

# “Effective factors in corporate demand for insurance: empirical evidence from Iran”

## AUTHORS

Saied Sehat  
Vahid Najafi Kalyani

## ARTICLE INFO

Saied Sehat and Vahid Najafi Kalyani (2011). Effective factors in corporate demand for insurance: empirical evidence from Iran. *Insurance Markets and Companies*, 2(3)

## RELEASED ON

Thursday, 26 April 2012

## JOURNAL

"Insurance Markets and Companies"

## FOUNDER

LLC “Consulting Publishing Company “Business Perspectives”



NUMBER OF REFERENCES

0



NUMBER OF FIGURES

0



NUMBER OF TABLES

0

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Saied Sehat (Iran), Vahid Najafi Kalyani (Iran)

## Effective factors in corporate demand for insurance: empirical evidence from Iran

### Abstract

Corporations and individuals purchase insurance with different motivation. Risk aversion is individuals' main incentive in the purchase of insurance policy, while corporations' motivation for insurance policy purchasing is influenced by a variety of factors. Researchers have proposed several theories on corporate incentives for purchasing insurance policies. Among reasons for corporation's insurance demand, transaction costs, expected bankruptcy costs, tax optimization, firm size, share ownership, debt to asset ratio (leverage), underinvestment and type of industry can be referred to. Since it is difficult to get access to information about corporate insurance purchase, few empirical studies have been done in this subject. In this study, critical factors in demand for property insurance by the listed companies on Tehran Stock Exchange during 2008-2009 have been investigated. Research's results, in accordance to our hypothesis, show that large companies with higher bankruptcy costs and operational risk compared to other companies demand more property insurance. In addition, type of industry has a significant effect on the amount of insurance purchase by corporate. Companies operating in service industry demand more property insurance relative to other companies. Contrary to our expectations, tax incentives, majority shareholders ratio and underinvestment were not found as determinants of property insurance purchase by the listed companies in the stock exchange.

**Keywords:** insurance demand, insurance, corporate demand, enterprise risk management.

### Introduction

Companies purchase a lot of insurance policies. Major part of the literature on risk management and insurance regards risk aversion as a main reason for insurance demand. Although risk aversion explains a demand on the part of individuals, but it is not able to explain insurance demand on the part of large companies, because an incentive of corporate for purchase of insurance policies differs from that of individuals (Zou, Adams & Buckle, 2003; Wallace, Mark & John, 1992; Lauren & Yeon, 2007). Conservative (small) firms may have an incentive similar to that of individuals for purchase of policy. However, shareholders of large risk taking companies may reduce or eliminate insurance taking risks through diversification (Wallace, Mark & John, 1992).

Mayers & Smith (1982) and Main (1983) believe that since shareholders may by holding diverse reserves portfolio diversify particular insurance taking risks, insurance does not increase company's value because an insurance policy involves imposed expenses (like additional costs related to insurance companies' administrative costs). Therefore, although they may be like risk avoiding individuals, the well-diversified shareholders do not allow companies to reduce their wealth by purchase of insurance policy against its assumed risk (Krummacker & Graf, 2007; Mayers & Smith, 1982; Mayers, Smith, 1990). As a result, insurance contract minimizes company's value and its return. Unlike, this theoretical prediction, evidence shows that firms purchase a considerable amount of policy. Then, what does induce

companies to purchase an insurance policy (Wallace & John, 1992; Krummacker & Graf, 2007).

Organizations are constantly confronted with risks (both systematic and non-systematic) (Joe, Mike & Mike, 2001). It is obvious that presence of risk brings about some costs for the company and reduction of risk can create value. Insurance is one of the most important tools of risk transfer and hence, helps risk to being controllable or tolerable for companies or their owners (Macminn & Han, 1990; Lauren & Yeon, 2007). In addition, insurance companies through non-monetary services which are appraised by enterprise's shareholders, limiting risk to lenders' risk avoidance or reducing cost of such risks, increase company's value and consequently, company acquires competitive advantage relative to its competitors (Ashby & Diacon, 1998; Lauren & Yeon, 2007; Zou, Adams & Buckle, 2003).

Since the essential assumptions of individuals' risk aversion is not enough in explanation of enterprise's incentive for purchase of insurance policy, various researchers have offered theories for explaining this behavior of risk management (Grace & Rebello, 1993). Among reasons for enterprise's insurance demand, information asymmetry and agency conflict, transaction and bankruptcy costs, tax optimization, company's legal environment, efficient risk allocation, and insurers' relative advantage in services related to risk and damage can be referred to (Ashby & Diacon, 1998; Lauren & Yeon, 2007; Zou, Adams & Buckle, 2003).

This study, first, provides a review of the research's background. Since access to information on companies' purchase is difficult, few research have been so far done on this subject. In the next section, the

theories pertaining to insurance demand and the factors affecting it are treated. In this section, research's hypotheses based on prior empirical studies are presented. Research's methodology and data analysis method is presented in section 3. Statistical society comprises the listed companies on Tehran Stock Exchange the data of which for the period 2008-2009 was gathered and recorded. Data analysis method is based on univariate and multivariate analysis for study of relationship between the independent variables and the dependent variable and mutual relationships between them. In section 4, the obtained results from simple and multi-variate regression analysis are presented. In this section, to measure the results' prediction correctness and power, sensitivity and diagnostic tests of the regression model have been performed. In the final section, conclusion and suggestions, the obtained results from the previous section are analyzed, and the research's general conclusion is given, meanwhile some suggestions with regard to present research and in respect with future works are offered.

## 1. Research background

Joe Z. Hong, Mike Adams & Mike Buckle (2001) investigated the relationship between risk of the publicly registered companies and purchase of property insurance in China. The findings show that companies with high operational leverage and systematic risk are more likely to purchase property insurance relative to other firms. In addition, the foreign-invested companies compared to domestically owned ones seem to spend more in property insurance. Non-systematic risk and geographical region of the companies were not found significant (Joe, Mike & Mike, 2001).

Simone Krummaker & J. Mathias von der Schulenburg (2007) carried out a research on enterprise demand for insurance in Germany. Results show firm size has a negative effect on insurance demand. In addition, the ratio of insurance policy-damage has a significant positive correlation with insurance demand. This is the logic that companies with a higher damage degree compared to the insurance policy demand a higher level of coverage. If the big companies have greater power in the insurance market, they maybe in insurance policy negotiations less effective from the risk. Stock companies relative to other companies' legal forms buy significantly less insurance. Industry laws and regulations stimulate legal companies to demand more insurance relative to illegal businesses. Furthermore, the greater the employees' share of total sale (turnover) is, the higher the demand for insurance will be (Krummacker & Graf, 2007).

Lauree Regan & Yeon Hur (2007) studied insurance demand by enterprise in Korean non-financial companies. In the complete capital market, there is no theoretical reason for purchase of insurance by companies, when shareholders are able to properly keep their portfolio diversified. When transaction and agency costs are raised, incentive for insurance demand is realized. Insurance purchase may be achieved from structure of tax instructions, costs of bankruptcy or bankruptcy probability. Real services provided by insurers, which are valued by shareholders, or difference in ownership structure of regulations of companies. Furthermore, accumulated depreciation is positively related with insurance demand. Besides, larger companies demand less insurance, which confirms a real service's hypothesis. Companies with a higher level of internal members' ownership share demand more insurance. Evidence shows that state ownership reduces insurance demand, while the companies which have a greater share of major ownership demand less insurance relative to companies, the ownership of which is widely distributed (Laureen & Yeon, 2007).

In another research by Erwan Michael-Kerjan et al. (2009) in the United States, the results showed that the larger companies were more likely to have greater disaster coverage. Enterprise demand for disaster insurance is less elastic compared to insurance of non-disastrous risks (Kerjan, Raschky & Kunreuther, 2009).

Mohammad Abdul Hamid (2010) studied factors such as underinvestment, debt ratio, growth opportunity, expected bankruptcy costs, tax considerations, managerial ownership, firm size and legal environment in order to identify enterprise's demand critical factors for prevalent insurance in Malaysia. The findings show that ration of debt to asset, expected bankruptcy costs, tax considerations, firm size and managerial ownership play a crucial role in determining enterprise's demand for insurance in Malaysia (Mohammad, 2010).

## 2. Theoretical framework

### 2.1. Theories of corporate demand for insurance.

Prior studies have investigated a relationship of enterprise's risk with insurance purchase. These studies suggest that insurance helps managers reduce commercial risks like bankruptcy arising from unexpected damages. As a result, it is expected risky business compared to low-risk companies to be more inclined to buy insurance. Researchers such as Harington (1984) and Harington & Danzen (2000) add that legal controls over an amount of insurance policy reinforce risky businesses' inclination to immune their operations through insurance, because such independent firms, given inability of insurers in

receiving fair insurance policy, maybe from statistical point of view obtain an economic advantage (Joe, Mike & Mike, 2001; Joe, Mike & Mike, 2006).

One of the theories of enterprise demand convexity in tax instructions (codes) encourages insurance as a way to reduce expected tax responsibilities. Mayers and Smith (1982) argue that insurance allows companies to reduce expected bankruptcy costs (commerce cease) by transferring costs of severe accidents to the insurer. In addition, legislators may consider purchase of some types of insurances necessary such as workers compensation insurance. Further, similar service insurers may provide damage payment and safety advices (Main, 1983; Mayers & Smith, 1982).

Agency theory states additional reasons for insurance purchase by enterprise. Mayers (1996) says shareholders may potentially lead forward a profitable investment if benefits belong to bondholders. In this regard, insurance can be used to unify investment decisions. Han (1996) investigates the relationship between optimum managers' service compensation and insurance purchase when managers are risk avoiding. Insurance can be a sign of credibility and act as a quality supervisor for shareholders and commercial partners. However, a company with a higher degree of institutional ownership may less rely on insurance as a potential bankruptcy supervisor, since institutional investors may have a relative advantage in supervision. Firm's ownership structure may affect insurance purchase. Small firms (few shareholders) are more likely to buy insurance relative to large firms (many shareholders), because their owners may have not been well diversified (Core, 1997; Laureen & Yeon, 2007).

**2.2. Effective factors on corporate demand for insurance.** Incentive for insurance purchase by large enterprises and common businesses has not been well understood. Moreover, there is little information on an amount of commercial insurance purchase in enterprises (Ashby & Diacon, 1998), this is while a great share of insurance policies belongs to businesses (Mohammad, 2010). Given importance of insurance demand on the part of enterprise, various researches to have been done on this head and researchers have proposed theories for explanation of enterprise's behavior (Laureen & Yeon, 2007). Given the prior studies and the results obtained from various studies, in this research, the following factors are regarded as the main factors affecting insurance demand: transaction costs, expected bankruptcy costs, tax optimization, firm size, share ownership, the ratio of debt to asset (leverage) underinvestment incentives, industry type.

**2.2.1. Expected bankruptcy costs.** Normally, bankruptcy costs are divided into two groups of direct and indirect costs. Direct costs fall within an area of bankruptcy management and include costs of bankruptcy stages and administrative and legal payments. Indirect cost concerns such as costs as market share loss, and the lost reputation. Meyers and Smith (1982) argue direct costs are likely to be to a ration less than firm size and smaller firms experience relatively higher direct bankruptcy costs. Since insurance can reduce the probability of the firm being faced with large loss bankruptcy, smaller firms compared to larger firms may purchase more insurance. In addition, apart from firm size, a firm with a relatively less liquidity or higher leverage in its capital structure and hence with higher bankruptcy probability is more likely to purchase insurance. Insurance coverage can reduce the bankruptcy probability, because in critical conditions, it helps companies by paying for loss or damage. A firm with a higher bankruptcy probability has more incentives to buy insurance (Zou, Adams & Buckle, 2003; Laureen & Yeon, 2009; Mohammad, Jamil, Bany & Nordin, 2009).

Meyers and Smith (1982) and McMinn (1987) have argued that insurance like other forms of companies' financing help them to prevent transaction bankruptcy costs. In fact, probability for occurrence of these costs is reduced by transfer of risks faced by companies to insurance companies. With regard, large firms which typically are composed of a large number of shareholders, extent of asset diversification can be very high and accordingly there may be no need for insurance. In this case, we must observe that larger firms are less likely to purchase standard insurance coverage (Kerjan, Raschky & Kunreuther, 2009). On the other side, firm's insurance purchase may result in increased firm's value through expected present value of firm's future cash flows. This state may be realized through reduction in cost of financial seizure or transaction bankruptcy reduction in firm's financial responsibility or simply owing to firm's profit, which is a concave function of return (Mayers & Smith, 1982; Mayers, Smith, 1990; Ashby & Diacon, 1998).

*Hypothesis 1: Expected bankruptcy costs positively affect insurance demand by large companies.*

**2.2.2. Tax considerations.** There are several incentives with regard to corporate tax for insurance purchase. First, by insurance purchase and policy payment a firm can show its revenue low and pay fewer taxes, since the insurance policy is normally an acceptable cost and on the other hand, a firm by insurance purchase reduces the risk, if self-insured property loss only up to book value is deductible from the revenues in the year when it has occurred.

Hence, the lost property cost has been deducted through depreciation deductions. This matter gives a clue to the second incentive regarding tax for insurance. Main (1983) showed as a difference between a book value and the lost property replacement cost increases, insurance demand increases. In any case, the difference between the book value and property replacement value exposed to tax is a capital gain. Until when the capital gain' tax rate is less than corporate profit tax rate, firms keep demanding insurance. Firms with greater accumulated depreciation are more eager to buy insurance (Joe & Mike, 2006; Mohammad, Jamil, Bany & Nordin, 2009; Main, 1983).

Mayers & Smith (1982) argue that convexity in tax codes creates demand for insurance. Under a condition of convex tax function and limitation of progressive loss, insurance purchase can reduce expected tax responsibility, because insurance reduces changeability in firm's proceedings, expected tax responsibilities and enhances expected pure cash flow (Laureen & Yeon, 2007; Krummaker & Graf, 2007; Mayers & Smith, 1982).

*Hypothesis 2: Accumulated depreciation positively affects corporate demand for insurance.*

**2.2.3. Firm size.** The first reason for an important role of firm size in corporate insurance demand is bankruptcy costs. These costs can be minimized through risk management. As transaction and bankruptcy cost is a function of firm size, large companies incur a greater amount of these costs. Therefore, large companies in order to reduce a responsibility for facing these costs are likely to buy more insurance relative to small firms.

The second reason is insurance companies' relative advantage in claim processing and in preventing loss and controlling claims. By insurance contract, enterprises can benefit from insurer's activities regarding prevention of loss, risk assessment and payment for loss. Next to risk transfer which is the main reason for insurance purchase, also getting an advantage from insurers' real service is a reason for insurance purchase. This theory gives more motivation to smaller firms, since they have fewer sources and experience in risk management (Yamori, 1999; Krummaker & Graf, 2007).

Large firms relative to small firms tend to more diversity. This indicates that large firms compared to small firms are less likely to be exposed to business risks and accordingly are less likely to need insurance coverage based on physical assets for purposes of financing losses (Laureen & Yeon, 2007; Joe, Mike & Mike, 2001). Research results by Hoyt and Khang shows that small firms have more demand for insurance (Hoyt & Khang, 2000).

*Hypothesis 3: Firm size negatively affects corporate demand for insurance.*

**2.2.4. Ownership structure and share ownership.** Share ownership may affect the insurance purchase decision of companies with considerable external capital which relative to companies with internal ownership may procure more insurance to reduce the accumulated business risk associated to investment in new and developing markets.

Lee and Rui (2000) reported that compared to internal investors, external investors are more likely to incur costs of obtaining and assessing additional information, for example, due to different legal and regulatory frameworks in the host country. This information asymmetry induces foreign investment companies' managers to purchase more insurance relative to their opposite point in domestically owned companies (Joe & Mike, 2006; Joe, Mike & Mike, 2001).

Incentive for insurance purchase also results from firm's ownership structure. Principal elements are the problem of delegation, separation of ownership and control. Owners invest in a company with the expectation to receive a return on their investment. However, investors should develop mechanisms in order to ensure that their investments are not lost by managers or by other ways. If the company is kept closing or privately, the issue is that owners get greater share the invested assets in the company and therefore, the ability of special risk diversification among other investors has been reduced. If owners have a relatively lower chance for special risk diversification, they will be more likely to demand insurance (Mayers & Smith, 1988; Grillet, 1992).

At any rate, if a relatively large block of the company's shares is held by institutional owners – more than what is held by individuals – direct control of managers by institutional investors may be more efficient than use of insurance for protection of the invested assets against potential expropriation by managers. Small investors will benefit from the control by institutional investors, even if they do not incur any cost (Laureen & Yeon, 2007). Institutional investor has a stronger incentive for control because the return obtained from the control is greater than its costs. Therefore, if there is a relatively higher level of institutional ownership in the company, demand for insurance may be more than other cases. The higher the control degree in firm's ownership is (more major shareholders, the less dispersed the firm's ownership becomes), the lower the demand level for insurance becomes. It is for this reason that major shareholders are able to efficiently diversify their portfolio, and accordingly, they emphasize less on insurance purchase. Major shareholders may be

able to enforce direct control and hence do not rely on insurance as an agent for control in this market (Laureen & Yeon, 2007; Xu, Wang, 1999).

Ownership structure, diversity of owners, and continuous transfer of risk depend on insurance demand. In individual businesses, manager is typically the owner. The owner incurs the risk by his wealth. In this case, we suppose that insurance purchase behavior can be deservedly explained by risk aversion. Against firms' stock, we expect these individual enterprises to buy more insurance compared to stocks of firms where lenders only incur the risk proportional to their share (Krummacker & Graf, 2007; Regan, Hur, 2007).

*Hypothesis 4: Ration of institutional investors positively affects corporate demand for insurance.*

**2.2.5. Debt to asset ratio.** Relatively little liquidity or high debt to asset ratio (operational risk) in capital structure increases the bankruptcy probability. On the other side, insurance coverage can reduce the bankruptcy probability, because in critical condition, it helps firm by paying for damages. As a result, a firm with higher operational risk and higher bankruptcy probability has a stronger incentive for buying insurance (Laureen & Yeon, 2007; Mohammad, Jamil & Nordin, 2009). In addition, sometimes calamities and accidents cause serious problems for companies and insurance coverage in such difficult situations, especially when the company's debt or risk is high helps very much (Grillet, 1992; Regan, Hur, 2007).

Companies with greater accumulated depreciation ratio demand more insurance, i.e., as distance between assets' book value and their replacement cost becomes the wider, incentive for insurance purchase becomes stronger. Higher liquidity ratio or higher ratio of assets to debts is associated with low demand for insurance. Likewise, greater debt relative to equity in capital structure implies the higher demand for insurance (Laureen & Yeon, 2007).

*Hypothesis 5: Operational risk positively affects corporate demand for insurance.*

**2.2.6. Agency theory and underinvestment incentive.** Mayers (1977) believes that in some cases, shareholders go further than project's net positive present value when benefits belong to bondholders. For example, with regard to property loss, shareholders should decide whether to repair or replace the damaged property. If they have risky debts in capital structure, they may not make necessary investment in shareholders' best interest. Bondholders discern that this incentive develops, and its price is guaranteed towards the returns' basis. If insurance is absent, shareholders bear the costs related to this lack

of investment (Laureen & Yeon, 2007). Mayers and Smith (1987) showed that insurance controls this problem the result of which is higher price of bonds on an issue date. The problem of investment incentive is most the case in companies with relatively high level of debts. Therefore, insurance demand must be higher for firms with the greater amount of debt (Mayers & Smith, 1987).

*Hypothesis 6: Higher debt ratio in capital structure positively affects demand for insurance by the corporate.*

**2.2.7. Industry type.** Probability of damage varies according to industry. Some industries are definitely faced with higher risk. For example, in chemical industry, presence of different chemical materials which are quickly inflammable causes higher risks for this industry. Hence, the firms which fall within the high-risk industry should have higher demand for insurance. Insurance companies next to insurance sale should take the issue of risk management into consideration and provide necessary consultations for reducing risk in the industry and risk in general (Yamory, 1999).

Insurance demand may also be affected by insurance ranking factors, which measure risk attributes. If a firm has experienced the insured (or uninsured but insurable) loss in a previous period, its insurance policy rate is likely to increase, which causes the company to adjust its insurance purchases. Insurance policy rate typically reflects risk attributes of industry groups plus experiences of particular firms so as riskier firms are faced with higher policy rate (Joe, Mike & Mike, 2001; Laureen & Yeon, 2007).

*Hypothesis 7: Type of industry has significant effect on amount of insurance demand by enterprise.*

### 3. Research methodology

This is a descriptive research based on historical studies. In this research, the data related to the listed companies on Tehran Stock Exchange within the time interval of 2008-2009 have been gathered and stored through financial statements. To reduce a random effect, the data of three years under study have been averaged.

Statistical society in this research includes the listed firms on Tehran Stock Exchange. Given necessity of procedure stability during several years, for validity of results the selected companies should meet the following criteria: (1) at least five-year memberships of the stock exchange; (2) being a member of the stock exchange at present; (3) record of information regarding the paid insurance policies in appendices to financial statements. The companies which did not meet the three mentioned criteria were removed from the statistical society.

**3.1. Statistical sample.** The required sample given size of society and based on the sample determination formula was calculated, and 185 firms were randomly selected from the site of Tehran Stock Exchange and the information related to these firms was collected.

**3.2. Data analysis method.** In this research, for data analysis, linear regression has been used. To enter the variable and to measure their relationship with the dependent variable, the Enter method in the regression model has been used. In this method, all the variables presented in the equation are simultaneously analyzed. Using SPSS software, correlation

coefficients of the independent variables are examined in order to make sure that they are statistically significant. In the next step, independent variables, the coefficients of which are not statistically significant ( $p$ -value  $< 0.05$ ) are removed from regression equation. Finally, those variables remain in regression equations, which are significant and are more effective than other independent variables (Gujarati, 1995, pp. 338-339; Hsiao, 2003). In this research, regression equation, according to the research background and the existing hypotheses, is considered as follows:

$$ID = \beta_0 + \beta_1 EBC + \beta_2 \text{LnTax} + \beta_3 FS + \beta_4 MS + \beta_5 OL + \beta_6 UI + \beta_7 \text{InT}, \quad (1)$$

where  $ID$  is the insurance demand (ratio of paid property insurance to value of the properties),  $EBC$  are the expected bankruptcy costs (ratio of working capital to total assets),  $Tax$  is the tax incentive (ratio of accumulated depreciation to total assets' net value),  $FS$  is the firm size (natural logarithm of firm's total assets),  $MS$  is the majority shareholders ratio to other shareholders,  $OL$  is the operational leverage (operational risk, ratio of debts to assets),  $UI$  is the underinvestment (logarithm of ratio of company's debts to its eigenvalue),  $IT$  is the industry type (service, industrial, manufacturing, electronic and computer).

## 4. Results

**4.1. Results of univariate analysis.** Table 1 (see Appendix) shows descriptive statistics related to the dependent variable and the independent variables for sample companies, which have been selected from the stock exchange for the period of 2008-2009 ( $n = 185$ ). Further, the calculated Kruskal-Wallis one-way analysis statistic for each variable during two years has been used to test the zero hypothesis suggesting variables distributions in each year is equal. At 5%, the statistic Chi-square (with degree of freedom 12) in two-tailed test was not significant for the company's ratio of property insurance expenses to value of properties. This result means that during the two years no radical change has occurred in property insurance purchase behavior among companies.

Table 2 (see Appendix) shows correlation coefficient among the dependent variables. The greatest correlation coefficient is between  $FS$  and  $EBC$ , which shows negative significance correlation between these two variables. Table 3 shows correlation coefficient between the dependent variable and the independent variables for observations related to 2008-2009. The reported Paired Correlation Coefficient (Pearson and Spearman) in Table 3 (see Appendix) indicates that there is a statistically significant relationship between the dependent variable ( $ID$ ) and the independent variables, namely, expected bank-

ruptcy costs ( $EBC$ ), firm size ( $FS$ ) and industry type ( $IT$ ) at 0.01 level and operational leverage ( $OL$ ) at 0.05 level in two-way test. Positive correlation between insurance demand and expected bankruptcy costs confirms the hypothesis suggesting that expected bankruptcy costs affect to positively affect insurance demand by large companies (hypothesis 1). Negative correlation between  $ID$  and  $FS$  is in accordance with the research hypothesis. According to the second research hypothesis, firm size has a negative relationship with insurance demand, i.e., smaller firms are more likely to purchase more insurance. With regards to concentrate activity in small firms, destroying properties could have a greater and extensive effect on firm's activities; therefore, it can impose more expenses to small firms compared to larger firms. Therefore, it seems logical that small firms relative to larger firms to purchase more property insurance. This research result isn't consistent with the result obtained by Joe Z. Hong et al. (2001) which indicates larger companies compared to small companies are more likely to purchase more property insurance. The statistically significant negative correlation between  $ID$  and  $IT$  (at the 0.01 level, two-tailed test) also indicates that industry type may have a great impact on the amount of property insurance purchase. In addition, Table 3 shows that correlation coefficient between  $ID$  and remaining independent variables at the 0.10 level and lower is not significant (two-tailed test).

To determine the effect of industry type on the amount of insurance purchase by the listed companies on the stock exchange, Kruskal-Wallis test was performed in order to compare the difference between median of firms' ratio of property insurance expenditures to value of properties in various industries. Given the calculated results in Table 4 (see Appendix), a statistically significant difference at the 0.01 level (freedom degree 3) was found. These results show that purchase of property insurance significantly differs in various industries, and industry type affects firms' demand level for property insurance.

Independent sample t-test (one-tailed) was performed to compare the purchased insurance between the paired industry groups (paired comparison). The obtained results from the paired comparison between independent samples in Table 4 show that service companies compared to other companies are more likely to purchase more property insurance. In contrast, it seems electronic and computer firms relative to other firms to have lower costs for property insurance. In addition, level of property insurance purchase by manufacturing and industrial firm's falls in the middle part. At the 0.05 level, no statistically significant difference was found between mean insurance purchase in service and industrial companies as well as among manufacturing and computer companies.

**4.2. Results of multivariate analysis.** To complete results of univariate analysis and to take interactions between variables into account, multivariate analysis of the data has been performed. Table 6 represents a multi-variable regression fixed effects for observations regarding sample of the listed companies on the stock exchange for the two-year period of 2008-2009. The results show that except for *OL*, signs of the independent variables in the assumed direction and the independent variables *EBC*, *FS*, *OL* and *IT* at the 0.05 level in the one-way test are significant. The main difference between results of simple and multivariate is *OL* correlation coefficient, which is statistically significant (at the 0.05 level, one-tailed). This result suggests that interactions between independent variables may hide the relationship between operational risk and property insurance demand by the company in the simple (univariate) analysis.

Positive and significant relationship between property insurance demand and operational risk suggests that, according to hypothesis 5 as we expect, the listed firms on Tehran Stock Exchange with higher operational risk relative to firms with lower opera-

$$ID = 1.872 + 0.712 EBC - 0.284 \text{LnTax} - 0.471 FS - 0.035 MS + 0.572 OL + 0.372 UI + 0.381 IT. \quad (2)$$

Since in the above regression model, all coefficients of the independents variables are not significant, the variables the coefficients of which are not significant are removed from the equation and only the variables with the statistically significant

$$ID = 1.872 + 0.712 EBC - 0.471 FS + 0.572 OL - 0.381 InT. \quad (3)$$

**4.3. Sensitivity and diagnostic tests of regression model.** Several sensitivity and diagnostic tests for examining power and efficiency of the multivariate analysis results were performed. Table 7 shows regression model. The calculated Durbin-Watson (D-W) statistic which is close to 2 indicates that there is no self-correlation in the independent variables. Column 2 in Table 7 shows *R* square coefficient value. *R* square

representing the model's reliability through change percentage in the dependent variable by significant independent variables. The *R* square .768 in Table 7 indicates 76.8% of changes in insurance demand by companies are explained by the four independent variables mentioned in the model and the remaining 23.2% of changes are related to other variables, which have not been included in the model.

Negative and statistically significant relationship between insurance demand and industry type (*IT*) supports our seventh hypothesis proposing that industry type and the respective laws and regulations in every industry affect property insurance demand by companies. These results are consistent with the findings of Hoyt and Khang (2000) which suggest the industry type affects managerial decisions for insurance purchase, especially in the developed markets with different regulations in various industries. In addition, these results are in agreement with the theory of Mayers and Smith, who predict the companies active in very regulated industries (e.g. in utilities) tend to purchase more insurance.

Given Table 6 and the obtained coefficients of the independent variables, equation of property insurance demand for the listed companies on the stock exchange becomes as follows:

coefficients remain (Regan & Hur, 2007). Given this point, final equation of property insurance demand for the listed companies on the stock exchange for the period of 2008-2009 is written as follows:

represents the model's reliability through change percentage in the dependent variable by significant independent variables. The *R* square .768 in Table 7 indicates 76.8% of changes in insurance demand by companies are explained by the four independent variables mentioned in the model and the remaining 23.2% of changes are related to other variables, which have not been included in the model.



To investigate whether there is definitely a linear relationship between variables, variance analysis was used. Table 8 presents the results regarding variance analysis of the model under study. Given that the obtained significance ( $p$ -value < 0.05) is less than 0.05, thus the model linearity assumption is confirmed. Hence, there is a linear relationship between the independent variables and the dependent variable and the used linear regression model in this research correctly shows the relationship between variables.

To examine normality of errors in the regression model, an error distribution diagrams has been used. Figure 1 shows the errors distribution diagram. Considering that mean errors is near zero and standard deviation of errors distribution is close to one, errors' distribution is almost normal. Therefore, there is no need to change the independent variables and to use their logarithm.

### Conclusion and suggestions

In this study, we used the recorded data in financial statements of the listed companies on the stock exchange for study the relationship of bankruptcy and operational risk, firm size and industry type with property insurance purchase. According to our hypothesis, companies with higher bankruptcy and operational risk, purchase more insurance. Higher operational risk increases bankruptcy risk. On the other hand, higher expected bankruptcy cost is a motivation for more insurance purchase by enterprises. This result isn't consistent with the findings of Hong (2001) suggesting larger companies with high operational leverage or risk compare to small companies with low operational leverage or risks are more likely buy more property insurance. Research results show service companies relative to other companies spend more for purchase of property insurance. Computer companies purchase less property insurance compared to other companies

perhaps because computer firms are faced with less risk regarding assets.

Tax incentive, majority shareholders ration and incentives for underinvestment were not found as critical factors in the purchase of property insurance. In some studies, tax incentives have a positive effect on insurance purchase by enterprise and in some other researches, their effect on insurance demand is not clear. Hence, effect of taxes as a determinant of insurance purchase has not been confirmed. Our results too, do not consider tax as a critical factor in insurance demand. In addition, shareholder's combination has no significant effect on insurance demand. Thus, the purchase amount of property insurance has no significant relationship with the shareholders' combination.

The research findings have important applications for the countries growing insurance market. For example, relationship between the purchased property insurance and operational financial risk suggests that insurance companies should adopt insurance rate in proportion to firms' risk and consider other variables such as industry type. In addition, insurance companies may develop the country's insurance market by adopting persuasive and protective policies such as fair rating, offering professional consultations with regard to risk management and damages. With regard to large and profitable enterprises which are capable of diversify their portfolio, insurance companies should lay the stress on those aspects of insurance services which the enterprises themselves are not able to manage and by providing a full package of services help enterprises in achieving competitive advantage relative to competitors. Finally, the empirical relationship which seems to exist between industry type and operational risk by purchase of property insurance by the corporate may help providers of insurance services better target potential insurance buyers.

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## Appendix

Table 1. Descriptive statistics of the listed companies on Tehran Stock Exchange during 2008-2009

Variables	N	Minimum	Maximum	Mean	Std. deviation
ID	185	.016	.353	.187	.1027
EBC	185	-.81	.57	-.0038	.3174
LnTax	185	-3.50	.92	-.8294	.6482
FS	185	21.54	38.15	24.873	1.9744
MS	185	.16	123.47	12.762	15.2873
OL	185	.14	1.84	.8198	.1893
UI	185	-1.84	3.62	1.1298	.8298
IT	185	1.00	4.00	2.28	.5172

Table 2. Results of correlation between independent variables

	EBC	LnTax	FS	MS	OL	UI	IT
EBC	1						
LnTax	.058	1					
FS	-.571**	.374*	1				
MS	.128	-.059	.271**	1			
OL	.384*	.217**	-.471*	.124	1		
UI	.082	-.173*	-.113	.208*	.153*	1	
IT	-.487**	.431*	.372*	.023	-.420*	.132	1

Table 3. Results of correlation between the existing variables in the regression model

		EBC	LnTax	FS	MS	OL	UI	IT
ID	Correlation coefficient	.621**	-.123	-0.376**	.280	.113*	.085	-.351**
	Sig (2-tailed)	.003	.518	.304	.080	.034	.482	.000

Notes: \*\*Correlation is significant at the 0.01 level (2-tailed). \*Correlation is significant at the 0.05 level (2-tailed).

Table 4. Kruskal-Wallis test to find difference in property insurance purchase between various groups

A: Mean insurance demand in each row			
Industry type		N	Mean rank
Insurance demand	Services	3	26.33
	Industrial	18	23.00
	Manufacturing	13	17.62
	Electronic & computer	6	16.33
		40	
B. Test statistic			
		Insurance demand	
Chi-square	3.124		
df	3		
Asymp. sig.	0.003		
Kruskal-Wallis test	Grouping variable: industry type		

Table 5. Paired comparison analysis of mean for ratio of property insurance purchase to value of properties in industry sub-groups

Variable pairs	Mean difference	Std. error difference	t-statistic	p-value
IT 1-2	-.1172	.8721	-.146	.085
IT 1-3	.2637	.7638	1.525	.038*
IT 1-4	1.3189	.7628	4.622	.000*
IT 2-3	1.2718	.7392	2.728	.005*
IT 2-4	1.3871	1.2871	3.854	.000*
IT 3-4	.3982	.5814	1.831	.025*

Note: IT is the industry type, respectively, 1 = Service, 2 = Industrial, 3 = Manufacturing and 4 = Electronic & Computer. \*Statistically significant at the 0.05 (two-tailed).

Table 6. Results multivariate analysis of one-tailed fixed effects model

	Unstandardized coefficient		Standardized coefficient	t	Sig	Tolerance	VIF
	B	Std. error	Beta				
(Constant)	1.872	2.143		3.354	.002		
EBC	.712	.862	.325	2.728	.008	.627	1.283
LnTax	-.284	.402	-.237	.283	.738	.583	1.572
FS	-.471	.273	-.420	4.184	.000	.627	1.471
MS	-.035	.108	-.017	-.119	.814	.920	1.038
OL	.572	1.823	.408	2.071	.011	.947	1.628
UI	.372	.781	.207	1.734	.063	.324	2.183
IT	-.381	.418	-.245	-4.728	.000	.627	1.371

Table 7. Summary of results regarding multivariate regression model

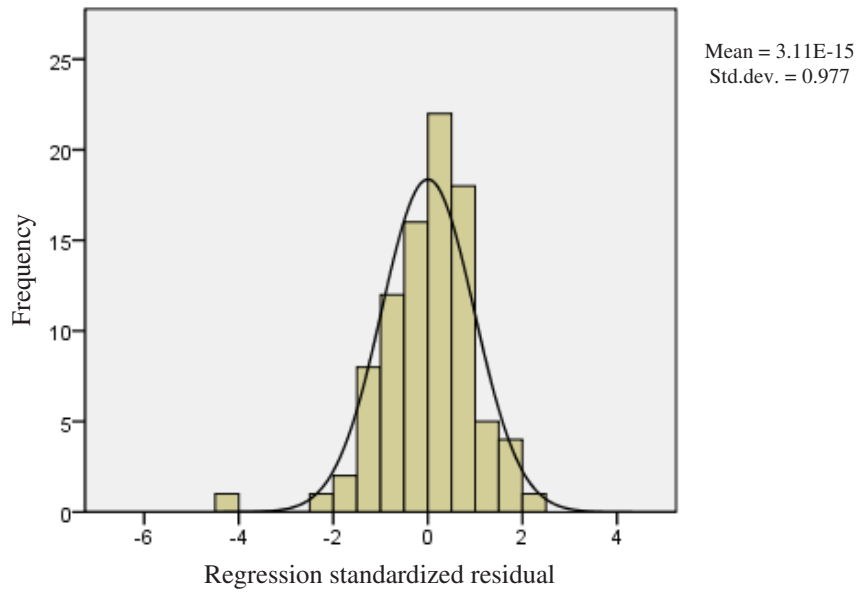
Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. error of estimate	Durbin-Watson
1	.718 <sup>a</sup>	.768	.732	1.45639	2.148

Note: <sup>a</sup> Predictors (constant): industry type, operational leverage, majority shareholders ratio, firm size, expected bankruptcy cost, under investment.

Table 8. Variance analysis – Anova<sup>a</sup>

Model		Sum of Squares	df	Mean square	F	Sig.
1	Regression	105.730	7	15.104	7.478	0.000
	Residual	67.874	32	2.121		
	Total	173.604	39			

Note: <sup>a</sup> Dependent variable: insurance demand.



**Fig. 1. Error distribution diagram**