A study on the impact of the factors reflect solvency to the bankruptcy risk of real estate companies: Evidence from Vietnam stock exchange

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CHRONICLE	ABSTRACT
	Under the impact of the global crisis, the Vietnam real estate exchange has become degraded and frozen for a long time. The solvency is decreased, leading to a high risk of bankruptcy of real estate companies. Therefore, determining the factors reflecting solvency in real estate companies helps to give synchronous solutions, to improve performance efficiency, to prevent and to mitigate bankruptcy risk in the real estate companies listed on Vietnam's stock exchange. Research data were collected from 45 out of 55 real estate companies listed on Vietnam's stock exchanges (accounting for 81.82% of the sample) with 360 observations. The study proposes a logit model showing the relationship between solvency and bankruptcy risk and conducts analysis and verification on SPSS dedicated software (version 25) to find out the variables affecting bankruptcy risk. The results show that (with a prediction accuracy of 91.4%) in these companies, indicators of solvency influencing bankruptcy risk include: (1) Operating cash flows to average total liabilities ratio and (2) Net working capital to total assets ratio. The impact of the remaining factors (a) Owner's equity to long-term debt and (b) Current assets to current liabilities was unclear. Based on the research results, specific recommendations and solutions were proposed to improve solvency, prevent and mitigate bankruptcy risk in the real estate companies listed on Vietnam's stock exchange.

1. Introduction

This study is experimental research on analyzing the impact of the factors reflecting solvency to the bankruptcy risk of the Vietnam real estate companies. In other words, we recognize the factors affecting the bankruptcy risk of the Vietnam real estate companies. Research data was derived from secondary data, taken from various items on the financial statements of the real estate companies listed on Vietnam's stock exchange and was collected from the State Securities Commission of Vietnam which was highly transparent (State Securities Commission of Vietnam, 2019). Based on the actual performance of Vietnamese real estate companies, to ensure the representativeness, completeness, and reliability of the collected samples, we collect the necessary based on the following criteria:

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First, research period: The study period is 8 years, from 2008 to 2015 due to the Vietnamese real estate market is degraded and frozen heaviest from early 2008 to mid-2009 and 2011-2013 period; after that, the real estate market recovered and grew again in the period of the end of 2009 to mid-2010, and from 2013 to 2015 as a stable period.

Second, sample objects are collected: First we choose listed real estate companies because in Vietnam, only large-scale companies are eligible to list. Moreover, the real estate industry is an industry that requires a large amount of capital and a long payback period. Therefore, small companies have no conditions to participate in the market or are affordable. Out the 55 listed real estate companies on both exchanges (HOSE and HNX), we selected 45 companies for the survey (after eliminating companies with insufficient data or lack of data). Sample rate accounted for 81.82%.

Third, sampling characteristics: Companies are selected to represent 2 groups: Group 1 including companies at risk of bankruptcy and Group 2 including companies which are not at risk of bankruptcy. The total number of observations was 360, and for the purpose of achieving the best estimate, the sample selected consisted of 103 observations in group 1 and 257 observations in group 2 to conduct analysis and verification on specialized software SPSS.

Last, business areas: The main activities of the companies surveyed are real estate business, the main revenue and income of these companies is from real estate business.

The primary objective of this study is to investigate the relationship and extent of the impact of solvency to the bankruptcy risk of the listed real estate companies. In order to achieve the research objectives, this study propose a logit model which demonstrates the relationship between solvency and the risk of bankruptcy. Furthermore, the study will examine the impact of the operating cash flow to average total liabilities and net working capital to total assets on the bankruptcy risk of the listed real estate companies on Vietnam's stock exchange. Consequently, the study proposed some recommendations and solutions to improve solvency in order to prevent and to reduce the risk of bankruptcy in listed real estate companies in the stock exchange in Vietnam.

2. Literature review

The risk of bankruptcy is one of the issues that have received substantial attention from many researchers around the world such as Beaver (1966), Altman (1968), Ohlson (1980), in which Beaver and Altman were considered pioneers in using financial ratios to predict bankruptcy in empirical studies. When investigating bankruptcy, Beaver (1966) pointed out that three important indicators in determining financial crisis in a company; namely total debt to total assets ratio, return on assets, and cash flow to total debt ratio. However, Altman (1968) argued that this method is too simple to recognize the complexity of bankruptcy as it is impossible to classify companies based on a single financial ratio at a time. Thus, he used Multiple Discriminant Analysis (MDA) based on a combination of multiple ratios to propose a better prediction model. MDA produces a linear or quadratic combination of variables which helps to distinguish groups effectively.

In his study, Altman combined both financial data and market data of the research sample of 66 manufacturing companies (33 bankrupt companies and 33 non-bankrupt companies) and tested on 25 other firms with a probability of 96%. Following the work of Beaver (1966) and Altman (1968), many researchers have applied and developed the model to predict the bankruptcy risk in different countries. Typical examples include Fulmer (1984), Gu (2002), McClure (2004), Jame Kolari (2002), Bandyopadhyay (2006), Ugurlu and Aksoy (2006), Jouzbarkand et al. (2013), Pongsatat et al. (2004), Xu and Zhang (2009), Alkhatib and Bzour (2011) and Ohlson's (1980). In addition, along with advances in other fields such as research and artificial intelligence, many researchers strived to figure out more

appropriate and sophisticated approaches. Odom and Sharda (1990) developed an artificial intelligence model for predicting bankruptcy and comparing the results with the MDA regarding classification accuracy. Coats and Font (1993) used an artificial intelligence model to estimate the financial situation of a firm. Their results proved that artificial intelligence is more effective than MDA technique.

Recently, the issue of bankruptcy has also received great attention from many researchers in Vietnam. Most studies focused on the application of Altman's Z-score bankruptcy model. However, there have been several studies proposing new models such as studies of Nguyen (2009, 2012), Hoang (2011), Nguyen (2011), Dao (2013), each study had certain achievement and limitations. Therefore, the lack of a standardised theory on bankruptcy has resulted in many studies with various technical methods in different corporate structures in a certain country (Merton, 1974; Etemadi et al., 2008; Hoang & Chu, 2008).

The limitation of these studies is the consideration and evaluation of financial factors affecting the risk of bankruptcy in many aspects and in different business lines while the risk of bankruptcy is affected directly by the solvency and the risk of bankruptcy is different between business sectors. From the review of the above studies, in this study, we focus on determining the impact of factors reflecting solvency on the risk of bankruptcy in real estate business, including weaknesses: (1) Operating cash flows to average total liabilities ratio, (2) Net working capital to total assets ratio, (3) Owner's equity to long-term debt, and (4) Current assets to current liabilities.

3. Conceptual framework and methods

3.1. Conceptual framework

In this study, in order to measure the impact the solvency of real estate companies on bankruptcy risks, we use the following four criteria:

+ X_1 - *Operating cash flow to average total liabilities ratio*: This indicator reflects the balance between the ability of a business to generate money and the amount of debts that a business has to pay. The study of Beaver (1968) also used this indicator and concluded that it is the best indicator representing the solvency of enterprises.

+ X_2 - *Owner's equity to long-term debt:* this indicator measures the ability to pay long-term liabilities from the owner's equity.

+ X_3 - *Current assets to current liabilities (current ratio)*: This indicator shows that for every dollar of current debt, how much money a company has in its current assets to pay for the debt. If this ratio is too low, it shows that a company's solvency is not good.

+ X_4- *Net working capital to total assets*: Net operating capital is defined as the difference between current assets and current liabilities. Generally, a company experiencing consistent operating losses is likely to have current assets shrink relative to total assets.

After the variables are determined, a regression model is developed with dependent variables and independent variables as follows:

Probability (bankruptcy risk) = f(Operating cash flow to average total liabilities, Net working capital to total assets, current assets to current liabilities, owner's equity to long-term debt).
where:
       * Dependent variable: bankruptcy risk.
       * Independent variables: include four variables; namely operating cash flow to average total liabilities, net working capital to total assets, current assets to current liabilities, owner's equity to long-term debt.

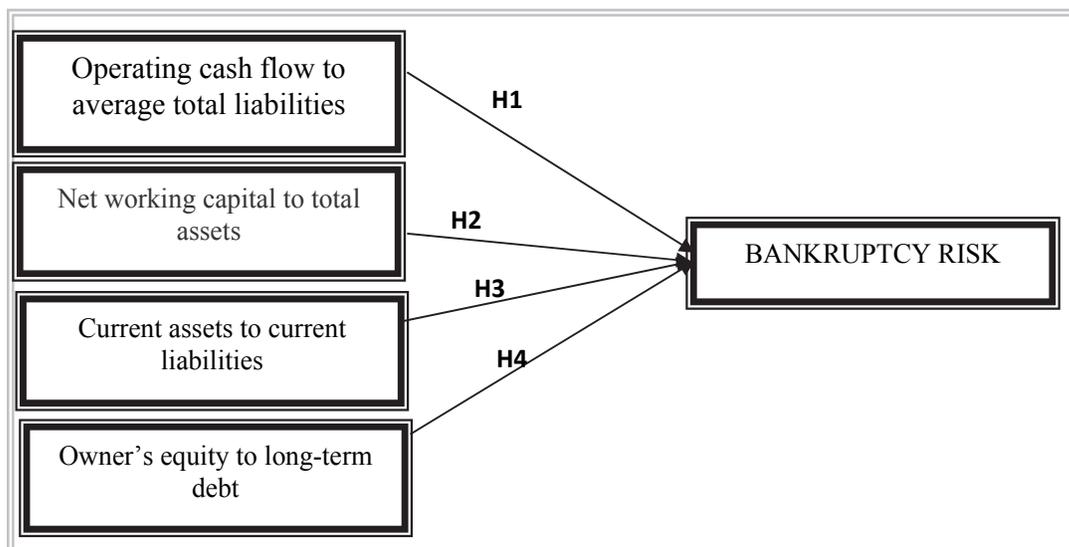A conceptual framework is displayed in Fig. 1:

Fig. 1. Conceptual framework

Source: Compiled by the authors based on research results

As the dependent variable in the study is bankruptcy or non-bankruptcy of companies (binary variables can only take values of either 0 or 1), the authors used the Logit model to study the relationship between bankruptcy risk (dependent variable) and indicators of solvency affecting the risk of bankruptcy (independent variable). We assume "c" is the value of the intersection, if a company has $P(Y_i = 1) > c$, that company is at risk of bankruptcy, otherwise, the company is not at risk of bankruptcy. It is noteworthy that the value of "c" may be different depending on the subjective analysis of the researcher on the issue. For the purpose of this study, companies with values of P ($Y\_i = 1$) equal or greater than 0.5 would be at risk of bankruptcy and the remaining firms with values of P ($Y\_i = 1$) less than 0.5 are classified as companies not at risk of bankruptcy (healthy companies). In this paper, the observations are classified as: Companies at risk of bankruptcy and companies not at risk bankruptcy. Binary dependent variables receive a value of 1 for observations (firm-year) at risk of bankruptcy and receive a value of 0 for observations (firm-year) not at risk of bankruptcy. The Logit model is now used to solve the problem of binary dependent variables only taking either value of "0" or "1".

From these analyzes, the authors propose the following research hypotheses:

+ Hypothesis H1: Operating cash flow to average total liabilities has a negative relationship with bankruptcy risk.

This indicator is considered by Beaver (1966) to have the most impact on distinguishing bankrupt companies and non-bankrupt companies. Regression result of real estate companies in Vietnam show that this indicator has an influence on bankruptcy risk. Net cash flows from operating activities are measured by cash inflows from operating activities minus cash outflows from operating activities. This indicator shows that if an enterprise can pay all its debts with net cash flow from the operating activities during the period. This ratio is the basis for investors and users to analyze the risk relating to cash flows, the solvency of enterprises from the net cash flow from operating activities of enterprises. Net cash flow from operating activities is derived from the index 20 in the statement of cash flows. This indicator was used in studies of many researchers such as Beaver (1966), Eljelly et.al (2001), Ohlson (1980).

+Hypothesis H2: Owner's equity to long-term debt has a negative relationship with bankruptcy risk.

The equity to debt ratio tells us how much net worth a company has relative to its debt. It does this by taking a company's shareholder equity and dividing it by total liabilities. The customary level of equity-to-debt has changed over time and depends on both economic factors and society's general feeling towards credit. All else, any company with a debt-to-equity ratio of less than 50% should be considered

more carefully to ensure there are no big risk risks lurking in the books, especially if those risks could portend a liquidity crisis.

+Hypothesis H3: Current assets to current liabilities has a negative relationship with bankruptcy risk.

Current solvency helps to determine whether an enterprise can pay short-term debts with the total net value of short-term assets. The higher the ratio, the higher the capability to repay short-term debts of the business and vice versa. Many authors have used this indicator in their research such as: Beaver (1966), Gu (2002), Edmister (1972), Altman et al (1977).

+Hypothesis H4: Net working capital to total assets has a negative relationship with bankruptcy risk.

Net working capital to total assets ratio is often found in research on corporate issues, which measures the net liquid assets of a business compared to total capital. This indicator was proved to have an influence on bankruptcy risk in many studies of researchers such as Atlman (1968), Ohlson (1980), Beaver (1966), Bandyopadhyay (2006), etc. Generally, consistent operating losses of a company in a long period of time will cause its net operating assets to shrink relative to its total assets.

3.2. Method

With secondary data collected from the financial statements and annual reports of 45 real estate companies listed on the Vietnam Stock Exchanges (HoChiMinh Stock Exchange, 2018), (Hanoi Stock Exchange, 2018) and collected from the Securities Commission The State of Vietnam from 2008 to 2015, the authors conducted divided companies divided into two groups: Group 1 includes companies at risk of bankruptcy and Group 2 includes companies without risk bankruptcy. The total number of observations was 360 and to achieve the best estimate, the selected sample included 103 observations in groups 1 and 257 in group 2 to conduct analysis and verification on SPSS specialized software.

Data analysis had three following steps:

Step 1: collecting and compiling data from various items in the financial statements during the period 2008-2015.

Step 2: Based on the data collected, selected financial indicators including four variables representing solvency were calculated.

Step 3: From the calculated data, data cleaning was conducted then data was analyzed and verified on SPSS 25 in order to figure out variables affecting bankruptcy risk. The results derived from the model will be the basis for enterprises to come up with appropriate solutions.

4. Research results and discussion

4.1. The situation of real estate companies listed on Vietnam's stock exchange

The statistical results based on the sample of 45 listed real estate firms show that the number of real estate companies classified as being at bankruptcy risk varied from year to year. During the period from 2011 to 2013, the number of companies at risk of bankruptcy was the highest.

Table 1
Statistic description

Bankruptcy risk	Year								Observations
	2008	2009	2010	2011	2012	2013	2014	2015	
If there is bankruptcy risk	31	38	43	27	24	25	37	32	257
If there is no bankruptcy risk	14	7	2	18	21	20	8	13	103
Total	45	45	45	45	45	45	45	45	360

Source: Compiled by the authors based on research results

The results in Table 1 reflect the difficult situation of the real estate market in this period when the government issued the monetary policy in 2011 to reduce money inflow into the real estate sector. Hence, it had a strong impact on the market and made the real estate market gloomy. Especially in 2012, it was the year of fierce competition and real estate companies strived to survive, resulting in a large number of

bankruptcies. Furthermore, the statistics of solvency show that the average value of operating cash flow to average total liabilities ratios of companies at bankruptcy risk is negative (-0.0458). This indicates that some companies in the group of being at bankruptcy risk were having difficulty in generating money from their business operations, which creates an imbalance cash flow and financial risks in the business operations of the firms. If this situation lasts for a long period of time, it is likely that the company will stop its operation, which may result in dissolution or bankruptcy.
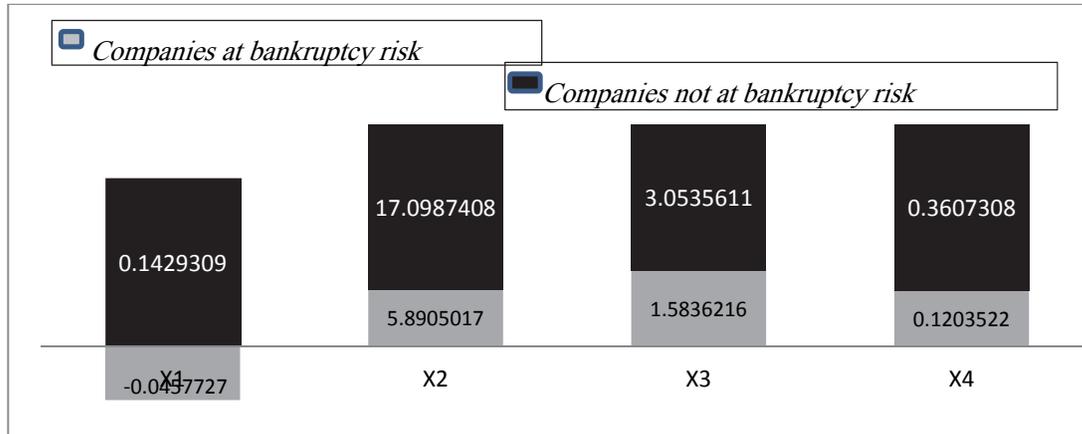

Fig. 2. Comparing the average value of solvency between companies at bankruptcy risk and companies not at bankruptcy risk

Source: Compiled by the authors based on research results

Fig. 2 shows that there is not much difference between the net working capital to total assets ratios of the two groups of companies. However, there is a major difference between the average values of owner's equity to long-term debt of two groups of companies. This difference is due to the fact that some companies had low ratios of owner's equity to long-term debt, while some companies had extremely high ratios (the reason is that they have a large amount of net working capital relative to long-term debt).

4.2. Regression analysis

As the dependent variable in the study is a binary variable which can only take values of either 0 or 1 (1= there is bankruptcy risk, 0 = there is no bankruptcy risk), the authors used the Logit model and analyzed data on SPSS 25. The results are shown in Table 2 as follows.

Table 2

Regression results

Notations	Variables	coefficients	S.E.	Wald	df	Sig.	Exp(B)
X_1	Operating cash flow to average total liabilities	-7.559	1.903	15.779	1	.000	1917.232
X_2	Owner's equity to long-term debt	.000	.021	.000	1	.993	1.000
X_3	Current assets to current liabilities	-.302	.381	.630	1	.427	1.353
X_4	Net working capital to total assets	-4.078	2.059	3.923	1	.048	59.044
Constant		3.992	.722	30.590	1	.000	.018

Source: Compiled by the authors based on research results

In Table 2, the Wald test used to task significance of the overall regression coefficients, shows that the significance values of variables X_1 (operating cash flow to average total liabilities), X4 (net working capital to total assets) are less than 0.05, so hypothesis H_0: $\beta_i=0$ is rejected. Thus the regression coefficients were significant and the model was used effectively. The probability of bankruptcy risk of a firm is calculated using the following formula:

$$P(Y_i = 1) = p_i = \frac{e^z}{1 + e^z}$$

or $Z = \ln(\frac{p}{1-p}) = X_i'\beta$. Based on results of Table 2, we have the following regression equation:

$$Z = \ln(\frac{p}{1-p}) = 3{,}992 - 7{,}559X_1 - 4{,}078X_4 \text{ Or } P = \frac{exp(3.992 - 7.559X_1 - 4.078X_4)}{1 + exp(3.992 - 7.559X_1 - 4.078X_4)}$$

From the regression equation, the following conclusions are drawn regarding influential factors:

X_1 - *Operation cash flow to average total liabilities:* The regression results show that the cash flow to average total debt variable is negatively associated with the risk of bankruptcy. Specifically, when the value of X_1 increases, the risk of bankruptcy decreases and vice versa. This result is consistent with the initial expectations of the authors and is consistent with the results of Beaver (1966) and Eljelly et al. (2001), Ohlson (1980). Specifically, Beaver (1966) argued that operating cash flow to average total liabilities ratio has the greatest impact on distinguishing companies at bankruptcy risk from companies not at bankruptcy risk.

X_4 - *Net working capital to total assets:* Apart from the operating cash flow to average total liabilities ratio, the net working capital to total assets ratio is also associated with the bankruptcy risk of real estate companies. This variable was also used by many researchers in prediction models of bankruptcy such as Beaver (1966), Altman (1968) and Nguyen (2009). The result shows that there was a negative relationship between X_4 and the risk of bankruptcy which means the higher the value of net working capital to total assets, the lower the risk of bankruptcy and vice versa. This result is consistent with the initial expectation of authors and consistent with studies of Altman (1968), Bandyopadhyay (2006), Ohlson (1980), and the study of Nguyen (2009). An enterprise that wants to operate uninterruptedly is required to maintain a certain amount of net working capital to meet short-term debt obligations and inventory requirements. Particularly, the greater the net working capital of a company, the higher the solvency of that company. In contrast, when net working capital declines, firms will lose their ability to pay, lose their flexibility and credibility with financial institutions, suppliers and customers. This leads to a decrease in the opportunity to potentially exploit new business opportunities.

X_2 - *Owner's equity to long-term debt* and X_3 - *Current assets to current liabilities:* Wald's test results on the significance of the overall regression coefficients show that variables X_2 and X_3 are significant when the level of significance is 0.05. This indicates that X^2 has an unclear effect on bankruptcy risk and X_2 is not statistically significant.

4.3. Checking model fit for logistic regression

In order to assess the model fit for logistic regression, in addition to testing the multicollinearity among independent variables through the correlation matrix, the following tests were conducted to assess the degree of fit of the model.

Testing the overall fit of the model:

Table 3 illustrates the results of testing overall fit of the model with the hypothesis H_0: $\beta_k = 0$ and alternative hypothesis H_1: there is at least one coefficient which is non-zero. This test examines the ability to explain the dependent variable of the set of independent variables.

Table 3
Assessing the fit of the regression model

		Chi-square	Df	Sig.
	Step	181.104	5	.000
Step 1	Block	181.104	5	.000
	Model	181.104	5	.000

Source: Compiled by the authors based on research results

The results in this table show that overall fit has a sig. = 0.000 so H_0 is rejected. This means that the linear combination of all coefficients in the model is statistically significant in explaining the dependent variable.

Testing the fit of the model:

Table 4 shows the results of the test of model fit. Unlike normal linear regression that the larger the coefficient R^2, the more appropriate the model, the logistic regression used an indicator -2LL (-2loglikelihood) to evaluate the fit of the model. The smaller the value of -2LL, the higher the model fit. The

smallest value of -2LL is 0 (which means no error), indicating the model is perfectly fit. This table shows that -2LL = 106.368 which is relatively low, indicating a good fit of the overall model.

Table 4

Testing the fit of the model

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	106.368a	.523	.757

Source: Compiled by the authors based on research results

Testing the predictive power of the model:

The test of the predictive power of the model is used to measure the accuracy of the prediction model regarding the bankruptcy risk of companies relative to actual results.

Table 5

Testing the predictive power of the model

Bankruptcy risk	Prediction (intersection point is 0.5)			
	If there is bank-ruptcy risk	If there is no bankruptcy risk	Total	Percentage of accu-rate prediction (%)
If there is bankruptcy risk	58	9	67	86.6
If there is no bankruptcy risk	12	166	178	93.3
Total	70	175	245	91.4

Source: Compiled by the authors based on research results

Table 5 presents the results of the comparison between the actual results and prediction of the model. The results show that among 178 cases predicted to be not at risk of bankruptcy, the model correctly predicted 166 cases, with the accuracy rate of 93.3%. For 67 companies at bankruptcy risk, the model has 9 cases of false predictions and accuracy rate was 86.6%. Therefore, the prediction of the number of companies not at bankruptcy risk was slightly more accurate (93.3%) compared with those companies at risk of bankruptcy (86.6%). The accuracy rate of the overall predictive model is 91.4%. This outstanding accuracy implies that the model has the potential for practical application when studying the impact of solvency to the bankruptcy risk of listed real estate companies.

5. Conclusions and recommendations

The research results show that: Among four indicators of solvency, there are two indicators that can affect the risk of bankruptcy of the real estate companies listed on the stock exchange of Vietnam which are: a) operating cash flow to average total liabilities and b) net working capital to total assets. These two indicators are negatively associated with the risk of bankruptcy. Furthermore, the results of the study indicated that two remaining indicators having no impact on bankruptcy risk of listed real estate companies on Vietnam's stock exchange are: (1) current solvency ratio and (2) owner's equity to long-term debt. From the research results, the authors make the following recommendations:

With the government:

In order for the real estate market to develop, the government should create transparency in the real estate market by developing and issuing a system of documents relating to real estate business, creating a legal business environment, clearly defining the rights and obligations of the real estate business. At the same time, the government should provide capital support to enterprises with certain criteria; develop real estate financial channels (mortgages, real estate bonds, saving and lending associations, savings banks, institutional and policy improvement for the real estate market); appropriately implement the interest rate policies, land policies, real estate transfer policies. Particularly, the bankruptcy law and relevant legal and practical guidance should be improved.

With real estate associations and real estate companies:

Real Estate Associations should submit a petition to the management agencies to simplify administrative procedures and provide preferential policies for businesses investing in low and medium cost real estates.

Furthermore, real estate companies need to review their business strategy; carry out market research, examine market segmentation; be flexible in the restructuring of products, business restructuring, place attention to issues such as capital mobilization, joint ventures, association. Particular emphasis is placed on improving the quality of operating cash flows and regulating net working capital appropriately

With credit and monetary institutions:

It is necessary to reconsider interest rate policy, prioritize lending to feasible and appropriate projects, serving poor workers, consider for real estate companies to restructure their old debts which were subjected to high interest rates.

Thus, in order to promote the market to overcome difficult periods, increasing solvency and preventing real estate companies from the financial crisis are the responsibilities of stakeholders. Solutions need to be deployed synchronously and resources must be exploited. Especially, cash should flow through the real estate market. Only when these solutions are implemented simultaneously, the real estate market has the impetus for positive changes. As prevention is always better than cure, enterprises should place emphasis on solvency indicators and take timely measures to improve these indicators to reduce the risk of bankruptcy.

The limitation of the study only refers to the impact of solvency on the risk of bankruptcy of listed real estate companies on Vietnam's stock exchange, so the level of generalization is not high. In the near future, the authors hope to expand the number of survey samples not only limited to listed real estate companies but also to survey almost all listed and unlisted businesses in Vietnam.

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