STOCK MARKET VALUES AND P/E RATIOS AS PREDICTORS OF NEW YORK STOCK EXCHANGE DELISTING

Aaron L. Phillips, Finance, University of Detroit

Abstract

The price-to-earnings ratio effect and the small firm effect literature suggests that stock markets are inefficient, asset pricing models are misspecified, or both. Consequently, it appears that one can earn positive, abnormal, risk-adjusted returns by investing in select stocks based on P/E ratio, firm size, or other anomalous behavior criteria. One potential explanation for the abnormal return observations is survivor bias in tests of asset pricing models. This research reports the results of an empirical investigation of delisting as a possible contributor to anomalous behaviors. The evidence indicates that delisting fails to contribute to the P/E effect; however, firm size is associated with delisting when survivor bias is controlled.

I. Introduction

Recent empirical investigations reported in the finance literature report apparent widespread deviations from the efficient market hypothesis. These deviations have acquired the name "stock market anomalies." Research results suggest that the average investor can achieve positive, abnormal, risk-adjusted stock market returns by investing in low price-to-earnings (P/E) ratio stocks (the P/E effect) [Basu (1977,1983), Cook and Rozeff (1984), Reinganum (1981)] and low market value stocks (the small firm effect) [Banz (1981), Cook and Rozeff (1984), Reinganum [(1981)].

Arguments have been put forward that the P/E effect is a proxy for the small firm effect [Reinganum (1981)] and vice versa [Basu (1983)]. Others suggest that these effects are independent [Cook and Rozeff (1984)] or that the two anomalies are proxies for a price effect [Kross (1985)]. A low common stock price could give rise to either a low P/E ratio, low market value, or both. A low price stock is not a necessary prerequisite for either

low market value or low P/E ratio.

The purpose of the current study is to investigate the possibility that P/E ratios and market values of common equity can be used to predict delisting from the New York Stock Exchange (NYSE). Specifically, the investigation centers on whether or not delisting from the NYSE is more likely to occur due to bankruptcy/liquidation reasons or merger/acquisition reasons in low P/E and market value securities relative to higher P/E and market value groupings. When survivor bias is eliminated, evidence is presented which indicates that the small firm effect is associated with delisting; however, the P/E effect is not.

II. Previous Literature

Edmister and Greene (1980) used Standard and Poor Corporation's COMPUSTAT Price-Dividend-Earnings (PDE) files for the February, 1967 through December, 1979 time period as the basis for stock price and stock return data in a test of the low price effect.

Based upon their tests, low priced (per share price of \$10 or less) and super-low-priced (\$3 or less per share) stocks achieved higher return-to-risk ratios than did stocks in higher price groups. These findings, however, are potentially biased by survivor bias in the COMPUSTAT data system. The PDE files have an inherent survivor bias since COMPUSTAT removes all historical information from the PDE files on covered firms which are delisted from stock exchanges due to merger, acquisition, bankruptcy, liquidation, etc. It is possible, due to this survivor bias, that Edmister and Greene did not discern the liquidation risks to low priced stocks previously reported by Bachrach and Galai (1979).

Bachrach and Galai drew month-end prices and returns from the University of Chicago Center for Research in Security Prices (CRSP) monthly data file. Bachrach and Galai classified as high price stocks those with values consistently over \$20 per share and as low price those stocks with prices consistently under \$20 per share for the 1926 to 1968 time period. They report that a larger percentage of stocks in the under \$20 group were delisted for liquidation or suspension reasons than for merger reasons, and vice versa for the over \$20 group. Their results, however, are potentially biased due to survivor criteria in the methodology. Bachrach and Galai required each stock to have a minimum of eight years of monthly observations and to have a price consistently over or under \$20 for the entire period.

In tests of the P/E effect Basu (1977), Cook and Rozeff (1984), and Reinganum (1981) prepared calendar year end P/E ratios for NYSE issues and employed these ratios in portfolio formation on April 1 of the subsequent year as part of the test methodology. The three month delay provided for market reaction to December fiscal year/quarter earnings information. Subsequent to portfolio formation, i.e.

ranking by P/E ratio and division into five or ten groups of equal numbers of firms, returns for the ensuing twelve months were determined. This methodology requires that firms survive through the subsequent fifteen months, thus imposing a survival bias.

Evidence on potential impacts of this type of survival bias is observed in the empirical results of Wansley, Roenfeldt and Cooley (1983). They compared merged firms to non-merged firms and found that merged firms in their sample had lower P/E ratios, smaller size (as measured by sales), and positive abnormal returns relative to the market. They also detected similar abnormal returns for firms with a "merger profile", i.e., low P/E ratio and small size, which do not become merger candidates. This type of delisting potential could be a significant contributor to explaining the P/E effect, small firm effect, or both, in test methodologies imposing a fifteen month survival criterion if low P/E and/or low market value firms delist due to merger/acquisition.

Similar to the survival criteria imposed in P/E effect studies are those imposed in small firm/firm size effect studies. Basu (1983), Cook and Rozeff (1984), and Reinganum (1981) used the fifteen month period subsequent to portfolio formation for joint tests of the P/E effect and firm size effect. Banz (1981), in one of the initial studies reporting the small firm effect, did not employ the three month delay; however, he imposed a twelve month return period. Also, Banz imposed a ten year prior-existence criterion for inclusion in his study; therefore, his sample suffers from survival bias.

Given that market participants appear to treat merger profile firms as potential merger candidates and reward them with positive abnormal returns, a similar behavior may occur with firms whose profiles appear as financially distressed firms but which survive. Given that survivor bias in both P/E

effect and small firm effect studies eliminate failed firms as well as merged firms, the surviving "failed firm profile" issues may be rewarded with positive abnormal returns due to their not failing. Therefore, abnormal returns to small market value and low P/E ratio stocks may reflect changing delisting probability assessments by investors.

III. Methodology

If delisting probability, as reported in Bachrach and Galai (1979), is an unspecified parameter in asset pricing models, and low price gives rise to a low P/E ratio such that delisting can be predicted by P/E ratio, then survivor bias in P/E effect studies can be examined by testing the null hypothesis:

$H_0(1)$: NYSE listed issues which do not survive 15 months subsequent to calendar year end are independent of P/E ratio.

If P/E ratios reflect an assessment by investors of eventual delisting, a longer examination period is warranted. Consequently, a second null hypothesis is proposed:

$H_0(2)$: NYSE listed issues which do not survive 60 months subsequent to calendar year end are independent of P/E ratio.

Similar to the effects of potential delisting on P/E ratios, market values can also be affected. To examine whether or not delisting is associated with market value in the near term and long term, the following null hypotheses are examined:

$H_0(3)$: NYSE listed issues which do not survive 12 months subsequent to calendar year end are independent of market value.

$H_0(4)$: NYSE listed issues which do not survive 60 months subsequent to calendar year end are independent of market value.

The CRSP monthly returns file is used as an initial basis for determining NYSE listed firms at calendar year end 1970 to 1979. P/E ratios are primarily obtained from COMPUSTAT Industrial and Industrial Research files. When COMPUSTAT lacks data on specific firms, the P/E ratio information is obtained from *Moody's Industrial, Transportation, Public Utility, and Bank and Finance* manuals in order to compile the total NYSE population and to avoid survivor bias.

To maintain comparability with previous studies [Basu (1977), Reinganum (1981)], only firms with a December fiscal year end (FYE) are employed in testing hypotheses one and two. Issues are ranked by P/E ratio and negative P/E ratio firms are included in the highest P/E grouping. A second ranking is performed to exclude negative P/E issues since some studies [Basu (1983), Cook and Rozeff (1984), Reinganum (1981)] employ only issues with positive P/E ratio values. In both instances the December FYE sample is divided into five portfolios of equal numbers of firms with the lowest P/E ratio issues contained in the first portfolio. Those issues which cease trading on the NYSE in the subsequent fifteen and sixty month periods are identified from the CRSP tape and sorted into the P/E quintiles. The chi-square test for goodness of fit is applied to the data since a nonparametric test is most appropriate for ranked data.

The entire population of NYSE issues is employed in testing hypotheses three and four. The only issues not used are those which do not have CRSP data available for price and/or number of shares held at the end of December each year. The year end market value of common equity is determined for each issue and the population is ranked by market value. After ranking, the issues are divided into quintiles with the lowest market value issues assigned to the first portfolio. Those stocks which are delisted from the NYSE in

the subsequent twelve and sixty months are identified and classified by market value quintile. The chi-square test is applied to those delisted issues for evidence of distributional effects.

IV. Empirical Results

Hypothesis one proposes that quintile of P/E ratio is not associated with delisting of firms from the NYSE, the tests of which are contained in Table 1. The only significant chi-square statistic occurs in 1976. Furthermore, the observed pattern of delistings suggests that in 1976 the majority of delistings fall into low P/E quintiles while in other years, e.g. 1970 and 1972, the delistings occur from the high P/E and negative P/E quintile. The years 1977 through 1979 evince an almost even distribution of firm delistings across P/E quintiles.

Null hypothesis two examines whether or not P/E quintile is a predictor of eventual delisting for a longer time period. Table 2 contains the distribution of firm delistings over the sixty month period subsequent to December year end P/E ratio formation. Delisted issues in the years 1970 through 1974 have distributions which are significantly different from the hypothesized relationship. An examination of the two major potential reasons firms become delisted is consequently provided. In 1970 through 1972 firms delisted by the exchange for non-merger reasons leave the sample from the high P/E and negative P/E ratio quintile, rather than from the low P/E quintile as would be suggested by the Bachrach and Galai results if low price is the principal determinant of low P/E and market values. Firms delisted due to being acquired/merged, however, appear to be evenly distributed among the five P/E portfolios. The only statistically significant chi-square test result for merged firms, coded (2) by CRSP, occurred in 1974. In that year firms with a December fiscal year end and low December 1974 P/E ratio became

the target of merger activity over the subsequent sixty month period.

Since previous P/E effect studies restrict themselves to positive P/E ratio firms, tests of hypotheses one and two are repeated using only positive P/E ratio firms. The evidence presented in Table 3 reveals that the distribution of P/E ratios for firms exiting the sample approximates the distribution of P/E ratios for firms remaining in the sample, except for 1971, 1973, and 1974. Removal of negative P/E ratio firms ranked in the highest quintile results in insignificant chi-square statistics for CRSP delisting code (5) in all years except 1973, as indicated in Table 3. Firms delisted by the NYSE for reasons other than merger during the sixty months following December, 1973 had P/E ratios in the lowest sixty percent of the distribution. Similarly, the majority of firms acquired/merged during the sixty months following December, 1974 had P/E ratios in the lowest forty percent of the 1974 year end distribution.

The conclusions drawn from these tests include (1) a small number of firms are excluded in any fifteen month period subsequent to December portfolio formation, (2) the firms so excluded are randomly distributed among P/E quintiles, and (3) positive P/E quintile has little, if any, bearing on whether or not firms leave the sample due to NYSE delisting for reasons other than merger. Similarly, merger candidates are not associated with P/E quintile in any year except 1974. Consequently, null hypotheses one and two cannot be rejected.

Null hypothesis three examines the distribution of firms delisted over the twelve month period subsequent to the December portfolio formation. The chi-square statistics in Table 4 support rejection of the null in eight of ten years. Delisting of firms for all reasons occurs from the low market valuation quintiles in every year of the study. In eight years the distribution

is significantly different from the hypothesis that an equal number of delistings would occur from each quintile. Hypothesis three, therefore, is rejected.

When reason for delisting is examined, delisting from the NYSE occurs from the lower market value quintiles for both the merger/acquisition group and the unfavorable delisting criteria group, which includes bankruptcy. In no year is there a sufficient number of category (5), non-merger related, delistings to determine a valid chi-square statistic. Of the four years in which a sufficient number of category (2), merger-related, delistings occur, three have significant chi-square statistics.

Table 5 displays the chi-square results from testing hypothesis four. The hypothesis of equal firm delisting by market value quintile is rejected in every year of the study. The distributions of all delistings, merger delistings, and unfavorable delistings are all skewed toward the low market value quintiles. Each classification of delisting in each year of the study produces a chi-square statistic which is significant at the .005 level or better except for the merger/acquisition grouping in 1979.

The results of the tests for hypothesis four support rejection of the null hypothesis. As in the case of delisting by P/E ratio, however, in any one year of the study only a minority of firms leave the sample due to delisting during the subsequent twelve months. The maximum occurs in 1979 when sixty-two firms are delisted for all reasons combined. These sixty-two firms represent only four percent of the NYSE population; hence, the significance of any bias is minimized.

V. Conclusions

Empirical evidence is presented which indicates that the P/E effect is not attributable to market participant assessments of impending delisting.

Firms leave the NYSE due to merger and non-merger reasons randomly from P/E quintile. Additionally, delisted firms are few in number in any five year period. These findings suggest that factors contributing to the P/E effect lie elsewhere.

The evidence on delisting by market value of common equity is less clear. It appears that firms are more likely, statistically, to become delisted for any reason, favorable or unfavorable to the stockholders, from lower size quintiles. In the 1970 to 1973 period the propensity to delist was due to non-acquisition reasons while the reverse is observed in the post-1973 period. The more pertinent observation is that the number of issues delisted for all reasons is small in number relative to the number of total firms on the NYSE.

The results of this investigation, then, rejects extending the Bachrach and Galai price-to-risk relationship to the anomalies of P/E effect and firm size effect. In the absence of survival bias, delisting is not interpreted to be a significant factor associated with either anomaly for the population of New York Stock Exchange issues; i.e., low market value and/or low P/E ratio cannot be reliably used to predict NYSE delisting.

References

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Table 1

Delisting of NYSE Issues by Quintile of P/E Ratio over the
Subsequent Fifteen Months

	<u>All P/E Ratios</u>					Chi-Square	<u>Positive P/E Ratios</u>					Chi-Square
	<u>Quintile</u>						<u>Quintile</u>					
	Low				High		Low				High	
	1	2	3	4	5		1	2	3	4	5	
1970	5	1	2	4	9	N/A ¹	5	1	1	3	5	N/A ¹
1971	2	1	3	3	6	N/A	1	2	1	4	2	N/A
1972	3	1	3	1	7	N/A	2	2	3	0	6	N/A
1973	4	6	3	1	4	N/A	4	5	4	0	3	N/A
1974	7	6	4	0	9	9.00	7	4	4	2	4	N/A
1975	5	3	2	3	7	N/A	4	4	1	4	2	N/A
1976	8	6	11	0	2	14.67 ²	7	7	10	1	0	13.40 ²
1977	5	9	7	7	8	1.22	5	7	9	8	7	1.22
1978	8	7	5	11	7	2.53	8	7	5	11	6	2.86
1979	6	6	6	7	9	1.00	6	7	4	8	7	1.44

1 Insufficient cell frequencies to calculate a meaningful statistic

2 Significant at the .05 level

Table 2
Frequency of Issues Delisted from the NYSE within 60
Months by P/E Ratio Quintile - All P/E Ratios

	Reason ¹	Quintile					Chi-Square
		Low 1	2	3	4	High 5	
1970	(2)	6	4	7	8	15	7.25
	(5)	8	0	3	6	12	14.62**
	All	15	4	10	14	28	22.03**
1971	(2)	5	4	8	11	13	7.17
	(5)	1	6	5	6	13	12.06*
	All	6	10	14	17	29	20.18**
1972	(2)	7	12	9	9	16	4.64
	(5)	9	2	4	5	12	10.19*
	All	17	15	14	14	31	11.58*
1973	(2)	13	21	17	8	11	7.43
	(5)	7	11	7	1	8	7.76
	All	22	34	26	10	22	13.19*
1974	(2)	26	28	15	12	11	13.98**
	(5)	8	4	4	2	10	7.71
	All	35	34	20	16	25	10.85*
1975	(2)	29	15	24	20	20	5.06
	(5)	6	1	0	2	11	N/A ²
	All	38	20	25	23	34	8.66
1976	(2)	30	24	30	26	23	1.62
	(5)	6	3	3	3	5	N/A
	All	39	30	34	29	31	2.00
1977	(2)	30	31	25	30	27	0.88
	(5)	5	5	3	4	5	N/A
	All	37	40	29	35	38	1.98
1978 ³	(2)	25	19	22	30	20	3.40
	(5)	8	4	2	3	6	N/A
	All	35	26	24	34	31	3.13
1979 ⁴	(2)	15	19	18	18	18	0.52
	(5)	5	2	1	3	5	N/A
	All	21	22	20	22	29	2.23

1 (2) is CRSP's code for merger and (5) is delisted by the NYSE.

2 Insufficient expected cell frequencies to create a meaningful statistic.

3 Subsequent 48 month delistings

4 Subsequent 36 month delistings

* Significant at the .05 level.

** Significant at the .01 level.

Table 3
Frequency of Issues Delisted from the NYSE within 60
Months by P/E Ratio Quintile - Positive P/E Ratios

	Reason ¹	Quintile					Chi-Square
		Low 1	2	3	4	High 5	
1970	(2)	5	4	7	4	12	7.06
	(5)	7	1	3	5	6	5.27
	All	13	5	10	9	18	8.55
1971	(2)	4	4	5	13	10	9.28
	(5)	1	5	5	5	8	5.17
	All	5	9	11	18	19	11.55**
1972	(2)	6	13	8	8	17	7.81
	(5)	9	2	4	5	7	5.41
	All	16	16	13	13	26	6.83
1973	(2)	13	20	18	6	13	8.43
	(5)	7	10	8	0	4	11.59**
	All	22	31	29	7	18	17.25**
1974	(2)	26	23	17	14	9	10.49*
	(5)	8	4	4	2	2	N/A ²
	All	34	30	21	19	14	11.41**
1975	(2)	24	18	19	19	15	2.21
	(5)	5	2	0	2	2	N/A
	All	32	24	19	22	18	5.39
1976	(2)	27	26	27	26	21	0.99
	(5)	6	3	2	4	1	N/A
	All	35	32	30	30	25	1.75
1977	(2)	30	26	25	34	27	1.87
	(5)	5	3	5	4	4	N/A
	All	37	33	31	39	35	1.14
1978 ³	(2)	25	18	23	30	20	3.74
	(5)	7	4	3	3	4	N/A
	All	33	25	26	34	29	2.22
1979 ⁴	(2)	14	19	17	17	16	0.80
	(5)	5	2	1	3	1	N/A
	All	20	22	19	21	22	0.33

1 (2) is CRSP's code for merger and (5) is delisted by the NYSE.

2 Insufficient expected cell frequencies to create a meaningful statistic.

3 Subsequent 48 month delistings

4 Subsequent 36 month delistings

* Significant at the .05 level.

** Significant at the .01 level.

Table 4
Frequency of Issues Delisted from the NYSE
within 12 Months by Market Value Quintile

	Reason ¹	Quintile					Chi-Square
		Low 1	2	3	4	High 5	
1970	(2)	6	7	4	0	1	N/A ²
	(5)	7	2	0	1	0	N/A
	All	13	9	5	1	1	18.76**
1971	(2)	3	3	2	2	0	N/A
	(5)	3	0	2	0	0	N/A
	All	7	3	4	2	0	N/A
1972	(2)	2	3	5	1	0	N/A
	(5)	7	3	2	1	0	N/A
	All	9	6	7	2	0	N/A
1973	(2)	0	5	2	2	0	N/A
	(5)	13	7	3	0	0	N/A
	All	13	12	5	2	0	21.44**
1974	(2)	2	4	5	0	0	N/A
	(5)	18	4	0	0	0	N/A
	All	21	9	5	0	0	43.14**
1975	(2)	8	4	4	2	2	N/A
	(5)	9	4	0	0	0	N/A
	All	17	9	4	3	2	22.00**
1976	(2)	12	12	10	3	1	14.37**
	(5)	9	0	1	0	0	N/A
	All	23	13	11	3	1	30.28**
1977	(2)	11	13	12	4	0	14.00**
	(5)	5	0	0	0	0	N/A
	All	18	16	13	4	1	21.65**
1978	(2)	13	14	16	9	2	11.37*
	(5)	3	1	1	0	0	N/A
	All	16	15	18	9	2	14.17**
1979	(2)	10	11	8	9	7	1.11
	(5)	6	3	0	0	0	N/A
	All	22	14	9	10	7	11.39*

1 (2) is CRSP's code for merger and (5) is delisted by the NYSE.

2 Insufficient expected cell frequencies to create a meaningful statistic.

* Significant at the .05 level.

** Significant at the .01 level.

Table 5
Frequency of Issues Delisted from the NYSE
within 60 Months by Market Value Quintile

	Reason ¹	Quintile					Chi-Square ²
		Low 1	2	3	4	High 5	
1970	(2)	15	18	16	3	2	21.74
	(5)	36	13	60	4	1	66.50
	All	52	31	23	7	3	67.28
1971	(2)	18	17	16	6	3	16.17
	(5)	37	9	13	1	1	71.87
	All	57	28	29	7	4	72.56
1972	(2)	25	30	16	11	3	27.41
	(5)	39	18	9	3	0	71.22
	All	68	49	26	14	3	87.06
1973	(2)	30	46	23	9	4	50.59
	(5)	42	21	8	1	0	85.64
	All	76	71	36	10	4	113.38
1974	(2)	49	48	36	13	3	58.35
	(5)	42	12	1	0	0	118.55
	All	96	65	42	13	3	132.21
1975	(2)	60	51	41	20	9	50.02
	(5)	30	9	2	0	0	79.12
	All	97	67	46	21	9	104.50
1976	(2)	62	66	49	30	13	45.23
	(5)	28	7	5	0	0	67.25
	All	98	81	57	30	13	88.08
1977	(2)	63	63	57	33	19	33.87
	(5)	29	7	7	0	0	66.19
	All	102	82	68	33	19	77.61
1978 ³	(2)	50	55	47	32	19	21.61
	(5)	24	8	4	2	0	48.84
	All	85	69	54	34	19	53.54
1979 ⁴	(2)	34	41	35	23	20	10.11 ²
	(5)	20	11	3	0	0	43.94
	All	65	57	41	24	20	37.71

1 (2) is CRSP's code for merger and (5) is delisted by the NYSE.

2 All chi-square values are significant at the .01 level except group (2) in 1979 which is significant at the .05 level

3 Subsequent 48 month delistings

4 Subsequent 36 month delistings