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OPTION TRADING AND THE INFORMATION CONTENT OF SECURITY PRICES WITH RESPECT TO ACCOUNTING EARNINGS

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Prior studies show that option listing and subsequent trading improve a firm's information environment and that the price-earnings relation is influenced by characteristics of the information environment. Motivated by these research findings, we examine whether option trading is associated with changes in the information content of security prices with respect to future accounting earnings. We find that before the listing of a firm's options, the firm's security returns from the previous fiscal year convey little information regarding the current year's earnings changes. In contrast, the returns from the previous fiscal year are a significant variable in explaining the current year's earnings changes after option listing. Our findings are robust after potential confounding factors, such as firm size, financial press coverage, and institutional concentration, are controlled. Overall, the evidence is consistent with the claim that option trading enhances the informativeness of security prices with respect to future accounting earnings.

I. INTRODUCTION

Considerable research has focused on the relation between security returns and accounting earnings. Earlier work by Ball and Brown [2] and Beaver et al. [3] documents the information content of accounting earnings. They show that both the sign and magnitude of annual unexpected earnings are significantly associated with annual abnormal returns.

Recognizing that accounting earnings are just one source of information that has impact on the valuation of security prices, Beaver et al. [4] invert the traditional price-earnings relation and test for the information content of security prices with respect to accounting earnings. Their results indicate that stock prices are useful in forecasting accounting earnings. Collins et al. [10] further suggest that the lead-lag relation between price changes and earnings changes is positively related to firm size, which is a proxy for differences in information environment. Their evidence indicates that security prices of large firms are more likely to lead accounting earnings than security prices of small firms.

The purpose of this paper is to examine the information content of security prices with respect to accounting earnings before and after a firm's stock is listed on option exchanges. Previous studies suggest that option trading may be an important conditioning variable in testing the information content of security prices with respect to accounting earnings. Option trading may affect the price-

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earnings relation in two ways. First, the option market may expand investment opportunities beyond those available in the stock alone (e.g., [7,8,12,19]). Thus, the option market increases incentives for private information production and attracts an additional set of traders with certain kinds of superior information. It follows that option trading may be associated with an increase in the amount of market information, thereby increasing the extent to which price changes lead future earnings changes.

Second, the option market may increase the rate at which private information is disseminated through observable trading. Diamond and Verrecchia [13] argue that short-sale constraints will reduce the speed with which private information is impounded into security prices. This occurs because short-sale constraints remove an informative subset of trading activity, thereby reducing the information content of each period's trade and slowing the speed with which security prices adjust to private information. To the extent that option trading reduces the costs and restrictions in short-selling the underlying stock, one would expect that option trading increases the speed of price adjustment to private information and enhances the informativeness of stock prices with respect to future earnings.

Motivated by previous research findings, the authors investigate whether option trading is associated with the information content of security prices. We conduct various regression analyses that examine whether firms' price changes from the previous fiscal year are useful in explaining both the sign and magnitude of earnings changes in the current fiscal year. Our results indicate that before the listing of a firm's options, the firm's stock prices from the previous fiscal year convey little information regarding earnings changes in the current year. In contrast, returns from the previous fiscal year are significantly associated with the current year's earnings after option listing. These findings are consistent with the claim that option trading enhances the informativeness of security prices with respect to future accounting earnings.

In addition, we examine several firm-specific factors that may provide alternative explanations for the observed results. We find that, for our sample firms, (1) firm size (proxied by market value of equity) increases significantly after option listing, (2) number of news releases in the *Wall Street Journal Index* increases significantly after option listing, and (3) institutional concentration is significantly higher after listing. Subsamples are formed to control for these factors. Our inference, however, is unaltered after these intervening factors are controlled.

This study is similar to Skinner's [21]. Both studies investigate changes in price-earnings relations before and after option listing. However, Skinner examines stock price reactions to quarterly earnings announcements (i.e., information content of quarterly earnings releases); and our study focuses on how stock prices predict future annual earnings (i.e., information content of security prices with respect to future earnings). In addition, Skinner's sample comprises all firms listed on the Chicago Board Options Exchange (CBOE) and American Stock Exchange (AMEX) option exchange. Our sample includes firms listed on

CBOE, AMEX, and both the Pacific and the Philadelphia option exchanges. Thus, our study differs from Skinner's [21] in orientation and scope.

Our study also extends work by Jennings and Starks [18] and Ho [17]. These studies document differences in the adjustment of stock prices to earnings releases for firms with and without exchange-traded options. Jennings and Starks find that it takes longer for stock prices of nonoption firms to adjust to quarterly earnings releases than stock prices of option firms. Ho documents that return variability surrounding quarterly earnings announcements is greater for nonoption firms than for option firms. In this study we examine how the information content of security prices varies through time (pre-listing versus post-listing periods), while their studies compare price adjustments to earnings announcements across firms (option versus nonoption firms). Our results complement their findings and provide additional insights into the role that option markets play in producing and processing market information.

The remainder of the paper is organized as follows. Section II presents the methodology. Section III describes the data and sample. A discussion of the empirical results is presented in section IV, followed by concluding remarks.

II. METHODOLOGY

To test our information content hypothesis, we conduct various regression analyses that examine whether security returns from various time periods (lagged, contemporaneous, and subsequent returns) are useful in explaining both the sign and magnitude of the current year's earnings changes. Following Beaver et al. [5], we employ reverse regressions. Specifically, we regress the percentage change in earnings per share on various CAR (cumulative abnormal returns) measures. As indicated by Beaver et al. [5], the reverse regression approach is preferred over the traditional price-earnings formulation in assessing the information content of security prices with respect to accounting earnings.[1]

To investigate the extent to which returns for year t-1 explain earnings changes for year t, the following reverse regression model is estimated for both pre- and post-listing periods. For each firm, the pre-listing (post-listing) period is defined as the ten-year period immediately before (after) the year of option listing.

$$\%DEPS_{it} = a + b_1 * CAR_{i,t-1} + t_{i,t} \quad (1)$$

where $\%DEPS_{it}$ = percentage change in earnings per share (excluding extraordinary items) from period t-1 to period t for firm i. $CAR_{i,t-1}$ = 12-month cumulative market-adjusted abnormal returns during period t-1 for firm i. Market-adjusted abnormal returns are calculated by subtracting the CRSP equally-weighted market index from the corresponding monthly returns for the particular firm.[2]

For both pre- and post-listing periods, the above regression model is estimated by pooling all cross-sectional observations over the ten-year period. In other words, one OLS pooled regression is estimated for the pre-listing period and the other one is estimated for the post-listing period. The regression coefficients are estimated in two ways. First, we follow Beaver et al. [5] and rank all firm-year observations based on $CAR_{i,t-1}$ values and form 25 portfolios. Then for each portfolio, the average values of %DEPS and CAR are computed. The average values of %DEPS and CAR for each of the 25 portfolios are then used in estimating the regression coefficients. Second, we perform the regression analysis using all individual firm data. As indicated by Beaver et al. [5] and Collins et al. [10], the portfolio approach can reduce the measurement error on the left-hand side of the equation because the average transitory component of earnings changes would be driven to zero at the portfolio level.

We hypothesize that the explanatory power of the regression model (i.e., R^2) is higher for the post-listing period than for the pre-listing period. In addition, the slope coefficient (i.e., b_1) is expected to be significantly positive after option listing. This hypothesis is based on the argument that option trading produces more timely information about a firm, which causes price changes to be a more accurate and efficient forecast of future earnings changes. Consequently, returns from the previous fiscal period (i.e., period t-1) would play a more important role in forecasting earnings of the current period (i.e., period t) after exchange-traded options are listed on firms' stocks.

Prior research also documents that there is a significant contemporaneous association between earnings and returns (e.g., [3]) and that the information in annual earnings may be revealed after the end of the fiscal year through the time of the earnings announcement (see e.g., [2]). Recent work by Collins et al. [10] and Freeman [15] further suggests that the magnitude of post-FYE (fiscal year-end) price adjustment is greater for small firms than for large firms. For example, Collins et al. [10] find that small firms exhibit a positive upward drift in cumulative abnormal returns during the three months after the fiscal year-end, while large firms' cumulative returns decline over the same period. They interpret the evidence as an indication that market participants are better able to anticipate the contents of earnings reports for large firms than for small firms. Accordingly, the following regression model is estimated to examine how lagged returns, contemporaneous returns, and returns from the post-FYE period explain the current year's earnings changes:

$$\%DEPS_{it} = a + b_1*CAR_{i,t-1} + b_2*CAR_{i,t} + b_3*CAR_{i,t+1} + e_{it} \quad (2)$$

where $\%DEPS_{it}$ = percentage change in earnings per share (excluding extraordinary items) from t-1 to t for firm i. CAR_i = cumulative market-adjusted abnormal returns for firm i. For periods t-1 and t the accumulation is over a

twelve-month period (January-December). For period t+1, the accumulation is over a three-month period (January-March).[3]

The above multiple regression model essentially examines how returns from various time periods explain both the sign and magnitude of the current period's earnings changes. Since more than one CAR is employed, we conduct the regression analysis using only the individual-firm approach. This model provides a way to assess the incremental explanatory power of lagged returns (i.e., $CAR_{i,t-1}$) with respect to earnings by controlling for the effects of returns from the contemporaneous (i.e., $CAR_{i,t}$) and subsequent (i.e., $CAR_{i,t+1}$) fiscal periods. The option trading arguments predict that b_1 would be significantly positive for the period after option listing. Based on prior research (e.g., [3,14]), b_2 is expected to be positive for both before and after option listing.

III. SAMPLE AND DATA

The sample firms comprise all firms that had initial listings on the CBOE, AMEX, Pacific Stock Exchange, and Philadelphia Stock Exchange over the period 1973-1982, subject to the following selection criteria:

(1) The sample firms must be listed on both the 1993 COMPUSTAT Annual Industrial File and the 1993 CRSP Returns File. This requirement assures that data needed are available in machine-readable form. Earnings information is obtained from the COMPUSTAT Annual Industrial File. Market-adjusted abnormal returns are computed by using the CRSP Returns File.

(2) The sample firms must be December 31 fiscal-year-end firms. This criterion is imposed to facilitate comparisons with previous studies that have imposed this restriction (e.g., [10,15]).

(3) Firms that were delisted from the option exchanges within six years after listing are dropped from the sample. For example, Electronic Data Systems is dropped from the final sample because it was listed on the Pacific Stock Exchange in 1982 and delisted in 1984. The purpose of this requirement is to have sufficient data for each firm in the empirical analysis and therefore to ensure the reliability of results.

Application of these selection criteria results in 172 firms. Table 1 presents selected descriptive information about the sample firms' year of option listing, average market value of equity in the year listed, and average market model beta over the 60-month period before the listing year.

Table 1

Descriptive Information for Sample Firms

Year of initial listing	Number of firms	Percent of Sample	Mean market value of equity (million)	Mean beta
1973	26	15.12	7,096	1.104
1974	6	3.49	3,905	1.110
1975	58	33.72	2,053	1.054
1976	29	16.86	1,282	1.215
1977	7	4.07	987	1.240
1978	2	1.16	738	2.353
1979*	0	0.00	---	---
1980	16	9.30	1,175	1.379
1981	5	2.91	860	1.634
1982	23	13.37	1,540	1.377
Total	172			
Overall Mean			2,506	1.186

Note: This table shows the distribution, size, and beta through calendar time of option listing years for the 172 sample firms. Firm size is measured by using the market value of outstanding common shares as of the last trading day in the year of option listing. Betas are obtained form the OLS market model regressions, estimated over the 60-month period before the listing year.
* No exchange-traded options were listed in 1979 because SEC imposed a moratorium on any expansion of option trading.

IV. RESULTS

Initial Results

Table 2 presents the results of regression model (1) for the entire sample. The results indicate that the regression model has much higher explanatory power for the post-listing period than for the pre-listing period. When the firm-year observations are grouped into 25 portfolios, the adjusted R^2 for the pre-listing period is -0.0221 whereas the adjusted R^2 for the post-listing period is 0.3158. In addition, the regression coefficient b_1 is significantly positive after listing (t-value = 3.475); but it is insignificantly different from zero before listing (t-value = -0.693). Clearly, there is a substantial improvement in the explanatory power of the regression model (1) from the pre- to post-listing period.

Table 2

Regression results for $\%DEPS_{it} = a + b_1 * CAR_{i,t-1} + t_{it}$

(T-Statistics in Parentheses)

	a	b_1	Adj. R^2	Prob. > F
Panel A: Based on 25 Portfolios				
Before listing (n=25)	0.191 (9.343)***	-0.046 (-0.693)	-0.0221	0.4951
After listing (n=25)	0.180 (3.731)***	0.627 (3.475)***	0.3158	0.0020
Panel B: Based on Individual Firms				
Before listing (n=1224)	0.191 (8.149)***	-0.058 (-0.777)	-0.0003	0.4371
After listing (n=1648)	0.178 (4.177)***	0.604 (3.827)***	0.0082	0.0001

$\%DEPS_{it}$ = percentage change in earnings per share (excluding extraordinary items) from period t-1 to period t for firm i.

$CAR_{i,t-1}$ = 12-month cumulative market-adjusted abnormal returns during period t-1 for firm i. Market-adjusted abnormal returns are calculated by subtracting the CRSP equally-weighted market index from the corresponding monthly returns for the particular firm.

*** Significant at the 1% level.

The tests based on individual firm data also confirm the portfolio results. Panel B of Table 2 indicates that, when the regression model (1) is estimated using individual firm data, the adjusted R^2 increases from -0.0003 before listing to 0.0082 after listing. The regression coefficient b_1 is significantly different from zero after listing (t-value = 3.827) but is not significant before listing (t-value = -0.777).[4]

Results After Controlling for Intervening Factors

While the results in Table 2 are consistent with the notion that the informativeness of security prices with respect to future accounting earnings is enhanced after option listing, there exists alternative explanations. Option firms may change systematically from the pre- to post-listing period and these changes could underlie our results. In this section we examine whether option firms change over time and discuss the extent to which these changes provide alternative explanations of the results previously reported.

Size and Beta As discussed by Ho [17], the option exchanges have incentives to list options on firms with a high level of investor interest or trading activity. Size and riskiness are important variables because investor interest generally increases with the size of the firm, and option value increases with the return variance (and so the general riskiness) of the stock. In addition, prior research suggests that the informativeness of security prices is positively related to firm size (see e.g., [10,15]).

Our analysis indicates that the size of sample firms increases significantly after option listing. The median market value for the 172 sample firms is $1,003 million for the two years immediately before listing and $1,336 million for the two years after. This difference is significant at the 5% level with a Wilcoxon test. With respect to systematic risk, there is no evidence of any significant changes in beta for sample firms in periods before and after option listing. Systematic risk coefficients are estimated from market model regressions by using monthly returns (60 months) immediately before and after the listing year. The results show that for our sample firms, the median beta increases from 0.71 to 0.74 after options are listed on their stocks. The increase is not significant at any conventional level using a Wilcoxon test.

To test whether firm size is the factor that drives the observed results, we construct a size subsample that conservatively controls for the significant increase in size after listing. The size subsample comprises those firms whose market values of equity decrease after options are listed on their stocks. If firm size is positively related to the information content of security prices (as suggested by prior research) and if the post-listing firm size is smaller than the pre-listing firm size, then one would expect lower information content of security prices for the post-listing period. On the other hand, if the post-listing firm size is smaller, yet the post-listing information content is higher, the evidence would support the argument that the observed results are not driven by firm size.

The size subsample consists of 44 firms. The regression results for the size subsample are presented in Panel A of Table 3. Overall, the evidence is consistent with the results in Table 2. The adjusted R^2 of the regression model (1) increases from the pre- to post-listing period. The regression coefficient b_1 is positive and significant for the post-listing period, but it is not significantly different from zero for the pre-listing period. Thus, it is unlikely that the change in price informativeness is due to the change in firm size from the pre- to post-listing period.

Table 3

Regression results for $\%DEPS_{it} = a + b_1 * CAR_{i,t-1} + t_{it}$
After Controlling for Intervening Factors
(T-Statistics in Parentheses)

	a	b_1	Adj. R^2	Prob. > F
Panel A: Size Sample				
A.1: Based on 25 Portfolios				
Before listing (n=25)	0.202 (5.863)***	0.056 (0.535)	-0.0306	0.5975
After listing (n=25)	0.181 (1.965)*	0.924 (2.881)***	0.2332	0.0084
A.2: Based on Individual Firms				
Before listing (n=298)	0.203 (5.622)***	0.028 (0.264)	-0.0032	0.7916
After listing (n=421)	0.159 (1.657)*	0.802 (2.388)**	0.0111	0.0174

Table 3 (Continued)

Panel B: Financial News Sample				
B.1: Based on 25 Portfolios				
Before listing (n=25)	0.188 (5.330)***	0.002 (0.016)	-0.0435	0.9871
After listing (n=25)	0.212 (2.690)**	1.106 (3.845)***	0.3648	0.0008
B.2: Based on Individual Firms				
Before listing (n=448)	0.188 (4.627)***	-0.034 (-0.257)	-0.0021	0.7969
After listing (n=570)	0.207 (2.766)***	1.134 (4.137)***	0.0275	0.0001

Panel C: Institutional Holding Sample				
C.1: Based on 25 Portfolios				
Before listing (n=25)	0.287 (4.093)***	0.126 (0.542)	-0.0303	0.5927
After listing (n=25)	0.157 (1.869)*	0.653 (2.226)**	0.1415	0.0361
C.2: Based on Individual Firms				
Before listing (n=199)	0.285 (4.075)***	0.120 (0.515)	-0.0037	0.6074
After listing (n=261)	0.162 (1.550)	0.692 (1.876)*	0.0096	0.0617

$\%DEPS_{it}$ = percentage change in earnings per share (excluding extraordinary items) from period t-1 to period t for firm i.

$CAR_{i,t-1}$ = 12-month cumulative market-adjusted abnormal returns during period t-1 for firm i. Market-adjusted abnormal returns are calculated by subtracting the CRSP equally-weighted market index from the corresponding monthly returns for the particular firm.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

Financial Press Coverage Grant [16] finds that the amount of information publicly available about a firm is positively associated with the number of news releases in the *Wall Street Journal Index* (as a proxy for the degree of financial press coverage). Our analysis reveals that sample firms have more extensive *Wall Street Journal Index* coverage after option listing. The medium number of news announcements before listing is 25.75 versus 29 after listing. This difference is significant at the 1% level with a Wilcoxon test.

To test whether *Wall Street Journal Index* coverage could provide an alternative explanation for the results in Table 2, a financial news subsample (67 firms) is constructed by using the procedure similar to that for the size subsample. The regression results are shown in Panel B of Table 3. Again, the results strongly support the hypothesis that the information content of security prices with respect to accounting earnings is higher after option listing.

Institutional Concentration Prior research (e.g., [20]) suggests institutional ownership as a component of the information environment. Both Jennings and Starks [18] and Ho [17] consider institutional concentration as a control variable in examining the differential price adjustment process between firms with and without exchange-traded options. The option firms in our sample have more institutional investors after option listing (a median of 185 versus 125 institutions). Consequently, an institutional-holding subsample is formed to examine whether the earlier results are sensitive to changes in institutional ownership. The institutional-holding subsample consists of 33 firms for which the number of institutional investors decreases after option listing. Panel C of Table 3 provides the regression results for this subsample. Consistent with the earlier results, the returns from the previous year convey little information regarding the current year's earnings changes for the pre-listing period. In contrast, returns from the previous year are significantly associated with the current year's earnings after option listing.

Results After Including Contemporaneous and Subsequent Returns

Table 4 presents the regressions of percentage change in earnings per share on lagged, contemporaneous, and subsequent market-adjusted returns. Panel A of Table 4 shows the results for the entire sample. For the pre-listing period, the regression coefficient b_1 is negative but insignificant (t-value = -0.609). Both b_2 and b_3 are significantly positive (t-value = 8.165 for b_2 and t-value = 2.405 for b_3). It appears that before the listing of a firm's options, the firm's stock prices from the previous fiscal year convey little information regarding the current year's earnings changes. The majority of the information in annual earnings is revealed in the current fiscal period and in the three months following the fiscal year-end.

Table 4

Results for $\%DEPS_{it} = a + b_1 * CAR_{i,t-1} + b_2 * CAR_{i,t} + b_3 * CAR_{i,t+1} + e_{it}$
(T-Statistics in Parentheses)

	a	b_1	b_2	b_3	Adj R^2	Prob. > F
Panel A: Entire Sample						
Before listing	0.200	-0.045	0.572	0.362	0.0524	0.0001
(n=1222)	(8.371)***	(-0.609)	(8.165)***	(2.405)**		
After listing	0.211	0.475	1.310	-0.423	0.0485	0.0001
(n=1647)	(4.848)***	(3.030)***	(8.371)***	(-1.412)		
Panel B: Size Sample						
Before listing	0.185	0.059	0.409	0.386	0.0473	0.0006
(n=298)	(4.965)***	(0.557)	(3.989)***	(1.590)		
After listing	0.233	0.653	1.480	-0.785	0.0532	0.0001
(n=421)	(2.303)**	(1.961)**	(4.393)***	(-1.231)		
Panel C: Financial News Sample						
Before listing	0.190	-0.027	0.720	0.319	0.0694	0.0001
(n=448)	(4.532)***	(-0.208)	(5.955)***	(1.115)		
After listing	0.254	1.060	1.303	-0.043	0.0641	0.0001
(n=570)	(3.315)***	(3.863)***	(4.921)***	(-0.086)		
Panel D: Institutional Holding Sample						
Before listing	0.299	0.115	0.531	0.262	0.0161	0.1039
(n=199)	(4.037)***	(0.491)	(2.362)**	(0.610)		
After listing	0.266	0.789	1.295	0.520	0.0504	0.0010
(n=261)	(2.404)**	(2.150)**	(3.597)***	(0.761)		

$\%DEPS_{it}$ = percentage change in earnings per share (excluding extraordinary items) from t-1 to t for firm i.

CAR_i = cumulative monthly market-adjusted returns for firm i. For periods t-1 and t the accumulation is over a twelve-month period (January-December). For period t+1, the accumulation is over a three-month period (January-March).

* Significant at the 10% level.
** Significant at the 5% level.
***Significant at the 1% level.

For the post-listing period, the regression coefficient b_1 is positive and significant (t-value = 3.030). This indicates that the market-adjusted returns from the previous fiscal year are a significant variable in explaining the current year's earnings changes even after controlling for the effects of returns in other periods. The regression coefficient b_2 is also significantly positive, which is consistent with prior research. Unlike the pre-listing period, b_3 is negative (but insignificant). These results are consistent with the claim that option trading

enhances the informativeness of security prices with respect to future accounting earnings.

Panels B, C, and D present the results for size, financial news, and institutional holding subsamples, respectively. Consistent with the findings for the entire sample, the results for each subsample indicate that the information content of security prices is significantly higher for the post-listing period.[5]

Sensitivity Analyses

A number of sensitivity analyses are performed to assess the robustness of our results. First, we examine whether the improvement in price informativeness is simply a market-wide phenomenon. To address this possibility, we construct a control sample of nonoption firms. The firms included in the control sample meet the following criteria: (1) they must be included in S&P 500 Index, (2) they are limited to NYSE/AMEX firms without exchange-listed options, and (3) they must be on the COMPUSTAT file to obtain earnings information. Eighty-eight firms meet the above criteria. These nonoption firms are randomly assigned to match the option firms. Each nonoption firm is then assigned a "pseudo" option listing date that is identical to the listing date of the matched option firm. We perform the regression analyses for this control sample to assess whether any observed change in the price informativeness for option firms is driven by market-wide changes.

The results indicate that, under the portfolio approach, the b_1 coefficient before (after) the assigned listing date is 0.193 (0.110) with a t-value of 0.787 (0.331). For the regression analysis using individual firm data, the b_1 coefficient before (after) the listing date is 0.125 (0.111) with a t-value of 0.523 (0.390). These results suggest that nonoption firms' security prices from the previous year convey little information regarding the current year's accounting earnings for both pre- and post-listing periods. Thus, it appears that the observed improvement in price informativeness is characteristic of option firms, not for the market as a whole.

Second, we employ the Bernard [6] approach to address the cross-sectional dependence that may exist in pooled regressions. More specifically, we run 20 cross-sectional OLS regressions using individual firm data, ten for the pre-listing period and ten for the post-listing period. In other words, one regression is run for each year over the pre-listing period [-1, -10] years relative to the option listing year. Similarly, one regression is run for each year over the post-listing period [+1, +10] years relative to the option listing year. For both pre- and post-listing periods, b_1 coefficients are obtained for each of the ten regressions; and the mean and standard deviation are computed. A t-test is then conducted to test for significance.

The analysis based on 20 cross-sectional regressions indicates that, for regression model (1), average b_1 is -0.262 with a t-value of -1.250 for the pre-listing period. For the post-listing period, average b_1 is 0.685 with a t-value of 2.508. Thus, the results confirm those based on pooled regressions.

Finally, we conduct diagnostic tests to examine the extent to which the assumptions underlying ordinary least squares regressions reported in Tables 2-4 are violated. To test for potential heteroskedasticity, we calculate a chi-square statistic suggested by White [22]. The results indicate that the assumption of variance homogeneity cannot be rejected for all regressions.

The assumption of no serial correlation in regression residuals is tested by conducting a Durbin-Watson test. The assumption of independent residuals cannot be rejected for all regressions in Tables 2-4 except for the post-listing regression based on 25 portfolios for the institutional holding sample in Table 3. Given that autocorrelated residuals would lead to a bias toward rejecting the null hypothesis too often, the portfolio results for the institutional holding sample need to be interpreted with caution.

V. CONCLUDING REMARKS

This paper documents differences in the informativeness of security prices with respect to future earnings for periods before and after option listing. In particular, we find: (1) that for the pre-listing period, the security prices of the prior fiscal year convey little information with respect to the current year's earnings changes and (2) that for the post-listing period, the security prices of the prior year are a significant variable in explaining the current year's earnings changes. The evidence is consistent with the notion that option trading improves the information environment.

We also find that our sample firms change along several dimensions after option listing. For example, the sample firms are associated with larger size, higher institutional concentration, and more extensive *Wall Street Journal Index* coverage after option listing. Prior research suggests that these changes are likely to explain the observed results. To examine these alternative explanations, we construct subsamples that conservatively control for those attributes. With a relatively smaller sample size, the evidence indicates that those intervening factors do not underlie our results. In addition, using a control sample of nonoption firms, we find that the observed improvement in price informativeness is unlikely to be driven by market-wide changes.

This paper contributes to the literature in two ways. First, our results provide additional insights into the relation between option trading and the information environment. The evidence documented in this study complements the findings in Jennings and Starks [18], Skinner [21], and Ho [17]. Second, this paper extends the work of Beaver et al. [4] and Collins et al. [10]. We find another information environment characteristic, i.e., option trading, that affects the informativeness of security prices with respect to future accounting earnings.

NOTES

1. In traditional price-earnings studies, the coefficients of the relation is estimated by regressing percentage change in price on percentage change

in earnings. Beaver et al. [4] use the conventional formulation to examine the information content of security prices with respect to accounting earnings. Furthermore, they group the data by the dependent variable (percentage change in price) to diversify away the measurement error in the explanatory variable (percentage change in earnings) and to reduce bias in the estimated coefficients.

Beaver et al. [5] argue that grouping on the dependent variable may induce an upward bias in the estimated slope coefficients. They indicate that grouping according to the dependent variable induces a spurious correlation between the explanatory variable and the disturbance term at the grouped level, which in turn leads to an increase in the estimated slope coefficients. Consequently, they suggest the reverse regression approach to assess the information content of security prices; and they find that grouping on price changes (the explanatory variable in the reverse regression model) does not induce serious biases in slope coefficients.

2. Using market-adjusted returns to calculate abnormal returns can be found in a host of accounting and finance studies (e.g., [1,11]). To assess the robustness of our results, we also employ the market model residuals as our abnormal returns. The market model is estimated using 60 monthly returns before the event period (at least 30 monthly returns must be available). The results are similar to those based on market-adjusted returns.

3. As discussed in Section III (SAMPLE AND DATA), the sample firms are limited to December 31 fiscal-year-end firms. Consequently, a twelve-month fiscal period begins in January and ends in December. For the post fiscal-year-end period, returns are accumulated over three months (January-March). The three-month interval is selected because annual earnings reports are most likely to be released within three months after the fiscal year ends. In addition, this interval is widely used in the literature (e.g., [1]). Finally, such selection enhances comparisons with Collins et al. [10], which document that the price adjustment during the three months after the fiscal year end is different for large firms than for small firms.

4. The regression results in Tables 2-4 are obtained after deleting firm-year observations with |%DEPS| (absolute value of percentage change in EPS) > 20. These observations are considered to be outliers. The results prior to this deletion are slightly less significant but qualitatively similar to those reported in Tables 2-4. To examine the extent to which outliers may affect the results, we deleted all observations with |%DEPS| greater than 15 and then all greater than 10 in turn. The overall results are not materially affected after these deletions.

5. The Chow test (see Chow [9]) is also conducted to examine equality of b coefficients for the pre- and post-listing regressions in Tables 2-4. For all regressions in Tables 2 and 3, b_1 coefficients in the pre-listing regressions are significantly different from those in the post-listing regressions at the 5% level. This confirms our results in Tables 2 and 3, indicating that security prices from the previous fiscal period play a different role in explaining the earnings changes in the current fiscal period after option listing. For the multiple regression analyses in Table 4, the Chow test also shows that the set of b coefficients on the pre- and post-listing regressions differs significantly at the 5% level except for the institutional holding subsample.

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