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ABSTRACT

The empirical relationship between earnings' yield, firm size and returns on the common stock of NYSE firms is examined in this paper. The results confirm that the common stock of high E/P firms earn, on average, higher risk-adjusted returns than the common stock of low E/P firms. This E/P effect is clearly significant even if experimental control is exercised over differences in firm size, i.e., the effect of size, as measured by the market value of common stock, is randomized. The results also show that while the common stock of small NYSE firms appear to have earned marginally higher risk-adjusted returns than the common stock of large NYSE firms, the size effect virtually disappears when returns are controlled for differences in E/P ratios. The evidence included in this paper lends credibility to the view that, at least for NYSE firms, the effect of differences in market value or size on common stock returns is of secondary importance when compared with the effect of E/P ratios.

1. INTRODUCTION

Recent empirical research on the relationship between earnings' yield, firm size and common stock returns has revealed some anomalies with respect to the pricing of corporate equities. In particular, the findings reported in Basu [1977] for instance indicate that portfolios of high (low) earnings' yield securities trading on the NYSE appear to have earned higher (lower) absolute and risk-adjusted rates of return, on average, than portfolios consisting of randomly selected securities. As noted by Basu, his results suggest a violation in the joint hypothesis that (i) the single-period capital asset pricing model (CAPM) has descriptive validity; and (ii) security price behavior on the NYSE is consistent with market efficiency.

Similarly, Banz [1981] shows that common stock of small NYSE firms earned higher risk-adjusted returns, on average, than the common stock of large NYSE firms. This size effect appears to have been in existence for at least forty years and, according to him, constitutes evidence that the CAPM is misspecified. Moreover, relying on the work of Reinganum [1981], Banz asserts that although the size and earnings' yield effects are related, the latter is a proxy for the former, i.e., the earnings' yield effect is a proxy for size and not vice-versa. This result, if correct, is an important one since it not only provides an explanation for the earnings' yield anomaly, but also suggests that in conducting tests of market reaction and/or efficiency researchers need only control for firm size. Unfortunately, the study by Reinganum contains sufficiently serious shortcomings that it would be inappropriate to rely exclusively on its findings in this regard.[1]

The purpose of this paper, accordingly, is to re-examine the relationship between earnings' yield (E/P ratios), firm size and returns on the common stock of NYSE firms. Section 2 describes the data, sample and other methodological considerations. The empirical results are then presented and discussed in Section 3. Finally, some concluding remarks are provided in Section 4.

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1. At least three facets of the Reinganum piece suggest that it might be of limited use in addressing the issue as to whether the earnings' yield effect reported by Basu for NYSE firms can be attributed to the size effect observed by Banz or vice-versa. First, the methodology employed in that work fails to adjust for differences in risk. This can be observed by noting that despite significant differences in the relative risk levels of the E/P and value (size) portfolios shown in Table 11 of that paper, excess or "abnormal" returns are computed as the difference between a given portfolio's realized return and that earned by a market index. In other words, the determination of excess returns is premised on the assumption that the risk levels of the experimental portfolios are the same as that for the market index. Second, by including both AMEX and NYSE firms in the sample, the author may have inadvertently introduced a potentially serious confounding factor. To the extent the earnings' yield and firm size effects are different for AMEX and NYSE securities due to the presence of a separate "exchange effect", then the results based on an aggregate AMEX-NYSE sample may have little significance, if any, for statements to be made in connection with each of the two groups of securities. Recall that the earnings' yield and size effects reported by Basu and Banz respectively are for NYSE securities only. Third, notwithstanding the use of the "research" COMPUSTAT database, Reinganum's findings may be affected by retroactive, as well as other sample selection biases. While this issue could easily have been tested, the study fails to have done so. Note that by comparing the distribution of returns for two samples of firms classified by market value of equity (size) and selected from the CRSP database and the merged CRSP-COMPUSTAT counterpart respectively, one can assess the effect of selection biases implicit in the latter. A priori, one would expect the effect of selection biases to be more pronounced in the case of AMEX firms because of their generally lower survival rates.

2. DATA AND METHODOLOGY

The following general research design was employed to examine the relationship between E/P ratios, firm size and common stock returns. Initially, securities were partitioned into groups or classes on the basis of their E/P ratios and the market value of their common stocks. These groups were then combined to form (i) a set of earnings' yield portfolios, each consisting of securities with similar E/P ratios but simultaneously belonging to different market value classes; and (ii) a set of market value portfolios, each consisting of securities with similar market values of equity but simultaneously belonging to different E/P classes. In other words, the earnings' yield and market value portfolios were constructed by controlling for (i.e., randomizing) the effect of firm size and E/P ratios respectively. The risk-return relationships of these portfolios then were compared and, finally, their risk-adjusted returns were tested statistically in a multivariate setting in order to determine the existence of a significant earnings' yield and/or size effects.

Data and Sample

The primary data for this investigation were drawn from two sources. Accounting earnings per share, on a 12-month moving basis, for the years ended December 1962 through 1978 were collected from an annually updated version of the Compustat Prices-Dividends-Earnings (PDE) Tape. The updated version of the PDE tape is analogous to the Merged Annual Industrial Compustat Tape produced by CRSP. Security prices, returns and common share data were obtained from the monthly stock return file of the CRSP tape.

To be included in the sample, a firm was required to have traded on the New York Stock Exchange during the period investigated, as well as its applicable return, market value and accounting earnings data must not have been missing from the data bases described above. A total of about thirteen hundred firms satisfied these requirements for at least one year, with approximately nine hundred qualifying for inclusion, on average, in each of the 17 years investigated.

Portfolio formation and risk adjustment issues

From a methodological point of view, the earnings-price ratios and market values of the common stock of all sample firms were computed as of December 31 of each year. While the market value of common stock was determined as the market price times the number of shares outstanding, the E/P ratio was defined as the most recent 12-month moving earnings per share, excluding extraordinary items and discontinued operations, as of December 31 of a given year scaled by the market price of common stock at that date.[2]

The computed E/P ratios for each year then were ranked in ascending order and the quintiles from the distribution served as the basis for assigning sample firms to one of five earnings' yield portfolios, i.e., lowest quintile to portfolio EP1, next lowest to portfolio EP2 and so on. As such, portfolio EP1 includes firms with the lowest E/P ratios, while portfolio EP5 includes those with the highest E/P ratios. These ranking and portfolio assignment procedures were repeated, but in this instance on the basis of the market value of common stock variable, to form five market value (size) portfolios with the smallest firms being included in portfolio MV1 and the largest in MV5. Some summary statistics pertaining to these two sets of portfolios are included in Panel A of Table 1.

As might be expected, the size (MV1-MV5) and earnings' yield (EP1-EP5) portfolios differ quite dramatically in terms of market value and the E/P

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2. In the case of firms with a December 31 fiscal year-end, the earnings measure represents the annual primary earnings per share figure reported in the annual report to shareholders. For other firms, it represents the sum of the primary earnings per share applicable to the four most recent quarters. For an elaboration, see the COMPUSTAT PDE Manual.

TABLE 1

SELECTED VALUES FROM THE DISTRIBUTION OF MARKET VALUES AND EARNINGS' YIELDS FOR PORTFOLIOS

		Portfolio[a]	Quartiles from the Distribution of:[b] Market Value (millions of $) Lower Q.	Median	Upper Q.	E/P Ratio Lower Q.	Median	Upper Q.
PANEL A: Basic (Nonrandomized) Portfolios	Market Value	MV1	17.4	27.7	40.5	0.053	0.090	0.146
		MV2	54.4	75.5	100.9	0.060	0.091	0.150
		MV3	125.9	165.8	213.8	0.057	0.085	0.131
		MV4	295.3	397.3	507.3	0.054	0.079	0.119
		MV5	807.7	1127.1	2041.5	0.048	0.072	0.108
	Earnings' Yield	EP1	58.1	230.2	774.3	0.018	0.033	0.050
		EP2	104.3	264.5	629.6	0.048	0.062	0.099
		EP3	83.9	199.8	535.5	0.063	0.080	0.125
		EP4	56.7	137.2	378.6	0.077	0.097	0.155
		EP5	34.7	74.5	215.2	0.097	0.144	0.215
PANEL B: Randomized Portfolios	Market Value	MV1*	17.8	29.7	48.7	0.051	0.084	0.131
		MV2*	50.3	85.7	125.1	0.052	0.083	0.130
		MV3*	103.3	179.1	251.6	0.056	0.084	0.128
		MV4*	249.4	402.0	557.4	0.056	0.083	0.128
		MV5*	724.9	1083.0	2021.0	0.056	0.083	0.127
	Earnings' Yield	EP1*	59.2	169.9	509.9	0.019	0.034	0.055
		EP2*	61.5	168.2	510.5	0.048	0.062	0.101
		EP3*	59.7	164.3	479.6	0.062	0.083	0.129
		EP4*	57.1	161.8	483.9	0.076	0.103	0.155
		EP5*	58.5	166.5	497.9	0.094	0.133	0.208

[a] The basic (or nonrandomized) portfolios are formed by ranking securities on market value or earnings' yield, as appropriate. The randomized market value (earnings' yield) portfolios are formed by controlling for the effects of earnings' yield (market value).

[b] Based on pooled annual data (as of December 31) for the period 1962-78.

ratio, respectively. More importantly however, the summary statistics in Panel A indicate that these two variables appear to be negatively associated. Observe from the north-east quadrant that smaller firms, on average, seem to have somewhat higher E/P ratios than the larger firms. Conversely, the south-east quadrant of Panel A reveals that the low E/P portfolios, on average, consist of larger firms when compared with the high E/P portfolios. Nonparametric analysis of variance (Kruskal-Wallis), moreover, confirms that the null hypotheses of equality in E/P ratios for the five size portfolios and the equality in market values for the five earnings' yield portfolios respectively, can be rejected at the 1% level or higher.

In order to control for the confounding effects that might arise because of the negative association discussed above, two additional sets of size and earnings' yield portfolios were constructed by randomizing with respect to the E/P and market value variables respectively. Consider initially the formation of the earnings' yield portfolios which are randomized in terms of firm size.

At the outset, all firms included in each of the five basic market value or size portfolios, MV1-MV5, were ranked annually from minimum to maximum on the basis of their E/P ratios. The quintiles from the distributions applicable to a given value class (portfolio) then were used to assign firms to one of five earnings' yields groups or sub-portfolios. Next, the lowest earnings' yield groups relating to the five market value classes were combined to form randomized portfolio EP1*. The firms included in the other four earnings' yield groups were combined in an analogous manner to form randomized portfolios EP2*-EP5*. Note that since these earnings' yield portfolios include securities drawn from the entire set of market value classes, they can be viewed as being randomized with respect to firm size.

The randomization approach described above was then employed to construct five market value or size portfolios, MV1*-MV5*, which are randomized in terms of the earnings' yield variable. Essentially, the market values of firms included in each of the basic earnings' yield classes (portfolios), EP1-EP5, were ranked annually and the quintiles from the underlying distribution were employed to assign firms to one of five market value or size groups. Securities assigned to the ith size group (i.e., ith market value quintile) applicable to each of the five E/P classes then were combined to form randomized portfolio MVi*(i=1,...,5). Some summary measures relating to these size portfolios, as well as to the earnings' yield portfolios EP1*-EP5* are provided in Panel B of Table 1.

As in the case of the basic portfolios, the randomized size (MV1*-MV5*) and earnings' yield (EP1*-EP5*) portfolios differ quite significantly in terms of market value and the E/P ratio, respectively. However by construction, all of the size portfolios MV1*-MV5* have similar E/P ratios (about 8.3-8.4% on average), while the five earnings' yield portfolios EP1*-EP5* consist of firms of similar size -- the market value of common stock of firms included in each of these latter portfolios, on average, is about $160-170 million. Indeed, results of statistical tests indicate that neither the null hypothesis of equality in E/P ratios for portfolios MV1*-MV5* nor the null hypothesis of equality in market values for portfolios EP1*-EP5* can be rejected at any reasonable level of significance.[3] This, of course, suggests that confounding effects attributable to the earnings' yield variable cannot be expected to be present in comparisons involving the size portfolios MV1*-MV5*. Similarly, assessments based on the earnings' yield portfolios EP1*-EP5* should be free from any confounding effects stemming from the size factor.

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3. Nonparametric analysis of variance (Kruskal-Wallis) was employed in this regard; see Hollander and Wolfe [1973] or Conover [1980] for an elaboration. The computed Kruskal-Wallis test statistics — distributed approximately as a chi-square random variable with 4 degrees of freedom and based on more than 16,000 observations (pooled annual data) -- are 3.45 and 5.80 for the null hypotheses pertaining to portfolios MV1*-MV5* and EP1*-EP5* respectively. Note that these amounts are well below even the critical value at the 10% level of significance, i.e., $Pr[\chi^2(4) > 0.90] = 7.78$.

The analysis then entailed the measurement of the risk-return relationships for the various size and earnings' yield portfolios. First, monthly portfolio returns were computed for the 17-year period 1963-1979 as an arithmetic average of the corresponding returns for constituent firms. Next, two measures of risk — standard deviation of monthly returns and systematic (nondiversifiable) risk — were estimated for each portfolio. The systematic risk measure in particular was determined in the context of the Sharpe-Lintner version of the CAPM:

(1) $$r_{P,t} - r_{f,t} = \hat{\delta}_P + \hat{\beta}_P[r_{m,t} - r_{f,t}]$$

where $r_{P,t}$ = return on portfolio p in month t; computed as the cross-sectional arithmetic average of the realized monthly returns on securities included in p.

$r_{f,t}$ = return on "risk-free" asset in month t; measured as the realized monthly return on 30-day U.S. treasury bills.

$r_{m,t}$ = return on the "market" portfolio in month t; measured by the CRSP Index of all NYSE firms.[4]

$\hat{\delta}_p$ = differential or abnormal return for portfolio p (estimated OLS intercept).

$\hat{\beta}_p$ = systematic or nondiversifiable risk for portfolio p (estimated OLS slope).

Finally, the configurations of the risk-adjusted differential or abnormal returns, $\hat{\delta}_p$, for the various market value and E/P portfolios were examined in order to ascertain the presence of a size and earnings' yield effects respectively. More specifically, the null hypothesis of no size effect on risk-adjusted returns was tested in the context of Hotelling's multivariate T^2 methodology by assessing whether the vector of $\hat{\delta}_p$ applicable to the five size portfolios MV1*-MV5* is significantly different from zero.[5] The null

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4. Both the "equally-weighted" and "value-weighted" versions of this index are employed in this paper in order to determine the extent to which the results are sensitive to the choice of a surrogate for the "market" portfolio.

hypothesis of no earnings' yield effect was tested in an analogous manner by employing the $\hat{\delta}_p$ pertaining to the portfolios EP1*-EP5*.

3. EMPIRICAL RESULTS

Rates of return for size and E/P portfolios

At the outset, consider some descriptive statistics pertaining to the rates of return earned by the various size and earnings' yield portfolios. Table 2 shows the mean monthly return, $\bar{r}_p$, and related standard deviation, $\sigma(\tilde{r}_p)$, for (i) the basic market value and earnings' yield portfolios (Panel A); (ii) their randomized counterparts — MV1*-MV5* and EP1*-EP5* (Panel B); and (iii) the equally-weighted and value-weighted versions of an NYSE-based "market" index (Panel C). In addition, the mean return per unit of standard deviation, $\bar{r}_p/\sigma(\tilde{r}_p)$, or the reciprocal of the coefficient of variation of monthly returns for the various portfolios is shown in column (3), and the differences between that amount and the corresponding values for the two versions of the "market" index, respectively, are shown in columns (4) and (5) of Table 2.

A survey of the results in Panel A indicates that consistent with previously published findings, the common stock of small NYSE firms appear to have earned, on average, higher monthly returns than the common stock of large firms: the smallest market value quintile, for instance, experienced an average monthly return of 1.5% during the seventeen years ending 1979, while

5. See, for example, Morrison [1967] for an elaboration on the properties of the Hotelling's T^2 test of means. The use of an analysis of covariance (i.e., cross-sectional "Chow" test) framework to test the null hypothesis of equal δ_p was rejected because the critical assumption of equal variances was clearly violated in the case of the size portfolios. Furthermore, the Hotelling test can be viewed as a generalized version of the multivariate counterparts formulated to test for the equality of coefficients within Zellner's seemingly unrelated regression framework; a description of the Zellner framework can be found, for example, in Theil [1971]. Note that the Hotelling T^2 methodology simultaneously tests all possible linear combinations of δ_p, including the ones formulated in the context of the Zellner framework.

TABLE 2

RATES OF RETURN FOR MARKET VALUE AND EARNINGS' YIELD PORTFOLIOS : SOME SUMMARY STATISTICS

(Based on monthly data for the period 1963-79)

		Portfolio[a]	Summary Statistic[b] $\bar{r}_p$	$\sigma(\tilde{r}_p)$	$\{\bar{r}_p/\sigma(\tilde{r}_p)\}$	$\{\bar{r}_p/\sigma(\tilde{r}_p)$ $-\bar{r}_{EI}/\sigma(\tilde{r}_{EI})\}$	$\{\bar{r}_p/\sigma(\tilde{r}_p)$ $-\bar{r}_{VI}/\sigma(\tilde{r}_{VI})\}$
			(1)	(2)	(3)	(4)	(5)
PANEL A: Basic (Nonrandomized) Portfolios	Market Value	MV1	0.0150	0.0736	0.2044	0.0106	0.0392
		MV2	0.0120	0.0604	0.1991	0.0054	0.0339
		MV3	0.0100	0.0549	0.1818	-0.0120	0.0166
		MV4	0.0091	0.0504	0.1810	-0.0128	0.0158
		MV5	0.0064	0.0431	0.1476	-0.0461	-0.0176
	Earnings' Yield	EP1	0.0083	0.0628	0.1326	-0.0611	-0.0326
		EP2	0.0071	0.0534	0.1323	-0.0614	-0.0329
		EP3	0.0088	0.0513	0.1722	-0.0216	0.0700
		EP4	0.0127	0.0534	0.2378	0.0440	0.0726
		EP5	0.0157	0.0597	0.2632	0.0695	0.0980
PANEL B: Randomized Portfolios	Market Value	MV1*	0.0136	0.0719	0.1894	-0.0043	0.0243
		MV2*	0.0115	0.0608	0.1890	-0.0048	0.0238
		MV3*	0.0097	0.0544	0.1790	-0.0147	0.0138
		MV4*	0.0097	0.0503	0.1933	-0.0005	0.0281
		MV5*	0.0081	0.0430	0.1882	-0.0055	0.0230
	Earnings' Yield	EP1*	0.0087	0.0632	0.1368	-0.0570	-0.0284
		EP2*	0.0083	0.0559	0.1483	-0.0454	-0.0169
		EP3*	0.0091	0.0528	0.1717	-0.0221	0.0065
		EP4*	0.0121	0.0524	0.2308	0.0371	0.0657
		EP5*	0.0144	0.0545	0.2645	0.0708	0.0994
PANEL C: "Market" Portfolio		Equally Weighted Index (EI)	0.0110	0.0568	0.1937	0.0	0.0285
		Value Weighted Index (VI)	0.0069	0.0420	0.1652	-0.0285	0.0

[a] The basic (or nonrandomized) portfolios are formed by ranking securities on market value or earnings' yield, as appropriate. The randomized market value (earnings' yield) portfolios are formed by controlling for the effects of earnings' yield (market value).

[b] $\bar{r}_p$ = mean monthly return on portfolio p; $\sigma(\tilde{r}_p)$ = standard deviation of monthly return on portfolio p; and $\bar{r}_p/\sigma(\tilde{r}_p)$ = reciprocal of the coefficient of variation of monthly returns for portfolio p. Note subscripts EI and VI represent equally weighted and value weighted indexes of NYSE firms respectively.

the largest had earned about 0.64% per month.[6] Similarly, portfolios of firms with high E/P ratios seem to have earned higher rates of return than their low E/P counterparts. Note, for example, that the highest earnings' yield quintile earned about 1.57% per month versus about 0.83% earned by the lowest quintile. More interestingly however, while the higher returns for the small firms appear to be simultaneously accompanied by generally higher levels of variability (risk), as evidenced by the $\sigma(\tilde{r}_p)$ values in column (2) of Table 2, this is clearly not the case for the high E/P portfolios. In fact, the highest earnings' yield portfolio EP5 seems to have a marginally smaller standard deviation of monthly returns than the lowest earnings' yield portfolio EP1. As a consequence, while the dispersion in the mean return per unit of variability measure, $\bar{r}_p/\sigma(\tilde{r}_p)$, for the five basic E/P portfolios largely parallels that for its unscaled counterpart (i.e, $\bar{r}_p$), it is substantially less in the case of the basic size portfolios.

Turning to Panel B of Table 2, one finds the results for the market value and earnings' yield portfolios that were constructed by controlling for the confounding effects stemming from differences in the E/P and size variables respectively. Although the preceding remarks on the configuration of the rates of return, by and large, are also applicable to these two sets of randomized portfolios, an important difference should be noted. Observe from column (3) that the mean monthly returns per unit of variability, $\bar{r}_p/\sigma(\tilde{r}_p)$,

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6. These results are based, as mentioned previously, on the sample of firms drawn from the merged COMPUSTAT-CRSP data base. In order to test for the existence of a survivorship bias, an additional five market value portfolios were constructed by partitioning all firms contained in the monthly return file of the CRSP tape. The rates of return for these latter portfolios then were compared with those for MV1-MV5 and the vector of differences between the two sets of returns was tested for statistical significance. Results of Hotelling's T^2 test of means indicates that the difference in returns for the two set of market value portfolios is not significantly different from zero at any reasonable probability level. This, of course, suggests that the effects of a significant survivorship bias on common stock returns is not present in this study.

earned by the portfolios of small firms (MV1* and MV2*) are virtually identical to the amounts earned by their large firm counterparts (MV4* and MV5*). In other words, the higher mean monthly returns experienced by MV1* and MV2* are accompanied by proportionately higher levels of variability in returns so that their coefficients of variation (i.e., the reciprocal of $\bar{r}_p / \sigma(\tilde{r}_p)$ shown in column (3)) are similar to the levels reported for portfolios MV4* and MV5*. It would appear, accordingly, that after controlling for confounding E/P effects, the entire difference in the realized returns for small and large NYSE firms can be explained by or attributed to differences in risk (variability) levels.[7] The lack of homogeneity in the $r_p / \sigma(\tilde{r}_p)$ statistic for portfolios EP1*-EP5*, on the other hand, confirms that the differential performance of the earnings' yield portfolios cannot be explained along these lines, i.e., the difference in returns between low and high E/P firms cannot be attributed to differences in variability (risk) or firm size.

Finally, the relative performance of the experimental portfolios vis-a-vis the equally-weighted and value-weighted versions of the NYSE index can be discerned from columns (4) and (5). A comparison of the statistics reported in these two columns reveals that the results are quite sensitive to the choice of a "market" index. For instance, while all five randomized portfolios MV1*-MV5* have earned rates of return (per unit of variability) in excess of the value-weighted index, a diametrically opposite result is obtained if the equally-weighted index was used instead. In this regard, note that the $\bar{r}_p / \sigma(\tilde{r}_p)$ statistic for the equally-weighted index is about 17% higher than the corresponding value for its value-weighted counterpart, i.e., 0.1937

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7. The issue as to whether the difference in returns of small and large NYSE firms can also be explained in terms of systematic (nondiversifiable) risk per se is addressed in the next sub-section. Recall that the variability measure, $\sigma(\tilde{r}_p)$, includes both systematic and unsystematic risk.

in the case of the former versus 0.1652 for the latter (see Panel C).[8]

CAPM risk-return relationships

Although the preceding analysis provides some insights into the risk-return relationships for the various experimental portfolios, it fails to address an important issue. Essentially, to what extent are the risk-return relationships observed for these portfolios consistent with the relationships predicted by the Sharpe-Lintner capital asset pricing model? In order to examine this issue, equation (1) was estimated for each of the size and earnings' yield portfolios by employing ordinary least squares. The equally-weighted NYSE index was assumed to be the surrogate for the "market" portfolio[9] and selected results pertaining to these asset pricing regressions are shown in Table 3. Specifically, that table includes: (1) the estimated systematic risk for experimental portfolio p, $\hat{\beta}_p$; (2) the coefficient of correlation between the return on portfolio p, net of the risk-free rate, and the corresponding net return on the "market" portfolio, $\rho(r_p', r_m')$; (3) the estimated abnormal or differential return for portfolio p, $\hat{\delta}_p$; and (4) the t-value pertaining to the null hypothesis $\hat{\delta}_p = 0$. Also shown are the results of Hotelling's T^2 test performed on the vector of abnormal returns applicable to the alternative sets of size and earnings' yield portfolios. While column (6) contains the value of the F-statistic corresponding to the computed T^2 statistic, the F-values relating to the individual null hypotheses that the $\hat{\delta}_p$

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8. The results for portfolios MV1-MV5 and MV1*-MV5* suggest that the difference in $\bar{r}_p/\hat{\sigma}(\tilde{r}_p)$ between the two versions of the "market" index can be attributed, more appropriately, to the confounding effect of the E/P variable, rather than firm size per se. Note that since E/P ratios and market values of NYSE firms appear to be negatively associated, the value-weighted index can be expected to have a somewhat lower weighted average earnings' yield than its equally-weighted counterpart.

9. The results corresponding to the use of the value-weighted NYSE index as a surrogate "market" portfolio are introduced at a later point.

TABLE 3

SOME CAPM RESULTS FOR MARKET VALUE AND EARNINGS' YIELD PORTFOLIOS : EQUALLY WEIGHTED NYSE INDEX

(Based on monthly data for the period 1963-79)

		Portfolio[a]	CAPM Statistic[b]				Hotelling's Test Results[c]	
			$\hat{\beta}_p$	$\rho(r'_p, r'_m)$	$\hat{\delta}_p$	$t(\hat{\delta}_p)$	$F(\hat{\delta}_p)$	$F^*(\hat{\delta}_p)$
			(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: Basic (Nonrandomized) Portfolios	Market Value	MV1	1.253	0.967	0.0024	1.82	0.65	1.06
		MV2	1.051	0.987	0.0007	1.07	0.23	
		MV3	0.954	0.987	-0.0007	-1.15	0.26	
		MV4	0.857	0.965	-0.0010	-1.02	0.20	
		MV5	0.681	0.897	-0.0026	-1.91	0.72	
	Earnings' Yield	EP1	1.055	0.955	-0.0030	-2.31	1.05	4.88
		EP2	0.911	0.968	-0.0034	-3.56	2.49	
		EP3	0.889	0.983	-0.0014	-2.15	0.91	
		EP4	0.923	0.981	0.0022	3.00	1.77	
		EP5	1.023	0.972	0.0046	4.66	4.27	
PANEL B: Randomized Portfolios	Market Value	MV1*	1.230	0.972	0.0011	0.95	0.18	0.61
		MV2*	1.062	0.992	0.0001	0.16	0.00	
		MV3*	0.945	0.987	-0.0009	-1.50	0.44	
		MV4*	0.864	0.974	-0.0004	-0.47	0.04	
		MV5*	0.700	0.923	-0.0010	-0.82	0.13	
	Earnings' Yield	EP1*	1.074	0.965	-0.0028	-2.43	1.16	4.85
		EP2*	0.963	0.979	-0.0025	-3.06	1.83	
		EP3*	0.919	0.987	-0.0014	-2.36	1.10	
		EP4*	0.907	0.983	0.0017	2.49	1.21	
		EP5*	0.934	0.972	0.0039	4.31	3.64	

a/ The basic (or nonrandomized) portfolios are formed by ranking securities on market value or earnings' yield, as appropriate. The randomized market value (earnings' yield) portfolios are formed by controlling for the effects of earnings' yield (market value).

b/ $\hat{\beta}_p$ = estimated systematic risk for portfolio p; $\rho(r'_p, r'_m)$ = coefficient of correlation between the return on portfolio p (net of the risk-free rate), r'_p, and that on the market index (net of the risk free rate), r'_m; $\hat{\delta}_p$ = differential return — estimated intercept for OLS regression of r'_p on r'_m; $t(\hat{\delta}_p)$ = t-value for $\hat{\delta}_p = 0$.

c/ Results for Hotelling's T^2 test of means. Shown are the $F(5,199)$ - statistics pertaining to the hypothesis that $\hat{\delta}_p = 0$; $F^*(\hat{\delta}_p)$ represents the F - value corresponding to the T^2 statistic. Selected fractiles from the $\tilde{F}$ (n,d) distribution are:

	0.90	0.95	0.99
$\tilde{F}$ (5,120)	1.90	2.29	3.17
$\tilde{F}$ (5,∞)	1.85	2.21	3.02

for a given portfolio is equal to zero are shown in column (5). Note that these latter F-values can be viewed as the multivariate analogs of the univariate t-statistics reported in column (4), and selected fractiles from the theoretical F-distributions are included in note (c) of Table 3.

Consider initially the results for the market value portfolios. It will be readily noted that the level of systematic risk ($\hat{\beta}_p$) declines quite dramatically and in a monotonic way as one moves from the portfolios consisting of small firms to those consisting of the larger ones. Since the correlation coefficients reported in column (2) suggest that these portfolios are equally well diversified (at least approximately), the difference in $\hat{\beta}_p$ can be attributed principally to the difference in the standard deviation of returns (see $\sigma(\tilde{r}_p)$ in Table 2).[10] Moreover, consistent with the discussion in the previous section, size portfolio MV1 seems to have earned a positive abnormal return of about 0.24% per month, while its large firm counterpart, MV5, experienced a negative abnormal return of about 0.26% per month. The magnitude of $\hat{\delta}_p$ for these two classes of firms, however, is considerably smaller in the case where the effects of differences in E/P ratios are controlled. Observe that the abnormal returns experienced by MV1* and MV5* amount to only about 0.11% and -0.10% per month, respectively. Results of both the univariate t-test and the Hotelling's multivariate T^2 test, moreover, indicate that the $\hat{\delta}_p$ for portfolios MV1*-MV5* are not statistically significant. In other words, the estimated abnormal returns for the five size portfolios, as well as all linear combinations thereof, are not stochastically different from zero. This result, of course, is consistent with the hypothesis that market value or firm size per se did not have a significant

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10. Recall that, by definition, $\beta_p = Cov(r_p,r_m)/\sigma^2(r_m) = \rho(r_p,r_m)\ \sigma(r_p)/\sigma(r_m)$. As such, the difference between the systematic risks of two portfolios can be explained in terms of the differences in the $\rho(r_p,r_m)$ and $\sigma(r_p)$ parameters.

effect on the risk-adjusted returns of NYSE firms during the period 1963-79.

An examination of the CAPM results for the earnings' yield portfolios, on the other hand, leads to an entirely different conclusion regarding the effect of E/P ratios on performance. At the outset, observe from columns (1) and (2) of Panel B that not only are the randomized portfolios EP1*-EP5* equally well diversified, but they also have similar levels of systematic risk, at least when compared to their market value counterparts. These similarities notwithstanding, it would appear that the five earnings' yield portfolios have earned abnormal returns that are by no means homogeneous. Note in this connection that the abnormal returns experienced by these earnings' yield portfolios range from -0.28% per month for EP1* to 0.39% per month for EP5*. Consequently, an arbitrage portfolio that had a "long" position in EP5* and, simultaneously, a "short" position in EP1* could have earned about 0.67% per month (or about 8% per annum) more than a randomly selected portfolio of equivalent risk. In addition, the Hotelling's T^2 test confirms that from a statistical viewpoint the vector of $\hat{\delta}_p$ for portfolios EP1*-EP5* is significant at the 1% level or higher. Multiple comparison test procedures suggest that this result can be attributed primarily to the highest earnings' yield portfolio EP5*; the $\hat{\delta}_p$ for the other four randomized portfolios, EP1*-EP4*, are not significantly different from zero in a multivariate setting (see the F-statistics in column (3) of Panel B).[11] In short, these findings are consistent with the statement that E/P ratios did, in fact, have a significant effect on the risk-adjusted returns of NYSE firms during the 17 year period

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11. In contrast, the t-values shown in column (4) lead to the inference that all five earnings' yield portfolios (EP1*-EP5*) have earned abnormal returns that are stochastically different from zero. Unfortunately, the statistical significance levels associated with these results can be expected to be overstated since they are based on univariate confidence intervals. It is important to recognize that the structure of the experiment and related hypothesis tests entail the adoption of a multivariate testing perspective and, as such, the construction of joint or simultaneous confidence intervals. Note that the test involves five variates (i.e., five E/P or size classes) rather than just one.

ending December 1979.

The CAPM results presented hitherto have been based on the equally-weighted NYSE index. In the light of Roll's [1977, 1978] criticisms of empirical tests of the CAPM, coupled with the evidence included in Table 2, it seems appropriate to test the sensitivity of those results to the use of an alternative surrogate for the "market" portfolio. A survey of Table 4, which presents the CAPM findings based on the value-weighted index, reveals that the conclusions stated above are not altered in any substantive way. Nonetheless, at least three facets of these results should be highlighted.

First, as might be expected given the weighting scheme underlying the market index, the correlation coefficients reported in column (2) indicate that the level of diversification for large firm portfolios is considerably higher than that for the small firms. On the other hand, this characteristic is not shared by the earnings' yield portfolios EP1*-EP5* because they are randomized with respect to firm size. Second, estimates of abnormal returns, $\hat{\delta}_p$, seem to be particularly sensitive to the use of the alternative versions of the NYSE index. For example, the value-weighted index yields a $\hat{\delta}_p$ of 0.0072 for portfolio EP5*, which is about 85% more than the 0.0039 estimate obtained by using the equally-weighted index. Finally, some caution should be exercised in interpreting the results pertaining to the relative performance of the size portfolios MV1*-MV5* in particular. Since the Hotelling's T^2 test indicates the vector of $\hat{\delta}_p$ for these five portfolios is not stochastically different from zero, the most appropriate inference is the returns earned by both small and large firms are statistically indistinguishable from the corresponding returns predicted by the CAPM.[12]

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12. Reliance on the t-test, on the other hand, seems to lead to a somewhat different conclusion. The $t(\hat{\delta}_p)$ statistics shown in column (3) indicate that, with the exception of MV3*, the other four size portfolios have $\hat{\delta}_p$ which are significantly greater than zero. Additional tests, moreover, suggest that the abnormal returns earned by small and large firms are not statistically

TABLE 4

SOME CAPM RESULTS FOR MARKET VALUE AND EARNINGS' YIELD PORTFOLIOS : VALUE WEIGHTED NYSE INDEX

		Portfolio[a/]	CAPM Statistic[b/] $\hat{\beta}_p$ (1)	$\rho(r'_p, r'_m)$ (2)	$\hat{\delta}_p$ (3)	$t(\hat{\delta}_p)$ (4)	Hotelling's Test Results[c/] $F(\hat{\delta}_p)$ (5)	$F^*(\hat{\delta}_p)$ (6)
PANEL A: Basic (Nonrandomized) Portfolios	Market Value	MV1	1.400	0.802	0.0071	2.30	1.04	1.54
		MV2	1.262	0.881	0.0044	2.21	0.96	
		MV3	1.206	0.925	0.0025	1.73	0.59	
		MV4	1.146	0.957	0.0018	1.78	0.62	
		MV5	1.014	0.990	-0.0006	-1.45	0.41	
	Earnings' Yield	EP1	1.379	0.926	0.0005	0.27	0.01	5.05
		EP2	1.192	0.940	-0.0004	-0.27	0.01	
		EP3	1.125	0.923	0.0016	1.14	0.25	
		EP4	1.181	0.892	0.0054	3.20	2.01	
		EP5	1.206	0.851	0.0083	3.75	2.76	
PANEL B: Randomized Portfolios	Market Value	MV1*	1.388	0.814	0.0057	1.95	0.75	1.77
		MV2*	1.295	0.897	0.0038	2.03	0.81	
		MV3*	1.202	0.932	0.0023	1.65	0.53	
		MV4*	1.141	0.954	0.0024	2.31	1.05	
		MV5*	1.007	0.986	0.0011	2.25	1.00	
	Earnings' Yield	EP1*	1.377	0.918	0.0008	0.44	0.04	5.25
		EP2*	1.227	0.923	0.0008	0.53	0.05	
		EP3*	1.161	0.926	0.0017	1.23	0.30	
		EP4*	1.126	0.905	0.0048	3.09	1.87	
		EP5*	1.137	0.878	0.0072	3.90	2.99	

a/ The basic (or nonrandomized) portfolios are formed by ranking securities on market value or earnings' yield, as appropriate. The randomized market value (earnings' yield) portfolios are formed by controlling for the effects of earnings' yield (market value).

b/ $\hat{\beta}_p$ = estimated systematic risk for portfolio p; $\rho(r'_p, r'_m)$ = coefficient of correlation between the return on portfolio p(net of the risk-free rate), r'_p, and that on the market index (net of the risk-free rate), r'_m; $t(\hat{\delta}_p)$ = t-value for $\hat{\delta}_p = 0$.

c/ Results for Hotelling's T^2 test of means. Shown are the F(5,199) - statistics pertaining to the hypothesis that $\hat{\delta}_p = 0$; $F^*(\hat{\delta}_p)$ represents F - value corresponding to the T^2 statistic. Selected fractiles from the $\tilde{F}(n,d)$ distribution are:

	0.90	0.95	0.99
$\tilde{F}$ (5,120)	1.90	2.29	3.17
$\tilde{F}$ (5,∞)	1.85	2.21	3.02

Results on interaction effects

To summarize, the empirical results presented above confirm the presence of a significant earnings' yield effect on the NYSE during the period 1963-79. But, was this effect homogeneous across alternative market value classes? In other words, to what extent did the E/P effect vary between small and large NYSE firms? An examination of this issue should permit one to determine whether or not there existed an interaction effect between earnings' yield and firm size.

Actual rates of return and selected CAPM results for earnings' yield portfolios pertaining to each of five market value classes are presented in Table 5. These earnings' yield portfolios were constructed by ranking securities included in a given market value class (i.e., size portfolio MV1-MV5) on the basis of their E/P ratios.

In general the E/P effect, which was observed in the case of the aggregate sample of NYSE firms, also seems to be present in each of the market value categories. To see this more clearly, Figure 1 contains a scatter diagram of $\bar{r}_p/\sigma(\tilde{r}_p)$ and $\hat{\delta}_p$ versus market value for the alternative sets of earnings' yield portfolios. It will be readily noted that in all five size classes, the common stock of high E/P firms have experienced higher risk-adjusted returns than the common stock of their low E/P counterparts. A closer examination of the configuration of $\hat{\delta}_p$ in Figure 1, however, suggests that the earnings' yield effect becomes somewhat weaker as one moves from the smallest size class (MV1) to the largest (MV5), i.e., the difference in the

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different from each other. Accordingly, it can be argued that although a significant size effect is not observable in the context of the univariate methodology, the estimated risk-return relationships for both small and large firms are inconsistent with CAPM predictions based on the value-weighted NYSE index. The propriety of this conclusion, however, should be questioned because of the serious shortcomings associated with relying on the t-test methodology in a multivariate setting (see note 11 above).

TABLE 5

ACTUAL RETURNS & SELECTED CAPM RESULTS FOR EARNINGS' YIELD PORTFOLIOS CLASSIFIED BY MARKET VALUE
(Based on monthly data for the period 1963-79)

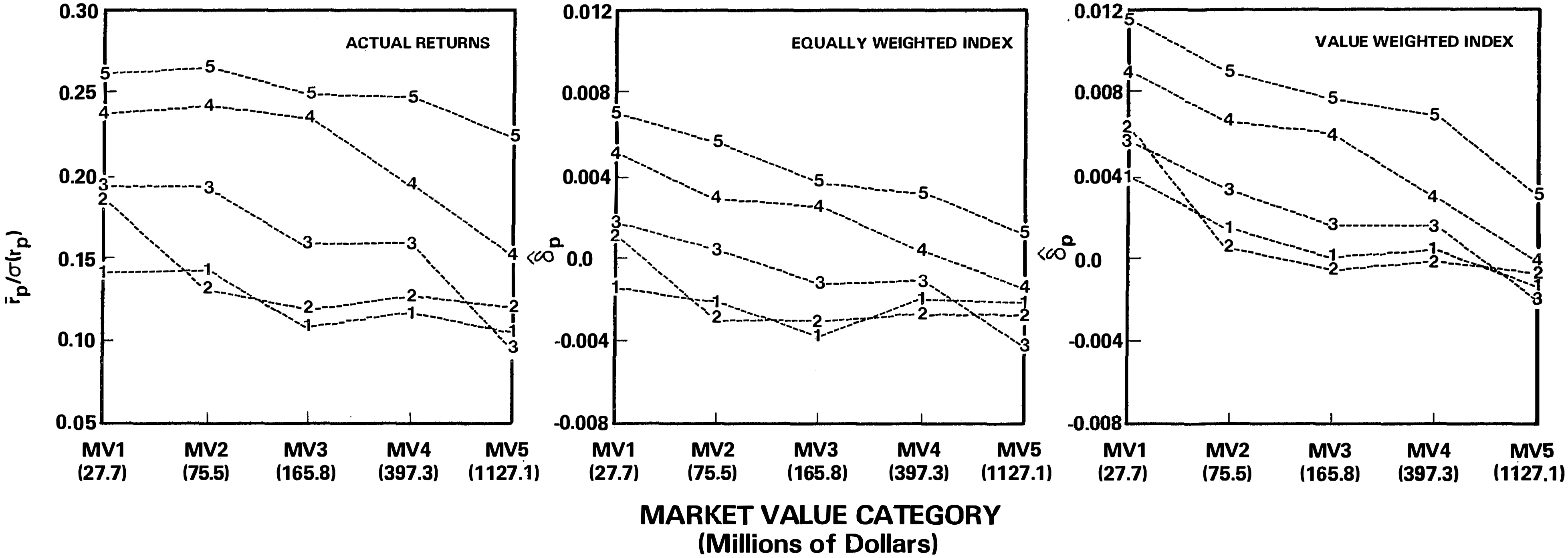
Portfolio[a]		Summary Statistics[b]												
		Actual Returns			Equally Weighted NYSE Index					Value Weighted NYSE Index				
MV Class	EP Class	$\bar{r}_p$	$\sigma(\tilde{r}_p)$	$\bar{r}_p/\sigma(\tilde{r}_p)$	$\hat{\beta}_p$	$\hat{\rho}(\tilde{r}'_p, \tilde{r}'_m)$	$\hat{\delta}_p$	$t(\hat{\delta}_p)$	$F^*(\hat{\delta}_p)$	$\hat{\beta}_p$	$\hat{\rho}(\tilde{r}'_p, \tilde{r}'_m)$	$\hat{\delta}_p$	$t(\hat{\delta}_p)$	$F^*(\hat{\delta}_p)$
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
MV1	1	0.0124	0.0886	0.140	1.449	0.932	-0.0016	-0.68	4.99	1.587	0.755	0.0040	0.98	5.44
	2	0.0135	0.0751	0.180	1.256	0.951	0.0009	0.52		1.417	0.796	0.0056	1.74	
	3	0.0131	0.0691	0.189	1.167	0.960	0.0010	0.73		1.326	0.809	0.0053	1.87	
	4	0.0170	0.0712	0.238	1.180	0.941	0.0048	2.82		1.338	0.792	0.0092	3.00	
	5	0.0193	0.0737	0.262	1.213	0.935	0.0069	3.77		1.331	0.762	0.0116	3.45	
MV2	1	0.0104	0.0728	0.142	1.223	0.955	-0.0021	-1.39	4.82	1.471	0.852	0.0023	0.84	5.33
	2	0.0082	0.0625	0.131	1.061	0.964	-0.0032	-2.74		1.288	0.868	0.0005	0.25	
	3	0.0111	0.0583	0.191	0.990	0.965	0.0002	0.16		1.202	0.869	0.0037	1.81	
	4	0.0140	0.0571	0.244	0.959	0.953	0.0032	2.63		1.151	0.849	0.0066	3.12	
	5	0.0165	0.0612	0.270	1.021	0.948	0.0054	3.92		1.120	0.827	0.0091	3.75	
MV3	1	0.0075	0.0661	0.114	1.074	0.923	-0.0039	-2.21	3.76	1.381	0.881	-0.0003	-0.16	4.35
	2	0.0069	0.0567	0.121	0.949	0.951	-0.0038	-3.07		1.199	0.891	-0.0006	-0.31	
	3	0.0088	0.0544	0.161	0.921	0.960	-0.0017	-1.63		1.176	0.909	0.0014	0.86	
	4	0.0127	0.0533	0.239	0.903	0.962	0.0024	2.34		1.117	0.883	0.0055	3.14	
	5	0.0140	0.0555	0.252	0.923	0.945	0.0035	2.75		1.158	0.879	0.0067	3.60	
MV4	1	0.0074	0.0607	0.123	0.916	0.858	-0.0030	-1.38	1.76	1.311	0.911	-0.0003	-0.16	2.50
	2	0.0069	0.0533	0.130	0.851	0.907	-0.0031	-1.96		1.164	0.921	-0.0004	-0.28	
	3	0.0081	0.0500	0.162	0.829	0.941	-0.0018	-1.49		1.089	0.918	0.0010	0.68	
	4	0.0104	0.0506	0.205	0.836	0.938	0.0004	0.34		1.083	0.902	0.0032	2.09	
	5	0.0128	0.0514	0.249	0.855	0.943	0.0027	2.28		1.082	0.886	0.0056	3.37	
MV5	1	0.0055	0.0529	0.105	0.705	0.757	-0.0035	-1.46	2.81	1.133	0.902	-0.0017	-1.08	2.76
	2	0.0059	0.0470	0.126	0.699	0.843	-0.0031	-1.75		1.069	0.956	-0.0012	-1.23	
	3	0.0043	0.0447	0.096	0.686	0.869	-0.0047	-3.00		1.013	0.953	-0.0027	-2.81	
	4	0.0065	0.0428	0.152	0.658	0.872	-0.0023	-1.55		0.940	0.925	-0.0003	-0.26	
	5	0.0096	0.0424	0.226	0.659	0.883	0.0008	0.56		0.916	0.910	0.0028	2.29	

[a] Portfolios are formed by ranking securities on the basis of their earnings' yields (EP) in a given market value (MV) class.

[b] $\bar{r}_p$ = mean monthly return on portfolio p; $\sigma(\tilde{r}_p)$ = standard deviation of monthly return on portfolio p, $\hat{\beta}_p$ = estimated systematic risk for portfolio p; $\rho(r'_{p}, r'_{m})$ = coefficient of correlation between the return on portfolio p (net of risk-free rate), r'_p, and that on the market index (net of risk-free rate), r'_m; $\hat{\delta}_p$ = differential return -- estimated intercept for OLS regression of r'_p on r'_m; $t(\hat{\delta}_p)$ = t-value for $\hat{\delta}_p = 0$; and $F^*(\hat{\delta}_p) = F(5,199)$ - value corresponding to Hotelling's T^2 test statistic for $\hat{\delta}_p$. Selected fractiles from the $\tilde{F}(n,d)$ distribution are:

	0.90	0.95	0.99
F (5,120)	1.90	2.29	3.17
F (5,∞)	1.85	2.21	3.02

FIGURE 1
Plots of $\bar{r}_p/\sigma(r_p)$ and $\hat{\delta}_p$ for Earnings' Yield Portfolios by Market Value Category



abnormal returns between the high and low E/P portfolios seems to be smaller for size category MV5 when compared to MV1 for instance. This inference, in fact, is confirmed by the Hotelling's T^2 test results, which are reported in columns (8) and (13) of Table 5. In particular, note that the vectors of abnormal returns for only size classes MV1 to MV3 are significant at the 1% level or higher. Additionally, multiple comparison tests performed in the context of the Hotelling framework indicate that while the $\hat{\delta}_p$ for the highest E/P portfolio is significantly different from that for low E/P portfolios 1 and 2 for MV1-MV3, this is not the case -- even at the 10% level of significance — for the two classes which include the largest NYSE firms.[13] It would appear, therefore, that the earnings' yield effect is not entirely independent of firm size.

Further evidence on this latter point is provided in Table 6, which shows more directly the effect of varying firm size per se on the performance of securities included in each of five mutually exclusive E/P categories. As before, the size portfolios in Table 6 were constructed by partitioning firms included in a given earnings' yield class (i.e., portfolios EP1-EP5) on the basis of the market value of their common stock.

With the exception of EP5, the abnormal return vectors for the other four earnings' yield classes are not significantly different from zero at the 1% level or higher. Furthermore, the normalized vector of weights associated with the maximum T^2 statistic for category EP5 reveals that the rejection of the null hypothesis can be attributed to the abnormal return performance of not only small high E/P firms, but also the larger high E/P firms included in

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13. In the case of size category MV5, the abnormal return for the highest E/P firms, however, is significantly larger than that for E/P portfolio 3 at the 5% level.

TABLE 6

ACTUAL RETURNS & SELECTED CAPM RESULTS FOR MARKET VALUE PORTFOLIOS CLASSIFIED BY EARNINGS' YIELD
(Based on monthly data for the period 1963-79)

Portfolio[a]		Summary Statistics[b]												
		Actual Returns			Equally Weighted NYSE Index					Value Weighted NYSE Index				
EP Class	MV Class	$\bar{r}_p$	$\sigma(\tilde{r}_p)$	$\bar{r}_p/\sigma(\tilde{r}_p)$	$\hat{\beta}_p$	$\rho(\tilde{r}'_p,\tilde{r}'_m)$	$\hat{\delta}_p$	$t(\hat{\delta}_p)$	$F^*(\hat{\delta}_p)$	$\hat{\beta}_p$	$\hat{\rho}(\tilde{r}'_p,\tilde{r}'_m)$	$\hat{\delta}_p$	$t(\hat{\delta}_p)$	$F^*(\hat{\delta}_p)$
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
EP1	1	0.0131	0.0894	0.146	1.449	0.922	-0.0009	-0.36	1.45	1.577	0.745	0.0047	1.12	0.78
	2	0.0099	0.0759	0.130	1.250	0.937	-0.0028	-1.48		1.574	0.875	0.0015	0.59	
	3	0.0066	0.0664	0.099	1.038	0.888	-0.0047	-2.18		1.409	0.894	-0.0014	-0.65	
	4	0.0058	0.0576	0.101	0.889	0.877	-0.0044	-2.28		1.251	0.915	-0.0017	-1.06	
	5	0.0063	0.0502	0.125	0.649	0.733	-0.0025	-1.02		1.083	0.907	-0.0009	-0.59	
EP2	1	0.0098	0.0706	0.138	1.186	0.955	-0.0024	-1.65	2.87	1.388	0.829	0.0019	0.68	0.73
	2	0.0075	0.0588	0.127	0.985	0.951	-0.0034	-2.69		1.248	0.895	-0.0001	-0.04	
	3	0.0061	0.0546	0.112	0.903	0.939	-0.0042	-3.23		1.184	0.914	-0.0013	-0.82	
	4	0.0062	0.0512	0.121	0.811	0.899	-0.0036	-2.29		1.133	0.932	-0.0011	-0.84	
	5	0.0058	0.0442	0.131	0.668	0.857	-0.0031	-1.91		1.008	0.959	-0.0012	-1.35	
EP3	1	0.0108	0.0656	0.165	1.106	0.958	-0.0009	-0.68	1.87	1.282	0.824	0.0032	1.21	1.25
	2	0.0093	0.0572	0.163	0.970	0.963	-0.0015	-1.37		1.200	0.884	0.0019	1.00	
	3	0.0081	0.0529	0.152	0.894	0.959	-0.0023	-2.15		1.143	0.910	0.0008	0.49	
	4	0.0097	0.0494	0.195	0.821	0.942	-0.0002	-0.15		1.073	0.914	0.0025	1.79	
	5	0.0063	0.0421	0.151	0.652	0.879	-0.0024	-1.69		0.925	0.926	-0.0004	-0.38	
EP4	1	0.0150	0.0705	0.213	1.181	0.952	0.0029	1.88	2.09	1.334	0.798	0.0073	2.44	2.29
	2	0.0137	0.0572	0.239	0.965	0.958	0.0029	2.52		1.161	0.855	0.0063	3.04	
	3	0.0124	0.0538	0.230	0.905	0.955	0.0020	1.80		1.119	0.877	0.0052	2.84	
	4	0.0125	0.0523	0.239	0.865	0.940	0.0024	1.88		1.091	0.880	0.0053	3.04	
	5	0.0099	0.0483	0.227	0.699	0.905	0.0009	0.68		0.952	0.915	0.0031	2.50	
EP5	1	0.0194	0.0750	0.259	1.227	0.930	0.0069	3.57	4.50	1.357	0.763	0.0116	3.40	3.00
	2	0.0171	0.0649	0.250	1.140	0.946	0.0052	3.34		1.292	0.796	0.0094	3.24	
	3	0.0155	0.0590	0.262	0.986	0.949	0.0046	3.50		1.157	0.826	0.0082	3.49	
	4	0.0145	0.0561	0.259	0.932	0.944	0.0040	3.03		1.156	0.869	0.0072	3.68	
	5	0.0121	0.0507	0.239	0.830	0.929	0.0022	1.69		1.069	0.887	0.0051	3.04	

[a] Portfolios are formed by ranking securities on the basis of their market value (MV) in a given earnings' yield (EP) class.

[b] $\bar{r}_p$ = mean monthly return on portfolio p; $\sigma(\tilde{r}_p)$ = standard deviation of monthly return on portfolio p, $\hat{\beta}_p$ = estimated systematic risk for portfolio p; $\rho(r'_p, r'_m)$ = coefficient of correlation between the return on portfolio p (net of risk-free rate), r'_p, and that on the market index (net of risk-free rate), r'_m; $\hat{\delta}_p$ = differential return -- estimated intercept for OLS regression of r'_p on r'_m; $t(\hat{\delta}_p)$ = t-value for $\hat{\delta}_p = 0$; and $F^*(\hat{\delta}_p) = F(5,199)$ - value corresponding to Hotelling's T^2 test statistic for $\hat{\delta}_p$. Selected fractiles from the $\tilde{F}(n,d)$ distribution are:

	0.90	0.95	0.99			0.90	0.95	0.99
F (5,120)	1.90	2.29	3.17		F (5,∞)	1.85	2.21	3.02

size groups 2-4.[14] In addition, multiple comparison tests lead one to infer that the abnormal returns experienced by the smallest firms (i.e., group 1) are not stochastically different -- at even the 10% level -- from the corresponding returns for firms included in any of the other four size portfolios (i.e., groups 4-5). This remark applies to all five earnings' yield categories.

In short, these results lend credibility to the view that for NYSE firms the effect of differences in firm size on common stock returns is of secondary importance when compared with the effect of E/P ratios.

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14. The weights underlying the maximum T^2 statistics for EP5 are as follows:

	Normalized Weights for EP Class 5 Size Portfolio				
Market Index	1	2	3	4	5
Equally-weighted	0.273	0.106	0.244	0.313	0.064
Value-weighted	0.220	-0.178	0.260	0.549	0.148

Note that about 56% of the weight underlying the T^2 statistic for the equally-weighted case can be accounted for by size portfolios 3 and 4. The comparable figure for the statistic pertaining to the situation involving the value-weighted index is 69%.

Incidentally, the quartiles from the distribution of market values (pooled data) for each of these five size portfolios applicable to EP class 5 are as follows:

Market Value	Size Portfolio for EP Class 5				
(millions of $)	1	2	3	4	5
Lower quartile	13.7	34.2	57.5	102.3	316.3
Median	21.5	44.0	74.9	161.3	574.7
Upper quartile	29.5	55.1	99.4	239.3	998.6

A comparison of the above with the distribution of market values for the entire NYSE (see Table 1) indicates that size groups 3 and 4 cannot be said to contain small firms, i.e., those belonging to the lowest market value quintile (MV1) on the exchange. On the contrary, they include firms with market values comparable to those contained in the second and third quintiles of the NYSE.

4. SOME CONCLUDING REMARKS

The empirical evidence presented in this paper indicates that, at least during the 1963-79 time period, the returns on the common stock of NYSE firms appear to have been related to earnings' yield and firm size. In particular, the common stock of high E/P firms seem to have earned, on average, higher risk-adjusted returns than the common stock of low E/P firms. This E/P effect, furthermore, is clearly significant even after experimental control was exercised over differences in firm size, i.e., after the effect of size, as measured by the market value of common stock, was randomized across the high and low E/P groups.

The results also indicate that while the common stock of small NYSE firms appear to have earned marginally higher risk-adjusted returns than the common stock of large NYSE firms, the size effect virtually disappears when returns are controlled for differences in E/P ratios. Accordingly, it would appear that the size effect observed by Banz for NYSE firms may, in fact, be a proxy for the earnings' yield effect rather than vice-versa. Further analysis for possible effects of interaction between E/P ratios and market values of common stock, however, suggest that a somewhat different interpretation is more appropriate. Essentially, the evidence indicates that firm size may have an indirect or second-order effect on the returns of NYSE common stocks: the strength of the earnings' yield effect seems to vary inversely with firm size. More specifically, the results show that the E/P effect is sufficiently weak for larger than average NYSE firms that from a stochastic viewpoint it either is not significant or, at best, is marginally significant. In other words, the common stock of high E/P firms seems to have experienced significantly higher risk-adjusted returns than the common stock of their low E/P counterparts in all market value categories other than those which include these large firms.

These empirical anomalies are consistent with the hypothesis that either the one-period capital asset pricing model is misspecified due to the omission of other relevant factors and, therefore, does not adequately represent market equilibrium or that the NYSE is not completely efficient, or both. To the extent one believes the former interpretation is appropriate because of the longevity of the E/P anomaly, then the results reported here imply that, as a minimum, E/P ratios are correlated with the set of missing factors that are relevant to the pricing of NYSE common stocks.

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