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SEASONALITIES IN SECURITY RETURNS: THE CASE OF EARNINGS ANNOUNCEMENTS*

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ABSTRACT

An examination of the behavior of stock returns around quarterly earnings announcement dates finds a seasonal pattern: small firms show large positive abnormal returns and a sizable increase in the variability of returns around these dates. Only part of the large abnormal returns can be accounted for by the fact that firms with good news tend to announce early. Large firms show no abnormal returns around announcement dates and a much smaller increase in variability.

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1. Introduction

The pattern of returns over time from holding a security depends on the resolution over time of uncertainty. Robicheck and Myers (1966) provide a classic illustration of this relationship. In their example, a ship sets out on a two-year voyage in search of gold. No information reaches the market while the ship is away, so during that time, the expected rate of return on financial claims to the payoff of the voyage is free of risk. However, the uncertainty is resolved once the ship returns with its cargo. Therefore, if the risk is not diversifiable, the expected return will be higher on that day, the day the market receives information about the claims' likely payoff. Epstein and Turnbull (1980) formally model this relationship between uncertainty and security prices and confirm the assertions of Robicheck and Myers. The purpose of this paper is to examine the empirical magnitude of the effect of the resolution of uncertainty on rates of return in the U.S. stock market.

We focus on the information contained in the quarterly earnings reports of firms. The volatility of stock returns is known to increase on dates around earnings announcements. [See, for example, Beaver (1968), May (1971), Patell and Wolfson (1982), Christie (1983), and Foster (1986).] This suggests that such announcements contain information. Earlier studies have examined how stock returns are affected by the nature of that information (good vs. bad news). Foster, Ohlsen, and Shevlin (1984), for example, use a forecasting model to generate earnings forecasts and show that unexpected earnings are positively associated with abnormal returns. Although the effect that this seasonal temporal resolution of uncertainty may have on expected returns, regardless of the nature of the news, has not received as much attention, there is some evidence that average returns around earnings announcement dates are relatively large. As early as in 1968, Beaver found that for 143 firms during 1961-65 the average risk premium in the annual earnings announcement week was about four times the average rate of return in other weeks.[1/] If, indeed, the expected risk premium is relatively large around earnings announcement dates, then even large, well-diversified portfolios are likely to display seasonal patterns in returns, since earnings announcements are clustered in calendar time. That is, portfolio returns generally are likely to behave differently during the four calendar months in which most earnings announcements are made. This may have important implications for the validity of the statistical tests commonly used to empirically examine asset pricing models.

Here we examine the average excess return around quarterly earnings announcement dates for 2,527 firms during the nine years from 1976 to 1984. To avoid survivorship bias, we restrict attention to firms in Standard & Poor's 1975 Compustat tape. We find that only the stocks of relatively small firms show large, positive abnormal returns around earnings announcement dates. For the smallest 10 percent of the firms, 16 percent of the average annual return occurs on eight days in a year, days corresponding to a two-day window surrounding each quarterly earnings announcement date. Our results complement those of Eades, Hess, and Kim

(1984) and Kalay and Loewenstein (1985), who examine returns around dividend announcement dates.

We also find that the variability of returns around earnings announcement dates is significantly different for small and large firms. For all firms the variance increases around these dates, but the increase is greatest for the smallest firms. These observations are consistent with the findings of Grant (1980), Atiase (1985), and Foster (1986).[2/]

A plausible hypothesis for the observed return differences between small and large firms is that the earnings announcements for large firms contain less information. Large firms are usually in mature industries where the factors affecting demand and costs are well known and understood. Perhaps also--though less likely--large firms are followed more closely in the market and have more sources from which information may leak into the market. The hypothesis that information is made available more continuously for large firms is made more plausible by our results. Note, however, that we do not test it.

2. Methodology

2.1. The data

Again, to avoid the survivorship bias introduced by ex post selection of the firms to be studied, we pick the firms based only on information known as of December 1975, before our 1976-84 study period. Our original sample was the 2,576 firms that were on the 1975 Compustat tape. Of these firms, (a) 827 firms ceased to exist for various reasons, (b) 1,393 firms could be identified among the firms in the 1984 Compustat tape, and (c) 356 firms could not be immediately identified. We examined changes in names and CUSIP numbers and identified 307 of the 356 firms in category (c). For these 307 firms and the 827 firms in category (a), we obtained the quarterly earnings announcement dates from Standard & Poor's Compustat Services, Inc. For firms in category (b), the earnings announcement dates were taken from the 1984 Compustat tape. We could not determine what happened to 49 of the original 2,576 firms. We have a total of 62,515 valid quarterly earnings announcements for the 2,527 firms we include in the study. We use daily return data from the Center for Research in Security Prices at the University of Chicago (the CRSP tape) for the period from 1976 to 1984. Our sample consists of 56,147 announcements for which both price data and complete return data for the event and the test period are available on the CRSP tape.

2.2. Excess return measures

We start with the null hypothesis that expected returns do not vary over time. To test whether the expected returns are higher around quarterly earnings announcement dates, we examine the OLS market (OLSM) model[3] excess returns on days around quarterly earnings announcement dates, using the event study methodology.

We assume that nominal returns are generated according to this process:

$$r_{jt} = \alpha_j + \beta_j r_{mt} + \varepsilon_{jt} \tag{1}$$

where r_{jt} denotes the continuously compounded rate of return on security j on day t, r_{mt} denotes the continuously compounded rate of return on the market index portfolio, and ε_{jt} denotes the unexpected return on security j. The variance of ε_{jt} is σ^2_{jt}. The use of continuously compounded rather than simple rates of return minimizes any bias that may arise due to an increase in the bid-ask spread around earnings announcement dates [Glosten (1985), Marsh and Rosenfeld (1986)].

For notational simplicity, we assign a unique label $i = 1, \ldots, n$ to each quarterly earnings announcement period of each firm, where n is the total number of earnings announcements by all firms during the sample period. Each earnings announcement period runs from day -64 to day +8; day 0 is the announcement date. For example, r_{1t} could refer to the date t return on firm XYZ's shares, where t is in the interval from -64 to +8 surrounding the 1976 first quarter earnings announcement date, and r_{2t} to the return on the same firm's shares in the same interval but surrounding that year's second quarter earnings announcement date. We obtain the estimates $\hat{\alpha}$ and $\hat{\beta}$ for each i (each announcement date for each firm) using the time series of realized r_t and r_{mt} for $t = -64, \ldots, -9$. We use the procedures described by Scholes and Willams (1977) to correct for nonsynchronous trading while estimating the α's and β's. We estimate the standard deviation σ_i of ε_i during the estimation period by s_i, the sample standard deviation of the OLS residuals $\hat{\varepsilon}_{it}$.

For each announcement date i, at any point in time, we form the standardized measure of <u>abnormal return</u> A_{it}:

$$A_{it} = \{\hat{r}_{it} - \hat{\alpha}_i - \hat{\beta}_i r_{mt}\} \frac{i}{s_i c_t} \tag{2}$$

where

$$c_t^2 = 1 + \frac{1}{56} + \frac{(r_{mt}-\bar{r}_m)}{\sum_{s=-64}^{-9}(r_{ms}-\bar{r}_m)^2}$$

and $\bar{r}_m$ denotes the average return on the market index portfolio during the estimation period [Patell (1976)]. We then form an equally weighted portfolio of the individual standardized excess returns. The <u>average excess return</u> from all the n announcement dates on event date t, then, is

$$\bar{A}_t = \frac{1}{n} \sum_{i=1}^{n} A_{it}. \tag{3}$$

When certain regularity conditions are satisfied, which is likely here, $\bar{A}_t$ has an asymptotic normal distribution with zero mean and variance σ_t^2. Under the assumption that the variance σ_t^2 of $\bar{A}_t$ is the same for all the event dates (ignoring the correlation between the $\bar{A}_t$'s), we can estimate σ^2 by s^2:

$$s^2 = \frac{1}{16} \sum_{t=-8}^{8} (\bar{A}_t - \bar{A})^2 \tag{4}$$

where $\bar{A}$ is the average of the $\bar{A}_t$'s during the 17-day test period (t = -8, ..., +8). In eq. (4), the sample variance s^2 is computed using the $\bar{A}_t$'s during the event period (from day -8 to day +8) rather than during the estimation period, to allow for a possible increase in the variance during the event period. Under the null hypothesis, the test statistic $\bar{A}_t/s$ has an approximate asymptotic t-distribution[4/] with 16 degrees of freedom, as the number of announcements n becomes large.

2.3. Corrections to account for the increased volatility of stock prices around earnings announcement dates

The test based on the variance estimator s^2 of eq. (4), however, is likely to accept the null hypothesis (that expected returns do not vary over time) too often when the null is false and reject it too often when it is indeed true. The variance of the daily return is known to increase substantially during day -1 and day 0 [Patell and Wolfson (1982)]. Hence, s^2 is likely to underestimate the true variance of the daily excess returns during these days, and we are likely to reject the null even when it is true. At the same time, s^2 will overestimate the true variance if n is large and if a substantial risk premium is realized on days -1 and 0. To see why, notice that as $n \to \infty$, the variance of the $\bar{A}_t$'s will approach zero whereas the sample variance of the $\bar{A}_t$'s will be finite since the $\bar{A}_t$'s will be close to zero except on days -1 and 0. Hence, the sample variance of the $\bar{A}_t$'s can be large compared to the true variance of $\bar{A}_t$ for any t. Therefore, besides the s^2 of eq. (4), our inference procedure also includes an alternative estimator for σ_t^2 based on cross-sectional data.

The alternate estimator for the variance σ_t^2 of $\bar{A}_t$ is based on the sample cross-sectional variance of the A_{it}'s on date t. This is a consistent estimator of σ_t^2 if the events are not clustered in calendar time. Our sample, however, has substantial clustering. At least 5 announcements occurred on two-thirds of the announcement dates and at least 45 on half the announcement dates. Since stock returns are positively correlated, we are likely to underestimate σ_t^2 if we ignore the effects of clustering. We therefore pick one firm at random from each trading day which had at least one announcement. The number of earnings announcements in this random sample (N) will be substantially less than the total number of earnings announcements (n). We compute the excess return for the N randomly selected events, as described in sections 2.1 and 2.2. We compute the average excess return on an event date t as before, except that we now average over $N < n$ announcements. We estimate σ_t^2 by s_{ct}^2:

$$s_{ct}^2 = \frac{1}{N^2} \sum_{i=1}^{N} (A_{it} - \bar{A}_t)^2. \tag{5}$$

Under the null hypothesis that the excess returns do not behave differently on announcement dates than on other days, the test statistic $\bar{A}_t/s_{ct}$ has an asymptotic normal distribution.

2.4. Three-day cumulative excess returns

Besides the OLSM model excess returns, we also examine the three-day cumulative average returns. Let $C\bar{A}_i = \bar{A}_{i2} + \bar{A}_{i1} + \bar{A}_{i0}$ and $C\bar{A}$ denote the average value of the $C\bar{A}_i$'s. While computing the standard error of $C\bar{A}$, we must take into account possible cross-sectional correlation among the OLSM model excess returns of different firms. Since we sample one announcement per calendar day, the three-day cumulative excess return corresponding to an announcement made on any trading day is likely to be correlated with those returns corresponding to the announcements made on the two preceding and the two following trading days. We take this into account in computing the standard error of $C\bar{A}$. Hansen (1982) has shown that under suitable regularity conditions, which are likely to be satisfied in our case,

$$\text{var }(C\bar{A}) = \frac{1}{N} \sum_{k=-2}^{2} \text{cov }(C\bar{A}_i, C\bar{A}_{i+k}). \qquad (6)$$

We estimate var $(C\bar{A})$ by its sample analogue.

The inclusion of day -1 in our study is motivated by the findings of Patell and Wolfson (1982) that earnings announcements are often made during the trading period on day -1. Patell and Wolfson also find some evidence that good news is released during trading hours on day -1 while bad news is released at the end of that day.

Inclusion of day -2 is motivated in part by the results of Diamond and Verrecchia (1985). Their model contains four features: constraints on short sales, differentially informed traders, trading through competitive market makers, and CRSP tape reports of the last traded price as the closing price for the day in the event of a "no trade." Consider a situation where some traders receive private information about the value of the firm. If the information is favorable, the informed traders will bid up the stock price. But if the information is unfavorable, with short sale constraints, informed traders may not be able to trade. If no uninformed traders enter the market, then the reported price on the CRSP tape will in general be higher than the price at which trades could be made. Consequently, reported returns will on average be biased upward. Suppose now that this private information is made public the next day. The reported prices will then reflect the public information. Hence reported returns on the day the information is made public will in general be biased downward. Of course, reported returns for the period from the day before the receipt of the private information to the day of the public announcement will be unbiased. These considerations suggest that we examine cumulative returns starting from days before day -1. The tradeoff is that by cumulating returns from many days before that our tests lose power. We thus choose an arbitrary cutoff at day -2.

2.5. Testing for increased variance

Under the null hypothesis that the same OLSM model holds in both the estimation period and the test period and the assumption that this model's residuals are normally distributed, each A_{it} has a t-distribution with 54 degrees of freedom. Hence, $(54/52)A_{it}^2$ has an expected value of one. Assuming that the A_{it}^2's are independent across the i's for each event day, we can test the null hypothesis that the variance of the OLSM model residuals does not increase, using procedures described in section 2.3.

3. Empirical findings

3.1. Returns and excess returns for the total sample

For each of the years from 1976 to 1984, firms listed on the New York Stock Exchange (NYSE) and the American Stock Exchange (AMEX) are grouped into ten size classes based on the market value of the common shares at the end of June of the previous year, with each size class containing 10 percent of the firms. We choose June instead of December price data to classify firms by size because part of the estimation period for first quarter announcements will use return data from November and December of the previous year.

Table 1 summarizes the return data for all firms and for the ten size classes. For firms in the smallest decile, the average daily return from day -2 to day 0 is 3.37 times as large as the average daily return during the study period; for firms in the second-smallest decile, this ratio is 2.76. For no other size decile is the ratio so large--which indicates that small firms have a higher rate of return around earnings announcement dates than do large firms.

Table 2 presents the average (mean) OLSM model excess returns around the 56,147 announcement dates in the sample. The reported t-statistics are computed using the standard deviation of the average excess returns during the event period as described in section 2.2. Notice that the average excess return for the sample of all firms is positive on all the event days. It is significant at the 5 percent level for day -2 and at the 1 percent level for day -1.

3.2. Excess returns around randomly selected quarterly earnings announcement dates

However, these excess return results should be interpreted with caution for the reasons discussed in section 2.3. To confirm that the results are indeed true, we randomly select one announcement for each calendar day, as described in section 2.3. This sampling is done independently for each size decile and for the sample of all firms. To take into account the increased variability of returns around earnings announcement dates, we use the cross-sectional variance of the excess returns in calculating the t-statistics, as described in section 2.3.

Table 3 presents the mean daily return and the mean daily excess return for firms in the top and the bottom size deciles around randomly selected quarterly announcement dates. As is clear in Table 3, mean excess returns are significantly different for the smallest and the largest firms. For the smallest firms, the OLSM model excess returns are significant and positive only on days -1 and -2, while for the largest firms, this is true only on day +4. Also, notice that for the small firms the t-statistics computed using the sample variance of the average excess returns during the 17 event days are substantially lower than those computed using the cross-sectional variance of the excess returns. However, the two t-statistics are not very different for the large firms. This is another indication that for the smallest firms significant risk premia are realized around earnings announcement dates, whereas for the largest firms the expected values of daily returns do not vary noticably.

These observations are reinforced by Table 4. The excess returns are positive and significant on day -1 for all firms[5/] and for firms in the first, second, third, fourth, sixth, and seventh size deciles. The excess returns are not significant on this day for firms in the top three deciles or the fifth decile. On day -2, the excess returns are positive and significant only for the smallest and the fifth size deciles. Excess returns are significant on day 0 only for the second size decile. The three-day cumulative excess returns are significantly positive for firms in all the size deciles except the top two and the seventh. The fact that good news tends to be released on day -1 and bad news on day 0 can partially account for the significantly positive excess returns on day -1. However, the fact that the three-day cumulative excess returns exhibit patterns similar to those of the day -1 excess returns indicates that the timing of the announcements between day -1 and day 0 cannot completely explain our results.

3.3. Bias due to the association between the timing of the announcement and the nature of the news

Still, our results may partly be due to the fact that earnings announcements which contain good news are usually made before their expected announcement date while bad news usually comes late [Penman (1984)]. A simple example illustrates this problem. Suppose that there are only two possible earnings announcement dates. Good news is always announced on the earlier date and bad news on the later. Then any firm which does not announce on the earlier date will suffer an immediate decline in its stock price and no change in that price on the actual date of announcement. Consequently, the measured average return over all firms on the earnings announcement dates will be biased upward.

To try to identify this bias in our results, we classify earnings announcements into three categories: early, on time, and late. We use the actual earnings announcement date for the corresponding quarter of the previous year as the expected date. Firms are classified as <u>on time</u> if their actual announcement date is within a window of four days on either side of the expected date. For firms that announce on time, the three-day cumulative excess returns are positive and significant in the five smallest deciles and the seventh decile. These results are consistent with our earlier findings. For firms that announce <u>late</u>, cumulative excess returns are positive in the lowest and the eighth size deciles and negative in the other categories. However, these returns are not significantly positive for late firms in any of the size deciles. For firms that announce <u>early</u>, the three-day cumulative excess returns are significantly positive for all except the fifth, seventh, eighth, and ninth size deciles.

We try to correct for the bias introduced by the correlation between the timing of the earnings announcements and the nature of the news. For firms that announce late, we calculate the cumulative excess returns from two days before the expected date to three days before the actual date and denote this sum by u_j. For each late announcement j, we compute the <u>adjusted three-day cumulative return</u> $\overline{ACA}_j$ by

$$\overline{ACA}_j = \overline{CA}_j + u_j. \tag{7}$$

For early and on-time announcements, the adjusted cumulative excess return is the same as the three-day cumulative excess return.

The average adjusted three-day cumulative excess return reported in Table 5 is the average of the three adjusted cumulative excess returns for the early, on-time, and late firms. The variance of $\overline{ACA}$, the average adjusted cumulative excess return, is computed assuming that the u_j's are independent across the j's.[6/] Notice that this adjustment reduces the three-day cumulative excess return for the smallest firms, reported in Table 4.

The reduction is 7 percent for these firms, but 51 percent for all firms and 209 percent for the largest firms. The adjusted three-day cumulative return is significant for firms in all but the fifth and seventh through tenth size deciles. This suggests that the positive excess returns around earnings announcement dates, especially for the smallest firms, are unlikely to be due to the bias introduced by firms with bad news systematically announcing late.

3.4. Bias in the random sampling rule toward selecting early and late announcements

Returning to Table 4, notice that for all firms in our random sample the average excess return (times 100) on day -2 is -4.392 (t = -1.76), whereas the average day -2 return is negative only for firms in the fourth and ninth size deciles. In fact, according to Table 2, for the full sample the average day -2 excess return (times 100) is 2.914, which is significant at the 5 percent level. This suggests that our random sample of one announcement per trading day is unlikely to be representative of the population.

A closer look at our selection rule suggests that, too. Again, we randomly select one announcement for each trading day. But early and late announcements are rare, so they are likely to be less clustered in calendar time than on-time announcements. Hence, our random sample is likely to contain a larger percentage of early and late announcements than the population. If the sample contains more early announcements, then the average excess returns we find are likely to be biased upward; if more late, biased downward. Thus our attention is best restricted to the on-time announcements, since the random sample is more likely to be representative of the population for them.

Recall from Table 5 that for on-time announcements the three-day cumulative excess returns are significantly positive for firms in the first five size deciles and the seventh as well. Significant results for smaller firms thus seem unlikely to be due to bias introduced by the random sampling procedure.

3.5. Controlling for the January return anomaly

There is substantial evidence that returns for small firms are highest in January, so our results might be driven by this anomaly. To examine that possibility, we remove January announcements from our random sample and repeat the calculations done earlier. Table 6 presents the results: for announcements in months other than January, the average three-day cumulative excess returns for early, on-time, and late firms and their adjusted cumulative excess returns, by firm size. The adjusted return is still significantly positive at the 5 percent level, at least, for firms in the six smallest deciles and the eighth decile. This suggests that the increased excess returns around earnings announcement dates are not likely due to the January anomaly.

3.6. Testing for increased variance

Table 7 contains the average of the squared standardized OLSM model excess returns (multiplied by a factor of 54/52) during days -3 through +3. As can be seen from the table, the volatility of excess returns increases significantly on days close to earnings announcement dates. This is consistent with other studies which document increased volatility of returns around earnings announcement dates. For our sample of all firms, the variance of the excess returns increases 119 percent. This effect is particularly pronounced for firms in the smallest size decile, where the variance increases 142 percent. For firms in the largest size decile, the variance increases somewhat less, 60 percent. Table 8 presents data on the average squared standardized residuals for each day in a 17-day window around (and including) day 0 for all firms and for firms in the top and bottom size deciles. Most of the variance increase occurs on days -1 and 0--a fact that supports our arguments for the random sampling procedure and the use of cross-sectional data to estimate the variance of the excess returns around earnings announcement dates.

To the extent that, on average, early announcements contain good news and late announcements bad news, part of the bad news would likely be anticipated. Late announcements might therefore contain less information than early announcements. Table 9 presents the average squared standardized OLSM model excess returns for days -1 and 0 for early, on-time, and late announcing firms in the different size deciles. These data suggest that the increase in the variance of the daily returns for late announcements is not less than that for early announcements.

3.7. Bias in the statistical test for increased variance

In testing for increased variance of the OLSM model residual, we examined the squared standardized residual, $U_{it} = A_{it}^2$, which has an F-distribution with 1 and 54 degrees of freedom. Under the null hypothesis of no increase in the variance during the test period, $E[U_{it}(54/52)] = E(u_{it}) = 1$. We tested the null hypothesis by examining whether $\bar{u}_t$, the average of the u_{it}'s, is different from unity. Under the null, the test statistic $z_t = (\bar{u}_t - 1)/s_{ut}$ has an asymptotic standard normal distribution, where s_{ut} is the sample standard deviation of the u_{it}'s divided by $N^{1/2}$, where N is the number of announcements i on date t. Note that, unlike most studies of the squared standardized residuals [Patell (1976)], we use the estimated standard deviation of $\bar{u}_t$ rather than the standard deviation of $\bar{u}_t$ under the null hypothesis. When stock return distributions are indeed normal and the null hypothesis is true, the standard deviation of the u_{it}'s is 1.46. Our sample standard deviation of the u_{it}'s is 3.83 for firms in the smallest size decile and 2.70 for firms in the largest, even on day 8; on day 0 it is 8.45 for the smallest firms and 4.27 for the largest. These results suggest that using the theoretical standard deviation of the u_{it}'s under the null to compute the standard deviation of $\bar{u}_t$ is likely to lead to rejecting the null too often, even when the null is true.

Our test is valid as long as $E(u_{it}) = 1$ and var (u_{it}) is finite. The reasonableness of $E(u_{it}) = 1$ here deserves scrutiny, because it assumes normality, and the distribution of daily stock returns may not be Gaussian.

Marais (1984) has examined the distribution of u_{it} using simulation methods; he suggests that even when the u_{it}'s are not drawn from a normal distribution, $E(u_{it})$ may not be different from unity. Marais' evidence, however, is not sufficient to conclude that $E(u_{it}) = 1$, since the distribution of daily stock returns may differ in important ways from the generalized lambda distribution he considers.[7/] An alternative test, that does not depend on the assumption that $E(u_{it}) = 1$, is to check whether the average of the squared standardized residuals during the window days -2, -1, and 0 is significantly different from the average of the residuals during the later days 6, 7, and 8. Such a test is valid even when $E(u_{it})$ is different from unity and is biased in favor of accepting the null hypothesis of no increased variance during days -2, -1, and 0.

For all firms, the average squared standardized residuals is 2.1855 during the window days and 1.1426 during the later days. The difference, 1.0429 ($t = 3.66$), is significantly different from zero at the 1 percent level. For firms in the smallest size decile, the average of the squared standardized residuals is 2.4247 during the window days and 1.1530 during the later days. This difference, 1.2717 ($t = 4.22$), is also significantly different from zero at the 1 percent level. Finally, for firms in the largest size decile, the average of the squared standardized residuals is 1.5954 during the window days and 1.1654 during the later days. The difference here, 0.43 ($t = 3.86$), although much smaller than that for the smallest firms, is still significantly different from zero at the 1 percent level. The difference in the average squared standardized residuals between firms in the largest and the smallest size deciles is also significantly different from zero at conventional significance levels. We therefore conclude that the increased variance of the daily returns around earnings announcement dates that we find in our study cannot be due to biases in the statistical tests we use.

4. Conclusions

In this empirical investigation, we have established that stock returns have distinct seasonal patterns. Returns for small firms display a sizable earnings announcement effect. Their returns are substantially higher than average on the two days before quarterly earnings announcements and substantially lower than average on the actual day of the announcement. In fact, for the smallest 10 percent of firms, approximately 16 percent of the annual return occurs on the two days before quarterly earnings announcements (eight calendar days in a year). There is no such effect for firms in the largest eight size deciles. The three-day cumulative excess returns from day -2 to day 0 are positive and significant for firms in the lowest four size deciles and the sixth decile. They are not significantly different from zero for firms in the largest two size deciles in any of our tests. In computing average excess returns, an important correction must be made to take account of the fact that firms with good news tend to announce earlier than expected and firms with bad news tend to announce late. During days -2, -1, and 0, the variance of daily stock returns increases by an average factor of 2.4 for the smallest firms and 1.6 for the largest.

We find significant differences in the seasonal pattern of returns of small and large firms. The differences occur in both the average and the variance of returns. Small firms display a sizable earnings announcement effect whereas large firms do not. This suggests that the discreteness in the temporal resolution of uncertainty is more important for small firms than for large. The fact that the returns behave substantially differently on some days than on others has implications for the small-sample distribution on the test statistics used in tests of asset pricing models.

Notes

[1]Penman (1986), who examined the returns for 2,205 firms from 1971 to 1982, also finds a positive mean abnormal return (of 0.11 percent) on the earnings announcement date.

[2]See Foster (1986, pp. 374-420) for a comprehensive discussion of these issues and an excellent survey of the literature.

[3]Brown and Warner (1985) compare the power of the mean adjusted model, the market adjusted model, and the OLS market adjusted model. They find that the OLS model outperforms the other two when events and dates cluster in calendar time, as in our study.

[4]The t-distribution is only an approximation because $\bar{A}_t$ is not independent of s^2.

[5]A note of caution is needed when interpreting Table 4's results for all firms. Since more small firms than others have fiscal years that do not coincide with the calendar year, our random sample (of all firms) will have more small firms than the population.

[6]We estimate the variance of $\overline{ACA}$ by

$$S^2_{CA_1} = \frac{1}{N}\left[\frac{1}{N}\sum_{j=1}^{N}(\overline{CA}_j-\overline{CA})^2\right] + \frac{N_L}{N^2}\left[\frac{1}{N_L}\sum_{i=1}^{N_L}(u_i-\bar{u})^2\right]$$

where N_L is the number of late announcements and

$$\bar{u} = \frac{1}{N_L}\sum_{i=1}^{N_L}u_i.$$

This estimator will have better properties in finite samples than

$$S^2_{CA_2} = \frac{1}{N}\left[\frac{1}{N} \sum_{j=1}^{N} (\overline{ACA}_j - \overline{ACA})^2\right].$$

For example, for firms in the lowest decile, the value of the t-statistic for the adjusted three-day cumulative return reported in Table 5 increases 23 percent, from 3.93 to 4.82, if $S^2_{CA_2}$ is used instead of $S^2_{CA_1}$.

[7/] Although Marais examines the bootstrap distribution of the u_{it}'s, he does not report the average values for the u_{it}'s for the bootstrap experiments.

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Table 1

Average daily returns for the full sample during the full study period and around earnings announcement dates, by firm size[a/]

Size decile[b/]	Number of announcements	% Average daily return: During 1976-84	On day[c/]: -2	-1	0	Ratio of 3-day average to 9-year average
1	4,012	0.0963	0.300	0.600	0.074	3.37
2	4,662	0.0744	0.157	0.372	0.087	2.76
3	4,779	0.0760	0.048	0.192	0.057	1.30
4	4,894	0.0736	0.048	0.120	-0.014	0.70
5	5,479	0.0658	0.078	0.116	0.032	1.15
6	5,768	0.0639	0.066	0.029	-0.016	0.41
7	5,844	0.0555	0.001	0.009	-0.031	-0.13
8	6,518	0.0488	-0.005	-0.022	0.030	0.01
9	6,742	0.0413	-0.026	-0.046	-0.037	-0.88
10	7,308	0.0302	-0.036	-0.079	-0.005	-1.32
All	56,147	0.0575	0.049	0.077	0.013	0.92

[a/]These are mean returns on an equally weighted portfolio of stocks for firms in Standard & Poor's 1975 Compustat list. The study period is 1976-84.

[b/]Firm size is based on the market value of all securities traded on the NYSE and the AMEX in June of the preceding year. Group 1 is the lowest 10%; group 10, the highest.

[c/]Day 0 is the date of the quarterly earnings announcement.

Table 2

Average daily returns and excess returns for the full sample during the full study period, by event day[a]

Event day[b]	% Return		OLSM model excess return	
	Average	t(16)[c]	Average	t(16)[c]
-8	0.063	3.08**	0.800	0.78
-7	0.047	2.30*	1.285	1.26
-6	0.026	1.28	0.309	0.30
-5	0.044	2.17*	0.765	0.75
-4	0.048	2.38*	0.819	0.80
-3	0.037	1.83	1.353	1.32
-2	0.049	2.39*	2.914	2.85*
-1	0.097	4.76**	4.792	4.68**
0	0.013	0.66	1.150	1.12
1	0.036	1.77	1.243	1.22
2	0.036	1.79	1.925	1.88
3	0.040	1.96	1.823	1.78
4	0.046	2.25	1.360	1.33
5	0.085	4.17**	1.845	1.80
6	0.062	3.05**	1.429	1.40
7	0.046	2.25*	0.911	0.89
8	0.066	3.27**	1.440	1.41

[a] These are mean returns on an equally weighted portfolio of stocks around 56,147 quarterly earnings announcements made in 1976-84. The excess returns have been multiplied by 100.

[b] Day 0 is the date of the quarterly earnings announcement.

[c] The t-statistics are computed using the variance of the average excess return in the 17-day event period. Significance at the 5% and 1% levels is denoted by * and **, respectively.

Table 3

Average daily returns and excess returns for the smallest and largest firms in a random sample, by event day[a]

	Smallest firms (Bottom size decile; N = 1,373)				Largest firms (Top size decile; N = 1,469)			
		OLSM model excess return				OLSM model excess return		
Event day[b]	Average return	Average	t(16)[c]	t_c[c]	Average return	Average	t(16)[c]	t_c[c]
-8	0.157	5.527	0.91	1.94	0.032	-1.654	-0.56	-0.62
-7	0.212	4.918	0.81	1.71	0.042	1.266	0.43	0.45
-6	0.088	1.695	0.28	0.60	0.076	3.548	1.20	1.25
-5	0.069	3.649	0.60	1.12	0.059	3.125	1.06	1.12
-4	0.101	4.330	0.71	1.43	0.059	2.256	0.77	0.81
-3	0.118	4.487	0.74	1.53	-0.022	-4.797	-1.63	-1.72
-2	0.438	11.357	1.87	3.61**	0.062	4.912	1.65	1.67
-1	0.669	18.816	3.09**	4.19**	-0.057	-0.851	-0.29	-0.24
0	0.156	8.245	1.35	1.73	-0.033	-0.050	-0.02	-0.01
1	0.188	4.493	0.74	1.20	-0.055	1.009	0.34	0.32
2	0.067	1.602	0.26	0.48	0.121	5.137	1.74	1.71
3	-0.032	-0.923	-0.15	-0.30	0.055	4.226	1.43	1.46
4	-0.234	-6.435	-1.01	-2.21*	0.095	7.997	2.71*	2.87*
5	0.081	-0.172	-0.03	-0.06	0.039	1.875	0.64	0.67
6	0.028	-2.161	-0.35	-0.75	0.027	0.840	0.29	0.29
7	-0.157	-5.171	-0.85	-1.85	0.040	2.923	0.93	1.03
8	0.003	-1.220	-0.20	-0.40	0.042	2.670	0.91	0.96

[a] These are mean returns (multiplied by 100) on an equally weighted portfolio of stocks around N quarterly earnings announcement dates, when one announcement is chosen randomly per trading day in the study period 1976-84.

[b] Day 0 is the date of the quarterly earnings announcement.

[c] t(16) refers to the t-statistics based on the variance of the average excess returns in the 17 event days; t_c, to those using cross-sectional data. Significance at the 5% and 1% levels is denoted by * and **, respectively.

Table 4

Average daily excess returns for the random sample during days around earnings announcement dates, by firm size[a]

Size decile[b]	Number of announce-ments (N)	OLSM model excess return: Day -2 Average	Day -2 t[d]	Day -1 Average	Day -1 t[d]	Day 0[c] Average	Day 0[c] t[d]	Cumulative from day -2 to day 0 Average	Cumulative t[d]
1	1,373	11.357	3.61**	18.816	4.19**	8.245	1.73	38.419	5.29** [5.07]
2	1,525	5.768	1.89	11.546	2.94**	11.173	3.00**	28.487	4.58** [4.52]
3	1,627	2.942	1.02	14.151	3.19**	4.617	1.23	21.170	3.35** [3.23]
4	1,679	-0.876	-0.31	13.257	3.60**	1.342	0.38	13.723	2.34* [2.28]
5	1,728	8.657	3.03**	7.225	1.88	5.551	1.62	21.433	3.64** [3.47]
6	1,701	4.063	1.35	9.735	2.90**	1.163	0.35	14.960	2.68** [2.53]
7	1,639	2.155	0.74	9.280	2.70**	-2.585	-0.70	8.850	1.52 [1.45]
8	1,656	5.023	1.87	4.651	1.50	0.962	0.30	10.638	2.05* [2.10]
9	1,574	-0.700	-0.26	-0.906	-0.27	-1.712	-0.53	-3.318	-0.61 [-0.58]
10	1,469	4.912	1.67	-0.851	-0.24	-0.050	-0.01	4.011	0.70 [0.71]
All	2,040	-4.392	-1.76	12.538	3.41**	1.663	0.47	9.809	1.73 [1.59]

[a] These are mean OLSM model excess returns (multiplied by 100) on an equally weighted portfolio of stocks around N quarterly earnings announcement dates when one announcement is chosen randomly per trading day in the study period 1976-84.

[b] Group 1 is the smallest 10%; group 10, the largest.

[c] Day 0 is the date of the quarterly earnings announcement.

[d] The t-statistics are computed using cross-sectional data. The numbers in brackets are also t-statistics, but are computed using Hansen's (1982) method, which allows for contemporaneous correlation between any two market model residuals. Significance at the 5% and 1% levels is denoted by * and **, respectively.

Table 5

Excess returns around earnings announcement dates for the full sample, by timing of announcement and firm size and adjusted for the nature of the news[a]

Size decile[b]	Cumulative mean OLSM model excess return from day -2 to day 0: Early		On time		Late		Adjusted cumulative excess return	
	Average	t[c]	Average	t[c]	Average	t[c]	Average	t[c]
1	70.573	3.68**	31.897	3.39**	24.450	1.54	35.912	3.93**
2	39.082	2.70**	33.834	4.07**	-25.550	-1.52	22.268	2.92**
3	56.031	3.05**	23.566	2.78**	-34.770	-2.17*	16.395	1.96*
4	42.346	2.75**	16.512	2.22*	-15.778	-0.96	20.376	2.34*
5	33.079	1.96	25.549	3.40**	-5.606	-0.34	13.295	1.80
6	47.702	2.77**	10.169	1.47	-8.084	-0.52	23.503	2.90**
7	30.470	1.48	13.948	2.02*	-18.181	-0.92	12.352	1.69
8	35.590	1.68	6.086	1.01	2.126	0.12	10.255	1.73
9	-22.312	-1.04	-2.643	-0.41	-1.776	-0.10	-2.405	-0.35
10	88.905	3.48**	-2.780	-0.42	-16.175	-0.76	-4.392	0.46
All	40.613	2.70**	10.123	1.37	-22.302	-1.45	4.805	0.57

[a] This is a breakdown and adjustment of the cumulative return (multiplied by 100) reported on Table 4. The methodology is described in sections 3.3 and 3.4. Day 0 is the date of the quarterly earnings announcement.

[b] Group 1 is the smallest 10%; group 10, the largest.

[c] The t-statistics are computed using cross-sectional data. Significance at the 5% and 1% levels is denoted by * and **, respectively.

Table 6

Excess returns around earnings announcement dates in months other than January for the random sample, by timing of announcement and adjusted for the nature of the news[a]

Size decile[b]	Cumulative mean OLSM model excess return from day -2 to day 0						Adjusted cumulative excess return	
	Early		On time		Late			
	% Early	Average[c]	% On time	Average[c]	% Late	Average[c]	Number of announce-ments (N)	Average[c]
1	21	61.711 (3.24)**	60	26.555 (2.78)**	19	17.211 (0.94)	1,204	28.209 (3.04)**
2	19	38.694 (2.71)**	64	31.852 (3.48)**	17	-23.292 (-1.35)	1,320	23.365 (2.95)**
3	14	54.699 (3.11)**	69	22.782 (2.28)*	17	-37.145 (-1.82)	1,391	19.281 (2.37)*
4	16	41.532 (2.46)**	68	15.658 (1.92)*	16	-13.373 (-1.12)	1,414	20.676 (2.42)*
5	13	32.288 (2.12)*	73	30.050 (3.72)**	14	-0.655 (-0.04)	1,449	16.425 (2.14)*
6	12	50.774 (2.88)**	76	11.840 (1.60)	12	-4.431 (-0.32)	1,433	22.734 (2.94)**
7	9	28.158 (1.41)	79	15.358 (1.90)*	12	-15.815 (-1.09)	1,379	13.723 (1.77)
8	8	37.267 (1.82)*	82	10.482 (1.72)*	10	0.190 (0.01)	1,391	15.154 (2.44)*
9	7	-13.217 (-0.53)	83	-0.019 (-0.29)	10	-0.711 (-0.04)	1,295	-1.110 (0.15)
10	6	84.503 (3.37)**	86	-0.036 (-0.50)	8	-12.851 (-0.59)	1,215	-0.597 (0.09)
All	13	42.032 (3.91)**	74	11.970 (1.34)	13	-24.891 (-1.68)	1,678	10.463 (1.35)

[a]This is a breakdown and adjustment of the cumulative returns (multiplied by 100) reported on Table 4 but excluding January dates. The methodology is described in sections 3.3-3.5. Day 0 is the date of the quarterly earnings announcement.

[b]Group 1 is the smallest 10%; group 10, the largest.

[c]The numbers in parentheses are t-statistics. Significance at the 5% and 1% levels is denoted by * and **, respectively.

Table 7

Volatility of excess returns around earnings announcement dates for the random sample, by firm size[a]

Size decile[b]	Number of announce-ments (N)	Event day[c]							Average from day -2 to day 0[c]
		-3	-2	-1	0	1	2	3	
1	1,373	1.1853 (2.68)	1.3722 (3.69)	2.7984 (7.89)	3.1035 (7.14)	1.9247 (3.20)	1.4994 (5.04)	1.3046 (3.24)	2.4247 (4.92)
2	1,525	1.1914 (1.75)	1.4248 (3.63)	2.3631 (8.73)	2.1218 (8.00)	1.4542 (4.49)	1.2774 (2.80)	1.3415 (1.75)	1.9699 (6.79)
3	1,627	1.3062 (2.51)	1.3406 (3.54)	3.2221 (4.62)	2.2879 (4.56)	1.9630 (3.20)	1.2950 (2.45)	1.3858 (2.97)	2.2835 (4.81)
4	1,679	1.2403 (2.52)	1.3657 (3.97)	2.2975 (8.97)	2.1026 (7.24)	1.4067 (4.68)	1.2994 (3.56)	1.2781 (3.97)	1.9219 (6.35)
5	1,728	1.1554 (2.44)	1.4191 (5.22)	2.5557 (8.31)	2.0243 (7.49)	1.3851 (5.35)	1.2418 (2.81)	1.1084 (1.70)	1.9997 (6.35)
6	1,701	1.1758 (2.32)	1.5548 (1.65)	1.9219 (8.48)	1.8509 (6.99)	1.7343 (2.04)	1.2384 (3.15)	1.2150 (3.19)	1.7725 (8.16)
7	1,639	1.2520 (3.13)	1.3903 (3.57)	1.9431 (8.26)	2.2315 (7.60)	1.4968 (3.38)	1.4153 (3.73)	1.2322 (2.10)	1.8550 (7.08)
8	1,656	1.1955 (1.47)	1.2015 (2.81)	1.5908 (6.36)	1.6984 (6.43)	1.4695 (3.28)	1.2698 (2.65)	1.4372 (3.31)	1.4969 (6.36)
9	1,574	1.1062 (2.01)	1.1545 (2.58)	1.7810 (6.81)	1.6642 (5.38)	1.2729 (3.69)	1.2203 (1.93)	1.2257 (2.53)	1.5332 (4.90)
10	1,469	1.1384 (2.07)	1.2692 (2.23)	1.7859 (7.15)	1.7312 (6.58)	1.4451 (5.33)	1.3215 (4.74)	1.2360 (3.93)	1.5954 (7.02)
All	2,040	1.1369 (2.21)	1.2728 (4.10)	2.7641 (4.72)	2.5197 (6.12)	2.1515 (3.25)	1.3777 (3.01)	1.3543 (2.94)	2.1855 (4.25)

[a] These are mean daily squared OLSM model excess returns around N quarterly earnings announcement dates (multiplied by 54/52) when one announcement is chosen randomly per trading day during 1976-84.

[b] Group 1 is the smallest 10%; group 10, the largest.

[c] Day 0 is the date of the quarterly earnings announcement. The numbers in parentheses are t-statistics.

Table 8

Volatility of excess returns for the random sample, by firm size and event day[a]

Event day[b]	All firms (N = 2,040)		Smallest firms (Bottom size decile; N = 1,373)		Largest firms (Top size decile; N = 1,469)	
	Average	t	Average	t	Average	t
-8	1.1061	1.50	1.1167	1.42	1.0898	1.64
-7	1.2825	3.11	1.1351	1.60	1.1669	2.59
-6	1.1305	1.95	1.0807	0.99	1.1845	2.12
-5	1.1291	1.72	1.4444	2.04	1.1402	2.29
-4	1.1808	3.35	1.2522	2.92	1.1500	2.46
-3	1.1369	2.21	1.1853	2.68	1.1384	2.07
-2	1.2727	4.10	1.3722	3.69	1.2692	2.23
-1	2.7641	4.72	2.7984	7.89	1.7859	7.15
0	2.5197	6.12	3.1034	7.14	1.7311	6.58
1	2.1515	3.25	1.9247	3.20	1.4451	5.33
2	1.3777	3.01	1.4994	5.04	1.3215	4.74
3	1.3542	2.94	1.3046	3.24	1.2361	3.93
4	1.3124	2.98	1.1663	2.26	1.1444	2.49
5	1.1831	2.86	1.1131	1.65	1.1535	1.62
6	1.1499	2.26	1.1247	1.68	1.1988	2.51
7	1.1196	2.19	1.0769	1.13	1.1717	2.64
8	1.1583	2.75	1.2574	2.49	1.1256	1.78

[a]These are mean daily squared standardized OLSM model excess returns around N quarterly earnings announcement dates (multiplied by 54/52) when one announcement is chosen randomly per trading day during 1976-84.

[b]Day 0 is the date of the quarterly earnings announcement.

Table 9

Volatility of excess returns around earnings announcement dates for the random sample, by timing of announcement and firm size[a/]

Size decile[b/]	Early		On time		Late	
	Day -1	Day 0	Day -1	Day 0	Day -1	Day 0
1	3.1000 (4.09)	5.1060 (3.29)	2.6112 (5.52)	2.7024 (6.57)	3.3632 (3.31)	2.0545 (3.41)
2	1.9283 (3.16)	1.9459 (3.15)	2.4676 (7.26)	2.2156 (6.36)	2.9001 (3.25)	2.1949 (3.05)
3	3.2566 (2.64)	2.5634 (2.86)	3.7106 (3.30)	2.3189 (3.11)	2.3906 (4.68)	2.4227 (2.27)
4	1.9477 (3.28)	2.2981 (3.66)	2.3110 (6.87)	1.9970 (7.13)	2.3578 (3.37)	1.9090 (3.40)
5	1.8433 (2.62)	2.1622 (2.10)	2.7363 (6.91)	2.0531 (5.99)	2.4923 (2.67)	1.8950 (3.57)
6	1.8630 (3.85)	2.2056 (1.87)	1.9683 (7.11)	1.7278 (6.03)	1.3933 (1.23)	1.6148 (1.84)
7	2.6734 (2.39)	1.4349 (1.13)	1.8599 (6.88)	2.2720 (6.82)	1.9355 (2.52)	1.8334 (3.49)
8	2.0051 (2.29)	1.7273 (2.14)	1.5139 (5.37)	1.6161 (4.94)	1.5582 (1.35)	1.8987 (2.29)
9	1.0514 (0.28)	1.5514 (1.53)	1.7447 (6.12)	1.7631 (4.67)	1.3055 (1.04)	1.4159 (1.59)
10	1.9219 (2.33)	1.9490 (2.70)	1.8136 (6.10)	1.7471 (5.77)	1.3676 (0.92)	1.6631 (1.26)
All	1.9731 (3.36)	1.9322 (2.97)	3.1958 (3.78)	2.5844 (4.64)	2.0214 (3.91)	1.8676 (3.25)

[a/]These are mean daily squared OLSM model excess returns (multiplied by 54/52) for firms announcing early, on time, or late when one announcement is chosen randomly per trading day during 1976-84. The numbers in parentheses are t-statistics.

[b/]Group 1 is the smallest 10%; group 10, the largest.