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A Logistic Regression Analysis for Predicting Bankruptcy in the Hospitality Industry

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A LOGISTIC REGRESSION ANALYSIS FOR PREDICTING BANKRUPTCY IN THE HOSPITALITY INDUSTRY

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ABSTRACT

The purpose of this study was to develop logit models for predicting bankruptcy in the hospitality industry. Using the financial data of 16 U.S. hospitality firms that went bankrupt between 1999 and 2004 and 16 non-bankrupt matching firms, this study estimated logit models for predicting bankruptcy up to 2 years in advance. The logit models, resulting from forward stepwise selection procedures, could correctly predict 91% and 84% of bankruptcy cases 1 and 2 years earlier, respectively. The estimated models imply that a hospitality firm is more likely to go bankrupt if it has lower operating cash flows and higher total liabilities. The models suggest that a prudent sales growth strategy accompanied by tighter control of operating expenses and less debt financing can help enhance a firm's ability to meet its financial obligations and thereby reduce bankruptcy risk.

INTRODUCTION

According to Rushmore (1998), starting from the late 1990s the U.S. lodging industry was heading into another cycle of new supply and overbuilding. In the restaurant industry, a significant number of U.S. restaurants go bankrupt every year due to the fast expansion accompanied by fierce competition (Gu, 2002). Similar situation was occurring in the casino industry. Gu (2001) found that U.S. casino hotels continued to face significant competition and challenging business conditions due to continuous expansion and overcapacity. In addition to the hardship resulting from market saturation, the 9/11 terrorist attacks have further increased the business risk for the industry and made the market conditions even more challenging for hospitality operations. Gu & Gao (2000) recorded only 14 bankruptcy cases among publicly traded hospitality firms for the 9-year period from 1988 through 1996, whereas this study

observed 16 hospitality bankrupt cases during the 6-year period 1999-2004. Evidently, hospitality firms have now become more vulnerable to bankruptcy in recent years.

Despite the fact that numerous hospitality firms go out of business year after year, not much effort has been made to predict bankruptcy for hospitality firms. To the best of our knowledge, there have been only two studies devoted to bankruptcy prediction in the hospitality industry. Gu and Gao (2000) estimated a multivariate discriminant analysis (MDA) model to predict bankruptcy for hospitality firms including restaurant, hotel, and casino firms. Gu (2002) further focused on the bankruptcy prediction in the restaurant industry using the same MDA methodology. The MDA model is subject to restrictive assumptions, especially the independent variables' multivariate normality which was often violated (Lennox, 1999). Both Gu & Gao (2000) and Gu (2002) studies failed to check the multivariate normality of their predicting variables, thus making the statistical soundness of the estimated models doubtful. Another limitation of the two studies was the short-term predictive ability of their MDA models. Both models were designed to predict bankruptcy only one year in advance. Realizing the limitations of the MDA models estimated by the two previous studies (Gu, 2002; Gu & Gao; 2000), this study attempts to develop a logistic regression prediction model that is free from restrictive assumptions (Lennox, 1999). Furthermore, unlike those two studies, the underlying study seeks to predict hospitality firm bankruptcy as early as two years in advance. Therefore, our study should make new contributions to hospitality bankruptcy prediction research. The model developed in this study will be not only statistically more viable but also practically more useful. As Gu & Gao (2000) argued, bankruptcy causes substantial financial losses to creditors, stockholders, and ultimately the society in terms of lost tax revenue, income, and jobs. Finding a statistically more reliable model with a longer prediction timeframe, as attempted here, will help

the hospitality industry take earlier preventive actions and hopefully reduce bankruptcy cases and minimize financial losses associated with bankruptcy (Gu, 2002; Gu & Gao, 2000). The findings of our study should benefit not only the hospitality academia but also the hospitality industry.

REVIEW OF PREVIOUS STUDIES

Beaver (1966) pioneered an empirical study in bankruptcy prediction using a univariate model. Since Beaver's univariate examination, numerous studies in bankruptcy prediction employed the statistical technique of MDA that allows for simultaneous consideration of several financial variables on the purpose of developing a bankruptcy prediction model. Although early bankruptcy prediction studies (Altman, 1968; Blum, 1974; Dambolena & Khoury; 1980; Deakin, 1972) used MDA to predict bankruoptcy, its suitability relies on three assumptions for proper application. According to Lennox (1999), these three assumptions are: (1) the predictor variables are assumed to have a multivariate normal distribution; (2) the samples of bankrupt and non-bankrupt firms are assumed to be drawn at random from their respective populations; and (3) MDA is only optimal when the restriction of equal group covariate matrices is satisfied.

Altman (1968) first employed MDA to predict firm bankruptcy. In his study, a group of 33 manufacturing firms that filed for bankruptcy petitions under Chapter 11 was matched by a group of 33 non-bankrupt manufacturing firms in terms of asset size and industry classification. Altman's model included five variables (working capital/total assets, retained earning/total assets, earning before interest and taxes (EBIT)/total assets, market value of equity/par value of debt, and sales/total assets and achieved 79% prediction accuracy for the holdout sample one year prior to bankruptcy. Deakin (1972) improved the accuracy of Altman's model by estimating a MDA model that included 14 financial ratios. His MDA model had error rates for the holdout sample at 22%, 16%, 12%, 23%, and 15% for one to five years prior to bankruptcy, respectively.

Blum (1974) used the MDA model to predict bankruptcy and concluded that his model could correctly predict 94% of bankruptcy cases one year before bankruptcy. Dambolena and Khoury (1980) constructed MDA models and achieved prediction accuracy rates of 87%, 85%, and 78% for 1, 3, and 5 years prior to bankruptcy, respectively. In the study, they included the stability of all financial ratios over time (measured by standard deviations) and the levels of these ratios as explanatory variables in the derivation of the MDA model.

Since the early 1980s, researchers (Darayseh, Waples, & Tsoukalas, 2003; Lennox, 1999; Ohlson, 1980; Zavgren, 1985) have switched their attention to the logit (logistic regression) model that has no restrictive assumptions for bankruptcy prediction. Ohlson (1980) first estimated a logit model with 9 independent variables and found that his model could correctly predict over 92% of the bankrupt firms 2 years earlier. Zavgren (1985) also used the logit analysis for predicting bankruptcy 1-5 years in advance. While the accuracy rate of his logit model for one year prediction was about the same as Ohlson's (1980) 92%, the error rates for longer predictions were similar to or slightly lower than those reported in the previous bankruptcy prediction studies using MDA. Darayseh et al. (2003) developed a logit model for bankruptcy prediction using a number of economic variables in combination with firm-wise financial ratios. In their study, a group of 110 manufacturing firms that went bankrupt between 1990 and 1997 was matched by 110 non-bankrupt firms according to total assets and industry classification. Their estimated model could make correct predictions for 87.82% and 89.50% of the in-sample and holdout samples for 1 year prior to bankruptcy.

Some researchers (Collens and Green, 1982; Hamer, 1983; Lennox, 1999; Lo, 1986; Press & Wilson, 1978; Theodossiou, 1991) compared the usefulness of the popular statistical techniques used in bankruptcy prediction. Their conclusions were mixed. Lo (1986) compared

the performance of a logit model versus a MDA model in predicting bankruptcy. While the logit model was more robust than MDA in parameter estimation, both models produced consistent estimates. In Theodossiou's (1991) study, three statistical techniques, namely the linear probability model, the logit model, and the probit model, were compared to identify the one with the most appealing performance in predicting bankruptcy in Greece. The results showed that all three models were successful in predicting bankruptcy with accuracy rates over 90%. However, both logit and probit models were superior to the linear probability model. Similar to Theodossiou's research (1991), Lennox's study (1999) examined the reasons for bankruptcy for UK companies using three popular statistical techniques. He constructed a MDA, a logit, and a probit model to identify bankrupt companies in the United Kingdom and compared the performance of the three models in predicting bankruptcy. The results showed that the probit and logit models outperformd the discriminant model. Collens and Green (1982), Hamer (1983), and Press and Wilson (1978) compared the performance of the logit model and the MDA model in predicting bankruptcy and found that the explanatory power of the logit model is similar to that of MDA.

For the hospitality industry, there is not much documented bankruptcy prediction research. Olsen, Bellas, and Kish (1983) first attempted to predict business failure in the restaurant industry. In their study, 7 failed restaurant firms were compared with 12 non-failed. A graph analysis of financial ratios, rather than sophisticated models, was used. The advantage of that analysis is its easy application in a real life situation. However, a major drawback of the study, as the authors admitted, is its lack of sophisticated statistical analysis.

Kwansa and Parsa (1991) examined business failure in restaurant companies. Instead of developing a statistical model, they adopted an event approach to identify events in the

bankruptcy process that characterized restaurant companies filing for bankruptcy under Chapter 11 or Chapter 7. The event approach, however, was an explanatory model rather than a predictive one. While the approach did not discriminate between failing and non-failing firms, it compared the two groups based on the characteristics common to failing firms, which are absent in the non-failing group.

Cho's (1994) doctoral dissertation investigated business failure in the hospitality industry and estimated logit models for predicting restaurant and hotel failures respectively. While the two-variable restaurant model achieved 91% in-sample classification accuracy one year prior to business failure, the one-variable hotel model could classify 92 percent of the in-sample firms correctly. The study defined business failure as consecutive negative net income for 3 or more years. Therefore, Cho's (1994) logit models were developed for predicting economic loss, rather than bankruptcy under Chapter 11. Another study by Kwansa and Cho (1995) estimated the size of indirect bankruptcy costs for bankruptcy restaurant firms and its significance in restaurant capital structure decision. The study shows that indirect bankruptcy costs are critical and substantial, perhaps more substantial than direct costs. That study, however, was not designed for bankruptcy prediction.

To the best of our knowledge, there are two documented studies specifically designed for hospitality bankruptcy prediction. Gu and Gao (2000) developed a MDA prediction model with five variables (total liabilities to total assets, EBIT to current liabilities, gross profit margin, long-term debts to total assets, and sales to fixed assets). The model was able to correctly predict 93% of the sample firms 1 year in advance. In that study, a group of 14 hospitality firms that went bankrupt from 1987 to 1996 was matched with a group of 14 non-bankrupt hospitality firms according to total assets and standard industrial classification (SIC) code. Gu (2002) further

estimated a MDA model for predicting bankruptcy in the restaurant industry alone. In his study, a sample of 18 public restaurant firms filing under Chapter 11 or Chapter 7 during the period 1986-1998 was matched by 18 non-bankrupt restaurant firms in terms of total assets. The MDA model estimation found two variables (EBIT to total liabilities and total liabilities to total assets) as the best discriminators between bankrupt and non-bankrupt restaurant firms. The MDA model was able to classify 92% of the sample firms into the right categories one year prior to bankruptcy. Both studies (Gu, 2002; Gu & Gao, 2000), however, did not check the multivariate normality of the predicting variables and hence their MDA models statistical viability remains unwarranted.

DATA AND METHODOLOGY

This study used New Business Generation Research, Inc.'s 2004 bankruptcy database to search for the hospitality firms that went bankrupt from 1999 to 2004. In this study, bankrupt firms were identified as having filed for bankruptcy under Chapter 11 or Chapter 7. Under Chapter 11, the bankrupt firms are allowed to continue their business by means of a plan of reorganization. Filing for Chapter 11 allows a bankrupt firm to gain temporary relief from paying debts. After filing for Chapter 11, if a bankrupt firm is unable to reorganize successfully, it is converted to Chapter 7 liquidation. Under Chapter 7, the bankrupt firm goes completely out of business and its assets are liquidated to pay off outstanding debts.

The sample for this study was determined based on the availability of financial data in the COMPUSTAT database. In removing firms with incomplete or unavailable financial data from the database, this study was able to collect a bankruptcy sample of publicly traded 16 hospitality firms. Among the 16 bankrupt hospitality firms, 10 firms are drawn from the restaurants industry

with a SIC code of 5812. The other 6 firms were collected from the hotel and casino industries with either a SIC code of 7011 or 7990. Numerous previous bankruptcy prediction studies (Altman, 1968; Aziz, Emanuel, & Lawson, 1988; Gentry, Newbold, & Whitford, 1985; Gu, 2002; Gu & Gao, 2000; Lennox, 1999; Lo, 1986; Mensah, 1984; Zavgren, 1985) paired bankrupt firms with non-bankrupt firms according to industry classification and asset size to estimate bankruptcy prediction models. The purpose of such pairing is to control for the industry and size effect, if any. Similarly, the non-bankrupt matching firm in this study must be a firm in the same type of business and with similar total assets. Financial data for 32 sample hospitality companies were extracted from the COMPUSTAT database in order to derive their financial ratios. The 16 bankrupt firms and their matching non-bankrupt firms are listed in Table 1.

(Table 1 here)

A literature review on bankruptcy prediction studies indicates that previous bankruptcy studies used financial ratios measuring four financial features of a firm, namely liquidity, solvency, profitability, and operating efficiency, for estimating prediction models. Taking its cue from the literature, this study employed 13 financial ratios representative of the four financial features and commonly used by previous studies to estimate the prediction models.

Liquidity ratios measure a firm's ability to satisfy its short-term obligations as they come due. Since a common phenomenon in financial distress or bankruptcy is low or declining liquidity, these ratios are regarded as good indictors of cash flow problems (Gitman & Madura, 2001). Moyer and Chatfield (1983) hypothesized that high liquidity indicates a low level of short-term obligation and implies low default risk. In this study, liquidity was measured by current ratio (defined as current assets divided by current liabilities), quick ratio (cash,

marketable securities, accounts receivable divided by current liabilities), and operating cash flows to current liabilities.

Solvency ratios would be expected to have a greater influence on bankruptcy because they measure the firm's ability to meet the debt service obligations (Zavgren, 1985). Solvency ratios measure the degree of indebtedness and the firm's ability to meet its long-term obligations. A firm's debt position refers to the amount of the creditor's money being used to generate profits (Gitman & Madura, 2001). While liquidity refers to the immediate default risk, solvency indicates fundamental causes of business failure rooted in a firm's financing policy (Gu, 2002). This study used debt ratio (total liabilities divided by total assets), long-term debt to total capitalization, operating cash flows to total liabilities, and times interest earned ratio (EBIT divided by interest expenses) as solvency ratios for model estimation. While the first two ratios measure the degree of debt use, the latter two measure a firm's ability to repay debts.

According to Logue and Merville (1972), profitability is expected to have a great impact on bankruptcy because high profitability lowers the chance of business failure. Scherrer and Mathison (1996) supported the proposition and argued that high profitability stabilizes operating cash flows and thus lowers the overall risk of the firm. Gu (2002) pointed out that unprofitable firms with cumulative losses tend to end up with negative worth and eventually go out of business. In this study, the firm's profitability was measured by gross profit margin (gross profits divided by sales), net profit margin (net income divided by sales), gross return on assets (EBIT divided by total assets), and return on assets (net income divided by total assets).

Zavgren (1985) proposed that operating efficiency would be expected to have a significant impact on bankruptcy because it measures the firm's ability to use assets to full capacity. Also, firms with higher operating efficiency tend to generate higher profits and thus

tend to be associated with lower probability of business failure (Logue & Merville, 1972). According to Gu (2002), high operating efficiency would help the firm increase its profitability and liquidity and thus lower default risk. This study employed total asset turnover (sales divided by total assets) and fixed assets turnover (sales divided by fixed assets) as operating efficiency measures.

Table 2 compares the mean values of the 13 candidate ratios of the 16 bankrupt hospitality firms in comparison with those of the 16 non-bankrupt hospitality firms. Their paired *t*-test statistics and related *P* values are also presented in the table. The t-tests of the differences in the means of the 13 ratios reveal that at the 0.05 significance level, the bankrupt firms were significantly lower in operating cash flows to current liabilities, operating cash flows to total liabilities, times interest earned ratio, net profit margin, and gross return on assets either one year or two years prior to bankruptcy years. Their mean return on assets two years prior to bankruptcy was also significantly lower than that of the non-bankrupt firms.

(Table 2 here)

Considering that the US economy experienced a downturn in 2001 and 2002, a dummy variable was created to represent macro economy impact, if any. For predictions made in 2001 and 2002, the dummy was assigned a value of 1 whereas for predictions made in other years, the dummy was given a value of 0.

The logistic regression model was estimated to analyze and predict bankruptcy in the hospitality industry. Logistic regression, also called logit analysis, is a form of regression model that is used when the dependent variable is dichotomous (SPSS, 2003). In this study, the forward stepwise regression method was employed to select the optimal sets of candidate variables that could best predict bankruptcy.

In estimating the logistic regression model for predicting bankruptcy, the dependent variable was assigned a value of 1 for bankrupt firms and 2 to non-bankrupt firms. According to Liao (1994), the logistic regression model with a dichotomous dependent variable can be expressed in terms of logit or event probability form. From the logit model, the estimated value of the dependent variable can be interpreted as the predicted probability of an event happening, which lies between 0 and 1 (Lio, 1994). In this study, the estimated value of the dichotomous dependent variable is interpreted as the predicted probability of non-bankruptcy or P_i. When expressed in logit form, the "odds" are defined as the ratio of the probability of non-bankruptcy to bankruptcy. The odds of bankruptcy can be defined as the ratio $P_i/(1-P_i)$ where P_i is the probability of non-bankruptcy. When expressed in logit form, the model can be specified as a linear function of the firm's financial ratios:

$$\text{Log } [P_i / (1-P_i)] = \beta_0 + \beta_1 X_{i1} + \ldots\ldots + \beta_n X_{in}$$

where:

P_i = probability of non-bankruptcy in the *i*th firm
β_o = an intercept
X_1-X_n = the financial ratios
β_1- β_n = coefficients of the *n*th financial ratios
X_1-X_n = *n*th financial ratio of the *i*th firm

By solving P_i through the above equation, the predicted probability of non-bankruptcy or P_i is described as:

$$P_i = 1 / [1 + e^{-y}]$$

where:

e = the base of the natural logarithm,
$y = \beta_0 + \beta_1 X_{i1} + \ldots\ldots + \beta_n X_{in}$

In this study, the logit (*y*) value of each sample firm was calculated based on the estimated logit model and then applied to the probability function, $P_i = 1 / [1 + e^{-y}]$, in order to

classify sample firms into two groups. In this study, companies with P_i values below 0.5 were classified into the bankruptcy group and companies with P_i values above 0.5 were classified into the non-bankruptcy group.

As indicated earlier, one limitation of the two previous studies (Gu, 2002; Gu & Gao, 2000) on hospitality bankruptcy prediction was that their estimated models were designed to predict bankruptcy just one year in advance. A one-year time frame may be too short to prevent business failure from happening. If a model could predict bankruptcy earlier, say two or three years in advance, then it would enable the firm to have enough time to take corrective measures and lower the chance of eventual bankruptcy. Therefore, this study estimated not only a logistic regression model for predicting hospitality bankruptcy one year earlier but also a model for bankruptcy prediction two years in advance.

ESTIMATION OF THE LOGISTIC REGRESSION MODELS

The study utilized the stepwise procedure of the SPSS program to estimate the logistic regression models. The stepwise regression method started with 13 candidate variables and the statistical significance for inclusion and exclusion of a variable in the model was set at the 0.05 level. The significance of the score statistics and the probability of a likelihood-ratio statistic based on the maximum partial likelihood estimates were used to determine which variables to enter or drop from the model. From the 13 candidate variables, only one variable, operating cash flows to total liabilities, was selected and retained in the model because it was believed to best differentiate the bankrupt from the non-bankrupt hospitality firms. The two estimated logistic regression models for firms selected via the stepwise procedure are presented in Table 3.

(Table 3 here)

While Model 1 is the estimated logistic regression model for predicting bankruptcy 1 year prior to bankruptcy, Model 2 is the estimated logistic model for predicting bankruptcy 2 years prior to bankruptcy. In this study, the statistical significance of the estimated models was tested with the model's goodness-of-fit measures. Hosmer and Lemeshow's goodness-of-fit value, which is not significant at the 0.05 level, revealed that both Model 1 and Model 2 fit the data well because there were no significant discrepancies between the observed and predicted classifications. The model χ^2 of the Omnibus Tests for Model 1 and Model 2 is 32.058 and 13.458, respectively. The observed significance level associated with χ^2 is less than 0.01, indicating that the overall fitness of both models was significant. These two goodness-of-fit measures support acceptance of the one-variable model as a significant logistic regression model for predicting bankruptcy as early as 2 years in advance.

The Wald statistic is equivalent to the t-statistic in the regular linear multiple regression (Liao, 1994). In both Model 1 and Model 2, the coefficient for operating cash flows to total liabilities is statistically significant at the 0.05 level. According to the analysis of the constant and the coefficient of the independent variable, Model 1 and Model 2 for predicting hospitality firm bankruptcy can be written in terms of the logit as follows:

Logit (y) = -4.592 + 33.861X (Model 1)

Logit (y) = -1.586 + 11.059X (Model 2)

where:

X = operating cash flows to total liabilities

IN-SAMPLE STATUS CLASSIFICATION

Sample firms were classified into a bankrupt group and a non-bankrupt group by the estimated logistic regression model to measure the classification accuracy of the model. The logit

(y) value of each sample firm was calculated based on the estimated model and then applied to the probability function, $P_i = 1 / [1 + e^{-y}]$, to obtain the predicted probability of the occurrence of bankruptcy. The estimated probability of the occurrence of bankruptcy, P_i, was compared with the cutoff probability of 0.5 to identify the sample firms' predicted status. While firms with P_i below 0.5 were classified into the bankrupt group, firms with P_i above 0.5 were classified into the non-bankrupt group.

Table 4 presents the predicted probability of bankruptcy for the sample firms and their assigned membership classifications. In Model 1, three out of 32 sample companies were misclassified, indicating an error rate at 9%. One non-bankrupt company, Main Street & Main Inc., was misclassified as a bankrupt company, and two bankrupt companies, Fresh Choice Inc., and Furrs Restaurant Group Inc., were misclassified as non-bankrupt companies. In Model 2, 5 out of the 32 companies were misclassified, showing an error rate of 16%. Two non-bankrupt companies, ELXSI Corp. and Meritage Hospitality Group, Inc., were misclassified as bankrupt companies and three bankrupt-companies, Fresh Choice Inc., Furrs Restaurant Group Inc., and ICH Corp., were misclassified as non-bankrupt companies. Table 5 presents the classification accuracy of the estimated two models. The classification accuracy of the model was determined by comparing the actual status with the predicted status. Table 5 shows that the estimated logit models could correctly classify 84% and 91% of bankruptcy versus non-bankruptcy status for 1 and 2 years earlier, respectively, similar to accuracy rates achieved by previous studies for non-hospitality industries. Also, our accuracy rate for predicting bankruptcy 1 year in advance is similar to that of Gu and Gao's (2000) MDA model for the hospitality industry. Our prediction results show that the longer the prediction time horizon, the less accurate the prediction results. The same accuracy pattern was commonly observed in previous studies.

(Tables 4 and 5 here)

DISCUSSION OF MODEL VARIABLES

In this study, the forward stepwise procedure selected only one variable, operating cash flows to total liabilities, as the variable that could best distinguish the bankrupt group from the non-bankrupt group. This does not mean that the bankrupt group differs from the non-bankrupt group on only one financial ratio. As indicated in Table 2, the two groups are significantly different in the five ratios of previous 1 to 2 years prior to bankruptcy. However, the logistic stepwise regression procedure selected only one variable for the model estimation. It is not uncommon for a bankruptcy prediction model to include only one or two variables. Dimitras, Zanakis, and Zopounidis (1996) examined 59 bankruptcy prediction models estimated by previous studies and found that 17 out of the 59 bankruptcy prediction models included only one or two independent variables. The restaurant bankruptcy prediction MDA model developed by Gu (2002) had only two solvency ratios, EBIT/total liability and total liabilities/total assets, as the optimal set of variables that could best classify the bankrupt group from non-bankrupt group.

Interestingly, the dummy variable representing macro economic impact was not included in both models. Possibly, other variables, especially those containing information of profitability and cash flows, have absorbed the impact of the economy, thus making this variable unnecessary.

In our models, operating cash flows to total liabilities is a solvency ratio that measures the firm's ability to meet its debt service obligations using operation generated cash flows. The positive sign of its coefficient suggests that a large positive value of this ratio will lead to a larger logit (y) value and a higher probability of being non-bankrupt. On the contrary, the predicting variable implies that hospitality firms generating lower operating cash flows but are with higher

degree of debt use are more likely to go bankrupt. In essence, the operating cash flows to total liabilities ratio reflects a firm's debt service ability at a given level of debt financing. It should be pointed out that operating cash flows are actually profits in terms of cash flow. Therefore, operating cash flows to total liabilities can also be regarded as a cash flow profitability ratio relative to liabilities. The retention of this ratio, rather than an accounting profitability ratio, in the model indicates the importance of cash flows in a hospitality firm's bankruptcy prevention.

As our models suggest, at given level of debt financing, a hospitality firm's ability to generate sufficient operating cash flows to cover the debts is critical to lowering its financial distress risk. To lower the risk of being bankrupt, on one hand a firm should adopt a prudent debt-financing policy to reduce its indebtedness. On the other hand, it must maximize its operating cash flow. According to Keown et al. (2006), in competitive markets, large profits are hard to earn and difficult to exist for long and to remain profitable, a firm must have cost advantages over its competitors. Therefore, in today's challenging hospitality market featured with overcapacity and intensified competition, decrease operating costs to boost operating cash would be essential for hospitality firms to avoid bankruptcy. In particular, tight control of labor costs is highly needed to enhance operating cash flows and reduce bankruptcy risk. Schmidgall (2002) reported that in 1999, labor costs, including payroll and payroll-related taxes, totaled 48 percent of revenue for the U.S. lodging industry. According to Miller and Mandelbaum (2005), a heated issue in the hospitality industry today is the rising labor costs, including payrolls and employee benefits. The labor costs are the largest operating cost item in the hospitality industry and thus should be the major area for cost saving efforts. Hospitality companies must reduce their operating costs, and particularly the high labor costs, if they are to survive in today's highly competitive markets.

CONCLUSIONS AND SUGGESTIONS FOR FUTURE STUDIES

This study developed bankruptcy prediction models for hospitality firms using the logistic regression analysis. The logistic regression models, resulting from forward stepwise selection procedures, achieved prediction accuracy rates of 91% and 84% for 1 and 2 years prior to bankruptcy, respectively. The predictive accuracy of the estimated models in this study is similar to that achieved in previous studies for other industries. Both models have operating cash flows to total liabilities as the only predicting variable. This single predicting variable suggests that in the hospitality industry, a firm that heavily relies on debt financing but is unable to generate sufficient operating cash flows is highly vulnerable to bankruptcy. Therefore, two major implications can be drawn from our study for the hospitality industry. First, a conservative financing policy with light reliance on debts is recommendable, especially for those firms unable to generate sufficient and stable operating cash flows in highly competitive markets due to overcapacity or market saturation. Second, since labor costs are the largest cost item in hospitality operations, tight control on labor costs could potentially result in significant cost savings and thus boost operating cash flows. Achieving labor cost advantage over competitors may be the key to cash flow enhancement in extremely competitive markets. Given today's relatively uncertain operating environments, a conservative growth policy along with low debt financing and tight operating cost control should help hospitality operators achieve a higher operating cash flows and prevent their companies from going out of business.

A major drawback of this study is that the models' predictive accuracy was derived from in-sample firms already used for model estimation. Due the small sample size, this study was unable to create a hold-out sub-sample for accuracy test. Future studies with larger samples may use a separate hold-out sample to test the accuracy of prediction. An accuracy test based on a

sample not used for model estimation would provide a better assessment of the predictive power of the logit model.

Non-financial factors, such as geographic diversification and market segmentation, may also help predict bankruptcy because they are likely to have some impact on a firm's financial variables. Given a small sample of only 16 bankrupt firms, this study did not add those as candidate variables because this could further reduce the degree of freedom. Future studies with larger samples may consider adding these two factors. Taking its cue from previous studies, this study paired bankrupt firms with non-bankrupt firms based on total assets. Future studies may alternatively use market value of the firm as the basis for pairing.

This study predicted hospitality firm bankruptcy as early as 2 years in advance of its occurrence. However, two years's warning may still be too short for a hospitality firm to take corrective actions to prevent bankruptcy. Future research should also extend the time horizon for bankruptcy prediction. Models capable of predicting hospitality firm bankruptcy with a longer prediction timeframe, say 4 to 5 years, will enable hospitality firms to take preventive actions as early as possible.

The neural network analysis (NNA) has appeared as a relatively new approach for bankruptcy prediction. Charalambous, Charitou and Kaourou (2000), Fletcher and Goss (1993), and Zhang, Hu, Patuwo and Indro (1999) have showed that the NNA approach has the potential to outperform the logit model in terms of prediction accuracy for non-hospitality industries. This new approach should also be employed for hospitality bankruptcy prediction in the future.

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Table 1. Sample of Bankrupt Hospitality Firms and Matching Non-Bankrupt Hospitality Firms (Assets in $million)

Bankrupt Firms	Year of Bankruptcy	Total Assets	Non-bankrupt Firms	Total Assets
AmeriKing Inc.	2002	233.17	The Steak N Shake Corp.	245.07
Big Buck Brewery & Steakhouse Inc.	2004	24.13	Backyard Burgers Inc.	24.50
Fresh Choice Inc.	2004	30.85	Creative Host Services Inc.	32.65
Furrs Restaurant Group Inc.	2003	76.65	ELXSI Corp.	78.70
ICH Corp.	2002	120.42	Main Street & Main Inc.	108.26
Planet Hollywood International Inc.	2001	146.21	Garden Fresh Restaurant Group	147.19
Prandium Inc.	2002	108.00	Frisch's Restaurant Inc.	138.64

Roadhouse Grill Inc.	2002	71.30	J Alexander Corp.	71.30
Schlotzskys Inc.	2004	125.79	Checkers Drive-In Restaurants Inc.	129.44
Steakhouse Partners Inc.	2002	32.71	Meritage Hospitality Group Inc.	37.88
Claridge Hotels & Casinos Corp.	1999	131.78	Monarch Casinos & Resorts Inc.	131.65
Fitzgeralds Gaming Corp.	2000	51.37	Century Casinos Inc.	56.12
Lodigan, Inc	2001	975.36	Orient-Express Hotels Ltd.	725.87
Presidents Casinos Inc.	2002	120.45	MTR Gaming Group Inc.	164.08
Sunterra Corp.	2000	663.49	The Marcus Corp.	723.78
Trump Hotels & Casino Resorts Inc.	2004	2,031.43	Boyd Gaming Corp.	1,873.00

Table 2. Test for the Difference in the Mean Financial Ratios of the Bankrupt vs. Non-Bankrupt Groups

Variable	Group	One Year Prior to Bankruptcy	Two Years Prior to Bankruptcy
Current ratio	Group 1	1.110	0.931
	Group 2	0.700	0.793
	T-value	(0.979)	(0.615)
Quick ratio	Group 1	0.891	0.587
	Group 2	0.474	0.564
	T-value	(1.078)	(0.155)
Operating cash flows to current liabilities	Group 1	-0.235	0.335
	Group 2	0.816	0.879
	T-value	(-3.538)***	(-2.326)**
Debt ratio	Group 1	0.501	0.465
	Group 2	0.372	0.369

	T-value	(1.360)	(1.007)
Long-term debt to total capitalization	Group 1	0.693	0.345
	Group 2	0.388	0.390
	T-value	(1.381)	(-0.426)
Operating cash flows to total liabilities	Group 1	-0.013	0.062
	Group 2	0.238	0.232
	T-value	(-6.772)***	(-3.844)***
Times interest earned ratio	Group 1	-0.829	0.411
	Group 2	3.396	3.399
	T-value	(-4.651)***	(-2.583)**
Gross profit margin	Group 1	0.266	0.303
	Group 2	0.264	0.264
	T-value	(0.030)	(0.686)
Net profit margin	Group 1	-0.146	-0.168
	Group 2	0.054	0.044
	T-value	(-2.130)**	(-2.482)**
Gross return on assets	Group 1	-0.028	-0.001
	Group 2	0.081	0.082
	T-value	(-2.167)**	(-2.205)**
Return on assets	Group 1	-0.001	-0.153
	Group 2	0.045	0.036
	T-value	(-0.311)	(-2.782)**
Total assets turnover	Group 1	1.302	1.290
	Group 2	1.178	1.201
	T-value	(0.643)	(0.511)
Fixed assets turnover	Group 1	2.682	2.756
	Group 2	1.785	1.820
	T-value	(1.984)	(1.825)

Note: 1. Group 1 = bankrupt firms, Group 2 = non-bankrupt firms.
2. **significant at the .05 level; ***significant at the .01 level.

Table 3. Estimated Logistic Regression Models

Variable	One Year Prior to Bankruptcy (Model 1)				Two Years Prior to Bankruptcy (Model 2)			
	b	SE	Ward	Sig.	b	SE	Ward	Sig.
OCFTL	33.861	15.611	4.705	0.030	11.059	3.881	8.120	0.004
Constant	-4.592	2.273	4.082	0.043	-1.586	0.676	5.499	0.019
Overall Model Fit	Value				Value			
-2 Log Likelihood (-2LL)	12.304				22.255			
Cox & Snell R^2	0.633				0.501			
	χ^2		Sig.		χ^2		Sig.	

Omnibus Tests				
Step	32.058	0.000	13.458	0.000
Block	32.058	0.000	13.458	0.000
Model	32.058	0.000	13.458	0.000
Hosmer & Lemeshow Test	1.371	0.995	2.166	0.977

Note: OCFTL = Operating cash flows/Total liabilities

Table 4. Classification for the Sample Hospitality Firms

Company	One Year Prior to Bankruptcy (Model 1)			Two Years Prior to Bankruptcy (Model 2)		
	Classification Based on the Cutoff Probability (0.5)			Classification Based on the Cutoff Probability (0.5)		
	Actual Group	Predicted Group	P(E)	Actual Group	Predicted Group	P(E)
AmeriKing Inc.	1	1	0.008	1	1	0.099
Big Buck Brewery & Steakhouse Inc.	1	1	0.002	1	1	0.101
Fresh Choice Inc.	1*	2	0.620	1*	2	0.556
Furrs Restaurant Group Inc.	1*	2	0.718	1*	2	0.777
ICH Corp.	1	1	0.003	1*	2	0.714
Planet Hollywood International Inc.	1	1	0.000	1	1	0.002

Prandium Inc.	1	1	0.060	1	1	0.056
Roadhouse Grill Inc.	1	1	0.033	1	1	0.023
Schlotzskys Inc.	1	1	0.335	1	1	0.280
Steakhouse Partners Inc.	1	1	0.016	1	1	0.219
Claridge Hotels & Casinos Corp.	1	1	0.064	1	1	0.024
Fitzgeralds Gaming Corp.	1	1	0.000	1	1	0.211
Lodigan, Inc	1	1	0.022	1	1	0.106
Presidents Casinos Inc.	1	1	0.039	1	1	0.108
Sunterra Corp.	1	1	0.006	1	1	0.001
Trump Hotels & Casino Resorts Inc.	1	1	0.017	1	1	0.343
The Steak N Shake Corp.	2	2	1.000	2	2	1.000
Backyard Burgers Inc.	2	2	1.000	2	2	0.997
Creative Host Services Inc.	2	2	0.998	2	2	0.899
ELXSI Corp.	2	2	1.000	2*	1	0.282
Main Street & Main Inc.	2*	1	0.134	2	2	0.574
Garden Fresh Restaurant Group	2	2	1.000	2	2	0.998
Frisch's Restaurant Inc.	2	2	1.000	2	2	0.998
J Alexander Corp.	2	2	0.871	2	2	0.521
Checkers Drive-In Restaurants Inc.	2	2	1.000	2	2	0.725
Meritage Hospitality Group Inc.	2	2	0.880	2*	1	0.133
Monarch Casinos & Resorts Inc.	2	2	0.702	2	2	0.876
Century Casinos Inc.	2	2	0.989	2	2	0.959
Orient-Express Hotels Ltd.	2	2	0.862	2	2	0.867
MTR Gaming Group Inc.	2	2	1.000	2	2	0.999
The Marcus Corp.	2	2	0.938	2	2	0.903
Boyd Gaming Corp.	2	2	0.684	2	2	0.649

Note: Group 1 = bankrupt firms, Group 2 = non-bankrupt firms, * Misclassified

Table 5. Classification Summary Matrix for the Sample Firms

One Year Prior to Bankruptcy (Model 1)				Two Years Prior to Bankruptcy (Model 2)			
		Predicted Group				Predicted Group	
Actual Group	No. of observations	Group 1	Group 2	Actual Group	No. of observations	Group 1	Group 2
Group 1	16	14	2	Group 1	16	13	3
Group 2	16	1	15	Group 2	16	2	14
Overall percentage of observations classified correctly		91% = [(14+15)/32]		Overall percentage of observations classified correctly		84% = [(13+14)/32]	

Note: Group 1 = bankrupt firms, Group 2 = non-bankrupt firms