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THE IMPACT OF OPTION LISTINGS: A STUDY OF CASINO AND GAMING STOCKS

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and

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ABSTRACT

This study examines the impact of option listings on the common stock of 21 firms specializing in the casino and gaming industry. Our results show that, on average, there is a significant decrease in price during the five-day window which includes the announcement of the listing, the listing day, and a two-day period following the listing during which a liquid market is created in the option. However, we also show that stock prices recover subsequent to the listing window and that there is no evidence of a permanent change in stock price resulting from the listing. We find a significant decline in trading volume beginning two days prior to the listing, suggesting that the option market displaces trades of a significant number of shares following the listing. Finally, we find a significant decline in firm-specific risk following the listing, but do not find a change in systematic risk. This result suggests that while the introduction of option trading does not change the relationship between these stocks' returns and market returns, the additional outlet for speculators reduces volatility surrounding firm-specific news, lowering the total risk of these stocks.

Introduction

A number of studies have documented the impact of an option listing on the performance of the underlying stock. Unfortunately for the investor, the implications of the studies have not been consistent. Trennepoll and Dukes (1979) and Detemple and Jorion (1989) conclude that the introduction of an option reduces the volatility of the underlying stock. Bollen (1995) finds "a dramatic increase" in the volatility of the underlying stock, but shows that the increase is linked to increases in market volatility, not the introduction of the option. He also concludes that increases in trading volume following option listings are not different than changes for an industry-matched control sample. Conrad (1989) provides evidence that, beginning three days prior to the introduction of the option, the listing results in a permanent stock price increase. But Detemple and Jorion (1989) report that stock price increases in their sample of listings were less pronounced toward the end of the sample period, implying that the marginal impact of additional options, especially those within the same industry, diminishes.

Conflicting evidence of postlisting behavior indicates that, even though the listings are announced several days prior their introduction, the market is unable, on average, to anticipate, and therefore price, the impact of the listing. This study provides evidence of

the impact of an option listing on the behavior of the underlying stocks in the casino and gaming industry. There are several reasons for studying this industry. Economic studies commonly draw broad inferences regarding the impact of an event of this type. The inconsistency of the available evidence, however, begs the question regarding specific industries. The casino and gaming stocks, because of their high volatility, are likely to attract a disproportionate number of speculators, rendering a unique reaction to this event. And because there is knowledge of—if not formal announcements of—option listings in advance, information regarding their impact on this sector is valuable to traders who specialize in the industry.

The evidence from our sample of 21 option listings from the casino industry between 1976 and 1995 shows that, on average, there is a significant decline in firm-specific risk and trading volume following the listing of an option. Market risk, measured by beta, is not affected by listing.¹ We also find a negative price reaction within a five-day window surrounding the option listing. However, we find no evidence of a permanent unexpected change in price resulting from the option listing. Our evidence regarding stock price differs from that of Conrad (1989), who provided evidence of a systematic increase in prices following the introduction of options. Her results support the notion that options free institutional traders from regulatory restrictions and lower costs associated with price discovery.² Our results, which suggest that prices of casino-related stocks show no permanent change, are consistent with Black and Scholes (1973), who argue the pricing and availability of options, which are “redundant” assets, should have no impact on price of the underlying asset. Evidence of a permanent, significant decline in trading volume, beginning at the time of the listing, and the reduction in unsystematic risk, suggests the availability of options supplanted trading in firm shares.

The remainder of the paper is organized as follows: Data and Methodology are presented in Section 2; Results are presented in Section 3; and our conclusions are presented in Section 4.

Data and Methodology

Table 1 contains option listing dates and exchanges, as well as the Standard Industry Classification (SIC) codes for the firms used for this study. Dates were obtained from the Chicago Board of Trade publication titled “Option Listing History,” dated January 24, 1996. Stock prices and trading volume were obtained from the Center for Research on Security Prices (CRSP) data base provided by the University of Chicago. To satisfy the requirements of the event methodology used in this study, each security was required to have at least 180 trading days prior to the listing. Daily volume figures were required for 50 days prior and 50 days following the option listing.

¹ Fifteen of the 21 stocks in our sample were used to test changes in risk. Seven were omitted due to data restrictions.

² See Ross (1976) and Hakansson (1978).

TABLE 1
Casino and Gaming Option Listings
1976-1995

Company	SIC Code	Listing Date	Exchange
Aztar	7011	930406	CBOE
Bally Entertainment	7011	930709	CBOE
Bally Gaming	3990	920803	AMEX
Boomtown	7990	930604	CBOE
Boyd Gaming	5099	940419	PHLX
Caesar's World (1)	7011	800519	PHLX
Caesar's World (2)	7011	850610	AMEX
Casino America	7990	930824	CBOE, PHLX, PSE
Casino Magic	7990	930625	AMEX, CBOE, PHLX, PSE
Circus Circus	7011	861001	AMEX
Hilton Hotels	7011	761018	AMEX
Hollywood Casino	7010	950619	PSE
International Game Technology	3990	900801	AMEX, PSE
Jackpot	7993	930422	AMEX
Mirage	7999	830817	CBOE
Players International	7990	930712	AMEX
Resorts International	7011	800121	AMEX, CBOE, PSE
Rio Hotel and Casino	7011	930330	CBOE
Scientific Game Holding	7376	950502	AMEX, CBOE
Showboat	7011	930330	CBOE
Video Lottery Technology	3990	930802	AMEX, CBOE

AMEX—American Stock Exchange. CBOE—Chicago Board Options Exchange. PHLX—Philadelphia Stock Exchange. PSE—Pacific Stock Exchange.

We use event study methodology, employing the market model, to investigate any unanticipated changes in stock price related to the option listing. This methodology is designed to capture any unanticipated changes in return, net of market-related changes, related to an economic event of short duration. The individual unanticipated changes are averaged across firms to determine the degree to which the firms' stock prices, on average, respond to the event.³

Our event, the option listing date, is defined as day $t = 0$. We use a 150-day period to calculate the market model parameter estimates (betas), where the estimation period is $t = -180$ through $t = -31$. Cumulative average prediction errors (CAPE) are calculated for $t = -30$ to $t = +30$ to observe average unanticipated changes in stock price resulting from the option listing. If trading in casino stocks is highly speculative we might see a temporary drop in price as trading shifts out of the stock and into the option for the stock. However, if the initiation of options trading conveys an increased level of analyst coverage, or an increase in the liquidity, a drop in risk should result in a permanent increase in stock price. Conrad (1989) provided evidence that there was a permanent increase in stock price, based in part on the volume of options traded.

We compare pre- and postlisting trading volumes as an additional test of the hypothesis that option trading provides an efficient alternative to stock speculators. If the marginal investors in casino and gaming stocks are speculators, then we expect to see reduced trading volume in these stocks following the introduction of an option.

To determine whether the option listing has an impact on the risk of the underlying stock, we compare pre- and postlisting risk measures. The total risk of the firm, σ^2 , is composed of a systematic component and an unsystematic component. According to modern portfolio theory, systematic risk, measured by beta, indicates the risk associated with a security held in a well-diversified portfolio. For these stocks, the only relevant risk, theory suggests, is the degree to which stock returns are correlated with the returns on the market. We calculate 220-day, prelisting betas using the days $t = -250$ through $t = -31$ and postlisting betas using day $t = +31$ through day $t = +250$. Comparing prelisting betas to postlisting betas will reveal any changes in the relationship between the stock returns and returns in the market. The introduction of options trading on a stock should convey no information regarding a change in the relationship between the stock's returns and returns on the market. Therefore, we would not expect to see a significant change in these stocks' betas.

The second component, unsystematic risk, is the volatility in stock returns related only to events associated with the firm. This volatility is eliminated when the stock is held within a well-diversified portfolio. However, much speculative trading is conducted based on firm-specific information. Therefore, we examine changes in the unsystematic risk of the underlying stock around the option listing to determine whether the volatility associated with firm-specific information changes due to a flight of speculators

³ Our methodology follows the procedures detailed in Mikkelsen and Partch (1988).

from the stock. We use the method described by Healy and Palepu (1990) for measuring the firm-specific volatility in our sample. They start with the market model:

$$R_{ij} = \alpha_j + \beta_i R_{mj} + \varepsilon_{ij} \quad (1)$$

where R_{ij} = the return on security i at time j .
 R_{mj} = the return on the market portfolio at time j .
 β_i = the beta, or measure of systematic risk for security i .
 ε_{ij} = the component of returns which is not correlated with the returns on the market, where ε is mean zero with variance σ^2 .

The total variance of returns can now be stated as,

$$\text{Var}(R_i) = \beta_i^2 \text{Var}(R_m) + \sigma^2 \quad (2)$$

where σ^2 is the unsystematic component of total variance. Speculators and day traders can add volatility to stock returns through frequent trading on new information. If they can exploit new information about a security more efficiently through the option market, and if, as Black and Scholes suggest, the trading options do not impact the pricing of the underlying asset, then the impact of speculators' trades on stock price volatility can be reduced or eliminated. As such, there should be a decline in the firm-specific, or unsystematic component, of total risk following the listing of options on the stock.

Results

Price Changes

Table 2 presents the results of our event study for 21 casino and gaming firms listing options between 1976 and 1995, for which at least 180 days of return data were available prior to the listing. Bold figures represent Average Prediction Errors (APEs) which are greater than zero at the 5% level of significance. On these days, the average return for our sample firms significantly exceeds the return predicted by the market model.

The high volatility of the industry is reflected in the high number of significant APEs prior to the option listing. Of the six significant APEs prior to listing, only one is negative (day $t = -24$). Table 3 reveals that the apparent 3.73% CAPE prior to the listing is not significantly different from zero. This suggests that there is little reason to believe that options are introduced at a time of unexpected increases in stock price. Similarly, there is no unanticipated change in price for the 5 days prior to the listing.

The window $t = -2$ through $t = +2$ captures three components of the listing event. Day $t = -2$ through $t = -1$ is most likely to capture any announcement of the listing.⁴

⁴ Listing announcement dates were available for only one of the 21 stocks in our sample. Prior studies have noted that announcement dates range from 1 to 2 days prior to the listing of the option. In many cases, the listing date and the announcement date are the same.

TABLE 2
Casino and Gaming Option Listings,
1976-1995
APEs of 21 Listings

Day	Average Prediction Error	Z-stat
-30	0.000602	-0.33557
-29	0.022322	3.34761
-28	0.012508	2.12454
-27	0.000133	-0.19211
-26	-0.003361	-0.43884
-25	0.000847	0.34558
-24	-0.021630	-3.04537
-23	-0.003277	-0.59125
-22	0.000619	-0.29109
-21	-0.001938	-0.63714
-20	0.020018	2.50444
-19	-0.001083	0.02750
-18	0.004106	0.27498
-17	0.000859	0.38681
-16	-0.003733	0.09646
-15	0.008357	1.11825
-14	-0.007103	-1.16079
-13	0.015440	2.10802
-12	0.002767	0.52270
-11	-0.003356	-0.58151
-10	-0.001433	-0.36282
-9	-0.009109	-1.14065
-8	-0.001746	-0.20084
-7	0.010364	2.24944
-6	-0.001944	-0.10672
-5	-0.000888	-0.23380
-4	0.004644	0.66190
-3	0.007421	0.91506
-2	-0.005943	-0.99353
-1	-0.003519	-0.12030
0	-0.003633	-0.56223
+1	-0.000888	-0.08675
+2	-0.016462	-2.92565
+3	-0.001342	0.33371
+4	0.014922	2.10561
+5	0.001034	0.76500
+6	-0.003475	-0.16649
+7	-0.001444	-0.18413

TABLE 2 (continued)
 Casino and Gaming Option Listings,
 1976-1995
 APEs of 21 Listings

+8	0.000365	0.35157
+9	0.007647	1.46307
+10	-0.001418	-0.30517
+11	-0.016651	-2.38133
+12	-0.000884	-0.19873
+13	-0.002127	-0.33164
+14	-0.003169	-0.39229
+15	-0.001150	0.12753
+16	0.001802	0.73907
+17	0.000133	0.09314
+18	-0.012637	-1.66596
+19	0.001351	0.32880
+20	0.002252	0.73505
+21	0.004741	0.77825
+22	-0.004800	-0.81390
+23	0.000637	0.47702
+24	0.002233	0.50635
+25	-0.000139	0.21741
+26	-0.000518	0.05918
+27	0.007916	1.00763
+28	0.012764	2.28696
+29	-0.012533	-1.81240
+30	-0.010674	-1.63205

Values in bold are significantly different from zero at the 5% level, two-tail test.

Day $t = 0$, listing day, is the day options begin to trade on the listed stock. The two days following the listing capture the creation of a liquid market for the options. While all 5 days in the window appear to contain negative APEs, only on day $t = +2$ is the APE significantly different from zero (-1.65% , p -value = 0.0081). The window $t = -2$ through $t = +2$ has a CAPE of -3.04% (p -value = 0.0647). This suggests that, on average, from the announcement of the listing through the establishment of a liquid market, there is a significant drop in stock price. This evidence is consistent with negative price pressure beginning with the announcement of the option listing and extending past the listing date as speculators trade fewer shares and more options. The significant recovery on day $t = +4$ (1.5% , p -value = 0.0470) reflects a return to fair value following the period of negative price pressure. The CAPEs for $t = 0$ through $t = +5$ (-0.64% , p -value = 0.8900), $t = 0$ through $t = 30$ (-3.61% , p -value = 0.8744), and $t = +3$ through $t = +30$ (-1.51% , p -value = 0.6876) confirm that, on average, the listing of the option has only a temporary impact on the stock price of the listing firms.

TABLE 3
 Casino and Gaming Options Listings
 1976-1995
 Cumulative Average Prediction Errors
 $n = 21$

Period	CAPE	Z-stat	Prob > Z
-30 through -1	0.0373	1.01	0.3240
-5 through -1	0.0018	0.10	0.9213
-2 through +2	-0.0304	-1.96	0.0647
0 through +2	-0.0210	-1.91	0.0670
0 through +5	-0.0064	-0.14	0.8900
0 through +30	-0.0361	-0.16	0.8744
+3 through +30	-0.0152	0.41	0.6876

speculators trade fewer shares and more options. The significant recovery on day $t = +4$ (1.5%, p -value = 0.0470) reflects a return to fair value following the period of negative price pressure. The CAPEs for $t = 0$ through $t = +5$ (-0.64%, p -value = 0.8900), $t = 0$ through $t = 30$ (-3.61%, p -value = 0.8744), and $t = +3$ through $t = +30$ (-1.51%, p -value = 0.6876) confirm that, on average, the listing of the option has only a temporary impact on the stock price of the listing firms.

Our evidence on the impact of option listings on prices is not consistent with Conrad (1989), who concluded that stock prices increased following options listings, on average. Increased stock prices following option listings, in general, may reflect the increased liquidity, market exposure, and status that firms listing options share. Our evidence, however, may reflect price pressure resulting from changes in the trading patterns of speculators.

Volume Changes

To test the hypothesis that a change in trading patterns may be contributing to the pattern in returns we observe, we examine the daily trading volume of our sample of stocks. If price pressure is driving the abnormal returns we observe, we should see a significant change in average trading volume over the corresponding periods. We use a 101-day window beginning 50 trading days prior to the listing, extending through 50 trading days after the listing.

The highlights of the test of changes in daily volume are presented in Table 4. Group 1 compares average trading volume for four periods relative to the listing. For the window beginning 50 trading days prior to the option listing and extending through the ninth day prior to listing, average daily trading volume is 194,304 shares. For the 6-day

TABLE 4
 Casino and Gaming Options Listings
 1976-1995
 Changes in Daily Trading Volume By Day

Group	Time Period	Mean Volume Shares/day	Difference from Prior Period	Significance <i>p</i> -value
1	Base: - 50 through - 9	194,304	-	-
	- 8 through - 3	255,106	60,802	0.0531
	Listing Window: - 2 through +2	180,854	- 74,252	0.0294
	+3 through +50	179,189	- 1,665	0.9260
2	Prelisting: - 50 through - 1	200,885	-	-
	Postlisting 0 through +50	179,461	- 21,424	0.0614
3	Prelisting Window: - 50 through - 3	201,905	-	-
	Postlisting Window: +3 through +50	179,189	- 22,716	0.0480

window beginning on the eighth day prior to listing and extending through day $t = -3$, volume increases significantly, to 255,106 shares per day (p -value = 0.0531). During the 5-day listing window ($t = -2$ through $t = +2$), which is designed to capture the option listing announcement and the listing itself and provide the creation of a liquid option market, volume drops significantly to 180,854 shares per day. The listing window average is significantly lower than the average for the period $t = -8$ through $t = -3$ (p -value = 0.0294). The last period in Group 1 shows that average trading volume does not change for the 48 days following our listing window.

Group 2 in Table 4 shows that the postlisting average trading volume of 179,461 shares per day is less than the 200,885 shares per day, prelisting, at the 6.14% significance level. Group 3 in Table 4 shows that, net of the 5-day listing window, postlisting volume of 179,189 shares per day is significantly less than the postlisting daily volume of 201,905 shares at the 5% level.

Changes in Risk

Tables 5 and 6 contain comparisons of the pre- and postlisting measures of systematic and unsystematic risk for the 15 firms in our sample which had at least 250 trading days prior to the listing. Our tests for changes in risk reveal that, on average, systematic risk does not change but unsystematic risk is reduced. This evidence is consistent with the flight of speculators away from the stock and into options as a means of capturing short-term profits associated with firm-specific events.

Table 5 contains a comparison of the pre- and postlisting measures of systematic risk, beta, for the firms in our sample. The mean prelisting beta of 2.01 reflects the high risk of these stocks. And while the mean beta falls to 1.76 for the 250-day period following the listing, the difference is not significant (p -value = 0.3401). This result supports the hypothesis that the availability of an option should not change the relationship between a stock's returns and the market.

Table 6 contains a comparison of the pre- and postlisting measure of unsystematic risk, σ^2 , for the 15 firms used in our sample. It reveals that firm-specific variance decreased significantly following the introduction of an option (-0.000416 , p -value = 0.0274). This evidence supports the notion that trading based on firm-specific information shifted to the option market following the listing, reducing the level of the risk component not related to returns on the market.

Table 7 contains individual listing window CAPEs and changes in unsystematic risk arranged by year. To determine whether the abnormal returns are time sensitive, we test for differences in mean CAPEs between the listings occurring in 1993 and the listings occurring in all other years. The difference in the mean CAPEs, 1.3%, is not different for the 1993 sample than for the other sample years (p -value = 0.6624). We also test for differences in changes in unsystematic risk between time periods. The difference in mean changes between the 1993 sample and the other years, 24.26%, is not significantly different.⁵

Conclusions

Our examination of option listings on the common stocks of casino and gaming firms reveals that, on average: 1) There is significant decrease in price during the five-day

⁵ The difference of 24% is not significant due to the high variance introduced by a change of 112% by International Game Technology. When IGT is removed from the test, the difference in means, 4.96%, is not statistically significant (p -value = 0.7581).

TABLE 5
 Casino and Gaming Options Listings
 1976-1995
 Changes in Systematic Risk

Company	Prelisting β	Postlisting β	Difference	% Change
Aztar	1.6857	1.6779	-0.0078	-0.47
Bally Entertainment	2.7711	1.0248	-1.7463	-63.02
Caesar's World (1)	0.9176	1.4952	0.5776	62.95
Caesar's World (2)	1.9511	2.2275	0.2764	14.17
Casino America	2.7418	2.0456	-0.6962	-25.39
Circus Circus	2.0051	1.4089	-0.5962	-29.73
Hilton Hotels	1.1161	1.501	0.3849	34.49
International Game Technology	1.6697	1.8719	0.2023	12.11
Jackpot	2.1821	1.4985	-0.6836	-31.33
Mirage	1.3373	2.5539	1.2166	90.97
Players International	2.9384	2.9052	-0.0333	-1.13
Resorts International	1.8742	1.0452	-0.8291	-44.23
Rio Hotel and Casino	1.6907	1.8407	0.1500	8.88
Showboat	1.7824	2.4720	0.6897	38.69
Video Lottery Technology	3.6102	0.8364	-2.7738	-76.83
Minimum	0.9176	0.8364	-2.7738	-76.83
Max	3.6102	2.9052	1.2166	90.97
Mean	2.0182	1.7603	-0.2579	-0.65
Standard Error			0.2611	
t-statistic			0.9877	
Prob > t	-	-	0.3401	-

TABLE 6
 Casino and Gaming Options Listings
 1976-1995
 Changes in Unsystematic Risk

Company	Prelisting variance	Postlisting variance	Difference	% Change
Aztar	0.000880	0.000871	-0.000009	-1.01
Bally Entertainment	0.001150	0.000513	-0.000638	-55.43
Caesar's World (1)	0.001841	0.000806	-0.001035	-56.20
Caesar's World (2)	0.000440	0.000364	-0.000076	-17.32
Casino America	0.001940	0.001497	-0.000443	-22.85
Circus Circus	0.000343	0.000372	0.000029	8.34
Hilton Hotels	0.000350	0.000329	-0.000021	-6.00
International Game Technology	0.000436	0.000926	0.000491	112.63
Jackpot	0.000706	0.000727	0.000021	2.90
Mirage	0.000607	0.000510	-0.000097	-15.92
Players International	0.002460	0.000972	-0.001488	-60.48
Resorts International	0.001233	0.000645	-0.000588	-47.68
Rio Hotel and Casino	0.001356	0.000675	-0.000681	-50.23
Showboat	0.000881	0.001070	0.000189	21.48
Video Lottery Technology	0.003584	0.001641	-0.001907	-53.74
Minimum	0.000343	0.000329	-0.001907	-60.48
Max	0.003548	0.001641	0.000491	112.63
Mean	0.001211	0.000796	-0.000416	-16.10
Standard Error	0.000234	0.000101	0.000169	11.55
t-statistic	-	-	-2.4623	-
Prob > t	-	-	0.0274	-

TABLE 7
 Casino and Gaming Options Listings
 1976-1995
 CAPEs and Changes in Unsystematic Risk, by Year and by Firm

Year	Company	CAPE $t = -2$ through $t = +2$	Changes in Unsystematic Risk %
1976	Hilton Hotels	-0.0108	-6.00
1980	Caesar's World (1)	-0.0374	-56.20
	Resorts International	0.0232	-47.68
1983	Mirage	-0.1075	-15.92
1985	Caesar's World (2)	0.0031	-17.32
1986	Circus Circus	-0.0112	8.34
1990	International Game Technology	-0.1120	112.63
1992	Bally Gaming	0.0174	*
1993	Aztar	-0.0159	-1.01
	Bally Entertainment	0.0553	-55.43
	Boomtown	-0.1230	*
	Casino America	0.0242	-22.85
	Casino Magic	-0.1849	*
	Jackpot	-0.0084	2.90
	Players International	-0.0358	-60.48
	Rio Hotel and Casino	-0.0640	-50.23
	Showboat	-0.1079	21.48
	Video Lottery Technology	0.0879	-53.74
1994	Boyd Gaming	0.0087	*
1995	Hollywood Casino	-0.0087	*
	Scientific Game Holding	-0.0316	*
	*Complete data are not available.		
	Mean 1993	-0.0243	-3.164
	Mean all other years	-0.0373	-27.42
	Prob > t	0.6624	0.3122

event window which includes the announcement of the listing, the listing day, and a two-day period following the listing during which a liquid market is created in the option. 2) Stock prices recover subsequent to the listing event window. As a result, we conclude that there is no permanent change in stock price resulting from the listing. 3) There is a significant decline in trading volume during the listing window. This suggests negative price pressure surrounding the listing. 4) The reduction in postlisting trading volume is persistent, suggesting that the option market supplanted trades of a significant number of shares following the listing. 5) There is a significant decline in unsystematic risk following the listings. This result suggests that while the introduction of options trading does not change the relationship between stock returns and market returns, the opportunity for speculators provided by options reduces volatility due to firm-specific news, lowering the total risk of these stocks.

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