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SIZE AND STOCK RETURNS, AND OTHER EMPIRICAL REGULARITIES

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1. Introduction

The recent plethora of papers documenting size, turn-of-the-year and earnings/price ratio 'effects' on stock returns represents an unusual coincidence of interest among a broad group of financial economists. This special issue of the *Journal of Financial Economics* contains some of the papers on the 'size effect' and other empirical regularities. These introductory remarks survey the papers in this issue, as well as some related papers, and attempt to put the research on the 'size effect' in perspective.

There are seven papers in this issue of the *Journal* that relate in different ways to the 'size effect'; that is, that average returns to small firms' stocks are substantially higher than any known capital asset pricing model predicts. These papers provide substantial new information about the 'size effect'. In particular, we now know that a large part of the high return occurs in the first few days of January and it exists in Australia as well as in the United States. We also know that transaction costs are higher for small firms' stocks than for larger firms' stocks, and that this does not seem to explain all of the 'size effect'. Finally, we know that the magnitude of the 'size effect' varies over time and it is related to other evidence concerning high average returns to stocks with low earnings/price ratios. The papers in this issue document some unexplained empirical regularities that will probably puzzle financial economists for at least the next several years.

2. Why is this topic interesting? Cross-sectional differences in expected returns

All of the papers in this issue are concerned with systematic cross-sectional differences among stock returns. The simple observation that there are systematic differences is neither novel nor exciting; this phenomenon

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motivates the various capital asset pricing models (CAPMs) that have interested financial economists for many years. However, the systematic cross-sectional differences that are examined here do not seem to be predicted by any of these models.

Standard asset pricing models are based on the proposition that individuals are risk averse. These models predict a positive relation between an asset's risk and its expected return. Asset pricing models have such an important place in contemporary finance that they are used as a pedagogic device to measure the opportunity cost of capital in most graduate finance courses.

The statistical evidence supporting the positive relation between risk and expected return is surprisingly weak. In tests of the Sharpe (1964), Lintner (1965), and Black (1972) capital asset pricing models, the statistical association between risk and average returns is often only marginally significant. For example, in Fama and MacBeth (1973) the t-statistic testing the hypothesis that the slope of the risk-return relation is zero is 2.57 for the 1935–68 sample period, but it is only 1.92, 0.70, and 1.73 for the 1935–45, 1946–55, and 1956–68 subperiods, respectively.

While there are many possible explanations for these empirical results, the weak statistical association between average returns and risk provides an interesting benchmark for measuring the strength of other types of differences in average returns among securities. For example, the association between firm size and average stock returns is about as strong as the association between risk and average returns. For this perspective, it is not surprising that there has been a growth in papers on the 'size effect' and other empirical regularities in average stock returns.

3. Empirical evidence on the 'size effect'

Banz (1981, p. 14) uses a methodology similar to Fama and MacBeth (1973) and finds a negative association between average returns to stocks and the market value of the stocks after controlling for risk. The t-statistic for whether the 'size effect' coefficient equals zero is -2.54 for the 1936–75 period, and it is -1.88 and -1.91 for the 1936–55 and 1956–75 subperiods, respectively. Thus, the statistical association between the 'size' of the firm and average stock returns is comparable to the association between average return and risk.

This peculiar empirical finding prompted a number of researchers to ask whether the 'size effect' is related to other empirical anomalies apparent in stock return data. For example, Reinganum (1981a, p. 45) finds: 'After controlling returns for any E/P effect, a strong firm size effect still emerged. But, after controlling returns for any market value effect, a separate E/P effect was not found'. Thus, Reinganum concludes that the 'size effect'

subsumes the evidence of Basu (1977), who finds that stocks with high earnings/price (E/P) ratios have higher average risk-adjusted returns than low E/P stocks.

The papers by Banz (1981) and Reinganum (1981a) have drawn a lot of attention, as evidenced by the large number of papers that attempt to explain the existence of the 'size effect'.[1] I will group these papers into three categories in the subsequent discussion: (a) papers that look for an explanation of the findings of Banz (1981) and Reinganum (1981a) in measurement or statistical testing errors; (b) papers that provide more detailed characterizations of the 'size effect'; and (c) papers that propose an economic explanation of the evidence.

3.1. The 'size effect' as a statistical artifact

A number of papers have analyzed the statistical tests in the papers by Banz (1981) and Reinganum (1981a). In particular, Roll (1981) suggests that the stocks of small firms are traded less frequently than the stocks of larger firms so that estimates of systematic risk from daily stock returns will be biased downward. Both Roll and Reinganum (1982) conclude, however, that the bias in risk estimates due to non-synchronous trading cannot explain the magnitude of the risk-adjusted average returns found by Reinganum (1981a).

Christie and Hertzel (1981) argue that the 'size effect' could be due to non-stationarity in the risk measures. The risk of the stock of a levered firm increases as the stock value decreases. Historical estimates that assume risk is constant over time understate the risk of levered stocks whose value has fallen; hence, average risk-adjusted returns for stocks with low current value should be positive because risk is underestimated. Nevertheless, adjusting for this bias in risk estimates does not eliminate the 'size effect'.

In this issue, Basu (1983) re-examines Reinganum's (1981a) results using a different sample period and a different procedure for creating portfolios of stocks ranked on both size and earnings/price ratios. Basu also uses a variety of procedures to control for risk and finds that returns to stocks of firms with low market value are riskier than the stocks of large firms. In one of his tests, Basu sorts stocks into portfolios with different E/P ratios but similar market value and concludes that high E/P stocks earn statistically significant positive risk-adjusted returns. On the other hand, when stocks are sorted into portfolios with different market value but similar E/P ratios, Basu finds no significant risk-adjusted returns related to market value for the 1963–80 period. Thus, it seems that Basu's results contradict Reinganum's (1981a) conclusion that the 'size effect' subsumes the 'E/P effect'. Finally, Basu notes that there is some interaction between size and E/P ratios in the sense that

[1]The references to this paper contain 19 papers dated 1981 or later that pertain to the 'size effect'; seven of these papers are contained in this issue of the *Journal of Financial Economics*.

the magnitude of risk-adjusted returns is largest for small firms with high E/P ratios. Basu concludes that both the 'E/P effect' and the 'size effect' probably are an indication of deficiencies in the capital asset pricing model, not a sign of market inefficiency.[2]

Recently, Roll (1982) and Blume and Stambaugh (1983) examine the effects of the different portfolio strategies implicit in alternative estimators of risk-adjusted returns to portfolios of small firms' stocks. They conclude that the annualized arithmetic average daily risk-adjusted returns calculated by Reinganum (1981a) are about twice as large as the risk-adjusted returns to a portfolio that is purchased at the beginning of the year and held for an entire year. The use of compounded arithmetic average returns is similar to a portfolio strategy that involves daily rebalancing to attain equal weights for the stocks in the portfolio. On the other hand, a buy-and-hold strategy involves no rebalancing within the measurement interval. Since the magnitude of the 'size effect' is apparently sensitive to the technique used to calculate average risk-adjusted returns, both Roll (1982) and Blume and Stambaugh (1983) question the empirical importance of this phenomenon.

In sum, several papers have attempted to explain the anomalous results of Banz (1981) and Reinganum (1981a) by showing that risk estimates are biased downward or average return estimates are biased upward for small firms' stocks. While it is true that the magnitude of the 'size effect' is affected by these statistical issues, none of these papers have been able to completely explain the evidence on the 'size effect'.

3.2. Further characterization of the 'size effect'

In this issue, Keim (1983) and Brown, Kleidon and Marsh (1983) provide new evidence on the time series behavior of the 'size effect'. Keim notes that the average risk-adjusted return to a portfolio of small firms' stocks is large in January and much smaller for the rest of the year. About half of the annual 'size effect' occurs in January, and about 25 percent of the annual 'size effect' occurs during the first five trading days of January. Therefore, Keim finds that the 'size effect' exhibits seasonality analogous to the earlier findings of Officer (1975) and Rozeff and Kinney (1976) for aggregate market portfolio returns.

Brown, Kleidon and Marsh (1983) examine the behavior of the 'size effect' over time. Using data from 1967–79, they find that the risk-adjusted average returns to portfolios ranked on size are linearly related to the logarithm of the size variable, but that the magnitude and sign of that relation are not

[2]Ball (1978) discusses tests of market efficiency that use the CAPM to measure equilibrium expected returns. Ball argues that significant abnormal returns to trading strategies that involve relatively stable portfolios of securities are evidence of errors in the CAPM, not evidence of inefficient capital markets. Thus, tests using E/P ratios, such as Basu (1977), probably indicate poor estimates of expected returns from the CAPM.

constant within the 1967–79 sample period. In particular, the 'size effect' seems to imply a negative excess return for small firms' stocks between 1969–73 and a positive excess return between 1974–79. Brown, Kleidon and Marsh speculate about the types of explanations that are consistent with a time-varying 'size effect', but find no explanation that seems likely to fit both Keim's (1983) evidence and their own.

3.3. Economic explanations for the 'size effect' — and the lack thereof

3.3.1. Tax effects

As a result of Keim's (1983) finding that a large part of the differential risk-adjusted returns to small firms' stocks occurs in the first week of January, several papers attempt to explain the 'turn-of-the-year effect'. A natural hypothesis to consider is that some investors sell securities at the end of the calendar year to establish short-term capital losses for income tax purposes. If this 'selling pressure' depresses stock prices prior to the end of the year, the increase in prices during the first week of the subsequent year superficially seems reasonable. This conjecture has become so commonplace that it was discussed in the 'Heard on the Street' column in the *Wall Street Journal* on December 27, 1982.

Roll (1983) and Reinganum (1983) examine the extent to which the 'January size effect' can be explained by the tax-loss-selling-pressure hypothesis. Both Roll and Reinganum find that the magnitude of the price increase in the first week of January is positively related to the magnitude of short-term capital losses that could have been realized at the end of the previous year. They conjecture that the effect is largest for small firms because small firms' stock returns are more volatile, and because tax-exempt investors, such as pension funds, have relatively small holdings in small firms' stocks. Also, the transaction costs of trading in small firms' stocks are larger than for stocks of larger firms. On the other hand, in this issue, Reinganum finds that average stock returns are high during the first five trading days of the calendar year, even for stocks that show capital gains over the previous year. He also finds that average returns to small firms' stocks are high relative to larger firms' stocks for the entire month of January. This difference is not limited to the first five trading days. Thus, Reinganum concludes that the 'January size effect' cannot be completely explained by tax-loss-selling.

3.3.2. International evidence on tax effects

Several papers examine the 'January size effect' using international data. In this issue, Brown, Keim, Kleidon and Marsh (1983) analyze the returns to Australian stocks, since the typical fiscal year end for tax purposes is June 30

in Australia. Using monthly data from 1958 to 1981, they find that average returns to most Australian stocks are substantially larger in January and July than in the other ten months. The 'size effect' does not appear to be seasonal, however, because the average return to the smallest decile of stocks is about 4 percent per year greater than any of the other size portfolios and this difference does not seem to vary across months. Thus, while stock returns are seasonal in Australia, as noted previously by Officer (1975), and there does seem to be a 'size effect', the 'size effect' is not obviously related to the end of the tax year. Brown, Keim, Kleidon and Marsh conclude that tax-loss-selling probably does not explain the 'January size effect' found in U.S. data.

Other papers that examine the relation between firm size, tax-loss-selling, and seasonality in stock returns include Gultekin and Gultekin (1982) and Berges, McConnell and Schlarbaum (1982). Gultekin and Gultekin examine average monthly returns to market portfolios of a number of different countries. They find seasonality in most countries, with a predominance of high average returns in January when the tax year ends in these countries. Berges, McConnell and Schlarbaum examine monthly returns to 391 stocks traded on the Toronto and Montreal Stock Exchanges from 1950 through 1980. They estimate average returns to five portfolios ranked on the market value of outstanding stock and find higher average returns in January, especially for small firms' stocks. However, this phenomenon seems to exist both before and after 1972, when Canada first imposed a capital gains tax. Therefore, Berges, McConnell and Schlarbaum agree with Reinganum (1983) that tax-loss-selling does not completely explain the 'January size effect'.

3.3.3. Transaction costs

In this issue, Stoll and Whaley (1983) and Schultz (1983) examine the magnitude of transaction costs for stocks of firms in different size categories. Stoll and Whaley examine monthly returns to New York Stock Exchange (NYSE)-listed stocks from 1960 through 1979 for ten portfolios ranked on market value of the stock. They note that small firms' stocks tend to have lower prices and higher bid–ask spreads, so transaction costs are relatively high for these stocks. Adding together estimates of the bid–ask spread and the commission rate, round-trip transaction costs average 6.8 percent for the smallest decile of firms and 2.7 percent for the largest decile of firms. Stoll and Whaley estimate risk-adjusted returns to the small firm portfolio net of transaction costs and find that a round-trip transaction every three months is sufficient to eliminate the 'size effect'. If round-trip transactions occur once per year, the average abnormal return is about 4.5 percent per year after transaction costs with a t-statistic of 1.75.

Schultz (1983) examines daily returns to New York and American Stock

Exchange stocks from 1963 through 1979. Since American Stock Exchange (AMEX) stocks generally have lower market values than NYSE-listed stocks, most of the firms in the smallest decile portfolio are listed on the AMEX. Consistent with the results of Stoll and Whaley (1983), Schultz finds the average round-trip transaction costs for the small firm portfolio are about 11.4 percent. Nevertheless, for holding periods of one year, the small firm portfolio earns average risk-adjusted returns of about 31 percent per year net of transaction costs. This 'size effect' has a t-statistic of 2.8. Schultz also estimates average transaction costs for each month and finds no evidence of seasonality that could explain the 'January size effect' found by Keim (1983). Therefore, Schultz concludes that transaction costs cannot explain the high average returns to small firms' stocks.

3.3.4. Other modifications of the CAPM

A number of papers have examined the relations between the 'size effect' and other variables that might be related to expected returns. For example, Cook and Rozeff (1982) examine the relations between firm size, dividend yield, and co-skewness. The latter variables have been proposed to account for effects of taxation and of skewness preference, respectively, on the specification of the capital asset pricing model. Keim (1982) analyzes the relation between dividend yield and firm size. Lakonishok and Shapiro (1982) examine the relation between firm size and the standard deviation of the stock return on the premise that standard deviation is an appropriate measure of risk if investors hold undiversified portfolios. Reinganum (1981b) examines the relation between firm size and the risk-adjusted returns from a version of the arbitrage pricing model of Ross (1976). While it is difficult to summarize the methodology and results of all these papers, none of these papers find a satisfactory explanation of the 'size effect'.

4. Where do we go from here?

The search for an explanation of this anomaly has been unsuccessful. Almost all authors of papers on the 'size effect' agree that it is evidence of misspecification of the capital asset pricing model, rather than evidence of inefficient capital markets. On the other hand, none of the attempts to modify the CAPM to account for taxation, transaction costs, skewness preference, and so forth have been successful at discovering the 'missing factor' for which size is a proxy. Thus, our understanding of the economic or statistical causes of the apparently high average returns to small firms' stocks is incomplete. It seems unlikely that the 'size effect' will be used to measure the opportunity cost of risky capital in the same way the CAPM is used because it is hard to understand why the opportunity cost of capital should

be substantially higher for small firms than for large firms. It is especially hard to understand why the cost of capital should be higher for small firms during the first week of January. Therefore, it is unlikely that the 'size effect' will be taken into account in teaching capital budgeting or performance evaluation for investment portfolios.

The evidence on the 'size effect' probably will influence the use of the CAPM in 'event studies', especially in cases where new information is released in early January or cases where the sample is concentrated on firms of a given size. For example, studies of whether large firms are differentially affected by political costs would probably want to take account of the 'size effect' in estimating abnormal returns associated with information events. Of course, if historical average returns or the market model are used to calculate 'normal' returns to stocks, the 'size effect' is not a problem as long as the seasonality of stock returns is taken into account.

In short, I believe that the 'size effect' will join the 'weekend effect' that has been documented by French (1980) and Gibbons and Hess (1981) as an empirical anomaly. French and Gibbons and Hess find that average returns to stocks are negative from the close of trading on Friday to the close of trading on Monday. While these anomalies are statistically significant, they have not been explained using conventional economic models.

Where do we go from here? I suspect that empirical researchers will continue to search for the variable or combination of variables that will make the 'size effect' go away. However, to successfully explain the 'size effect', new theory must be developed that is consistent with rational maximizing behavior on the part of all actors in the model. As several authors have noted, the attempts to use institutional factors such as differential taxation or transaction costs to explain the 'size effect' seem to suggest the existence of profitable trading strategies for tax-exempt institutional investors that face relatively low costs of transacting. In equilibrium, these profits should be competed away, so that more sophisticated models are necessary to explain this apparent empirical regularity. Given the variety of plausible hypotheses that have been tried with at best partial success, I am not optimistic that we will understand the causes of the 'size effect' soon.

I also suspect that researchers will continue to measure the extent to which the 'size effect' is related to other anomalous differences in average returns to financial assets such as the 'E/P effect'. However, evidence on the similarity of two anomalies is not likely to help us understand either one.

The papers in this issue of the *Journal of Financial Economics* set a standard for future papers on the 'size effect'. Each paper contains carefully done empirical research. As a result, much more is known about the association between firm size and average stock returns, and we know that a variety of plausible hypotheses do not explain the 'size effect'. This work

provides us with facts that are difficult to understand given our current knowledge about capital markets. I hope these empirical regularities will stimulate future research on the aspects of capital market institutions that will explain what now seem to be anomalies. New models of asset pricing that can explain the empirical evidence on the 'size effect', while maintaining the assumption of rational maximizing behavior, would be a significant step forward in financial research.

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