Modeling Political Risk Insurance: Utility Maximization Perspective

Chao-Chun Leng[1]

and

Min-Ming Wen[2]

Abstract

In this paper, we introduce a political risk variable, *d*, to measure risk of foreign direct investment (FDI). The political risk variable has opposite effects of loss reduction and loss prevention in Ehrlich and Becker (1972). The unique characteristics of political risk insurance make the applications of actuarially-based pricing models infeasible. In this study, by taking into account the effects of self-protection and self-insurance through the variable d and by maximizing utility function, we find the equilibrium for insured and insurer in a competitive market and in a monopoly one. In addition, under the equilibrium status, the boundary for the amount of investment, the insurance coverage, and the minimum required rate of return on the FDI are derived.

[1] Ph. D. in Risk, Insurance, and Healthcare Management, Fox School of Management, Temple University. E-mail: cleng@mail.com.

[2] Assistant professor in Finance, Shippensburg University. E-mail: mmwen@wharf.ship.edu.

Introduction

Political Risks

According to West (1996), political risk is commonly referred to as corporate exposure to risk as a result of politically and socially generated change. Political and economic risks are difficult to distinguish. A risk is perceived to be political if it relates to potential government act and general instability in the political/social system.

Wells (1998) stated that political risks are threats to profitability that are the results of forces external to the industry and which involve some sort of governmental action or inaction. Stephens (1998) suggests that the lumpiness, unpredictability and duration of political risk make it difficult to submit such business to actuarial analysis and pricing.

Political Risks Insurance

Political risk insurance can act as an effective deterrent against host government interference with insured private investments, thereby deterrence value embedding in the project investment insurance (West, 1999). In addition, political risk insurance provides leverage value to the project; equivalently it is able to facilitate the assembly of project financing. For example, the tenors provided by the insurance enables the lenders to extend the terms of their loans and improve the project's amortization, in which long-term debt financing is often critical to the project's continuation.

There are four types of coverage for political risk insurance: expropriation, currency inconvertibility, political violence, and breach of contract. Usually, expropriation has the largest claim losses and currency inconvertibility is the most frequent claims. The underwriters of political risk insurance included multilateral institutions, bilateral ones, and private insurers. Lloyd's of London is the largest insurer with 36% of market share. Overseas Private Investment Corporation (OPIC), with 19% of market share, is owned and operated by the US government. American International Group (AIG) has about 12%. Exported Credit Agencies (ECA; Stephens, 1998), including Export Insurance Department of the Ministry of International Trade and Industry of Japan, Companies Francaise d'Assurance pour le Commerce Exterieur (COFACE) of France, Export Credit Guarantee Department (ECGD) of the United Kingdom, Export Development Corporation (EDC) of Canada, Export Finance of Insurance Corporation (EFIC) of Australia, *etc.*, have 11% of market share. The next two largest insurers are Multilateral Investment Guarantee Agency (MIGA), Ministry of International Trade and Industry (MITI). Other private entities, such as Chubb, Exporters Insurance Services, Lehman Brothers, Sovereign Risk, Unistrat, and Zurich-American Political Risks, are also in the market.

In addition, there is an increasing trend that private- and public-sector insurers collaborate in facilitating investment insurance against political risks; especially for the larger and long-term projects, such as infrastructure projects. The cooperation among investment insurers not only can increase the insurance capacity, but also can mitigate the risk. MIGA's Cooperative Underwriting Program is one initiative reflecting the cooperation of public and private insurers. Likewise, Zurich has participated in co-insurance and reinsurance opportunities with public agency providers, such as OPIC, and MIGA.

James (2000) argues that there is no enough experience or data on loss frequency and severity to say that pricing in the political risk insurance is "actuarially-based."

However, he suggests that understanding the incentives of insureds is one important factor in pricing determinants. To accurately assess the price of political risk insurance, instead of explicitly recognizing the risk components and pricing each of them, we employ utility theory to derive the equilibrium premium which maximizes the insurer's expected profits and insured's expected utility. In addition, to achieve the objective of maximizing the expected utility, the investor chooses the invested country for overseas investment, investment amount and insurance coverage and requires a minimum return on the investment.

Model

The firm is the party to make decision on which country/region to invest. *d* is a variable measuring the political risks[1] of the invested country. When *d* increases, the risk of investment increases. Several possible measurements for *d* in practice are in appendix.

Let *P* be the premium, *L* the loss, π the probability that a loss event happens, *C* the compensation for the loss event. *r* is the expected return on investment the firm makes.[2] The expected utility of the firm[3] is the following:

$$\begin{aligned} V(W) &= \pi(d)\cdot U[W+I(d)\cdot r(d)-P(\pi(d),C(d))-L(d)+C(d)] \\ &+(1-\pi(d))U[W+I(d)\cdot r(d)-P(\pi(d),C(d))] \end{aligned} \quad (1)$$

[1] The political risk here is included political and economic factors which affect foreign direct investment.
[2] It is expected return on investment because most of the investment with political risk insurance have coverage up to 15 years.

[3] Some arguments state that utility function is for individuals, not for organizations. If this is the case, we can also maximize the expected future wealth.

s.t. $C \leq L$, *and* C is subject to policy maximum. When $C = L$, the firm purchases full insurance. In a later section, we will show that partial coverage is the solution to the maximization objective if utility function presents constant relative risk aversion property.

$W - I$ is the wealth that the firm retains,[4] I is the amount of the wealth invested in the country with political risk d. At the end of the period, if no political risk insurance is purchased and no loss occurs, the wealth of the firm is $(W - I) + I * (1 + r) = W + I * r$. And, $V(W) \geq U(W)$. Otherwise, the firm won't invest in foreign country. There are some conditions from the model:

$$P(\pi(d), C(d)) \Rightarrow \frac{\partial P}{\partial \pi} \geq 0, \frac{\partial P}{\partial C} \geq 0, \frac{\partial P}{\partial d} \geq 0 \qquad (3)$$

$$r(d) \Rightarrow \frac{\partial r}{\partial d} \geq 0 \qquad (4)$$

Since self-protection affects the probability of loss and self-insurance affects the amount of loss, then $\frac{\partial \pi}{\partial d} \geq 0$ is the inverse of self-protection and $\frac{\partial L}{\partial d} \geq 0$ is the inverse of self-insurance. As a result, through the creation of the risk index d, the model implicitly takes into account the self-protection and self-insurance as illustrated in Ehrlich and Becker (1972).

The investor achieves the utility maximization by determining which country to invest given that countries' political risk level, the insurance coverage, and the amount of the overseas investment.

[4] We assume that the wealth the firm retained does not have return and has no exposure to political risk.

For simplification, let $L = k * I$ and $C = f * L = k * f * I$ where k is constant and f is insurance coverage which depends on d. Both k and f should be less than or equal to one. If k is less than or equal to one, then this insurance policy is for property insurance. If f is less than or equal one, then it shows the existence of coinsurance.[5] Therefore, the simplified model is:

$$\begin{aligned} V(W) &= \pi(d)\cdot U\{W + I(d)\cdot[r(d) - k(1-f)] - P(\pi(d), I(d))\} \\ &+ (1-\pi(d))U[W + I(d)\cdot r(d) - P(\pi(d), I(d))] \end{aligned} \tag{4}$$

$$P(\pi(d), I(d)) \Rightarrow \frac{\partial P}{\partial \pi} \geq 0, \frac{\partial P}{\partial I} \geq 0, and\ \frac{\partial P}{\partial d} \geq 0 \text{ }^{6} \tag{5}$$

$$f(d) \Rightarrow \frac{\partial f}{\partial d} \geq 0 \tag{6}$$

Let *0* state be the no loss state and *1* be loss state. With respect to the political risk of invested country, *d*, the investment amount, *I*, the minimum required return on the investment given the existence of political risk insurance, *r*, and the coinsurance level, *f*, the investors can achieve the utility maximization using the following first order conditions.

$$\begin{aligned} \frac{\partial V}{\partial d} &= \pi^{'}(U_1 - U_0) + [\pi U_1^{'} + (1-\pi)U_0^{'}](I\cdot r^{'} + I^{'}\cdot r - \frac{\partial P}{\partial \pi}\pi^{'} - \frac{\partial P}{\partial I}I^{'} - \frac{\partial P}{\partial f}f^{'}) \\ &+ \pi\cdot U_1^{'}\cdot k[I^{'}(f-1) + If^{'}] = 0 \end{aligned} \tag{7}$$

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[5] For political insurance underwriters, most of the coverage is less than 50% of investment and interest , *(1+r) * I*, or $150 million, either one is less. Therefore, the coinsurance is less than one and the coverage is for property insurance only.

[6] We also assume that $\frac{\partial^2 P}{\partial \pi^2} \geq 0, \frac{\partial^2 P}{\partial I^2} \geq 0, \frac{\partial^2 P}{\partial d^2} \geq 0, and\ \frac{\partial^2 r}{\partial d^2} \geq 0.$ This implies that the variance of investment return increases as the risk of the country increases.

$$\Rightarrow \pi'(U_1 - U_0) + \pi U_1' k I' - [\pi U_1' + (1-\pi)U_0'](\frac{\partial P}{\partial \pi}\pi' + \frac{\partial P}{\partial I} I' + \frac{\partial P}{\partial f} f')$$
$$= \pi \cdot U_1' \cdot [I' r + I r' + k(I' f + I f')] + (1-\pi) U_0' (I' r + I r') \qquad (8)$$

The first and the second terms in the left hand side of Equation (8) are the cost of inverse self-protection and the one of inverse self-insurance, respectively. This equation shows that the marginal cost from decreasing utility due to increasing *d* should be equal to the marginal gain from decreasing the probability of loss.

$$\frac{\partial V}{\partial I} = \pi U_1'[(r - k + kf) - \frac{\partial P}{\partial I}] + (1-\pi)U_0'(r - \frac{\partial P}{\partial I}) = 0$$
$$\Rightarrow \frac{\partial P}{\partial I} = \frac{\pi U_1'(r - k + kf) + (1-\pi)U_0' r}{\pi U_1' + (1-\pi)U_0'} = r + \frac{\pi U_1'(-k + kf)}{\pi U_1' + (1-\pi)U_0'} \geq 0 \qquad (9)$$

The price of insurance should go up as the investment amount increases. From Equation (9), we get the lower bound of the expected rate of return:

$$r \geq \frac{\pi U_1' \cdot k \cdot (1 - f)}{\pi U_1' + (1-\pi)U_0'} \qquad (10)$$

As mentioned earlier, the firm views the overseas investment as a project and evaluate the expected return corresponding to the hurdle rate to determine whether the project should be taken; the minimum expected return on the project (overseas investment) has to satisfy Equation (10) so that the value of $\frac{\pi U_1' \cdot k \cdot (1 - f)}{\pi U_1' + (1-\pi)U_0'}$ can be viewed as the hurdle rate embedded in the project with which the expected returns are compared. In addition, increasing insurance purchase, that is increasing *f*, the investor would require less expected rate of return. As long as the expected rate of return is greater than zero, investor will go for this investment opportunity when full insurance is purchased.

$$\frac{\partial V}{\partial f} = \pi U_1^{'}(Ik - \frac{\partial P}{\partial f}] + (1-\pi)U_0^{'}(-\frac{\partial P}{\partial f}) = 0$$
$$\Rightarrow \frac{\partial P}{\partial f} = \frac{\pi U_1^{'} Ik}{\pi U_1^{'} + (1-\pi)U_0^{'}} \tag{11}$$

Put Equations (9) and (11) into (8), we can get:

$$\frac{\partial P}{\partial \pi} = \frac{U_1 - U_0}{\pi U_1^{'} + (1-\pi)U_0^{'}} + \frac{Ir^{'}}{\pi^{'}} \geq 0$$
$$\Rightarrow I \geq \frac{\pi^{'}(U_0 - U_1)}{r^{'}[\pi U_1^{'} + (1-\pi)U_0^{'}]} \tag{12}$$

This is the minimum investment amount to be efficiency for the investor with the existence of political risk insurance.

The Investment Decision of a More Risk Averse Investor[7]

Suppose that an investor with utility function, a(U) and is more risk averse than an investor with utility function U. a(U) is a function of U and satisfy the following conditions: $a(U_1) = U_1, a(U_0) = U_0$. In addition, a(U) is more risk averse than U suggesting that $a^{'}(U_1) > 1, a^{'}(U_0) < 1$. The first order condition for the investor with utility a(U) is represented by Equation (13).

$$\frac{\partial a(V)}{\partial d} = \pi^{'}(a(U_1) - a(U_0)) + \pi a^{'}(U_1)U_1^{'}(I \cdot r^{'} + I^{'} \cdot r - kI^{'} + kI^{'}f + kIf - \frac{\partial P}{\partial d})$$
$$+ (1-\pi)a^{'}(U_0)U_0^{'}(I \cdot r^{'} + I^{'} \cdot r - \frac{\partial P}{\partial d}) \tag{13}$$

where $\frac{\partial P}{\partial d} = \frac{\partial P}{\partial \pi}\pi^{'} + \frac{\partial P}{\partial I}I^{'} + \frac{\partial P}{\partial f}f^{'}$. From Equation (7), we got $\frac{\partial V}{\partial d}\Big|_{d=d^*} = 0$. That is:

[7] This part of analysis is based on Briys and Schlesinger (1990).

$$\pi U_1^{'}(I \cdot r^{'} + I^{'} \cdot r - kI^{'} + kI^{'} f + kIf - \frac{\partial P}{\partial d}) =$$
$$- \pi^{'}(U_1 - U_0) - (1-\pi)U_0^{'}(I \cdot r^{'} + I^{'} \cdot r - \frac{\partial P}{\partial d}) \tag{14}$$

Put Equation (14) into Equation (13), we got:

$$\frac{\partial a(V)}{\partial d}\Big|_{d=d^*} = (1 - a^{'}(U_1))\pi^{'}(U_1 - U_0)$$
$$+ (a^{'}(U_0) - a^{'}(U_1))(1-\pi)U_0^{'}(I \cdot r^{'} + I^{'} \cdot r - \frac{\partial P}{\partial d}) \tag{15}$$

Equation (15) could be positive or negative which depends on utility function. In other words, for more risk averse investor, optimal level of political risk could be higher or lower than less risk averse investor. When $d \geq d^*$, more risk averse investor would buy more insurance to cover the risk and when $d \leq d^*$, more risk averse investor would invest in the countries with lower political risk.[8]

Market Insurance

We assume that *U* a simple linear function. That is *U (W) =W*. Let 0 be the state without political risk insurance, 1 be otherwise. Then given that no political risk insurance exists in the market, the expected utility is represented by V_0 as follows:

$$V_0 = W + I_0 r_0 - \pi I_0 k$$

The first order condition is:

$$\frac{\partial V_0}{\partial I_0} = r_0 - \pi k = 0 \Rightarrow r_0 = \pi k$$

When there is political risk insurance, the expected utility is as follows:

[8] This result is consistent with Briys and Schlesinger (1990) since the first term in the right hand side of Equation (15) is self-protection effect which could be positive or negative. The second term is the combination of self-protection and self-insurance effects, which are negative.

$$V_1 = W + I_1 r_1 - P + \pi I_1 k(-1 + f)$$

The first order conditions are:

$$\frac{\partial V_1}{\partial I_1} = r_1 - \frac{\partial P}{\partial I_1} + \pi I k(-1 + f) = 0 \Rightarrow r_1 = \frac{\partial P}{\partial I_1} + \pi I k(-1 + f)$$

$$\frac{\partial V_1}{\partial f} = \pi I_1 k - \frac{\partial P}{\partial f} = 0 \Rightarrow I_1 = \frac{1}{\pi k}\frac{\partial P}{\partial f}$$

The investor purchases political risk insurance only if his/her expected utility can be increased, it means that:

$$V_1 - V_0 = (I_1 r_1 - I_0 r_0) - P - \pi k(I_1 - I_0)(-1 + f) + \pi I_1 k f \geq 0$$

By putting in all the first order conditions, we got:

$$\frac{I_1}{P}\frac{\partial P}{\partial I} \geq 1$$

It shows that the marginal effect of investment on price is greater than the average effect. It implies that political risk insurance has very low substation effect and insurers can increase price more than the investor increases the amount of investment.

Model of Insurer's Profit Maximization

The objective function of insurers providing political risk insurance is to achieve the profit maximization based on the equilibrium premium and loss coverage. Insurers' profits are:

$$\Pi = N \cdot (P(\pi(d), C(d)) - \pi(d) \cdot C(d)) \geq 0 \qquad (8)$$

N is the number of policies or exposures. When the insurer underwrites foreign investment to different countries, its profit is:

$$\Pi = \sum_g N \cdot (P(\pi(d_g), C(d_g)) - \pi(d_g) \cdot C(d_g)) \geq 0$$

where *g* indicates the various countries the insurer does business with.[9]

From insurer's point of view, the maximum premium it can charge, that is the actuarial fair premium plus the risk premium, is based on the following equation:

$$\begin{aligned} &\pi(d) \cdot U(W + I \cdot r(d) - L(d)) + (1 - \pi(d)) \cdot U(W + I \cdot r(d)) \\ &= U[W + I \cdot r(d) - P(\pi(d), C(d)) - \pi(d) \cdot (L(d) - C(d))] \end{aligned} \tag{9}$$

Let $L = k * I$ and $C = f * L = k * f * I$, as we defined earlier, Equation (9) becomes:

$$\begin{aligned} &\pi(d) \cdot U(W + I(d) \cdot (r(d) - k)) + (1 - \pi(d)) \cdot U(W + I(d) \cdot r(d)) \\ &= U\{W + I(d) \cdot [(r(d) - k \cdot \pi(d)(1 - f)] - P(\pi(d), I(d))\} \end{aligned}$$

Let $EU = \pi(d) \cdot U(W + I(d) \cdot r(d) - L(d)) + (1 - \pi(d)) \cdot U(W + I(d) \cdot r(d))$. From Equation (9), we obtain:

$$\begin{aligned} &W + I \cdot r - P(\pi(d), I(d)) - \pi k(1 - f) = U^{-1}(EU) \\ &\Rightarrow P = W + I \cdot r - \pi k(1 - f) - U^{-1}(EU) \end{aligned} \tag{10}$$

As we have mentioned earlier, for political risk insurance providers, understanding their insureds is as important as understanding the country and project risks. The potential adverse selection risk embedded in the investor's investment projects can be reflected in the choice of invested country in terms of variable *d*, and in the investment amount. In addition, the investors' attitudes towards risk can be represented by the utility functions. As a result, Equation (10) suggests that the determination of the

[9] At the average, each firm would have to pay the premium which is equal to its own expected loss.

equilibrium premium incorporates the insured's information through the investor's initial wealth, choices of invested country in terms of variable *d*, the investment amount, *I*, and the co-insurance, *f*. The employment of utility maximization methodology resolves the difficulty of applying "actuarially-based" pricing models to political risk insurance. The difficulty is attributed to the characteristics of political risk insurance, such as the large lumps and unpredictability (Stephens 1998).

Let $G(\pi) = U^{-1}(EU)$,

$$\frac{\partial P}{\partial \pi} = -k(1-f) - \frac{\partial G(\pi)}{\partial EU}(U_1 - U_0) = 0 \Rightarrow G'(\pi) = \frac{k(1-f)}{(U_0 - U_1)} > 0 \tag{11}$$

$$\frac{\partial^2 P}{\partial \pi^2} = -\frac{\partial^2 G(\pi)}{\partial EU^2}(U_1 - U_0)^2 < 0$$

The second order condition shows that there is a maximum:

$$U'(G(\pi)) = \frac{U_0 - U_1}{kI} \tag{12}$$

From the definition for Equation (11), we got:

$$\pi^* = \frac{U_0 - U(G(\pi^*))}{U_0 - U_1} \tag{13}$$

And put Equation (13) in Equation (10), we can get:

$$P = W + I \cdot r - \frac{U_0 - U(G(\pi^*))}{U_0 - U_1} k(1-f) - U^{-1}(EU)$$

Constant Relative Risk Aversion

In this section, we assume that the investor firm have a logarithm utility function so that the investor intends to maximize his expected utility.

Let $U(W) = log(W)$, then substitute $U_1^{'} = 1/W_1$ *and* $U_0^{'} = 1/W_0$, where W_1 = wealth at state 1 that losses occurred, and W_0 = wealth at state 0, when there is no loss. In addition, $W_1 = W_0 - I \cdot k \cdot (1-f)$. The boundary of the investment amount is:

$$\pi U_1^{'} + (1-\pi)U_0^{'} = U_1^{'} + (1-\pi)(U_0^{'} - U_1^{'}) = \frac{W_0 - (1-\pi)Ik(1-f)}{W_0 W_1} > 0$$

$$\Rightarrow 0 \le I < \frac{W_0}{(1-\pi)k(1-f)}$$

$$\Rightarrow 0 \le I < \frac{W-P}{(1-\pi)k(1-f)-r} \because W_0 = W + rI - P \tag{14}$$

From Equation (7), the boundary for the expected rate of return is:

$$r > \frac{1}{1+\frac{1-\pi}{\pi}\cdot\frac{W_1}{W_0}} \cdot k \cdot (1-f) = \frac{1}{\frac{(1-\pi)\cdot W_1 + \pi W_0}{\pi W_0}} \cdot k \cdot (1-f) \tag{15}$$

$$\mathrm{r} > \frac{\pi W_0}{E(W)} \cdot \frac{L-C}{I}, \tag{16}$$

where $E(W) = \pi \cdot W_1 + (1-\pi) \cdot W_0$, $k = L/I$, and $f = C/L$ so $k \cdot (1-f) = \dfrac{L-C}{I}$

From Equation (14)

$$I < \frac{W_0}{(1-\pi)\frac{L-C}{I}} \tag{17}$$

because $(1-\pi) \cdot \dfrac{L-C}{I} > 0$

$$\Rightarrow \quad L - \frac{W_0}{1-\pi} < C \tag{18}$$

We know C has to be bounded by L, so

By Equation (18), we have the lower bound of the coverage at $L - \frac{W_0}{1-\pi}$. In summary,

$$L - \frac{W_0}{1-\pi} < C \leq L\ , \tag{19}$$

As shown in (19) and exhibited in graph 1, the feasible coverage range is partial coverage, in other words, under the equilibrium condition, the investor firm does not choose full coverage insurance to maximize its expected value of utility.

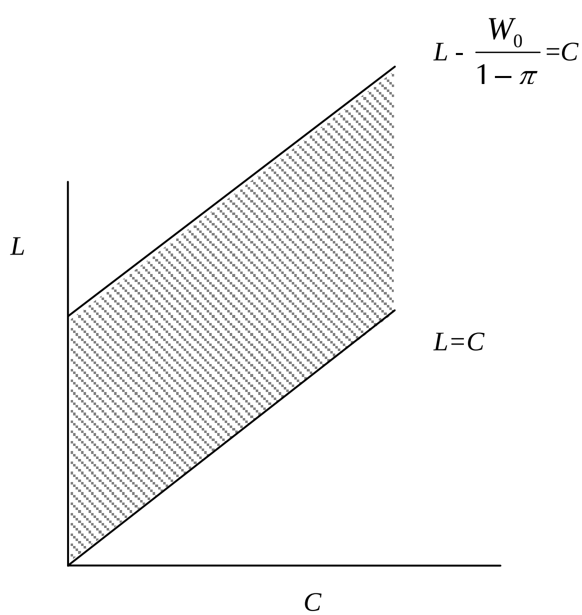

Figure 1. The Boundary of Insurance Coverage

Through Equations (16) and (17), we can find the upper bound of the expected "amount" of investment return, in terms of $r \cdot I$. That is

$$r \cdot I < \frac{\pi W_0^{\ 2}}{(1-\pi)E(W)} \tag{20}$$

Data

We have OPIC data from 1966 to 2000, containing the names of the investment firms which makes the claims, invested countries, industry, type of claim, and settlement amount. From 1973 to 2000, exposures amount is available.

The report of the OPIC's historical insurance claims records the claims of political risk losses for U.S. firms filed from 1966 to 2000 against the OPIC. Total 245 claims occurred and were settled during that period; 175 of them were from the inconvertibility risk, 55 from the expropriation risk, and 15 from the political violence events. Among all the countries where political risks claims were made, recorded, and settled, the number of claims is the largest in Philippine (29 claims) and Zaire (28 claims) and all claims from these two countries are due to the inconvertibility risk. The high frequency of the expropriation risk occurs in Iran and Chile. The 14 of 15 claims in Iran and the 13 of 25 claims in Chile were due to the expropriation risk.

Conclusions:

In this study, by introducing a variable measuring the political risk and maximizing a general utility function, we derive the equilibrium premium for the political risk insurance. In addition, under the equilibrium status, the insureds are able to determine the optimal boundary conditions of insurance coverage, investment, and required rate of returns. We further apply a constant relative risk aversion (CRRA) utility function, like logarithmic utility to illustrate the theoretical model. The use of a CRRA utility function is based on Friend and Blume's (1975) empirical results in which they conclude that CRRA is a fairly accurate utility function for an economy.

Political risk insurance is a very unique market. First, this is a quasi-monopoly market. Investors have limit sources to get insurance. For example, the investors in the US can get insurance from OPIC. Only in the end of 1990, private insurers started getting into this market. Since this is quasi-monopoly market insurers can charge premium to maximize their profits. Second, asymmetric information is serious in this market. However, in this case, insurers have more information about political risk in the invested countries than investors do. Third, as most of insurance products, moral hazard and adverse selection are problems. Therefore, investors would like to take more risk and buy more insurance. As we mentioned earlier, insurers have a way to control those problems by limiting the insured amount or the co-insurance. Finally, insurers can recover the loss payment from the invested countries. The percentage of recovery depends on the authority of the insurers. From those conditions, we can imagine insurers may enjoy monopoly profits. From the information we have, this is the case. MIGA started operation in 1990, at the time 1999, it only has one claim and most of the loss is covered by reinsurance. Lloyd’s of London puts operating realists from 1991 to 1995 in public. It shows that the loss ratio (claim loss/premium) is 9% and it has recovery rate about 50% to 75%. AIG’s recovery rate is 70% and OPIC has recovery rate at 95%. In a way, most of the insurers in the market have done a great deal of loss prevention by toughing up the authority towards the invested countries. Those insurers did enjoy high profits which may be the reason to attract more private insurers to enter this market.

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Appendix

The possible indexes for *d*

1. Lehman Brothers Eurasia Group Stability Index (Legsi)[10]
2. International Country Risk Guide, published by International Business Communications
3. World Political Risk Forecast (WPEF) developed by Frost and Sullivan
4. The *Economist* index
5. The Business Environment Risk Intelligence (BERI) Political Risk Index (PRI)
6. The Political Risk Service (PRS) system
7. Political Risk Services' International Country Risk Guide (ICRG) provides measures of country risk in terms of political risk, economic risk, and financial risk.
8. The credit rating score provided by *Euromoney*
9. Institutional Investor (II) provides country credit ratings (CCR).
10. Erb et al established a country-risk web-site for reference: http://www.duke.edu/charvey/Country_risk/couindex.htm
11. Transparency International's annual assessment of 85 countries in terms of expert and public perception of their degree of corruption (www.transparency.de)
12. The Fraser Institute's ratings of 115 countries in terms of economic freedom (www.fraserinstitute.ca)
13. A credit insurance program administered by the Export/Import Bank of the United States (Eximbank) and Foreign Credit Insurance Association (FCIA).

[10] LEGSI contains two factors. Economic factor is weighted 35%, while political factor is weighted as 65%. However, LEGSI only focuses on certain countries, while countries recorded in OPIC claim database with political risk insurance claim may not have a specific stability index from LEGSI. Therefore, in this study we will use our way to create this risk indicator.