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Are Cover Stories Effective Contrarian Indicators?

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Cover Stories: Are Business Magazine Cover Stories Effective Contrarian Indicators?

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Cover Stories: Are Business Magazine Cover Stories Effective Contrarian Indicators?

Abstract:

Headlines from cover stories are collected over a twenty year period from *Business Week*, *Fortune*, and *Forbes* to determine if positive stories are associated with superior future performance and if negative stories are associated with inferior future performance for the featured firm (when compared to an index or to another firm within the same industry and of the same size). Statistical testing implies that positive stories generally indicate the end of superior performance and negative news generally indicates the end of poor performance.

INTRODUCTION:

The covers of business magazines have been considered to be informative as a potential contrarian signal (see Stalter (2005), Forsyth (1996, 1997), and Queenan (1991) as examples). However, aside from anecdotal evidence and a few factual examples, such a view has never been validated statistically. Other business media following specific analysts or television programs (see Desai and Jain (2004) and Ferreira and Smith (2003)) have been tested statistically and demonstrate a limited effect on future short-term stock prices (many times only on the first day after the information is reported). The goal of this paper is to statistically test over a 1000-day horizon the effect of business magazine cover stories on stock prices/returns (500 days prior and 500 days after publication; we exclude the publication date from the analysis). The effect is investigated using 20 years (1983 – 2002) of cover stories from *Business Week*, *Fortune*, and *Forbes*.

To formalize the intuition of how a magazine cover article can affect future returns, one can assume that the given story reports new pertinent information or simply reports past information. If the information is genuinely new, the market can react as follows:

- Instantly and correctly – a very short-term effect, but no lingering future effects
- Under-react – a potentially longer-term effect making the story a momentum indicator
- Over-react – a potentially longer-term effect making the story a contrarian indicator

If the information contained in the article is not really new:

- No reaction – all information has been incorporated in prices
- Coincides with popularity of the stock – possible momentum indicator
- Coincides with stock being mis-priced – possible contrarian indicator

Most of the anecdotal evidence follows the idea that cover stories are not informational because of the time it takes to gather information for the article and to print the article. The availability of instantaneous business news and, to a lesser extent, the availability of daily business news outlets put weekly and bi-monthly news magazines at a great disadvantage to provide new information about a firm. Further, the anecdotal evidence tends to view the scenario in which the article coincides with a stock being mis-priced giving credence to the idea that the magazine cover story is a contrarian indicator (again, assuming no new information is revealed in the article).

In this paper, we test to determine if the cover story is an indicator of future performance (momentum or contrarian). We do not consider whether the given article reveals new information about the firm or not. Our bias, based on the discussion of weekly and bi-monthly business news magazines being disadvantaged in reporting news in a timely manner, is towards the hypothesis that cover stories do not reveal new information about the firm.

SECTION 1: Cover Story Data and Analysis

Companies that are the subject of feature (cover) stories in *Business Week* (weekly), *Fortune* (bi-monthly; every two weeks), and *Forbes* (bi-monthly) magazines between 1983 and 2002 are analyzed for stock price performance 24 months prior (500 business days) to and 24 months after the feature story is published. For purposes of analysis, the “publication date” is the date on the cover less 7 calendar days for *Business*

Week stories and less 14 calendar days for *Fortune* and *Forbes* stories. This makes the publication date equivalent to the first day the magazine is available. The cover date indicates how long the magazine is available for sale rather than the actual publication date.

The headline for the feature story is categorized on a five point scale (1 being very positive, 2 being positive, 3 being neutral, 4 being negative, and 5 being very negative). Although the determination of a story being positive or negative appears very subjective, the headlines of the stories tend to follow particular patterns:

- Category 1: Firm A “is” or “has done” something very innovative or profitable. (Very positive cover)
- Category 2: Firm A “plans to” or “in the process of” something very innovative for the future, but will it work? (Optimistic cover)
- Category 3: No particular intuition as to a company being good or bad. (Companies identified on cover, but no indication of a positive or negative slant to the feature)
- Category 4: Firm A has experienced poor performance, but the headline questions that the end of poor performance may be near. (Pessimistic past, with implication for potential turnaround)
- Category 5: Firm A is doing very poorly or a scandal has occurred. (Pessimistic cover sometimes with an implication of a future management change and/or litigation)

Further, the large sample should also help to eliminate misinterpretations that may have occurred in categorizing the feature stories.

INSERT TABLE 1 HERE

There were 593 feature stories during the twenty year time period, of which 549 had four years of stock returns available for testing.¹ Table 1 displays the frequency of positive (categories 1 or 2), neutral (category 3), and negative (categories 4 or 5) feature stories over the twenty year time period in total and by periodical. Note, in general

¹ 24 months prior to the feature story are used for hypotheses testing.

magazine feature stories do not focus on specific corporations. This is demonstrated by the fact that out of a potential of 2080 cover stories, only 593 feature stories are focused on a particular corporation. Also, feature stories tend to be positive. 350 of the 549 sample feature stories are definitely positive (63.7%) and only 100 of the 549 sample feature stories are definitely negative (18.2%).

INSERT TABLE 2 HERE

Table 2 displays characteristics about the companies featured in the cover stories. The firms tend to be large-cap and do not vary in size greatly between magazines. This is not surprising given that the magazines tend to have similar readership.

To analyze a given feature story on a firm, 1 month (-21 to -1 trading days prior to publication date), 6 month (-125 to -1 trading days prior to publication date), 12 month (-250 to -1 trading days prior to publication date) and 24 month (-500 to -1 trading days prior to publication date) holding period returns are calculated prior to the publication of the story. Similar holding periods are calculated after the publication of the story with an additional holding period of 1 to 5 days to examine short-term effects. The holding period returns do not include the day in which the feature story is published to allow for the testing of cover stories as a contrarian or momentum indicator. More specifically, the goal is to not measure a “quick” adjustment by the market, but something more “predictive” of the future, in the sense of allowing a specific trading strategy to succeed

In Table 3, the average holding period return (HPR) for all firms within a category (positive story [1 or 2], neutral story [3], and negative story [4 or 5]) are reported over different time horizons before and after publication. The “adjusted return” (AR) is the average of the holding period return less the equivalent holding period return

for the value-weighted CRSP stock index. The “average holding period abnormal return – industry and size matched” (AHPAR-ISM) is the average of the holding period return of a given firm less the equivalent holding period return of another firm that has been matched based on size and industry² (i.e. a non-cover story equivalent firm). The latter two measures provide adjustments to the initial holding period return calculation to determine if a positive or negative abnormal return is present. For all return calculations we attempt to eliminate ‘duplicate’ observations.³ We define ‘duplicate’ as a feature story happening less than three months after another feature for a given firm and having the same categorization. We include the first instance and drop the subsequent observation(s) (see Table 3 for information on the number of duplicate firms within feature stories). Additionally, when a firm is delisted post-publication, the return calculation is carried out through the delisting date and included in all holding period return calculations.

INSERT TABLE 3 HERE

Viewing the firms with positive cover stories, positive holding period returns exist before and after the publication date that are generally statistically significant (based on a t-test and a sign-rank test). However, when the holding period return is adjusted for an index or size/industry, positive abnormal returns tend to dissipate after the publication date. This is not always the case, the AR measure displays some positive adjusted returns based on t-tests (a mean-based test), but not always based on the sign-rank test (a median-

² Size and industry match is as of day of publication on market value of equity and two-digit SIC classification.

³ Results in all tables remain qualitatively similar if these observations are not deleted.

based test). The AHPAR-ISM measure only displays a statistically significant positive adjusted return based upon agreement by both statistical tests for the six month post-publication horizon. In Table 4, where category 1 and category 2 story firms are separately examined (displayed later), much of the statistical significance vanishes except for the six month horizon AHPAR-ISM measure within category 2. Consequently, for firms that are the subject of positive cover stories, there is at best some weak evidence of a momentum indicator over the six month horizon for “optimistic” stories (i.e. category 2 stories).

When viewing firms with negative cover stories (categories 4 and 5), statistically negative adjusted holding period returns exist for the two years (and less than 2 year measures) prior to publication, except, when measured one month prior to publication. After publication, the holding period returns cease being negative and tend to not be significantly different from zero on an adjusted basis. When examining categories 4 and 5 separately (see Table 4), just about all statistical significance of an adjusted return being different from zero disappears. However, the one month prior to publication holding period return on category 5 firms does become significantly negative on an adjusted basis. Consequently, there are no signs of a momentum or contrarian indicator based on a negative cover story. However, if a trader was shorting one of these stocks, the trader should consider closing the short position after seeing a negative cover story on the company because the stock has hit its “bottom” level.

INSERT TABLE 4 HERE

To test the robustness of the above results, a calendar time portfolio analysis is performed. For each particular group (category and sub-period) an equally weighted portfolio of firms is formed with rebalancing every month for the entire sample period, January 1983 through December 2002. Therefore, over time some firms will drop out of the portfolio, as the firms are delisted. The results are consistent with Tables 4 and 5 and are available at the CFA Institute website.

SECTION 2: Conclusion

As one might expect, positive business magazine cover stories follow extremely positive performance and negative stories follow extremely negative performance. However in both cases the appearance on a cover of *Business Week*, *Fortune*, or *Forbes* tends to signal the end of extreme performance. Going forward, there is weak evidence that “optimistic” positive cover stories (category 2) are an indicator for momentum on a six month horizon after publication. However, negative cover stories do not provide a good signal for momentum or contrarian strategies on an index or size/industry adjusted basis despite a popular belief that such cover stories are a contrarian signal. Indeed, negative cover story firms tend to have positive holding period returns after the publication of the magazine, but the positive return is not abnormally positive when adjusted for an index or for size and industry. Consequently, if an investor is short the stock that is the subject of a negative cover story, it is time to cover the short position because the stock has hit its “bottom.”

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Table 1: Feature Story Frequency

| Periodical: | Positives | | | Neutral | Negatives | | |
|---|------------------|--------------|--------------|----------------|------------------|-------------|--------------|
| | 1's | 2's | Total | 3's | 4's | 5's | Total |
| <i>Business Week:</i> (290 features) | 62 (21%) | 97 (33%) | 159 (54%) | 57 (20%) | 38 (13%) | 36 (12%) | 74 (26%) |
| <i>Fortune:</i> (156 features) | 76 (49%) | 44 (28%) | 120 (77%) | 24 (15%) | 3 (2%) | 9 (6%) | 12 (8%) |
| <i>Forbes:</i> (103 features) | 47 (46%) | 24 (23%) | 71 (69%) | 18 (17%) | 7 (7%) | 7 (7%) | 14 (14%) |
| Total: (549 features) | 185 (34%) | 165 (30%) | 350 (64%) | 99 (18%) | 48 (9%) | 52 (9%) | 100 (18%) |

Note: Feature Categories: 1 (very positive), 2 (positive), 3 (neutral), 4 (negative), and 5 (very negative); 549 total feature stories on specific corporations between 1983 and 2002.

Table 2: Feature Story Firm Size

| Firm Characteristic: | Business Week: | Fortune: | Forbes: | Total: |
|---|---------------------------|-----------------|----------------|---------------|
| Market Capitalization Mean (mils): | 43,653.6 | 52,371.4 | 38,112.6 | 45,091.1 |
| Market Capitalization Median (mils): | 14,365.2 | 19,781.2 | 16,771.3 | 15,112.3 |
| Adjusted Market Capitalization Mean (mils) ^a : | 49,532.3 | 61,312.5 | 41,651.5 | 51,401.5 |
| Adjusted Market Capitalization Median (mils) ^a : | 19,884.4 | 23,402.2 | 16,711.1 | 19,332.0 |

^a Adjusted to 2002 dollars using Consumer Price Index (CPI).

Table 3: Holding Period Returns (measured in percentages) – Three Groups

| Period in trading days from publication | -500 to -1 | -250 to -1 | -125 to -1 | -21 to -1 | 1 to 5 | 1 to 21 | 1 to 125 | 1 to 250 | 1 to 500 |
|--|------------|------------|------------|-----------|---------|---------|----------|----------|----------|
| <i>Positives- Category 1 or 2 (n=338)</i> | | | | | | | | | |
| <i>(12 cover stories are redundant because the given firm exists in category 1 or 2 within the prior 3 months)</i> | | | | | | | | | |
| HPR | 111.07 | 43.68 | 19.19 | 2.34 | 1.25 | 1.16 | 9.01 | 18.23 | 37.63 |
| <i>t</i> -test | 7.47*** | 9.97*** | 8.10*** | 2.97*** | 3.35*** | 1.63 | 4.70*** | 5.85*** | 5.90*** |
| sign-rank test | 13.26*** | 11.05*** | 8.24*** | 2.35** | 3.33*** | 1.60 | 4.66*** | 5.60*** | 6.79*** |
| AR | 79.58 | 28.17 | 11.94 | 1.13 | 0.72 | -0.11 | 2.97 | 5.93 | 12.92 |
| <i>t</i> -test | 5.42*** | 6.75*** | 5.59*** | 1.59 | 2.27** | 0.18 | 1.69* | 2.07** | 2.13** |
| sign-rank test | 8.66*** | 7.00*** | 4.88*** | 0.49 | 1.77* | 0.47 | 0.85 | 0.47 | 0.24 |
| AHPAR-ISM | 24.97 | 11.11 | 5.00 | 0.87 | 0.39 | -0.36 | 5.13 | 3.85 | 11.48 |
| <i>t</i> -test | 1.45 | 2.14** | 1.81* | 0.97 | 0.82 | 0.42 | 2.51** | 1.18 | 1.65* |
| sign-rank test | 2.75*** | 2.49** | 2.16** | 0.34 | 1.26 | 1.04 | 1.78* | 1.02 | 1.05 |
| <i>Neutrals - Category 3 (n=98)</i> | | | | | | | | | |
| <i>(1 cover story is redundant because the given firm exists in category 3 within the prior 3 months)</i> | | | | | | | | | |
| HPR | 131.00 | 56.60 | 20.13 | 3.77 | 0.06 | 3.94 | 13.31 | 26.83 | 43.37 |
| <i>t</i> -test | 2.81*** | 3.40*** | 3.67*** | 2.38** | 0.10 | 1.69* | 3.68*** | 3.58*** | 4.99*** |
| sign-rank test | 6.73*** | 5.43*** | 3.81*** | 2.05** | 0.36 | 1.42 | 3.87*** | 3.64*** | 4.98*** |
| AR | 96.90 | 40.83 | 13.22 | 2.01 | -0.36 | 1.85 | 5.34 | 14.47 | 17.87 |
| <i>t</i> -test | 2.09** | 2.48** | 2.50** | 1.49 | 0.66 | 0.84 | 1.59 | 2.04** | 2.25** |
| sign-rank test | 2.06** | 2.29** | 1.66* | 1.29 | 1.11 | 0.33 | 1.55 | 1.01 | 1.03 |
| AHPAR-ISM | 2.11 | 14.11 | 9.52 | 2.23 | -0.33 | 1.24 | 4.66 | 8.88 | 12.61 |
| <i>t</i> -test | 0.03 | 0.83 | 1.87* | 1.46 | 0.64 | 0.59 | 1.04 | 1.57 | 1.42 |
| sign-rank test | 2.30** | 1.40 | 1.53 | 1.49 | 1.04 | 0.85 | 1.02 | 1.52 | 1.59 |
| <i>Negatives- Category 4 or 5 (n=96)</i> | | | | | | | | | |
| <i>(4 cover stories are redundant because the given firm exists in category 1 or 2 within the prior 3 months)</i> | | | | | | | | | |
| HPR | 6.11 | -2.12 | -0.72 | -0.31 | 1.53 | 0.87 | 2.98 | 13.18 | 31.75 |
| <i>t</i> -test | 1.08 | 0.55 | 0.23 | 0.21 | 1.98** | 0.69 | 1.23 | 3.18*** | 4.42*** |
| sign-rank test | 0.48 | 0.16 | 0.40 | 0.20 | 2.25** | 0.42 | 1.18 | 2.83*** | 4.27*** |
| AR | -23.15 | -15.96 | -8.67 | -2.04 | 1.11 | 0.30 | -0.50 | 3.58 | 8.23 |
| <i>t</i> -test | 4.79*** | 4.70*** | 2.73*** | 1.15 | 1.73* | 0.29 | 0.24 | 0.94 | 1.25 |
| sign-rank test | 4.80*** | 4.78*** | 2.86*** | 1.46 | 1.88* | 0.08 | 0.53 | 0.04 | 0.24 |
| AHPAR-ISM | -71.22 | -34.62 | -13.54 | -3.15 | 0.44 | -0.17 | 0.08 | 3.22 | 7.91 |
| <i>t</i> -test | 3.34*** | 4.36*** | 3.66*** | 1.68* | 0.57 | -0.11 | 0.27 | 0.75 | 1.07 |
| sign-rank test | 4.85*** | 4.86*** | 3.41*** | 1.49 | 0.17 | 0.17 | 0.64 | 0.20 | 0.37 |

*90% significance **95% significance ***99% significance

Notes: HPR is holding period return, AR is adjusted return – the HPR less value weighed CRSP index return, and AHPAR-ISM is average holding period abnormal return – industry and size matched. Returns shown are average returns for the sample. *t*-test statistics are for differences from zero. Sign-rank test statistics are for Wilcoxon signed rank tests for differences from zero.

Table 4: Holding Period Returns (measured in percentages) – Positives and Negatives

Panel A: Positives

| Period in trading days from publication | -500 to -1 | -250 to -1 | -125 to -1 | -21 to -1 | 1 to 5 | 1 to 21 | 1 to 125 | 1 to 250 | 1 to 500 |
|--|------------|------------|------------|-----------|--------|---------|----------|----------|----------|
| <i>Positives- Category 1 (n=182)</i> | | | | | | | | | |
| <i>(3 cover stories are redundant because the given firm exists in category 1 within the prior 3 months)</i> | | | | | | | | | |
| HPR | 119.41 | 56.92 | 19.73 | 1.54 | 1.15 | 1.45 | 8.13 | 17.37 | 29.81 |
| <i>t</i> -test | 5.70*** | 7.41*** | 5.77*** | 1.78* | 2.20** | 1.69* | 3.66** | 3.86*** | 5.16*** |
| sign-rank test | 10.50*** | 9.00*** | 6.53*** | 1.30 | 2.24** | 1.70* | 3.21*** | 3.58*** | 4.87*** |
| AR | 88.82 | 32.01 | 13.02 | 0.64 | 0.79 | -0.03 | 1.82 | 4.63 | 5.07 |
| <i>t</i> -test | 4.29*** | 5.31*** | 4.19*** | 0.78 | 1.56 | 0.06 | 0.87 | 1.09 | 0.93 |
| sign-rank test | 8.00*** | 6.575*** | 4.62*** | 0.04 | 1.20 | 0.05 | 0.04 | 0.38 | 0.77 |
| AHPAR-ISM | 42.71 | 17.63 | 8.25 | 1.03 | 0.37 | -0.43 | 2.87 | 2.75 | 4.18 |
| <i>t</i> -test | 1.87* | 2.40** | 2.05** | 0.93 | 0.50 | 0.51 | 1.26 | 0.62 | 0.59 |
| sign-rank test | 3.91*** | 3.36*** | 2.92*** | 0.51 | 0.38 | 0.91 | 0.19 | 0.06 | 0.34 |
| <i>Positives - Category 2 (n=162)</i> | | | | | | | | | |
| <i>(3 cover stories are redundant because the given firm exists in category 2 within the prior 3 months)</i> | | | | | | | | | |
| HPR | 105.61 | 39.92 | 18.65 | 3.23 | 1.22 | 0.51 | 9.57 | 19.59 | 45.76 |
| <i>t</i> -test | 5.02*** | 6.89*** | 5.84*** | 2.39** | 2.55** | 0.51 | 3.04*** | 4.59*** | 3.92*** |
| sign-rank test | 8.23*** | 6.71*** | 5.27*** | 2.08** | 1.97** | 0.21 | 3.24*** | 4.32*** | 4.79*** |
| AR | 73.37 | 23.78 | 10.93 | 1.68 | 0.51 | -0.21 | 4.11 | 7.92 | 21.43 |
| <i>t</i> -test | 3.54*** | 4.32*** | 3.81*** | 1.35 | 1.48 | 0.27 | 1.44 | 2.11** | 1.93* |
| sign-rank test | 4.28*** | 3.42*** | 2.45** | 0.69 | 0.94 | 0.73 | 1.07 | 1.08 | 0.38 |
| AHPAR-ISM | 4.12 | 1.72 | 0.03 | 0.22 | 0.37 | -0.16 | 7.46 | 5.15 | 18.54 |
| <i>t</i> -test | 0.16 | 0.25 | 0.01 | 0.23 | 0.75 | 0.10 | 2.16** | 1.11 | 1.53 |
| sign-rank test | 0.05 | 0.10 | 0.16 | 0.17 | 1.45 | 0.51 | 2.30** | 1.39 | 0.99 |

*90% significance **95% significance ***99% significance

Notes: HPR is holding period return, AR is adjusted return – the HPR less value weighed CRSP index return, and AHPAR-ISM is average holding period abnormal return – industry and size matched. Returns shown are average returns for the sample. *t*-test statistics are for differences from zero. Sign-rank test statistics are for Wilcoxon signed rank tests for differences from zero.

Table 4: Holding Period Returns (measured in percentages) – Positives and Negatives

Panel B: Negatives

| Period in trading days from publication | -500 to -1 | -250 to -1 | -125 to -1 | -21 to -1 | 1 to 5 | 1 to 21 | 1 to 125 | 1 to 250 | 1 to 500 |
|---|------------|------------|------------|-----------|--------|---------|----------|----------|----------|
| <i>Negatives- Category 4 (n=47)</i> (1 cover story is redundant because the given firm exists in category 1 within the prior 3 months) | | | | | | | | | |
| HPR | 7.11 | 1.61 | 4.44 | 4.27 | 0.78 | 0.285 | 0.12 | 6.89 | 23.66 |
| t-test | 0.88 | 0.36 | 1.06 | 1.75* | 1.01 | 0.19 | 0.02 | 1.50 | 3.29*** |
| sign-rank test | 0.11 | 0.27 | 0.23 | 1.37 | 0.92 | 0.27 | 0.11 | 1.39 | 2.76*** |
| AR | -21.13 | -11.40 | -3.17 | 2.14 | 0.81 | -0.20 | -2.58 | 0.20 | 4.01 |
| t-test | 2.90*** | 2.78*** | 0.78 | 0.92 | 1.23 | 0.15 | 0.39 | 0.05 | 0.60 |
| sign-rank test | 3.20*** | 2.83*** | 1.11 | 0.26 | 1.06 | 0.25 | 0.83 | 0.50 | 0.21 |
| AHPAR-ISM | -111.03 | -46.10 | -12.67 | 0.645 | -0.58 | -2.88 | -2.18 | 0.72 | 5.91 |
| t-test | 2.65*** | 3.14*** | 2.22** | 0.25 | 0.70 | 1.89* | 0.48 | 0.14 | 0.63 |
| sign-rank test | 3.54*** | 3.23*** | 1.84* | 0.20 | 1.01 | 1.40 | 0.15 | 0.02 | 0.50 |
| <i>Negatives- Category 5 (n=52)</i> | | | | | | | | | |
| HPR | 4.62 | -6.33 | -6.21 | -4.73 | 1.81 | 1.14 | 5.27 | 18.78 | 39.63 |
| t-test | 0.60 | 1.10 | 1.21 | 1.89* | 1.56 | 0.65 | 1.57 | 2.92*** | 3.39*** |
| sign-rank test | 0.41 | 0.72 | 1.05 | 1.09 | 1.93* | 0.12 | 1.51 | 2.65*** | 3.34*** |
| AR | -25.22 | -20.44 | -14.57 | -5.85 | 1.38 | 0.79 | 0.79 | 5.98 | 12.03 |
| t-test | 4.09*** | 4.03*** | 3.17*** | 2.44** | 1.17 | 0.44 | 0.22 | 1.00 | 1.12 |
| sign-rank test | 3.63*** | 4.01*** | 2.93*** | 2.53** | 1.37 | 0.13 | 0.32 | 0.24 | 0.24 |
| AHPAR-ISM | -34.63 | -23.72 | -15.41 | -6.78 | 1.25 | 2.22 | 2.98 | 5.37 | 12.42 |
| t-test | 3.77*** | 3.76*** | 3.31*** | 2.76*** | 1.12 | 1.25 | 0.79 | 0.81 | 1.11 |
| sign-rank test | 3.50*** | 3.71*** | 3.17*** | 2.53** | 0.95 | 1.51 | 0.99 | 0.17 | 0.40 |

*90% significance **95% significance ***99% significance

Notes: HPR is holding period return, AR is adjusted return – the HPR less value weighed CRSP index return, and AHPAR-ISM is average holding period abnormal return – industry and size matched. Returns shown are average returns for the sample. *t*-test statistics are for differences from zero. Sign-rank test statistics are for Wilcoxon signed rank tests for differences from zero.