8. M. Godfrey, C. Granger, and D. Morgenstern. "The Random Walk Hypothesis and Stock Market Behavior." *Kyklos.* 17 (January 1964), 1–30.
9. D. Keim. "Size-Related Anomalies and Stock Return Seasonality: Further Empirical Evidence." *Journal of Financial Economics.* 12 (June 1983), 13–32.
10. J. Lakonishok and M. Levi. "Weekend Effects on Stock Returns: A Note." *Journal of Finance.* 37 (June 1982), 883–889.
11. G. Leffler and L. Farwell. *The Stock Market.* New York: Ronald Press, 1963.
12. P. Prince. "Day of the Week Effects: Hourly Data." Manuscript, University of Chicago, 1982.
13. R. Roll. "Orange Juice and Weather." Manuscript, UCLA, 1983.
14. M. Smirlock and L. Starks. "Day of the Week Effects in Stock Returns: Some Intraday Evidence." Manuscript, University of Pennsylvania and Washington University, 1983.
15. S. Stickel. "Empirical Tests of Futures Prices." Manuscript, University of Chicago, 1982.
16. H. Theil. *Principles of Econometrics.* New York: John Wiley and Sons, 1971.

DISCUSSION

RICHARD J. ROGALSKI*: The Monday effect refers to the average return for Monday (from Monday close to the previous Friday close) being negative. Several papers have identified and attempted to explain the Monday effect, but to no avail. Keim and Stambaugh [2] extend earlier evidence on the Monday effect historically back to 1928. They rule out various kinds of measurement errors and specialist-related biases and document that the Monday effect is similar for all ten of their size portfolios. The paper is well-written, straightforward, and methodologically sound. Therefore, I will interject in my discussion some new evidence I have uncovered by distinguishing between trading and non-trading day returns that may help direct future research toward an understanding of the Monday effect, and more generally, day of the week and seasonal anomalies.[1]

New York Stock Exchange Composite Index (NYSE) values were obtained as of 10:15 a.m. and 4:00 p.m. (close) every trading day during October 1, 1974 to December 9, 1983. In addition, opening and closing S&P Composite Index (SP500) values for December 29, 1978 to December 9, 1983 were collected. Excluding holidays and holiday-weekends, close to close returns are computed as the natural logarithm of the ratio of successive closing index values. The close to close returns are decomposed into trading and non-trading day returns. Trading day returns are calculated from close to previous open (or 10:15 a.m.) index values. Non-trading period returns are computed from open (or 10:15 a.m.) to previous close index values.

Monday close to close returns for NYSE and SP500 are on average negative as reported by Keim and Stambaugh [2]. However, all of the negative average return for NYSE and SP500 occurs during the non-trading period from Monday open to previous Friday close. We dub this the weekend effect. In particular, the average Monday close to close returns for SP500 (NYSE) are −.1097 (−.0554) percent whereas the corresponding Monday open to previous Friday close averages are −.1283 (−.0738) percent.[2] Thus, the Monday effect discovered by French [1] and updated by Keim and Stambaugh [2] may actually be a weekend effect.

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[1] All of the results to follow are contained in Rogalski [4].

[2] The SP500 close to close Monday mean of −.1097 percent for 1979–1983 is similar to the Monday average of −.1016 for 1978–1982 reported in Table 1 of Keim and Stambaugh [2].

An F-test for the equality of close to close mean returns across days of the week is rejected using a 5% level for SP500 and NYSE. Equality of average trading time returns (close to previous open), however, cannot be rejected for both indexes at a 5% level. This latter hypothesis that we accepted is what French [1] termed the trading time hypothesis and it asserts that the expected return is the same for each trading day of the week. French [1] may have incorrectly rejected the trading time model because he used close to close returns instead of close to previous open returns to represent trading day returns.[3]

The trading time hypothesis is consistent with a multiple component jump process (MCJP) for common stock returns developed by Oldfield and Rogalski [3]. A MCJP is a mixture of a diffusion process and several separate jump processes. The diffusion process operates over all open and closed periods while a different jump component is specified for the transaction process during a trading day and for overnight, holiday, weekend, and holiday-weekend transactions. Three major conclusions are drawn from statistical analysis of the SP500, NYSE data that are consistent with a MCJP. First, trading day returns (close to previous open) are identically distributed each day of the week. Second, overnight returns (open to previous close) excluding weekends are identically distributed. Last, closed period returns are largely independent of the next trading period returns.

The Monday effect and the weekend effect are also related to the January effect. Segmenting index returns into January's versus the rest of the year reveals that the Monday effect and the weekend effect are on average positive in January and on average negative for the rest of the year. This Monday/January effect is also linked to firm size. Keim and Stambaugh [2] find that the Monday effect is similar for all size portfolios. They don't, however, segment size portfolios into January's versus the rest of the year to see if the Monday effect is related to firm size any differently in January. In doing so, we find that mean close to close returns of small firms on Monday in January are positive and related to firm size.[4] In fact, average returns on all other days of the week in January are related to firm size. A large portion of day of the week effects in January occur during the first five trading days of January, especially the Monday effect. In January, an F-test of equal mean returns across all days of the week cannot be rejected for seven of the ten size portfolios at a 1% level of significance. On Mondays during the rest of the year, small and large firms have negative mean returns. Other days of the week during the rest of the year have mean percentage returns similar to all months combined. That is, on Mondays, Thurdays, and Fridays the average returns of small firms are greater than large firm returns.

In summary, we find that the Monday effect is actually a weekend effect. That is, for whatever reason, the average negative Monday close to previous Friday close return documented in several papers occurs from Friday's close to Monday's

[3] As noted, we also reject the trading time hypothesis using close to close index returns.

[4] Ten size portfolios exactly like those in Keim and Stambaugh [2] are constructed for 1963–1982 using the CRSP tapes. Size portfolio daily returns are close to close. Holidays and holiday-weekends are excluded.

open. This means that opening price data are important for understanding day of the week effects. Second, the sample data do not allow us to reject the MCJP as a descriptive stochastic process model of common stock returns. Lastly, January/firm size/turn-of-the-year effects appear to be interrelated with day of the week returns.

REFERENCES

1. K. French. "Stock Returns and the Weekend Effect." *Journal of Financial Economics* 8 (March 1980), 55–69.
2. D. Keim and R. Stambaugh. "A Further Investigation of the Weekend Effect in Stock Returns." Manuscript, University of Chicago (December 1983).
3. G. Oldfield and R. Rogalski. "A Theory of Common Stock Returns Over Trading and Non-Trading Periods." *Journal of Finance* 35 (June 1980), 729–751.
4. R. Rogalski. "New Findings Regarding Day of the Week Returns Over Trading and Non-Trading Periods." Manuscript, The Amos Tuck School of Business Administration, Dartmouth College, (December 1983).

DISCUSSION: WHAT THE ANOMALIES MEAN

MARC R. REINGANUM*: Discovery of exceptions rather than confirmation of rules has characterized empirical studies of equity markets for the past several years. The empirical exceptions, the so-called anomalies, seriously have challenged the simple structures constructed by asset pricing models. The real promise of these models is that they offer a parsimonious way to describe the price behavior of risky assets. Indeed, the persistence of chapters on the Capital Asset Pricing Model in textbooks probably reflects, at least in part, the desire to communicate in a simple yet formal way basic principles which may extend beyond the CAPM. However, if the existing simple theoretical models fail to describe the actual pricing of risky assets within reasonable limits, they must be supplanted by new, more accurate, and hopefully simpler explanations of the data.

Well-entrenched paradigms are not easily killed. Initial work by Banz (1) and Reinganum (14) suggested a serious misspecification in the CAPM: returns on smaller capitalized companies were much greater than those on larger companies, even after adjusting for difference in estimated beta risk. Perhaps most disturbing to theorists, market capitalization was a much better predictor of average return than beta. Yet, this evidence was not taken at face value at first. Researchers natually attempted to discredit the conclusions of the studies by looking for faults in the data or methodologies; if serious flaws in the original "size effect" research could have been found, then the integrity of the CAPM could have been maintained. A host of conjectures were offered as potential problems. These included suggested misestimation of beta coefficients due to non-synchronous trading (e.g., Roll [17]), possible distortions due to ignored but excessive trans-

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