# Construction Risks: Single versus Portfolio Insurance

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**Abstract:** Risks and uncertainties are naturally inherent in the construction industry and negatively affect contracting parties and executed projects. This paper explores the possibility of insuring against construction risks, which are beyond the control of contractors and not covered by surety policies, through single and portfolio insurance strategies. Accordingly, the writers programmed Iman and Conover's bootstrapping method for inducing correlations using Microsoft Excel and consequently, developed a technique for pricing insurance premiums as an exotic option using Monte Carlo simulation. The aforementioned methodology was applied on a data set of five defined risks that were collected from small, medium, and large scale projects in California. Pursuant to this study, the calculated premiums for insuring against the defined risks are in line with the premiums available in market for other insurance policies. Moreover, the estimated premium for the proposed portfolio insurance product is more advantageous to contractors in both risk coverage and cost because it is well below the estimated premiums for single insurance products covering individual risks. It is foreseen that this research could open horizons for new construction related insurance products, which would significantly contribute to the efficiency of the risk management process in the construction industry.

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## Introduction

A contract risk can be defined as the element that would render the parties to the contract unable to obtain/achieve the required service or quality standards stipulated in that contract (Black 2005). Construction risks can be categorized in a number of ways based on the source of risk, by impact type, or by project phase (Klemetti 2006). Finnerty (1996) described nine types of risk that include supply, technological, completion, economic, financial, currency, political, environmental, and force majeure risks. Another study divided construction risks according to their impact and by where their control lies to include business, insurable risks, external risks, and internal risks (Turner 1999). Miller and Lessard (2001) defined risks according to their source to include market, completion, and institutional risks. Market risk is mainly caused by the demand uncertainty, completion risks refer to technical risks during and after the completion of a project, and institutional risks are related to the political uncertainties in a specific situation. Furthermore, as quoted in Klemetti (2006), a four-level risk categorization was presented, which is divided into pure risks such as hazards and weather conditions; financial risks including cash flow or credit risk; business risks that confines almost anything that can happen in a project; and political risks which are caused mostly by extreme conditions such as wars. Most recently, Brown (2004) indicated that construction risks would include design, construction, site, economic, political, environmental, and human risks.

As a result of such risks and other associated complexities as well as the diverging interests of the parties involved, many studies have focused on developing risk management strategies for mitigating the cost of risk in the construction industry. Current risk management practices in the United Kingdom include: (1) risk identification and definition during the design and procurement process; (2) developing an in advance expectations agreement on the consequences of occurrence of such risks; (3) sharing of risks in order to provide incentive for effective management that would be absent of risk is solely borne by one party; and (4) risk allocation should be based on the premise that each party is responsible for the risk that he can best manage its consequences (Black 2005). Along the same line, industry practitioners thought of ways to allocate and thus, reduce negative effect of construction risks through development of organizational strategies for projects. Organizational strategies for any construction project decide upon the optimal combination between the appropriate procurement method as well as the suitable contract type.

Risks continue to negatively affect the contracting parties, their projects, and the construction industry as a whole. A list of research projects that focused on risk management in construction industry includes pricing construction risk using fuzzy set application (Paek et al. 1993), predicting contractor failure using stochastic dynamics of economic and financial variables (Russell and Zhai 1996), assessing corporate risk using historical cost control data (Minato and Ashley 1998), studying contingency and assumption of risk small to medium contractor (Smith and Bohn 1999), developing integrated methodology for project risk management (Del Cano and De La Cruz 2002), evaluating invest-

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ments in emerging architecture/engineering/construction technologies under uncertainty (Ho and Liu 2003), quantifying risks in construction works (Jannadi and Almishari 2003), implementing relational contracting and joint risk management (Rahman and Kumaraswamy 2004), using of owner-controlled insurance programs by transportation agencies (Schexnayder et al. 2004), and risk management on large capital projects (Turnbaugh 2005). These aforementioned studies have contributed significantly to both the practice and study of construction risk management. These studies, however, have not attempted to address number important risks such as site, economic, political, design, and environmental risks using single and portfolio insurance approaches.

## Goal and Objectives

The main objective of this paper is to evaluate the viability of insuring against construction site, economic, political, design, and environmental risks, which are beyond the control of contractors and not covered by surety policies, using single and portfolio insurance strategies. To this end, this research develops an integrated insurance pricing technique using principles of bootstrapping, inducing correlation, options theory, and Monte Carlo simulation toward effective and efficient insurance pricing.

## Background Information

### Risk Management

Risk management is a preloss planning for postloss delivery that aims to cost-effectively controlling and financing the risks an organization could face (Harrington and Niehaus 2004). The traditional discipline of risk management focused only on managing pure risks. Pure risks are those that involve the potential for loss without a corresponding possibility of gain (Chance and Brooks 2007). Over the years, the emphasis on only pure risk has changed with the adoption of "enterprise risk management" by large corporations, which seeks to integrate the management of all risks that the corporation faces including investment and other business risks. The goal of any risk management plan is to (1) protect the assets and financial viability of the organization and (2) minimize the cost of risk (Bing et al. 1999). As previously mentioned, risks constitute a substantial element in the cost of construction projects. Thus, a contractor can gain a significant competitive advantage by reducing cost of risk below the industry average.

Any risk management strategy is a combination of risk control and risk financing techniques. Risk control techniques, also commonly referred to as loss control techniques, are designed to reduce the frequency (i.e., loss prevention) and severity (i.e., loss reduction) of losses (Harrington and Niehaus 2004). On the other hand, risk financing involves arranging for funds to be available to pay losses that occur. The primary types of risk financing are risk retention and risk transfer. Losses can be retained through a number of methods including loss sensitive rating plans, qualified self-insurance, captive insurance subsidiaries, and risk retention groups (Harrington and Niehaus 2004). Meanwhile risk retention involves the contractor funding the losses from internal means; risk transfer involves shifting the financial burden of losses to another party. The two prevalent risk transfer techniques used by contractors are contractual risk transfer and insurance policies that shift the financial consequences of losses that may affect the project to third parties (such as sureties and insurance companies) (Chance and Brooks 2007).

### Principle of Insurance

Insurance is defined as the equitable transfer of the risk of a loss, from one entity to another, in exchange for an indemnity rate called premium (Tsanakas and Desli 2005). According to Raviv (1979), the optimal insurance premium should be based on a sizeable amount of historic data of around 5,000 points. That said the accuracy of information is the most important element for the success of any insurance business (Gogol 1993). There are two issues that negatively affect any insurance policy, namely, adverse selection and moral hazard. On one hand, adverse selection is the situation where the insured pool is mostly composed of high risk beneficiaries and thus, premiums are kept at a fair level (Janssen and Karamychev 2005). On the other hand, moral hazard is the setting where a loss will always be a misfortune to the insured pool and thus, the existence of the insurance will not change the behavior or due diligence of the insured party (Lee and Ligon 2001; Breuer 2005; and Doherty and Smetters 2005).

According to Jaffee and Russell (1997) as well as Harrington and Niehaus (2004), in order for a risk to be insurable, it should have the following characteristics: (1) the number of homogeneous exposure units is large to allow insurers to benefit from the "law of large numbers," which in effect states that as the number of exposure units increases, the actual results are increasingly likely to become close to expected results; (2) the loss is definite which means that the event that gives rise to the loss that is subject to insurance should, at least in principle, take place at a known time, in a known place, and from a known cause; (3) the loss is accidental such that the event that constitutes the trigger of a claim should be least outside the control of the beneficiary of the insurance; (4) the loss is large such that the size of the claim is significant to the insured because insurance premiums paid by insurers need to cover both the expected cost of losses plus around 30–50% of this cost to account for cost of issuing and administering the policy, adjusting losses, and supplying the capital needed to reasonably assure that the insurer will be able to pay claims; (5) the loss is measurable such that the frequency and severity of losses are easy to be calculated in a designated pool; and (6) the calculated premium is affordable in the sense that the premium cannot be so large that there is not a reasonable chance of a significant loss to the insurer.

### Construction Industry and Insurance

Contractors usually purchase a set of insurance policies that include: (1) workers compensation and employers liability insurance; (2) commercial general liability insurance; (3) umbrella or excess liability insurance; (4) contractors equipment insurance; and (5) property insurance covering the contractor's real and personal property. Thus far, there are no insurance policies that cover site, economic, political, design, and environmental risks, which are beyond the control of contractors and negatively affect their associated financial and economic standing. Table 1 highlights these risks as outlined by Brown (2004). This represents a prime opportunity especially that the characteristics of these risks are in line with the aforementioned characteristics of insurable risks. Moreover, none of the insurance policies available for the con-

**Table 1.** Categorization and Sources of Risks

| Source of risk | | | | |
|---|---|---|---|---|
| Site | Economic | Political | Design | Environmental |
| Floods, earthquakes and windstorms | Economic fluctuations | Social legislation | Errors and inadequacy | Site contamination |
| Differing geotechnical conditions | Embargoes | U.S. Congress appropriations | | Perceived environmental impact of project |
| Expansive or corrosive soils | | Federal transit administration | Changes and modifications | Long-term degradation of environment |
| Unexpected utilities | | War, insurrection and other hostilities | | Toxic spills |
| Archaeological finds | | Sabotage/terrorism | Inappropriate specifications | Environmental legislation |
| Sight-line conflicts | | | | |

struction sector provide a portfolio of insurance coverage though such policies are available in other sectors including agricultural and ethanol industries.

## Methodology

In the present study, the choice of the suitable methodology was based on the availability of the required data. Accordingly, a pilot study was conducted where contacts were initiated with various contractors, designer, project managers, and construction surety companies in order to collect detailed data about occurrence of site, economic, political, design, and environmental risks in their projects as well as the associated U.S. Dollar amounts with such risks. Pursuant to this pilot study, it was concluded that scarcity and/or privacy of data will be the main challenge for this study. In fact, the overall collected data as shown in Table 2 represents five small, medium, and large construction projects that witnessed the aforementioned risks as well as their associated costs as certified by architects, engineers, or project managers, which were furnished by a California based Surety Company. It is evident that five projects represent too little data to determine the fair premium of an insurance policy. Nevertheless, this was never a problem for insurers in similar circumstances since they usually utilize simulation computation techniques such as bootstrapping (Hart et al. 2006). This fact was an integral determinant of the choice and development of the forthcoming research methodology.

This research develops an integrated methodology using principles of bootstrapping, inducing correlation, options theory, and Monte Carlo simulation toward effective and efficient insurance pricing. In this regard, the writers programed Iman and Conover (1982) bootstrapping method for inducing correlations using Microsoft Excel and consequently, developed a technique for pricing insurance premiums as an exotic option using Monte Carlo simulation.

### *Bootstrapping*

In finance, bootstrapping is a name that is applied in cases of scarcity of data for imposing correlation to generate large set data that is statistically identical to smaller one (Hart et al. 2006). One of the important theories in this field is that of Iman and Conover (1982) for inducing correlation where: (1) the procedure works well with any distribution function compared to other correlation techniques are aimed directly at standard distribution functions and cannot be used with other distribution functions; (2) the mathematics behind the procedure is not extremely complex and Cholesky factorization and inversion of matrices are the most complex steps in the procedure; (3) the procedure can be used under any sampling scheme; and (4) the marginal distributions of interest are maintained throughout the procedure and the moments of the marginal distributions are not affected at all.

The theoretical basis for the method is that given a random matrix $\mathbf{A}$ whose columns have a correlation matrix $\mathbf{I}$ (the identity matrix) and a desired correlation matrix $\mathbf{B}$, there exists a transformation matrix $\mathbf{C}$ such that the columns of $\mathbf{AC}'$ (where $\mathbf{C}'$ is the transpose of $\mathbf{C}$) have a correlation matrix $\mathbf{B}$. Since $\mathbf{B}$ is positive definite and symmetric, there exists a lower triangular matrix (the transformation matrix) $\mathbf{C}$ such that $\mathbf{B}=\mathbf{CC}'$. In this regard, Let $\mathbf{X}$ be a matrix of draws of marginal distributions of interest. Let $\mathbf{R}$ be a matrix of the same size that contains what Iman and Conover call “scores.” In this regard, Iman and Conover suggest using ranks, random normal deviates, or Van Der Waerden scores [i.e., $\theta^{-1}(i/N+1)$ where $\theta^{-1}$ is the inverse of the standard normal distribution function, $N$ is the number of draws, and $i=1,\ldots,N$] as possible scores. Let $\mathbf{T}$ be the target rank correlation matrix for a transformation of the columns of $\mathbf{X}$. Since $\mathbf{T}$ is positive definite and symmetric, there exists a lower triangular matrix $\mathbf{P}$ such that $\mathbf{T}=\mathbf{PP}'$. $\mathbf{P}$ can be found by Cholesky factorization. The transformed score matrix is $\mathbf{R}^*=\mathbf{RP}'$. The columns of $\mathbf{R}^*$ have a rank correlation matrix $\mathbf{M}$, which is close to the target rank cor-

**Table 2.** Quantification of Risks in Investigated Projects

| | Risks in US$ | | | | |
|---|---|---|---|---|---|
| Project | Site | Economic | Political | Design | Environmental |
| A | 0 | 654,287 | 131,256 | 12,427,243 | 1,422,206 |
| B | 4,731,828 | 0 | 0 | 17,824,371 | 872,706 |
| C | 7,427,835 | 1,424,729 | 0 | 2,841,843 | 0 |
| D | 4,269,859 | 0 | 0 | 13,271,548 | 4,327,431 |
| E | 13,712,319 | 2,412,671 | 1,549,421 | 92,634 | 30,184,008 |

relation matrix **T**. When the elements of **X** are arranged in the same ranking as in $\mathbf{R}^*$, then the columns of the transformed **X** matrix will also have a rank correlation matrix equal to **M**, close to **T**. Iman and Conover method was successfully modeled in Microsoft Excel to induce a target correlation between as much as 70 different variables and generate as much as needed data that maintains the very same correlation. The procedure is based on rank correlations and Iman and Conover (1982) pointed out that raw correlation numbers can be misleading when the underlying data are non-normal or contains outliers.

### *Calculation of Insurance Indemnity*

The fair premium in insurance pricing is equal to the expected loss resulting from the underwritten risk. Accordingly, a premium calculation principle is a function that takes as an argument (i.e., the probability distribution) of a risk and returns its fair premium. In this regard, the properties of a premium principle should reflect the characteristics of the actual prices charged in insurance market (Tsanakas and Desli 2005). Thus, an insurance premium is simply calculated from the average payout in cases of losses (Brocket et al. 1986). Interestingly, this is the very same concept behind the pricing of a "put" or "call" warrants under the options theory (Hart et al. 2006). An option is a security giving the right to buy or sell an asset or any financial instrument, subject to certain conditions, within a specified period of time (Chance and Brooks 2007). The whole theory of option pricing is referred to Samuelson (1965) where: (1) a stock price is a definite probability distribution, $P(\mathbf{X},x;\mathbf{T})$, with constant mean expected growth per unit time $\alpha \geqslant 0$, and (2) the warrant's price, derivable from the stock price, must earn a constant mean expected growth per unit time $\beta \geqslant \alpha \geqslant 0$. Once the axioms, the numbers $\alpha$, $\beta$, and the form of $P(\mathbf{X},x;\mathbf{T})$ are given, Samuelson (1965) drew the rational warrant price functions $Y_t(\mathbf{T}_t)=F(\mathbf{X}_t,\mathbf{T}_t)$ as follows:

$$F(x,\mathbf{T}) = e^{-\beta\mathbf{T}}\int_1^{\alpha}(\mathbf{X}-1)dP(\mathbf{X},x;\mathbf{T}) = e^{-\beta\mathbf{T}}e^{\alpha\mathbf{T}}x - e^{-\beta\mathbf{T}} + e^{-\beta\mathbf{T}}\theta_2\theta_2 \quad (1)$$

The most known theory for options theory was developed by Black and Scholes (1973); however, the Black and Scholes theory is only applicable for financial instruments that follow a lognormal probability distribution. That said, in cases of other probability distributions, an option might be priced using approximate methods such as Monte Carlo simulation (Glasserman 2003).

In finance, the Monte Carlo method is used to simulate the various sources of uncertainty that affect the value of the instrument, portfolio, or investment in question, and then to calculate a representative value given these possible values of the underlying inputs (Harrington and Niehaus 2004). For the purpose of this study, the writers will utilize the principles highlighted by Boyle (1977) and Boyle et al. (1997, 2002) for using standard Brownian motion theorem to price options using Monte Carlo simulation as follows: (1) simulate the dynamics of the underlying asset using the Euler scheme; (2) calculate the payoff of derivative security on each path (i.e., claimed amount and settled amount); (3) discount payoff at risk-free rate; and (4) calculate average over each of the aforementioned paths. Options priced through averaging payouts are exotic options similar to Asian options because they depend on the average price of the underlying asset during a specific time period (Mun 2002).

### *Design of Construction Risks Insurance Policy*

Based on the above, the foreseen construction risks insurance policy will be designed as follows:

1. In order to avoid the issue of adverse selection, continuous care should be given so that the policy is not only insuring contractors whose projects have witnessed risks but should extended to contractors who were parties to projects with no, minimal, or fewer risks.
2. The problem of moral hazards is not of concern under this policy because the insured risks are totally outside the control of the beneficiary (i.e., contractors).
3. The starting premium paid to insure against construction risks will be based upon past experiences with the predefined risks in a set of at least 5,000 projects. Under all these projects, the insurer should be interested in the U.S. dollar associated with each risk as certified by the architect, engineer, or project manager.
4. The fair indemnity rate (i.e., premium) paid by the groups' members will be calculated by the principles highlighted by Boyle (1977) and Boyle et al. (1997, 2002) for using standard Brownian motion theorem to price exotic options using Monte Carlo simulation. The fair premium will not be adjusted for costs associated with administering the policy in order to have the worst possible scenario.
5. The required premium for each risk will be calculated and compared with the fair indemnity for insuring against all risks in one portfolio.

## Results and Analysis

### *Bootstrapping*

The correlation between site, economic, political, design, and environmental risks in the collected data set shown in Table 2 was calculated using statistical measures. In this regard, the associated correlation matrix **X** is shown hereunder

$$\mathbf{X} = \begin{bmatrix} 1.000 & 0.797 & 0.808 & -0.770 & 0.826 \\ 0.797 & 1.000 & 0.825 & -0.950 & 0.768 \\ 0.808 & 0.825 & 1.000 & -0.678 & 0.988 \\ -0.77 & -0.95 & -0.67 & 1.000 & -0.64 \\ 0.826 & 0.768 & 0.988 & -0.645 & 1.000 \end{bmatrix} \quad (2)$$

The correlation matrix **X** was used to produce the lower triangular matrix **T** shown below

$$\mathbf{T} = \begin{bmatrix} 1.000 & 0.000 & 0.000 & 0.000 & 0.000 \\ 0.797 & 0.604 & 0.000 & 0.000 & 0.000 \\ 0.808 & 0.300 & 0.507 & 0.000 & 0.000 \\ -0.77 & -0.55 & 0.219 & 0.222 & 0.000 \\ 0.826 & 0.182 & 0.524 & -0.10 & 0.000 \end{bmatrix} \quad (3)$$

Afterwards, the developed Microsoft Excel spreadsheet continued to implement Iman and Conover (1982) bootstrapping technique using the Cholesky factorization. Consequently, the writers successfully created a data set composed of 5,000 observations that carries the same statistical characteristics including correlation and probabilistic distribution. Also, and in order to assure the exactness of the method, Table 3 shows that the correlation over the new generated data are mostly the same as the

**Table 3.** Comparison between Correlation Values in Original and Developed Data Set

| | Risks | | | | |
|---|---|---|---|---|---|
| Data | Site | Economic | Political | Design | Environmental |
| Original | 1 | 0.79685 | 0.807982 | −0.77025 | 0.825669 |
| New | 1 | 0.79254 | 0.806435 | −0.76576 | 0.825681 |

correlation values over the original data set, which draws confidence in the robustness of the used bootstrapping technique in inducing correlations.

### Descriptive Statistics

The descriptive statistics for the newly generated data set of site, economic, political, design, and environmental risks are presented in Table 4. The statistics included therein demonstrate that the generated data set is properly dispersed, which helps in putting hands on the value at risk (VAR) represented by the tail of the distribution. VAR is one of the important elements when pricing an insurance policy, as it provides a measure of the minimum loss that would be expected over a period of time for the given probability distribution (Chance and Brooks 2007). Moreover, and in order to decide upon the optimal way to price the indemnity rates according to the option theory principles using the Monte Carlo simulation, it was essential to fit the risks under investigation into probabilistic distributions. In this regard, a fitness analysis showed that site, economic, political, design, and environmental risks follow a normal distribution. This would accord with the conjecture that in most cases the occurrence of risks happens pursuant to a normal probability distribution (Paulson 2007). This would confirm that the premium for ensuring construction claims risks in the said projects cannot be priced using the closed solution outlined by Black and Scholes (1973). Instead, the indemnity rate will be calculated using the principles highlighted by Boyle (1977) and Boyle et al. (1997, 2002) for using standard Brownian motion theorem to price exotic options using Monte Carlo simulation.

### Premium Calculations

The Monte Carlo method was employed to model the premium calculation of the beforehand data as an exotic option pursuant to Boyle (1977) and Boyle et al. (1997, 2002) theories. In this regard, Table 5 shows the calculated rates for different policy coverages. Fortunately, the calculated premiums are in line with the premiums available in market for different insurance policies. Thus, it is conjectured that insuring against construction risks would fit into the six aforementioned requirements for insurance. However, it is important to investigate if there will be any benefit for contractors if they insured construction risk in a portfolio rather than on individual basis.

### Single versus Portfolio Insurance

Table 6 highlights the fair required premium for insuring against all risks in one portfolio compared with the premiums paid when insuring against each risk individually. The estimated premium for the proposed portfolio insurance product is well below: (1) the combined total of estimated premiums for insurance products covering each of the risk individually and (2) the estimated premium for even insuring against only one risk. This conclusion is sensible as it accords with the results outlined by Hennessy et al. (1997) and Hart et al. (2001, 2006) when working with portfolio insurance. Portfolio risk insurance is more advantageous to contractors in both risk coverage and cost. In addition, it may provide higher coverage levels because of coverage diversification leading to lower risk and the limiting of potential moral hazard problems that occur with more specialized coverage.

**Table 4.** Descriptive Statistics for New Generated Data Set

| | Risks | | | | |
|---|---|---|---|---|---|
| Indicator | Site | Economic | Political | Design | Environmental |
| Mean | 5,932,044.47 | 904,534.42 | 334,665.14 | 9,363,159.24 | 7,297,646.07 |
| Median | 5,926,554.91 | 910,578.18 | 325,336.82 | 9,302,272.95 | 7,253,089.44 |
| Standard deviation | 5,010,144.71 | 1,036,660.02 | 674,538.54 | 7,427,294.81 | 12,766,211.80 |
| Kurtosis | 0.01 | 0.12 | −0.02 | −0.12 | 0.03 |
| Skewness | 0.03 | −0.05 | 0.01 | −0.03 | 0.02 |
| Count | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 |

**Table 5.** Indemnity Rates

| | Risk indemnity in US\$/US\$100 based on studied pool | | | | |
|---|---|---|---|---|---|
| Coverage | Site | Economic | Political | Design | Environmental |
| 100% | 5.648 | 0.910 | 0.410 | 8.836 | 8.366 |
| 95% | 5.365 | 0.865 | 0.389 | 8.394 | 7.948 |
| 90% | 5.083 | 0.819 | 0.369 | 7.953 | 7.529 |
| 85% | 4.801 | 0.774 | 0.348 | 7.511 | 7.111 |

**Table 6.** Single versus Portfolio Insurance

| Coverage | Risk indemnity in US$/US$100 based on studied pool for all risks | |
|---|---|---|
| | Single insurance | Portfolio insurance |
| 100% | 24.170 | 4.237 |
| 95% | 22.962 | 4.026 |
| 90% | 21.753 | 3.814 |
| 85% | 20.545 | 3.602 |

## Summary and Conclusions

This paper proposed a portfolio insurance to manage construction risks that are beyond the control of contractor and are not covered by surety policies. In this regard, the writers have: (1) investigated the feasibility of pricing insurance premiums using the options pricing theory; (2) explored the applicability of modeling the options pricing theory using Monte Carlo simulation; (3) set up the principles required for optimal design of construction risks insurance policy; and (4) tested the possible impact of the newly developed policy for single and portfolio insurance policies using bootstrapped data set of 5,000 points that are based on historic data of five California based small, medium, and small projects.

Pursuant to this study, it was verified that of site, economic, political, design, and environmental construction risks satisfy the required principles for insurance. Also based on the used testing framework, the developed portfolio insurance policy is more advantageous to contractors than single insurance policy in both risk coverage and cost for construction claims has proved success from the insured and insurer sides. It is the writers' hope that this study could lay basis for new construction related insurance products that could be extended over the nation for the benefit of more effective and efficient risk management in the construction industry.

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