variates
- set $u_i = \left(1+\frac{v_i}{z}\right)^{-\frac{1}{\theta}}$
- the resulting vector is: $u=\begin{pmatrix}u_1\\ ...\\ u_d\end{pmatrix}$ and follows a Clayton copula with parameter $\theta>0$.

Mirrored Clayton copula:
A mirrored Clayton copula is constructed in the same way as described in the previous paragraph (simulating a strict Clayton copula) but the final resulting vector is mirrored as follows:

$$u'=\begin{pmatrix}1-u_1\\ ...\\ 1-u_d\end{pmatrix}$$

The properties of the mirrored Clayton copula are:

- It has upper tail dependency: $\lambda_u = 2^{-\frac{1}{\theta}}$
- The Kendall Tau is: $\rho_\tau = \frac{\theta}{\theta+2}$

In the remainder of this article, we will then focus on the Mirrored Clayton copula as one example of Archimedean copula. The reason to focus on this copula is due to the fact that, in insurance business, it seems reasonable to assume that there is a higher dependence between extreme losses stemming from the different risks underlying the underwritten contracts than between extreme gains stemming from the same risks.
As a result, the first characteristic of a copula used for aggregating risks present on an insurance balance sheet should be its asymmetry where:

- The copula should have a high upper tail dependency,
- The copula should have a small lower tail dependency.

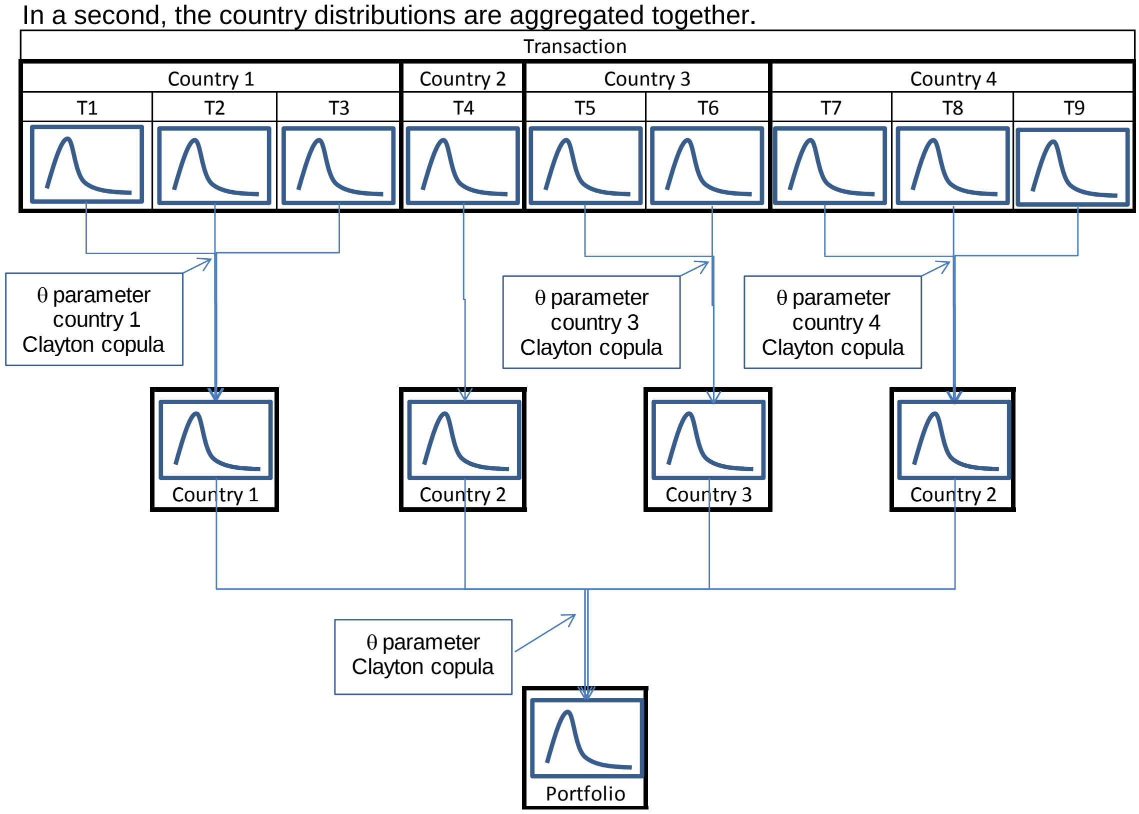
As a final characteristic, we could mention the limited number of parameters. Insurance data which can be used to calibrate a copula are rare and, therefore, a copula which would have many parameters would be difficult to calibrate and, hence, to use.

Due to the above characteristic, it is decided to use a Mirrored Clayton copula for the aggregation of Political Risk transactions.

4.2 Applied aggregation tree

Using the Mirrored Clayton copula, the 2-step aggregation tree is described below:

- In a first step, the transactions are aggregated per country ;
- In a second, the country distributions are aggregated together.



The θ parameters of the clayton copulas are calibrated based on the country rating. The higher the country rating is, the higher the parameter and the lower the country rating is, the lower the parameter: This corresponds to the assumption described in the introduction of this section. The calibration of the above copulas is based on expert judgment due to the lack of data: A process could be put in place to derive the exact calibration (see Arbenz 2012).

Practically, the countries are divided in 3 groups: The stable countries, the unstable countries and the countries in transition. The θ parameters for each group are given below:

Group	Stable	Transition	Unstable
θ parameter	0.136	0.384	1

For the final country aggregation, the θ parameter is taken as 1.

5. NUMERICAL EXAMPLE

In order to illustrate the above pricing framework, the numerical example below relates to the pricing of a reinsurance treaty covering the 43 transactions below. The priority of the treaty is 1 and the capacity of the treaty is 200 000 000.

Transaction	Country	Group	Obligor Exposures amounts	Country Exposures amounts	Limit	Duration	PoD		LGD	
			Risk i	Risk j			Risk i	Risk j	Risk i	Risk j
T1	Afghanistan	Unstable	191 250	191 250	191 250	2	1,10%	8,35%	15,60%	20%
T2	Argentina	Unstable	12 000 000	12 000 000	12 000 000	2	1,10%	8,35%	15,60%	20%
T3	Argentina	Unstable	42 500 000	42 500 000	42 500 000	2	1,10%	8,35%	15,60%	20%
T4	Argentina	Unstable	7 747 823	7 747 823	7 747 823	2	0,36%	8,35%	15,60%	20%
T5	Argentina	Unstable	8 000 000	8 000 000	8 000 000	2	1,10%	8,35%	15,60%	20%
T6	Armenia	Transition	3 187 500	3 187 500	3 187 500	2	1,10%	1,85%	15,60%	18%
T7	Australia	Stable	10 028 748	10 028 748	10 028 748	2	0,43%	0,03%	15,60%	5%
T8	Australia	Stable	25 000 000	25 000 000	25 000 000	2	0,27%	0,03%	15,60%	5%
T9	Australia	Stable	55 000 000	55 000 000	55 000 000	2	0,09%	0,03%	15,60%	5%
T10	Australia	Stable	13 956 662	13 956 662	13 956 662	2	1,10%	0,03%	15,60%	5%
T11	Australia	Stable	25 000 000	25 000 000	25 000 000	2	0,37%	0,03%	15,60%	5%
T12	Australia	Stable	20 000 000	20 000 000	20 000 000	2	1,10%	0,03%	15,60%	5%
T13	Australia	Stable	50 000 000	50 000 000	50 000 000	2	0,07%	0,03%	15,60%	5%
T14	Australia	Stable	3 592 765	3 592 765	3 592 765	2	1,10%	0,03%	15,60%	5%
T15	Australia	Stable	944 472	944 472	944 472	2	1,10%	0,03%	15,60%	5%
T16	Azerbaijan	Transition	7 770 537	7 770 537	7 770 537	2	1,10%	0,43%	15,60%	15%
T17	Bahrain	Transition	16 000 000	16 000 000	16 000 000	2	1,10%	0,16%	15,60%	13%
T18	Bahrain	Transition	12 073 735	12 073 735	12 073 735	2	1,10%	0,16%	15,60%	13%
T19	Bangladesh	Transition	12 626 000	12 626 000	12 626 000	2	1,10%	1,85%	15,60%	18%
T20	Bangladesh	Transition	11 682 900	11 682 900	11 682 900	2	1,10%	1,85%	15,60%	18%
T21	Bangladesh	Transition	6 777 000	6 777 000	6 777 000	2	1,10%	1,85%	15,60%	18%
T22	Bangladesh	Transition	11 275 000	11 275 000	11 275 000	2	1,10%	1,85%	15,60%	18%
T23	Bangladesh	Transition	4 259 438	4 259 438	4 259 438	2	1,10%	1,85%	15,60%	18%
T24	Bangladesh	Transition	31 422 835	31 422 835	31 422 835	2	1,10%	1,85%	15,60%	18%
T25	Bangladesh	Transition	5 100 000	5 100 000	5 100 000	2	1,10%	1,85%	15,60%	18%
T26	Bangladesh	Transition	2 821 500	2 821 500	2 821 500	2	1,10%	1,85%	15,60%	18%
T27	Bangladesh	Transition	24 493 425	24 493 425	24 493 425	2	1,10%	1,85%	15,60%	18%
T28	Bangladesh	Transition	7 558 488	7 558 488	7 558 488	2	1,10%	1,85%	15,60%	18%
T29	Bangladesh	Transition	33 345 000	33 345 000	33 345 000	2	1,10%	1,85%	15,60%	18%
T30	Bangladesh	Transition	7 299 600	7 299 600	7 299 600	2	1,10%	1,85%	15,60%	18%
T31	Bangladesh	Transition	1 912 500	1 912 500	1 912 500	2	1,10%	1,85%	15,60%	18%
T32	Bangladesh	Transition	26 939 270	26 939 270	26 939 270	2	1,10%	1,85%	15,60%	18%
T33	Belarus	Unstable	2 550 000	2 550 000	2 550 000	2	1,10%	8,35%	15,60%	20%
T34	Bermuda	Stable	51 800 000	51 800 000	51 800 000	2	0,80%	0,07%	15,60%	10%
T35	Brazil	Transition	19 856 340	19 856 340	19 856 340	2	1,10%	0,07%	15,60%	10%
T36	Brazil	Transition	20 000 000	20 000 000	20 000 000	2	1,10%	0,07%	15,60%	10%
T37	Brazil	Transition	22 228 858	22 228 858	22 228 858	2	1,10%	0,07%	15,60%	10%
T38	Brazil	Transition	5 926 750	5 926 750	5 926 750	2	1,10%	0,07%	15,60%	10%
T39	Brazil	Transition	30 000 000	30 000 000	30 000 000	2	1,10%	0,07%	15,60%	10%
T40	Brazil	Transition	1 275 000	1 275 000	1 275 000	2	1,10%	0,07%	15,60%	10%
T41	Brazil	Transition	3 187 500	3 187 500	3 187 500	2	1,10%	0,07%	15,60%	10%
T42	Brazil	Transition	11 250 000	11 250 000	11 250 000	2	1,10%	0,07%	15,60%	10%
T43	Brazil	Transition	131 340 000	131 340 000	131 340 000	2	0,14%	0,07%	15,60%	10%

The PoD and LGDs given here-above are examples and relate to the single risks $i, j \in \{\mathrm{CF, NH, PV, CEND, CI, MISC}\}$.

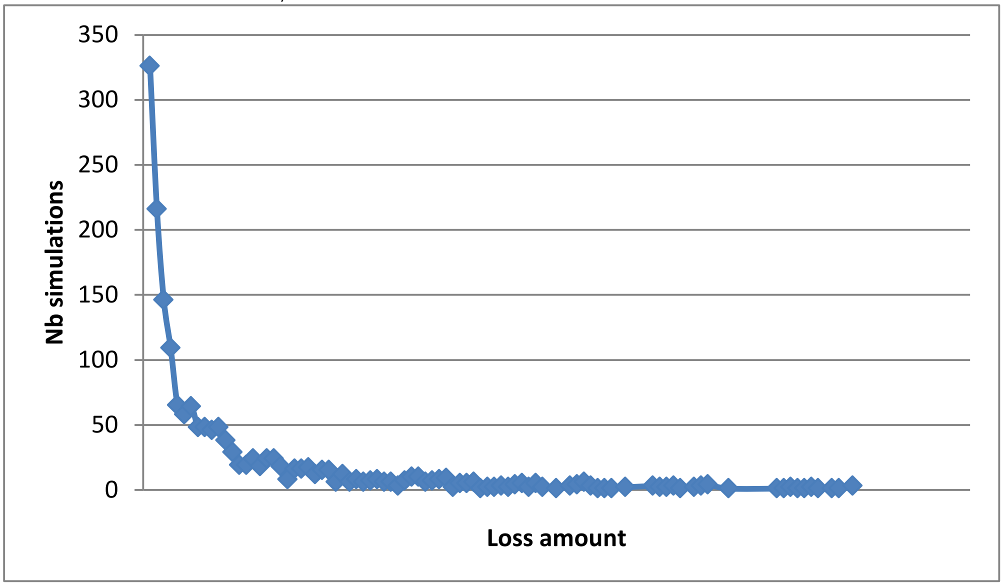
For transaction T_2, we have the following characteristics:

- Expected loss : $E(T_2) = 12000000 \times 1.1\% \times 15.6\% + 12000000 \times 8.35\% \times 20\% = 220992$
- $\alpha_{Risk\ i,T_1} = 0.7$ and $\beta_{Risk\ i,T_1} = 3.8$
- $\alpha_{Risk\ j,T_1} = 0.7$ and $\beta_{Risk\ j,T_1} = 2.8$

With 10 000 simulations done on excel, we find the expected loss for transaction T_2 equal to 226 667. The small difference to the true expected loss is due to the random element of the simulation and is deemed acceptable.

Overall when aggregating all the distributions using the aggregation tree described in section 4, we find an overall expected loss of 2 686 930 with 10 000 simulation while the true expected loss should be 2 775 180. The small difference due to the random element of the simulation is deemed acceptable. This expected loss corresponds to the pure premium of the treaty.

From these simulations, we can then derive the overall loss distribution which is shown below:



The graph does not show the number of simulations where the loss is 0 and where the loss is higher than 103 000 000.

The above distribution is clearly an extreme value distribution: This corresponds to the Political Risk Insurance type of risk with very low frequency and very high severity. Hence it can be concluded that the proposed methodology reflects the type of risk of the modelled insurance.

From this distribution, the undiversified capital can be derived under two risk measures:

- Value at Risk 99.5% = 78 325 435
- Expected Shortfall 99% = 95 763 870

The tenor of the transaction is 2 years. The following simplified capital patterns will therefore be used to estimate the cost of capital:

Development year	1	2	3
Pattern x_l	100%	50%	0%

For the purpose of the paper, we will assume a fix discount rate of 2% and the cost of capital formula will be (corresponding to a cost of capital of 6%):

$$\text{Cost of Capital} = 6\% \sum_{l=1}^{3} \frac{\text{Undiversified Capital} \times x_l}{(1+2\%)^l}$$

With this formula, we have the cost of capital for both risk measures:

- Cost of capital(based on Value at Risk 99.5%) = 6 865 897
- Cost of capital(Expected Shortfall 99%) = 8 394 526

The comparison of both cost of capital to the pure premium shows clearly that the cost of capital as one element of pricing is much more important than the pure premium and that efforts should be put on modelling it correctly. This is what this paper tried to achieve, in particular on selecting a copula which reflects the extreme behaviour of such risk.

6. CONCLUSION

In this paper, a pricing methodology for the Political Risk (re)insurance is proposed. It is based on best practice for its calibration. The aggregation tree is also proposed with a calibration that could be improved on using expert judgment. The aggregation tree is currently divided in 2 steps, and could be improved in adding an intermediary aggregation step to introduce cross-countries dependencies.
As a result, the overall risk distribution fits the expectation of an extreme event distribution. In this framework, the example shows that the modelling of the cost of capital is much more important than the modelling of the pure premium.
The real challenge which lies ahead for using this model is the calibration of the PoD and LGD for each risk class involved in the Political Risk Insurance cover. For each of these and depending on the quality of the obligor, PoDs and LGDs should be defined. However, due to the very scarce available data and to the uniqueness of each Political Risk situation, such calibration is certainly a major challenge for the practitioners who will want to put in place this model.

Please finally note that the methodology described in this paper could be extended to others LoBs where data are not abundant, such as Cyber Risk Insurance.

ACKNOWLEDGMENTS

The views expressed in the paper are entirely our own and should not be taken as representing those of our firm.

REFERENCES

1. ALWIS A., KREMERMAN V., LANTSMAN Y., HARGER J., SHI J., 2006 : “Political Risk Reinsurance Pricing – A Capital Market Approach”, Willis Re Inc.
2. ARBENZ, P. and CANESTRARO, D. (2012): “Estimating copula for insurance from scarce observations, expert opinion and prior information: a Bayesian approach”. ASTIN Bulletin, 42 (1): 271-290
3. JENSEN N., 2005: “Measuring Risk: Political Risk Insurance Premiums and Domestic Political Institutions”, UCLA Comparative Politics Workshop
4. KIMBERLING, C.H., 1974: “A probabilistic interpretation of complete monotonicity”. Aequationes Math.
5. Multilateral Investment Guarantee Agency (“Miga”), 2004 : “Political Risk Insurance Costing/Pricing: Methodology and Applications”, Presentation given on May 5, 2004, World Bank Group
6. NELSEN, R., 1999: “An Introduction to Copulas”, Springer, New York.
7. ROLFINI R., PACIOTTI S., 2010 : "Political Risk Insurance. A Technical Apporach”, Working Paper N. 14, SACE
8. SIGMA No 6, 2006: “Credit insurance and surety: Solidifying commitments”, Swiss Re
9. WÜTHRICH, M. V., MERZ, M., 2008: “Stochastic Claims Reserving Methods in Insurance“, Wiley, Chichester

Dal Moro Eric
SCOR Switzerland AG
General Guisan-Quai 26, 8022 Zurich, Switzerland
E-mail (personal): eric_dal_moro@yahoo.com

Hubinois Géraud
SCOR Global P&C
5 Avenue Kléber, 75795 Paris cedex 16, France
E-mail (personal): hubinois_geraud@hotmail.com