An Analysis of Anomaly Sensitivity to Market Conditions Using Linear and Nonlinear Techniques

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Abstract

This paper extends current knowledge of capital market anomalies through an analysis of their explanatory power under a variety of market conditions. The market anomalies considered are the popularly reported firm size effect, price/earnings ratio effect, and Value Line enigma. This paper demonstrates that their previously documented significant relationship with subsequent returns is dependent upon stock market and business conditions. Linear estimation tools include analysis of variance and means comparison routines. Anomaly significance also is investigated using stochastic dominance. Before portfolio formation on the basis of these anomalies, the investor must consider market conditions.

Introduction

Abnormal returns cast doubt on the efficient market hypothesis and tempt investors with the opportunity to earn returns in excess of those supported by portfolio risk. One question that has not been addressed fully previously in the market efficiency literature is the importance of market conditions in anomaly significance. Should the investor consider anomaly characteristics in light of the current stock market and business conditions? Should investors focus on some anomalies under a given set of market conditions and another set of anomalies under a different set of conditions? Furthermore, might anomaly significance be a statistical artifact resulting from the use of linear parametric analytical techniques? These are the research questions in this investigation.

Additional insight to market efficiency may be gained by analyzing the sensitivity of the anomalies to the concurrent market condition. It is possible that an anomaly has explanatory power only in the presence of bull or bear market conditions. For instance, small firms may do extremely well in expanding (bull) markets, but show lackluster performance during business contractions. Alternatively, Value Line may find it easier to project the few star performers in a recessionary (bear) market than the best of the advancing crowd when a bull market exists. If the market's condition has no impact on anomaly

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explanatory power, then the significance of chosen anomaly characteristics would remain unchanged.

This report describes an empirical analysis of the relationship between equity returns and firm size, price/earnings (P/E) ratios, and Value Line timeliness rankings under alternative market conditions. Parametric and nonparametric methods are used in the analysis.

Review of Relevant Anomaly and Market Condition Literature

The Firm Size Effect

Among the most commonly studied anomalies are firm size, P/E ratio, and Value Line's timeliness rankings. A continuous line of rigorous research dating to Banz (1981) suggests that small firms, on average, earn higher risk-adjusted returns than larger firms. The size term was found to have roughly the same statistical significance in explaining returns as did beta.

Reinganum (1982, 1983) demonstrated that differences in trading frequency, tax-loss selling, or differences in the bid-ask spread between large and small firms did not explain fully the January effect. P/E ratios, dividend yield, standard deviation of return, and coskewness were unable to explain the negative relationship between firm size and subsequent returns (Elton and Gruber (1984, p. 406)).

The P/E Ratio Effect

Wall Street folklore advocated buying firms with low P/E ratios long before Basu (1975, 1977) rigorously tested the P/E anomaly. Exaggerated optimism was believed to be associated with high P/Es and exaggerated pessimism supposedly led to low P/E figures. Subsequent price adjustments, as investor perception becomes more moderate, supposedly produce an inverse relationship between P/E and security returns.

Abnormal returns of the two lowest P/E quintile portfolios were positive in at least 14 of 18 months following portfolio formation in Basu's original sample. After controlling for differences in firm size, Basu (1983) provided evidence that the common stock of low P/E ratio firms earn, on average, higher risk-adjusted returns than the common stock of high P/E firms. Low P/E ratio stocks stochastically dominated high ratio stocks in a study completed by Levy and Lerman (1985). Transaction costs and errors in P/E ratio forecasts are insufficient explanations of the P/E effect, according to Dowen and Bauman (1984, 1987).

Jacobs and Levy (1988) found the P/E and size effects to be independent and statistically significant. Furthermore, the anomalies are not apparently proxying for other underlying effects. Rogers (1988) also documented the existence of both the size and P/E anomalies on the American Stock Exchange. Although Tseng (1988) found the P/E effect was subsumed within the firm size effect, these conflicting results may be the result of using a within-groups portfolio assignment procedure, which was scrutinized in Cook and Rozeff (1984).

The Value Line Timeliness Rankings Enigma

Employing over 200 security analysts, Value Line Incorporated is among the largest independent investment advisory services. Approximately 1700 stocks are ranked 1 through 5, with 1 being the most timely selection, based on expected price performance over the subsequent year, relative to other stocks analyzed by Value Line.

The Value Line predictions have been the subject of several academic studies because they represent a clear attempt to use historical data to try to predict future performance. The first systematic study of Value Line's rankings ability found that the risk-adjusted performance on a long position in rank 1 and a short position in rank 5 was 10 percent. This finding led Black (1982) to conclude that most investment management organizations would improve performance if they fired all but one security analyst and provided him or her with the Value Line service. An analysis based upon benchmark betas led Copeland and Mayers (1982) to conclude that Value Line rankings represent an enigma. Huberman and Kandel (1987) recently have noted little relationship between the Value Line and firm size phenomena.

Market Condition Research

Much of the prior research on the influence of stock market conditions on equity returns has investigated the sensitivity of risk measures to such conditions. Fabozzi and Francis (1977) found little shifting of alphas or betas across bull or bear market conditions. Kim and Zumwalt (1979) found that 11 percent of the firms in their sample had significantly different betas in up markets and down markets. Kim and Zumwalt (1979) and Chen (1982) observed the equity markets compensating the investor for assuming downside return variation. Klein and Rosenfeld (1987) suggest the use of either market-adjusted or single index risk-adjusted models (as are used in this study) instead of mean-adjusted or raw market returns, the latter being upwardly (downwardly) biased during bull (bear) markets.

One researcher has considered anomaly performance in terms of market conditions. Holloway (1981) states that there was little difference in timeliness explanatory power in rising and falling markets, although the abnormal return on rank 1 portfolios ranged from 0 percent to 10 percent. Holloway's sample only consisted of stocks ranked 1 by Value Line over the 1974 to 1977 period. This period had one bear market period followed by one bull market. Whereas Holloway presents returns data, this study directly tests the significance of the relationship between timeliness rankings and subsequent returns.

Recent investigations of the influence of business conditions on equity returns tend to focus on the response of broad stock market indexes to unanticipated macroeconomic information (see Hardouvelis (1987) and Abell and Krueger (1989)). Fama and French (1988) investigated the behavior of metals prices across business cycles.

Research Procedure

The Sample

Firms continually followed by Value Line from 1975 through 1984 form the sample set. This set was chosen because it consists of corporations on which information was disseminated widely. Therefore, it tends not to be sensitive to the firm neglect/informational deficiency hypothesis of Arbel (1985) and Strebel and Arbel (1983).[1]

Data for portfolio assignment and return generation were obtained from *Value Line Investment Survey* and three tapes: the Compustat PDE file, Center for Research in Security Prices (CRSP) tape, and Value Line Data Base-III. The sample consisted of the common stock of firms for which the following set of information was available:

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[1]To identify the level of institutional interest among small firms, the frequency of institutional ownership and percentage of outstanding shares held by institutions was obtained using the Standard & Poor's *Stock Guide*. Ownership information was gathered for the months at the beginning (January 1975), mid-point (January 1980), and end (December 1984) of the sample period. The average small firm had 17 institutional investors. Institutional ownership ranged from 0 to 92 institutions, while the percentage ownership ranged from 0 percent to 85 percent. Fewer than 4 percent of small firms were not held by at least one institution, while 82 percent were held by over three institutions. Some medium size and large firms were also without institutional ownership. Institutions tended to pay attention to the small firms in this sample. The authors wish to thank an anonymous reviewer for suggesting this analysis.

- Complete monthly closing price data from December 1969 through December 1984.
- Value Line timeliness rankings for December 1974 through September 1984.
- Complete information on the number of shares outstanding for the 1975 through 1984 period.
- Complete quarterly earnings information from the last quarter of 1973 through the second quarter of 1984.

Only corporations traded on an exchange located in the United States were included in the sample set, in order to remove any confounding effects on capital appreciation caused by exchange rate fluctuations. Of a potential 1600 firms that are followed by Value Line, 913 met these information requirements and were included in the sample set.[2]

Monthly returns were calculated on the basis of monthly closing prices and dividends reported by Compustat. Market-adjusted excess returns were obtained by reducing monthly portfolio returns by the return on the equally-weighted CRSP portfolio including dividends. Market-excess returns were calculated using the following equation:

$$E_{jt} = R_{jt} - R_{mt}$$

where:

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[2]There is the potential for survivorship bias. The main reasons for firms being excluded from the sample are a lack of monthly data available on the PDE tape back to 1969 or that Value Line ceased to follow the firm. Approximately one half of the firms no longer followed by Value Line were the result of mergers or acquisitions. Other reasons for exclusion include timeliness rank withholding during periods of firm uncertainty, name change, Canadian, lack of interest, going private, and bankruptcy. About 2 percent of the nonsurviving firms went bankrupt. Firms that went private, were acquired or merged, or went bankrupt are not on the PDE tape. Likewise, firms that change name generally have CUSIP changes. Historical names and CUSIPs are not contained on the PDE tape. It is unclear what effects the survivorship problem may have on the results. To the extent Value Line is capable of predicting candidates for acquisition or potential bankruptcies, these activities probably would be reflected in their timeliness rankings. Thus, including such firms potentially could have increased the relative importance of the ranking variable. Also, the ranking by P/E interaction might be enhanced under the assumption that takeover targets tend to be undervalued and may have low P/E ratios. Last, to the extent acquisitions are associated with smaller firms and that more premiums are associated with these acquisitions, the size variable effects could have been enhanced. A detailed analysis of the nonsurviving firms would be an interesting study, but such analysis is beyond the scope of this investigation.

E_{jt} = portfolio j's excess return during month t;
R_{jt} = portfolio j's actual return during month t;
R_{mt} = CRSP equally-weighted return during month t.

Alphas and betas were calculated by regressing the latest five years of monthly returns on changes in the equally-weighted CRSP portfolio, using the single index market model. Beta then was multiplied by the next period's market return. Alpha and this equity risk premium were subtracted from each portfolio's return in order to generate beta-adjusted residual returns. The equation is:

$$BAR_{jt} = R_{jt} - a_{jt} - b_{jt}R_{jt}$$

where:

BAR_{jt} = portfolio j's beta-adjusted residual return in month t;
R_{jt} = portfolio j's actual return during month t;
a_{jt}, b_{jt} = portfolio j's regression parameters calculated using the market model over the prior 60 months;
R_{mt} = CRSP equally-weighted return during month t.

Portfolio formation was conducted on a quarterly basis, in accordance with the cycle over which Value Line updates all timeliness recommendations. Portfolio formation was conducted after the market closed on the last day of each calendar quarter from December 1974 through September 1984.

In accordance with prior research, size was measured in terms of the market value of the firm's outstanding common equity.[3] Share price was multiplied by the number of shares outstanding. P/E ratios were obtained by dividing the quarterly closing share price by the latest reported 12 month earnings, requiring a reporting lag of at least two months. Value Line rankings were collected manually from the latest *Investment Survey*.[4] A 45 cell portfolio matrix was

[3]The kurtosis of the return distribution of information-poor firms is greater than that of information-rich firms, according to Damodaran (1987). The kurtosis values for the market-excess returns data are 2.69, 1.17, and 2.99 for small, medium, and large firms, respectively. A kurtosis value between those of the other size categories implies that small firms in the Value Line universe are not necessarily information poor.

[4]There may have been a lag of up to four trading days between the publication of the *Survey* and the portfolio formation date. During these four days, the market may have reacted to the timeliness report, which would reduce the explanatory power of timeliness rankings.

used for testing purposes, based on three equally sized classes of both firm size and P/E and Value Line's five level timeliness rank.[5]

The Methods

Analysis of variance results were generated in order to compare results to those commonly presented in prior anomaly literature. According to Lindman (1974, pp. 31-37), for most sets of population means, the F-test is the most powerful test that one can make, given that the data are generally in agreement with the following list of assumptions:

- Cell observations are drawn from independent normal distributions;
- The variance of the distribution is constant and the same across cells; and
- Cell observations are independent within the cell.

Any appreciable divergence from these assumptions would result in a large ANOVA F-ratio. Perhaps the last assumption, of mutual independence of observations, is potentially the most serious of the potential deviations from the underlying assumptions of the ANOVA. As the observations in the cells are from a time series, it could be expected that they potentially would have serial correlation. In order to measure the degree of correlation in the residuals, the Durbin-Watson statistic was estimated for the set of market-excess and beta-adjusted residual returns. As one can see by reviewing the first column of figures in Table 1, the level of serial correlation appears to be minimal.

A multiple comparison method based on Fisher's least significant difference (LSD) procedure was used to obtain more specific information about relative anomaly-based portfolio performance differences. This technique allows one to specify which anomaly-based portfolios have significant positive and negative returns and invest accordingly if the return difference exceeds transactions costs. According to Ott (1977, pp. 384-388), this is a beneficial test following a significant F-test in the analysis of variance.

Both analysis of variance and means comparison techniques assume that portfolio returns are normally distributed and have equal variance. Lindman (1974) and Glass and Stanley (1970, pp. 368-374) note the robust nature of the F-test to nonnormality and inequality of variance when portfolios have similar sizes and at least 35 observations. In the present analysis, over 35 portfolio

[5]Preliminary tests that were run using over three classes of firm size and P/E resulted in an abundance of empty cells.

returns were available in all but one instance.[6] As is shown in Table 1, however, market-excess returns exhibit positive skewness and a flat platykurtic shape. Beta-adjusted returns have less skewness and a slightly peaked leptokurtic shape.

An alternative method of comparing anomaly-based portfolio returns is through the identification of their stochastic dominance relationship. This approach benefits from the analysis of the probability distribution of each portfolio's returns, thereby avoiding the normality issue.[7] Analysis of portfolio returns through stochastic dominance also permits the researcher to examine market efficiency without assuming an equilibrium model. It is conceivable that analysis of variance and means comparison results could be interpreted as rejecting the hypothesis that the chosen equilibrium pricing model is valid instead of the efficient market hypothesis. Levy and Lerman (1985) and Jean and Helms (1988) support the use of stochastic dominance in anomaly studies because fewer assumptions about investor utility functions or return distributions are necessary to insure the accuracy of findings.

Empirical Results

Stock Market and Business Conditions

The number of bull stock market periods, as defined by Cohen, Zinbarg, and Zeikel (1987, p. 67), exceeded the number of bear markets by a ratio of almost two to one during the 1975 through 1984 period. There were 26 quarters during which the NYSE advanced and 14 quarters during which the NYSE composite index declined. The average quarterly advance of the NYSE composite index during bull markets was 4.39 points, while the average loss during bear markets was 3.64 points per quarter.

The identification of quarters as part of a business expansion or contraction was based upon the historical business cycle turning dates designated by the National Bureau of Economic Research (NBER). Business cycles have been

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[6]Value Line's policy of limiting the number of rank 1 and rank 5 stocks to 100 created the potential for many empty cells. Seventy-one percent of the anomaly-defined portfolios had the maximum of 40 quarterly return observations. At least 37 observations were available for all but one portfolio. This rarest combination--large size, low P/E, and timeliness rank 5--contained stocks during 30 time periods.

[7]Like all tests based on historical data (including analysis of variance and means comparisons), stochastic dominance assumes that all observed returns come from a stable distribution. In stochastic dominance analyses, the sampled return distribution set is treated as the population.

defined as sequences of expansion and contraction in various economic processes that appear as major fluctuations in aggregate economic activity. During the period covered in this study, NBER has designated the following three periods as recessionary:

January 1975-March 1975
January 1980-July 1980
July 1981-November 1982.

Anomaly Sensitivity to Stock Market Conditions

F-ratios indicating the significance of the anomalies' explanatory power both individually and in conjunction with each other during bull and bear markets are given in Table 2. Stock market condition had an effect on each anomaly's explanatory power. Firm size was more significant during bull markets than during bear markets. The largest F-ratios were found in the firm size column and bull market rows of Table 2. After adjusting for systematic risk, a firm size effect was still observed during bull markets.

Alternatively, the P/E ratio and timeliness ranking variables had consistently more explanatory power during bear markets. An insignificant P/E ratio may imply that the selection of firms whose earnings are not being capitalized as much as other firms during bull markets may not be advantageous, especially before adjusting for systematic risk. Greater explanatory power during bear markets may reflect the problems of growth companies, which often carry higher P/E multiples, that are trying to sustain earnings growth rates in excess of the market rate during bear markets. The elevated significance of timeliness rankings during bear markets may reflect a greater ability on the part of Value Line to pick the few winners and big losers in declining stock markets. One may observe that only the firm size-P/E interaction was significant and that this significance only occurred during bull markets by analyzing the last four columns of Table 2.[8]

An F-statistic obtained through the analysis of variance indicates whether portfolio returns are different from each other when groupings are based on multiple, specified, independent variables. Multiple comparison methods give more detailed information about which portfolio means differed from which other means. Fisher's LSD test is a popular procedure for locating those portfolios that created a significant analysis of variance F-ratio.

[8]The significance of the size-P/E interaction may have been a statistical artifact caused by using returns on the equally-weighted CRSP database as a measure of securities returns and changes on the NYSE index as a measure of the bullish or bearish nature of the market.

Three basic sets of portfolios were chosen for application of LSD's multiple t-test procedure. One group consists of the high mean portfolio and all portfolios whose mean returns were not significantly less than the highest mean return. Another group consisted of the low mean portfolio and all portfolios that do not have significantly greater means. The remainder consists of those mean portfolio returns that are significantly lower than the high mean return and significantly greater than the low mean or are not significantly different from the high and low return means.

The distribution of high, central, and low mean returns across anomaly classes on the basis of the LSD multiple t-test routine is presented in Table 3. The number of portfolios within each size class is a function of the number of divisions within the other anomalies. For instance, small firms may fall into one of five timeliness ranking categories, and this combination may fall into one of three P/E ratio categories, for a total of 15 small size subsets.

During bull markets, all portfolios with high market-adjusted excess returns consisted of small firms. During bear markets, slightly more portfolios providing high market-adjusted returns consisted of large firms. Although the high beta-adjusted residuals tend to be provided on portfolios of small firms, one cannot overlook the frequency of medium and large firms providing high risk-adjusted returns.

P/E ratios are a useful portfolio screen in both bull and bear markets. During bull markets, all 15 of the low P/E subsets were classified as providing high beta-adjusted returns, while half of the portfolios in the high beta-adjusted return classification set during bear markets had low P/E ratios.

The evidence on the timeliness rankings is mixed. There appears to be a tendency for the low market-excess residual cluster to consist of stocks considered untimely by Value Line. After adjusting for risk, however, the portfolios providing significantly high means were distributed across all timeliness ranks. Rank 1 stocks provide the greatest likelihood of a significantly low risk-adjusted return during recessions.

The choice of small firms with low P/E ratios is appropriate for an investor interested in beta-adjusted residuals. All five of the small low P/E firms (based upon five divisions created by the five timeliness ranks) provided significantly high risk-adjusted returns, during bull and bear markets. One safely could select small firms with high P/Es only during bull markets.

Anomaly Sensitivity to General Business Conditions

The other research question is whether anomaly significance is a function of general business conditions. Stock market and business conditions may not be the same. It is not necessary that both conditions change in the same manner.

Over the 1952 through 1982 period, the stock market peaked eight months, on average, before economic conditions; the stock market also bottomed three months prior to the economic trough (see Cohen, Zinbarg, and Zeikel (1987, p. 216)). Given that the analyzed anomalies are sensitive to stock market conditions, a logical extension is the examination of whether general business conditions, as defined by the National Bureau of Economic Research, influence anomaly significance.

Under the hypothesis of no relationship between business conditions and anomaly significance, one would expect similar F-ratios and regression coefficients across business conditions. This was not the finding. The importance of business conditions is demonstrated by the different F-ratios exhibited in Table 4.

One may state with a 99 percent level of confidence that firm size is related to both excess returns and beta-adjusted residuals when the economy is expanding. The highly significant relationship between firm size and excess returns is reduced after adjusting returns for systematic risk, which tends to be greater for smaller firms. There is no relationship between firm size and beta-adjusted residuals during recessionary periods. The importance of business conditions when basing portfolio formation decisions on the P/Es and Value Line timeliness rankings is more extreme. These anomalies are only significant during expanding business conditions. During these periods, P/Es and timeliness rankings are related to excess returns at a 99 percent level of confidence. The interactions of the independent variables largely are limited to expansionary periods.

Applying Fisher's LSD test to the results indicates that portfolios composed of smaller firms tended to provide higher market-excess and beta-adjusted residuals during business expansions. By reviewing the Low row of Table 5, Panel B, one may observe that fewer portfolios with small firms, as opposed to large firms, generated abnormally low mean returns during business contractions. After adjusting for risk, however, there is little value gained by choosing stocks on the basis of firm size during contractions.

In agreement with the analysis of variance results, P/E ratios only have value during expansions. Eleven of 15 possible low P/E portfolios provided high mean beta-adjusted residuals, while 11 high P/E portfolios generated low mean beta-adjusted residuals. This dissimilarity largely disappears during recessions.

None of the rank 1 stocks provided low market-excess residuals during expansions. After adjusting for risk, there was only a slight tendency for rank 1 and 2 firms to outperform rank 4 and 5 firms. Only rank 1 and 2 stocks appear in the high return cluster during business contractions. Low beta-adjusted mean returns were earned by portfolios at all ranks during recessions.

Holding Period Returns

The prior sections discuss the sensitivity of anomalies to stock market and business conditions and denote potential portfolio selection strategies under each condition. An advantage of the means comparison technique is that output includes a listing of portfolios that accounted for the generation of significant F-values. Mean quarterly beta-adjusted residual returns (MQBAR) from a proposed anomaly-based portfolio were calculated and compared to a portfolio at the opposite extreme. The *proposed* label was assigned to any anomaly for which there appears to be a definite trend as one moves from the high mean return class to the low return class. For instance, during bull markets, small firms are preferred because of their tendency to generate excess risk-adjusted returns. A portfolio at the opposite end of the anomaly spectrum used would consist of large firms.

The MQBAR on the preferred portfolio during bull markets (consisting of small firms with timeliness rankings of 1, 2, or 3) exceeded the return on large, rank 4 and 5 firms by 1.25 percent. During bear markets, the MQBAR on low P/E firms exceeded the return on high P/E firms by 2.04 percent. In periods when the economy was expanding, the MQBAR on small, low P/E firms exceeded the return on large, high P/E firms by 3.41 percent. In recessionary periods, the MQBAR on low P/E firms ranked 1 or 2 for timeliness exceeded the return on high P/E firms with timeliness rankings of 4 or 5 by 2.58 percent. In all instances, the gains from adjusting anomaly-based portfolio components in order to benefit from the concurrent conditions exceeded normal transactions costs.

Stochastic Dominance of Anomaly Portfolios

An alternative method of comparing anomaly-based portfolios returns is through the identification of their stochastic dominance relationship. The previously employed statistical procedures required the assumption of normality. Stochastic dominance, although not a statistical test, compares the probability distribution of each portfolio's returns in order to ascertain membership in the efficient set. Through stochastic dominance, one can obtain additional insight into portfolio performance without assuming an equilibrium pricing model or a particular distribution.

In order to guarantee an equal number of portfolio observations, stocks ranked 1 and 2 for timeliness by Value Line were combined into one portfolio, as were those ranked 4 and 5 for timeliness. This process had the side effect of diversifying away unique factors related to the return of any one stock in any period. The minimum portfolio size increased from zero, or being empty, to five

securities. Second degree stochastic dominance results are presented in Table 6, which stipulates the normal investor assumptions of risk aversion and nonsatiation.

Within each anomaly division (i.e., small firms) one may find three classes of the other anomalies. Hence, a maximum of nine portfolios within the efficient set could have been from each anomaly class. Small firms tended to be in the efficient set during both business expansions and bull markets. Small firm dominance ends during business contractions and bear markets.

Low P/E stocks had a greater tendency to be in the efficient set across all market conditions. The investor would be wise to focus selection criteria upon the P/E ratio during business contractions and bear markets. During bear markets, all dominant portfolios consisted of firms with low P/E ratios.

Timeliness rankings information is most useful during business contractions. It may be possible that Value Line has a greater ability in picking the few remaining timely investments when businesses, in general, are in a recession. During business expansions and bear markets, taking the middle ground (rank 3 stocks) is as good as any special rank position.

Conclusions

This paper demonstrates the importance of considering both stock market and business conditions when basing portfolio selection on the basis of firm size, P/E, or timeliness ranking. The negative relationship between these variables and subsequent returns, which has been reported in prior studies, also is observed here. One may enhance returns, however, by considering an anomaly subset that is chosen in the light of stock market and business conditions.

Findings obtained through analysis of variance indicate that the chosen variables were related significantly to stock returns, while their interactions generally were unrelated to stock returns. Results suggest that firm size should be a portfolio selection criterion during bull markets and periods of business expansion. P/E ratios have more benefit during bear markets and expanding business conditions. After adjusting for systematic risk, the timeliness rankings variable became insignificant at the five percent level.

Means comparison and stochastic dominance analyses support the analysis of variance findings. Means comparison suggests that the selection of small firms during bear markets may be beneficial, while the returns on small firms tend only to be stochastically dominant during bull markets and expansions. Means comparison and stochastic dominance results suggest that low P/E stocks outperform high P/E stocks during either bull or bear markets and business expansions. Stochastic dominance results make the strongest case for following

Value Line directives during business contractions. Untimely stocks are found in the efficient set only during business expansions.

In short, investors must be cognizant of the current market conditions before they base portfolio selection upon popular capital market anomalies.

References

1. Abell, J., and T. Krueger, "Macroeconomic Influences on Beta," *Journal of Economics and Business*, 41 (April 1989), pp. 185-193.

2. Arbel, A., "Generic Stocks: The Key to Market Anomalies," *Journal of Portfolio Management*, 11 (Summer 1985), pp. 4-13.

3. Banz, R.W., "The Relationship Between Return and the Market Value of Common Stocks," *Journal of Financial Economics*, 9 (March 1981), pp. 3-18.

4. Basu, S., "The Information Content of Price-Earnings Ratios," *Financial Management*, 4 (Summer 1975), pp. 53-64.

5. _____, "Investment Performance of Common Stocks in Relation to Their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis," *Journal of Finance*, 32 (June 1977), pp. 663-689.

6. _____, "The Relationship Between Earnings' Yields, Market Value and Return for NYSE Common Stocks: Further Evidence," *Journal of Financial Economics*, 12 (June 1983), pp. 129-156.

7. Black, F., "Yes, Virginia, There is Hope: Tests of the Value Line Ranking System," in Arnold Bernhard (ed.), *How to Use the Value Line Investment Survey* (New York: Arnold Bernhard & Co., 1982), pp. 20-23.

8. Chen, S., "An Examination of Risk-Return Relationship in Bull and Bear Markets Using Time-Varying Betas," *Journal of Financial and Quantitative Analysis*, 17 (June 1982), pp. 265-281.

9. Cohen, J.B., E. Zinbarg, and A. Zeikel, *Investment Analysis and Portfolio Management* (Homewood, Illinois: Irwin, 1987).

10. Cook, T.J., and M.S. Rozeff, "Size and Earnings/Price Anomalies: One Effect or Two?" *Journal of Financial and Quantitative Analysis*, 19 (December 1984), pp. 449-466.

11. Copeland, T.E., and D. Mayers, "The Value Line Enigma (1965-1978): A Case Study of Performance Evaluation Issues," *Journal of Financial Economics*, 10 (November 1982), pp. 289-321.

12. Damodaran, A., "The Impact of Information Structure on Stock Returns," *Journal of Portfolio Management*, 13 (Spring 1987), pp. 53-58.

13. Dowen, R.J., and W.S. Bauman, "The Relative Importance of Size, P/E, and Neglect," *Journal of Financial and Quantitative Analysis*, 19 (December 1984), pp. 440-466.

14. Dowen, R.J., and W.S. Bauman, "The Relation of Earnings Surprise to the E/P Ratio Effect," working paper, presented at the 1987 Financial Management Association meeting, Las Vegas, NV, October 1987.

15. Elton, E.J., and M.J. Gruber, *Modern Portfolio Theory and Investment Analysis*, 2nd ed. (New York: Wiley & Sons, 1984).

16. Fabozzi, F.J., and J.C. Francis, "Stability Tests for Alphas and Betas over Bull and Bear Market Conditions," *Journal of Finance*, 32 (September 1977), pp. 1093-1099.

17. Fama, E.F., and K.R. French, "Business Cycles and the Behavior of Metals Prices," *Journal of Finance*, 43 (December 1988), pp. 1075-1093.

18. Glass, G., and J. Stanley, *Statistical Methods in Education and Psychology* (Englewood Cliffs, New Jersey: Prentice-Hall, 1970).

19. Hardouvelis, G.A., "Macroeconomic Influences and Stock Prices," *Journal of Economics and Business*, 39 (May 1987), pp. 131-140.

20. Holloway, C., "A Note on Testing an Aggressive Investment Strategy Using Value Line Ranks," *Journal of Finance*, 36 (June 1981), pp. 711-719.

21. Huberman, G., and S. Kandel, "Value Line Rank and Firm Size," *Journal of Business*, 60 (October 1987), pp. 577-589.

22. Jacobs, B., and K. Levy, "Disentangling Equity Return Regularities: New Insights and Investment Opportunities," *Financial Analysts Journal*, 44 (May-June 1988), pp. 18-43.

23. Jean, W., and B. Helms, "Moment Ordering and Stochastic Dominance Tests," *Journal of Business Finance & Accounting*, 15 (Winter 1988), pp. 573-584.

24. Kim, M.K., and J.K. Zumwalt, "An Analysis of Risk in Bull and Bear Markets," *Journal of Financial and Quantitative Analysis*, 14 (December 1979), pp. 1015-1023.

25. Klein, A., and J. Rosenfeld, "The Influence of Market Conditions on Event-Study Residuals," *Journal of Financial and Quantitative Analysis*, 22 (September 1987), pp. 345-351.

26. Levy, H., and Z. Lerman, "Testing P/E Ratio Filters with Stochastic Dominance," *Journal of Portfolio Management*, 11 (Winter 1985), pp. 31-40.

27. Lindman, H., *Analysis of Variance in Complex Experimental Designs* (San Francisco: W. H. Freeman, 1974).

28. Ott, L., *An Introduction to Statistical Methods and Data Analysis* (North Scituate, Massachusetts: Duxbury Press, 1977).

29. Reinganum, M.R., "A Direct Test of Roll's Conjecture on the Firm Size Effect," *Journal of Finance*, 37 (March 1982), pp. 27-35.

30. _____, "The Anomalous Stock Market Behavior of Small Firms in January: Empirical Tests of Tax-Loss Selling Effects," *Journal of Financial Economics*, 12 (June 1983), pp. 89-104.

31. Rogers, R., "The Relationship Between Earnings Yield and Market Value: Evidence from the American Stock Exchange," *Financial Review*, 23 (February 1988), pp. 65-80.

32. Strebel, P.J., and A. Arbel, "Pay Attention to Neglected Firms!" *Journal of Portfolio Management*, 9 (Winter 1983), pp. 37-42.

33. Tseng, K., "Low Price, Price-Earnings Ratio, Market Value, and Abnormal Stock Returns," *Financial Review*, 23 (August 1988), pp. 333-343.

Table 1
Description of Quarterly Portfolio Returns Distribution
1975-1984

Residual Return	Durbin-Watson Statistic	Skewness Statistic	Kurtosis Statistic
Market-Excess	2.01	1.17	1.86
Beta-Adjusted	1.96	0.10	4.30

Table 2
Anomaly Significance Across Bull and Bear Stock Market Conditions[a]
F-Ratios Based on Analysis of Variance[b]

Stock Market Condition	Main Effects: Firm Size	Main Effects: P/E Ratio	Main Effects: Timeliness Rankings	Interaction Effects: Size *P/E	Interaction Effects: Size *Rank	Interaction Effects: P/E *Rank	Interaction Effects: Size* P/E*Rank
Dependent Variable: Market-Excess Returns							
Bull Markets	30.49***	0.71	7.99***	2.60**	0.99	0.28	0.86
Bear Markets	0.93	22.21***	3.79***	1.19	0.70	1.07	0.88
Both Markets	21.49***	3.97**	8.36***	2.01*	1.00	0.36	0.69
Dependent Variable: Beta-Adjusted Residuals							
Bull Markets	7.73***	2.99**	0.63	4.14***	1.30	0.28	0.87
Bear Markets	1.42	5.51***	2.19*	0.55	0.99	0.63	0.97
Both Markets	5.74***	6.87***	1.87*	2.32**	1.51	0.23	0.75

[a] There were 26 quarters during the 1975-1984 period in which the New York Stock Exchange composite index had a higher value at the end than at the beginning of the quarter. During 14 quarters the NYSE composite index declined. During the bull market periods, 1197 observations were made; 579 observations were generated during bear market periods

[b] Asterisk(s) indicate the following levels of F-ratio significance: * = .10; ** = .05; *** = .01

Table 3
Distribution of High, Central, and Low Mean Returns Classes Across Capital Market Conditions
Multiple T-Test Analysis[a]

Panel A: Bull Markets

Arithemetic[b] Mean Return Class	Firm Size			P/E Ratio			Timeliness Rank				
	Small	Medium	Large	Low	Medium	High	1	2	3	4	5
Dependent Variable: Market-Adjusted Excess Returns											
High	5	0	0	1	1	3	2	2	1	0	0
Central	9	7	1	7	6	4	5	4	3	3	2
Low	1	8	14	7	8	8	2	3	5	6	7
Total	15	15	15	15	15	15	9	9	9	9	9
Dependent Variable: Beta-Adjusted Residual Returns											
High	13	11	9	15	11	7	5	6	7	8	7
Central	0	1	0	0	0	1	0	1	0	0	0
Low	2	3	6	0	4	7	4	2	2	1	2
Total	15	15	15	15	15	15	9	9	9	9	9

Table 3 (continued)
Distribution of High, Central, and Low Mean Returns Classes Across Capital Market Conditions
Multiple T-Test Analysis[a]

Panel B: Bear Markets

Arithemetic[b] Mean Return Class	Firm Size			P/E Ratio			Timeliness Rank				
	Small	Medium	Large	Low	Medium	High	1	2	3	4	5
Dependent Variable: Market-Adjusted Excess Returns											
High	10	8	12	13	13	4	6	8	6	6	4
Central	2	3	1	1	2	3	2	1	2	0	1
Low	3	4	2	1	0	8	1	0	1	3	4
Total	15	15	15	15	15	15	9	9	9	9	9
Dependent Variable: Beta-Adjusted Residual Returns											
High	11	7	6	12	9	3	2	6	7	5	4
Central	2	0	1	0	3	0	0	1	0	1	1
Low	2	8	8	3	3	12	7	2	2	3	4
Total	15	15	15	15	15	15	9	9	9	9	9

[a] Multiple t-tests were conducted using Fisher's least significant difference at the 0.05 level of significance

[b] High mean numbers represent the number of portfolios within a specified set of anomaly characteristics having arithmetic mean returns that were significantly greater than the mean of at least one other portfolio at the 0.05 level, but not significantly less than the highest mean return. Central mean numbers represent the number of portfolios within a specified set of anomaly characteristics having arithmetic mean returns that were either insignificantly different from the high mean portfolio and the low mean portfolio or were significantly different from both the high mean and low mean return portfolios. Low mean numbers represent the number of portfolios within a specified set of anomaly characteristics having arithmetic mean returns that were significantly less than the mean of at least one other portfolio at the 0.05 level of significance, but were not significantly greater than the lowest mean return

Table 4
Anomaly Significance Across Business Expansions and Contractions[a]
F-Ratios Based on Analysis of Variance[b]

Business Condition	Main Effects: Firm Size	Main Effects: P/E Ratio	Main Effects: Timeliness Rankings	Interaction Effects: Size *P/E	Interaction Effects: Size *Rank	Interaction Effects: P/E *Rank	Interaction Effects: Size* P/E*Rank
Dependent Variable: Market-Excess Returns							
Expansion	17.90***	6.65***	7.40***	1.51	1.17	0.29	0.71
Recession	4.12**	0.08	1.39	0.64	0.42	0.18	0.35
Both Conditions	21.49***	3.97**	8.36***	2.01*	1.00	0.36	0.69
Dependent Variable: Beta-Adjusted Residuals							
Expansion	6.95***	5.72***	1.86*	2.74**	1.75*	0.24	0.79
Recession	0.27	1.38	0.33	0.93	0.48	0.15	0.33
Both Conditions	5.74***	6.87***	1.87*	2.32**	1.51	0.23	0.75

[a] There were 31 quarters during the 1975-1984 period that the National Bureau of Economic Research designated as being part of an expansionary business cycle. Nine quarters were classified as recessionary. During the expansionary period, 1265 observations were made; 370 observations were made during the recessionary period

[b] Asterisk(s) indicate the following levels of F-ratio significance: * = .10; ** = .05; *** = .01

Table 5
Distribution of High, Central, and Low Mean Returns Classes Across Business Conditions
Multiple T-Test Analysis[a]

Panel A: Business Expansions

Arithemetic[b] Mean Return Class	Firm Size			P/E Ratio			Timeliness Rank				
	Small	Medium	Large	Low	Medium	High	1	2	3	4	5
Dependent Variable: Market-Adjusted Excess Returns											
High	12	6	2	9	5	6	6	7	4	2	1
Central	1	4	5	4	5	1	3	0	2	3	2
Low	2	5	8	2	5	8	0	2	3	4	6
Total	15	15	15	15	15	15	9	9	9	9	9
Dependent Variable: Beta-Adjusted Residual Returns											
High	11	4	5	11	5	4	3	6	5	4	2
Central	0	0	0	0	0	0	0	0	0	0	0
Low	4	11	10	4	10	11	6	3	4	5	7
Total	15	15	15	15	15	15	9	9	9	9	9

Table 5 (continued)
Distribution of High, Central, and Low Mean Returns Classes Across Business Conditions
Multiple T-Test Analysis[a]

Panel B: Business Contractions

Arithemetic[b] Mean Return Class	Firm Size			P/E Ratio			Timeliness Rank				
	Small	Medium	Large	Low	Medium	High	1	2	3	4	5
Dependent Variable: Market-Adjusted Excess Returns											
High	2	0	0	0	0	2	1	1	0	0	0
Central	12	13	6	12	10	9	7	5	7	6	6
Low	1	2	9	3	5	4	1	3	2	3	3
Total	15	15	15	15	15	15	9	9	9	9	9
Dependent Variable: Beta-Adjusted Residual Returns											
High	1	0	0	0	0	1	0	1	0	0	0
Central	12	15	13	15	13	12	8	7	9	9	7
Low	2	0	2	0	2	2	1	1	0	0	2
Total	15	15	15	15	15	15	9	9	9	9	9

[a] Multiple t-tests were conducted using Fisher's least significant difference at the 0.05 level of significance

[b] High mean numbers represent the number of portfolios within a specified set of anomaly characteristics having arithmetic mean returns that were significantly greater than the mean of at least one other portfolio at the 0.05 level, but not significantly less than the highest mean return. Central mean numbers represent the number of portfolios within a specified set of anomaly characteristics having arithmetic mean returns that were either insignificantly different from the high mean portfolio and the low mean portfolio or were significantly different from both the high mean and low mean return portfolios. Low mean numbers represent the number of portfolios within a specified set of anomaly characteristics having arithmetic mean returns that were significantly less than the mean of at least one other portfolio at the 0.05 level of significance, but were not significantly greater than the lowest mean return

Table 6
Stochastic Dominance Across Market Conditions
Efficient Portfolios via Second Degree Stochastic Dominance[a]

Market Condition	Firm Size			P/E Ratio			Timeliness Ranking[b]		
	Small	Medium	Large	Low	Medium	High	1/2	3	4/5
Business Expansion	5	2	1	4	3	1	2	4	2
Business Contraction	4	4	4	6	3	3	9	3	0
Bull Markets	5	2	0	3	3	1	4	3	0
Bear Markets	1	1	2	4	0	0	1	3	0

[a] Efficient portfolio figures represent the number of portfolios within each classification that were not dominated by any other portfolio. There were a total of nine possible efficient portfolios within each anomaly division, based upon the three subclasses of the other anomalies. For instance, there were three P/E and rank classifications possible for each small firm, 3 * 3 = 9

[b] Firms with timeliness rankings of 1 or 2 were combined into one portfolio, while firms with timeliness rankings of 4 or 5 were combined into another portfolio in order to eliminate all empty cells