Market Anomalies Revisited

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Abstract

The existence of market return anomalies have long been recognized in the finance literature. Several studies have documented the effects of size, dividend yields, E/P ratios, book-to-market value ratios, weekend, and turn of the year (January effect) on market returns. Still, much controversy surrounds the existence of, and explanations for the observed market anomalies. This study uses 1987-92 returns data to help provide more current evidence concerning market anomalies. A multivariate regression model (MVRM) is used to test for the presence of size effect, weekend effect, and January effect in this period. Evidence indicates the existence of a January effect for small firms, but other effects are not detected at any significant levels.

Introduction

Research relating the return on a company’s common stock to its size can be traced back to Peterson (1976). The seminal study in this area, however, was undertaken by Banz (1981). He observed that stocks of smaller companies outperformed stocks of larger companies by a statistically significant margin. In addition, Banz showed that this size effect was long term; persisting over a forty-year period.

Ball (1978) presented evidence that high earnings/price (E/P) ratio stocks provide higher risk-adjusted returns than low E/P stocks. Reinganum (1981) questioned the separate existence of both the small firm and E/P effects. He found that both the effects were present in rates of return if the two effects were considered separately, but not when taken together. Basu (1977, 1983) employed a different risk adjustment method and derived a contrary result. He observed that the E/P effect was clearly significant even after experimental control was exercised over differences in firm size. In recent years, Fama and French (1992, 1995) observed that two variables, size and book-to-market value ratio, combine to capture the cross-sectional variation in average stock returns. Kothari, Shanken, and Sloan (1995) observed similar, though weaker and less consistent effect.

In an effort to explain the small firm effect, Keim (1983) observed that about 25% of the size effect occurs during the first five trading days in January. The abnormal phenomenon, involving high excess returns for the entire month of January, is known as the year-end effect or January effect. Roll (1983) argued that the most likely cause of this abnormal behavior is tax-loss selling. He observed that a significant correlation exists between the realized rates of return during the year and the size of the turn-of-the-year price recovery. However, Reinganum

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(1983) observed that small firms tend to produce larger returns for the first five days in January whether or not they showed capital loss or capital gains over the previous period. This would seem to contradict the tax-loss hypothesis.

More recent studies post conflicting results about this abnormal behavior as well. Chan (1986) analyzed the tax-loss selling hypothesis as an explanation of the January seasonality in stock returns and argued that tax-loss selling implies little relation between the January seasonality and long-term loss. His evidence is inconsistent with a model that explains the January seasonality by optimal tax trading. Ritter (1988) examined the size effect at the turn of the year and observed that buying and selling behavior of individual investors has a strong relation with the magnitude of the turn-of-the-year effect. His findings seem to contradict Reinganum's (1983) observations. On the other hand, Ritter and Chopra (1989) used value-weighted, rather than equally weight ed, portfolios and found that the market's risk-return behavior does not have a January seasonal component. They observed that there is a positive relationship between the excess return on small firms and beta irrespective of the direction of the market movement in January.

Another interesting pattern in stock prices is the so-called "weekend effect". In one of the earliest studies, French (1980) observed that negative returns on Monday were highly significant in each of the five-year sub-periods they studied. Gibbons and Hess (1981), and Keim and Stambaugh (1984) also examined daily common stock returns and observed that the average return on Friday is abnormally high and the average return on Monday is abnormally low. Abraham and Ikenberry (1994) found that the effect is more acute in small- and medium-sized firms. In a related study, Khaksari and Bubny (1992) also found a more pronounced January effect in small firms.

The scope of this paper is twofold. First, this study complements the ongoing debate on market anomalies. It utilizes comparatively more current data from the CRSP daily stock return database. In addition, it attempts to simultaneously assess the magnitude of the weekend, January and size anomalies via a single system of equations. In other words, this study examines whether over a number of years, firms experienced various anomalies in their stock returns. No previous study has made a comprehensive test of this type.

The remainder of this paper is organized as follows: next section describes the methodology and hypothesis of the study. A detailed description of the data is provided in the following section. The results and interpretations are presented in the subsequent section, followed by conclusion. Suggestions for future research are provided in the last section.

**Methodology and Hypotheses**

Following the seminal work of Fama, Fisher, Jensen and Roll (1969) on stock splits, numerous studies have attempted to determine the degree of impact of various events on stock returns. Brown and Warner (1980, 1985) proposed three models which became the basic tools used in most event studies. However, their proposed market models are appropriate only under a relatively narrow set of circumstances, primarily for events that can be individually isolated for a given company and are not simultaneous across companies. For the study of return anomalies spanning multiple events, with many events being simultaneous across firms (for both the weekend and January effects), the traditional Brown and Warner models are poorly suited.

This study employs a multi-variate regression model (MVRM) to test for market anomalies under an event study framework. A similar technique has been used by Binder (1985a, 1985b, 1988), Cornett and Tehranian (1989, 1990), Rose (1985), Schipper and Thompson (1983), and Smith, Bradley and Jarrel (1986). This methodology has the advantage of explicitly incorporating heteroscedasticity and allowing contemporaneous dependence of ran-
dom error terms across equations. This is important because similar companies, as would usually be observed in a group, may react in a similar manner to any common event. Standard methodologies such as Brown and Warner (1980, 1985) are ill suited to this environment due to the violation of underlying assumptions.¹

In the MVRM specification, a system of equations is created by adding binary (zero-one) dummy variables to the usual market model. The dummy variable is equal to one if an event occurs and zero otherwise. Coefficients corresponding to these dummy variables measure the impact of the respective events on stock returns. As proposed by Cornett and Tehranian (1990), the model used in this study also incorporates two leads and two lags of market returns as explanatory variables which incorporate the effects of non-synchronous trading in the sample. Scholes and Williams (1977) observed that non-synchronous trading is prominent, specially in the small firms. Leads and lags of the market returns are included as explanatory variables to capture the possibility of non-synchronous trading. The daily S&P 500 index from CRSP index returns file is used as a proxy to the market. The system is estimated by the generalized method of moments (GMM) by setting the calculated correlations of the zero moment conditions (the moment conditions of an equation is set equal to zero) and the disturbances as close to zero as possible. The GMM takes the broad view of the correlation among the residuals. It seems appropriate since the explanatory variables are similar for all equations in the system.

The data for this study consists of daily stock returns for several industries listed on the New York Stock Exchange (NYSE), the American Stock Exchange (ASE) or in the Over-the-Counter (OTC) market between 1987 and 1992. The data set has been extracted from the CRSP Daily Stock Returns file. The size effect, as observed by Banz (1981), Basu (1977, 1983), Reinganum (1981), and Cook and Rozell (1982), is captured by dividing the data set into three distinct subgroups representing small, medium and large firms. Firms with total assets between one and fifty million dollars are defined as small firms, firms with total assets between one hundred and five hundred million dollars are defined as medium firms, and firms with total assets over one billion dollars are defined as large firms. It should be noted that the grouping ranges are not continuous. Thus, the three categories represent companies with distinct differences in the size characteristic.

The model consists of a set of three equations representing the three size groups:

\[
R_{1t} = \alpha_1 + \beta_{11} R_{m(t-2)} + \beta_{12} R_{m(t-1)} + \beta_{13} R_{m(t)} + \beta_{14} R_{m(t+1)} + \gamma_{t} D_{t} + \sum_{q=1}^{Q} \gamma_{q(tan)} D_{q(tan)} + e_{1t}
\]

\[
R_{2t} = \alpha_2 + \beta_{21} R_{m(t-2)} + \beta_{22} R_{m(t-1)} + \beta_{23} R_{m(t)} + \beta_{24} R_{m(t+1)} + \gamma_{2t} D_{t} + \sum_{q=1}^{Q} \gamma_{q(tan)} D_{q(tan)} + e_{2t}
\]

\[
R_{3t} = \alpha_3 + \beta_{31} R_{m(t-2)} + \beta_{32} R_{m(t-1)} + \beta_{33} R_{m(t)} + \beta_{34} R_{m(t+1)} + \gamma_{3t} D_{t} + \sum_{q=1}^{Q} \gamma_{q(tan)} D_{q(tan)} + e_{3t}
\]

where,

\(R_{jt} = \text{Return on portfolio } j \text{ on day } t\)

\(R_{1t} = \text{Return on day } t \text{ for the portfolio of small size firms}\)

\(R_{2t} = \text{Return on day } t \text{ for the portfolio of medium size firms}\)

\(R_{3t} = \text{Return on day } t \text{ for the portfolio of large size firms}\)

\(R_{mt} = \text{Return on Composite Stock Index on day } t\)

\(\alpha_j = \text{Intercept coefficient for portfolio } j\)

\(\beta_{j1} \ldots \beta_{j3} = \text{Risk coefficients for the } j\text{th portfolio}\)

\(\gamma_{jk} = \text{The effect of the } k\text{th weekend on } j\text{th portfolio} \text{ (} k = 1 \ldots K, \text{ } K = \text{total number of weekends, } 1987-92)\)

\(D_{kt} = \text{Dummy variable for the } k\text{th weekend} \text{ (equals to 1 on Monday, 0 otherwise)}\)

\(\gamma_{q(tan)} = \text{The January effect of the } q\text{th year on } j\text{th portfolio} \text{ (} q = 1 \ldots Q, \text{ } Q = \text{total number of years, } 1987-92)\)

\(D_{q(tan)} = \text{The dummy variable for the } q\text{th year}\)
January effect. (equals to 1 on each trading day during January each year; 0 otherwise)
\( e_j = \) Random error terms.

This MVRM model of a system of equations assumes that the random error term variances exist across equations (incorporating heteroscedasticity). It also assumes that the contemporaneous covariance of the error terms are nonzero, while the noncontemporaneous covariance are all equal to zero. In line with Binder (1985b), the model specification further assumes that the explanatory variables in the return generating process are the same for each of the three returns in the system of return equations. The four joint hypotheses to be tested are:

**Hypothesis 1:**

\[ \gamma_j = 0 \quad \forall \ j, k. \]  

(4)

This implies that abnormal returns are jointly equal to zero on a particular weekend. The test statistic follows t-distribution.

**Hypothesis 2:**

\[ \gamma_k = 0 \quad \forall j. \]  

(5)

This implies that abnormal returns across firm sizes are equal to zero on a particular weekend. The test statistic follows F-distribution.

**Hypothesis 3:**

\[ \gamma_{jq(k)} = 0 \quad \forall \ j, q. \]  

(6)

This implies that abnormal returns during January are equal to zero. The test statistic follows t-distribution.

**Hypothesis 4:**

\[ \sum_{k=1}^{K} \xi_{1k} - \sum_{k=1}^{K} \gamma_{2k} = 0 \quad \forall \ k \]  

(7)

\[ \sum_{k=1}^{K} \xi_{2k} - \sum_{k=1}^{K} \gamma_{3k} = 0 \quad \forall \ k \]  

(8)

\[ \sum_{k=1}^{K} \xi_{3k} - \sum_{k=1}^{K} \gamma_{1k} = 0 \quad \forall \ k \]  

(9)

This implies that abnormal returns during weekends are the same for each size group. The test statistic follows F-distribution. The procedure for joint testing of these hypotheses are described in Rao (1973).

The results of this study could support a wide array of conclusions and provide much useful information. Hypothesis 1 describes the weekends that are significant for each firm size. Hypothesis 2 describes those particular weekends that are significant across firm sizes to these firms, and can also rank those weekends according to their level of significance. Moreover, it can detect seasonality, if any, in the weekend effect. Hypothesis 3 addresses the existence of the January effect during this period. Hypothesis 4 addresses the size effect by determining which size group is experiencing the most of the abnormal returns.

For the purpose of simultaneous testing of the weekend and the January effects, the model is tested with all the relevant dummy variables. The purpose is to study the weekend and the January effects concurrently. The weekend dummy variables take the value of unity if the particular return corresponded to a Monday, zero otherwise. For the January effect, the dummy variables take the value of unity for returns occurring in January and zero otherwise.

**Data Collection**

The research design calls for the formation of 3 distinct portfolios, each belonging to a different size class, herein referred to as small, medium and large. The market value of shares outstanding was chosen to proxy the firm size. Firms with a market value of common shares outstanding less than $50 million are classified as small, those in the range $100 million to $500 million are defined as medium-sized, and those above $1 billion are assigned to the large size group. The delineation of the size class is admittedly arbitrary, but should be sufficient to allow size-dependent anomalies to be detected. Note that the size ranges are not continuous.
Table 2  
Coefficients of the Significant Weekend Dummy Variables  
and Their Respective t- and F-values for the Firms of All Size Classes  

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Variable</th>
<th>Coefficient</th>
<th>Variable</th>
<th>Coefficient</th>
<th>Variable</th>
<th>F-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>D4</td>
<td>-0.01522</td>
<td>(2.149)</td>
<td>D4</td>
<td>-0.01224</td>
<td>(2.415)</td>
<td>D38</td>
<td>-0.00770</td>
</tr>
<tr>
<td>D101</td>
<td>0.01927</td>
<td>(2.734)</td>
<td>D11</td>
<td>-0.01153</td>
<td>(2.284)</td>
<td>D53</td>
<td>-0.00930</td>
</tr>
<tr>
<td>D150</td>
<td>-0.01528</td>
<td>(-2.168)</td>
<td>D19</td>
<td>-0.01138</td>
<td>(-2.255)</td>
<td>D88</td>
<td>0.00722</td>
</tr>
<tr>
<td>D154</td>
<td>0.01393</td>
<td>(1.974)</td>
<td>D73</td>
<td>-0.01059</td>
<td>(-2.100)</td>
<td>D132</td>
<td>-0.00784</td>
</tr>
<tr>
<td>D156</td>
<td>-0.01539</td>
<td>(-2.183)</td>
<td>D98</td>
<td>0.01069</td>
<td>(2.114)</td>
<td>D174</td>
<td>-0.00073</td>
</tr>
<tr>
<td>D170</td>
<td>-0.01422</td>
<td>(-2.011)</td>
<td>D153</td>
<td>0.01235</td>
<td>(2.449)</td>
<td>D188</td>
<td>-0.00718</td>
</tr>
<tr>
<td>D196</td>
<td>0.01619</td>
<td>(2.297)</td>
<td>D156</td>
<td>-0.01774</td>
<td>(-3.513)</td>
<td>D234</td>
<td>-0.01329</td>
</tr>
<tr>
<td>D212</td>
<td>0.01430</td>
<td>(2.031)</td>
<td>D170</td>
<td>-0.01034</td>
<td>(-2.041)</td>
<td>D236</td>
<td>-0.00835</td>
</tr>
<tr>
<td>D221</td>
<td>0.01392</td>
<td>(1.974)</td>
<td>D174</td>
<td>-0.01269</td>
<td>(-2.516)</td>
<td>D247</td>
<td>-0.00843</td>
</tr>
<tr>
<td>D231</td>
<td>-0.01573</td>
<td>(-2.226)</td>
<td>D234</td>
<td>-0.02754</td>
<td>(-5.244)</td>
<td>D284</td>
<td>-0.00727</td>
</tr>
<tr>
<td>D234</td>
<td>-0.03555</td>
<td>(-4.845)</td>
<td>D240</td>
<td>-0.01128</td>
<td>(-2.221)</td>
<td>D156</td>
<td>6.5239</td>
</tr>
<tr>
<td>D240</td>
<td>-0.01760</td>
<td>(-2.481)</td>
<td>D241</td>
<td>0.02030</td>
<td>(4.004)</td>
<td>D170</td>
<td>3.4422</td>
</tr>
<tr>
<td>D244</td>
<td>0.03115</td>
<td>(4.394)</td>
<td>D244</td>
<td>0.01691</td>
<td>(3.334)</td>
<td>D174</td>
<td>4.0716</td>
</tr>
<tr>
<td>D267</td>
<td>0.01754</td>
<td>(2.484)</td>
<td>D288</td>
<td>0.01717</td>
<td>(3.403)</td>
<td>D234</td>
<td>6.5923</td>
</tr>
<tr>
<td>D269</td>
<td>0.01484</td>
<td>(2.106)</td>
<td></td>
<td></td>
<td></td>
<td>D244</td>
<td>20.1600</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>D245</td>
<td>2.9051</td>
<td>(2.554)</td>
<td>D255</td>
<td>3.0295</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>D284</td>
<td>3.6608</td>
<td>(2.554)</td>
<td>D288</td>
<td>7.9576</td>
</tr>
</tbody>
</table>

* indicates significance at the 5 percent level.  

be random in nature. It has been observed, however, that the coefficients for Mondays are consistently negative, implying negative Monday returns. It is further observed that the absolute values of the Monday coefficients for small firms are consistently higher than the corresponding coefficients for large and medium firms. It indicates the interrelationship between the size and weekend effects. Empirical support for this finding can be found in Rogalski (1984), and Abraham and Ikenberry (1994).

The table also reports the significant F-values for hypothesis 2 (that individual weekends
produce significant effects across size groups). Out of 290 weekends, only 19 F-values are reported significant at the 5% level. This result also does not support the existence of any systematic weekend effect. Therefore, hypothesis 1 and hypothesis 2 are accepted that no significant weekend effect is present across size groups.

Table 3 shows dummy variable coefficients for the January effect and their respective t-values. In three out of six years under study, the January returns are found significant for small firms. For the medium-sized firms, the January returns are significant in only one year. There is no significant January returns for large firms. Therefore, the evidence seems to support the presence of January Effect for small firms only. However, it should be noted that the absolute values of the coefficients for small firms are consistently larger than the coefficients of other size classes. It is also interesting to note that three coefficients are negative for the large firms, only one is negative for the medium firms; while none are negative for the small firms. A negative coefficient implies negative abnormal returns for the medium and large size firms in the month of January. Hypothesis 3, therefore, is rejected only for the small firms. Empirical support for the existence of the January effect on small firms can be found in Keim (1983) and Reinganum (1983).

Numerous researchers have also observed the similar strong relationship between the size and January effects. Ownership structure of the small firms can be thought off as one reason for this particular finding. It can be argued that high individual ownership concentration as opposed to institutional ownership is more prominent for smaller firms. Significant holdings on small firms by tax-motivated individual investors might cause a significant January effect. Strebel and Arbel (1983) observed that information about smaller firm is less available, because they are neglected by large institutional traders. This information deficiency makes smaller firms riskier and command higher return. Arbel (1985) further found that the January effect was largest for those neglected (smaller) firms.

To test the final hypothesis, in line with Cornet and Tehranian (1989, 1990) three F-statistics are calculated to observe the size effect. These values are then compared with the critical value \(F(1, 3663, 0.05) = 3.84\). The computed F-values are observed as following:

\[
\begin{align*}
F \text{ (small - medium)} & = 0.0840 \\
F \text{ (medium - large)} & = 0.2850 \\
F \text{ (small - large)} & = 1.2198
\end{align*}
\]

As shown, the F-value between the small and large size groups is the largest, followed by F-value between small and medium firms, and finally the F-value between medium and large
firms. All three values, however, are insignificant. Therefore, hypothesis 4 is accepted with the conclusion that size effect was not significant during the period of this study. Keim (1983) and Reinganum (1983) observed that the higher return for the small firms in comparison to the large firms are generated only in the first few days in January. Roll (1983), and Blume and Stambaugh (1983) further observed that the magnitude of the size effect would be greatly reduced if any possible bias induced by daily rebalancing of portfolios (specially, for the first few days in January) is eliminated. Recently, Badrinath and Kini (1994) observed that the size effect is almost entirely a January phenomenon. In line with this argument, the MVRM model specification ensures that the size and January effects are tested simultaneously. That produces an insignificant size effect.

Conclusion

The study employs a Multivariate Regression Model (MVRM) technique to test for the presence of size effect, weekend effect, and January effect on market returns. The novelty of the model specification lies in its simultaneous testing of these effects. The methodology has the advantage of explicitly incorporating heteroscedasticity and allowing contemporaneous dependence of random error terms across equations.

Evidence indicates the presence of significant January effect for small firms. Correspondingly, the study produces an insignificant size effect in other size classes. Numerous researchers have found that the higher returns for the small firms, in comparison to the large firms are generated only in the first few days in January. They observed that the size effect is almost a January phenomena. The finding of this study is in conformity with that observation.

The result of the paper does not support the presence of any pervasive weekend effect during the entire period of the study. Though insignificant in most of the weekends, the study finds consistently negative Monday returns for all size groups. Specifically, the negative returns are higher in absolute values in most cases for the smaller firms than for medium or large size firms. In line with the previous studies, the finding indicates the interrelationship between size and weekend effects.

Suggestions For Future Research

Future research can be pursued in two directions. First, the MVRM specification can be utilized to simultaneously test the effects of different anomalies on market returns. Reinganum (1981) suggested that size and E/P ratio effects should be considered jointly. On the other hand, Fama and French (1992, 1995) observed the joint movements of the size and book-to-market value ratios. It calls for the inclusion of these two variables into the model for comprehensive evaluation.

Second, these anomalous behavior of stock returns should be judged in the light of the ‘Efficient Market Hypothesis’. Fama and French (1993) argued that these effects simply manifest risk premiums (where, different anomalies act as determinants of risk). They concluded that these phenomena, therefore, are consistent with a rational (efficient) market. However, the debate over whether market anomalies are simply risk premiums or a deviation from the efficient market, is far from over and warrants further research.

Endnotes

1. See Cornett and Tehranian (1990) for a discussion on the failure to take into account of non-synchronous trading behavior, serial correlation, and heteroscedasticity in the OLS model specification.
2. Only significant weekend dummy variables are reported in Table 2. The estimated coefficients with their respective t-values and the F-values for all 290 weekends will be made available upon request.
References


23. Gibbons, Michael R., and P. J. Hess,


