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Anomalies
A Mean-Reverting Walk Down Wall Street

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Economics can be distinguished from other social sciences by the belief that most (all?) behavior can be explained by assuming that agents have stable, well-defined preferences and make rational choices consistent with those preferences in markets that (eventually) clear. An empirical result qualifies as an anomaly if it is difficult to "rationalize," or if implausible assumptions are necessary to explain it within the paradigm. This column will present a series of such anomalies. Readers are invited to suggest topics for future columns by sending a note with some references to (or better yet copies of) the relevant research. Comments on anomalies printed here are also welcome. The address is: Richard Thaler, c/o *Journal of Economic Perspectives*, Johnson Graduate School of Management, Malott Hall, Cornell University, Ithaca, NY 14853.

Introduction

Few propositions in economics are held with more fervor than the view that financial markets are "efficient" and that the prices of securities in such markets are equal to their intrinsic values. For stocks, prices should reflect a rational forecast of the present value of future dividend payments. The efficient market hypothesis has also been traditionally associated with the assertion that future price changes are unpredictable[1] or, in the language of finance texts, efficient capital markets "have no

[1]Price changes would be expected to be totally unpredictable if expected returns were zero. Actually, since stock prices drift up, there is a predictable positive return. However, over short time intervals, expected returns are so small that they are swamped by the return volatility. Some adherents of the efficient market hypothesis no longer believe that predictability implies market inefficiency. The new view is explained below.

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memory" (Brealey and Myers, 1988, p. 289). The logic of this assertion is simple and compelling. If stock prices were predictable, knowledgeable investors would buy cheap and sell dear. Soon, the forces of competition and rational arbitrage would guarantee that prices adjust, only to move again, randomly, in response to unanticipated events.

Many early observers of financial markets, however, believed that security prices could diverge from their fundamental values. For example, in *The General Theory*, Keynes (1936, pp. 153–154) argued that "day-to-day fluctuations in the profits of existing investments, which are obviously of an ephemeral and non-significant character, tend to have an altogether excessive, and even an absurd, influence on the market." Williams (1938, p. 19) notes in his *Theory of Investment Value* that "prices have been based too much on current earning power, too little on long-run dividend paying power."

More recently, the idea that fashions and fads in investor attitudes (or other types of systematic "irrationality") may affect stock prices has gained new respectability with work by, among others, Shiller (1984), De Long, Shleifer, Summers, and Waldmann (1987), and Shefrin and Statman (1988). These papers investigate economies with both rational "information" traders and irrational "noise" traders. Even though specifics differ, rational information trading is usually thought to be based upon the objectively correct probability distribution of returns, conditional on what is known at the time. In contrast, noise trading is based upon incorrect conditional probability assessments. In a world populated by noise traders, there is no theoretical certainty that rational traders dominate the market or that noise traders become extinct, even in the long run. In fact, under plausible conditions, noise traders can even outperform "rational arbitrageurs." Also, prices do not necessarily equal intrinsic value. However, so long as prices have any tendency to gravitate back to fundamentals, they will be mean-reverting over long horizons. That is, they are somewhat predictable and not a random walk.

Whether stock prices *are* predictable is an old question. Eugene Fama's classic (1965, p. 34) paper on this subject begins as follows: "For many years the following question has been a source of continuing controversy in both academic and business circles: To what extent can the past history of a common stock's price be used to make meaningful predictions concerning the future price of the stock?" He concludes some 60 pages later (p. 98): "It seems safe to say that this paper has presented strong and voluminous evidence in favor of the random-walk hypothesis." However, a more recent paper by Fama and French (forthcoming, p. 1) has a rather different opening sentence: "There is much evidence that stock returns are predictable."

Indeed, stock prices do appear to be somewhat predictable. In particular, if one takes a long-term perspective (3–7 years) or examines individual securities that have experienced extreme price movements, then stock returns display significant negative serial correlation, in other words, prices are mean reverting. This column reviews some of this evidence.[2]

[2]For a more extensive survey of the literature and a more complete bibliography, see De Bondt (forthcoming). One topic that we do not discuss is what (prior to October 1987) used to be called the excess volatility "debate." For a review of this literature, see West (1988). As Campbell and Shiller (1988) stress, excess volatility implies predictability, so the issues are closely related.

Mean Reversion In Stock Market Averages

The early empirical investigations which led to Fama's 1965 conclusion that stock prices were unpredictable stressed simple short-run correlations using data bases that, at least by modern standards, seem small. Fama's study investigated whether there was any serial correlation in the day-to-day price changes of the 30 stocks composing the Dow Jones Industrial Average for the period 1957–62. Though Fama found statistically significant positive serial correlation, he concluded that the correlations were too small to be of any economic significance. However, if the time period is lengthened, and the number of stocks are increased, new patterns emerge. For example, French and Roll (1986) repeat Fama's tests for all NYSE and AMEX stocks during the 1963–1982 period. They report significant negative serial correlation in daily returns.

Also, much larger and economically more important correlations are found by examining longer time periods. For example, the procedure adopted by Fama and French (1988) is simply to regress the return on a stock market index over some time period of length T, on returns over the prior period of equal length. If prices are a random walk, then the slope in the regression should be zero. If prices are mean reverting, then the slope should be negative. Fama and French use monthly nominal return data from 1926–1985 for firms listed on the New York Stock Exchange. They study both equal-weighted and value-weighted indexes as well as the returns to portfolios formed on the basis of the size of the firms.[3]

The results reveal considerable mean reversion. The slopes of the regressions are generally negative for horizons from 18 months to 5 years. Both the R^2 and the slope increase with the length of the horizon, T, up to 5 years, then decrease. The slopes are more negative for portfolios of smaller firms and for the equal-weighted index than for the large-firm portfolios or the value-weighted index. The mean reversion also has declined over time, with the results for the subperiod 1941–1985 weaker than the earlier period.

The fact that prices are mean reverting implies that prices are predictable. Regressing a three to five year future return on past annual returns yields substantial forecasting power. For the equal weighted index and the smallest quintile the R^2 is about .4. The R^2 is about .3 for the middle quintiles, and above .2 for the largest quintile and the value weighted index. Thus about 25–40 percent of the three to five years are predictable from past returns. Even better forecasts are possible using the current market dividend yield, that is the price divided by the dividend (Fama and French, forthcoming).

Fama and French's results have been replicated and extended by Poterba and Summers (forthcoming) using a variance ratio test. This test exploits the fact that if the log of stock prices follows a random walk then the return variance should be proportional to the return horizon. That is, the variance of monthly returns should be

[3]The procedure is to rank all the NYSE firms that appear on the Center for Research in Security Prices (CRSP) tape based on their market value (price of the stock times number of shares outstanding). Then decile portfolios are formed with the smallest 10 percent of the firms in the first portfolio, and so on.

1/12 of the variance of annual returns, which in turn should be 1/5 of the variance of 5 year returns. The variance ratios are scaled so that if returns are uncorrelated the ratios equal 1.0. A variance ratio of less than unity implies negative serial correlation; a ratio greater than one implies positive serial correlation. While Poterba and Summers argue that the variance ratio test is best, they show that even it has limited power to test the random walk model against plausible alternatives. In their view, it may be appropriate to reject the null hypothesis (of a random walk) at confidence levels higher than the conventional .05. The point is that while the tests may not always reject the random walk, they clearly do not reject mean reversion either.

Poterba and Summers first confirm Fama and French's results for both real returns and returns in excess of a Treasury bill yield. The variance of eight year returns is about four (rather than eight) times the variance of annual returns. For horizons of less than one year, however, returns display some positive serial correlation (see also Lo and MacKinlay, 1988). The evidence for mean reversion over long horizons is weaker if the depression years before World War II are excluded. However, there appears to be substantial mean reversion in nominal and excess returns over the period 1871–1925.[4]

Poterba and Summers also investigate whether mean reversion can be found on the stock exchanges of other countries. They use data for Canada since 1919, Britain since 1939, and fifteen other countries for shorter postwar periods. The Canadian and British markets display patterns similar to those found in the United States, namely strong mean reversion over long time horizons, and some positive serial correlation over short horizons. The eight year variance ratios are .585 for Canada and .794 for Britain. Most of the other countries also display negative serial correlation at long horizons, the only exceptions being Finland, South Africa and Spain. The average eight year variance ratio for all non-U.S. countries is .754 (or .653 if Spain, a distinct outlier, is excluded.) From the international evidence, Poterba and Summers conclude that mean reversion is more pronounced in less broad-based and less sophisticated (foreign) equity markets.

In the face of this evidence, adherents of efficient markets must search for rational explanations of why equilibrium expected returns vary over time. Following a line of argument suggested by Shiller (1981), one might ask how much expected returns in the stock market would have to vary to account for the observed changes in stock prices. Poterba and Summers calculate that the annual standard deviation of expected returns would have to be between 4.4 percent and 15.8 percent. Given the fact that investors will only put money into stocks if there is a positive expected return —if the expected return in stocks is not positive, they can always keep their money in a bank account—the variances calculated by Poterba and Summers would imply that expected returns must exceed 20 percent fairly regularly. They (and we) judge 20 percent to be too high an expected return to be plausible in a world with only rational investors. (Wouldn't you buy stocks if you thought the expected return were 20

[4]The mean reversion for real returns is weaker. Poterba and Summers argue that this may be produced by the "jagged character of the Consumer Price Index series in the years before 1900."

percent?) Since the power of the statistical tests is low and the tests do not permit us to reject either hypothesis conclusively, judgments of this sort are a necessary part of evaluating the evidence.

Mean Reversion in the Cross Section

One type of mean reversion in cross-sectional stock prices has been discussed in the literature at least since the time of Benjamin Graham (1949), one of the pioneers of security analysis. He advocated the purchase of stocks whose prices seemed low relative to their fundamental value. This "contrarian" advice is based on the premise that such prices are temporarily low, and can be expected to bounce back after one or two years.

Modern empirical work suggests that simple contrarian strategies do yield excess returns. For example, Basu (1977) showed that the strategy of buying stocks with low price to earnings per share ratios (P/E ratios) yields "abnormal" returns over and above the "normal" required returns that represent compensation for risk. (Similarly, firms with high P/E's earn below normal returns.) Basu offered the "price-ratio hypothesis" to explain the results. Companies with low P/Es are temporarily undervalued because the market gets inappropriately pessimistic about current or future earnings. Eventually, however, actual earnings growth differs predictably from the growth rate impounded in the price. Price corrections and the P/E anomaly inexorably follow. Also consistent with the hypothesis, earnings yields affect the association between annual income numbers and share prices (Basu, 1978). During the twelve months that lead up to the announcement date, unanticipated increases in earnings cause larger positive residual returns to securities with low P/Es than to securities with high P/Es.

Similar results apply to other contrarian indicators such as the dividend yield (high dividend yields may suggest that a firm's stock price is too low) or the ratio of the price of the stock to the book value per share, an accounting measure of the value of the firm's assets. Stocks with very high dividend yields or very low price to book value ratios also earn abnormal returns after normal risk adjustments (Keim, 1985; Rosenberg, Reid, and Lanstein, 1985).

Our own research on this topic (De Bondt and Thaler, 1985, 1987) was motivated by the hypothesis that the contrarian strategies are successful because of systematic investor overreaction. There is substantial evidence in the psychology literature that individuals tend to overweight recent data in making forecasts and judgments (Kahneman and Tversky, 1973; Grether, 1980). If this behavior is manifest in financial markets, then we should observe mean-reverting returns to stocks that have experienced extremely good or bad returns over the past few years.

To test for this possibility, our 1985 paper studied the investment performance of (35 stock, 50 stock, or decile) portfolios of long-term winners and losers; that is, exceptional performers over prior "formation periods" ranging between one to five years. We used monthly return data for the 1926–1982 period and considered all

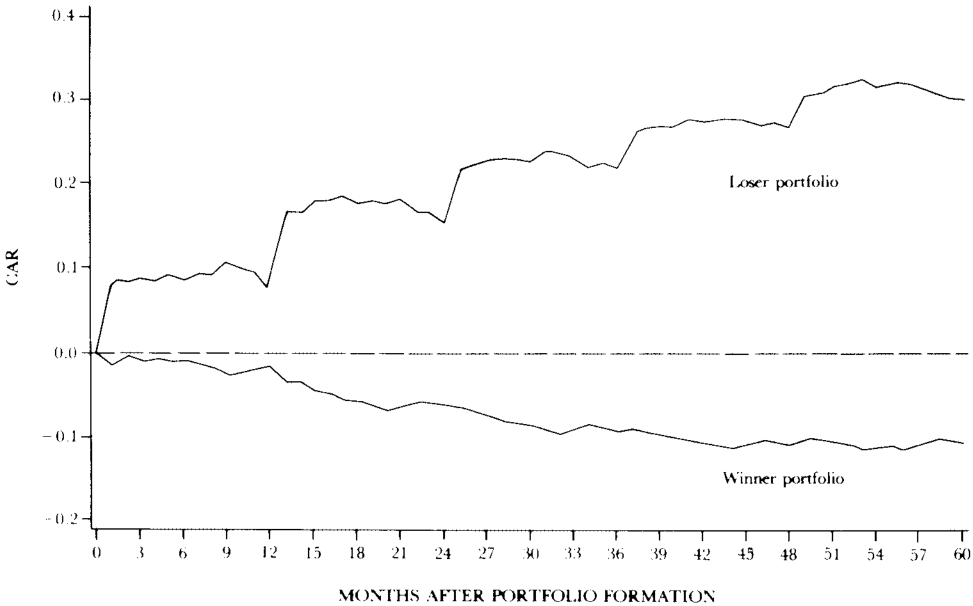

Fig. 1. Cumulative excess returns for winner and loser portfolios (De Bondt and Thaler, 1985)

stocks listed on the NYSE for possible inclusion. In one such experiment, portfolios of the 35 most extreme winners and losers over the five years between January 1928 and December 1932 were formed and then followed and for the next five years (the "test period"). The same experiment was conducted 46 times by advancing the starting date one year each time. Finally, average test period performance in excess of the mean return on a NYSE index (giving equal weight to each company on the exchange) was computed.

The test period findings are displayed in Figure 1. Three aspects of the results stand out. First, the returns for both winners and losers are mean-reverting. Second, the five-year price reversals for losers[5] are more pronounced than for winners (about +30 percent vs. about −10 percent excess return). Third, most of the excess returns for losers occur in January, as shown by the five sharp jumps in the return line. These three qualitative results are observed in all the versions of the study we conducted. In addition, and consistent with overreaction, it appears that the more extreme are the initial price movements, the greater are the subsequent reversals. For formation periods of three to five years, an "arbitrage" strategy that buys losers by selling

[5]The excess returns to the losers are not caused by a "survivorship bias." To enter the sample a firm must only be listed as of the start of the test period. If a firm goes bankrupt, or is otherwise delisted during the test period, we "sell" the stock at the next price at which the stock is traded; if necessary at zero. In fact, however, few NYSE firms actually go bankrupt, even within our loser sample.

winners short earns average annual returns ranging between 5 and 8 percent, with most of the returns occurring in (the successive months of) January.[6]

Two sorts of explanations have been offered for the apparent excess returns earned by the losers. First, losers tend to be smaller than average firms. It has been established that small firms earn abnormally high returns (though mostly in January, Banz, 1981; Keim 1983), so perhaps the "losing firm effect" is simply a reincarnation of the small firm effect. Second, since the losers have obviously been having a rough time financially, perhaps they have become substantially riskier, and the apparent excess return is simply a normal return to their high level of risk. We find neither explanation completely satisfactory.

There is, certainly, a relationship between the size effect and the losing firm effect. The firms in our loser portfolios have lost a substantial portion of their value. Since firm size is usually measured by the market value of equity (share price times number of shares outstanding), the losing firms became much "smaller" during the formation period. Nevertheless, the losers are not the same very small firms normally associated with the small firm effect. In our 1987 paper we replicated our original results with NYSE and AMEX firms from a COMPUSTAT sample covering the period 1966–83. We found that even quintile portfolios of losing firms (less extreme performers than the stocks studied in our earlier paper) earn about 25 percent above the market over a four year period after portfolio formation. These firms had an average market value of $304 million. In contrast, the mean market value of the smallest quintile of firms is only $9 million. These firms earn about 30 percent above the market in four years. Also, these very small firms have, on average, fallen in price over the past few years. That is, they are losers. So, while losing firms tend to be smaller than average, and small firms tend to be prior losers, it seems that there are two anomalies here, not one.

Nevertheless, Fama and French (1986) and Zarowin (1988) both argue that the losing firm effect is subsumed by the size effect. Fama and French first form decile portfolios ranked by size. Then within each size portfolio they examine the returns for 3-year winner and loser *quartiles*. They find that the losers outperform the winners, but insignificantly except in January. In contrast to our results, they find stronger reversals for the winners than for the losers. Using a similar approach Zarowin finds that the 3-year return on an arbitrage (loser minus winner) portfolio ranges from 7 to 19 percent for the smallest four quintiles, but virtually zero for the largest quintile. However, none of the returns are significantly different from zero.

Since both winners and losers tend to be relatively small, it follows mechanically that computing excess returns relative to a size-matched portfolio will decrease the returns to losers and increase the returns to winners. However, without any theory explaining how the market value of a company may proxy for its investment risk, it is

[6]The excess returns in January do not depend on when the investment strategy starts. There are still excess returns in January for portfolios formed, say, in July.

difficult to interpret size-adjusted returns. Why should a portfolio of many small firms represent a more risky investment than just one conglomerate firm of equivalent size?

More generally, the argument that the apparent excess return to losers or small firms is compensation for risk, however understood, cannot be falsified in the absence of operational risk measures suggested by economic theory. The most common risk measure used in finance remains the Capital Asset Pricing Model (CAPM) beta. The CAPM beta is the coefficient of the return on the security regressed on the return on the market index. Beta measures the degree to which a security's price variability cannot be smoothed out and diversified away, even by an investor who chooses to hold the market portfolio. Only this "systematic" risk should be priced in equilibrium.[7]

If the CAPM beta is an adequate risk measure, then the difference between the winner and the loser returns cannot be attributed to differences in risk. If beta is measured over the formation period, in fact, the losers have lower betas than the winners. However, Chan (1988) and Vermaelen and Verstringe (1986) argue that one should look at the test period betas, since risk may have changed as the losers were losing and the winners were winning. Still, the test period betas are only slightly higher for losers than for winners (1.263 vs. 1.043) and this estimated risk difference is not capable of explaining the gap in returns. Actually, it may well be argued, at least intuitively, that the beta difference is misleading because both winners and losers have very peculiar time patterns of returns. In De Bondt and Thaler (1987) we estimated for both portfolios two types of betas: one for periods when the market portfolio is rising in value, and one for periods when the market is falling. (An implicit assumption of the CAPM is that these two betas are equal.) In the test period, the loser portfolio has a bull market beta of 1.39 and a bear market beta of .88. This implies that the losers go up 13.9 percent when the market goes up 10 percent, but the losers only fall 8.8 percent when the market falls 10 percent. This doesn't seem too risky to us! In contrast, the winner portfolio's bull and bear betas are .99 and 1.20 respectively. Combining them we find that the arbitrage portfolio has a bull beta of .40 and a bear beta of −.32. This means that, on average, the arbitrage portfolio goes up when the market rises, and also goes up when the market falls.

Short Term Mean Reversion

One way of testing the size and risk explanations of the loser price reversals is to examine shorter time horizons. If a stock falls or rises 10 percent in a day, it is unlikely that the objective risk of the stock has changed significantly, and obviously the company's "size" has changed only by 10 percent. Thus if mean reversion is observed over very brief time periods, factors other than size or objective risk can be assumed to be at work.

[7]The more recent Arbitrage Pricing Theory (APT) retains the intuition that expected returns are related to systematic risk, but the theory moves beyond a single factor model of returns. However, the APT does not specify how many factors there are, nor does it say what they are.

Table 1
Short-Term Price Reversals: An Overview of the Literature

	Sample	*Methods*	*Summary of selected findings*
Dyl and Maxfield [1987]	daily returns 1974–1984 NYSE and AMEX companies	buy/sell 3 stocks with largest price 1-day loss/gain on 200 trading days selected at random	next 10 trading days winners: −1.8 % losers: +3.6 %
Bremer and Sweeney [1988]	daily returns 1962–1986 Fortune 500 companies	all one-day (absolute) returns in excess of 7 1/2,10 or 15 percent	next 5 trading days winners: −.004 % losers: +3.95 %
Brown, Harlow and Tinic [1988]	daily returns 1963–1985 200 largest companies in the S & P 500	all one-day (market model) residual returns in excess of (absolute) 2 1/2 percent	next 10 trading days winners: +.003 % losers: +.37 %
Howe [1986]	weekly returns 1963–1981 NYSE and AMEX companies	all returns that rise or fall more than 50 percent within one week	next 10 weeks winners: −13.0 % losers: +13.8 %
Lehmann [1988]	weekly returns 1962–1986 NYSE and AMEX companies	buy all stocks that lagged the market during the previous week ("losers") and sell short the equivalent "winners"	for $1 long in zero-investment arbitrage portfolio, earn 39 cents every 6 months; 2/3 of profits generated by prior "losers"
Rosenberg, Reid, and Lanstein [1985]	monthly returns 1981–1984 NYSE companies	buy stocks with negative residuals (relative to multifactor model) and sell short stocks with positive residuals over the previous month	arbitrage portfolio earns 1.36 % per month; profits mostly generated by prior "losers"
Jegadeesh [1987]	monthly returns 1945–1980 NYSE companies	regressions relating Sharpe-Lintner residual returns to raw returns of previous month and returns in earlier years	extreme decile portfolios: difference in residual returns is 2.5 % per month
Brown and Harlow [1988]	1- to 6-month returns; 1946–1983 NYSE companies	study stocks with residual returns that gain/lose (between absolute) 20 and 65 percent between one to six months	large rebounds for losers; no decline for winners except in first month

Several studies have used a design similar to De Bondt and Thaler (1985) to examine short-term price movements. We will describe one of these studies in detail, and present the key results of the other studies in Table 1. The study we will concentrate on is by Bremer and Sweeney (1988). For the period July 1962 to December 1986 they consider all the cases where a Fortune 500 company has a one-day price change of 10 percent or greater. (They also report the results for cutoffs of 7.5 percent or 15 percent.) By considering only large firms, Bremer and Sweeney eliminate several possible objections to their results. For example, for very low-priced stocks large percentage price changes could reflect (in part) the bid-ask spread. However, since large firms' stock prices tend to be traded for more than $10 a share, this problem should not be of great importance.[8] Also, it is clear that the small firm effect cannot be invoked to explain any anomalous results.

For Bremer and Sweeney's sample there are 1,305 price declines and 3,218 increases. Stock prices are then tracked for 20 days after the jump. For losers, after five days the stocks have earned 3.95 percent return. (The average initial drop was about 13 percent). For the cutoff values of 7.5 percent and 15 percent, the five day excess returns are 2.84 percent and 6.18 percent. Winners, on the other hand, show virtually no excess returns in the period immediately following the event.

Notice that the pattern of returns following these large one-day jumps is remarkably similar to that observed for long-term winners and losers. That is, there is a significant correction for losers but not for winners, and the correction increases with the size of the initial price jump. As shown in Table 1, this pattern is repeated in most of the other studies of large short-run price changes.

There is one more study of short-term price reversals that deserves mention but differs from the other papers summarized in Table 1. This is the paper by Lehmann (1988). Using weekly returns, Lehmann studies the profitability of a return reversal strategy which finances its purchases of short-term losers (the stocks that underperformed the market over the previous week) by selling winners short (the stocks that outperformed the market). Unlike the others papers summarized in Table 1, Lehmann's research is not limited to extreme performers. Almost all securities listed on the NYSE and AMEX over the period 1962–1986 are included in his strategy. However, the dollar amount invested in each security is proportional to its (absolute) weekly excess return—that is, extreme performers carry more weight in the arbitrage portfolio. Typically, there are more than 2000 round trip transactions per week.

Because of the large number of transactions, the profitability of this strategy depends critically on the level of transaction costs. For floor traders, however, the strategy is extraordinarily successful. If transaction costs are assumed to be 0.1 percent each way, then portfolios which are long $100 million of losers and short $100 million of winners earn average six-month profits of $38.77 million, with about 2/3 of the profit generated by the losers. Consistent with the other studies, the winners and losers that gained or lost the most experienced the largest reversals.

Commentary

Risk and Perceived Risk

Many fields of inquiry have idiosyncratic disclaimers. In finance, a popular disclaimer in papers reporting anomalies is this: "Of course, it is not possible to test

[8] Indeed, Bremer and Sweeney test for this problem by deleting all firms with share prices less than $10 and find that the first post-event day returns are virtually unaffected.

for market efficiency directly. It is only possible to conduct *joint* tests of market efficiency and some model of equilibrium prices." In light of this problem, Fama and French (1986, p. 23) conclude:

> The tendency toward reversal... may reflect time-varying expected returns generated by rational investor behavior and the dynamics of common macro-economic driving variables. On the other hand, reversals generated by a stationary component of prices may reflect market-wide waves of over-reaction of the kind assumed in models of an inefficient market. ... Whether predictability reflects market inefficiency or time-varying expected returns generated by rational investor behavior is, and will remain, an open issue.

This is an open-minded but pessimistic conclusion. Are market rationality and irrationality indistinguishable? While the task ahead is certainly difficult, we prefer to keep pushing for implications of competing models.

Consider the problem of discriminating between overreaction and risk as explanations for mean reversion. If the excess return to losers or the mean reversion in market indexes is to be satisfactorily explained by some as yet poorly understood risk measure, then it will also be necessary to show that the (time varying) risk is "real." There is substantial evidence in other domains that perceived risk and actual risks can diverge. For example, people judge the risk of death by homicide to be greater than the risk of death by diabetes or stomach cancer, though the actual numbers of deaths are about 18,000, 39,000, and 95,000 per annum respectively (Slovic, Fischhoff, and Lichtenstein, 1982).

To get a sense of how a model with faulty risk perceptions might work, suppose that (marginal) investors judge the risk of both extreme winners and losers to be greater than the objective risk. Losers might be considered very risky because bankruptcy risk is overestimated. Winners might be considered risky because they appear to have so much "down-side potential." Such firms will bear an excess risk premium, forcing prices lower. Suppose further that investors have a tendency to overreact to recent earnings trends, failing to make proper Bayesian forecasts. This combination of misperceived risks and faulty judgments could explain the observed asymmetry in returns to winners and losers. That is, losers show price reversals because the overreaction effect and the excess risk premium both work in the same direction (lowering prices). When information comes in and investors discover that their fears were exaggerated and their earnings forecasts were too pessimistic, prices increase. For winners, however, the overreaction effect drives prices too high while the excess risk premium holds prices down. Since the two effects go in the opposite direction, the reversals of winners should be smaller or nonexistent, as observed.[9]

[9]See Brown, Harlow and Tinic (1988) for a similar analysis, couched in terms of rational choice. The evidence they present, however, is inconsistent with the CAPM, and therefore appears to support an irrational perceived risk interpretation more than their rational risk aversion explanation.

Event Studies

The assumption of efficient capital markets is incorporated in the "event study" methods now popular in accounting, industrial organization, and finance. Event studies attempt to measure the financial impact of a change in the company's environment by focusing on the change in the firm's stock market value around the time that news about it first became known to the public. Typical events include takeover bids, new equity issues, changes in accounting rules, or a change in the tax law. Many event studies, particularly those which draw policy conclusions, take it as an article of faith that the change in market value is an unbiased estimate of the change in "fundamentals." It is an article of faith because, as far as we know, there is no evidence to support this claim. Suppose one firm buys another and increases in value by 10 percent. This represents the market's estimate of the net present value of the acquisition. To test whether this estimate is unbiased, one would want to look at a long enough period of time for the actual results of the merger to be realized. Do the managers get along? Does the synergy that was hoped for actually occur? Is top management overextended? Were the buyers subject to the winner's curse? Perhaps after five years or so it would be possible to answer most of these questions. So, one measure of whether the event day price is unbiased is whether it is an accurate forecast of the price five years later. Unfortunately, stock prices are so variable that we have no real way to test this hypothesis.

In this context, the Bremer and Sweeney paper may be thought of as an "event study of event studies." Since such studies focus on large price changes, what Bremer and Sweeney have done in essence is to collect a series of events without specifying what they are. For positive events, the market yields unbiased estimates (as judged two weeks or so later) while, for negative events, the immediate price reaction appears biased. The De Bondt and Thaler results for long-term losers suggest a similar conclusion. For companies that experience a series of "bad events," the price correction may take several years.

Concluding Remarks

Financial markets are fertile territory for anomaly mining. However, we do not think that anomalies are so abundant in finance because the theories are worse than in other areas of economics. Rather, anomalies are common because the theories are unusually well-specified (so they can be tested) and the data are unusually rich. This combination of well-specified models, good data, and many anomalies makes finance an extremely exciting research area. The real challenge facing the field is to develop new theories of asset pricing that are consistent with known empirical facts *and* offer new testable predictions. We are pessimistic about the chances of success for traditional models in which all agents are assumed to be fully rational. Models in which some agents have nonrational expectations of future cash flows, or have faulty risk perceptions, seem to us to offer greater promise. However, the current state of these models does not permit them to be carefully tested. When such tests become possible, it may well turn out these models are in as much conflict with the data as is the traditional framework.

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