

1-1-1999

## The relationship between casino drop and gaming stock performance: A multivariate analysis

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**THE RELATIONSHIP BETWEEN CASINO DROP  
AND GAMING STOCK PERFORMANCE:  
A MULTIVARIATE ANALYSIS**

by

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**A thesis submitted in partial fulfillment  
of the requirements for the**

**Masters of Science Degree  
William F. Harrah School of Hotel Administration**

**Graduate College  
University of Nevada, Las Vegas  
December 1999**

**UMI Number: 1397982**

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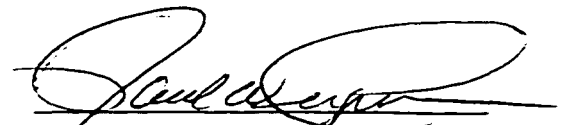
THE RELATIONSHIP BETWEEN CASINO DROP AND GAMING STOCK PERFORMANCE:

A MULTIVARIATE ANALYSIS

is approved in partial fulfillment of the requirements for the degree of

MASTERS OF SCIENCE

  
Examination Committee Chair

  
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## **ABSTRACT**

### **The Relationship Between Casino Drop And Gaming Stock Performance: A Multivariate Analysis**

by

**Mark Howard Gilbert**

**Dr. Zheng Gu, Examination Committee Chair  
Professor of Hotel Administration  
University of Nevada, Las Vegas**

In reference to the gaming industry, investors and analysts examine many different variables that affect the financial viability of the business. Areas of investigation have included competition, governmental regulation, debt structure, cash flow, visitor volume, and so on.

The purpose of this study was to analyze the relationship of yet another variable of casino performance, the casino drop, to gaming stock performance. Utilizing statistics provided from the State of Nevada's Gaming Revenue Report, the casino drop was divided into five segments, blackjack, craps, baccarat, quarter slots, and dollar slots.

Tested by using a multiple regression analysis against a market capitalization-weighted index consisting of Aztar Gaming, Boyd Gaming, Harrahs Entertainment, MGM Grand, Mandalay Resort Group, Mirage Resorts, and Station Casinos, all five independent variables were proven statistically significant at a .10 confidence level. However, the results of the study were deemed inconclusive due to the presence of

negative coefficients for craps, baccarat, and quarter slots. The negative coefficients for these independent variables are incongruent with the underlying premise that an increasing drop, analogized to increasing revenue, should lead to an increasing stock price.



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## **ACKNOWLEDGMENTS**

For a graduate student, the completion of a thesis represents countless hours of researching, writing, and revising. In addition, the process is filled with many individuals who lend their intellect, guidance, and support to this academic endeavor.

In acknowledgment of these people, I first offer my upmost appreciation to Dr. Zheng Gu and Dr. Shannon Bybee for not only their invaluable assistance in the completion of this study, but also for serving as unequaled mentors during my University of Nevada, Las Vegas academic career. Also, I thank Dr. Karl Mayer for his helpful suggestions and comments, and Dr. Melvin Jameson for his guidance as a graduate faculty representative.

Finally, I bestow my unending gratefulness to my wife, Melissa, who endured many nights alone as I was tapping away at the computer, my son, Mason, who lost his football buddy for a Fall, and my daughter, Megan, who at one-year-old, gave her Daddy all the unconditional love he needed to get the job done.

## CHAPTER 1

### INTRODUCTION

#### Foreword

(Author's note: The following account was provided by a Las Vegas casino executive. Though the author has embellished some aspects of the tale, the basic facts of the story are true.)

Shoeless Joe walked into a Las Vegas Strip casino on a morning just like any other late winter morning a few years ago. The timing of his visit was coordinated by the arrival of his monthly Social Security check. Since Shoeless Joe, a homeless man, did not have a bank account, he would make the trek to a casino to cash his only source of income. The general assumption held that Shoeless Joe would immediately make his way to the nearest exit, only to be seen in another 30 days to cash the next month's check. But, not Shoeless Joe, he was a gambler. Shoeless Joe was in a casino, and he had money in his pocket.

It didn't matter that this \$450 could buy him a cot and three squares a day at a shelter with enough to indulge in a few vices for the remainder of the month. Shoeless Joe was a gambler. Though games of chance had cost him his family, his friends, his health, and all of his worldly possessions, this money represented a momentary escape from a disheartening life on the street. Be it several hours if the cards were against him, or a few days or a week if Lady Luck was on his side, Shoeless Joe was simply looking for some

respite from a monotonous life. However, no matter how the cards fell, long before the end of the month, Shoeless Joe would always find himself penniless.

On this aforementioned visit, Shoeless Joe sat down at a blackjack table to tend to his trade as a compulsive gambler. Without doubt, the dealer and floor supervisor eyed this untidy individual with suspicion as he laid down over \$400 on the table. Though Shoeless Joe didn't exactly fit the mold of a properly attired casino guest, he had money and he wasn't bothering anyone. Consequently, the dealer yelled out "change". Simultaneously, the supervisor responded in accordance. Little did they know that the exploits of Shoeless Joe were about to become a part of gaming lore.

To add to the improbability of Shoeless Joe's tale, he had often wandered into this very same casino. Although, on most occasions, he had no check to cash, and had no cash in his pocket. Invariably, Shoeless Joe's stay was always cut short by the forceful hand of security personnel escorting him off property. And, in situations that required additional support, namely the police, Shoeless Joe would often find himself spending the night behind bars. Shoeless Joe was definitely no stranger to the inner workings of the local precinct as the local keeper's of public semblance maintained a rap sheet for Shoeless Joe representing innumerable offenses of vagrancy, petty theft, etc. However, on this fateful day, Shoeless Joe would not have to worry about any brushes with the law. As it turns out, the only thing Shoeless Joe would have to be troubled with is what gourmet restaurant he would be dining at that evening.

When Shoeless Joe passed his money across the table, he requested "green" chips. No messing around with his usual table minimum \$5 bets, Shoeless Joe began by betting \$25 a hand. In retrospect, it seems that Shoeless Joe knew something special

was going to happen that day. Because, with uncanny precision, Shoeless Joe began to win hand, after hand, after hand, after hand, 20s, 21s, blackjacks, double downs, splits. Everything was falling into place for Shoeless Joe. Suddenly, \$25 bets turned into \$100 bets, then \$500, all the way up to the table maximum. He even was going against conventional blackjack wisdom and winning. Hitting a “hard” thirteen against the dealer’s 6. Standing on “soft” seventeens. Doubling down on a hard 18, and catching a deuce. Nobody does that. Shoeless Joe did, and he won.

As the shift changeover from graveyard to day convened at 11:00 a.m., Shoeless Joe had parlayed his original buy-in of \$450 into \$60,000. A return of over 13,000% in just a few short hours. Not bad for someone whose life revolved around finding a secure place to lay his head each night. Considering this incredible run of luck, surely Shoeless Joe would say “thank you very much”, and be on his merry way. Sixty thousand dollars could afford Shoeless Joe a fairly comfortable lifestyle considering his current simplistic ways of existence. But, not Shoeless Joe, he was a gambler. Shoeless Joe was in a casino, and he had chips in front of him.

Needless to say, Shoeless Joe kept playing. However, as remarkable as it sounds, he kept winning, and winning, and winning. By the time he had decided to call it a day, Shoeless Joe was surrounded by nearly a quarter of a million dollars. \$250,000. Now, without doubt, Shoeless Joe would make like a tree and leave. However, being around casinos for a major portion of life, Shoeless Joe understood there was a game to play. The casino was not going to let him simply walk out of the building with that amount of money. They were going to do all they could to keep him in tow, a suite with all of the amenities, food and beverage complimentaries. Whatever it took to keep Shoeless Joe

playing in their casino, they were going to offer it to him, within reason. Because, they knew Shoeless Joe was a gambler, a degenerate gambler. He was in their casino, and he had their money. The law of gaming averages dictated that over a course of time, Shoeless Joe wasn't really winning, he was just borrowing the money. Or was he?

To make a long story short, Shoeless Joe's saga took about two weeks to run its course. During this time, Shoeless Joe eventually ran his total winnings up to an astonishing \$1.35 million. Wall Street could never come up with a better return in ten years, let alone ten days. Shoeless Joe was a millionaire, and it lasted all of one day. Shoeless Joe was a gambler, and he was in a casino. What else was he going to do with \$1.35 million, walk away, buy a life that most could never afford? No. He was going to continue doing what he would always do. Shoeless Joe was a degenerate gambler.

In the end, as one could have probably guessed, Shoeless Joe returned the lion's share of his booty back to the casino. Eventually, he walked into the sunset with a "mere" \$60,000, the same amount he had won during that remarkable, initial morning. As for the nearly \$1.3 million that Shoeless Joe gave back to the casino, it was just a matter of time until the mathematics of gaming finally caught up to him.

The Shoeless Joe case illustrates two key elements of the casino business. The first component concerns the short-term volatility of the business. Lee (1991) explains that when a casino caters to the high-roller segment, or in this case the Shoeless Joe market, there is the possibility of negative revenue days. Though every game in a casino, table or slot, has a built-in house advantage that warrants long-term profitability, short-term anomalies can occur. And, this not only holds true for one player, but potentially for an



entire company, or market, or overall industry. However, over the course of a financial quarter or year, the impact of a high-roller will be smoothed by other high-rollers, as well as the thousands of smaller bettors. This second factor pertains to the long-term profitability of the industry, as over the long haul, normalized standards will always prevail.

### Statement of the Problem

Wall Street, in its attempt to accurately forecast the financial future of the gaming industry, scrutinizes many variables. Areas of analysis include debt structure, competition, governmental regulation, win percentage, visitor volume, and so on. Though all of these components contribute extensively to the bottom line, no other figure has a greater bearing on the profitability of gaming than “drop”. Though interpretations vary on its calculation, drop corresponds to the amount of money wagered in a casino.

Given the basic fact that casinos hold a definitive mathematical advantage over the gaming patron, the primary goal of casino management is to provide and maintain an enticing atmosphere for players to enter the “betting circle”. As long as casino management can elongate the gaming experience for existing players, while attracting previously inexperienced gamblers to the casino floor, gaming revenue will continually increase.

Though drop provides a key barometer for casino profitability, analyzed exclusively, is it also as important to the industry’s analysts and investors? More precisely, is there a correlation between casino drop and the volatility of a gaming stock index?

Specifically, this study will investigate the correlation of casino drop to gaming stock prices between the period of January 1994 to June 1999. This will be accomplished by applying casino drop figures from the state of Nevada to an index of seven gaming firms that comply with the prerequisites of the study. Additionally, the total drop will be broken down into five areas of interest, blackjack, craps, baccarat, \$0.25 slots, and \$1.00 slots. The purpose of the dissemination will further examine the potential effect of each component on the variability of stock price index.

### **Justifications**

Van Horn (1995) states that the primary objective of a company must be to create value for its shareholders. If the correlation of the volatility of a gaming stock index and the variance of drop proves to be a positive one, then the results can offer gaming managers, investors, and hospitality researchers a better comprehension of the risk characteristics of the gaming industry. Also, given the ultimate goal of a firm's executives to increase shareholder wealth, this study will assist in developing strategies designed to maximize revenue potential, and thus enhance the value of the company.

### Hypothesis

To examine the relationship of gaming stock price volatility and gaming drop, a multiple regression equation is formulated using a combination of six independent variables, five related to casino drop, and an overall market index applied as a controlling function, and a dependent variable. Each coefficient ( $A_i$ ) indicates an individual parameter of the multiple regression equation.

$$Y = A_0 + A_1X_1 + A_2X_2 + A_3X_3 + A_4X_4 + A_5X_5 + A_6X_6 + E_i$$

where:

$Y$  = market capitalization-weighted gaming stock index;

$X_1$  = overall market index;

$X_2$  = blackjack drop;

$X_3$  = craps drop;

$X_4$  = baccarat drop;

$X_5$  = quarter slots drop;

$X_6$  = dollar slots drop;

$E_i$  = the error about the regression line.

Based upon the above multiple regression equation, the following six null hypotheses will be tested. The rejection of the null hypothesis would imply that the applied independent variable is statistically significant and affects the gaming stock price index in a negative or positive manner.

#### Null Hypothesis #1:

There is no significant relationship between the overall market index and the market capitalization-weighted gaming stock index.

Null Hypothesis #2:

There is no significant relationship between blackjack drop and the market capitalization-weighted gaming stock index.

Null Hypothesis #3:

There is no significant relationship between craps drop and the market capitalization-weighted gaming stock index.

Null Hypothesis #4:

There is no significant relationship between baccarat drop and the market capitalization-weighted gaming stock index.

Null Hypothesis #5:

There is no significant relationship between quarter slots drop and the market capitalization-weighted gaming stock index.

Null Hypothesis #6:

There is no significant relationship between dollar slots and the market capitalization-weighted gaming stock index.

### **Delimitations of the Study**

For the purpose of this study, gaming figures from the state of Nevada were utilized exclusively. Though Nevada dominates the gaming industry in terms of total dollars wagered in one single market, a better representation could have been obtained by including New Jersey, Mississippi, and all other domestic gaming jurisdictions.

In addition, there is a marked discrepancy in the comparison of casino drop statistics and the sampled gaming stock index. While the drop totals of all 370 nonrestricted

gaming locations in Nevada were utilized, the seven firms that compose the index represented less than 50% of the state's gaming revenue.

### **Limitations of the Study**

The selection of a gaming stock index proved to be a daunting task. Though the equity market, as well as individual analysts, offer a wide array of options, the index employed in this study was constrained by the following parameters:

1. The index should include companies whose primary gaming interests are in Nevada.
2. Those included companies should be involved in the operation sector of gaming, rather than gaming equipment manufacturers.
3. To obtain a proper amount of data sets, those indexed companies should have been traded publicly for at least five years.

Based upon these prerequisites, all of the most commonly recognized gaming indexes could not be used. The Chicago Board of Exchange's GAX gaming industry index was excluded for a number of reasons. First, the index contained three companies which did not fall into the previously stated parameters, as International Game Technology and Anchor Gaming are manufacturers, and Trump Hotel and Casino Resorts does not compete in the Nevada market. Secondly, the structure of the GAX has changed somewhat dramatically since its inception in January of 1994. Originally, the index consisted of fifteen companies, whereas today, the index tracks only eleven. Mergers and acquisitions (Caesar's, Rio, Showboat), relegation to small capitalization status (President), commencement of public trading (MGM Grand), all have contributed to a diverse, yet untrackable source, for this study of gaming index volatility.

Another potential source of gaming market indices are maintained by industry

analysts. For example, Jason Ader of Bear Stearns, publishes three indices that track large cap, small cap, and equipment companies in the gaming segment. For the purpose of this study, the large cap index would have been the most applicable. However, of the six companies, two were rejected. Sun International, though in the process of purchasing the Desert Inn from Starwood, does not currently compete in the Nevada market, and Park Place Entertainment, the spin-off gaming arm of Hilton has only been traded publicly since the beginning of 1999.

### Definitions

**Beta:** This term depicts the sensitivity of a security's returns compared to the returns of widely-held market index. In numerical terms, the beta for the market index will always be 1, as it is correlated against itself. The beta for the security can be greater than or less than 1, based upon the volatility of the security's systematic risk.

**Diversifiability:** The portion of unsystematic risk that can be eliminated by diversification.

**Drop:** Kilby (1998) defines drop with regard to type of device. For slots, it is the total amount of currency and coin removed from bill acceptors and the drop bucket located at the base of the machine. For table games, it is the total amount of currency and chips removed from the drop box along with credit issued at the game.

**Handle:** Freidman (1974) defines handle as the total value of all wagers a customer makes. For slots, this figure is obtainable due to the player-tracking systems installed in today's machines. However, for table games, this number is not available because of the inconceivableness of recording each customer's wagers

**High-roller:** Contingent upon the casino, the term describes a premium player who is willing to wager up to the house maximum betting limit.

**House advantage:** This phrase indicates the mathematical advantage the casino has over the player. For the traditional table games, Kilby (1998) explains that the house advantage ranges from less than 1% for single-deck blackjack, to 5.24% for double-zero roulette. For slots, the house advantage descends from the lower denominational machines, approximately 8-9% for nickels games, to approximately 3% for large denominational devices (\$25 and up).

**Return:** For calculation purposes, return is the ending price of a security during a specified time period, minus the beginning price, divided by the beginning price.

**Risk:** The sum total of systematic and unsystematic risk measured by variance.

**Systematic risk:** The portion of risk that is attributable to the overall market variance, conditioned by world and domestic economic environments measured by beta.

**Unsystematic risk:** The portion of risk that is attributable to managerial and financial decision-making of a firm.

## **CHAPTER 2**

### **REVIEW OF RELATED LITERATURE**

#### **Introduction**

The review of related literature attempts to provide historical content to casino stock price volatility and the cyclical nature of casino drop. Unfortunately, previous analysis of the relationship of the two variables has not been undertaken. Therefore, the subject matter of this chapter will be presented on a mutually exclusive basis.

Additionally, the variables will be further segregated by the origination of analysis. Casino stock price variance is presented from an academic perspective, whereas the subject of casino drop is assessed from the publications of gaming industry investment analysts.

#### **Casino Stock Price Assessment**

Any analysis of stock price encompasses two primary measures, return and risk. Return refers to the performance of the security over a given time period, while risk, also denoted as standard deviation, calculates the variance. A third standard of evaluation, beta, which is a derivative of the standard deviation, calculates the volatility of a stock against a market index, such as the Dow Jones Industrial Average or the Standard and Poor's 500. These measures, either alone or in combination, provide the basis of assessment for this study's review of casino stock related literature.

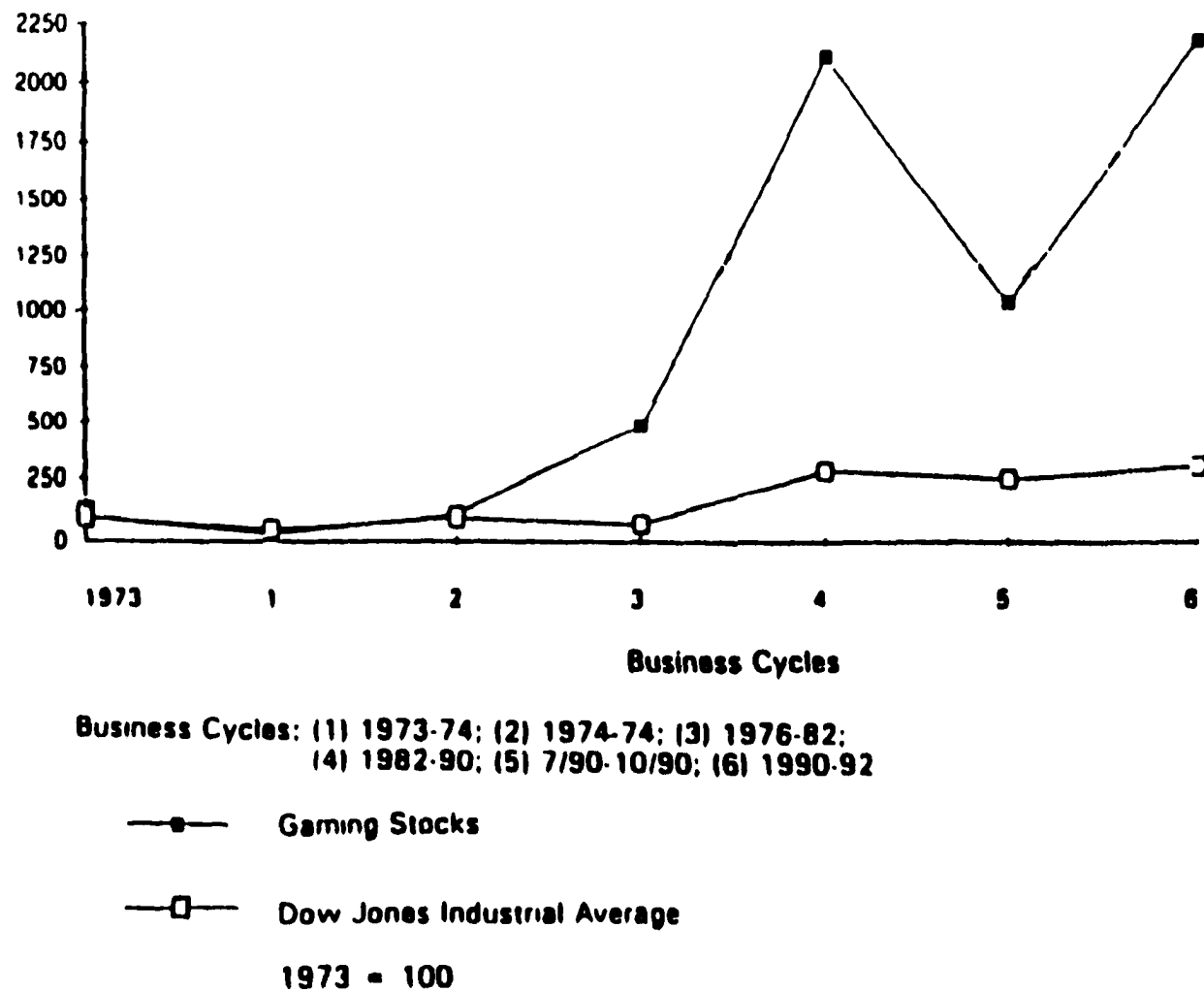


The most comprehensive examination of casino stocks, in terms of the length of analysis, was produced by Goodall (1994). Goodall reported on the movement patterns of gaming stocks compared with the Dow Jones Industrial Average between 1973 and 1992, roughly the first twenty years that gaming stocks were traded publicly. Dividing the period into six distinct stock market cycles, the study suggested that gaming stocks tended to be more volatile, in advancing as well as declining periods. Figure 2-1 illustrates this greater variability of gaming stocks as related to the market index.

In his summary, Goodall suggests that stocks of smaller companies tended to be more volatile when compared to those of larger ones. While today, gaming companies certainly equal the size and structure of those in other established industries, back in the 1970's and 1980's, gaming firms were relatively small. Goodall referred to the research of Malkiel (1975) and Dremen (1982) in establishing this fact.

Furthermore, Goodall, in justifying the return and risk patterns of gaming stocks, states that gaming stocks advanced or declined in directions opposite to the general market due to industry-specific events. An example of this occurred during the period of 1976 to 1982, a term of languishing overall market returns. However, for the gaming sector, the approval of casino gaming in New Jersey provided a major impetus for gaming stocks to move against the overall market trend.

Finally, Goodall concluded that despite this greater variance of gaming stocks as compared to the overall market, the average return for the observed gaming stocks far exceeded the returns of the indexed market. Goodall stated that the average annual return for the Dow Jones Industrial Average was 6.1% for the 1973 to 1992 term, whereas the return for gaming stocks was 17.7%.



**Figure 2-1. Price Fluctuations of Gaming Stocks and Dow Jones Industrial Average**

Source: Goodall (1994). "Market Behavior of Gaming Stocks: An Analysis of the First Twenty Years". p. 334.

Gu (1994) expanded the scope of analysis in evaluating the investment achievements of the casino industry for the period 1983 to 1992, by introducing two performance indexes. It should be noted that Gu also analyzed the investment performance of the hotel and restaurant segments of the hospitality industry, but, for this study, only the casino results will be scrutinized. Sharpe's Index and Treynor's Index, which are derivations of return and risk, allow potential investors to quantify the trade-off between return and risk by assigning a value to the expected reward of the security. While Goodall's results offered comparative information of return and risk, the study does not render a conclusive statistic of corresponding risk adjusted return. On the other hand, Gu submitted decisive deductions concerning the give and take of return and risk by utilizing the indexes.

The performance index developed by Sharpe (1966) is represented by the mean return of an asset, minus the risk-free return, divided by the standard deviation of the return of the asset. By evaluating the total risk, Sharpe's model is best suited for the assessment of a single asset fund, or portfolio consisting of similar industry assets. The premise being that the market-related systematic risk cannot be diversified away since the assets comprising the portfolio are subject to identical market trends and variance.

The ratio developed by Treynor (1965) is quite similar to the former, in that the only variation is in the composition of the denominator. Sharpe utilized the total risk of the asset, represented by the standard deviation, whereas Treynor employed only the systematic risk of the asset, or the beta. The principle applied by Treynor is that the unsystematic risk of the individual security will be diversified away by possessing many different securities, and is designed for investors who possess assets of varying industries.

The results of Gu's investigation remained consistent with the findings of Goodall. In focusing solely on the casino sector of the study, the mean monthly return outdistanced the market index (Standard and Poor's 500) by 71%. However, these results were accompanied by a decidedly larger standard deviation, 0.0742 for the casino sector versus 0.0070 for the market index.

By applying the performance indexes to the initial findings of return and risk, Gu revealed that the casino's high return outweighed the sector's high risk, when compared to the overall market performance. Table 2-1 illustrates the casino segment's superior index rating when judged against the overall market index, as well as the hotel and restaurant sectors.

Table 2-1

Hospitality Investment Performance Indexes (1983-1992)

	S & P 500	Casino	Hotel	Restaurant
Sharpe's Index	0.0933	0.1110	0.0016	0.0789
Treynor's Index	0.0032	0.0053	0.0001	0.0036

Source: Gu (1994). "Hospitality Investment Return, Risk, and Performance: A Ten-Year Examination". p. 23.

In summing his results, Gu suggested that the casino segment's high return, as dictated by its propensity for high profit margins, combined with its high degree of risk, provides an attractive investment opportunity for aggressive, high-yield investors.

In comparison to Gu's ten-year analysis, Atkinson and LeBruto (1995) present a rather

simplistic one-year assessment of the attractiveness of gaming stocks. Using 1993 as the year of investigation, Atkinson and LeBruto calculated the weekly mean return and standard deviation for twelve firms related to hotel/casino operations, four gaming equipment manufacturers, and five companies who they identified as the casino management segment. Additionally, Atkinson and LeBruto determined the betas for the 21 firms in relation to a general market index, the Standard and Poor's 500, and a gaming-specific indicator, the Barron's Casino Group Index.

Consistent with the previously defined studies, Atkinson and LeBruto found that the mean return and standard deviation were greater than the market index. Yet, when compared with the industry index, the sampled firms provided a smaller return with a larger amount of variance. Interestingly, Atkinson and LeBruto do not attempt to explain the cause for the variations from market index to industry index.

For the next step of the analysis, Atkinson and LeBruto described a return/risk ratio termed the Reward Ratio. Without adjusting for the risk-free rate, or identifying the type of risk utilized, as specified by Sharpe and Treynor, Atkinson and LeBruto simply divided the mean return by the standard deviation to determine the Reward Ratio.

The usefulness of Atkinson and Lebruto's is compromised by an inaccurate statistical calculation. Referring to Table 2-2, Atkinson and LeBruto's descriptive measures for the average of all 21 companies, the S & P 500, and the Casino Industry Group Index, there is an incorrect figure in the matrix.

Table 2-2

Descriptive Stock Return Measures of the Casino Industry (1993)

	Mean Return	Standard Deviation	Reward Ratio
Average of Firms	0.0085	0.0990	0.0859
S & P 500	0.0012	0.0106	0.1132
CIG Index	0.0093	0.0451	0.0262

Source: Atkinson and LeBruto (1995). "Gaming Stocks: Hot or Not?" p. 36.

Dividing 0.0093 by 0.0451, the Reward Ratio for the CIG Index should yield a figure of 0.2062, instead of the published 0.0262. Thus, this inaccuracy leads to erroneous conclusions deduced from the study. The authors state, "15 of the 21 firms had a Reward Ratio greater than the second comparative index, the CIG" (Atkinson and LeBruto, 1995), whereas, by applying the correct figure to the Reward Ratio of the CIG Index, only two of the 21 firms surpass the figure of 0.2062.

The final study reviewed investigates the relationship between financial ratios and the unsystematic risk of gaming firms (Kim, 1996). Though the actual correlation of financial ratios to risk is not readily applicable to the focus of this study, Kim also examined the systematic risk, unsystematic risk, and diversifiability of selected gaming companies.

For the study, Kim utilized 35 gaming firms that operated either traditional hotel/casino(s), water-based casino(s), or slot routes. Stock return data, collected on a weekly basis for a three-year period from January 1992 to December 1994, provided the foundation for analysis.

Though principally concerned with the risk results of the individual firms, Kim provides a cumulative mean return, standard deviation, and beta for the entire sample as compared to his market index, the New York Stock Exchange Composite Index. Table 2-3 reveals that the casino industry's lower weekly mean return was accompanied by a higher standard deviation. Thus, the casino industry's beta of 1.7929 indicates that gaming stocks were systematically riskier than the overall index during the period of study.

Table 2-3

Return and Risk Features of the Casino Industry (1992-1994)

	Casino Industry	NYSE Index
Return	0.0019	0.0034
Standard Deviation	0.0115	0.0075
Beta	1.7929	1

Source: Kim (1996). Risk Features and Relationship Between Financial Variables and Beta: An Analysis of the Casino Industry. p. 55.

In terms of the total risk associated with investment performance, Kim's research offers a unique view of the gaming sector's ratio of systematic and unsystematic risk . By calculating the diversifiability, or the portion of risk that can be eliminated by diversification, a better understanding of the risk nature of gaming is identified. Kim found that his sample's mean diversifiability was 0.92, or that 92% of the industry's total risk was caused by firm-specific factors, as compared to 8% attributable to market

factors. These figures denote that the stock returns of the gaming industry tend to be more susceptible to firm-specific risk when contrasted against the typical security. This claim follows Van Horne's (1995) assertion that the unsystematic risk of the standard stock accounts for approximately 70% of the total risk, or variance, of a stock.

### Casino Drop

Goodall (1994), in his conclusions, comments on the relative insignificance of gaming stocks in the 1970's and 1980's, based upon the comparative small total capitalization of the gaming industry. However, from 1982 to 1994, the gaming industry experienced tremendous development as gross annual revenues rose 266%, from \$4.2 billion to \$15.4 billion (International Gaming and Wagering Business, 1995). According to Boushy (1993), many factors contributed to this exponential growth of gaming. One of the key points was the transformation of casino ownership from thinly-veiled covers of organized crime to widely-held, multinational corporations. Corporations that were legitimized by being publicly traded on the New York Stock Exchange, American Stock Exchange, etc.

As the public's perception of gaming changed from a back-alley ritual to an acceptable form of entertainment, so did the public's acceptance of gaming stocks. Soon, gaming securities became a part of mutual fund, retirement fund, pension fund indices.

With the rise of gaming stocks came the necessity for investment banking firms to develop the vocation of the gaming industry investment analyst. Consequently, individuals such as Jason Ader of Bear Stearns, Harry Curtis of BancBoston, Joe Coccimiglio of Prudential, Brian Egger of Donaldson, Lufkin & Jenrette, Bruce Turner of



Salomon Brothers, have become household names within the financial circles of the sector.

To include all of the thoughts and ideas of each one of these analysts would prove informative, but redundant. Thus, to limit the section on casino drop to a concise, yet truncated segment, only the publications of three analysts will be included, Todd Jordan of Raymond James & Associates, Jason Ader, and Brian Egger.

The vast majority of gaming investment publications generally do not examine specific topics of the business, such as casino drop. Rather, they focus their direction on the many macro-market indicators, and their effects on industry-wide, as well as individual firm financial performance.

From a market perspective, Jordan (1999) cites critical demand trends of visitor volume and airline passenger traffic as key determinants in spurring stock movement. For example, Jordan comments on the incredible growth that the Las Vegas market has experienced in the first and second quarters in 1999 in both of the aforementioned trends. Justly, the advances are due in part to the wave of must-see properties that have come on-line in late 1998, and early 1999 on the Las Vegas Strip. However, as any analyst will do to cover their bases, Jordan tempers his optimism by stating that "it will take some time for the market (Las Vegas) to fully absorb the new supply" (Jordan, 1999).

From an individual firm perspective, Jordan initially reports on the financial condition of the company, along with projected figures for range of stock, growth rate, and earnings per share. From this numerical examination, Jordan then submits a pro and con approach to his analysis. Concerning Mirage Resorts, Jordan comments on their disappointing second quarter performance of 1999, and infers what factors drove the company's

earnings per share to 50% below 1998 figures. Conversely, the analysis then remarks on Mirage's strong position for the long term, and that the company is continually forward looking in its approach to expanding into other gaming jurisdictions.

For firms that have posted above consensus predictions for the second quarter of 1999, namely MGM Grand, Mandalay Bay, Harrahs, and Station Casinos, Jordan commends them for their continued diversification of gaming properties outside the Las Vegas gaming market. Because, as mentioned previously, Jordan remains cautious of Las Vegas conditioned upon the market's room inventory increase of 15% by the time the new Aladdin opens in May 2000.

Regarded as the top gaming analyst, Jason Ader of Bear Stearns presently publishes a bi-weekly Gaming Intelligence Report, complete with market recap, stock performance, valuation summary, and current business related statistics. Though practically void of text, the Intelligence Report provides an ample array of graphs and charts describing the trends of the industry.

In terms of casino drop, Figure 2-2 illustrates a breakdown of drop, hold, and hold percentage for the month of June 1999, and year-to date for the Las Vegas Strip (Ader 1999). The figures show a total drop increase of 29.1% over June 1998. Additionally, the year-to-date numbers signal a 13.0% growth in drop over the same six-month period in 1998.

Ader offers some dialogue on the state of the Las Vegas Strip by reporting that the increase in table game drop, excluding baccarat, is due in part to higher-end players shifting their play from baccarat to blackjack, craps, roulette, etc. However, Ader fails to acknowledge the presence of three major additions to the Strip, namely the Bellagio, the

	June-99			Year to Date		
	Drop	Hold	Hold %	Drop	Hold	Hold %
Slot	3,378,015	178,697	5.3%	18,296,112	1,081,518	5.9%
Table (excluding baccarat)	905,028	111,727	12.3%	6,186,513	808,582	13.1%
Total (excluding baccarat)	4,283,043	292,725	6.8%	24,482,625	1,906,357	7.8%
Baccarat	156,827	29,703	18.9%	1,333,614	231,678	17.4%
Total (including baccarat)	4,439,870	322,428	7.3%	25,816,239	2,138,035	8.3%

% Change						
Slot	34.7%	15.0%	-90 bps	13.3%	12.6%	0 bps
Table (excluding baccarat)	22.4%	12.7%	-110 bps	15.8%	19.3%	40 bps
Total (excluding baccarat)	31.9%	14.1%	-110 bps	13.9%	15.4%	10 bps
Baccarat	-19.0%	31.7%	730 bps	-2.5%	29.6%	430 bps
Total (including baccarat)	29.1%	15.5%	-80 bps	13.0%	16.8%	30 bps

Notes: Financial data restated by the Nevada Gaming Control Board are not restated. Table totals do not include player banked poker.  
Source: Bear, Stearns & Co. Inc.; Nevada Gaming Control Board.

The drop for table games, excluding baccarat, experienced a 22.4% increase, which, when combined with a 110-bp decline in table games hold percentage, provides further evidence that the high-end player may be shifting focus to games other than baccarat.

Baccarat revenues appeared to be the primary driver of growth in June, with revenue increasing 31.7%. A 730-bp improvement in baccarat hold drove the overall gain in revenues as baccarat drop plunged 19.0%.

Strong table play on the Las Vegas Strip is one of the key drivers behind the 19.3% rise in gaming revenues year to date.

Figure 2-2. Las Vegas Strip Revenue Report

Source: Ader (1999). "Gaming Industry Intelligence Report". p. 15.

Venetian, and Mandalay Bay. When compared to the same period one year prior, these megaresorts undoubtedly contributed dramatically to this increase.

In the middle caption of Figure 2-2, Ader continues his assessment of Strip revenue by concluding that baccarat revenues appeared to be the primary driver of growth in June, with revenue increasing 31.7%. However, revenue did not increase 31.7%, it was the hold percentage that increased 31.7%. Coupled with a drop decrease of 19.0%, Strip baccarat revenue only grew 14.0% for June 1999 (Nevada Gaming Revenue Report, 1999).

Discrepancies in Ader's figures and the Gaming Revenue Report may have occurred in the definition of Las Vegas Strip properties. For the Gaming Revenue Report, the Strip is outlined as those locations within the boundaries of Clark County that generate \$72 million or more in revenue. Bound by these parameters, the Gaming Revenue Report lists 72 units of baccarat in its analysis. On the contrary, Ader reports statistics on 85 units in his summary of the Las Vegas Strip. It appears that Ader extends his sample of baccarat play beyond Mandalay Bay to the south, and the Sahara to the north. However, in his investigation, he does not offer any explanation to his methodology.

Another cause for disparity in the examination of casino drop occurs in the calculation of the figure. The Nevada State Gaming Control Board includes in its definition of drop the value of credit markers redeemed at the gaming table. That is to say, when a player requests a marker (credit) at the table, the player has the option of paying back the marker at the table, at the casino cashier, or at a later time predisposed by their credit obligations. When a marker is redeemed at the table, some casino companies such as Mirage Resorts, do not include these redeemed markers in their drop totals. Yet,

other casino firms do include the issuance of credit in the drop total as the credit transaction mirrors the cash transaction in that gaming chips are given to the player in both instances.

To uniformly account for the varying policies on marker redemptions, analysts will estimate casino drop figures through the Gaming Revenue Report, company guidelines, and their own inferences. Though most analysts do not explicitly explain the formulas utilized in their assessment, at least some, such as Brian Egger of Donaldson, Lufkin & Jenrette will provide key assumptions included in his examination.

While continuing to comment on the financial state of the industry, Egger has made the Las Vegas baccarat market his primary focus of analysis. In March of 1998, with the impending opening of Bellagio looming just months away, Egger (1998) published a baccarat market share study. The publication estimated the effect Bellagio would have on other historical baccarat operators, conditioned by the soft economic conditions of the Far East, the principal feeder market of Las Vegas' high-rollers. Egger projected that though Bellagio would cannibalize approximately 20% of the market, its presence would expand the market by 5% by serving as a beacon for increased visitation.

Spurred by a recovery in several key Asian financial markets, as well as stronger than expected gaming activity sparked by Bellagio's initial marketing efforts, Table 2-4 illustrates an overall market gain of 17% in baccarat drop for the first quarter of 1999 (Egger, 1999).

Table 2-4

Las Vegas Baccarat Win and Drop Analysis

	1 <sup>st</sup> Quarter 1999			% Change	
	<u>Win</u>	<u>Drop</u>	<u>Win %</u>	<u>Win</u>	<u>Drop</u>
The Bellagio	\$33	\$118	28.0%	NA	NA
The Mirage	22	79	28.0%	-26%	-29%
MGM Grand	22	104	21.0%	142%	-10%
Caesars Palace	27	84	32.1%	42%	-10%
Rio Hotel and Casino	8	42	20.0%	33%	0%
Other Casinos	33	99	33.7%	16%	10%
Total Las Vegas Market	\$146	\$525	27.7%	56%	17%

Note: Figures are in millions. Percentage changes compares 1999 statistics to 1998.

Source: Egger (1999). "High-Roller Highlights: DLJ's First Quarter 1999 Baccarat Market Study Reveals Better-Than-Expected Gain in Drop, Only Moderate Cannibalization." p. 9.

Further examination of Table 2-4 shows that Bellagio impacted the Mirage's baccarat results tremendously, as drop declined 29%. The impact was expected as Mirage Resorts invited many of its Mirage players to Bellagio. Excluding the Mirage, the overall market cannibalization was not as severe as Egger had predicted. Instead of the 20% estimation, the market only suffered a 10% aggregate baccarat drop decline of those casinos prior to the October 1998 opening of Bellagio.

When compared to Nevada's Gaming Control Board figures, Egger's first quarter

drop increase of 17% equals the Gaming Revenue Report's growth for the Las Vegas Strip. Egger explains that he utilizes the Gaming Control Board's statistics for the market total, and that the formulation of a company's contribution is based on the individual corporate definition of drop.

### Summary

As explained in the Introduction of this Chapter 2, academicians and analysts have yet to combine their mutual reverence for gaming securities to produce a study correlating gaming stock price performance and casino drop figures. While academic research tends to concentrate on the results of the industry's stock performance, investment research tends to focus on the individual factors affecting these results.

However, a brief foray by Kim (1996), stating that "high operating income, and high predictability of cash flow.....have positively influenced casino stock prices," illustrates some convergence of thought between the two schools of research. Operating income and cash flow both are a component of revenue, and in the casino business, drop is revenue. The inference can be made that an increasing casino drop should lead to an increasing stock price.

An example of this basic concept is evident in Egger's (1999) report on the resurgence of baccarat drop for the Las Vegas market in the first quarter of 1999. This development, combined with the observed incremental increases of other macro-market indicators such as airline passenger volume, visitor counts, and overall gaming revenue, Egger raised the industry investment rating from market performance to outperform. Thus, some semblance of credence can be given to this study's assumption that there is a

significant correlation between casino drop and gaming stock prices.



## **CHAPTER 3**

### **DATA AND METHODOLOGY**

#### **Introduction**

The purpose of this study is to examine the relationship between five areas of casino drop, an overall market index, and a market capitalization-weighted index of gaming stocks. This chapter introduces and explains the procedures in obtaining the necessary data, and the methodology in producing the results.

The chapter is organized as follows:

1. Composition of sample gaming index
2. Time frame of the study
3. Data collection and analysis procedure
4. Pearson's correlation coefficient test
5. Multicollinearity test
6. Multiple regression for testing the relationship

#### **Composition of Sample Gaming Index**

In reiteration of the parameters placed on the study's index as stated in the Limitations section of Chapter 1, included gaming companies should:

1. Derive a substantial amount of their revenue from Nevada-based operations.

2. Be involved in the operational sector of the industry, as opposed to the gaming equipment manufacturing sector.
3. Be a publicly traded company for at least five years.

Ideally, the goal of the investigation intended to include an established gaming index as its basis for investigation. However, upon initial examination, it was evident that this was not possible. Potential selections, such as the Chicago Board of Exchange's GAX gaming index, or the Las Vegas Sun's gaming index were disqualified for violating one or more of the parameters. Additionally, indexes published by industry analysts, such as Jason Ader of Bear Stearns, or by industry periodicals, such as the International Gaming and Wagering Business, were excluded for many of the very same reasons.

Thus, the composition of sample firms was derived from a combination of large capitalization and small capitalization gaming stocks, as prescribed by Ader (1999). In selecting four firms from his Large-Cap Gaming Index, and four firms from the Small-Cap Gaming Index, the sample companies were able to meet the standards prescribed by the author's criterion. Table 3-1 reveals the seven selected companies, their primary area(s) of operation and percentage of revenue from Nevada operations.

Table 3-1

Sample Gaming Companies

Company	Sector of the Gaming Industry	Percentage of Revenue from Nevada Operations
Aztar	Casino	32.02
Boyd Gaming	Casino, Riverboat	59.15
Harrahs	Casino, Riverboat	39.71
MGM Grand	Casino	95.96
Mandalay Resort	Casino	87.75
Mirage Resorts	Casino	100.00
Station Casinos	Casino, Riverboat	63.86

Note: Revenue figures are based upon first quarter 1999 results

Source: Raymond James & Associates (1999). "Gaming Quarterly Q2".

Unfortunately, the restrictions placed upon the examination eliminated properties under the Park Place corporate flag. The Las Vegas Hilton, Flamingo Hilton Las Vegas, Flamingo Hilton Laughlin, Reno Hilton, Ballys, Paris, and the soon-to-be Caesars Palace could not be included in the study since Park Place, a spin-off of Hilton Hotels, only began trading publicly in January 1999.

Other significant contributors to Nevada's gaming revenue, including Coast Casinos' Barbary Coast, Gold Coast, and Orleans, and the Imperial Palace, were omitted due to private ownership.

### Time Frame of the Study

This study examined monthly gaming stock price returns for the period of January 1994 to June 1999. The beginning term of study was constrained by Boyd Gaming's public offering of stock in the last quarter of 1993 (Boyd Gaming, 1999).

Casino drop figures, obtained from the State of Nevada's Gaming Revenue Report, were utilized from November 1993 to June 1999. The variance of dates, January 1994 for the gaming stock index to November 1993 for the casino drop statistics, was due to the utilization of the Gaming Revenue Report's three-month summary of gaming figures. Consequently, the January 1994 Gaming Revenue Report includes cumulative drop statistics for January 1994, December 1993, and November 1993. The usage of the three-month summary is further explained in the Data Collection section of this chapter.

In reporting the state's gaming numbers, Nevada's Gaming Control Board releases information on a two-month delay. For example, May 1999 gaming statistics were released on July 7, 1999. Initial thought, on the part of the author, determined that for the purposes of this study, the sampled gaming stock prices were to be compared to casino drop figures two months previous. Thus, in compensating for the aforementioned delay of information, investors and analysts would have full disclosure of casino drop information.

However, in an efficient capital market, investors and analysts are privy to knowledge on an immediate basis, not on a two-month delay. Stock prices instantly and fully reflect all relevant information of a firm that is available to the public (Copeland and Weston, 1983). Hence, this study will abandon the author's initial supposition, and compare corresponding monthly information.

### **Data Collection and Analysis Procedure**

The stock price data for the seven sampled gaming companies, and the overall market index (Standard & Poor's 500) was obtained from the financial section of Yahoo.com. Figures were attained by using the closing price on the last day of trading for each month. The gaming stock prices were adjusted for stock dividends and splits during the period of analysis. Additionally, the index was weighted based upon the market capitalization of the individual firm. For the years 1994 to 1998, the average of the beginning fiscal year and ending fiscal year market capitalization was calculated to derive the portion of each company's contribution to the weighted index. For 1999, only the beginning fiscal year market capitalization was used in this determination.

The casino drop data was acquired from the State of Nevada's Gaming Control Board. The Board publishes a monthly Gaming Revenue Report that details financial statistics from all state gaming locations. For this study, revenue numbers from all 370 nonrestricted gaming locations were used. Nonrestricted gaming locations are those establishments that have more than fifteen or more gaming devices.

Within the Gaming Revenue Report, gaming figures are presented in monthly, three-month, and twelve-month summaries. To smooth out the random fluctuations caused by the volatility of gaming revenue, the three-month summary was utilized in this examination.

In addition, gaming figures are further dissected in the Gaming Revenue Report by the type of table game or slot. For this study, numbers for blackjack, craps, baccarat, 25 cent slot, and \$1 slot, are applied. Based upon the June 1999 report, these five outlets of chance represented 69.5% of the total gaming win for the state. Though the Gaming

Revenue Report does not publish drop statistics, the figure can be calculated by dividing the win amount by the win percentage, two statistics that are included in the publication.

Furthermore, casino drop figures were deseasonalized to allow for period-to-period comparisons that are more meaningful and can help identify whether trends exist (Anderson, Sweeney, and Williams, 1998). Spurred by such special events as the Super Bowl in January, Chinese New Year in February, and the NCAA men's basketball championship in March, drop statistics tend to be incrementally larger during the first half of the calendar year.

Deseasonalization is derived by dividing the monthly results by a corresponding seasonal index. The seasonal index is deduced by calculating the monthly centered-moving average, dividing the monthly data by the centered-moving average, and then taking the average of these results.

Lastly, the inclusion of the S & P 500 as an independent variable in the multiple regression model will act as a control function for the gaming stock index. Although Kim (1996) found that 92% of the total risk associated with gaming stocks was attributed to firm-specific events, the overall market index will account for the systematic risk of the sampled gaming securities.

### **Pearson's Correlation Coefficients Test**

To measure the strength of the linear relationship between a dependent variable and the independent variable, a Pearson correlation coefficient test is utilized (Norusis, 1997). The purpose of the test is to examine the one-on-one relationship between the casino stock index and an independent variable, at the interval level.

When examining the Pearson correlation coefficient, the null hypothesis indicates that the result is equal to 0 (Norusis, 1997). If the null hypothesis is rejected, it is highly probable that there is a linear relationship between the dependent variable, and the selected independent variable. The two-tailed t-test was performed at a 10% confidence level, which is an appropriate significance level for this study's exploratory research.

### **Multicollinearity Test**

Multicollinearity, measured by tolerance, determines the strength of the linear relationship among the independent variables (Norusis, 1997). The figure represents the proportion of variability not explained by the linear relationships with the other independent variables.

Since the measure is a proportion, the values range from 0 to 1. A measure close to 1 indicates an independent variable whose variability is minimally explained by the other independent variables. A value close to 0 indicates an independent variable whose linearity is a combination of the other independent variables. When the latter occurs, multicollinearity is likely present in the data. Though confidence levels are not calculated, the benchmark for tolerance is typically defined at 0.1, or below (Norusis, 1997).

### **Multiple Regression for Testing the Relationship**

The ultimate test of this study is to examine the relationship between a dependent variable, and six independent variables. A multiple regression analysis is performed to

produce a t-test statistic that will determine if the individual drops of blackjack, craps, baccarat, \$0.25 slots, and \$1.00 slots, and an overall market index, are statistically significant with the movements of a gaming stock index.

The multiple regression was performed using the statistical software program, SPSS 8.0 for Windows. In the analysis, SPSS calculates a number of data sets, including a model summary, analysis of variance, and regression coefficients. Though all of the statistics offer insight into the equation, the two-tailed t-test within the coefficients section is used to test the six null hypotheses. If the observed value of the test statistic of an independent variable falls beyond the rejection region, the null hypothesis is rejected, with a .10 probability of Type I error. Conversely, if the observed value falls within the rejection area, the null hypothesis fails to be rejected.



## **CHAPTER 4**

### **DATA ANALYSIS**

#### **Introduction**

In the previous chapter, the methodology and procedure for the data analysis was discussed. In this chapter, the results of the data analysis are presented, ultimately leading to the rejection or acceptance of the null hypotheses described in the multiple regression model in Chapter 1.

Initially, the descriptive statistics of the study are offered to provide an overview of the data set. Then, the data generated by Pearson's correlation coefficient will illustrate the strength on the linear relationship between the dependent variable and the independent variables, individually. Next, the results of the multicollinearity test are presented to illustrate the proportion of variability of each independent variable that is not explained by its linear relationship with the other independent variables. Finally, the results of the multiple regression are presented in examining the statistical significance of the six independent variables to the dependent variable.

#### **Descriptives**

Table 4-1 summarizes the descriptive statistics of the gaming stock index, the overall market index, and the drop figures for blackjack, craps, baccarat, quarter slots, and dollar slots. The minimum, maximum, mean, and standard deviation of the dependent and the

six independent variables are presented. The purpose of providing the descriptive statistics to define the numerical parameters of the study.

For the gaming stock index, the figures are presented as a market capitalization-weighted index. The overall market index, the S & P 500, is presented by the raw price of the index. Lastly, the casino drop statistics are represented by the deseasonalized three-month summary from November 1993 to June 1999.

Table 4-1

Descriptive Statistics of the Gaming Stock Index, S & P 500, and Casino Drop Figures

Variable	Minimum	Maximum	Mean	Std Dev
Gaming Stock Index	15.02	33.77	23.55	3.79
S & P 500	444.27	1,372.71	781.32	279.47
Blackjack	1,633,176	2,164,806	1,822,157	124,439
Craps	656,837	843,616	709,088	38,659
Baccarat	622,608	1,179,514	834,227	124,544
Quarter Slots	9,636,404	11,614,400	10,772,713	541,151
Dollar Slots	7,672,368	8,730,962	8,322,454	241,170

Note. Figures for the drop statistics are in thousands (add 000).

**Pearson's Coefficient Correlation**

Table 4-2 illustrates Pearson's correlation matrix the examines the strength of the linear relationship between the dependent variable and each independent variable. The results show coefficients of -.255, -.178, -.317, .158, -.195, and .296, for the

S & P 500, blackjack, craps, baccarat, quarter slots, and dollar slots, respectively. The coefficients for the S & P 500, craps, and dollar slots are shown to have a statistically significant linear relationship with the gaming stock index, while the remaining three independent variables, blackjack, baccarat, and quarter slots failed to reject the null hypothesis.

Table 4-2

Pearson's Coefficient Correlation Results

	Gaming Stock Index
S & P 500	-.255
	(60)
	P = .039
Blackjack	-.178
	(60)
	P = .153
Craps	-.317
	(60)
	P = .009
Baccarat	.158
	(60)
	P = .206
Quarter Slots	-.195
	(60)
	P = .116
Dollar Slots	.296
	(60)
	P = .016

Note. Each row shows the coefficient, degree of freedom, and two-tailed significance at .05 confidence level, respectively.

### Multicollinearity

Table 4-3 shows the results of the tolerance test, which examines the strength of the linear relationships among the six independent variables of casino drop. Ideally, the tolerance figures should be larger than .10, as variables computed below this threshold indicate a potential multicollinearity problem. Since the tolerance statistic for the S & P 500, blackjack, and quarter slots fall below this benchmark, special consideration must be given to the variables when reviewing the results of the multiple regression model.

Table 4-3

#### Tolerance Statistics

Variable	Tolerance
S & P 500	.035
Blackjack	.062
Craps	.132
Baccarat	.625
Quarter Slots	.044
Dollar Slots	.263

### Multiple Regression

Table 4-4 shows the results of the multiple regression analysis investigating the relationship between the gaming stock index, the overall market index, and the five areas of casino drop.

Table 4-4

Multiple Regression Results

Variable	Coefficient	t-statistic	Probability
Constant	46.862		
S & P 500	171.40	2.395	.020
Blackjack	3.390E-05	2.670	.010
Craps	-1.10E-04	-3.769	.000
Baccarat	-4.65E-06	-1.211	.231
Quarter Slots	-4.42E-05	-4.255	.000
Dollar Slots	1.297E-05	4.328	.000

Note. R square = .428; F-statistic = 7.362; Probability (F-statistic) = .000;

degrees of freedom = 60; rejection region;  $t > 1.282$  or  $t < -1.282$  at

the .10 significance level.

Referring to Chapter 1, a null hypothesis was formulated for each of the independent variables to test the significance of the correlation to the dependent variable. The first research hypothesis examined the relationship of an overall market index to the gaming stock index. The t-test suggests that the coefficient of the S & P 500 is significantly different from zero at the .10 significance level (see Table 4-4). Thus, the null hypothesis can be rejected. The S & P 500 is significantly correlated with the gaming stock index for the period of examination.

The next null hypothesis tested analyzes the relationship of blackjack drop to the gaming stock index. The t-test suggests that the coefficient of blackjack is significantly

different from zero at the .10 significance level (see Table 4-4). Thus, the null hypothesis can be rejected. Blackjack drop is significantly correlated with the gaming stock index for the period of examination.

The third null hypothesis tested analyzes the relationship of craps drop to the gaming stock index. The t-test suggests that the coefficient of craps is significantly different from zero at the .10 significance level (see Table 4-4). Thus, the null hypothesis can be rejected. Craps drop is significantly correlated with the gaming stock index for the period of examination.

Before continuing to the following null hypothesis test, attention must be given to the negative status of the craps coefficient. Conventional thought would indicate that the coefficient be positive, as an increasing drop would increase the value of the index. Conversely, the regression model's assertion is that an increasing craps drop will have a negative effect on the price of the gaming stock index. Additionally, the coefficients of baccarat and quarter slots also exhibit the same negative condition. Reasoning for this quandary will be offered in Chapter 5.

The fourth null hypothesis to be tested considers the relationship of baccarat drop to the gaming stock index. The t-test suggests that the coefficient of baccarat is not significantly different from zero at the .10 significance level (see Table 4-4). Thus, the null hypothesis fails to be rejected. Baccarat drop is not significantly correlated with the gaming stock index for the period of examination.

The fifth null hypothesis to be tested considers the relationship of quarter slots to the gaming stock index. The t-test suggests that the coefficient of quarter slots is significantly different from zero at the .10 significance level (see Table 4-4). Thus, the

null hypothesis can be rejected. Quarter slots drop is significantly correlated with the gaming stock index for the period of examination.

The final null hypothesis to be tested considers the relationship of dollar slots to the gaming stock index. The t-test suggests that the coefficient of dollar slots is significantly different from zero at the .10 significance level (see Table 4-4). Thus, the null hypothesis can be rejected. Dollar slots drop is significantly correlated with the gaming stock index for the period of examination.

### Summary

The descriptive statistics of the study varied by a range of 55% for the market capitalization-weighted gaming stock index. The minimum value of 15.02 occurred in September 1998, a period of trepidation for the industry as concerns over the influx of five megaresorts to the Las Vegas market would oversaturate the gaming supply. The maximum value of the index, 33.77, followed the openings of the Monte Carlo and the Stratosphere in May 1996.

Further examination of the descriptive figures illustrate a relatively large standard deviation for baccarat, when compared to the other drop numbers. Approximately equal to the standard deviation for blackjack, the baccarat statistic is associated with a mean (834,227) that is over half as small as blackjack's mean (1,822,157). This greater volatility exhibited by baccarat serves as a precursor for the variable's non-significant relationship with the dependent variable in both Pearson's coefficient test and the multiple regression analysis.

The results of the t-test in the multiple regression suggest that the overall market index



was significantly correlated with the gaming stock index. In addition, drop figures for blackjack, craps, quarter slots, and dollar slots were also significantly correlated with the gaming stock index. However, the findings were tainted by the negative status of the coefficients for craps and quarter slots, as the assumption of the study dictates that the independent variables would provide a positive relationship with the dependent variable.

## CHAPTER 5

### CONCLUSIONS AND RECOMMENDATIONS

#### Summary

The primary purpose of this study was to examine the relationship between a market capitalization-weighted index of seven gaming firms and six independent variables, five components of casino drop, blackjack, craps, baccarat, quarter slots, and dollar slots, and an overall market index, the Standard and Poor's 500. Encompassing the period of January 1994 to June 1999, the study sought to determine the significance of the relationships by utilizing a multiple regression analysis.

The results of the investigation showed that there was a significant relationship between the dependent variable and five of the six independent variables, at a .10 significance level. Shown to be statistically significant, the S & P 500, blackjack and dollar slots were positively correlated with the gaming stock index, whereas craps and quarter slots were negatively correlated. The only independent variable found not significantly correlated with the gaming index was baccarat. Since no previous empirical studies were found in examination of gaming stocks and casino drop, inferences into the validity of this study cannot be made.

The existence of negative coefficients in the regression results signal potential validity problems in the model due to the presence of collinearity. An increasing drop, which can be analogized to increasing revenue, would seem to precipitate an increasing

stock price. Thus, the negative coefficients present in the craps and quarter slots variables appear to be erroneous, as the figures indicate a decreasing drop would increase the stock index.

In an attempt to revert the two coefficients in question from negative to positive, statistical adjustments were made. Original figures were subjected to moving averages, quarterly versus monthly statistics, and lagging. Also, to compensate for the multicollinearity results which indicated that the S & P 500, blackjack, and quarter slots fell below the acceptable standard of .10, a regression was executed excluding the transgressed variables. In addition, the drop totals of blackjack and quarter slots were combined to potentially offset the low tolerance statistics. However, all efforts proved ineffectual as the modified regression models provided similar negative coefficients.

### Conclusions

The conclusions for this study are as follows:

1. The results of the study are valid. Therefore, gaming operators should focus their managerial attention on blackjack in the table games department, and dollar machines in the slots department. Some sense of credibility can be given to this analysis as blackjack is far and away the most lucrative table game in terms of win amount to the State of Nevada. According to the June 1999 Gaming Revenue Report, blackjack accounted for 38.2% of the total table game win, whereas the next closest game in win amount, craps, accounted for 15.4%.

Additionally, when compared to other "mass market" denominational devices, namely nickel and quarter slots, dollar machines outdistance the competition in terms of win amount per unit. Dollar slots contribute \$3648 per unit, compared to \$2379 for quarters,

and \$1906 for nickels, according to the June 1999 Gaming Revenue Report.

2. The results of the study are invalid. Though the correlation was proven to be statistically significant for every one of the six independent variables, the results were a product of “dumb luck”. Since three of the six variables provided coefficients that were negative, the data defies reasonable thought that to increase the drop (revenue), a firm’s stock price would actually decrease.
3. The results of the study are inconclusive. As stated in the previous two summaries, the findings of the study, while offering information that could potentially be useful to gaming operators, are burdened with questions concerning its validity.

Comparing the results of Pearson’s coefficient correlation and the multiple regression analysis, the existence of alternating positive and negative coefficients signals unreliable results. For example, when examining the one-on-one linear relationship of blackjack to the gaming index, the correlation produces a negative coefficient. Yet, when blackjack, combined with the linear relationships of the other five independent variables in the regression model, yields a positive coefficient. Under normal statistical circumstances, one would expect the coefficients to be consistent, either in the positive or negative.

Another problem in the findings of the study involves the effects of multicollinearity. Norusis (1997) states that when collinearity is present, the results may encounter coefficients with the wrong sign, and the recommendation is made to remove the offending variables from the model. Nevertheless, the removal of the S & P 500, blackjack, and quarter slots rendered similar coefficients.

However, when the casino drop totals were regressed cumulatively with the overall market index, the analysis provided useful data. Though not statistically significant at the .10 confidence level, the coefficient was positive for the total drop amount for blackjack,

craps, baccarat, quarter slots, and dollar slots. This finding provides some glimmer of optimism for future research in the relationship of casino drop and gaming stock performance.

### **Recommendations for Future Research**

In order to examine the relationship between the variance of gaming stock prices and industry financial variables, future studies can utilize several other revenue-related determinants. For example, casino revenue (win), win percentage, cash flow (EBITDA), profit margin, etc., all could be used in conjunction with a cumulative drop figure to test for the significance, as related to gaming stocks, of various revenue-related variables.

In replicating the aim of this study, the scope of the investigation should be refocused to fully reflect the intent of the study. Instead of including all of the nonrestricted gaming locations in the state, a better representation would be to just include the Las Vegas Strip market in future research. For example, with respect to baccarat, the Strip accounted for 84% of the statewide win amount according to the June 1999 Gaming Revenue Report. By including statewide figures, the effects of baccarat, as compared to the other independent variables, are diffused.

Further support to the exclusive utilization of the Las Vegas Strip market involves the composition of the index. For the last month of the study, June 1999, the four large-cap Strip operators contributed 95% to the market capitalization-weighted gaming stock index, compared to 5% for the three small-cap operators. In addition, in future studies, when more data becomes available, this percentage will significantly rise due to the inclusion of Park Place Entertainment.

Finally, the breadth and depth of future study can be expanded. Though somewhat constrained by the availability of stock price data, the breadth of future research could be elongated to a longer period of analysis to sufficiently observe the relationship of gaming stock prices and casino drop statistics. The depth of future research can be achieved by including additional table games and denominational machines in the study.

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