

Calendar Anomalies: Abnormal Returns at Calendar Turning Points

There is overwhelming evidence that abnormal equity returns are associated with the turn of the year, the week and the month, as well as with holidays and the time of day. These returns are not unique to one historical period, nor can they be explained by considerations of risk or value.

Tax-loss selling at year-end, cash flows at month-end and negative news releases over the weekend may explain some of these return abnormalities. But human psychology offers a more promising explanation. Calendar anomalies tend to occur at turning points in time. While these artificial moments have little economic significance, investors may deem them important, and behave accordingly.

The question remains why these effects, which have been recognized for some years, have not been arbitrated away. Trading costs are, of course, an impediment. A portfolio manager would not consider liquidating an entire portfolio on a Friday merely in order to avoid experiencing relatively poor weekend returns. But planned trades can be scheduled to take advantage of calendar-based return patterns. Calendar effects should be of particular importance to traders.

CALENDAR ANOMALIES have long been part of market folklore.¹ Studies of the day-of-the-week, holiday and January effects first began to appear in the 1930s.² And although academics have only recently begun seriously to examine these return patterns, they have found them to withstand close scrutiny.

Calendar regularities generally occur at cusps in time—the turn of the year, the month, the week, the day. They often have significant economic impact. For instance, the “Blue Monday” effect was so strong during the Great Depression that the entire market crash took place over weekends, from Saturday’s close to Monday’s close. The stock market actually rose on average every other day of the week.

Calendar anomalies are often related to other return effects. For instance, some calendar anomalies are more potent for small than for

large capitalization stocks. While analysis of cross-sectional effects requires fundamental databases—a relatively recent innovation—the study of calendar anomalies requires only time-dated records of market indexes. Hence calendar anomalies can be tracked historically for much longer periods than effects requiring fundamental data.

The availability of a century of data brings enormous statistical power for testing calendar effects, but it also increases the likelihood of data-mining. If enough patterns are tested, some will appear significant merely by chance. In exploring calendar anomalies, therefore, significance levels must be properly adjusted for the number of hypotheses examined, out-of-sample tests should be encouraged, and only plausible hypotheses considered.³

Calendar regularities appear to be even more aberrant than cross-sectional return effects. A skeptic, for instance, might assert that low P/E stocks provide outperformance simply because of their greater riskiness; this argument can be deflected, but it requires potentially controver-

1. Footnotes appear at end of article.

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sial assumptions about risk modeling.⁴ Others might claim that the low P/E characteristic merely proxies for value (although this argument can also be rebutted).⁵ Risk or value considerations appear insufficient to explain calendar anomalies such as the day-of-the-week effect.

Because calendar anomalies appear relatively easy to exploit, their continued existence seems inexplicable. To arbitrage the P/E effect, for example, investors would have to increase their demand for low P/E stocks; psychological considerations may inhibit investors from doing so.⁶ But to arbitrage the time-of-day effect, investors merely have to schedule discretionary trades at a more advantageous time of day.

Calendar anomalies are difficult to exploit as a stand-alone strategy because of transaction cost considerations. For instance, full capture of the day-of-the-week effect would require 100 per cent turnover per week. Calendar return patterns can, however, be of benefit in timing a preconceived trade. While cross-sectional return effects, such as low P/E, might be useful to portfolio managers in selecting stocks, calendar anomalies may be of greater interest to traders.⁷

The January Effect

The turn of the year is a special time for the stock market. Most individuals have calendar tax years, and many firms close their books at this time. The turn of the year represents a clean slate for government, business and consumer budgeting, as well as for purposes such as investment manager performance evaluation. Additionally, investors' cash flows may be jolted by bonuses, pension contributions and holiday liquidity needs.

Stocks exhibit both higher returns and higher risk premiums in January.⁸ These results have been corroborated in many foreign markets.⁹ But the higher returns accrue primarily to smaller stocks. January does not appear to be an exceptional month for larger-capitalization issues.¹⁰

January seasonals have been noted in returns to a variety of stock characteristics, including size, yield and neglect.¹¹ Returns to small size, for example, occur at the turn of the year—specifically, on the last trading day in December and the first four trading days in January.¹² The magnitude of this effect can be substantial. Over these five trading days from 1970 to 1981, small stocks provided an average return of 16.4 per cent, compared with 1.9 for large stocks.¹³

It is vital to disentangle interrelated effects in attributing returns to stock characteristics in order to identify properly underlying sources of return. Disentangled return attributions are referred to as "pure" returns, because they are purified of other related effects. After "purification," two effects emerge strongest in January. One is a return rebound for stocks with embedded tax losses, especially those with long-term losses. The other is an abnormal return to the yield characteristic, with both zero-yielding and high-yielding stocks experiencing the largest returns.

Other January seasonals appear to be mere proxies for these two effects. In fact, *pure* returns to smaller size (after controlling for other factors) exhibit no January seasonal at all. There is also evidence of January selling pressure for stocks with long-term gains, apparently due to the deferral of gain recognition until the new year.¹⁴

Rationales

The most commonly cited reason for the January return seasonal is tax-loss-selling rebound.¹⁵ That is, taxable investors dump losers in December for tax purposes, and the subsequent abatement of selling pressure in January explains the higher returns. The tax-loss explanation has been found to be consistent with returns in many foreign equity markets and for other asset classes, such as corporate bonds.¹⁶

But the tax-loss hypothesis does not seem fully satisfactory. First, there is little evidence that selling pressure near year-end is strong enough to account for the rebound.¹⁷ Second, it is not clear why rational investors would await the new year to reinvest, although temporary "parking" of proceeds in cash could account for the observed seasonality.¹⁸ Third, it seems suboptimal for investors to wait until year-end to transact. Until the Tax Reform Act of 1986, short-term losses sheltered more income from taxes than long-term losses. It would thus have been preferable to establish tax losses before an asset's holding period became long term.¹⁹ Also, the tax-loss theory would predict a larger rebound for stocks having short-term losses, yet the January rebound is stronger for stocks with long-term losses.²⁰ Fourth, market returns prior to the imposition of the U.S. income tax, and returns in a few foreign countries, appear inconsistent with the tax-loss explanation.²¹ In any case, sophisticated investors should anticipate

predictable price patterns and arbitrage them away.

Tax-loss-selling pressure might be expected to be stronger in down-market years, when losses are more prevalent. Also, higher taxable incomes or higher tax rates may strengthen tax-loss taking. Current evidence of such relationships is rather weak.²²

Another rationale for the January effect is year-end "windowdressing."²³ In this view, some portfolio managers dump embarrassing stocks at year-end to avoid their appearance on the annual report. Similar stocks are repurchased in the new year, resulting in the January effect. This argument also begs the question of countervailing arbitrage.

A January risk seasonal might explain the higher returns at the turn of the year. In fact, beta (systematic risk) and residual risk for small firms rise in January.²⁴ According to the Capital Asset Pricing Model, only systematic risk earns compensation. While the January increase in beta for small firms is approximately 30 per cent, it is insufficient to explain the January return seasonal.

Moreover, risk appears to be priced *only* in the month of January. In all other months, there is no significant relation between risk and return, whether risk is measured in a CAPM or APT framework, or even without appealing to any particular asset pricing model.²⁵ This remains a mystery. Foreign evidence on the point is mixed. In some countries, risk and return patterns do not coincide, belying the risk explanation for return seasonality.²⁶

Alternatively, the January return seasonal may be compensation for bearing informational risk.²⁷ The seasonal may stem from the reduction of uncertainty associated with the dissemination of information after the close of the fiscal year, especially for small, neglected firms. But informational risk is not resolved precipitously at the turn of the year. Furthermore, a study of firms with non-December fiscal years presents stronger evidence.²⁸ Such companies do not experience a return seasonal at the turn of their fiscal year, as informational risk is resolved, but rather at calendar year-end. Thus informational risk appears to be an inadequate explanation of the January seasonal.

Cash-flow patterns at the turn of the year may produce the return seasonal. Annual bonuses and holiday gifts might be invested in the stock market, along with year-end pension plan con-

tributions. Also, savings spent on holiday consumption may in part be replenished. In Japan, where bonuses are paid semiannually, equities exhibit seasonals in January and June.²⁹ Once again, this predictable return regularity could be arbitrated.

Novel cognitive psychological approaches, including *Prospect Theory* and *Procedural Rationality*, offer substantial insight into market behavior.³⁰ Once we entertain the notions that investors are loathe to admit mistakes, tend to "frame" decisions, have finite mental capacity, and generally behave in rather human ways, seemingly irrational market behavior is demystified. For instance, Prospect Theory is consistent with the predilection of investors to defer tax trading until year-end and the finding that long-term tax-loss selling is stronger than short-term. These behaviors arise from the use of year-end tax planning as a justification for admitting mistakes and from the tendency to ride losers too long. Procedural Rationality also offers clues into behavioral causes for January anomalies, such as the abnormal performance of both zero and high-yielding stocks.

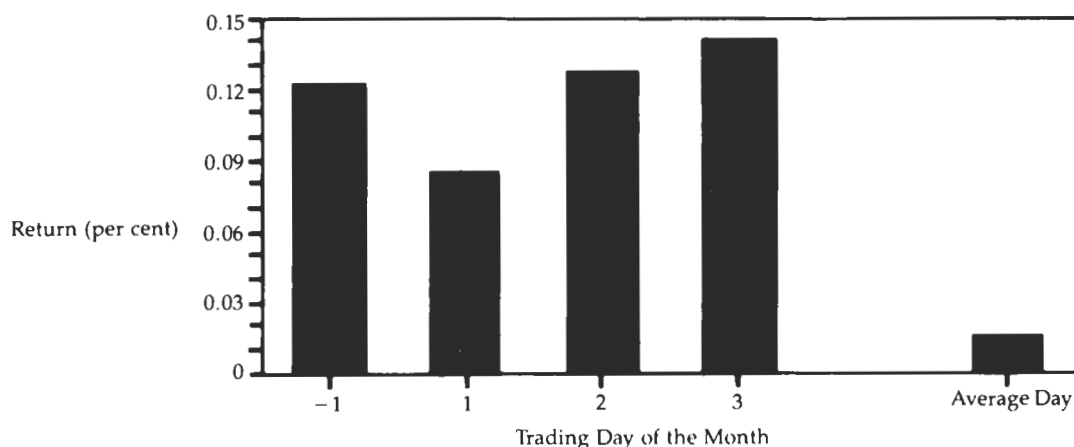
The Turn-of-the-Month Effect

Recent academic studies demonstrate anomalous returns at the turn of each month, vindicating the claims of practitioners.³¹ While not as dramatic as the January effect, this anomaly is substantial. In fact, turn-of-the-month returns have alone accounted fully for the positive returns generated by the stock market.

Figure A plots average returns to the Dow Jones Industrial Average for trading days near month-end for the period 1897 to 1986.³² Returns are high for each trading day from the last day in the previous month (denoted as day -1) to the third trading day in the current month. These four trading days averaged 0.118 per cent, versus 0.015 per cent for all trading days. While this anomaly has existed for almost a century, it has weakened somewhat in the most recent decade. It has, however, been documented in periods both before and after those in which it was first identified; this "out-of-sample" evidence rebuts allegations of data-mining.

Might the turn-of-the-month effect merely proxy for other anomalies? Studies have rejected January, day-of-the-week, holiday, tax-loss-selling and size effects as underlying causes.³³ Methodological deficiencies seem an unlikely explanation, as various studies have controlled

Figure A The Turn-of-the-Month Effect (average daily returns)



Data from J. Lakonishok and S. Smidt, "Are Seasonal Anomalies Real? A Ninety-Year Perspective" (Johnson working paper # 87-07, Cornell U., May 1987).

for dividends, pricing errors and outliers. Also, risk, as measured by standard deviation of market returns, is no higher at the turn of the month.

Some practitioners have suggested month-end portfolio rebalancing as a possible explanation; investors may reinvest accumulated cash dividends at this time. A more convincing rationale is based on higher month-end cash flows, such as salaries. An interest-rate seasonal to Treasury bills maturing at the turn of the month has been attributed to investor cash-flow considerations.³⁴ Increased demand for equities at month-end might produce the observed return regularity.

The timing of earnings announcements may provide additional insight. While companies often disclose good news voluntarily, the publication of bad news is often suppressed until the next mandatory quarterly report.³⁵ Moreover, good earnings reports tend to be released faster than bad ones. Some observers have suggested that the positive returns around the first of each month reflect a clustering of positive earnings announcements.³⁶ But while good earnings news is predominant in the first half of the month, it is not concentrated in the first few days, when the return seasonality occurs. Also, excluding earnings report months from the sample diminishes the effect, but does not eliminate it.³⁷

The absence of countervailing arbitrage remains a puzzle.

The Day-of-the-Week Effect

Stock returns are intimately tied to the day of the week. The market has a tendency to end each week on a strong note and to decline on Mondays. This pattern is deeply ingrained in folk wisdom, as evidenced by the recent book *Don't Sell Stocks on Monday*.³⁸ It is often referred to as the "weekend" or "Blue Monday" effect.

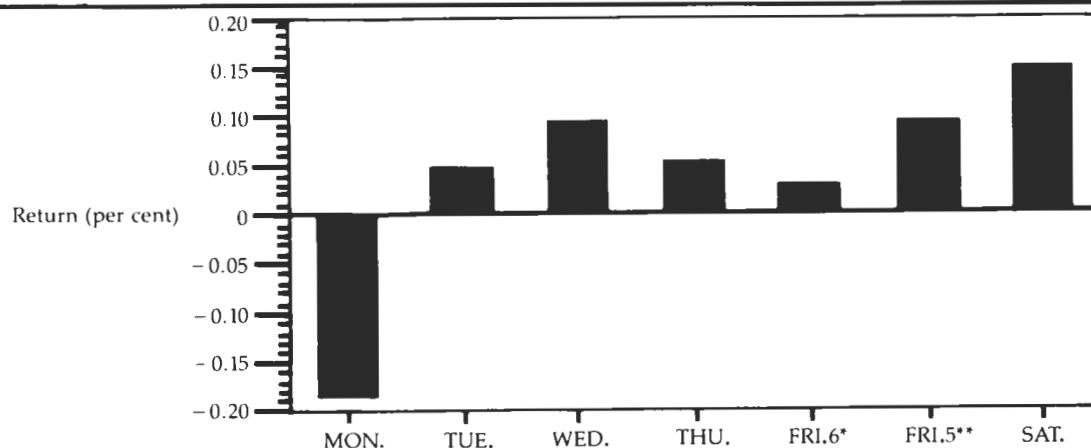
Figure B illustrates average daily returns of the S&P composite for each day of the week from 1928 to 1982.³⁹ Monday is the only down day, and is significantly different statistically from all other days. The last trading day of the week—Friday in five-day weeks and Saturday in six-day weeks—has a substantial positive average return.

The economic magnitude of the effect is not trivial. For an equity portfolio with a cash flow of \$100,000 per week, for example, switching the sale day from Monday to the previous Friday might earn an additional \$14,700 per annum.⁴⁰

As with the turn-of-the-month effect, researchers have recently verified the existence of this anomaly in both earlier and later periods than previously studied.⁴¹ The robustness of the day-of-the-week effect across time periods attests to its stability and defuses any data-mining criticism.

Day-of-the-week patterns also exist in other U.S. markets. Because stock option and stock index futures prices are anchored by the underlying spot market, a day-of-the-week effect for

Figure B The Day-of-the-Week Effect (average daily returns)



*Fri. 6 = Friday in a six-day trading week. **Fri. 5 = Friday in a five-day trading week.
Data from D. Keim and R. Stambaugh, "A Further Investigation of the Weekend Effect in Stock Returns," *Journal of Finance*, July 1984, pp. 819-837.

these derivative securities would not be surprising. Such effects have been found in both markets, even though low transaction costs in the futures market facilitate arbitrage of this effect.⁴² The U.S. Treasury bill and bond markets also display a weekly pattern similar to that of the equity markets. Most notably, Monday returns are negative, and more negative for longer maturity instruments.⁴³

A day-of-the-week effect is also present in many foreign equity markets, again with weeks ending strong and opening down, and in foreign exchange rates, which do not offset the local currency equity return patterns from the perspective of a U.S. investor.⁴⁴ A pattern remarkably similar to the day-of-the-week effect has even been identified for orange juice futures.⁴⁵ We must thus be cautious in evaluating potential explanations that rely on institutional features peculiar to the U.S. stock market, such as settlement procedures, specialist behavior or dividend patterns.

The day-of-the-week effect is related to other anomalies. The weekly pattern is stronger for smaller-capitalization stocks. In fact, 63 per cent of the small-size effect occurs on Fridays.⁴⁶ There are conflicting findings on the day-of-the-week effect in the month of January.⁴⁷ Interaction of day-of-the-week with holiday and time-of-day regularities are discussed below.

Rationales

Measurement error has often been suggested as a cause of the observed pattern, especially because the effect appears stronger for smaller-capitalization stocks. But this possibility has been rejected by many researchers.⁴⁸ For example, an upward bias in Friday closing prices can be dismissed as an explanation because the correlation between Friday and Monday returns is positive and the highest of any pair of days. Also, a Monday decline is even more likely than usual after a Friday decline. Explanations involving specialists, such as the frequency of closing at bid versus ask prices, have also been rejected by studies utilizing only over-the-counter bids and by others using markets with different structural characteristics.⁴⁹

Attempts have been made to test various value-based explanations for the day-of-the-week effect. The obvious hypotheses that returns accrue during trading time or during clock time are easily rejected.⁵⁰ One study found the day-of-the-week effect to be subsumed by options expiration, unexpected inflation and earnings surprise events.⁵¹ But options, money supply announcements and other explanatory measures utilized did not exist early in this century. Moreover, the one year examined in this study—1978—was perverse, in that Mondays were on average up and Fridays down.

Others have proposed trade settlement rules as a partial explanation for stock value fluctuations across days of the week.⁵² While this rationale has theoretical appeal, the day-of-the-week effect predates the 1968 advent of current settlement procedures. The anomaly also exists in foreign countries where settlement procedures alone would predict different weekly return patterns. Furthermore, the effect has been stronger during periods of lower interest rates when, according to this theory, it should have been weaker.⁵³ Finally, the large magnitude of the effect clearly swamps an interest-based, or even a dividend-based, explanation.

Similar arguments apply to explanations based on inventory adjustments. Short-sellers might, for peace of mind, cover positions prior to the weekend, and short again on Monday mornings. Specialists might close trading on Fridays at ask prices. Investors might be more inclined to throw in the towel after a weekend of introspection.⁵⁴ One problem with such rationales is that they seem insufficient to account for the ubiquitous nature of the anomaly. Day-of-the-week effects are evident over the entire century for which we have data, in spite of changing trading mechanics, short-sale regulations, methods of investment management and even modes of communication. Furthermore, the anomaly is present in foreign equity markets, as well as other asset classes.

Risk considerations also seem inadequate as an explanation of the day-of-the-week effect. It is difficult to conceive of any market risk factor that could have varied so systematically over the past century as to produce the observed return regularity. The standard deviation of Monday returns is the highest of all days, but only slightly above average. If risk determined daily returns, Monday would be an above-average day.

Explanations rooted in human nature show promise. For example, in experimental market games conducted by psychologists, an effect similar to the day-of-the-week has been observed around trading halts.⁵⁵ The day-of-the-week effect has recently been related to the human tendency to announce good news quickly and defer bad news. The pattern of earnings and other announcements over the week may actually drive the observed return effect.⁵⁶ We indicated earlier that the entire market decline of the Great Depression occurred on average over weekends. Not coincidentally, most bad

news, such as bank closings, was released after the Saturday close to allow the market to "absorb the shock" over the weekend. As a more recent example, the 1987 string of insider trading indictments were generally announced after the market close on Friday.⁵⁷

The Holiday Effect

The unusually good performance of stocks prior to market holidays was first documented over the 1901-32 period and has since become an article of faith among many practitioners. Recent academic studies confirm the existence of the holiday effect.

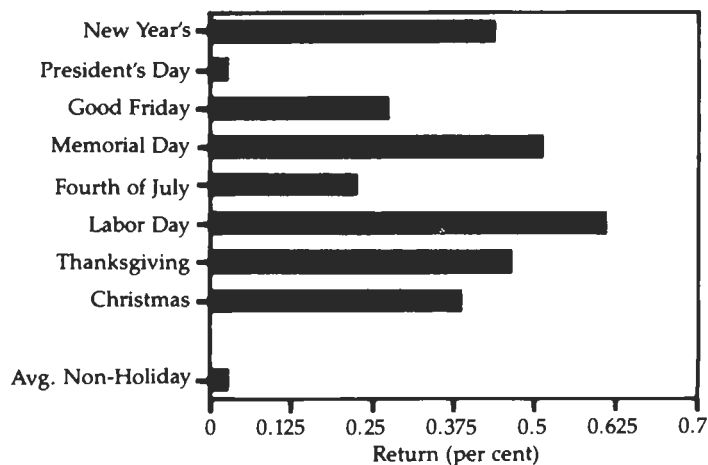
Figure C plots the average return for the day prior to each of the eight market holidays for the period 1963 to 1982.⁵⁸ The average pre-holiday return of 0.365 per cent dwarfs the average regular-day return of 0.026 per cent. In fact, 35 per cent of the entire market advance over this period occurred on just the eight pre-holiday trading days each year.

Another study examining both earlier and later periods confirmed the existence of the holiday anomaly.⁵⁹ This study also identified a holiday-related phenomenon occurring from December 24 to 31 each year. Not only Christmas and New Year's Eve, but also the days between the holidays exhibit exceptional returns. In fact, the average cumulative return for just these eight calendar days is a remarkable 1.6 per cent. This year-end rally was identified in the Dow and may reflect windowdressing in Blue Chip issues towards year-end. In any case, the dollar magnitude of this year-end, large-capitalization-stock rally is several times the magnitude of the more well-known January small-size effect.

The holiday anomaly appears fairly stable over time. In the most recent decade, however, pre-holiday returns have not been exceptional. Nevertheless, the effect does not appear to be a statistical artifact. For instance, it is not driven by outliers, as 75 per cent of pre-holiday days are up, versus only 54 per cent of all trading days.⁶⁰

The settlement process, discussed as a potential explanation for the day-of-the-week effect, has complex implications for fluctuations in value around holidays.⁶¹ For example, this theory predicts a high Thursday return preceding a Friday holiday, which is what occurs. But it predicts a lower-than-average Friday return preceding a Monday holiday, and this is not consis-

Figure C The Holiday Effect (average pre-holiday returns)



Data from R. Ariel, "High Stock Returns Before Holidays" (Sloan working paper, MIT, 1984).

tent with empirical results. Moreover, the magnitude of any value changes occurring because of settlement procedures is much too small to account for the holiday effect.

Abnormal pre-holiday returns are not attributable to increased risk. In fact, the standard deviation of pre-holiday returns—0.609—is less than the non-holiday volatility of 0.783 per cent.⁶²

Another perspective is afforded by holidays not associated with market closings, like St. Patrick's Day or Rosh Hashanah. Such days do not experience abnormal returns.⁶³ The absence of anomalous returns may be due to the lack of a trading break or to a lower level of festivity than that associated with major market holidays.

In a class by itself—almost considered the antithesis of a holiday by the superstitious—is Friday the 13th. Studies examining this day have had conflicting results. Over the 1940–84 period, the Dow was up as frequently on Friday the 13th as on a regular Friday.⁶⁴ For the 1962–85 period, however, the return for the CRSP index was significantly negative on this day.⁶⁵ There are several ways of reconciling these findings. Possibly the market has become more superstitious in recent years. Perhaps the large-capitalization Dow stocks are less susceptible to irrationality than smaller stocks. Also, the up-versus-down-day measure utilized in the first study may be less appropriate than percentage returns. If stocks suffer on Friday the 13th, market psychology would appear to be the likely culprit.

Holiday effects interact with other anomalies. The holiday effect appears to be stronger for smaller stocks.⁶⁶ It also swamps the day-of-the-week effect. Monday returns preceding a Tuesday holiday are on average positive.⁶⁷ After controlling for the holiday effect, the best day of the week shifts from Friday to Wednesday.⁶⁸ The high frequency of holidays falling on Saturday, Sunday or Monday benefits the previous Friday's return.

One potential hypothesis is that pre-holiday returns represent another manifestation of return abnormalities around trading halts, such as weekends. There are important differences, however. While Mondays are on average down, the day after a holiday does not exhibit unusual returns.⁶⁹ Also, the holiday effect is two to five times the strength of the last-trading-day-of-the-week effect, which suggests that more than a simple trading halt is the cause.⁷⁰

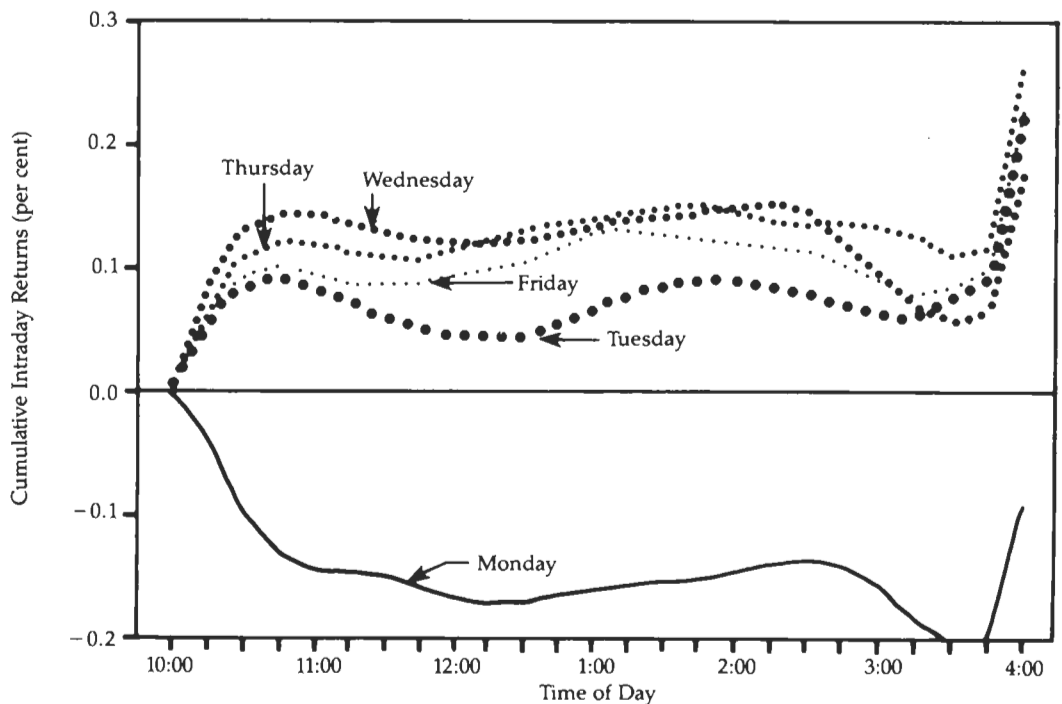
Another possibility is that holiday euphoria leads to short-covering and general buying pressure. But there is little evidence of a market correction as holiday spirits subsequently subside. While no fully satisfactory explanation of the holiday effect has yet surfaced, psychological reasons appear to be the most promising.

The Time-of-Day Effect

Stock returns exhibit intraday, as well as interday, patterns. The advent of real-time pricing databases has only recently allowed academic scrutiny of these effects.

Figure D plots cumulative returns, at 15-

Figure D The Time-of-Day-Effect



Data from L. Harris, "A Transaction Data Study of Weekly and Intradaily Patterns in Stock Returns," *Journal of Financial Economics*, 16, 1986, pp. 99-117.

minute intervals throughout each trading day of the week, for a recent 14-month period on the NYSE.⁷¹ Tuesday through Friday exhibit similar patterns: Prices rise for approximately the first 45 minutes, the bulk of the trading day is flat, and another rally takes place in the last 15 minutes of the day. The strong opening is roughly attributable to the first three trades of the day in each stock, while the strong close is due primarily to the last trade. On Monday, in contrast, prices during the first 45 minutes of trading are down sharply, while the rest of the day resembles the other days of the week.

The time-of-day anomaly has been fairly stable in recent decades, except that the "weekend effect" component has been moving up in time. Prior to 1968, the weekend effect took place all through the trading day on Monday, with every hour's return being negative. Since 1974, the effect has shifted forward in time to the weekend, with only the first two hours of Monday's trading being down in price.⁷² This day-of-week/time-of-day interaction is also related to the size effect. Most of the weekend decline occurs prior to Monday's open for large-capital-

ization stocks, but continues into Monday morning for smaller stocks.⁷³ Also, the closing price anomaly has been found to be robust across days of the week but stronger at the turn of the month.⁷⁴

One study analyzed the close-of-day anomaly in great detail.⁷⁵ It found the average return of the last trade to equal 0.05 per cent, or 0.6 cents per share. The return was higher, however, the closer the final trade to the close of business. Final trades occurring after 3:55 p.m. averaged a 0.12 per cent return, or 1.75 cents per share.

The closing-price anomaly is unrelated to whether a stock has listed options or is traded on a regional exchange beyond the NYSE closing time. Results are not due to data errors, because there is little evidence of return reversals at the following open. The effect is robust over time and not attributable to outliers.

Do fundamental values rise at the open and close, causing the observed return pattern? Unanticipated good news towards the close might not be fully reflected in prices until the next morning, particularly if specialists dampen the rise in order to maintain orderly markets.⁷⁶ Of

course, this would not explain Monday morning negative returns. And what might account for a rush of good news just before the close? While stocks that trade right at the close experience the largest day-end effect, those that do not trade near the close do not catch up by morning. This seems to rule out the possibility that marketwide good news accounts for the day-end return anomaly.

There is a relation between risk and intraday returns. The unusually high opening and closing returns are more variable than returns during the rest of the day.⁷⁷ Theories have been proposed that may account for the observed pattern in riskiness.⁷⁸ If investors are averse to volatility, they would require higher expected returns at the open and close. But the risk increase is insufficient to explain the magnitude of the observed return effect. Furthermore, Monday morning negative returns run counter to this hypothesis.

The open differs from the balance of the day in some important respects. Opening prices are determined by a market call, unlike the continuous market-making process the rest of the day. Also, orders at the open are heavily influenced by foreign investors. While opening returns exhibit greater dispersion, are less normally distributed and more negatively autocorrelated than other returns, it remains unclear why any of these differences would result in the morning return anomaly.⁷⁹

Closing prices are also special. They are utilized for valuing portfolios, for performance evaluation, as strike prices for program trades, and for settling options and futures contracts at expiration. They are the prices reported in the press and stored in databases. For all these reasons, closing prices might be likely candidates for manipulation, possibly causing the day-end return anomaly. However, volume for day-end trades is not abnormally small, as would be the case if someone were painting the tape.⁸⁰

Those who must purchase a stock on a given day might conceivably rush to beat the closing bell, thus placing upward pressure on prices. But the converse should hold for sellers. As the day-end price effect is stronger at the turn of the month, windowdressing might play a role. Also, about half the effect is attributable to changes in the frequency of trades at bid versus ask prices near the close, but the cause of this distributional shift remains unknown.⁸¹

As with the holiday and day-of-the-week effects, the day-end return anomaly may relate to the impending trading halt. As psychological experiments have demonstrated, there may be a behavioral predisposition to bid up prices prior to the close.

Conclusion

The existence of abnormal returns at calendar turning points is indisputable. Moreover, these effects are not implausible. A return regularity occurring at an arbitrary time on an arbitrary day might justifiably be regarded with suspicion. But calendar anomalies occur at cusps in time. These turning points have little economic significance, but they apparently evoke special investor behavior. Psychology appears to offer the most promising explanations for this behavior.

While cross-sectional return effects should be of interest to portfolio managers, calendar effects may be of greater interest to traders. Both classes of anomalies have important implications for market efficiency. ■

Footnotes

1. For example, see A. Merrill, *Behavior of Prices on Wall Street* (Chappaqua, NY: Analysis Press, 1966); Y. Hirsch, *The Stock Trader's Almanac* (Old Tappan, NJ: The Hirsch Organization, published annually since 1968); and N. Fosback, *Stock Market Logic* (Fort Lauderdale, FL: Institute for Econometric Research, 1976).
2. M. Fields, "Stock Prices: A Problem in Verification," *Journal of Business*, 1931; M. Fields, "Security Prices and Stock Exchange Holidays in Relation to Short Selling," *Journal of Business*, 1934, pp. 328-338; and S. Wachtel, "Certain Observations on Seasonal Movements in Stock Prices," *Journal of Business* 15, 1942, pp. 184-193.
3. For an elaboration on these points, see J. Lakonishok and S. Smidt, "Are Seasonal Anomalies Real? A Ninety-Year Perspective" (Johnson working paper #87-07, Cornell U., May 1987).
4. See B. Jacobs and K. Levy, "Disentangling Equity Return Regularities: New Insights and Investment Opportunities," *Financial Analysts Journal*, May/June 1988.
5. See B. Jacobs and K. Levy, "On the Value of 'Value'," *Financial Analysts Journal*, July/August 1988.
6. *Ibid.*
7. For portfolio management implications of cross-sectional return effects, see B. Jacobs and K. Levy, "Disentangling Equity Return Regularities," in *Equity Markets and Valuation Methods*

- (Charlottesville, VA: The Institute of Chartered Financial Analysts Continuing Education Series, forthcoming 1988). For trading implications of calendar anomalies, see B. Jacobs and K. Levy, "Trading Tactics in an Inefficient Market," in W. Wagner, ed., *A Complete Guide to Securities Transactions: Controlling Costs and Enhancing Performance* (New York: John Wiley, forthcoming 1989).
8. M. Rozeff and W. Kinney, "Capital Market Seasonality: The Case of Stock Returns," *Journal of Financial Economics* 3, 1976, pp. 379-402.
 9. M. Gultekin and B. Gultekin, "Stock Market Seasonality: International Evidence," *Journal of Financial Economics*, December 1983, pp. 469-481.
 10. Consider the absence of a January seasonal in the Dow Jones Industrial Average, noted by Lakonishok and Smidt, "Are Seasonal Anomalies Real?" *op.cit.*
 11. See D. Keim, "Size Related Anomalies and Stock Market Seasonality: Further Empirical Evidence," *Journal of Financial Economics*, June 1983, pp. 12-32; D. Keim, "Dividend Yields and Stock Returns: Implications of Abnormal January Returns," *Journal of Financial Economics* 14, 1985, pp. 473-489; and A. Arbel, "Generic Stocks: An Old Product in a New Package," *Journal of Portfolio Management*, Summer 1985, pp. 4-13.
 12. See Keim, "Size Related Anomalies," *op.cit.*, and R. Roll, "Was Ist Das? The Turn-of-the Year Effect and the Return Premia of Small Firms," *Journal of Portfolio Management*, Winter 1983, pp. 18-28.
 13. J. Lakonishok and S. Smidt, "Trading Bargains in Small Firms at Year-End," *Journal of Portfolio Management*, Spring 1986, pp. 24-29. Results cited are for largest and smallest deciles of listed stocks. While large in percentage terms, however, the January effect is less substantial in dollar terms because of the illiquidity of small stocks.
 14. See Jacobs and Levy, "Disentangling Equity Return Regularities," *op.cit.*, for a complete discussion of January interrelationships.
 15. See D. Givoly and A. Ovadia, "Year-End Tax-Induced Sales and Stock Market Seasonality," *Journal of Finance*, March 1983, pp. 171-185.
 16. M. Gultekin and B. Gultekin, "Stock Market Seasonality," *op.cit.*, find higher returns coincident with the turn of the tax year in 13 countries, with the exception of Australia. E. Chang and M. Pinegar, "Return Seasonality and Tax-Loss Selling in the Market for Long-Term Government and Corporate Bonds," *Journal of Financial Economics* 17, 1986, pp. 391-415.
 17. There is no documentation of downward price pressure on losers at year-end comparable in magnitude to their subsequent January bounce-back. While J. Lakonishok and S. Smidt, "Volume in Winners and Losers: Taxation and Other Motives for Stock Trading," *Journal of Finance*, September 1986, pp. 951-974, show evidence of tax-motivated trading in December and January, they find other trading motives more important.
 18. J. Ritter, "The Buying and Selling Behavior of Individual Investors at the Turn of the Year" (Working paper, U. Michigan, July 1987).
 19. See G. Constantinides, "Optimal Stock Trading with Personal Taxes: Implications for Prices and the Abnormal January Returns," *Journal of Financial Economics*, March 1984, pp. 65-89.
 20. See K. C. Chan, "Can Tax-Loss Selling Explain the January Seasonal in Stock Returns?" *Journal of Finance*, December 1986, pp. 1115-1128, and Jacobs and Levy, "Disentangling Equity Return Regularities," *op.cit.*
 21. C. Jones, D. Pearce and J. Wilson, "Can Tax-Loss Selling Explain the January Effect: A Note," *Journal of Finance*, June 1987, pp. 453-461, find no difference in the January effect pre and post-income tax. For foreign evidence, see P. Brown, D. Keim, A. Kleidon and T. Marsh, "Stock Return Seasonalities and the Tax-Loss Selling Hypothesis: Analysis of the Arguments and Australian Evidence," *Journal of Financial Economics*, June 1983, pp. 33-56, and S. Tinic, G. Barone-Adesi and R. West, "Seasonality in Canadian Stock Prices: A Test of the 'Tax-Loss-Selling Hypothesis'," *Journal of Financial and Quantitative Analysis*, March 1987, pp. 51-63.
 22. While Jacobs and Levy, "Disentangling Equity Return Regularities," *op.cit.*, found a January tax-loss rebound effect in each year of their sample, the weakest effects occurred in 1981 and 1986, after substantial stock market advances. However, if there are fewer individual stocks offering losses, there may be more tax-loss selling pressure on each one.
 23. J. Bildersee and N. Kahn, "A Preliminary Test of the Presence of Window Dressing," *Journal of Accounting, Auditing & Finance*, Summer 1987.
 24. See R. Rogalski and S. Tinic, "The January Size Effect: Anomaly or Risk Mismeasurement?" *Financial Analysts Journal*, November/December 1986, pp. 63-70.
 25. See S. Tinic and R. West, "Risk and Return: January vs. the Rest of the Year," *Journal of Financial Economics*, December 1984, pp. 561-574, for CAPM; M. Gultekin and B. Gultekin, "Stock Return Anomalies and the Tests of the APT," *Journal of Finance*, December 1987, pp. 1213-1223 for APT; and E. Chang and M. Pinegar, "A Fundamental Study of the Seasonal Risk-Return Relationship: A Note," *Journal of Finance*, September 1988, pp. 1035-1039, for more general findings.
 26. A. Corhay, G. Hawawini and P. Michel, "Seasonality in the Risk-Return Relationship: Some International Evidence," *Journal of Finance*, March 1987, pp. 49-68.
 27. Arbel, "Generic Stocks," *op.cit.*

28. V. Chari, R. Jagannathan and A. Ofer, "Fiscal Year End and the January Effect" (Kellogg working paper #20, Northwestern U., January 1986).
29. K. Kato and J. Schallheim, "Seasonal and Size Anomalies in the Japanese Stock Market," *Journal of Financial and Quantitative Analysis*, June 1985, pp. 243-260.
30. On Prospect Theory and January, see H. Shefrin and M. Statman, "The Disposition to Sell Winners Too Early and Ride Losers Too Long: Theory and Evidence," *Journal of Finance*, July 1985, pp. 777-792, and S. Ferris, R. Haugen and A. Makhija, "Predicting Contemporary Volume with Historic Volume at Differential Price Levels," *Journal of Finance*, July 1988, pp. 677-699. On Procedural Rationality and January, see E. Miller, "Explaining the January Small Firm Effect" (Working paper, U. New Orleans, November 1986).
31. R. Ariel, "A Monthly Effect in Stock Returns," *Journal of Financial Economics* 18, 1987, pp. 161-174; S. Penman, "The Distribution of Earnings News Over Time and Seasonalities in Aggregate Stock Returns," *Journal of Financial Economics* 18, 1987, pp. 199-228; and Lakonishok and Smidt, "Are Seasonal Anomalies Real?" *op.cit.*
32. Data from Lakonishok and Smidt, "Are Seasonal Anomalies Real?" *op.cit.*
33. For example, see Ariel, "A Monthly Effect in Stock Returns," *op.cit.* However, Ariel reports that when small-capitalization stocks perform poorly, it is generally in the last half of the month.
34. J. Ogden, "The End of the Month as a Preferred Habitat: A Test of Operational Efficiency in the Money Market," *Journal of Financial and Quantitative Analysis*, September 1987, pp. 329-343.
35. M. McNichols, "A Comparison of the Skewness of Stock Return Distributions in Earnings Announcement and Non-announcement Periods" (Working paper #953, Stanford U., June 1987.)
36. See Penman, "The Distribution of Earnings News Over Time," *op.cit.*
37. Ariel, "A Monthly Effect in Stock Returns," *op.cit.*
38. Y. Hirsch, *Don't Sell Stocks on Monday* (New York: Facts on File, 1986).
39. Data from D. Keim and R. Stambaugh, "A Further Investigation of the Weekend Effect in Stock Returns," *Journal of Finance*, July 1984, pp. 819-837.
40. See L. Harris, "How to Profit From Intradaily Stock Returns," *Journal of Portfolio Management*, Winter 1986, pp. 61-64.
41. Lakonishok and Smidt, "Are Seasonal Anomalies Real?" *op.cit.*
42. For options, see D. Peterson, "A Transaction Data Study of Day-of-the-Week and Intraday Patterns in Option Returns" (Working paper, Florida State U., September 1988). For futures, B. Cornell, "The Weekly Pattern in Stock Returns: Cash Versus Futures: A Note," *Journal of Finance*, June 1985, pp. 583-588, found no anomaly; however, E. Dyl and E. Maberly, "The Weekly Pattern in Stock Index Futures: A Further Note," *Journal of Finance*, December 1986, pp. 1149-1152, located an error in Cornell's data set; F. Phillips-Patrick and T. Schneeweis, "Indexes and Stock Index Futures: Dividend and Interest Rate Effects," *Journal of Futures Markets*, February 1988, pp. 115-120, provide additional evidence.
43. M. Flannery and A. Protopapadakis, "From T-Bills to Common Stocks: Investigating the Generality of Intra-Week Return Seasonality," *Journal of Finance*, June 1988, pp. 431-450.
44. J. Jaffe and R. Westerfield, "The Week-end Effect in Common Stock Returns: The International Evidence," *Journal of Finance*, June 1985, pp. 433-454, find patterns in the U.K., Canada, Japan and Australia similar to those in the U.S. However, in Japan and Australia, both Monday and Tuesday are down, not only because of time-zone differences with the U.S. Mixed evidence from other European countries is reported in G. Hawawini, ed., "European Equity Markets: Price Behavior and Efficiency" (Salomon Brothers Center/N.Y.U. Monograph #4/5, 1984). On exchange rates, see Jaffe and Westerfield, "The Week-end Effect in Common Stock Returns," *op.cit.*
45. R. Roll, "Orange Juice and Weather" (UCLA working paper #10-83, November 1983).
46. D. Keim, "Daily Returns and Size-Related Premiums: One More Time," *Journal of Portfolio Management*, Winter 1987, pp. 41-47. However E. Miller, "Why a Weekend Effect?" *Journal of Portfolio Management*, Summer 1988, argues that intraweek patterns in returns to size are unrelated to the long-run size effect.
47. R. Rogalski, "New Findings Regarding Day-of-the-Week Returns over Trading and Non-Trading Periods: A Note," *Journal of Finance*, December 1984, pp. 1603-1614, demonstrates that the January effect dominates the day-of-the-week effect (that is, Mondays are up on average in January) because of the good performance of small-capitalization stocks, especially during the first five trading days in January. M. Smirlock and L. Starks, "Day of the Week and Intraday Effects in Stock Returns," *Journal of Financial Economics* 17, 1986, pp. 197-210, concur. However, Keim, "Daily Returns and Size-Related Premiums," *op.cit.*, reports that the day-of-the-week effect is not different in January after controlling for the higher overall market return in that month. Although Mondays may be up in January, they lag other days, especially Fridays.
48. See F. Cross, "The Behavior of Stock Prices on Fridays and Mondays," *Financial Analysts Journal*,

- November/December 1973, pp. 67–69; M. Gibbons and P. Hess, "Day of the Week Effect and Asset Returns," *Journal of Business*, October 1981, pp. 579–596; Keim and Stambaugh, "A Further Investigation of the Weekend Effect in Stock Returns," *op.cit.*; Jaffe and Westerfield, "The Week-end Effect in Common Stock Returns," *op.cit.*; L. Harris, "A Transaction Data Study of Weekly and Intradaily Patterns in Stock Returns," *Journal of Financial Economics* 16, 1986, pp. 99–117; and Smirlock and Starks, "Day of the Week and Intraday Effects," *op.cit.*
49. Keim and Stambaugh, "A Further Investigation of the Weekend Effect in Stock Returns," *op.cit.*
 50. See K. French, "Stock Returns and the Weekend Effect," *Journal of Financial Economics*, March 1980, pp. 55–69. The trading-time hypothesis posits that returns are equal each trading day. Clock-time posits that Monday returns should be three times as high as other trading days, because of the weekend.
 51. D. Whitford and F. Reilly, "What Makes Stock Prices Move?" *Journal of Portfolio Management*, Winter 1985, pp. 23–30.
 52. See J. Lakonishik and M. Levi, "Weekend Effects on Stock Returns: A Note," *Journal of Finance*, June 1982, pp. 883–889; E. Dyl and S. Martin, "Weekend Effects on Stock Returns: A Comment," *Journal of Finance*, March 1985, pp. 347–349; and J. Lakonishik and M. Levi, "Weekend Effects on Stock Returns: A Reply," *Journal of Finance*, March 1985, pp. 351–352.
 53. Keim and Stambaugh, "A Further Investigation of the Weekend Effect in Stock Returns," *op.cit.*
 54. Miller ("Why a Weekend Effect?" *op. cit.*) suggests that individual investors buy stocks uniformly over weekdays, at their brokers' urging, but often make sell decisions over weekends.
 55. D. Coursey and E. Dyl, "Price Effects of Trading Interruptions in an Experimental Market" (Working paper, U. Wyoming, 1986).
 56. Penman, "The Distribution of Earnings News Over Time," *op.cit.*
 57. "Federal prosecutors have made several of their most important moves in the [insider trading] scandal late on Friday afternoons, when the market is finished with business and investors can mull the situation over during the weekend," noted J. Crudele, "Dow Off 8.68," *New York Times*, March 14, 1987.
 58. Data from R. Ariel, "High Stock Returns Before Holidays" (Sloan working paper, MIT, 1984). Returns are for the capitalization-weighted CRSP index.
 59. Lakonishok and Smidt, "Are Seasonal Anomalies Real?" *op.cit.*
 60. Ariel, "High Stock Returns Before Holidays," *op.cit.*
 61. See Lakonishik and Levi, "Weekend Effects on Stock Returns," *op.cit.*
 62. Ariel, "High Stock Returns Before Holidays," *op.cit.*
 63. While Hirsch, *Don't Sell Stocks on Monday*, *op.cit.*, reports that St. Patrick's Day is up more frequently than a normal day (p. 121), the percentage return is not abnormal (p. 122).
 64. Hirsch, *Don't Sell Stocks on Monday*, *op.cit.*, p. 38.
 65. R. Kolb and R. Rodriguez, "Friday the Thirteenth: 'Part VII'—A Note," *Journal of Finance*, December 1987, pp. 1385–1387.
 66. Rogalski, "New Findings Regarding Day-of-the-Week Returns," *op.cit.*
 67. Lakonishok and Smidt, "Are Seasonal Anomalies Real?" *op.cit.*
 68. Ariel, "High Stock Returns Before Holidays," *op.cit.*
 69. French, "Stock Returns and the Weekend Effect," *op.cit.*
 70. Lakonishok and Smidt, "Are Seasonal Anomalies Real?" *op.cit.*
 71. Data from Harris, "A Transaction Data Study of Weekly and Intradaily Patterns in Stock Returns," *op.cit.*
 72. Smirlock and Starks, "Day of the Week and Intraday Effects in Stock Returns," *op.cit.*. This non-stationarity resolves previously conflicting evidence on the exact timing of the weekend drop.
 73. L. Harris, "A Transaction Data Study of Weekly and Intradaily Patterns in Stock Returns," *op.cit.*
 74. L. Harris, "A Day-End Transaction Price Anomaly" (USC working paper, October 1986).
 75. *Ibid.*
 76. *Ibid.*
 77. R. Wood, T. McInish and K. Ord, "An Investigation of Transactions Data for NYSE Stocks," *Journal of Finance*, July 1985, pp. 723–739. A strong contemporaneous relation between intraday returns and trading volume is documented in G. Joh, "The Dependence Between Hourly Prices and Trading Volume," *Journal of Financial and Quantitative Analysis*, September 1988.
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 79. Y. Amihud and H. Mendelson, "Trading Mechanisms and Stock Returns: An Empirical Investigation," *Journal of Finance*, July 1987, pp. 533–555.
 80. Harris, "A Day-End Transaction Price Anomaly," *op.cit.*
 81. *Ibid.*