

2 Stock market regularities: a synthesis of the evidence and explanations

DONALD B. KEIM*

1 Introduction

The capital asset pricing model (CAPM) has occupied a central position in financial economics over the twenty years since its origins in the papers by Sharpe (1964), Lintner (1965) and Treynor. Given certain simplifying assumptions,¹ the CAPM states that the expected rate of return on any asset is related to the riskless rate and the expected market return as follows:

$$E(R_i) = R_Z + [E(R_M) - R_Z]\beta_i \quad (1)$$

where:

$E(R_i)$ is the expected rate of return on asset i ;
 R_Z is the rate of return on the riskless asset in the Sharpe-Lintner-Treynor model and is the rate of return of an asset with zero correlation with the market in Black's (1972) extension;
 $E(R_M)$ is the expected rate of return on the market portfolio of all marketable assets; and
 β_i (beta) is the asset's sensitivity to market movements.

If the model is correct and security markets are efficient (Fama, 1970), security returns will *on average* conform to the above relation. Persistent departures, however, represent violations of the joint hypothesis that both the CAPM and efficient market hypothesis are correct.²

The strict set of assumptions underlying the CAPM has prompted numerous criticisms. Although any model proposes a simplified view of the world, that is not sufficient basis for its rejection; the rejection or acceptance of the theory should rest on the scientific evidence. Sophisticated tests of the propositions of the CAPM were made possible by the creation of a computerized data base of stock prices and distributions at the University of Chicago in the 1960s. Numerous studies were conducted in the early 1970s, the most prominent being those conducted by

Black *et al.* (1972), Blume and Friend (1973) and Fama and MacBeth (1973). The results of these studies were generally interpreted as supportive of the CAPM, although the coefficient on beta – representing an estimate of the market risk premium – was only marginally important in explaining cross-sectional differences in average security returns.

Although the early tests lend some credence to the CAPM in its basic form, Roll (1977) raises some legitimate questions regarding the validity of these tests. Very briefly, Roll argues that tests performed with any market portfolio other than the true market portfolio are not tests of the CAPM and that tests of the CAPM can be extremely sensitive to the choice of market proxy. He also points out that the need to specify an alternative model to the CAPM in some of the early tests – e.g. the Fama and MacBeth test of whether residual variance or beta squared are relevant for explaining returns – can lead to faulty inference. That is, the CAPM may be false, but if residual variance or beta squared do not explain the violation, the test will not reject the CAPM. In response to Roll's first point, Stambaugh (1982) constructs broader market indices that include, for example, bonds and real estate, and finds that such tests do not seem to be very sensitive to the choice of market proxy. The second point has been addressed in the work of Gibbons (1982), Stambaugh (1982) and others, which introduced the use of multivariate tests that do not require the specification of an alternative asset pricing model when testing the CAPM. These multivariate tests have not, however, yielded conclusive results regarding the validity of the CAPM.

Since the CAPM is not unambiguously supported by the tests, researchers have formulated alternative models. Many have developed equilibrium models by relaxing some of the CAPM assumptions. For example, Mayers (1972) allows for non-marketable assets such as human capital and Brennan (1970) and Litzenberger and Ramaswamy (1979) relax the no-tax assumption. Others have examined more *ad hoc* alternatives to the CAPM in the spirit of Fama and MacBeth. For example, Banz (1981) examines the importance of market value of common equity and Basu (1977) examines the importance of P/E ratios in explaining beta-risk-adjusted returns.

The remainder of this chapter discusses such alternatives to the CAPM. The next section addresses models that relax the no-tax assumption of the CAPM. Section 3 contains a discussion of the empirical evidence relating to the ability of market value of equity, E/P ratios and other *ad hoc* variables to explain violations of the CAPM. This evidence is followed by a rather lengthy section on potential explanations that addresses, among other issues, the exaggerated occurrence of these

effects in January. Section 5 discusses other persistent patterns in security returns; the chapter ends with some concluding remarks.

2 After-tax asset pricing models

A well-known extension of the CAPM explicitly recognizes the complexity of the tax laws in many countries. For example, higher marginal tax rates of dividend income versus capital gains should make taxable investors prefer a dollar of pre-tax capital gain to a dollar of dividends. Under such conditions as exist in the US, Brennan (1970) and Litzenberger and Ramaswamy (1979) extend the CAPM to include an extra factor, dividend yield. The hypothesis is that, holding risk constant, the higher is a stock's dividend yield, the higher is the required before-tax return to compensate taxable investors for the higher tax liability.

There are, of course, counter-arguments. Miller and Scholes (1978) argue that the tax code has provisions that permit investors to transform dividend income into capital gains. If the marginal investors are using these or other effective shelters, then the before-tax rate on dividend-paying stocks may be no different from stocks that do not pay dividends even though the tax law appears to penalize dividends. Nevertheless, the tax differential has prompted some tax-exempt institutions to 'tilt' their portfolios toward higher yielding securities with the hope of capturing the benefits of the supposedly higher before-tax returns without bearing the costs of the higher implied taxes.

The effectiveness of such a strategy, of course, hinges on whether these after-tax models are supported by the evidence. The general form of the after-tax CAPM is

$$E(R_i) = a_0 + a_1 \beta_i + a_2 d_i \quad (2)$$

where d_i is the dividend yield for security i and a_2 is an implicit tax coefficient that is independent of the level of the dividend yield. The question is whether a_2 is reliably positive and consistent with realistic tax rates.

Empirical testing of the hypothesis that $a_2 = 0$ presents the researcher with a number of difficult problems. For example, since asset pricing models are cast in terms of expectations, the researcher needs to arrive at a suitable *ex-ante* dividend yield measure. Further, he must ask whether the tax effects that motivate the model occur at a single point in time (i.e. the ex date) or whether they are spread over a longer period. Finally, most researchers, based on the models of Brennan and of Litzenberger and Ramaswamy (1979), have assumed a linear relation between dividend yields and returns, even though the relation might be more complicated.

Table 1 *Summary of implied tax rates from studies of the relation between dividend yields and stock returns*

Author(s) and date of study	Test period and return interval	Implied tax rate (%) (<i>t</i> -statistic)
Black and Scholes (1974)	1936-66, monthly	22 (0.9)
Blume (1980)	1936-76, quarterly	52 (2.1)
Gordon and Bradford (1980)	1926-78, monthly	18 (8.5)
Litzenberger and Ramaswamy (1979)	1936-77, monthly	24 (8.6)
Litzenberger and Ramaswamy (1982)	1940-80, monthly	14-23 (4.4-8.8)
Miller and Scholes (1982)	1940-78, monthly	4 (1.1)
Morgan (1982)	1936-77, monthly	21 (11.0)
Rosenberg and Marathe (1979)	1931-66, monthly	40 (1.9)
Stone and Barter (1979)	1947-70, monthly	56 (2.0)

Studies have employed a variety of definitions of dividend yield and methodologies in addressing these issues. In the interest of brevity, we forego discussion of the methodological subtleties and simply summarize the major results. Table 1, adopted from Litzenberger and Ramaswamy (1982) and updated, reports estimates of the dividend yield coefficient a_2 . In each instance the estimate of a_2 is positive indicating that, holding beta risk constant, the higher is the dividend yield the higher is the before-tax rate of return for common stocks. Although not all of the coefficients are significantly different from zero (e.g. Black and Scholes, 1974; Miller and Scholes, 1982) and not all authors attribute the positive coefficients to taxes (e.g. Blume, 1980; Gordon and Bradford, 1980), the evidence in many of the studies appears to be consistent with the after-tax models.

The story may not be as simple, though, as the models of Brennan (1970) and Litzenberger and Ramaswamy (1979) suggest. Blume (1980) and Litzenberger and Ramaswamy (1980) find that the yield-return relation is not linear for some definitions of dividend yield. They find that the average return for non-dividend paying firms is higher than for many dividend paying firms. Further, Keim (1985, 1986a) finds that this non-linear relation is primarily due to the exaggerated occurrence of the effect in January. Keim (1985) uses a definition of dividend yield similar to Blume and estimates dividend yield coefficients separately in January

Table 2 Mean daily returns (standard errors) and estimated betas for ten size portfolios of NYSE and AMEX firms, 1964-1978*

Portfolio	Mean daily mean (%)	Average median market value (\$ million)	OLS beta	Dimson beta
Smallest	0.142 (0.015)	4.7	0.75	1.69
2	0.092 (0.015)	11.1	0.87	1.64
3	0.079 (0.014)	19.8	0.90	1.55
4	0.064 (0.140)	31.5	0.96	1.50
5	0.058 (0.014)	48.3	0.98	1.46
6	0.053 (0.013)	75.4	0.97	1.39
7	0.046 (0.013)	120.4	0.95	1.31
8	0.042 (0.013)	213.4	0.97	1.24
9	0.035 (0.012)	436.3	0.95	1.13
Largest	0.024 (0.012)	1086.0	0.98	0.97

*Table adapted from Reinganum (1982).

and non-January months. The estimated coefficients are positive and significant in January and non-January months, but the January coefficient of 1.15 [$t(a_{21}^{AN} - \alpha^{F-D}) = 5.6$] is significantly larger [$t(a_{21}^{AN} - \alpha^{F-D}) = 4.6$] than the non-January coefficient of 0.18 [$t(a_{21}^{F-D} - \alpha^{F-D}) = 3.3$]. Such a finding is not entirely consistent with the simple tax-related models and is suggestive of the possible manifestation of other anomalous effects that exhibit January seasonals, such as the size effect.

3 Other observed asset pricing regularities

The size effect

Considerable interest has been generated in the financial and academic communities by the finding of a significant relation between common stock returns and the market value of common equity, commonly referred to as the size effect. Other things equal, the smaller is firm size the larger is the stock's expected return. Banz (1981) was the first to

document this phenomenon. For the period from 1931 to 1975, Banz estimated a model of the form

$$E(R_i) = a_0 + a_1 \beta_i + a_2 S_i \quad (3)$$

where S_i is a measure of the relative market capitalization ('size') for firm i . He found that the statistical association between returns and size is negative and of approximately the same magnitude as that between returns and beta, documented in, for example, Fama and MacBeth (1973).

Reinganum (1981, 1982), using daily data over the period from 1963 to 1977, found that portfolios of small firms had substantially higher returns, on average, than large firms. Table 2, adopted from Reinganum (1982), reports average returns and other characteristics for portfolios comprising the ten deciles of size for NYSE and AMEX firms. The difference in returns between the smallest and largest firms is about 30 percent annually. In response to Roll's (1981) conjecture that this size effect may be a statistical artifact of improperly measured risk due to the infrequent trading of small firms, Reinganum (1982) estimates betas according to methods designed to account for these problems (see Scholes and Williams, 1977; Dimson, 1979). He finds that the magnitude of the size effect is not very sensitive to the use of these estimates. (The Dimson estimator is reported in table 2). Blume and Stambaugh (1983) demonstrate, however, that the portfolio strategy implicit in Reinganum's paper (requiring daily rebalancing of the portfolio to equal weights) produces upward-biased estimates of small-firm portfolio returns due to a 'bid-ask bias' that is inversely related to size. Blume and Stambaugh show that the size-related premium is halved in portfolio strategies that avoid this bias.

Two reservations are usually expressed regarding implementation of these findings – the market for the smallest capitalization firms is rather illiquid and the firms in this market do not meet minimum capitalization requirements for many institutional investors. The average market values reported in table 2 demonstrate that such potential constraints may not be binding. The table shows that the effect is approximately linear in the decile of size, meaning that portfolios of securities with successively smaller firm values yield successively larger risk-adjusted returns. The evidence suggests a wide array of possible portfolios with higher average returns (in some cases, substantially higher returns) than a portfolio of large firms such as the S&P 500 – a typically-used performance benchmark in the investment industry.³ In other words, the abnormal return opportunities presented by smaller firm stocks are not confined to the very smallest and least liquid stocks on the NYSE and AMEX.

Table 4 Temporal behavior of the size effect

Average differences (*t*-statistics) in daily returns (percent) between portfolios constructed from firms in the top and bottom decile of size (measured by market value of equity) on the NYSE and AMEX over the period 1963-79

	Monday	Tuesday	Wednesday	Thursday	Friday	Mean daily return over all days
January	0.742 (6.51)	0.698 (5.47)	0.607 (4.80)	0.645 (5.54)	0.821 (7.07)	0.702 (13.01)
February	0.288 (2.80)	0.150 (1.78)	0.181 (2.15)	0.217 (2.41)	0.240 (2.46)	0.212 (5.18)
March	0.091 (1.31)	-0.006 (-0.08)	0.171 (2.99)	0.175 (3.14)	0.127 (1.97)	0.112 (3.81)
April	-0.010 (-0.14)	-0.096 (-1.64)	0.008 (0.10)	0.047 (0.81)	0.159 (3.00)	0.018 (0.62)
May	0.196 (2.57)	-0.093 (-1.21)	0.052 (1.00)	-0.007 (-0.08)	0.153 (2.23)	0.057 (1.74)
June	-0.038 (-0.46)	-0.135 (-1.80)	0.081 (1.71)	0.011 (0.17)	0.171 (2.62)	0.018 (0.57)
July	-0.027 (-0.38)	0.151 (2.35)	-0.106 (-1.33)	0.152 (2.24)	0.242 (3.62)	0.084 (2.61)
August	0.034 (0.47)	-0.020 (-0.28)	0.018 (0.27)	0.130 (1.68)	0.162 (2.28)	0.065 (2.00)
September	0.156 (1.50)	0.108 (1.84)	0.043 (0.71)	0.044 (0.52)	0.210 (3.68)	0.111 (3.37)
October	-0.241 (-2.16)	-0.159 (-1.90)	-0.080 (-0.76)	0.043 (0.66)	0.050 (0.60)	-0.077 (-1.87)
November	-0.110 (-1.52)	-0.158 (-1.61)	-0.069 (-0.89)	-0.007 (-0.07)	0.247 (4.41)	-0.016 (-0.44)
December	-0.155 (-1.81)	-0.182 (-1.87)	-0.023 (-0.20)	0.068 (0.90)	0.402 (5.44)	0.022 (0.52)
Mean return over all months	0.069 (2.60)	0.021 (0.85)	0.075 (3.08)	0.128 (5.43)	0.249 (10.98)	0.109 (9.84)

The abnormal return opportunities presented by smaller firm stocks do not seem to be confined to the US. Analysis of stock returns on four major stock exchanges - Australia, Canada, Japan and United Kingdom - has revealed a distinct size-return relation.⁴ The results are summarized in table 3. It is difficult to draw comparisons about the relative magnitude of the size effect across the four countries because of differing time periods and research design (e.g. some studies use size quintiles, others use deciles). Nevertheless, in each country there is an inverse relation between stock returns and market capitalization.

Table 3 The firm size effect: international evidence*

Australia (1958-81) ^a	Canada (1951-80) ^b	Japan (1966-83) ^c	United Kingdom (1956-80) ^d	1956-65		1966-80	
Size portfolio	Size portfolio	Size portfolio	Size portfolio	Return %	Return %	Return %	Return %
Smallest	Smallest	Smallest	Smallest	1.27	1.00	1.27	1.00
2	2	2	2	1.18	0.89	1.18	0.89
3	3	3	3	0.98	0.84	0.98	0.84
4	4	4	4				
5	Largest	Largest	Largest				
6							
7							
8							
9							
Largest							

Note: *Monthly returns are reported for each country.

Sources:
Brown et al. (1983b).
Berges et al. (1984).
Nakamura and Terada (1984).
Reinganum and Shapiro (1983).

Much of the subsequent research on the US size effect has attempted to provide a more complete characterization of the phenomenon. For example, we know that among the firms that academic researchers consider 'small,'⁵ those small firms with the largest abnormal returns tend to be firms that have recently become small (or that have recently declined in price), that do not pay a dividend or that have high dividend yields (Keim, 1986a) that have low prices (Stoll and Whaley, 1983; Blume and Stambaugh, 1983) and that have low P/E ratios (Reinganum, 1981; Basu, 1983).

Others have examined the time-related patterns of portfolio returns stratified by market capitalization. Brown *et al.* (1983a) find that when averaged over all months the size effect reverses itself for sustained periods: in many periods there is a consistent premium for small size, in (fewer) other periods there is a discount. In other words, there have been periods (one, for example, was 1969–73) when a small-capitalization strategy would have underperformed a large-capitalization strategy on a risk-adjusted basis.

The magnitude of the size effect also seems to differ across days of the week and months of the year. Keim and Stambaugh (1984) find that the size effect becomes more pronounced as the week progresses and is most pronounced on Friday. These tendencies are evident as you scan across the rows of table 4. Reported in table 4 is the average magnitude of the size effect as measured by the difference in returns between the smallest and largest deciles of firms on the NYSE and AMEX, cross classified by day of the week and month of the year over the period 1963–79. The bottom row which measures the average effect by day of the week, demonstrates the tendency for the size effect to increase as the week draws to a close.

The most dramatic seasonal pattern in the size effect is found at the turn of the year. Keim (1983) finds that the size effect is concentrated in January: approximately 50 per cent of the return difference between small and large firm stocks found by Reinganum (1981) is concentrated in January. The January seasonal in the size effect is evident in the rightmost column of table 4. Keim further reports that 50 percent of this January effect is concentrated in the first five trading days of the year. This turn-of-the-year return behavior is also found by Roll (1983a) who notes that, in addition, small firms have abnormally large returns on the last trading day in December.

The price/earnings effect

Earnings-related strategies have a long tradition in the investment community. The most popular of such strategies, buying stocks that sell at low multiples of earnings, can be traced at least to Graham and Dodd

(1940, p. 533) who proposed that 'a necessary but not a sufficient condition' for investing in a common stock is 'a reasonable ratio of market price to average earnings.' They advocated that a prudent investor should never pay as much as 20 times earnings and a suitable multiplier should be 12 or less.

Nicholson (1960) published the first extensive study of the relation between P/E multiples and subsequent total returns showing that low P/E stocks consistently provided returns greater than the average stock. Basu (1977) introduced the notion that P/E ratios may explain violations of the CAPM and found that, for his sample of NYSE firms, there was a distinct negative relation between P/E ratios and average returns in excess of those predicted by the CAPM. If one had followed his strategy of buying the quintile of smallest P/E stocks and selling short the quintile of largest P/E stocks, based on annual ranking, the average annual abnormal return would have been 6.75 percent (before commissions and other transaction costs) over the 1957 to 1971 period. Reinganum (1981), analyzing both NYSE and AMEX firms, confirmed and extended Basu's findings using returns data to 1975.

Some have argued that because firms in the same industry tend to have similar P/E ratios, a portfolio strategy that concentrates on low P/E stocks may indeed benefit from higher than average returns, but at a cost of reduced diversification. These arguments also suggest that the P/E effect may in fact be an industry effect. Peavy and Goodman (1983) address this potential bias and examine the P/E ratio of a stock relative to its industry P/E (PER). They find a distinct negative relation between PERs and abnormal returns over the 1970–80 period. A portfolio strategy that bought the quintile of lowest PER stocks and sold short the stocks in the highest PER quintile would have yielded an annualized abnormal return of 20.80 percent over the period. These results, in conjunction with the findings of Basu and Reinganum, suggest that the P/E ratio – or an underlying and perhaps more fundamental variable for which P/E is a proxy – is capable of explaining a considerable portion of the variation in cross-sectional security returns.

The Value Line enigma

Investment advisory services often base their recommendations on earnings-related information. The largest and most consistently successful advisory service is the Value Line Investor Survey. Value Line forecasts the prospective performance of approximately 1700 common stocks on a weekly basis. Value Line separates these stocks into five categories of expected return based on historical and forecast information such as earnings momentum and P/E ratios.

Table 5 Average values of price to book (P/B), market value, earnings to price (E/P) and price for ten portfolios of NYSE firms constructed on the basis of increasing price to book values^a (1964-82)

Price/book portfolio	Average P/B	Average market value (\$ million)	Average E/P	Average price (\$)
Lowest	0.52	217.1	0.06	20.09
2	0.83	402.5	0.11	22.97
3	1.00	498.6	0.11	25.08
4	1.14	604.7	0.11	27.79
5	1.29	680.2	0.10	28.97
6	1.47	695.6	0.10	31.55
7	1.71	888.9	0.09	36.07
8	2.07	872.6	0.09	37.84
9	2.80	1099.2	0.07	44.80
Highest	7.01	1964.3	0.05	60.09

Note: ^aPortfolios are rebalanced at March 31. Prices and number of shares outstanding are March 31 values. Book values and earnings are year-end values. Only December fiscal closers are included in the portfolios.

The success of the Value Line system has been borne out by several academic studies. Black (1973), Holloway (1981) and Copeland and Mayers (1982) all find that, after adjusting for beta risk, investors can obtain abnormal performance by, for example, buying group 1 securities and selling short group 5 securities. Stickel (1985) finds that investors can earn abnormal returns by devising strategies based on rank changes (e.g. buying stocks upgraded from group 2 to group 1).

Value Line's successful performance is puzzling for the same reasons that the size and P/E effects are puzzling – predetermined variables are used to construct portfolios that have abnormal returns relative to the CAPM. It is possible that there is a high degree of association between a ranking produced by Value Line's system and a simple ranking based on P/E or size. Indeed, the evidence of Stickel suggests that much of Value Line's abnormal performance might be attributable to small firms. More research is necessary to sort out these issues.

Interrelation between the effects

The literature discussed in the preceding sections documents a strong cross-sectional relation between abnormal returns and market capitalization, P/E ratios and dividend yields. Other effects have also been documented in the literature, perhaps most notably the relation between risk-adjusted returns and the ratio of price per share to book value per share (P/B) discussed most recently by Rosenberg *et al.* (1985). Few

Table 6 The P/E, P/B and price effects

Average monthly returns (standard deviations) for portfolios of NYSE firms over the 1964-1982 period

Decile of ranking variable	Price/earnings effect ^a		Price/book effect ^a		Price effect ^b	
	January	Feb-Dec	January	Feb-Dec	January	Feb-Dec
Lowest	6.65	1.04	9.14	0.87	12.02	0.96
2	(9.39)	(5.34)	(10.32)	(5.64)	(14.07)	(7.15)
	6.34	0.98	7.34	0.83	8.08	0.89
3	(8.62)	(4.88)	(8.99)	(5.30)	(10.38)	(5.70)
	5.06	0.95	5.96	0.87	6.00	0.83
	(7.44)	(4.49)	(7.81)	(4.78)	(9.06)	(5.17)
4	4.22	0.95	4.64	0.81	4.98	0.85
	(7.85)	(4.49)	(7.99)	(4.48)	(8.62)	(4.85)
5	4.01	0.62	3.97	0.67	3.93	0.78
	(7.49)	(4.53)	(7.49)	(4.30)	(7.70)	(4.70)
6	3.60	0.63	3.28	0.67	3.22	0.79
	(7.60)	(4.68)	(7.09)	(4.62)	(7.85)	(5.00)
7	3.32	0.48	3.21	0.79	2.69	0.83
	(7.18)	(4.67)	(7.13)	(4.84)	(7.29)	(4.70)
8	3.25	0.75	2.64	0.69	2.24	0.77
	(8.14)	(5.19)	(7.67)	(5.17)	(6.39)	(4.89)
9	2.39	0.89	2.93	0.87	1.27	0.85
	(7.07)	(5.15)	(7.39)	(5.37)	(6.59)	(5.02)
Largest	2.77	0.90	1.43	1.05	0.83	0.90
	(6.96)	(5.82)	(6.55)	(5.51)	(6.09)	(4.93)

Notes: ^aPortfolios are rebalanced at March 31 of each year. The P/E and P/B ratios used to create deciles are computed using the previous year-end earnings and book values and March 31 prices. Only December fiscal closers are included in the portfolios. Portfolios are rebalanced annually at year-end. Year-end prices are used to create deciles.

would argue that these separate findings are entirely independent phenomena, since market capitalization, P/E and P/B are computed using a common variable – price per share of the common stock. Further, results in Blume and Husic (1973), Stoll and Whaley (1983) and Blume and Stambaugh (1983) reveal a cross-sectional association between price per share and average returns.

To demonstrate the association among these variables, table 5 reports average values of P/B, market capitalization, E/P and price for ten portfolios constructed of NYSE firms on the basis of increasing values of P/B. Portfolios are rebalanced annually over the 1964–82 period. It is apparent from table 5 that the higher is the average P/B of the firms in a portfolio, the higher are the corresponding average values of market capitalization, P/E and stock price.⁶

Perhaps more direct evidence that the effects are associated with some common underlying factor lies in the finding that there are significant January seasonals in the dividend yield effect (Keim, 1985), P/E effect (Cooke and Rozeff, 1984) and price and P/B effects. Evidence on the last three effects is reported in table 6 which contains average January and non-January returns for portfolios based on annual rankings on P/B, E/P and price over the 1964–82 period. The three time series of portfolio returns are created in a manner analogous to many previous studies. At annual intervals during the period, NYSE firms are ranked separately according to their P/E ratio, P/B ratio or price and sorted into ten portfolios. These portfolios are held for the next twelve months and equal-weighted portfolio returns are computed in each month. This process is repeated for each year of the sample period. The results are basically the same for each separate experiment. There is a strong inverse relation between the ranking variable and average returns in January, and not much of a relation in the other months.

From a practical perspective, the investor's objective is to isolate and use in a portfolio strategy the characteristic(s) that will result in the highest risk-adjusted returns for the portfolio. That is, the typical investor is less interested in the conjecture that all these effects are somehow related than he is in finding the ranking characteristic that works best. Recent studies have addressed this issue by trying to answer the following question: If an investor screens first on characteristic X, say P/E, can he further improve portfolio performance (on a beta risk-adjusted basis) by adding an additional screen based on characteristic Y, say market capitalization (or vice versa)?

Most of the studies in this area (Reinganum, 1981; Peavy and Goodman, 1982; Basu, 1983; Cooke and Rozeff, 1984) address the interrelation between the P/E and market capitalization effects. The results are less than conclusive: Reinganum argues that the size effect

subsumes the P/E effect (i.e. there is no marginal value to P/E after first ranking on size); Basu argues just the opposite. Peavy and Goodman and Cooke and Rozeff, after performing meticulous replications of and extensions to the methodologies of Basu and Reinganum reach surprisingly different conclusions. Peavy and Goodman's results agree with those of Basu, but Cooke and Rozeff (1984, p. 464) conclude, 'it does not appear that either market value subsumes earnings/price ratio or the earnings/price ratio subsumes market value as has been claimed.'

The upshot of these studies is that if one constructs a portfolio based on high E/P stocks, there may still be some value added by considering the additional dimension of firm size, and vice versa. In a similar vein, Keim (1985, 1986a) analyzes the interrelation between the dividend yield and size effects and finds that the two effects are not mutually exclusive and that, over and above the benefits from discriminating along the size dimension, it may be beneficial to discriminate those firms that pay no dividends or that have high dividend yields. One interpretation is that market capitalization, E/P and dividend yield (as well as the other variables mentioned above) may be imperfect surrogates for an underlying and more fundamental 'factor' that is missing from the CAPM (see, for example, Ball, 1978).

4 Can we explain the size effect?

The lion's share of the effort expended in attempts to explain the above phenomena has been directed to the size effect. Some have argued that alternative asset pricing models may explain the cross-sectional association between risk-adjusted returns and size. For example, Chen (1983) and Chan *et al.* (1983) argue that most of the abnormal returns associated with the size effect are explained by additional risk factors in the context of the arbitrage pricing theory of Ross (1976). Others maintain that market imperfections assumed away by the CAPM are responsible. In this vein Stoll and Whaley (1983) argue that round-trip transactions costs are sufficient to offset the abnormal returns associated with the size effect. Schultz (1983) points out, however, that transactions costs would have to be larger in January than in other months to explain the January seasonal in abnormal returns, but he finds no evidence of seasonally varying transaction costs.

Others have addressed the possibility that the size effect is merely a statistical artifact. Roll (1981) suggests that large abnormal returns of small firms could be due to systematic biases (due to infrequent or nonsynchronous trading) in the beta estimates for these firms, but Reinganum (1982) demonstrates that this bias cannot explain the anomaly. Christie and Hertz (1981) argue that the size effect could be

due to non-stationarity of beta. A firm whose common stock price has recently declined – i.e. a firm that is becoming ‘small’ – has effectively experienced, other things equal, an increase in leverage and a concomitant increase in the risk of its equity. Thus, historical estimates of beta that assume such risk is constant over time are ‘stale’ and understate (overstate) the risk and overstate (understate) average risk-adjusted returns of stocks whose market capitalization has fallen (risen). Christie and Hertzler adjust for this bias, but the adjustment does not eliminate the size effect. Chan (1983) makes a similar adjustment and finds that ‘the size effect is reduced to a magnitude whose economic significance is debatable.’ Unfortunately, neither study differentiates between January and non-January returns. Finally, Blume and Stambaugh (1983) demonstrate that the portfolio strategies implicit in papers such as Reinganum (1982) and Keim (1983), which require daily rebalancing of the portfolio to equal weights, yield upward-biased estimates of small-firm portfolio returns due to a ‘bid-ask bias’ that is inversely related to market capitalization. Roll (1983b) presents similar arguments. The idea is that such strategies sometimes implicitly buy at the bid price and sell at the ask price. Blume and Stambaugh show that for portfolio strategies that avoid this bias, the size effect is substantially reduced and is significant only in January.

In light of these last findings, attempts to explain the size phenomenon have focused primarily on January. Rather than exploring alternative equilibrium models that may accommodate the seasonal, most explanations have instead focused on frictions in the market that represent violations of the CAPM assumptions. The most popular hypothesis attributes the effect to year-end tax-loss selling. The tax-loss hypothesis can be summarized as follows:

The hypothesis maintains that tax laws influence investors’ portfolio decisions by encouraging the sale of securities that have experienced recent price declines so that the (short-term) capital loss can be offset against taxable income. Small firm stocks are likely candidates for tax-loss selling since these stocks typically have higher variances of price changes and, therefore, larger probabilities of large price declines. Importantly, the tax-loss argument relies on the assumption that investors wait until the tax year-end to sell their common stock ‘losers.’ For example, in the U.S., a combination of liquidity requirements and eagerness to realize capital losses before the new tax year may dictate sale of such securities at year-end. The heavy selling pressure during this period supposedly depresses the prices of small firm stocks. After the tax year-end, the price pressure disappears and prices rebound to equilibrium levels. Hence small firm stocks display large returns in the beginning of the new tax year. (Brown *et al.*, 1983b, p.107)

Although popular on Wall Street, support for the tax-loss selling hypothesis has been less than overwhelming (on a priori grounds) in the

academic community. Roll (1983b) has called the argument ‘ridiculous’ and Brown *et al.* (1983b) maintain that the tax laws in the US do not unambiguously induce the year-end price behavior of small stocks as predicted by the hypothesis. Further, Constantinides (1984) claims that optimal tax trading of common stocks should produce a January seasonal pattern in stock prices only if investors behave irrationally.

The evidence on the tax-loss hypothesis is less than conclusive. Reinganum (1983) and Roll (1983b) both examine the hypothesis and their tests suggest that part, but not all, of the abnormal returns in January is related to tax-related trading. On the other hand, Schultz (1985) finds that prior to 1917 – before the US income tax as we know it today created incentives for tax-loss selling – there was no evidence of a January effect.

The tax-loss selling hypothesis predicts a price rebound in the month of January immediately following price declines but makes no predictions regarding price movements for these stocks in subsequent turn-of-the-year periods. Chan (1985) and DeBondt and Thaler (1985) present evidence that the January abnormal returns of such ‘loser’ firms persist for as long as five years after the loser firms are identified. For example, Chan identifies ‘losers’ and ‘winners’ and constructs an ‘arbitrage’ portfolio (long losers, short winners) within each decade of market value for NYSE firms at December 31 of year t and tracks January abnormal returns in each of the following four years ($t + 1$ to $t + 4$). His results demonstrate a persistent January effect in each of the subsequent three years. Based on such evidence, both Chan and DeBondt and Thaler conclude that the January seasonal in stock returns may have little to do with tax-loss selling.

Others have tested the hypothesis by examining the month-to-month behavior of abnormal returns in countries with tax codes similar to the US code but with different tax year-ends. The tax-loss selling hypothesis predicts that, in the month immediately following the tax year-end, abnormal returns of small firms will be large relative to both other months and larger firms. The hypothesis makes no predictions regarding the time series behavior of abnormal returns during other months. The studies that examine returns in countries with similar tax codes to the US but different tax year-ends (Brown *et al.* (1983b) examine Australia (which has a June tax year-end); Reinganum and Shapiro (1983) examine the UK (which has an April tax year-end)) find seasonals after the tax year-end, but also find seasonals in January that are not predicted by the hypothesis. Further, Berges *et al.* (1984) find a January seasonal in Canadian stock returns prior to 1972, a period when Canada had no taxes on capital gains.

The inconsistent evidence regarding the tax-loss selling hypothesis

argues for investigating other possibilities. One such possibility that has received attention on Wall Street is the notion that liquidity constraints of market participants may influence security returns, and these effects may have seasonal patterns. For example, periodic infusions of cash into the market as a result of, say, institutional transfers for pension accounts or proceeds from bonuses or profit-sharing plans, may impact the market. In fact, some evidence can be interpreted as supporting this idea. For example, Kato and Schallheim (1985), in an examination of the size effect in Japan, find January and June seasonals in small firm returns that coincide with traditional Japanese bonuses paid at the end of December and in June. Further, Rozeff (1985) finds a substantial *upward* shift in the ratio of sales to purchases of common stock by investors (who are not members of the NYSE) at the turn of the year that coincides with the dramatic increase in small firm returns in January (but Rozeff interprets this as evidence of a tax-loss selling effect). Ritter (1985) documents a similar pattern in the daily sale to purchase ratio for the retail customers of a large brokerage firm. Finally, Ariel (see chapter 8) finds a pattern in daily stock returns in *every month* but February that parallels precisely the pattern that occurs at the turn of the year. It would be easier to interpret such monthly patterns as liquidity or payroll effects than as tax effects.

5 Other 'seasonal' patterns in stock returns

In addition to the January effect, recent studies have documented additional empirical regularities that are related to the day of the week or the time of the month. Research on the so-called 'weekend effect' finds that average stock returns tend to be higher on Fridays and negative on Mondays. Cross (1973) and French (1980) document the effect using the S&P Composite Index beginning in 1953 and Gibbons and Hess (1981) document it for the Dow Jones Industrial Index of 30 stocks (1962-78). Keim and Stambaugh (1984) extend the findings for the S&P Composite to include the period 1928 to 1982 and also find the effect in actively traded OTC stocks. Jaffe and Westerfield (1985) find the effect on several foreign stock exchanges. The average returns associated with this intra-weekly phenomena in the US are shown in figure 1 for the 1928 to 1982 period.

All of the above studies document negative Monday returns using Friday-close-to-Monday-close returns and thus cannot ascertain whether the negative returns are due to the week-end non-trading period or to active trading on Monday. The findings of authors who have investigated this appear to be period-specific. Harris (see chapter 7), for all NYSE stocks for the period 1981 to 1983, and Smirlock and Starks (1984), for the Dow Jones 30 for the period 1963 to 1973, examine intra-daily returns



Figure 1 Day of the week effect, S & P Composite, 1928-1982
Source: Keim and Stambaugh (1984)

and show that negative Monday returns accrue from Friday close to Monday open, as well as during trading on Monday. On the other hand, Rogalski (1985) examines intra-daily data from 1974 to 1984 and finds that negative Monday returns accrue entirely during the weekend non-trading period.

Keim and Stambaugh (1984), noting results in Gibbons and Hess that suggest Friday returns vary cross-sectionally with market value, find that the return differential between small and large firms increases as the week progresses, and is largest on Friday (see table 4). In addition, Keim (1986b) demonstrates that, controlling for the large average returns in January, the 'Friday effect' and the 'Monday effect' are no different in January than in the other months.

Although we do not yet have an explanation of the weekend effect, we do know that the effect is not likely to be a result of measurement error in recorded prices (Gibbons and Hess, 1981; Keim and Stambaugh, 1984; Smirlock and Starks, 1984), the delay between trading and settlement due to check clearing (Gibbons and Hess, 1981; Lakonishok and Levi, 1982) or specialist trading activity (Keim and Stambaugh, 1984).

The monthly effect was found by Ariel (see chapter 8) who showed that for the period 1963 to 1981 the average returns for common stocks on the NYSE and AMEX are positive only for the last day of the month and for days during the first half of the month. During the latter half of the month returns are indistinguishable from zero. Ariel (chapter 8, p. 109) concludes that during his sample period 'all of the market's cumulative advance occurred around the first half of the month, the second half

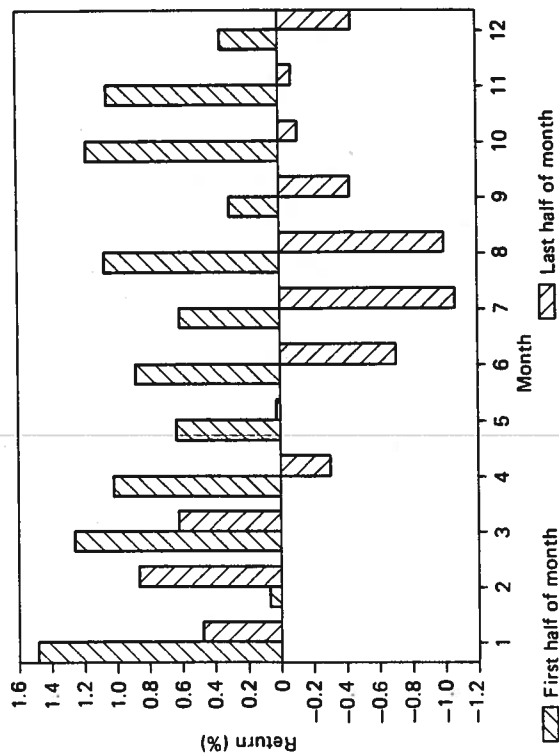


Figure 2 Monthly effect in stock returns, value-weighted CRSP

index, 1963-1981

Source: Ariel (chapter 8)

contributing nothing to the cumulative increase.' Figure 2, which is drawn from table 3 in chapter 8, illustrates the phenomenon for the total returns for the CRSP value-weighted index of NYSE and AMEX stocks. The figure clearly demonstrates that returns in the first half of the month are consistently larger than second-half returns (except for February); in fact, negative average returns occur only in the second half. The results given by Ariel (chapter 8) also suggest that, with the exception of January, the difference between first-half returns of small firms and the first-half returns of large firms is not substantial. Although Ariel is unable to explain the effect, one potential explanation involves liquidity constraints of investors as discussed above.

6 Concluding remarks

This chapter has presented a summary of evidence on empirical regularities that have persisted for quite a long time – in some instances for as long as fifty years. Many of these findings are inconsistent with an investment environment where the CAPM is descriptive of reality and argue for consideration of alternative models of asset pricing. Other findings, such as the day-of-the-week effect, do not necessarily represent

violations of any particular asset pricing model, yet are still interesting for their regularity.

Of course, the bottom line for investors is the extent to which this information can be translated into improved portfolio performance. That strategies based on the evidence here can improve performance has, in fact, been borne out in actual 'real world' experiments. In addition, I have attempted in the above discussion to convey (whenever possible) some sense of the practical magnitude of these effects. However, several caveats regarding implementation of such strategies might form a fitting conclusion. First, that some effects have persisted for as many as fifty years in no way guarantees their persistence into the future. In other words, there is no sure thing. Second, even if the effects were to persist, the costs of implementing strategies designed to capture these phenomena may be prohibitive. For example, illiquidity of the market and transactions costs may render a small stock strategy infeasible. Day-of-the-week and other seasonal effects may have practical value only for those investors who were planning to trade (and pay transactions costs) anyway and, thereby, incur only the costs of timing the trade. Finally, one must be cautious when interpreting the magnitudes of the 'abnormal' returns reported in these studies. To the extent that alternative models of asset pricing may be more appropriate than the CAPM, studies that use the CAPM as a benchmark may not be adjusting for the relevant risks and costs in a complete way. In that case, superior performance relative to the CAPM may not be superior once these other costs and risks are considered.

Notes

* This is a substantially revised and expanded version of a paper that appeared in the *Financial Analysts Journal*. I would like to thank Wayne Ferson, Allan Kleidon, Craig MacKinlay, Terry Marsh, Krishna Ramaswamy and Jay Ritter for helpful comments and suggestions at various stages of this project. Of course, any remaining errors are my responsibility.

1 The assumptions for the one-period CAPM are: (1) investors are risk averse and choose 'efficient' portfolios by maximizing expected return for a given level of risk; (2) no taxes or transactions costs; (3) identical borrowing and lending rates; (4) investors are in complete agreement with regard to expectations about individual securities; and (5) security returns have a multivariate normal distribution.

2 Such persistent departures are often referred to as 'anomalies.' The term anomaly, in this context, can be traced to Thomas Kuhn (1970) in his classic book, *The Structure of Scientific Revolutions*. Kuhn maintains that research activity in any normal science will revolve around a central paradigm and that experiments are conducted to test the predictions of the underlying paradigm and to extend the range of the phenomena it explains. Although research most often supports the underlying paradigm, eventually results are found that don't conform. Kuhn (1970, pp. 52-3) terms this stage 'discovery': 'Discovery commences with the awareness of anomaly, i.e., with the recognition that nature has somehow violated the paradigm-induced expectations that govern normal science' (emphasis added).

3 The S&P 500, being a value-weighted index of primarily high-capitalization firms, behaves like a portfolio of very large firms (e.g. portfolios 9 and 10 in table 2).

- 4 Nakamura and Terada (1984) also document a P/E effect on the Tokyo stock exchange.
- 5 For example, in 1980 the firms that comprised the smallest quintile of size for the NYSE had market capitalization of less than about \$50 million.
- 6 One exception is the lowest P/B portfolio whose stocks on average have a low average E/P. This is due to the negative earnings firms that tend to be concentrated there. Note that firms with negative book values are excluded from the sample.

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