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COMPARATIVE ANALYSIS OF THE IMPACTS OF RISKS ON BONDED AND UNBONDED CONSTRUCTION PROJECTS

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ABSTRACT

Despite the introduction and adoption of various techniques and innovative practices geared towards improving the delivery of construction projects, some notable problems of cost overrun, time delay, low quality, dissatisfied clients, etc. still persist. One of the notable practices in the construction industry is the use of bonds and guarantees. Construction bond was introduced as an instrument to protect or indemnify its recipients against risks and problems associated with construction projects but the challenge over the years lies in the practical enforcement of bonding conditions and its overall benefits to the construction industry. This research therefore evaluate the risks that are associated with bonded and unbonded projects with a view to ascertaining their effects on overall construction projects success. Primary data were collected through administration of questionnaires on identified construction bond stakeholders namely: clients of public projects: quantity surveying and architectural firms; and construction firms. Questionnaires were administered on 337 respondents out of which 242 were returned while 236 were certified fit for analysis. Mean item score was used for ranking the identified factors while Kruskal-Wallis and Mann-Whitney tests were employed to examine relationship and differences in sample means of different groups of respondents respectively. The study revealed that financial soundness of the issuer also known as credit risk has major effect on projects with bond while for projects without bond, liquidity risk requires the most attention. The identified bond risks are more inherent in bonded projects except for liquidity and volatility risk. In view of this, special attention should be accorded the activities of guarantors, that is banks and insurance companies, shouldered with the responsibilities of issuing bonds in an attempt to reduce their influence on construction bond process. This will enhance value for money for contractors seeking the bonds and eventually lead to success of construction project.

Keywords: Construction stakeholders, Construction bond, Guarantor, Principal, Surety.

1. INTRODUCTION

Construction bonds also known as guarantees are risk management tools for enhancing better performance of construction projects. Bond or guarantee in the context of construction projects, is an undertaking by a bank or other financial institution, to make payment to the employer up to a stated aggregate amount (the bond amount) in defined circumstances

(Ndekugri and Rycroft, 2009). A bond is a discretionary item in any contract and it is a matter for each individual client to decide whether a bond is required from a contractor. This decision is usually made pre-tender and all tenderers would be made aware of the requirement. The Contractor will need to satisfy the guarantor that it has the financial and technical resources and management capability to carry out and complete the contract in question. In a study on construction surety bonding, Kangari and Bakheet (2001) observed that a contract bond guarantees the construction contract and all its provision in which the prime contractor accepts two responsibilities which are to perform the objective of the contract; and to pay all costs associated with the work.

In the Chinese construction industry, Xianhai (2002) concluded that there has been a significant tendency for the default risk to increase in recent years and establishing a construction contract guarantee system therefore becomes a necessary choice to make both contractors and owners honour contracts and act in good faith. Surety bonds existed long ago when it was simply an honest hand shake between two or more parties. The parties agreed to a decision and gave their personal guarantees of following through by completing all work (Kangari and Bakheet, 2001). Construction bonds are effective tools for ensuring successful construction projects (Boswall, 2010). Like any tool, it requires an understanding of how it works, proper maintenance and proper use. A further problem according to Australian Constructors Association (2009) is that clients sometimes delay the cancellation or release of performance bonds following completion of construction at the end of the defects liability period. It was however opined that this delay may not be caused by concerns relating to the contractor's performance, but purely the result of administrative processes. For this study, projects that are executed with the use and application of bonds or guarantees are termed bonded projects while those without any of the bonds are referred to as unbonded projects.

A bond constitutes a legal guarantee that the project will be completed as expected. In instances where a bonded contractor fails to perform, the bonding company will provide some form of restitution to the owner. Huang (2008) observed that construction contracts require contractors to furnish performance securities that serve as fundamental financial management tools for project owners to transfer contractor default risks to security providers. According to Emily (2009), bonds are issued by organizations known as surety companies. It was further stated that once a contractor becomes aware of bid requirements on a job, he will contact a surety company to arrange a bond. The surety company will evaluate the contractor as well as the risks associated with the project before determining the bond rate. This leads to various risks in contrast to the purpose for which the process of bond was conceived to address, which is to ensure that projects are delivered to cost, time, quality and satisfaction of stakeholders. This study therefore examined the effect of risks associated with construction projects executed with and without bond and guarantee with a view to determine the difference in the two groups of projects.

2. CONSTRUCTION BOND, RISK AND CLAIMS

2.1 Risks Associated with Construction Bonds

A distinct characteristic of construction projects is risk (Xianhai, 2002) and one of the major ways of managing it is through the use of bonds. Deng, Ding and Tian (2004) observed that surety bonds and bank guarantees also known as letter of credit in the US, are the two major instruments to protect the owners of a construction project against the risk of non-performance of the contractor. In Nigeria, Ojo (2011) opined that bonds is to indemnify the oblige against the default of the principal. Primarily, the contractor (principal) is shoulder to bear most construction risks and this is mostly transferred to the surety for an amount (e.g. bank interest charge, etc.) for a particular period of time depending on the contractual obligations and requirements. A construction surety bond is a financial instrument used generally when the first party (owner) has an agreement with a second party (Construction Company). This financial instrument serves as a guarantee to the first party from a third party (surety company) that a construction job (obligation) will be completed according to the terms and conditions within a written contract. Construction bond is a risk sharing or transfer method and Lam, Chiang and Chan (2011) argued that though the conventional wisdom seems to regard bond investment as being safe, the level of risk varies with the bond structure and terms of use. Mehmet and Makarand (2010) concluded that the risky and hazardous nature of construction business makes the underwriting decisions crucial for sureties. One of the distinct characteristics of construction projects is that they are full of various risks and Xianhai (2002) opined that contract guarantee has proved to be an effective measure to defend against default risk.

On a general note, El-Diraby and Gill (2006) identified the significant construction project risks to include construction risk, performance/operating risks, economic and financial risk, privatized-infrastructure finance, environmental risks and political risks. There are four ways of addressing risks in construction and they are through risk transfer, risk sharing, risk acceptance and acting as if there is no risk (laissez-faire). In the US., Surety Information Office (2009) noted that construction bond is a risk transfer mechanisms regulated by state insurance departments in support, Kangari and Bakheet (2001) observed that a surety bond is a risk transfer mechanism that shifts the risk of contract default from the project owner to the surety. It further classified quantitative and qualitative risk factors impacting construction bond underwriting, to improve the quality of the evaluation analysis and to reduce the highly unstructured environment and the subjectivity of the bond evaluation in underwriting. Kangari and Bakheet (2001) identified major risk factors impacting construction bond administration to include education and experience of the company's key people, contractor's cashflow, etc. More so, Mehmet, *et al.* (2006) classified relative importance of different risk factors for warranty bonds into four characteristics which are project, warranty, design and contractor. The project characteristics includes such things as type of project, size of project, construction period and method of contract. warranty characteristics is concerned with amount of warranty bond, warranty period, warranty specifications and risk of innovation. Design characteristics

entails probability exceeding design traffic, pre-existing conditions and contractor control over design. Contractor characteristics is the fourth and it can be measured by the following factors: reputation, project experience, performance, credit history, capacity, financial strength as well as current workload.

Lam, *et al.* (2011) identified nine (9) types of risks associated with construction bond from literature. They include: credit risk, interest rate risk, liquidity risk, prepayment risk, reinvestment risk, currency risk, inflation risk, sovereign risk and volatility risk. Credit risk refers to financial soundness of issuer, that is, the ability of issuer to make interest payments and return principal on schedule. Typical credit risk involves credit spread risk, downgrade risk, and default risk. Interest rate risk refers to sensitivity of bond prices to changing market conditions. Bond values move in opposite direction from prevailing interest rates. Liquidity risk is the risk for not effecting immediate redemption of bond at market value. If investors want to redeem bond at once, selling price will most likely be below market value. Prepayment risk relates to redeeming bonds by issuer before maturity; usually investors will receive less cash flow than expected. Reinvestment risk is the risk that payment of interest and principal at specific time may be reinvested at lower interest rate than original bond yield.

Currency risk is the risk of receiving less domestic currency when investing in bond issue that makes payments in currency other than domestic. Inflation risk is the value of bond's cash flows (both interest and principal) declines because of inflation. Sovereign risk results from actions undertaken by a foreign government; usually associated with credit risk. There is high tendency that bond credit will deteriorate after governmental actions and poor credit rating will eventually drag down bond price. Volatility risk applies to bonds embedded with callable and putable options. Price reduction will be caused by change of expected yield volatility while increase in expected yield volatility will raise value of callable bond but reduce the value of putable bond, and vice versa

2.2 Construction Bonds and Claims

If the principal fails to perform the obligation stated in the bond, Powelson (2007) opined that both the principal and the surety are liable on the bond. When there is a default by the principal, the oblige has the right to contractual claim which will be shouldered by the guarantor. Most defaults do not occur overnight, they are the product of a number of causes over an extended period of time (The Associated General Contractors of America, 2006). It was recommended that parties to the default problem can greatly increase the likelihood of a good result by communicating promptly, factually and objectively. Heath (2004) claimed that the risk of losing contractor's surety resources in case of contractor's default are always substantial and ever present since the responsibility of the surety is to answer for the default of the contractor according to the specific provision of the construction contract. However, the surety's legal rights and responsibility in a default situation are determined by the provision of the bond.

Standard Bank (2010) noted that payment under guarantee is called for at the sole discretion of the beneficiary (oblige), who submits a written claim stating that the applicant

has failed to meet the obligations under the contract. The guarantor is liable to pay the beneficiary provided that the claims, together with the supporting documents are presented according to the requirements of the guarantee. A guarantee is irrevocable and can only be cancelled or amended provided that all parties are in agreement (Standard Bank, 2010). Hinchey (1986) opined that the essence of awarding damages is to place the aggrieved party (oblige) in as good position as it would have been but for the breach of the principal's default.

3. RESEARCH METHODOLOGY

The population of this study are construction stakeholders in the Nigerian construction industry that are directly involved with the management of risks emanating from administration of bonds. These includes: Contractors (and sub-contractors), Clients of public projects as well as Consultants (Architects and Quantity surveyors) in Lagos and Ondo states, Nigeria. Guarantors, that is, banks and insurance companies were not involved in this aspect of this research because they are not directly involved in managing the risks associated with construction bonds.

Various forms of validity and reliability tests were carried out. Content validity was achieved by ensuring that the survey carried out is based on factors identified from literatures which were modified to suit Nigeria situation. Face validity was achieved using pilot study. Pilot survey was carried out at the initial stage of the research in order to pre-test the instrument for data collection. In carrying out the pilot study, it was ensured that each of the group of respondents were contacted as appropriate using convenience sampling method. In order to ensure uniformity, four questionnaires each were administered on each group of respondents making a total of twelve. It was also expected that this diversity will provide for wide range of views. For contractors, it was ensured that quantity surveyors, architects, builders and engineers are the four respondents for the questionnaire administration in the selected construction firms. The same was also ensured for the clients in the selected government establishments. In the case of consultants, two respondents each from quantity surveying and architectural firms were selected. Nine PhD holders and PhD students from within and outside the country were also involved in the pilot study for necessary corrections and suggestions on way to improve the instrument. Their comments, observations, suggestions and corrections were noted and incorporated into the final draft of the instruments for final survey.

Interrater reliability was achieved by ensuring that questions in the research instruments for different categories of respondents are customized and adjusted based on the respondents' peculiarities but using the same set of factors and variables. For internal reliability, Cronbach's alpha (α) test was employed and the result in table 1 depict that the instrument used for the study is reliable since the values are close to 1.00. Test-retest reliability was achieved by examining the significance of the differences in the responses of respondents from Ondo and Lagos states using Mann-Whitney U-test (MW). The result in table 1 indicate that there is no significant difference in the opinion of respondents from the two states.

Table 1. Reliability test

Description	Asymptotic significance
Internal Reliability (Cronbach's alpha test)	
Effect of risk on projects with bond	0.866
Effect of risks on projects without bond	0.867
Test-retest reliability (Mann-Whitney)	
Effect of risk on projects with bond	0.825
Effect of risks on projects without bond	0.508
Parallel reliability (Kruskal-Wallis)	
Effect of risk on projects with bond	0.152
Effect of risks on projects without bond	0.682

* Significant at $p < 0.01$, ** Significant at $p < 0.05$.

Parallel reliability was achieved in this study by comparing and correlating the response of different group of respondents using Kruskal Wallis K-test since the respondents are more than two groups. The results indicate that there is no significant difference in the measured factors from the opinions of the groups of respondents.

Table 2. Population and sampling frame of respondents

	Population			Sampling frame		
Respondent	Lagos	Ondo	Total	Lagos	Ondo	Total
Clients of public projects	25	28	53	25	28	53
Quantity Surveying firms	39	19	58	39	17	56
Architectural firms	62	22	84	58	21	79
Contractors	83	119	202	78	71	149
Total			397			337

Out of 379 identified population, only 337 could be reached after conducting an initial survey as indicated in table 2. Questionnaires were administered on these stakeholders using census method but due to time constraints and lack of commitment from some of the respondents, 242 of these were returned out of which only 236 were certified fit for further analysis (the remaining 6 questionnaires were not completely and correctly filled by the respondents). The 236 figure represents about 59% and 70% of the population and sampling frame respectively. This response rate is considered sufficient base on the assertion of Moser and Kalton (1999) that the result of a survey could be considered as biased and of little significant if the return rate was lower than 20-30%.

4. FINDINGS AND DISCUSSION

4.1 Characteristics of Questionnaire Respondents

Table 3 revealed that of the 236 respondents for the study, 107 are from Ondo state while the remaining 129 are from Lagos state. Of these total figure, 118 are contracting firms representing about 50%, 72 are consultants, that is, architectural and quantity surveying firms while 46 are clients' organisation.

Table 3. Respondents and their location

	Ondo		Lagos		Overall	
Respondent	No	Percent	No	Percent	No	Percent
Contractors	53	49.53	65	50.39	118	50.00
Consultants	29	27.10	43	33.33	72	30.51
Clients	25	23.36	21	16.28	46	19.49
Total	107	100.00	129	100.00	236	100.00

4.2 Risks of Bonded Construction Project

In examining the effect of identified bonding risks, construction projects with and without bond were considered. Contractors, consultants and clients participated in the survey for this aspect of the study and table 1 revealed an asymptotic significance value of 0.152 and 0.682 for projects with and without bond respectively using Kruskal-Wallis K-test. It could be observed that the generated value is higher than 0.05 and 0.01 which therefore denote that the difference is not significant. It can thus be concluded that there is no significant difference in the opinions of respondents as regards effect of risks associated with project with and without bond in the construction industry. This is in line with the assertion of Oke *et al.,* (2016). It was stated that as much as the sampled stakeholders are experienced and knowledgeable of the practice of bonds and guarantees, there should be no difference in their opinions on issues relating to the process and administration.

Effect of identified risk on bonded construction projects is illustrated in table 4. Using ANOVA as the test statistics, generated p-value revealed that difference in mean values of seven of the risks variables are significant as their mean values are less than 0.01 and 0.05. This revealed that there is significant difference in the opinion of respondents regarding the seven variables which corroborate the earlier Kruskal-Wallis test result. The analysis further connote that there is significance agreement for the other two risk factors, that is, credit and inflation risk.

Consultants and clients unanimously agreed that risk factor with the most effect on bonded project is credit risk. The only difference is in the ranking of these two factors, that is prepayment and inflation risk, which are ranked second and third by both group of stakeholders. To contractors, interest rate and prepayment risks has the most effect on bonded

project followed by liquidity risk. It could also be observed that all stakeholders unanimously agree that volatility risk has the least effect on construction projects that are bonded.

Table 4. Risks of projects with bond

Risk factors	Contractors		Consultants		Clients		Overall		F-ratio	Sig. (p-value)
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank		
Credit risk (Financial soundness of issuer)	3.81	4	4.08	1	4.04	1	3.94	1	1.774	0.172
Interest rate risk (Bond sensitivity to changing market)	4.03	1	3.19	4	3.57	4	3.69	4	14.252	0.000*
Liquidity risk (Difference in market value and selling price)	3.89	3	3.06	5	3.26	5	3.51	5	12.409	0.000*
Prepayment risk (Bond redeemed by issuer before maturity)	4.03	1	3.75	2	3.59	3	3.86	2	5.078	0.007*
Reinvestment risk (Change of value of amount of bond)	3.55	6	2.57	8	2.82	8	3.11	8	35.930	0.000*
Currency risk (Difference in currency exchange rate)	3.34	8	2.87	7	3.00	7	3.14	7	3.172	0.044**
Inflation risk (Economy instability)	3.71	5	3.68	3	3.77	2	3.71	3	0.066	0.936
Sovereign risk (Action from foreign government)	3.53	7	2.96	6	3.04	6	3.25	6	7.283	0.001*
Volatility risk (Bonds with callable and putable option)	3.04	9	2.17	9	2.52	9	2.65	9	19.981	0.000*

* Significant at $p < 0.01$, ** Significant at $p < 0.05$.

On a general point of view, credit, prepayment, inflation and interest rate risk has the highest effect on bonded project while the effect of reinvestment and volatility risk are the lowest. It could be observed that all the identified risk factors have very high effect on bonded projects except volatility risk. This is reflected in the overall mean values of the variables in that the remaining eight factors are well above 3.00 from a possible score of 5.00.

4.3 Risks of Construction Project without Bond

Table 5 described the effect of identified risk factors on construction projects without bond. Generated p-value using ANOVA test statistics revealed that difference in mean values is only significant for three factors, that is, liquidity, currency and volatility risks. This implied that stakeholders differ significantly in responding to the itemised risks factors while they are in agreement for the remaining six.

Table 5. Risks in projects without bond

Risk factors	Contractors		Consultants		Clients		Overall		F-ratio	Sig. (p-value)
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank		
Credit risk	2.66	7	2.61	7	2.74	7	2.66	7	0.284	0.753
Interest rate risk	2.44	8	2.65	6	2.76	6	2.57	8	1.475	0.231
Liquidity risk	3.52	1	4.18	1	4.15	1	3.85	1	13.279	0.000*
Prepayment risk	2.38	9	2.18	9	2.63	8	2.37	9	2.307	0.102
Reinvestment risk	2.82	4	2.93	4	2.95	5	2.88	4	0.359	0.699
Currency risk	2.68	6	3.23	3	3.49	3	2.99	3	9.881	0.000*
Inflation risk	3.49	2	3.72	2	3.79	2	3.61	2	1.264	0.285
Sovereign risk	2.99	3	2.29	8	2.46	9	2.67	6	9.186	0.000*
Volatility risk	2.82	5	2.82	5	2.98	4	2.85	5	0.228	0.796

* Significant at $p < 0.01$, ** Significant at $p < 0.05$.

All the stakeholders are of the opinion that three risk factors, that is, liquidity, inflation and credit risk have the 1st, 2nd and 7th effect on non-bonded construction projects respectively. In contractors and consultants' view, prepayment risk has the least effect while it is sovereign risk from the opinion of clients. It could be observed that risk factors with the highest and lowest effect is from consultants' view and the factors are liquidity and prepayment risk.

Since Kruskal-Wallis K-test indicate that there is no significant difference in the response of stakeholders, it therefore mean that overall mean value can be relied upon as a true representative of respondents' opinions. Using the overall mean value, it could be observed that only the first two factors, that is, liquidity and inflation risk has high effect on construction projects that are not bonded. Six factors are have average effect while the last factors, that is, prepayment risk has a low effect on such type of construction projects.

4.4 Comparative Risks of Bonded and Unbonded Construction Projects

To examine the difference between effects of risks on construction project with and without bond, two methods were adopted, that is , mean gap and Mann-Whitney U-test. Using the mean gap value in table 6, the analysis revealed that risks associated with bonded projects are higher when compared with that of project not bonded except for liquidity and volatility risk with negative mean gap values. Risk factor with the highest difference is prepayment risk followed by credit risk. This connote that prepayment, credit and interest risks are more inherent in bonded construction projects, liquidity and volatility risks are more in project that are not bonded while currency and inflation risks are common to the two types of construction projects. On a general note, identified risk factors has a high effect on bonded projects as against average for projects without construction bond. Oke *et al.* (2015) observed that despite the age long introduction of construction bonds and guarantees to combat some challenges in the construction industry, issues relating to the management and administration of the bonds

have been a major concern for stakeholders. In support of the findings relating to credit risk, Oke *et al.* (2013) noted that a major issue with construction bonds is the insistence of clients on the choice of guarantors for the contractors which is linked to the financial soundness of the issuer of the bond.

Table 6. Risks and project with/without bond

Risk factors	With bond		Without bond		Mean Gap
	Mean	Rank	Mean	Rank	
Credit risk (Financial soundness of issuer)	3.94	1	2.66	7	1.28
Interest rate risk (Bond sensitivity to changing market)	3.69	4	2.57	8	1.12
Liquidity risk (Difference in market value and selling price)	3.51	5	3.85	1	-0.33
Prepayment risk (Bond redeemed by issuer before maturity)	3.86	2	2.37	9	1.49
Reinvestment risk (Change of value of amount of bond)	3.11	8	2.88	4	0.23
Currency risk (Difference in currency exchange rate)	3.14	7	2.99	3	0.15
Inflation risk (Economy instability)	3.71	3	3.61	2	0.11
Sovereign risk (Action from foreign government)	3.25	6	2.67	6	0.57
Volatility risk (Bonds with callable and putable option)	2.65	9	2.85	5	-0.20
Average	*3.43*		*2.94*		*0.49*

Mann-Whitney U-test statistics was also used in examining the difference. With asymptotic significance (2-tailed) value of 0.038 and Z value of -2.075, it could be deduced that the difference is not significant at 5% level. This implies that there is no significant difference in effect of risks on projects with and without bond. Against this finding, the identified risks are known as bond risks and they were expected to be inherent and have more effects on bonded projects. However, Oke (2013) as well as Oke *et al.* (2016) noted that most of construction risks, challenges and problems of construction bonds are more associated with projects without bonds including some bond risks. Ojo (2011) further noted that corruption and other negative practices have reduced the potency of construction bonds in the country and leading to persistence of the problems the bonds were meant to solve.

5. CONCLUSION AND RECOMMENDATION

This study has contributed to the body of knowledge by identifying various risks and problems that are inherent in construction projects that are executed with and without the use of bonds and guarantees. Opinions of clients, consultants and contractors were sought so as to gain an in-depth knowledge of the subject matter from the concerned and relevant stakeholders. The findings revealed that credit risk which is concerned with financial soundness of the guarantor, has the most effect on bonded construction projects while liquidity risk (difference in market value and selling price) is the most important for projects that are without bond. Except for liquidity and volatility risks, the generally finding revealed

that bond risks are more inherent in bonded projects and this can be attributed to the fact that the identified risks are bond related and are inherent in such type of project.

Overall, volatility risk has very low effect on project that are executed with bond while all except liquidity and inflation have low impact on projects without the use of project bond. Previous studies have stated the necessity to adopt the usage of bonds in all forms of projects either public or private against current practice where it is only mandated for public projects. However, it is important to understand various risks that may lead to ineffectiveness of the process. This can be achieve by identifying, measuring and highlighting various ways of combating the risks and their effects on overall project delivery. There is also a need for concerned stakeholders including clients, contractors and construction professionals to pay more attention to credit risk which is concerned with the financial soundness of the guarantor, that is , banks and insurance companies, issuing the bond. This will reduce delay in project start time as a result of delay in securing bonds by the project contractors and eventually help in achieving value for money for client of construction projects.

Using survey approach, the focus of the study is on effects of bonds' risks of public projects with emphasis on the views of concerned stakeholders. Further studies can be conducted using other research approach such as direct observation as well as historical and cost data of projects executed with and without construction bonds can also be collected for improved study and explanation. More so, research can be carried out using private projects especially the corporate ones and comparative analysis of the public and private projects can also be examined.

6. REFERENCES

Deng, H., Ding, S. and Tian, Q. (2004). Reasons underlying a mandatory high penalty construction contract bonding system, *Journal of Construction Engineering and Management*, 13(1), 67-74.

El-Diraby, T. A. and Gill, S. M. (2006). A taxonomy for construction terms in privatized-infrastructure finance: supporting semantic exchange of project risk information, *Construction Management and Economics*, 24, 271-285.

Emily B. (2009). What is bonding in construction? Retrieved November, 12, 2010 from http://www.ehow.com/about_5295907_bonding-construction.html.

Entrusty Group. (2005). What is a performance bond, its purposes and implications? Retrieved March 2011 from *www.entrusty.com*.

Hart, J. (2011). Gain an edge with bid and performance guarantees, *Canadian Consulting Engineer*, March/April, 15-16.

Heath, L. B. (2004) Cost Engineering applications for performance bond surety defaults, *Cost Engineering*, 4(10), 18-24.

Hinchey, J. W. (1986). Payment and performance bond coverages and claims, *The Arbitration Journal*, 14(2), 25-33.

Huang, Y. (2008). The pricing of conditional performance guarantees with risky collateral, *Construction Management and Economics*, 26, 967–978.

Kangari, R. and Bakheet, M. (2001). Construction Surety Bonding. *Journal of Construction Engineering and Management*, 127 (3), 232-238.

Lam, P.I., Chiang, Y. H. and Chan, S. H. (2011). Critical success factors for bond financing of construction projects in Asia, *Journal of Management in Engineering*, 27(4), 190-199.

Laryea, S. and Hughes, W. (2008). How contractors price risk in bids: theory and practice, *Construction Management and Economics*. 26(9), 911-924.

Mehmet E. B., Qingbin C., Makarand H., and Issam M. (2006). Warranty Bonds from the Perspective of Surety Companies, *Journal of Construction Engineering and Management*, 34, 333-337.

Mehmet, E. B and Makarand, H. (2010). Scoring approach to construction bond underwriting, *Journal of Construction Engineering and Management*, 136(9), 957-967.

Moser, C.A. and Kalton, G. (1999). *Survey Methods in Social Investigation*, (2nd ed.), Aldershot, Gower Publishing Company Ltd.

Ojo, A. E. (2011). Why do clients require construction bonds, *Construction Connects*, 1, 1-4.

Oke, A. E. (2013). Benefits and level of using retention bond for construction projects in Nigeria, *International Journal of Architecture, Engineering and Construction*, 2(2), 98-105

Oke, A. E., Ogunsemi, D. R., Ogunlana, S. O. and Aje, I. O (2016). Evaluation of risks associated with bonds and guarantees in construction projects. In ZEBAU – Centre for Energy, Construction, Architecture and the Environment GmbH (Ed.), *Strategies, Stakeholders, Success factors, Proceeding of International Conference on Sustainable Built Environment*, 7th-11th March 2016, HafenCity University Hamburg, ZEBAU, pp. 546-555.

Oke, A. E., Ogunsemi, D. R., Ogunlana, S. O. and Aje, I. O. (2015). An overview of usage and management of construction bonds in Nigeria. In Aluko, B. T., Odeyinka, H. A., Amole, O. O., Ademuleye, B. A. and Daramola, O. P. (Ed.), *Responsive Built Environment, Proceeding of Environmental Design and Management International Conference*, 9th-12th March 2015, Faculty of Environmental Design and Management, Obafemi Awolowo University, Nigeria, pp. 183 - 192.

Oke, A.E., Ogunsemi, D. R., Aje I. O. and Ogundimu, A. F. (2013). Effect of bid bond on construction project performance in Nigeria. In Laryea, S. and Agyepong, S. A. (Ed), *Proceeding of the 5th West Africa Built Environment Research (WABER) conference, 12th-14th August, 2013*, Johannesburg, WABER, pp. 407 - 418.

Powelson, G. (2007). Public construction: payment, performance and bid bonds – A look under the hood, *Business Credit*, 44-46.

Qingbin C., Mehmet E. B., Makarand H., and Issam M. (2004). Use of warranties on highway projects: A real option perspective, *Journal of Management in Engineering*, 20 (3), 118–125.

Standard Bank. Guarantees (2010). Report of the Standard Bank of South Africa Limited, Retrieved March 15, 2012 from www.standardbank.co.za.

Surety Information Office (2009). The importance of surety bonds in construction, retrieved 13th June, 2012 from www.sio.org.

Tar, J.H. and Carr, V. A (1999). Proposal for Construction Project Risk Assessment Using Fuzzy Logic, *Construction Management and Economics*. 18, 491-500.

The Associated General Contractors of America (2006). An overview of the contract surety bond claims process, retrieved 23rd March, 2012 from www.sio.org.

Xianhai, M. (2002). Guarantees for Contractor's Performance and Owner's Payment in China. *Journal of Construction Engineering and Management*, 128 (3) 232-237.