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Bankruptcy prediction in the casino industry

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BANKRUPTCY PREDICTION

IN THE CASINO

INDUSTRY

By

David W. Patterson, CPA

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ABSTRACT

Bankruptcy Prediction in the Casino Industry

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An exploratory study of the effectiveness of traditional bankruptcy prediction models as applied to the casino industry. The study uses financial information from a sample of failed and non-failed casino companies to evaluate the ability of bankruptcy prediction models developed for general industry usage to predict financial failure in the casino industry.

The models tested were the ones developed by Edward I. Altman, Edward B. Deakin and Christine V. Zavgren. The financial information utilized in the study was limited to that which could be obtained from publicly available information sources. The sample size was limited to the number of failed firms for which information was available and an equal number of non-failed firms.

The study showed that traditional bankruptcy prediction models did not significantly enhance the ability to predict business failure in the casino industry beyond a random fail/no-fail prediction.

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CHAPTER ONE

INTRODUCTION

Since the opening of Resorts International in Atlantic City in 1978, the amount of money invested in the casino industry has grown from millions of dollars to billions of dollars. The industry has accomplished much of this growth through public stock offerings, public debt offerings and an increasingly large amount of bank debt. Not only has there been an increase in the magnitude of the investment in the casino industry the number of individuals directly and indirectly investing has also increased significantly. With this increased investment and increased investor base has come a more complex vulnerability to potential loss caused by business failure. There has been no published research concerning methodologies to predict business failure in the casino industry.

Beginning with the research studies of William H. Beaver in 1966 and Edward I. Altman in 1968, several models have been developed which use financial ratios to predict bankruptcy. Each of these models uses different methodologies or different financial ratios. None of the research done in the development of these models has specifically been directed towards the applicability of the models to the casino industry.

Since the financial dynamics of the casino industry has qualities that are different from other businesses, it is possible that the financial relationships that would indicate the likelihood of bankruptcy would also be different from other businesses. If there is a model or models that would more accurately predict financial failure for the casino industry, utilization of those models could assist in making decisions concerning investments in the casino industry.

Problem statement

The objective of this study is to analyze failed casinos using traditional bankruptcy prediction models in order to evaluate their ability to predict financial failure in the casino industry.

Limitations

A limitation of this analysis is the availability of financial data on casino businesses that have failed. Another limitation is the consistency and level of detail of the presentation of the data that is available.

Delimitation

Due to the traditions of the casino industry, property specific financial data is generally kept highly confidential. In general, sufficient financial data to perform meaningful analysis is only available for publicly traded companies. The data used in this study is therefore limited to that which is available through documents filed with the Securities and Exchange Commission.

Since the first bankruptcy prediction study by William Beaver in 1966, there have been numerous bankruptcy prediction studies in the financial literature. The models tested in this study are limited to the one developed by Edward I. Altman, the one developed by Edward B. Deakin and the one developed by Christine V. Zavgren.

The Altman model is generally considered the landmark model in bankruptcy prediction; it was the first published study that used multi-variant analysis to study the differences between failed and non-failed firms, by using multiple ratios simultaneously. The Altman model, which was first published in 1968, is still the most widely used and widely quoted bankruptcy prediction model.

The Deakin model is another early multi-variant analysis model that is generally cited and used as a standard for evaluating new approaches to bankruptcy prediction. It uses different ratios than the Altman model and may produce different results when applied to gaming analysis.

The Zavgren model was chosen because it uses a different approach than either the Altman or the Deakin model, and may yield different conclusions from those of the other two models.

Definitions

Acid Test Ratio: The ratio of quick assets to current liabilities

Business Failure: The inability of a firm to meet its obligations when due. For purposes of this study, the firm filing bankruptcy indicates financial failure.

Casino Industry: The population of all casino companies that offer typical casino games, including table games and slot machines. Includes casinos in all jurisdictions.

Failed casinos in this study did not include any California card clubs, Indian reservation casinos, sports or race booking facilities, as none of these types of casinos that had failed were identified. Since the financial characteristics of these casinos may or may not be similar to the casinos that were identified in the study, the results may or may not be valid for the casino types not specifically studied.

Collinearity: Describes a relationship between two variables. According to Zavgren, "In a sense, multi-collinearity is not a problem in discriminatory analysis, since, strictly speaking, the predictive ability of the function is not affected. The inter-correlations among variables may be used to enhance discriminatory power." (Zavgren, 1983, p. 15).

Current Assets: Cash plus marketable securities plus receivables plus inventories plus prepaid expenses.

Current Liabilities: Accounts Payable plus Accrued Expenses plus Deposits plus the Current Portion of Long Term Debt.

Current Ratio: The ratio of current assets to current liabilities.

Failed Firm: A firm that has filed for bankruptcy protection.

Fixed Charges: Interest expense plus interest on capitalized leases plus rent payments.

Multiple Discriminant Analysis: A statistical analysis technique for distinguishing among defined groups by developing a linear combination of discriminating independent variables. Inputs are variables that discriminate between the groups. The analysis defines each group as a vector of attributes that constitute a density function. The process maps the multi-dimensional characteristics of the density function of the population's

attributes onto a one-dimensional measure by forming a linear combination of the attribute variables along some axis. The purpose of the analysis is to derive relationships that minimize the variances within a group while maximizing the variances between groups.

Naïve determination: The likelihood of predicting an outcome without any knowledge of the variables.

Non-failed firms: Firms that have not filed for bankruptcy protection.

Operating Income: Revenues less operating expenses.

Quick Assets: The sum of cash plus net receivables.

Type One Errors: Classifying a failing firm as non-failing. These are generally considered the more serious errors for investors or lenders, as investments could be made which otherwise might not have been made.

Type Two Errors: Classifying a non-failing firm as failing.

Unclassified Results: When the score a firm obtains in a bankruptcy prediction model does not predict either failure or non-failure. Altman termed this the "zone of ignorance" (Altman, 1968). Indicates the need to look at other factors.

Univariant Analysis: The technique of looking at only one variable at a time to explain a result. Assumes implicitly that all other variables are equal. This is the method used by Beaver to analyze financial ratios and develop values that indicated the ratio level to be expected in a failed or a non-failed firm.

Working Capital: Current Assets less Current Liabilities.

Test of results

One possible outcome of the study would be that none of the three models will be able to predict business failure any better than a naïve determination. An alternative outcome would be that one or more of the models are better than naïve prediction of business failure.

Organization of paper

Chapter Two traces the history of financial statement analysis and bankruptcy prediction studies. Each of the major bankruptcy studies is reviewed and analyzed, comparing the alternative techniques that have been employed.

Chapter Three describes the sample selection process and the analytical process of testing each of the selected models. The collection of financial information and the computation of the ratios to be used in the models are described.

Chapter Four presents the results of the data collection and the testing of each of the models. Comparisons of the results of the tests for each model are presented and the tests are compared for predictive ability.

Chapter Five summarizes the results of the tests and conclusions about the applicability of the existing tests to the casino industry. Opportunities for additional research and future studies are also presented.

CHAPTER TWO

LITERATURE REVIEW

Introduction

The literature review will provide a brief history and background of financial ratio analysis. Each of the models that will be used in this study will be discussed individually. The literature review will also include a general review of other prediction models and of research that has been done in the field of bankruptcy prediction.

Background of financial ratio analysis

In 1900, Thomas F. Woodlock published a classic analysis of the railroad business, The Anatomy of a Railroad Report. This report discussed such financial measures as "the percentage of operating expenses to gross earnings", "the ratio of fixed charges to net income" and "the relative proportion which the funded debt and stock of a company should bear to the actual cost of the property". In regard to current position, Woodlock said, "In general, current items on each side of the account should at least fairly offset each other, year by year." In his 1911 The Principles of Bond Investment, Lawrence Chamberlain used Woodlock's ratio of operating expenses to gross earnings, calling it the "operating ratio" (Myer, 1939, p. 6-7).

The need for a measurable method of making credit and investment decisions was the primary reason for the initial development of financial ratio analysis. "Analysis of financial ratios began in the early 1900's with the development of the current ratio and the creation of a benchmark level for an acceptable relationship" (Beaver, 1966, p. 71). "Other ratios were developed in the 1890's, but this ratio, the current ratio, was to have a more significant and long lasting impact upon financial statement analysis than any other ratio." (Horrigan, 1968).

A classic report issued in 1919 to the Federal Reserve Bank, "Study of Credit Barometrics", by an employee of a Detroit bank, Alexander Wall, used seven different financial ratios from a thousand firms to establish a norm for analysis. (McGurr, 1996, p. 10). In the article Wall criticized bankers who based their decisions on the current ratio alone. He maintained that to get a complete picture of the financial condition of a firm other relationships should be used as a check on the current ratio, (Myer, 1939, p. 12).

Studies conducted in the 1930's found that failing firms had significantly different financial ratios than non-failing firms (Altman, 1968, p.590). Arthur Winakor and Raymond Smith published studies for the University of Illinois in 1930 and 1935 that analyzed trends in financial ratios of failed firms. They found that the most accurate and consistent indicator of failure was the ratio of working capital to total assets. (Horrigan, 1968, p. 288-289).

Paul Fitzpatrick in his 1931 study, Symptoms of Industrial Failure, studied trends in thirteen ratios over a period of three years for twenty failed and nineteen non-failed companies. He found that all of his ratios predicted failure to some extent, but the ratio

of net profit to net worth, the ratio of net worth to debt and the ratio of net worth to fixed assets were the best predictors. (Horrigan, 1968, p. 289).

In 1942, Charles Merwin published a study, Financing Small Corporations: In Five Manufacturing Industries, 1926-36. He analyzed trends in ratios over a six-year period for "continuing and discontinuing" firms, comparing mean ratios for the discontinued firms against the average ratio values for the continuing firms. His conclusion was that three ratios accurately predicted failure, net working capital to total assets, net worth to debt and the current ratio. According to Horrigan, "Merwin's study was the first really sophisticated analysis of ratio predictive power." (Horrigan, 1968, p.290).

William H. Beaver did a classic study using univariate analysis to examine the ability of financial ratios to predict business failure in 1966. According to Edward Altman, this study "set the stage for the multivariate attempts, by this author and others, which followed." (Altman, 1993, p. 181). Horrigan said, "This study will undoubtedly become a landmark for future analysis in ratio analysis." (Horrigan, 1968, p. 291).

William H. Beaver, 1966

Beaver first selected a set of thirty existing financial ratios that he felt were the best measures of a firm's health. He then grouped these ratios into six groups according to what they measured. The six groups were cash flow ratios, net income ratios, debt-to-total assets ratios, liquid assets to total assets ratios, liquid assets to current debt ratios and turnover ratios. The ratios studied are shown in Table 1.

Table 1

Beaver's List of Ratios Tested

Cash Flow Ratios

1. Cash flow to sales
2. Cash flow to total assets
3. Cash flow to net worth
4. Cash flow to total debt

Net Income Ratios

1. Net income to sales
2. Net income to total assets
3. Net income to net worth
4. Net income to total debt

Debt to Total Asset Ratios

1. Current liabilities to total assets
2. Long-term liabilities to total assets
3. Current + long-term liabilities to total assets
4. Current + long-term liabilities + preferred stock to total assets

Liquid Assets to Total Asset Ratios

1. Cash to total assets
2. Quick assets to total assets
3. Current assets to total assets
4. Working capital to total assets

Liquid Asset to Current Debt Ratios

1. Cash to current liabilities
2. Quick assets to current liabilities
3. Current ratio

Turnover Ratios

1. Cash to sales
2. Accounts receivable to sales
3. Inventory to sales
4. Quick assets to sales
5. Current assets to sales
6. Working capital to sales
7. Net worth to sales
8. Total assets to sales
9. Cash to expenditures for operations
10. Defensive assets to expenditures for operations
11. Defensive assets minus current liabilities to expenditures for operations.

(Beaver, 1966, p. 78).

These ratios were selected based on three criteria. First the ratio had to generally be considered, by the financial literature, to be reflective of the crucial relationships of a firm's condition. He cautioned that the popularity of a ratio did have a drawback, in that, "the most popular ratios will become those most manipulated by management (an activity known as window dressing) in a manner that destroys their utility" (Beaver, 1966, pp. 79-80).

The second criterion was that the ratio had performed well in one of the previous studies of bankrupt companies. The third criterion was that the ratio be defined in terms of a cash-flow concept. Beaver felt that "cash-flow ratios offer much promise for providing ratio analysis with a unified framework..." (Beaver, 1966, p. 80). Satisfaction of any of the criteria was sufficient for inclusion in the study. In order to have each of the ratios provide as much additional information as possible; Beaver excluded any ratio that was a "transformation" of another ratio that was already selected.

Beaver's model was based on four propositions, all else being equal. First that the more net liquid assets a firm has, the smaller the probability of failure. Second that the larger the net cash flow from operations, the smaller the probability of failure. Third that the larger the amount of debt of the company, the greater the probability of failure. Finally that the larger the amount of liquid assets required to fund operating expenditures, the greater the probability of failure.

He used these propositions to test the predictive ability of the ratios. Using a set of 79 failed companies and a matched set of 79 non-failed companies; he calculated each of the thirty ratios. His results showed that, "The difference in the mean values is in the predicted direction for each ratio in all of the five years before failure. Failed firms not

only have lower cash flow than non-failed firms but also a smaller reservoir of liquid assets. Although the failed firms have less capacity to meet obligations, they tend to incur more debt than do the non-failed firms" (Beaver, 1966, p. 80).

He found that the data was very consistent and that it suggested that there is a difference in the ratios of failed firms and non-failed firms. This was consistent with earlier studies. Fitzpatrick had published a study of nineteen pairs of failed and non-failed firms in 1932, which indicated repeated differences in the ratios for at least three years prior to failure. Winakor and Smith in a 1935 study had found deterioration in the mean values of failed firms for ten years prior to failure, with the rate of deterioration increasing as failure approached. These were the same results observed by Charles L Merwin in his 1942 study, (Beaver, 1966, pp. 81-82).

Having demonstrated that there was a difference in the ratios, Beaver wanted to answer the question of how large the difference was. To accomplish this he then determined the relative frequency distribution of each ratio for each group, failed and non-failed. Using these distributions, he was able to identify the ratio value at which the likelihood of the firm being classified in the appropriate company group (failed or non-failed) was high and the likelihood of the firm being classified in the wrong company group was low, for each of the ratios he tested.

The six ratios that had the lowest classification error rate were cash flow to total debt, net income to total assets, total debt to total assets, working capital to total assets, current ratio and the no-credit interval ratio. The best performing ratio was cash flow to total debt, which had a classification error of 13% in the year prior to failure. The next best performing ratio was net income to total assets.

Beaver concludes that the predictive ability of certain financial ratios, particularly cash flow to total debt provide useful information in assessing the likelihood of a firm failing. However, he acknowledges that further research using the combination of several ratios or changes in ratios might provide better predictive information. (Beaver, 1966 & 1968).

Edward I. Altman, 1968

The first study to look at the effect of using a combination of financial ratios to predict business failure was done by Edward I. Altman in 1968 (Altman, 1968). Altman used a statistical technique known as multiple discriminant analysis (MDA) to analyze the ratios of the groups of failed and non-failed firms in his study. Essentially what this technique does is to derive a formula through a regression technique whose answer will assign a firm to the proper group, failed or non-failed, with the least amount of error in classification. The formula consists of the ratios, which are the independent variables, and the coefficients of those variables that are derived by the analysis. The equation that Altman developed produced what he called a "Z Score", which is still widely accepted as an indication or a firm's bankruptcy potential.

To choose the ratios to be used in the study, Altman began with a set of twenty-two variables that had either been found to be significant indicators of failure in previous studies or which he felt might be significant. Starting with a sample of 33 failed and 33 non-failed firms, Altman tested the predictive ability of various combinations of ratios.

Using these ratios, Altman went through several procedures to finalize his formula. One of the procedures was the creation of alternative functions, an evaluation of

the statistical significance of each function and a determination of the relative contribution of each ratio. He also evaluated the ratios for correlation or collinearity with each other.

From his analysis, Altman ended up with a function that used only five of the ratios. It actually turned out that none of these five ratios were among the ones which, when measured by themselves, were the most significant in predicting bankruptcy. Model 1 is Altman's final discriminant function.

Model 1

Altman Z-Score Multiple Discriminant Analysis Model

$$Z = .012X_1 + .014X_2 + .033X_3 + .006X_4 + .999X_5$$

Where X_1 = Working capital/Total assets

X_2 = Retained earnings/Total assets

X_3 = Earnings before interest and taxes/Total assets

X_4 = Market value equity/Book value of total debt

X_5 = Sales/Total Assets

Z = Overall Index

(Altman, 1968, p. 594).

There are understandable rationales behind the predictive ability of each of the ratios. The working capital to total assets ratio measures the firm's liquid assets relative

to its total capitalization. A firm experiencing consistent operating losses will usually have a shrinking proportion of current assets relative to its total assets.

The retained earnings to total assets ratio measures cumulative profitability. Since the retained earnings account is a cumulative account, younger firms will have had less time to build it up. This creates a bias against younger firms, which is consistent with the reality that the incidence of failure is higher in a firm's early years.

The earnings before interest and taxes to total assets ratio is a measure of the firm's productive use of its assets. Insolvency occurs when a firm's liabilities exceed the value of its assets. Since earning ability is in fact the true measure of the value of the firm's assets, this ratio provides a basis for assessing the earning ability.

The market value of equity to book value of total debt ratio shows the level that the firm's value can decline before its liabilities exceeds its assets. The fifth ratio, sales to total assets measures management's ability to deal with competition.

To evaluate the effectiveness of the model, Altman had to group the results of the model to determine the average score for each group, which then became the point against which each firm's score could be compared to determine its group membership. The firm would be assigned to the group whose mean was closest to its score.

To evaluate the effectiveness of the model, Altman used what he called an "accuracy-matrix"; set up as follows:

	Predicted Group Membership	
Actual Group Membership	Bankrupt	Non-Bankrupt
Bankrupt	H	M_1
Non-Bankrupt	M_2	H

The H's stand for correct classifications (Hits) and the M's stand for misclassifications (Misses). M_1 represents Type 1 errors and M_2 represents Type 2 errors. The sum of the correct hits divided by the total number of firms being classified gives the per cent of firms correctly classified. This percentage is similar to the coefficient of determination (R^2) in regression analysis, which measures the per cent of the variation of the dependent variable explained by the independent variables. (Altman, 1968, p. 599).

When the original sample of failed and non-failed firms were tested using this formula, the overall classification error rate one year prior to failure was 5%. Secondary samples used to test the accuracy of the model also validated the accuracy of the model.

To make the model usable without having to replicate the study for each application, Altman further studied the results of his initial tests and derived cut-off values that would provide a basis for classification. The cut-off values Altman established was that all firms with Z scores less than 1.81 were failed, all firms with Z scores greater than 2.99 were non-failed and Z scores greater than 1.80 but less than 3.00 were in a "zone of ignorance" or gray area.

In his conclusions, Altman said, "A limitation of the study is that the firms examined were all publicly held manufacturing corporations, for which comprehensive financial data were obtainable, including market price quotations. An area for future research, therefore, would be to extend the analysis to relatively smaller asset-sized firms and unincorporated entities where the incidence of business failure is greater than with larger corporations." (Altman, 1968, p. 609).

Edward B. Deakin, 1972

Deakin's study combined the research of Beaver and Altman into a single model. His perception was that while Beaver's method had a superior predictive ability, Altman's approach was intuitively more appealing. Using the fourteen ratios from Beaver's study that best predicted failure, Deakin used the same MDA approach that Altman had used to derive a linear function that weights and combines the ratios in order to maximize the difference between the failed and non-failed groups.

In replicating the Beaver study, Deakin used a smaller sample, 32 failed firms instead of 79, and took the data from a different time period, 1964 to 1970 instead of 1954 to 1964. He also ranked the values of the ratios and then selected a cut-off point for each ratio that would minimize the occurrence of misclassification errors. He compared his results to Beaver's and found that the results "would tend to confirm Beaver's observations." (Deakin, 1972, p.169).

Deakin also performed a test to determine the correlation of the predictive ability of the ratios, called the Spearman rank-order correlation coefficient test. This test showed "a rather high correlation of relative predictive ability of the various ratios." (Deakin, 1972, p. 169).

The correlation coefficient in the third year before failure, while still significant, was 20 to 30 points lower than the other years. Through an analysis of the financial statement items that were used to calculate the ratios, Deakin concluded that the failed firms tended to expand rapidly in the third or fourth years prior to failure. This expansion was financed by increased debt and preferred stock rather than from funds provided by operations or additional common stock. Subsequently the firms were unable to generate

sufficient increases in sales and net income to repay this bigger debt load, therefore causing them to lose assets.

Deakin's MDA yielded relationships for each of five years preceding failure. While some of the ratios showed a low contribution to the function, he found that leaving out any of the fourteen ratios increased the number of classification errors significantly. Rather than establishing a cut-off score, as Altman had done, Deakin classified firms according to their score's deviation from the mean score for each group.

Despite an error rate of less than 5% in the three years prior to failure, Deakin's original model was criticized for having different models for each year (Altman, 1993, p. 227). Expanding on a technique used by Robert Libby in his 1975 study of the usefulness of accounting ratio information (Libby, 1975), Deakin revised his model.

Using principal-components analysis, Libby had identified five independent sources of variation in the fourteen ratios used in Deakin's original study. . His reduced set of ratios accurately classified slightly better for one data sample and slightly worse for another sample. He then provided the reduced set of five of Deakin's ratios to a group of loan officers to test how well they would classify the failed and non-failed firms using only that information. His test showed that the bank officers used the information correctly and that the classification based on the information was superior to random classification.

Deakin developed a new model based on the five ratios identified by Libby. The model was tested against his original sample, as well as an additional sample of 31 firms that failed during 1970 and 1971 and another sample of 47 firms that failed during the period 1972 to 1974. For the last sample, the model correctly predicted 39 of the failures,

misclassified one firm and identified seven companies as in need of further investigation, two years prior to failure, (Deakin, 1977, p 84).

Classification into the failed group or the non-failed group was based on the relative distance of its index from the average of the failing and non-failing groups. Deakin did not specify cutoff values or ranges of non-determinability in his study. However, from the information he did provide about his results it is possible to estimate cutoff values. Deakin provided the results of the calculation of the group mean for each ratio. Using these means to solve the linear and the quadratic equations it is possible to determine a solution for each equation for each group's mean values. The values that result from solving the linear equations are –1.381 for failed firms and +1.053 for non-failed firms. The values for the quadratic formula are –37.84 for failed firms and –54.24 for non-failed firms. Using these values however does not provide a zone of ignorance. If a firm's score is closer to the failed group, it is classified as failed, if it is closer to the non-failed group it is classified as non-failed. In order to resolve any differences between the two tests, Deakin used the decision rule that when both of the tests showed that the firm was failing or non-failing, the firm was so classified. If the two tests classified the firm differently, the firm fell into the "investigate further" category. Deakin's business failure prediction formulas are shown in Model 2.

Model 2

Deakin's Multiple Discriminate Analysis Model

Linear Equation:

$$I = -1.369 + 13.855X_1 + 0.060X_2 - 0.601X_3 + 0.396X_4 + 0.194X_5$$

Quadratic Equation:

$$I = 1.78 - 8.242X_1 - 70.06X_1^2 - 31.57X_2 - 5.65X_1X_2 - 22.06X_2^2 + 12.93X_3 + 20.49X_1X_3 + 50.82X_2X_3 - 204.7X_3^2 - 5.79X_4 + 0.68X_1X_4 - 2.06X_2X_4 - 1.0X_3X_4 - .88X_4^2 - .42X_5 - .57X_1X_5 - 1.46X_2X_5 + 2.5X_3X_5 - .34X_4X_5 + .17X_5^2$$

Where I = Overall Index

X_1 = Net Income/Total Assets

X_2 = Current Assets/Total Assets

X_3 = Cash/Total Assets

X_4 = Current Assets/Current Liabilities

X_5 = Sales/Current Assets

(Deakin, 1977, p. 79).

Altman also produced a model using both the linear and quadratic approach. This new model uses seven ratios that are different from the five used in his first model. The seven ratios measure return on assets, stability of earnings, debt-service, cumulative profitability, liquidity, capitalization and size. The new model yields what Altman terms a Zeta score that produces superior accuracy to the old model in classifying firms and has received generally high reviews in financial literature. However, the model cannot be

independently utilized for testing, as Altman has not released the details of the model. He has a firm that markets the use of the model for testing firms, (Altman, 1993, 207-221).

Marc Blum and Robert Edmister conducted two other studies that are often included in financial literature concerning business failure prediction. Blum's 1974 study was similar to Altman's, except he broadened the definition of failure and he used a different set of ratios. Edmister's study also used multiple discriminant analysis, but his study only looked at smaller companies.

Robert O. Edmister, 1972

Edmister's study was the first to focus on small business failure. He used a sample drawn from Small Business Administration loans. Edmister tested five methods of ratio analysis on a set of 19 ratios. All the ratios were chosen from ratios used in prior studies by Beaver, Altman and Blum. The first method tested was using the ratio itself as a predictor of failure. The premise was that the level of the ratio itself might be a predictor of failure. To test his theory, Edmister compared the values of individual ratios to the average ratio of other small businesses in the same industry. The comparison showed that the failed firms' ratios were consistently lower.

The second method tested was the accuracy of a test using a three-year trend in the ratios. Only ratio values that went in the same direction all three years were considered trends. Upward trends were considered positive and downward trends were considered negative. Variables for up-trends and downtrends were assigned a value of

one if the ratios exhibited either an upward trend or a downward trend; otherwise those variables were assigned a value of zero.

The third test looked at the combination of the ratio's trend and the ratio value. The fourth test looked at the three-year average of the ratios. The fifth test looked at a combination of the industry trend and the industry level of the ratios, by dividing each ratio by the corresponding industry average ratio.

Edmister's study did not result in an accurate function for data within one year of failure. However, an accurate prediction function was developed using data three years prior to failure. This equation is shown below, Model 3.

The study achieved a classification accuracy of 93%, with a Z-score below .47 indicating failure, above .53 indicating non-failure and scores between those values being a "gray zone" similar to Altman's. The most significant contribution of Edmister's study was the concept of using industry averages to calculate standardized ratios and the converting of the ratios to dichotomous variables, which added to the significance of the results. (Edmister, 1972).

Model 3

Edmister's Small Firm Multiple Discriminate Analysis Model.

$$Z = 0.951 - 0.423X_1 - 0.293X_2 - 0.482X_3 + 0.277X_4 - 0.452X_5 - 0.352X_6 - 0.924X_7$$

Where Z = Overall Index

X_1 = 1 if funds flow/current liabilities < 0.05

= 0 otherwise

X_2 = 1 if equity/sales < 0.07

= 0 otherwise

X_3 = 1 if (net working capital/sales)/industry average ratio < -0.02

= 0 otherwise

X_4 = 1 if (current liabilities/equity)/industry average ratio < 0.48

= 0 otherwise

X_5 = 1 if (inventory/sales)/industry average ratio < 0.04 and trends upward

= 0 otherwise

X_6 = 1 if quick ratio/industry average < 0.34 and trends downward

= 0 otherwise

X_7 = 1 if quick ratio/industry average trends upward

= 0 otherwise

(Edmister, 1972, p. 1487-1488).

Marc Blum, 1974

Blum's definition of failure went beyond looking at just bankrupt firms. He also included firms that could not pay their debts when due and firms that had entered into an agreement to reduce debts. Using this definition, he was able to obtain a data set that contained 115 failed and 115 non-failed companies from the years 1954 to 1968.

As a framework for his study, Blum used a set of six propositions for predicting failure that was very similar to the set of propositions that Beaver had used. The first proposition was that the smaller the pool of net liquid assets, the greater is the likelihood of failure. The second proposition was that the smaller the inflow of resources from operations the more likely the probability of failure. Third that the larger the claims on the resources by creditors, the greater the probability of failure. Fourth that the greater the outflow of funds required by the operation of the business the higher the probability of failure. Fifth that the more highly variable earnings and claims against resources, as shown by outflows to maintain current operations and by obligations to creditors, the higher the probability of failure. Finally the more "failure-prone" the industry locations of a firm's business activities are expected to be, the higher the likelihood of failure.

To measure these propositions Blum grouped twelve ratios into three general classifications: liquidity, profitability and variability. He further broke down liquidity into short-run liquidity and long-run liquidity, and measured both the flow and the position of each.

The ratios he used to measure short-term liquidity were the "quick flow" ratio and the ratio of net quick assets to inventory. The "quick flow" ratio was defined as cash + notes receivable + market securities + (annual sales ÷ 12) ÷ (cost of goods sold − depreciation expense + selling and administrative expense + interest) ÷ 12. He defines

net quick assets as cash and equivalents plus accounts and notes receivable less short-term resource claims.

Long-run liquidity was measured by three ratios, cash flow to total liabilities, net worth at fair market value to total liabilities and net worth at book value to total liabilities. He used the harmonic mean of the bounds of the range of stock prices during a year as the measure of fair market value, in order to eliminate speculative upsurges in market value.

Profitability was measured as the rate of return to common stockholders who invest for a minimum of six years. Rate of return was the internal rate of return computed over the six years. Initial investment was defined as the average stock price during the first year and cash flows over the period were defined as dividends received plus a presumed sale at the end of the six years in an amount equal to the average stock price for the sixth year.

Blum's inclusion of measures of variability was the most extreme departure from the conventional analyses. He used six ratios to determine variability and trend of resource inflow and to determine the variability of his short-term liquidity indicator – net quick assets to inventory. For both net income and for the net quick assets to inventory ratio he computed the standard deviation over each year, trend breaks and slope. Trend breaks were defined as a decline in either net income or the ratio from one year to the next. Slope is the trend line fitted to the observations using the least-squares method.

Blum reported a 93-95 percent predictive accuracy for his model in the first year before failure. He found, like Beaver had, that cash flow/total debt was the best predictor ratio. He also developed functions using raw accounting data which had a better

predictive accuracy than the models using ratios, but he offered no explanation for this, suggesting the need for additional research. He also suggested that his study indicated that the use of non-traditional ratios and non-traditional approaches to looking at ratios might yield more discriminating results. Blum did not publish his actual formulas for failure prediction, and none of the other studies reviewed attempted to present a formula. (Blum, 1974).

James A. Ohlson, 1980

There have been several other studies that have attempted to improve on the ability to predict financial failure. The primary distinctions between these studies have been the method of selecting the ratios to be used, the statistical technique used to evaluate the relationship of the variables, the method of selecting the data sample and the types of businesses being reviewed.

In 1980, James Ohlson developed a model using the logit technique that was later to be used by Zavgren in her 1985 study. Ohlson cited three primary problems with prior studies that had been done using the more popular MDA technique. First he objected to the statistical requirements imposed on the distributional properties of the ratios. Among these requirements were that the variance-covariance relationships of the ratios had to be the same for both groups and that the ratios had to be normally distributed.

Ohlson also felt that the use of a score, which is the output of the MDA approach, was only a ranking method, and did not provide the opportunity for interpretation. Finally, he did not feel that the use of the procedure of matching failed and non-failed firms provided any benefit to an analysis. He felt that, "The use of use of conditional

logit analysis, on the other hand, essentially avoids all the problems discussed with respect to MDA." (Ohlson, 1980, p. 112).

In addition to his preference for the logit analysis technique, Ohlson also objected to the data used in prior studies. He felt that by using financial statement information from Moody's Manual, the source for most prior studies, no consideration had been given to the dates that information was available to the public. He noted that all the prior studies had assumed that the information was available as of the date of the financial statements, which is of course not the case. To overcome this limitation, he used SEC reports that were dated.

According to Ohlson, "No attempt was made to select predictors on the basis of rigorous theory. To put it mildly, the state of art seems to preclude such an approach." (Ohlson, 1980, p.118).

Ohlson chose nine ratios for his analysis, based on "simplicity". Five of the ratios were ones often cited in the literature; total liabilities divided by total assets, working capital divided by total assets, current liabilities divided by current assets, net income divided by total assets and funds provided by operations divided by total liabilities. He also used size of the firm as defined by the equation: log(total assets/GNP price-level index).

He also used two variables that were defined as decision variables. One of these variables compared total liabilities to total assets, assigning a value of one if liabilities exceed assets and zero otherwise. The other assigned a value of one if net income was negative for the two years prior to failure and zero otherwise. The final factor measured

the change in net income. The change was determined using the following formula: $(NI_t - NI_{t-1})/(|NI_t| + |NI_{t-1}|)$, where NI_t is net income for the most recent period.

While Ohlson's results were not as good as Altman's or Deakin's, he concluded that his methodology was more sound. He also reached some other interesting conclusions from his study. He found that size was the important predictor in his model, with financial structure being the next. Ohlson's model is shown in Model 4.

Model 4

Ohlson's Logistic Regression Model.

$$Y_i = -1.32 - 0.0407X_1 + 6.03X_2 - 1.43X_3 + 0.0757X_4$$
$$2.37X_5 - 1.83X_6 + 0.285X_7 - 1.72X_8 - 0.521X_9$$

And

$$P = (1 + \exp\{-Y_I\}^{-1}) \text{ so that } Y_I = \log[P/(1-P)]$$

Where P = Overall Probability of Failure

X_1 = log (Total Assets/GNP price-level index)

X_2 = Total Liabilities/Total Assets

X_3 = Working Capital/Total Assets

X_4 = Current Liabilities/Current Assets

X_5 = Net Income/Total Assets

X_6 = Funds from Operations/Total Liabilities

X_7 = 1 if net income was negative for the last two years

= 0 otherwise

X_8 = 1 if total liabilities > total assets

= 0 otherwise

$X_9 = (NI_t - NI_{t-1})/(|NI_t| + |NI_{t-1}|)$, where NI_t is net income for the most recent period.

(Ohlson, 1980, p. 118-119).

Rose and Giroux, 1984

Peter Rose and Gary Giroux developed a model in their 1984 study that used ratios that had not been used in previous studies. They developed 130 new ratios and tested a set of 92 firms, 46 failed and 46 non-failed. Their analysis showed that 34 of these ratios showed significant differences between the two groups.

They combined these 34 ratios with 27 ratios that had been used in other bankruptcy prediction studies. The ratios were then used in a MDA procedure that resulted in a model using 18 of the ratios. Of these 18 ratios, 13 were ones that had not been used in prior models.

The study developed both a linear prediction equation and a quadratic prediction equation. The overall classification accuracy of their model was 92%. The linear equation accurately classified the firms from 97.4% to 88% over the seven-year period of the study. The quadratic equation's accuracy ranged from 86.7% to 74.5%. While the results were not consistent enough to make the model a more reliable predictor than either the Altman model or the Deakin model, there were some findings that could influence future studies.

The performance of the new ratios they used indicates that creative ways of choosing ratios could improve the accuracy of new models. Their study also showed that the quadratic function had less variance than the linear function, perhaps indicating the need to include a quadratic equation in future studies (which Zavgren did in her study). The actual equation developed by Rose and Giroux was not presented in their study, only the results. (Rose & Giroux, 1984).

Christine V. Zavgren, 1985

Zavgren used a different statistical analysis technique than Altman and Deakin used. She used a technique called logit. Logit, like multiple discriminant analysis, is a multi-variant technique that considers all the predictive factors in a problem taken simultaneously. Unlike MDA, logit weighs each of the variables in such a way that the formula generates a probability of classification of the total set of weighted variables into one of two separate groups. MDA generates a linear relationship whose solution will maximize the difference between two possible classifications.

Zavgren chose the ratios to be used in her study based on a 1973 study by Pinches, Mingo and Caruthers that used factor analysis to identify the most appropriate grouping of factors affecting a firm's financial position and financial performance. The seven areas their study showed as the most critical were return on investment, capital intensiveness, inventory intensiveness, financial leverage, receivables intensiveness, short-term liquidity and cash position, (Bukovinsky, 1993, p. 47).

Using 48 separate ratios, Zavgren selected the seven ratios that provided the best measure for each of the seven factors. The seven ratios were total income to total capital, sales to net plant, inventory to sales, debt to total capital, receivables to inventory, quick assets to current liabilities and cash to total assets. Zavgren's final formula is shown in Model 5.

Model 5

Zavgren's Logistic Regression Model.

$$Y_i = 0.23883 + 0.00486X_1 + 0.001110X_2 - 0.00108X_3 - 0.0435X_4$$
$$0.01583X_5 + 0.03074X_6 - 0.1078X_7$$

Where Y_i = Overall Probability of Failure

X_1 = Net Income/Total Equity

X_2 = Total Sales/Net Plant

X_3 = Total Inventory/Total Sales

X_4 = Total Liabilities/Total Equity

X_5 = Total Receivables/Total Inventory

X_6 = Quick Assets/Current Liabilities

X_7 = Total Cash/Total Assets

(Zavgren, 1985, p. 24, 29).

According to Zavgren, the expected results of her study were not supported by the analysis. The model she developed had less accurate results than the Altman model or the Deakin model. Using probabilities as a financial risk measure in the pattern of the financial attributes and the information provided the primary significance of her study. (Zavgren, 1983).

Cash flow models

Prior to the issuance by the Financial Accounting Standards Board (FASB) of Statement of Financial Accounting Standards No. 95, Statement of Cash Flows, in 1987, consistent information concerning actual cash flow was generally not available. The studies conducted prior to 1987 generally used a proxy for cash flow, net income plus depreciation, for their ratios that required a cash flow factor. In addition to ignoring the impact of changes in other current assets and changes in current liabilities on cash flow from operations, the use of net income plus depreciation also leaves out the funds provided/used in financing and investing activities. Measures of actual cash flow were used in several bankruptcy studies during the 1980's. (Bukovinsky, 1993).

Unfortunately, the results of the cash flow based studies showed very little incremental value to traditional accrual based prediction models (Altman, 1984). Although cash flow is considered in many of the traditional bankruptcy prediction models, using information from accrual statements provide adequate information.

In the FASB Statement of Financial Accounting Concepts No. 1 an objective of financial accounting was said to be the providing to decision-makers of useful information to assess the amount, timing and uncertainty of future cash flows. The FASB and accounting academics agree that accrual accounting provides the best information about a firm's current and future performance (Shroff, 1998).

Casey & Bartczak, 1984 & 1985

In their first study, Casey and Bartczak used a sample of 60 companies that filed for bankruptcy from the period 1971-1982 and matched them with 230 non-failed

companies. For each of these companies they computed three variables, operating cash flow, operating cash flow divided by current liabilities and operating cash flow divided by total liabilities.

Their conclusion was, "that none of the variables could discriminate between the bankrupt and non-bankrupt companies with reasonably good accuracy. In fact, overall accuracy for operating cash flow was only slightly better than chance (50%) for the first and second years before failure and was worse than chance for the remaining years." (Casey & Bartczak, 1984, p.64).

In a letter to the editor of the Harvard Business Review, Edward Altman commented on Casey & Bartczak's study. "Casey and Bartczek are absolutely correct in their assertion that OCF or its variation measures are poor predictors of insolvency, either by themselves or as parts of a multivariate model of the type that I have been discussing ever since the original Z-score approach for bankruptcy prediction was developed. Indeed, my own skepticism about liquidity measures in general and cash flow variables in particular has caused me to almost eliminate them from consideration." (Altman, 1984, p. 176).

In a follow-up study, Casey and Bartczak tested the effect adding operating cash flow information to existing accrual-based models in order to enhance their predictive ability. The results again showed that the operating cash flow data do not provide incremental predictive power over accrual-based ratios. They suggested that a broader definition of cash flows, like total cash flow might lead to improved classification accuracy. (Casey & Bartczak, 1985).

Gentry, Newbold & Whitford, 1985

Using a matched sample of 33 failed and 33 non-failed companies, Gentry, Newbold & Whitford used both MDA and logit techniques to analyze eight funds flow variables. The eight variables were funds provided by operations, flows provided by changes in working capital, fixed coverage expenses (interest and rent), funds used for capital expenditures, dividends, other asset and liability flows and change in cash and marketable securities.

Using a probit model to develop a formula that predicts the probability of failure for each of the firms, they were only able to achieve 79% accuracy in predicting failure using their funds flow variables. They also tested the effect of combining accrual-based ratios to their model. Their conclusion was "that the addition of cash-based funds flow components to the traditional financial ratios used to discriminate between failed and non-failed companies results in significantly improved predictive performance." (Gentry, Newbold & Whitford, 1985).

However, according to Bukovinsky, "this conclusion is based only on the statistical significance of the models. The ultimate test of the incremental predictive ability of the models would involve the use of the models to classify a sample of firms and to compare the classification accuracies of the models. No such test of the comparative classification accuracies of the models was performed." (Bukovinsky, 1993).

Aziz & Lawson, 1988

Aziz and Lawson formally tested the differences between the predictive accuracy of Altman's Z and Zeta models, a cash flow based model and a model that combines the cash flow based model with Altman's Z-model. What they found was that in the first year before failure the combined model showed better classification accuracy than that showed by any of the other three models. However, in terms of overall accuracy they found that the ability to discriminate between bankrupt and non-bankrupt firms was about the same for all the models.

In terms of predictive accuracy, the cash flow model and the combined model were superior to either the Z-model or the Zeta model, particularly in the second through the fifth years before failure. Their conclusion was that while the study showed mixed results, it did indicate that cash flow information was important and should be considered in future studies. (Aziz, Emanuel & Lawson, 1988) & (Aziz & Lawson, 1989).

Summary of literature

While there are many studies that have been conducted in the field of predicting business failure and many failure prediction models developed, there is no consensus on which model is the best or which variables are the most effective. A limitation on all of the studies has been the lack of sufficient data to perform extensive testing or satisfactory validation procedures. It would seem that more study concerning the causes of financial failure and how these causes might be revealed by financial data would provide insight into failure prediction. To date, the models have concentrated on identifying the

symptoms of a failed firm, which could be simply a definition of what a failed firm looks like after it has entered into a failure mode, rather than what indicates the cause of failure.

Of all the models reviewed, none proved consistently more accurate or more generally accepted than the models chosen for this study. In addition, many of the other studies did not provide explicit details of their models, so replicating their study with a different sample would not be possible anyway.

A recent study evaluating existing bankruptcy prediction models showed that no one model in the existing literature was entirely satisfactory at differentiating between bankrupt and non-bankrupt firms. The study concluded that the different models might have different uses and that the challenge for new research is to make full use of all readily available data within a better model of the bankruptcy process. (Mossman, 1998).

A review of financial journals and internet resources for the past four years shows that the popularity of bankruptcy prediction research has declined since the 70's and 80's. With the exception of research into possible artificial intelligence applications to bankruptcy prediction, no new approaches were discovered.

CHAPTER THREE

RESEARCH METHODOLOGY

Introduction

This study analyzes failed and non-failed casino companies using three traditional bankruptcy prediction models in order to evaluate their ability to predict financial failure in the casino industry. A possible outcome of the study is that none of the models will be able to accurately predict business failure in the gaming industry. An alternative outcome is that at least one of the three models will be a reliable predictor of business failure in the casino industry. Using financial information from failed and from non-failed casinos, the ratios needed as independent variables for each of the models will be calculated. These ratios are then used to generate a prediction of failure for each of the models. The results will then be evaluated to assess the accuracy of each model.

Sample selection

The primary limitation of this study is the availability of financial information from failed and non-failed casinos. Casino managers and owners are traditionally very sensitive to revealing financial information about their operations. The industry was

begun by people whose lives were often shrouded in secrecy and who had very little trust of anyone outside of their own organization.

In Nevada, this tradition of secrecy has even extended to information provided to the state government. Public assess to reported casino financial information in Nevada has been limited by law to aggregations that conceal the identity of individual properties. New Jersey makes more individual property financial information available to the public, but this information is primarily operating data, and is not sufficient for the bankruptcy prediction models being tested.

With the advent of publicly traded casino corporations, the availability of financial data has improved. Publicly traded companies, including publicly traded casino companies, are required to file financial information with the SEC. Also any casino that has registered debt is required to file the same types of information. This information is available through various sources, including the company annual shareholder reports and the SEC information that is compiled on the Disclosure database and on the Edgar database, which are both available at the UNLV library. All of these sources are utilized in this study.

Prior to beginning the search for financial information, it was necessary to determine which financials were necessary for the study. Since the number of casino companies that have failed is the smaller group, a list of those casinos was developed. This list was developed through interviews of several casino industry experts.

The people interviewed were the senior gaming industry partners for two of the leading CPA firms in the casino industry, Steve Comer of Arthur Anderson and Jeff Cooper of Bradshaw Smith. The former senior gaming industry partner of Laventhol and

Horwath, Saul Leonard, who now has his own gaming consulting business in Los Angeles was also interviewed. Two bankruptcy trustees, Larry Bertsch, CPA from Las Vegas and H. S. Duffy Stanley, Jr. from Biloxi, Mississippi were interviewed. Neil Baker, a Ph.D. candidate at UNLV, whose dissertation includes information on bankrupt casino/hotels was interviewed. Jason Ader the senior gaming industry analyst for Bear Sterns and Bruce Turner the senior gaming analyst for Smith Barney were interviewed. Also, Shannon Bybee, Executive Director of the UNLV International Gaming Institute, and William Dougall, the former president of Del Webb Nevada, the Aladdin, the Marina and the Claridge casinos.

The final list of bankrupt casinos compiled consisted of 32 casinos. Twelve of these casinos were privately owned and were immediately eliminated from the study. Information on the remaining firms for the two years preceding their bankruptcy was potentially available from the sources identified. At the same time financial information on the bankrupt casinos was being located, non-failed casinos that had financial information available were also identified and the information accumulated.

The first step in looking for available casino financial information was to review the collection of casino company financial statements in the UNLV Library. Thomas Mirkovich, Assistant Collection Development & Management Librarian assembled this collection for UNLV's James R. Dickinson Library over the past few years. Mr. Mirkovich initially reviewed casino industry publications to identify corporate casinos that might have available financial information. Working with representatives of Disclosure, Inc., he then assembled a collection of historical financial information from

SEC reports. Although the collection is somewhat dated and incomplete, it did provide a starting point.

UNLV also has two other collections of gaming information. The IGT Corporation purchased a collection of gaming literature from a Reno CPA, Gary Royer, which is maintained at the College of Hotel Administration. And the UNLV library has also established a collection of gaming publications. The IGT Special Collection of gaming information and the UNLV library's special collection of gaming information both include limited collections of casino company annual reports for various casino companies. These reports provided a limited amount of information.

Finally, SEC records were reviewed for additional information using the Edgar and Disclosure databases. The UNLV's sources of historical SEC information do not include any reports prior to 1991, which if available may have provided additional failed firms to include in the study.

The reviews yielded financial information on twelve of the bankrupt casinos for the appropriate years. To test the ability of the models to not predict failure for non-failed firms, a list of non-failed casino companies for which there is financial information was necessary. Although there are more non-failed casinos than failed casinos, the size of the sample was limited to the same number as the failed sample to make the two samples comparable. There were 24 non-failed casinos identified during the search that had financial information available. Since this is essentially a convenience sample, the 12 non-failed casinos selected to be included in the study were the ones that most closely matched the time period and size of the failed casinos. An attempt was also made to include as broad a cross section of casino types and locations as possible with the limited

size of the sample. The selection of non-failed casinos did not include any marginally successful casinos, which should emphasize the differences between the financial strength of failed and non-failed casinos.

Models used in the study

The models tested in this study are limited to the one developed by Edward I. Altman, the one developed by Edward B. Deakin and the one developed by Christine V. Zavgren.

The Altman model is generally considered the landmark model in bankruptcy prediction; it was the first published study that used multi-variant analysis to study the differences between failed and non-failed firms, by using multiple ratios simultaneously. The Altman model, which was first published in 1968, is still the most widely used and widely quoted bankruptcy prediction model.

The Deakin model is another early multi-variant analysis model that is generally cited and used as a standard for evaluating new approaches to bankruptcy prediction. It uses different ratios than the Altman model and may produce different results when applied to gaming analysis.

The Zavgren model was chosen because it uses a different approach than either the Altman or the Deakin model, and may yield different conclusions from those of the other two models.

Computation of ratios

To assure that the ratios used in the models are directly comparable, any reported ratios were ignored and the ratios were computed using financial data from the financial statements. Reviewing the requirements of each of the models identified the ratios that had to be computed. In the three models there is only one ratio that is duplicated. both Deakin and Zavgren use Total Cash/Total Assets in their models, all of the other ratios are unique to each model.

Altman uses the following ratios in his model: Working capital to Total assets, Retained earnings to Total assets, Earnings before interest and taxes to Total assets, Market value equity to Book value of total debt and Sales to Total Assets. The one variable in the Altman model that is not presented in a company's financial statements is the market value of the equity. For the casinos that are publicly traded this value will be considered to be the closing price of the company's stock times the number of shares outstanding as of the date of the financial statements. For the non-public companies the book value of the equity will be used as a proxy for market value. This treatment is not consistent with his original model, which only looked at public companies, but is the only reasonable alternative.

The Deakin model uses the following ratios: Net income to Total assets, Current assets to Total assets, Cash to Total assets, Current assets to Current liabilities and Sales to Current assets. All of the variables in Deakin's ratios are available in financial statements prepared using Generally Accepted Accounting Principals (GAAP).

The Zavrgen model uses the following ratios: Net income to Total equity, Total sales to Net plant, Total inventory to Total sales, Total liabilities to Total equity, Total

receivables to Total inventory, Quick assets to Current liabilities and Total cash to Total assets.

In total there are eleven balance sheet accounts, four income statement accounts and market value that will have to be identified from the financial statements in order to be able to calculate the ratios in the three models. The balance sheet accounts are total assets, total liabilities, total equity, current assets, current liabilities, total receivables, total inventory, cash, retained earnings, total debt and total fixed assets. The income statement accounts are net income, sales, interest expense and tax expense.

Analysis of results

Once the variables are identified for each of the companies in the study, the ratios for each model are computed. Applying the formula(s) for each model to the ratios yields the appropriate score for the firm.

The Altman model will produce one score for each company. In Altman's original study, he determined that all firms with a score of less than 1.81 were failed and that all firms that had a score in excess of 2.99 were not failed. Scores between 1.81 and 2.99 were not consistently failed or non-failed and required further investigation. These cutoff values will be the same for this study.

The firms will be grouped into the two classifications, failed or non-failed. Using the computed scores, each firm within each group will then be put into a secondary group that indicates the results of the test, failed, non-failed or unclassified. The results will be presented in a "prediction accuracy-matrix" format adapted from the accuracy matrix format used by Altman to evaluate his study.

An analysis of the predictive ability of the model can now be evaluated, whether the model correctly predicts the firm's status, fails to predict the firm's status or is unable to predict the firm's status. The model's accuracy will be determined based on the percentage of the firms that are correctly classified. Therefore there will be three separate measures for accuracy, the percentage of failed firms classified as failed, the percentage of non-failed firms classified as non-failed and the percentage of all the firms that are properly classified.

Since the utility of the model is determined not only by its accuracy but also by the frequency of each type of error when the firm is incorrectly classified. Whether one type of error is considered more severe than another type of error depends on the perspective of the user.

A type one error occurs when a failing firm is incorrectly classified as non-failing. This type of error would be particularly bad for a lender or an investor who is considering additional investment in the firm. If the firm is judged as unlikely to fail, investment that might otherwise not be made will be at higher risk. While the additional investment could actually lower the likelihood of failure, it is the nature of the investment that changes. The investor should be aware that an investment is a bailout investment as opposed to a going concern business investment, when making the decision.

A type two error occurs when a non-failing firm is incorrectly classified as failing. The costs of type two errors are primarily opportunity costs. An investor or a lender may not make what would be a sound investment in a firm that is not likely to fail. Alternatively the cost to the firm of obtaining investment dollars may be unfairly priced due to the inappropriately perceived risk of failure. A higher cost of obtaining funds or

the non-availability of needed funds could also change the status of the firm from probably non-failing to failing.

The frequency of non-classification also impacts the utility of the model. If the model is unable to predict failure or non-failure, further analysis is required before making decisions and no predisposition indication is available. While additional analysis is always appropriate before making decisions, the model just does not add any value to the analysis if it does not provide a classification.

Since the study is using matched pair samples, a simple random classification of a firm as either failed or non-failed would be accurate 50% of the time. This type of classification is called a naïve selection, and the added utility of the models being evaluated is determined by how much better they predict failure or non-failure than a naïve prediction.

The Deakin model has two functions that must be solved for each company, a linear function and a quadratic function. Each equation yields a score for each firm.

Using the criteria derived from Deakin's study, a score on the linear equation that is closer to –1.381 than to 1.053 will be considered failed. Using the midpoint of the two values as the cutoff means that a score below –0.164 will be considered failed and above –0.164 will be considered non-failed. For the quadratic equation a score closer to –37.84 than to –54.24 will be considered failed. Again using the midpoint between these two values as the cutoff means that a score higher than –46.02 will be considered failed and a score lower than –46.02 will be considered non-failed.

For each equation an accuracy matrix will be developed showing the correct classifications, the type one errors and the type two errors. In addition, using the decision

criteria recommended by Deakin, the firms would be classified a third time based on the results of the two equations. His criteria were that to be considered failed or not failed a company would have to have scores in both models that were the same.

It is the third accuracy matrix that will be used to evaluate the model, since Deakin used this as the test to resolve any differences in the models. This means that like the Altman model, the Deakin model will have an accuracy percentage, type one errors, type two errors and unclassified firms.

The Zavgren model calculates a probability of failure rather than a score. Thus the reliability of the model will have be determined in a different manner than the one used for the Altman and the Deakin models. In her study, Zavgren presented graphs that showed the results of the analysis for each of the five years preceding failure. The graphs showed the actual failure rates at intervals of computed probability of failure. The graphs showed that both one year and two years prior to failure, the failed firms had a computed probability of failure greater than 70% approximately 65% of the time. Non-failed firms had a probability of failure of less than 30% approximately 65% of the time. Therefore for purposes of this study, these percentages will be used to determine the accuracy of the model, with percentages between 30% and 70% being considered non-classified.

After the accuracy of each model is determined, the overall results of each model will be compared to determine which model is the better predictor of failure for the casino industry. The results of each model will also be evaluated against the results of a naïve model.

CHAPTER FOUR

DESCRIPTIVE ANALYSIS OF FINDINGS AND RESULTS

This chapter presents the results of the data collection and the testing of each of the models. Comparisons of the results of the tests for each model are presented and the tests are compared for predictive ability.

Table 2 presents the financial data needed to calculate the ratios to be used in the three models being tested for each of the failed casino companies in the study. Table 3 presents the financial data for each of the non-failed casino companies in the study. All of the information was obtained from published financial statements, except a value of one was substituted for any of the reported numbers that were zero and would have resulted in meaningless ratios. The market values did not come from the financial statements either. Closing prices of stock or end-of-the-year high stock prices were multiplied by the number of shares outstanding were used to calculate market value, if the information was available. In cases where information was not available, the year-end balance of the equity section (if positive) of the balance sheet was used to represent market value. If the equity section had a negative value, a market value of 1 was assigned, using the assumption that the company was not worth enough to pay off its creditors.

Table 4 shows the results of calculating the ratios to be used in each of the models for the failed casinos in the study. Table 5 shows the results of calculating the ratios to be used in each of the models for the non-failed casinos in the study.

The ratios calculated for the Altman models are working capital to total assets, retained earnings o total assets, earnings before interest and taxes to total assets, market value to total debt and sales to total assets.

The ratios used in the Deakin models are net income to total assets, current assets to total assets, cash to total assets, current assets to current liabilities and sales to current assets.

The ratios used in the Zavgren models are net income to total equity, total sales to net plant, total inventory to total sales, total liabilities to total equity, total receivables to total inventory, quick assets to current liabilities and total cash to total assets.

Table 6 shows the results of calculating the model results for each of the failed casinos in the study. Table 7 shows the results of calculating the model results for each of the non-failed casinos in the study.

Table 8 shows the calculated classification of each of the failed casinos for each of the three model tests. Table 9 shows the calculated classification of each of the non-failed casinos for each of the three model tests.

Tables 10, 11, 12, 13 and 14 summarize the results of the tests for each of the two groups (failed and non-failed) for each of the three models, using the Prediction Accuracy Matrix format.

The analysis and conclusions of the model results are presented in the next chapter.

Table 2
Financial Statement Information for Failed Casinos ($000)

	Arizona Charlies		Bally's Grand		Claridge	
Year	1996	1995	1990	1989	1997	1996
Total Assets	62,357	65,273	66,519	70,110	150,380	164,163
Total Liabilities	71,858	70,215	41,129	24,075	166,193	173,997
Total Equity	(9,501)	(4,942)	25,390	46,035	(15,813)	(9,834)
Current Assets	8,306	13,131	40,087	46,940	37,096	31,753
Current Liabilities	66,836	10,211	14,036	13,602	41,234	39,027
Total Receivables	473	658	14,561	23,659	21,467	19,744
Total Inventory	575	661	12,199	14,107	2,935	3,199
Cash	4,591	5,404	1,012	1	12,424	8,532
Retained Earnings	(9,970)	(5,411)	18,923	39,690	(20,866)	(14,887)
Total Debt	60,022	60,004	26,637	9,434	85,023	85,000
Total Fixed Assets	45,681	48,358	18,306	17,539	32,094	35,188
Net Income	(4,559)	(4,936)	(30,367)	(4,166)	(5,979)	(15,389)
Sales	63,301	57,082	54,509	65,424	192,753	193,311
Interest Expense	7,095	6,574	3,365	2,979	10,567	9,350
Tax Expense	-	-	(9,600)	(2,334)	-	(5,398)
Market Value	1	1	25,390	46,035	1	1

	Debbie Reynolds		Four Queens		Gold River	
Year	1996	1995	1994	1993	1989	1988
Total Assets	9,292	11,929	67,315	71,923	137,730	42,672
Total Liabilities	15,621	12,813	68,979	67,356	133,464	33,026
Total Equity	(6,329)	(884)	(1,664)	4,567	4,266	9,646
Current Assets	1,831	2,504	6,204	7,499	25,882	7,566
Current Liabilities	15,621	12,563	16,709	12,799	15,314	8,643
Total Receivables	985	1,451	742	699	225	174
Total Inventory	541	615	396	202	194	236
Cash	2	324	3,407	5,114	22,267	6,427
Retained Earnings	(21,490)	(15,026)	(63,023)	(53,582)	(17,579)	(12,354)
Total Debt	8,688	8,328	52,081	54,368	118,150	24,303
Total Fixed Assets	10,586	10,434	28,341	27,168	70,420	34,409
Net Income	(6,464)	(8,603)	(9,441)	(2,537)	(5,225)	3,796
Sales	6,421	9,790	62,706	66,852	39,911	46,370
Interest Expense	1,554	2,601	9,086	4,256	9,106	2,844
Tax Expense	-	-	-	(624)	-	-
Market Value	1	1	23,814	51,298	4,266	9,646

Table 2 (con't)
Financial Statement Information for Failed Casinos ($000)

	Gold River		Palace		Resorts International	
Year	1995	1994	1995	1994	1993	1992
Total Assets	35,926	96,833	27,685	67,499	575,785	568,950
Total Liabilities	97,132	87,699	65,936	62,230	689,529	586,212
Total Equity	(61,206)	9,134	(38,251)	5,269	(113,744)	(17,262)
Current Assets	5,982	4,809	9,935	13,297	115,419	107,937
Current Liabilities	96,863	82,460	2,632	57,802	550,500	72,500
Total Receivables	457	374	48	49	19,297	25,457
Total Inventory	597	620	1	30	8,664	8,531
Cash	3,600	2,195	8,435	12,212	62,546	56,818
Retained Earnings	(83,360)	(13,020)	(57,698)	(14,179)	(210,720)	(108,556)
Total Debt	269	5,239	63,304	4,429	551,365	460,712
Total Fixed Assets	29,000	91,241	17,256	52,437	447,840	450,816
Net Income	(70,340)	(5,631)	(43,519)	(10,316)	(102,164)	(53,454)
Sales	48,871	56,477	27,593	5,406	439,564	436,934
Interest Expense	6,571	10,673	3,699	1,486	57,244	40,856
Tax Expense	-	-	-	-	(1,000)	1,348
Market Value	1	9,134	1	5,269	42,834	25,196

	Sands - Atlantic City		Santa Fe		Stratosphere	
Year	1997	1996	1997	1996	1996	1995
Total Assets	15,752	221,345	216,296	228,656	181,080	433,906
Total Liabilities	158,868	380,552	195,438	196,180	318,522	241,616
Total Equity	(143,116)	(159,207)	20,858	32,476	(137,443)	192,290
Current Assets	9,381	46,203	22,457	27,085	37,941	104,279
Current Liabilities	106,372	53,063	26,459	25,805	45,983	38,616
Total Receivables	61	10,656	910	1,530	4,575	4,486
Total Inventory	164	4,016	1,248	1,218	2,629	1,697
Cash	6,555	24,991	15,146	17,498	25,237	92,596
Retained Earnings	(218,847)	(198,283)	(51,099)	(37,965)	(356,814)	(7,972)
Total Debt	30,894	322,897	168,979	167,687	272,539	203,000
Total Fixed Assets	1,210	156,887	140,751	148,412	130,000	194,908
Net Income	(20,564)	(35,566)	(11,617)	17,594	(348,843)	(4,663)
Sales	263,366	283,640	104,989	148,432	108,739	59,864
Interest Expense	38,246	39,851	22,608	24,422	21,762	11,970
Tax Expense	(1,014)	(160)	3,821	4,237	-	-
Market Value	3,268	8,092	25,149	38,313	41,970	408,617

Table 3
Financial Statement Information for Non-Failed Casinos ($000)

	Ameristar		Argosy		Aztar	
Year	1995	1994	1993	1992	1996	1995
Total Assets	202,220	125,347	94,635	21,022	1,119,582	1,013,238
Total Liabilities	137,173	68,738	13,683	18,210	680,308	653,579
Total Equity	65,047	56,609	80,952	2,812	439,274	359,659
Current Assets	33,807	14,965	17,626	3,096	113,320	73,134
Current Liabilities	29,400	2,701	12,370	13,975	120,238	102,068
Total Receivables	888	615	521	99	41,723	21,325
Total Inventory	2,273	1,538	201	248	7,508	6,591
Cash	14,787	9,169	7,404	2,749	44,131	26,527
Retained Earnings	21,800	13,362	8,844	2,599	44,846	24,922
Total Debt	94,428	38,617	431	3,351	527,006	496,439
Total Fixed Assets	163,217	108,155	53,787	17,112	927,059	853,680
Net Income	8,438	4,220	10,825	15,214	20,639	(4,994)
Sales	123,867	114,353	67,525	58,019	777,472	572,869
Interest Expense	3,958	3,379	800	7,882	58,577	51,052
Tax Expense	5,236	2,426	3,956	338	22,699	5,187
Market Value	145,065	167,970	454,419	15,785	427,500	349,177

	Boomtown		Boyd Gaming		Caesar's	
Year	1995	1994	1997	1996	1994	1993
Total Assets	239,198	238,467	1,030,185	953,425	1,018,021	955,719
Total Liabilities	133,953	130,450	838,869	720,168	461,154	482,829
Total Equity	105,245	108,017	191,316	233,257	556,867	472,890
Current Assets	33,714	23,510	95,540	86,816	276,841	241,135
Current Liabilities	24,831	25,270	99,077	95,814	179,301	165,459
Total Receivables	924	1,321	16,946	16,040	71,341	66,041
Total Inventory	2,715	3,016	8,501	6,531	12,986	11,364
Cash	20,775	11,391	55,220	48,980	143,499	108,616
Retained Earnings	1,793	4,670	52,610	130,102	477,766	399,405
Total Debt	106,547	105,140	739,792	590,808	212,556	243,024
Total Fixed Assets	150,955	157,298	744,038	796,093	626,740	616,393
Net Income	(2,877)	(8,052)	(77,492)	28,144	78,361	83,215
Sales	231,767	103,375	819,259	775,857	1,015,766	983,459
Interest Expense	13,434	5,632	61,672	52,360	19,295	26,883
Tax Expense	876	(2,779)	(34,025)	20,021	50,194	50,761
Market Value	114,197	175,973	376,835	986,942	1,137,940	1,252,543

Table 3 (con't)
Financial Statement Information for Non-Failed Casinos ($000)

	Casino America		Circus Circus		Harvey's	
Year	1997	1996	1997	1996	1994	1993
Total Assets	528,421	226,474	2,729,111	2,213,503	229,868	213,462
Total Liabilities	450,448	176,204	1,694,739	968,161	114,934	123,454
Total Equity	77,973	50,270	971,791	1,226,812	123,611	90,008
Current Assets	78,415	27,379	151,849	125,990	26,167	24,910
Current Liabilities	69,538	38,311	129,768	95,532	20,165	16,253
Total Receivables	4,793	1,764	34,434	16,137	2,629	2,789
Total Inventory	1,776	1,030	19,371	20,459	2,890	2,379
Cash	51,846	18,585	69,516	62,704	7,446	11,338
Retained Earnings	15,202	36,253	984,363	883,630	94,217	90,200
Total Debt	364,617	130,884	1,405,897	715,214	64,895	80,203
Total Fixed Assets	285,234	129,306	1,920,032	1,474,684	192,240	166,419
Net Income	(21,051)	1,555	100,733	128,898	5,138	4,809
Sales	375,602	157,963	1,334,250	1,299,596	128,286	132,259
Interest Expense	40,332	15,293	54,681	51,537	3,556	4,559
Tax Expense	(1,560)	3,333	63,130	76,861	2,500	2,994
Market Value	392,583	253,102	2,328,985	3,877,775	140,235	102,113

	Hollywood Park		Lady Luck		Mirage	
Year	1997	1996	1996	1995	1996	1995
Total Assets	419,029	205,886	223,718	217,281	2,143,490	1,791,713
Total Liabilities	195,729	44,711	200,973	200,675	852,607	582,370
Total Equity	221,354	158,160	6,315	1,937	1,290,883	1,209,343
Current Assets	60,206	40,959	20,584	35,219	236,283	214,816
Current Liabilities	57,317	35,364	19,892	23,702	218,465	174,351
Total Receivables	9,417	7,110	1,276	597	70,196	76,859
Total Inventory	1,633	2,441	1,198	885	27,554	25,601
Cash	24,156	16,408	15,490	22,148	81,908	48,026
Retained Earnings	(3,618)	(10,775)	(25,096)	(29,474)	856,215	650,170
Total Debt	132,102	282	181,081	176,973	468,140	248,548
Total Fixed Assets	300,666	130,835	173,119	155,664	1,728,348	1,439,517
Net Income	8,670	(4,249)	6,139	4,461	206,045	163,163
Sales	248,128	143,225	161,707	149,590	1,367,544	1,330,744
Interest Expense	7,302	942	22,170	20,058	31,106	32,799
Tax Expense	5,850	3,459	(69)	(401)	112,363	95,313
Market Value	221,354	158,160	73,213	87,855	3,856,516	3,185,550

Table 4
Financial Ratios for Failed Casinos

	Arizona Charlies		Bally's Grand		Claridge	
Year	1996	1995	1990	1989	1997	1996
Altman Ratios:						
Working capital/Total assets	-94%	4%	39%	48%	-3%	-4%
Retained earnings/Total assets	-16%	-8%	28%	57%	-14%	-9%
Earnings B4 interest & taxes/Total assets	4%	3%	-55%	-5%	3%	-7%
Market value/Total debt	0%	0%	95%	488%	0%	0%
Sales/Total assets	102%	87%	82%	93%	128%	118%
Deakin Ratios:						
Net income/Total assets	-7%	-8%	-46%	-6%	-4%	-9%
Current assets/Total assets	13%	20%	60%	67%	25%	19%
Cash/Total assets	7%	8%	2%	0%	8%	5%
Current assets/Current liabilities	12%	129%	286%	345%	90%	81%
Sales/Current assets	762%	435%	136%	139%	520%	609%
Zavgren Ratios:						
Net income/Total equity	48%	100%	-120%	-9%	38%	156%
Total sales/Net plant	139%	118%	298%	373%	601%	549%
Total inventory/Total sales	1%	1%	22%	22%	2%	2%
Total liabilities/Total equity	-756%	-1421%	162%	52%	-1051%	-1769%
Total receivables/Total inventory	82%	100%	119%	168%	731%	617%
Quick assets/Current liabilities	8%	59%	111%	174%	82%	72%
Total cash/Total assets	7%	8%	2%	0%	8%	5%

Table 4 (con't)
Financial Ratios for Failed Casinos

	Debbie Reynolds		Four Queens		Gold River	
Year	1996	1995	1994	1993	1989	1988
Altman Ratios:						
Working capital/Total assets	-148%	-84%	-16%	-7%	8%	-3%
Retained earnings/Total assets	-231%	-126%	-94%	-74%	-13%	-29%
Earnings B4 interest & taxes/Total assets	-53%	-50%	-1%	2%	3%	16%
Market value/Total debt	0%	0%	35%	71%	3%	23%
Sales/Total assets	69%	82%	93%	93%	29%	109%
Deakin Ratios:						
Net income/Total assets	-70%	-72%	-14%	-4%	-4%	9%
Current assets/Total assets	20%	21%	9%	10%	19%	18%
Cash/Total assets	0%	3%	5%	7%	16%	15%
Current assets/Current liabilities	12%	20%	37%	59%	169%	88%
Sales/Current assets	351%	391%	1011%	891%	154%	613%
Zavgren Ratios:						
Net income/Total equity	102%	973%	567%	-56%	-122%	39%
Total sales/Net plant	61%	94%	221%	246%	57%	135%
Total inventory/Total sales	8%	6%	1%	0%	0%	1%
Total liabilities/Total equity	-247%	-1449%	-4145%	1475%	3129%	342%
Total receivables/Total inventory	182%	236%	187%	346%	116%	74%
Quick assets/Current liabilities	6%	14%	25%	45%	147%	76%
Total cash/Total assets	0%	3%	5%	7%	16%	15%

Table 4 (con't)
Financial Ratios for Failed Casinos

	Gold River		Palace		Resorts Inter'l	
Year	1995	1994	1995	1994	1993	1992
Altman Ratios:						
Working capital/Total assets	-253%	-80%	26%	-66%	-76%	6%
Retained earnings/Total assets	-232%	-13%	-208%	-21%	-37%	-19%
Earnings B4 interest & taxes/Total assets	-178%	5%	-144%	-13%	-8%	-2%
Market value/Total debt	0%	174%	0%	119%	8%	5%
Sales/Total assets	136%	58%	100%	8%	76%	77%
Deakin Ratios:						
Net income/Total assets	115%	-62%	114%	-196%	90%	310%
Current assets/Total assets	17%	5%	36%	20%	20%	19%
Cash/Total assets	10%	2%	30%	18%	11%	10%
Current assets/Current liabilities	6%	6%	377%	23%	21%	149%
Sales/Current assets	817%	1174%	278%	41%	381%	405%
Zavgren Ratios:						
Net income/Total equity	115%	-62%	114%	-196%	90%	310%
Total sales/Net plant	169%	62%	160%	10%	98%	97%
Total inventory/Total sales	1%	1%	0%	1%	2%	2%
Total liabilities/Total equity	-159%	960%	-172%	1181%	-606%	-3396%
Total receivables/Total inventory	77%	60%	4800%	163%	223%	298%
Quick assets/Current liabilities	4%	3%	322%	21%	15%	113%
Total cash/Total assets	10%	2%	30%	18%	11%	10%

Table 4 (con't)
Financial Ratios for Failed Casinos

	Sands - Atl Cty		Santa Fe		Stratosphere	
Year	1997	1996	1997	1996	1996	1995
Altman Ratios:						
Working capital/Total assets	-616%	-3%	-2%	1%	-4%	15%
Retained earnings/Total assets	-1389%	-90%	-24%	-17%	-197%	-2%
Earnings B4 interest & taxes/Total assets	106%	2%	7%	20%	-181%	2%
Market value/Total debt	11%	3%	15%	23%	15%	201%
Sales/Total assets	1672%	128%	49%	65%	60%	14%
Deakin Ratios:						
Net income/Total assets	-131%	-16%	-5%	8%	-193%	-1%
Current assets/Total assets	60%	21%	10%	12%	21%	24%
Cash/Total assets	42%	11%	7%	8%	14%	21%
Current assets/Current liabilities	9%	87%	85%	105%	83%	270%
Sales/Current assets	2807%	614%	468%	548%	287%	57%
Zavgren Ratios:						
Net income/Total equity	14%	22%	-56%	54%	254%	-2%
Total sales/Net plant	21766%	181%	75%	100%	84%	31%
Total inventory/Total sales	0%	1%	1%	1%	2%	3%
Total liabilities/Total equity	-111%	-239%	937%	604%	-232%	126%
Total receivables/Total inventory	37%	265%	73%	126%	174%	264%
Quick assets/Current liabilities	6%	67%	61%	74%	65%	251%
Total cash/Total assets	42%	11%	7%	8%	14%	21%

Table 5
Financial Ratios for Non-Failed Casinos

	Ameristar		Argosy		Aztar	
Year	1995	1994	1993	1992	1996	1995
Altman Ratios:						
Working capital/Total assets	2%	10%	6%	-52%	-1%	-3%
Retained earnings/Total assets	11%	11%	9%	12%	4%	2%
Earnings B4 interest & taxes/Total assets	9%	8%	16%	111%	9%	5%
Market value/Total debt	154%	435%	105434%	471%	81%	70%
Sales/Total assets	61%	91%	71%	276%	69%	57%
Deakin Ratios:						
Net income/Total assets	4%	3%	11%	72%	2%	0%
Current assets/Total assets	17%	12%	19%	15%	10%	7%
Cash/Total assets	7%	7%	8%	13%	4%	3%
Current assets/Current liabilities	115%	554%	142%	22%	94%	72%
Sales/Current assets	366%	764%	383%	1874%	686%	783%
Zavgren Ratios:						
Net income/Total equity	13%	7%	13%	541%	5%	-1%
Total sales/Net plant	76%	106%	126%	339%	84%	67%
Total inventory/Total sales	2%	1%	0%	0%	1%	1%
Total liabilities/Total equity	211%	121%	17%	648%	155%	182%
Total receivables/Total inventory	39%	40%	259%	40%	556%	324%
Quick assets/Current liabilities	53%	362%	64%	20%	71%	47%
Total cash/Total assets	7%	7%	8%	13%	4%	3%

Table 5 (con't)
Financial Ratios for Non-Failed Casinos

	Boomtown		Boyd Gaming		Caesar's	
Year	1995	1994	1997	1996	1994	1993
Altman Ratios:						
Working capital/Total assets	4%	-1%	0%	-1%	10%	8%
Retained earnings/Total assets	1%	2%	5%	14%	47%	42%
Earnings B4 interest & taxes/Total assets	5%	-2%	-5%	11%	15%	17%
Market value/Total debt	48%	74%	37%	104%	112%	131%
Sales/Total assets	97%	43%	80%	81%	100%	103%
Deakin Ratios:						
Net income/Total assets	-1%	-3%	-8%	3%	8%	9%
Current assets/Total assets	14%	10%	9%	9%	27%	25%
Cash/Total assets	9%	5%	5%	5%	14%	11%
Current assets/Current liabilities	136%	93%	96%	91%	154%	146%
Sales/Current assets	687%	440%	858%	894%	367%	408%
Zavgren Ratios:						
Net income/Total equity	-3%	-7%	-41%	12%	14%	18%
Total sales/Net plant	154%	66%	110%	97%	162%	160%
Total inventory/Total sales	1%	3%	1%	1%	1%	1%
Total liabilities/Total equity	127%	121%	438%	309%	83%	102%
Total receivables/Total inventory	34%	44%	199%	246%	549%	581%
Quick assets/Current liabilities	87%	50%	73%	68%	120%	106%
Total cash/Total assets	9%	5%	5%	5%	14%	11%

Table 5 (con't)
Financial Ratios for Non-Failed Casinos

	Casino America		Circus Circus		Harvey's	
Year	1997	1996	1997	1996	1994	1993
Altman Ratios:						
Working capital/Total assets	2%	-5%	1%	1%	3%	4%
Retained earnings/Total assets	3%	16%	36%	40%	41%	42%
Earnings B4 interest & taxes/Total assets	3%	9%	8%	12%	5%	6%
Market value/Total debt	108%	193%	166%	542%	216%	127%
Sales/Total assets	71%	70%	49%	59%	56%	62%
Deakin Ratios:						
Net income/Total assets	-27%	3%	10%	11%	4%	5%
Current assets/Total assets	15%	12%	6%	6%	11%	12%
Cash/Total assets	10%	8%	3%	3%	3%	5%
Current assets/Current liabilities	113%	71%	117%	132%	130%	153%
Sales/Current assets	479%	577%	879%	1032%	490%	531%
Zavgren Ratios:						
Net income/Total equity	-27%	3%	10%	11%	4%	5%
Total sales/Net plant	132%	122%	69%	88%	67%	79%
Total inventory/Total sales	0%	1%	1%	2%	2%	2%
Total liabilities/Total equity	578%	351%	174%	79%	93%	137%
Total receivables/Total inventory	270%	171%	178%	79%	91%	117%
Quick assets/Current liabilities	81%	53%	80%	83%	50%	87%
Total cash/Total assets	10%	8%	3%	3%	3%	5%

Table 5 (con't)
Financial Ratios for Non-Failed Casinos

	Hollywood Park		Lady Luck		Mirage	
Year	1995	1994	1997	1996	1994	1993
Altman Ratios:						
Working capital/Total assets	1%	3%	0%	5%	1%	2%
Retained earnings/Total assets	-1%	-5%	-11%	-14%	40%	36%
Earnings B4 interest & taxes/Total assets	5%	0%	13%	11%	16%	16%
Market value/Total debt	168%	56085%	40%	50%	824%	1282%
Sales/Total assets	59%	70%	72%	69%	64%	74%
Deakin Ratios:						
Net income/Total assets	2%	-2%	3%	2%	10%	9%
Current assets/Total assets	14%	20%	9%	16%	11%	12%
Cash/Total assets	6%	8%	7%	10%	4%	3%
Current assets/Current liabilities	105%	116%	103%	149%	108%	123%
Sales/Current assets	412%	350%	786%	425%	579%	619%
Zavgren Ratios:						
Net income/Total equity	4%	-3%	97%	230%	16%	13%
Total sales/Net plant	83%	109%	93%	96%	79%	92%
Total inventory/Total sales	1%	2%	1%	1%	2%	2%
Total liabilities/Total equity	88%	28%	3182%	10360%	66%	48%
Total receivables/Total inventory	577%	291%	107%	67%	255%	300%
Quick assets/Current liabilities	59%	67%	84%	96%	70%	72%
Total cash/Total assets	6%	8%	7%	10%	4%	3%

Table 6
Bankruptcy Prediction Model Results for Failed Casinos

	Altman		Zavgren	
Year	One Year Prior	Two Years Prior	One Year Prior	Two Years Prior
Arizona Charlies	1.002	0.874	0.553	0.857
Bally's Grand	0.815	0.973	0.179	0.246
Claridge	1.279	1.172	0.605	0.941
Debbie Reynolds	0.623	0.776	0.325	0.882
Four Queens	0.918	0.922	2.045	(0.451)
Gold River	0.290	1.088	(1.118)	0.089
Gold River	1.238	0.583	0.294	(0.192)
Palace	0.922	0.072	(0.372)	(0.323)
Resorts Inter'l	0.746	0.765	0.466	1.709
Sands - Atl Cty	16.470	1.268	0.481	0.312
Santa Fe	0.485	0.654	(0.171)	(0.026)
Stratosphere	0.513	0.152	0.330	0.197

	Deakin - Linear		Deakin - Quadratic	
Year	One Year Prior	Two Years Prior	One Year Prior	Two Years Prior
Arizona Charlies	(0.891)	(1.102)	3.504	(15.080)
Bally's Grand	(6.272)	(0.515)	(64.627)	(67.343)
Claridge	(0.590)	(1.184)	(12.778)	(8.617)
Debbie Reynolds	(10.269)	(10.527)	(32.625)	(35.383)
Four Queens	(1.229)	0.067	8.932	3.204
Gold River	(1.012)	1.319	(20.688)	(10.696)
Gold River	16.113	(7.620)	(102.610)	0.592
Palace	16.266	(28.422)	(157.136)	(266.821)
Resorts Inter'l	11.844	42.861	(70.949)	(715.488)
Sands - Atl Cty	(14.190)	(2.115)	(11.399)	(10.231)
Santa Fe	(0.906)	1.137	(6.434)	(9.617)
Stratosphere	(27.249)	(0.451)	(258.120)	(35.579)

Table 7
Bankruptcy Prediction Model Results for Non-Failed Casinos

	Altman		Zavgren	
Year	One Year Prior	Two Years Prior	One Year Prior	Two Years Prior
Ameristar	0.626	0.943	0.151	0.285
Argosy	7.046	2.818	0.204	(0.027)
Aztar	0.702	0.571	0.102	0.121
Boomtown	0.973	0.437	0.281	0.288
Boyd Gaming	0.796	0.824	0.032	0.083
Caesar's	1.016	1.048	0.140	0.125
Casino America	0.718	0.713	(0.041)	0.068
Circus Circus	0.506	0.629	0.158	0.216
Harvey's	0.578	0.635	0.197	0.183
Hollywood Park	0.603	4.060	0.122	0.193
Lady Luck	0.727	0.693	(1.138)	(4.248)
Mirage	0.698	0.830	0.189	0.191

	Deakin - Linear		Deakin - Quadratic	
Year	One Year Prior	Two Years Prior	One Year Prior	Two Years Prior
Ameristar	0.341	2.737	(13.355)	(70.832)
Argosy	1.487	12.312	(18.259)	(2.028)
Aztar	0.573	0.355	(5.367)	(0.067)
Boomtown	0.292	(0.638)	(10.738)	(7.350)
Boyd Gaming	(0.392)	1.107	(1.044)	(0.491)
Caesar's	0.952	1.153	(23.221)	(21.073)
Casino America	(3.784)	0.420	(13.935)	(5.375)
Circus Circus	2.223	2.596	(4.158)	(2.295)
Harvey's	0.659	0.983	(12.146)	(14.298)
Hollywood Park	0.107	(0.554)	(10.962)	(14.222)
Lady Luck	0.909	0.276	(3.900)	(16.069)
Mirage	1.498	1.573	(10.051)	(11.697)

Table 8
Bankruptcy Prediction Model Classifications of Failed Casinos

	Altman		Zavgren	
Year	One Year Prior	Two Years Prior	One Year Prior	Two Years Prior
Arizona Charlies	Failed	Failed	Unclassified	Non-Failed
Bally's Grand	Failed	Failed	Failed	Failed
Claridge	Failed	Failed	Unclassified	Non-Failed
Debbie Reynolds	Failed	Failed	Unclassified	Non-Failed
Four Queens	Failed	Failed	Non-Failed	Failed
Gold River	Failed	Failed	Failed	Failed
Gold River	Failed	Failed	Failed	Failed
Palace	Failed	Failed	Failed	Failed
Resorts Inter'l	Failed	Failed	Unclassified	Non-Failed
Sands - Atl Cty	Non-Failed	Failed	Unclassified	Unclassified
Santa Fe	Failed	Failed	Failed	Failed
Stratosphere	Failed	Failed	Unclassified	Failed

	Deakin - Linear		Deakin - Quadratic	
Year	One Year Prior	Two Years Prior	One Year Prior	Two Years Prior
Arizona Charlies	Failed	Failed	Failed	Failed
Bally's Grand	Failed	Failed	Non-Failed	Non-Failed
Claridge	Failed	Failed	Failed	Failed
Debbie Reynolds	Failed	Failed	Failed	Failed
Four Queens	Failed	Non-Failed	Failed	Failed
Gold River	Failed	Non-Failed	Failed	Failed
Gold River	Non-Failed	Failed	Non-Failed	Failed
Palace	Non-Failed	Failed	Non-Failed	Non-Failed
Resorts Inter'l	Non-Failed	Non-Failed	Non-Failed	Non-Failed
Sands - Atl Cty	Failed	Failed	Failed	Failed
Santa Fe	Failed	Non-Failed	Failed	Failed
Stratosphere	Failed	Failed	Non-Failed	Failed

Table 9
Bankruptcy Prediction Model Classifications of Non-Failed Casinos

	Altman		Zavgren	
Year	One Year Prior	Two Years Prior	One Year Prior	Two Years Prior
Ameristar	Failed	Failed	Failed	Failed
Argosy	Non-Failed	Non-Failed	Failed	Failed
Aztar	Failed	Failed	Failed	Failed
Boomtown	Failed	Failed	Failed	Failed
Boyd Gaming	Failed	Failed	Failed	Failed
Caesar's	Failed	Failed	Failed	Failed
Casino America	Failed	Failed	Failed	Failed
Circus Circus	Failed	Failed	Failed	Failed
Harvey's	Failed	Failed	Failed	Failed
Hollywood Park	Failed	Non-Failed	Failed	Failed
Lady Luck	Failed	Failed	Failed	Failed
Mirage	Failed	Failed	Failed	Failed

	Deakin - Linear		Deakin - Quadratic	
Year	One Year Prior	Two Years Prior	One Year Prior	Two Years Prior
Ameristar	Non-Failed	Non-Failed	Failed	Non-Failed
Argosy	Non-Failed	Non-Failed	Failed	Failed
Aztar	Non-Failed	Non-Failed	Failed	Failed
Boomtown	Non-Failed	Failed	Failed	Failed
Boyd Gaming	Failed	Non-Failed	Failed	Failed
Caesar's	Non-Failed	Non-Failed	Failed	Failed
Casino America	Failed	Non-Failed	Failed	Failed
Circus Circus	Non-Failed	Non-Failed	Failed	Failed
Harvey's	Non-Failed	Non-Failed	Failed	Failed
Hollywood Park	Non-Failed	Failed	Failed	Failed
Lady Luck	Non-Failed	Non-Failed	Failed	Failed
Mirage	Non-Failed	Non-Failed	Failed	Failed

Table 10
Prediction Accuracy Matrix for Altman Model

One Year Prior to Failure:

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	11	1	12	0
Non-Bankrupt	11	1	12	0
Total	22	2	24	0

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	92%	8%	100%	0%
Non-Bankrupt	92%	8%	100%	0%
Total			50%	0%

Two Years Prior to Failure:

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	12	0	12	0
Non-Bankrupt	10	2	12	0
Total	22	2	24	0

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	100%	0%	100%	0%
Non-Bankrupt	83%	17%	100%	0%
Total			58%	0%

Table 11
Prediction Accuracy Matrix for Deakin Linear Model

One Year Prior to Failure:

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	9	3	12	0
Non-Bankrupt	2	10	12	0
Total	11	13	24	0

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	75%	25%	100%	0%
Non-Bankrupt	17%	83%	100%	0%
Total			79%	0%

Two Years Prior to Failure:

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	8	4	12	0
Non-Bankrupt	2	10	12	0
Total	10	14	24	0

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	67%	33%	100%	0%
Non-Bankrupt	17%	83%	100%	0%
Total			75%	0%

Table 12
Prediction Accuracy Matrix for Deakin Quadratic Model

One Year Prior to Failure:

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	7	5	12	0
Non-Bankrupt	12	0	12	0
Total	19	5	24	0

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	58%	42%	100%	0%
Non-Bankrupt	100%	0%	100%	0%
Total			29%	0%

Two Years Prior to Failure:

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	9	3	12	0
Non-Bankrupt	11	1	12	0
Total	20	4	24	0

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	75%	25%	100%	0%
Non-Bankrupt	92%	8%	100%	0%
Total			42%	0%

Table 13
Prediction Accuracy Matrix for Deakin Combined Models

One Year Prior to Failure:

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	7	3	12	2
Non-Bankrupt	2	0	12	10
Total	9	3	24	12

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	58%	25%	83%	17%
Non-Bankrupt	17%	0%	17%	83%
Total			29%	50%

Two Years Prior to Failure:

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	7	1	12	4
Non-Bankrupt	2	1	12	9
Total	9	2	24	13

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	58%	8%	67%	33%
Non-Bankrupt	17%	8%	25%	75%
Total			33%	54%

Table 14
Prediction Accuracy Matrix for Zavgren Model

One Year Prior to Failure:

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	5	1	12	6
Non-Bankrupt	12	0	12	0
Total	17	1	24	6

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	42%	8%	50%	50%
Non-Bankrupt	100%	0%	100%	0%
Total			21%	25%

Two Years Prior to Failure:

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	7	4	12	1
Non-Bankrupt	12	0	12	0
Total	19	4	24	1

	Predicted Group Membership			
Actual Group Membership	Bankrupt	Non-Bankrupt	Total	Non-Classified
Bankrupt	58%	33%	92%	8%
Non-Bankrupt	100%	0%	100%	0%
Total			29%	4%

CHAPTER 5

CONCLUSIONS AND SUMMARY

This section contains an analysis of the results of the tests of the models for the casinos included in the study. Explanations for the major findings are discussed. The nature of the data and the variables used in the models are also reviewed.

An evaluation of each of the models examines their predictive ability and limitations. A determination of the answer to the study's research problem is presented.

Also presented are questions that arose during the study and topics that the study suggests might be appropriate for additional research.

Results of tests

The basis for evaluating the contributions of the models is a naïve prediction. The naïve prediction would be that in a sample population that contained exactly the same number of failed and non-failed firms, assigning an individual firm to one group or another on a random basis would, on average, result in a correct classification 50% of the time.

The Altman model had an accuracy rate of 50% one year prior to bankruptcy and 58% two years prior. These results do not suggest any incremental value to the

prediction decision. The major weakness of the Altman model is that it predicts failure for all but two firms in each of the two years tested. While it is generally agreed that a type two error, predicting failure for a non-failing firm, is less costly than a type one error, predicting failure in all cases except absolutely certain successes would preclude almost all investment decisions.

In looking at the Altman prediction formula, the emphasis on the comparison to the level of investment is obvious. Four of the five variables have total assets as the denominator. One of the problems with using total assets as a basis for determining efficiency in the casino industry is that a large proportion of a casinos assets are not productive assets. Many of the firms in the study had a large portion of their assets in the construction in progress account. There also may be a large amount of intangible assets caused by licensing and pre-opening costs that are being amortized.

While the emphasis of Altman's formula on the amount of total assets and the low level of productive assets in the casino industry explains why the results are low, it does not justify the results. While a low amount of working capital indicates the utilization of a low cost source of capital, from vendors, employees and government, it increases the level of overall risk of the organization. Current liabilities are, by definition, due currently, within twelve months or less, and allowing the amount of liabilities to become too large can create a higher degree of vulnerability to periodic fluctuations in business.

Unlike a manufacturing firm, casinos do not purchase a large volume of raw materials that are then used in the process of creating the product to be sold. Labor and other direct costs are consumed almost immediately coincident with the related sales. This cycle results in the casino paying for its costs with the proceeds of future sales rather

than the sales of the goods being used to pay for its own costs. In a manufacturing situation the raw materials are usually purchased sufficiently prior to their consumption in a finished product that they are paid for before the proceeds of the sale are realized or at least at the same time as the proceeds are realized. This cash flow process would seem to make the casino industry more risky, as its success depends more heavily on the outcome of future events. It does not necessarily indicate a greater likelihood of failure, but it certainly does increase risk. Casinos might be well advised to take better advantage of early payment discounts and reduce their levels of current liabilities relative to their current assets.

Another factor that impacts the Altman formula is the level of short-term debt that casinos are carrying. Casinos have historically been placed in the position of not being able to obtain an adequate level of long-term debt to achieve an equalization of the lives of its fixed assets and the length of the debt repayment schedule for the debt on those assets. The recent trends of some of the larger casino companies to become more dependent on short-term bank loans and lines of credit will exacerbate this problem. The casino industry's dependence on short-term debt could easily increase the vulnerability of the industry to failure, and should be carefully monitored and studied.

The final issue raised by the Altman model is the level of debt carried by the casinos relative to the amount of their equity value. When calculating the market value of the firm to debt ratio, the publicly traded casinos show a strong relationship, indicating the popularity of casino stocks in recent years. The questions of the appropriateness of debt level relative to the total investment or to the amount of equity are not addressed in the Altman model.

The Deakin models present different results. Deakin's linear model has an overall accuracy rate of 79% one year prior to failure and 75% two years prior. While these results are clearly superior to the results of a naïve selection process, they do not come close to the 97.5% success rate he achieved in his original study. The other two models do not come close to the accuracy of a naïve selection process. The quadratic function only achieved an accuracy rate of 29% one year prior to failure and 42% two years prior. The combined model results were 29% and 33% respectively for one and two years prior to failure.

Like the Altman model's variables, the Deakin model variables are heavily influenced by the value of the total assets of the firm. In the linear equation, the highest weight is attributed to the net income to total assets ratio, which measures the return on the total investment. This relationship is not considered in any of the other models, and may explain the reason this model exhibits the best prediction accuracy of all the models. By comparing net income to total assets, which is the same as total investment, both the needs of the equity holders and the debt holders are considered. This would tend to indicate that the failed and the non-failed casinos' ability to generate or not generate an appropriate return do accurately indicate their likelihood of success.

The significance of cash and of current assets relative to the total capitalization of the casinos is the primary reason for the failure of the quadratic equation to accurately predict failure in the casino business. The required levels of cash in the casino industry are highly dependent upon regulatory requirements, and do not really vary significantly between a successful firm and an unsuccessful firm. The levels of cash and working capital are to the Deakin model, as in the Altman model, important factors about which

the casino industry should probably be more attentive, but they do not appear to be significant discriminators between failing and non-failing firms.

The relationships of the Deakin quadratic model do not appear to provide any discriminating information concerning the viability of a casino. According to Deakin, all the casinos are going to fail. Due to the differences in predictive ability between his linear model and his quadratic model it would appear that the primary distinguishing characteristic is the return on investment, and that the coefficients of the quadratic model are not appropriate for casinos.

The Zavgren model has the lowest classification accuracy of the three models. One year prior to failure, the model only classified 75% of the firms and then correctly classified only 21%. Two years out classified a higher percentage of the firms, 96%, but only did slightly better at classification, 29%. This accuracy level is significantly lower than what would be expected from a naïve classification.

The Zavgren model uses inventory levels in two of the variables of the model. In the casino business, inventory levels are not as important as they would be in a manufacturing or a retailing firm. Relationships between inventory levels and sales or between receivables and sales would generally not be indicative of any poor management decisions in the casino business.

The return on equity ratio also does not seem to work for a casino. Because of the high leverage rates of many casinos, equity holders may appear to be achieving acceptable returns if the debt holders are ignored. Since this is the effect of computing return on equity without any return on liabilities or total investment being considered, the

result is non-discrimination. The other ratios in the Zavgren equation reflect the same measurement problems of the casino industry as seen in the Altman and Deakin models.

Evaluation of models & conclusions

The traditional bankruptcy prediction models tested do not provide significant incremental information for predicting bankruptcy in the casino industry. Only a part of one of the models showed results that were superior to what would be expected from a naïve classification. A possible explanation for the inability of the models to perform adequately in the casino industry is that the original studies were done using manufacturing companies, which typically exhibit financial structures that are different than what is seen in the casino industry.

The Altman Z score, which is often quoted in investment banker reports has been widely used in all types of businesses, including casinos, had an accuracy classification rate of only 50% in year one of the test, and 58% in year two. While it accurately predicted failure for 92% of the firms that failed, it did this at the expense of erroneously predicting failure in 92% of the firms that did not fail. The same rate would have been achieved by saying that all casinos are going to fail.

The Deakin linear model did better than the Altman model, achieving a prediction accuracy rate of 79% in year one and 75% in year two. While this represents a positive contribution to overall knowledge of the firm's total financial information, the rates and types of errors can confuse this information. The type one errors were fairly high at 25% and 33%, and would probably not represent an acceptable level relative to the risk of investing in a firm that is likely to fail.

The Deakin quadratic model and the combined results model did not perform as well as a naïve prediction, at 29% in year one and 42% and 33% for year two. The models also produced conflicting results in three of the years. The type two errors were higher than the type one errors in both years for the quadratic model, at 100% and 92% versus 42% and 25%, but both types of errors are higher than acceptable. While the error rates were higher in the combined model, only 46% of the firms were classified.

The Zavgren model achieved the lowest classification accuracy at 21% and 29% for year one and year two respectively. The Zavgren model also had a high rate of non-classified firms, 25% in year one and 4% in year two. The type two errors for those firms classified by the Zavgren model were 100% in each test period and 33% type one errors in year two. The accuracy level would have been much higher by simply saying that all casinos will fail.

The answer to the problem statement of this study is that traditional bankruptcy prediction models do not provide significant incremental information concerning financial performance in the casino industry.

Areas for future research

This study indicates that the financial characteristics of the casino industry are sufficiently different from traditional manufacturing and retail businesses that there is probably a need for a set of financial measurements that reflects its own qualities.

1. As seen in the Zavgren model, inventories are probably not significant to the casino business.

2. Receivables are probably more important to financial strength and stability in the casino business than in other businesses. How long it takes to collect versus the terms of current liabilities. The proportions of total sales that are cash or on-account and how much of the receivables are collectable.

3. What are proper levels or proportions of working capital? A large amount of cash is required in a casino, for the cage operations, for potential jackpot payoffs and for slot machine loads. There is a reluctance to keep even more cash just for working capital, but maybe it is necessary to reduce the likelihood of slow business periods. The amount of the cash need for a casino is particularly sensitive during the initial stages of a new casino or a casino expansion. While not a part of the sample studied, there are examples of casinos that got into financial problems due at least in part to the under-estimation of initial bankroll and the length of the start-up period.

4. Due to the types of financing generally available to casinos, and the often short-term nature of that financing, repayment ability needs to be closely monitored. The relationship between total debt service and cash flow from operations could be critical to a casino's future.

5. Another aspect of the casino business that would seem to be significant is the high level of labor costs. Some measure of labor costs relative to sales or debt service might provide additional insight to the health of the casino.

6. All of the factors of the casino business could be modeled into a health model, if there was sufficient data available to conduct a reliable study.

7. A model for bankruptcy prediction specifically designed for the service and hospitality industries could be developed using the techniques of previous studies with ratios more aligned to the service and hospitality industries.

8. More than anything else, this study has shown the critical need to develop a more extensive data base of financial information for casinos in order to be able to analyze the industry. The barriers of secrecy are being broken by legal reporting requirements, but more property specific operational and financial data would allow management of the industry to make better decisions.

Summary

This study has shown that traditional financial analysis techniques may not be satisfactory for analyzing the casino business. More financial information needs to be accumulated and analyzed so that there is a better understanding of what characterizes a healthy casino and what a financial model of a healthy casino would look like. Non-traditional, casino specific measurements could provide valuable information to enhance the professional management of the casino industry.

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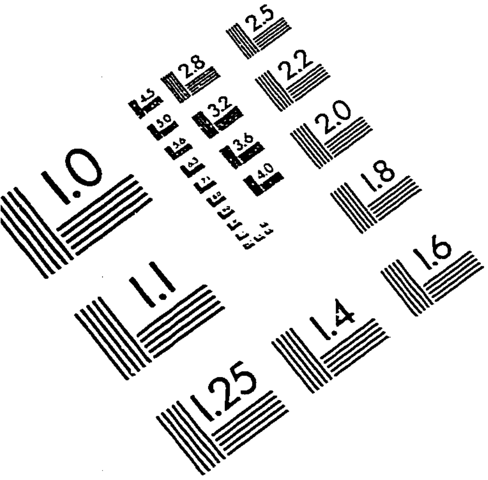
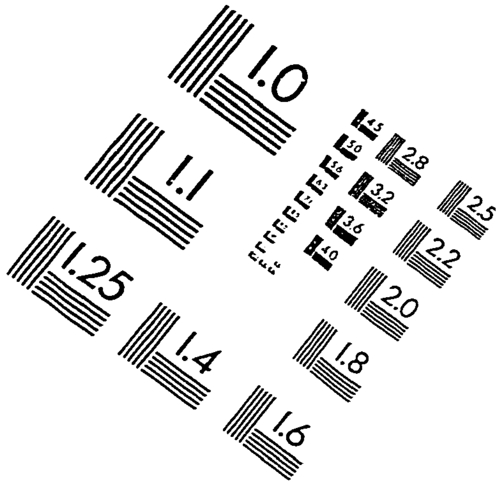
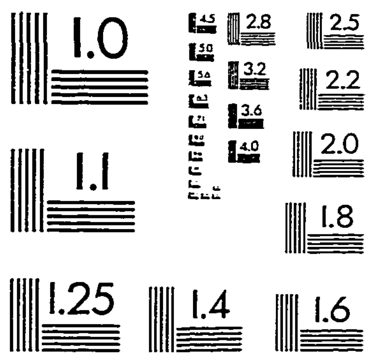
IMAGE EVALUATION TEST TARGET (QA-3)







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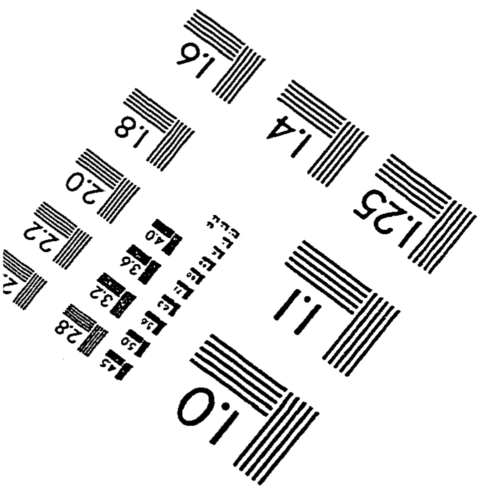

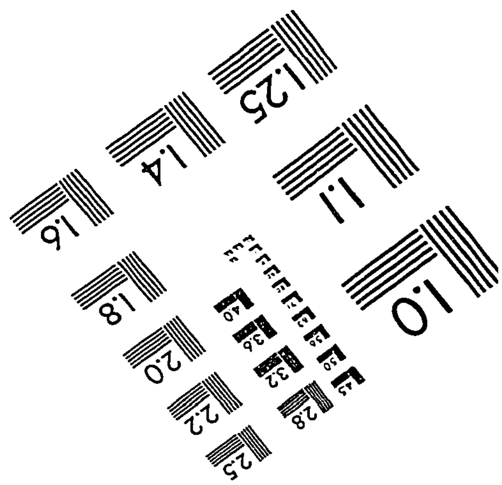

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