

How does the Occurrence of Stock Price Reversals Following End-of-the-day Price Moves Differ in Bull and Bear Markets?

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Abstract

This paper uses intraday price data for 326 individual firms to examine how the occurrence of interday stock price reversals differs in bull and bear markets. We find that price reversals following the previous day's larger high-to-close (low-to-close) price differences are more likely to occur in a bull (bear) market. Based on these findings, we find that the portfolios based on larger high-to-close price differences in the bull market, and portfolios based on smaller low-to-close price differences both in bull and bear markets are profitable investment strategies. In particular, in bull markets, the portfolios based on smaller low-to-close price differences in the Mining and Service industries yield higher returns; in bear markets, portfolios based on smaller low-to-close price differences in Construction, Finance and Retail Trade yield higher returns.

Keywords: Intraday stock prices; Stock price reversals; Bull and bear markets

Introduction

De Bondt and Thaler [1] proposed that most stock investors overreact to unexpected and dramatic news, and therefore put forward the overreaction hypothesis. One set of articles examines stock price reversals. For instance, Nam, Pyun, and Avard [2], Cox and Peterson [3] and Atkins and Dyl [4] investigate short-term price reversals, ranging over time periods from a few days up to a month, and find that they occur following a 1-day extreme price movement. Zawadowski, Andor and Kertes [5] and Grant, Wolf and Yu [6] find significant intraday price reversals following a large intraday price change. Kudryavtsev [7] finds that the stock price reversals during subsequent trading days follow relatively large price moves towards the end of the trading days. Another set of articles examines how some other important factors explain the price reversals. Atkins and Dyl [4] and Park [8] find evidence that the bid-ask spread partially accounts for the price reversal patterns. Bremer and Sweeney [9] and Cox and Peterson [3] provide evidence indicating that the more the liquid the markets, the weaker the price reversals. Since market investors are more pessimistic during a bear market, they become more emotional about trading and avoid risking large losses. They also have less liquidity to hold onto their investments while awaiting a market reversal. Thus, stock prices in a bear market are likely to continue to decline as a result of the investors' panic selling of stocks. Conversely, the optimism and increased trading that occurs during a bull market serves to boost investor confidence. The increased market liquidity results in higher volumes of trading, further raising the prices of stocks. Since market conditions affect investor confidence in different ways, the adjustment process of market prices might be heterogeneous across stocks in bull and bear markets, while experiencing an external shock. We expect that the market conditions might affect the short-term price reversals following a large price move. For example, in a bear market, stock prices do not sufficiently reflect the bad news within a trading day since investors are over-pessimistic. That is, the effect of this bad news possibly continues on the next trading day, and the stock price continuously declines. Thus, the price reversal might not occur. However, the price reversal across stocks in bull and bear markets has been less studied in the previous literature. This paper thus aims to expand the overreaction literature by examining how the price reversals during the subsequent trading days following large price moves take place in different ways in bull and bear markets. We follow Kudryavtsev [7] to employ high-to-close and low-to-close price differences to measure the price moves at the end of the trading days. For each stock i in the sample and for each trading day t , we calculate

the daily close to close stock return, the stock's high-to-close price difference $R_{HCi,t-1}$, and the stock's low-to-close price difference $R_{LCi,t-1}$. We define $R_{HCi,t-1}$ and $R_{LCi,t-1}$ as absolute percentage price differences.

Data

Our stock return data are gathered from data on the 500 publicly-traded firms that constituted the S&P 500 index in 2009. We exclude firms with missing stock returns over the period January 2000 – June 2009, leaving us with 326 individual firms. Each firm has 2,363 days; we then have a total of 770,338 observations in our sample.

Measure of bull and bear markets

Our definition of bull and bear markets follows Nyberg [10]. The stock market was in a bull market form in October 1990 until another peak in August 2000, at which point the market was a bear market until a trough in February 2003, and the market state was that of a bull market till another peak in October 2007. Then the market state was that of a bear market until another trough in February 2009, after which the market state was that of a bull market until the end of the sample period (June 2009).

Research Hypotheses and Results

Hypothesis 1

Price reversals following the previous day's prevailing high-to-close (low-to-close) price differences are more likely to occur in a bull (bear) market. We follow Kudryavtsev [7] by employing the high-to-close (low-to-close) stock price differences as a proxy for the end-of-the-day stock price decreases (increases). For each of the sample stocks and for each of the trading days, we compare the respective price differences. Then we calculate the mean daily returns following the days with prevailing high-to-close and prevailing low-to-close price

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differences, respectively. Figure 1 shows the distribution of the mean returns across 326 firms for subsequent trading days. We find a glaring and large heterogeneity in the mean returns across the 326 stocks. The left (right) graph of Figure 1 shows that the ranges are from -0.35% to +0.33% (-0.42% to 0.26%), while prevailing high-to-close (prevailing low-to-close) price differences are clearly evident. The distribution with prevailing high-to-close (prevailing low-to-close) price differences is strongly skewed towards the right (left). Overall, these results provide evidence that the stock prices display a reverting behavior following the previous day's "end-of-the-day" price moves. Our results are consistent with Kudryavtsev's findings (2013). Figure 2 shows the distributions of the mean returns of the next trading days in bull and bear markets, respectively. The upper left (right) graph of Figure 2 shows that the distribution with prevailing high-to-close price differences is strongly skewed towards the right (left) in a bull (bear) market. Our results indicate that for 312 (135) out of 326 stocks, the mean daily returns in the subsequent trading days are positive in bull (bear) markets with prevailing high-to-close price differences. The bottom right graph of Figure 2 shows that the distribution with prevailing low-to-close price differences in bear markets is strongly skewed towards the left; the bottom left graph indicates that the distribution with prevailing low-to-close price differences in bull markets looks symmetric. For 197 (38) out of 326 stocks, the mean daily returns in the subsequent trading days are positive in bull (bear) markets with prevailing low-to-close price differences. Overall, our results support our hypotheses that the stock price reversals following the previous day's prevailing high-to-close price differences are more likely to occur only in bull markets; price reversals following prevailing low-to-close price differences are more likely to occur only in bear markets. These results have some important implications. First, the price reversal patterns are different in bull/bear markets, indicating that the reversal may result from the fundamental behavior of investors. That is, investor sentiment plays an important role in driving price reversals. Second, in bear markets, the stock prices are unlikely to sufficiently reflect the underlying news, and the effect of such news will continue to be felt on the next trading day. Thus, the price reversals will not occur.

Hypothesis 2

There is significant heterogeneity in the mean returns of portfolios based on stock price reversals in bull and bear markets. Based on the results for Hypothesis 1, we search for potentially profitable investment strategies in the bull and bear markets. We construct 20 different portfolios based on the idea of holding and adjusting daily a long (short) position in the stocks according to the reversal pattern, and where these portfolios are expected to yield high (low) daily returns. We follow Kudryavtsev [7] to obtain a proxy for the "relatively large" high-to-close and low-to-close price differences, for each of the stocks and for each of the trading days. We then compare these measures of price differences with each other and also with the respective mean measures for the total sample on the respective trading days.

We construct the following portfolios,

a. **Portfolios based on high-to-close price differences:** Portfolio HA: A portfolio implying an equally-weighted long position in the stocks whose previous day's high-to-close price differences were greater than the sample average, and an equally-weighted short position for the rest of the sample stocks.

b. **Portfolios based on low-to-close price differences:** Portfolio LA: A portfolio implying an equally-weighted long position in the stocks whose previous day's low-to-close price differences were smaller

than the sample average, and an equally-weighted short position in the rest of the sample stocks.

c. **Portfolios based on high-to-close price differences across industries:** Portfolio HA in IND_i: We form the equally-weighted portfolio of intra-industry firms. Portfolio HA in IND_i implies Portfolio HA across industries.

d. **Portfolios based on low-to-close price differences across industries:** Portfolio LA in IND_i: implying Portfolio LA across industries.

The first and second rows of Table 1 show the daily performances of portfolios HA and LA. These two portfolios yield significantly positive mean daily returns (0.017% vs. 0.118%). That is, stock returns are significantly higher following the days with relatively large high-to-close price differences, and are also higher following the days with relatively small low-to-close price differences. Rows three through eleven of Table 1 show that the stock returns of portfolio HA in the Mining, Manufacturing, Transportation and Service industries yield significantly positive returns following those days with relatively large high-to-close price differences. Rows twelve through twenty indicate that portfolio LA in each industry yields significantly positive returns except for Public Administration. Portfolios HA and LA for the stocks in the Mining industry yield the highest stock returns. Table 2 shows the portfolios' daily performances in the bull and bear markets, respectively. Row one shows that the mean stock returns

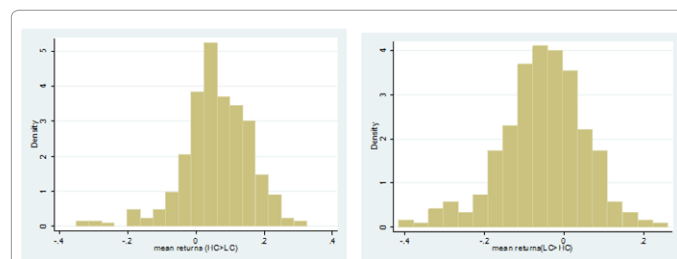


Figure 1: Distribution of mean returns in the next trading days across 326 stocks with prevailing high-to-close, ($R_{HCl,t-1} > R_{LCl,t-1}$) and prevailing low-to-close ($R_{LCl,t-1} > R_{HCl,t-1}$) price differences.

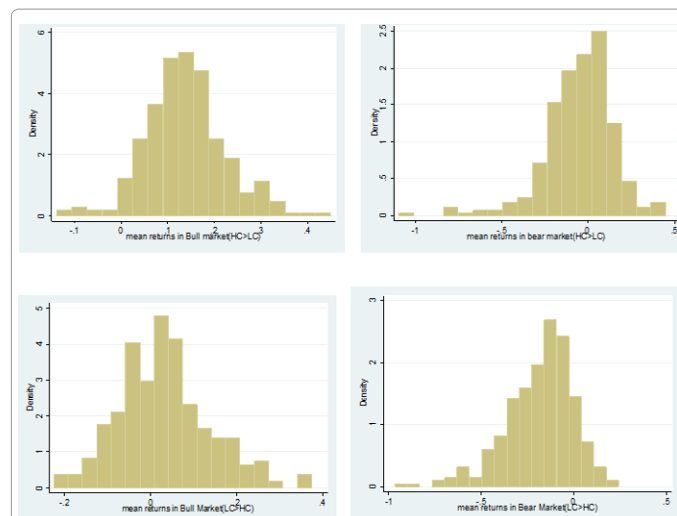


Figure 2: Distribution of mean returns in the next trading days across 326 stocks with prevailing high-to-close ($R_{HCl,t-1} > R_{LCl,t-1}$) and prevailing low-to-close ($R_{LCl,t-1} > R_{HCl,t-1}$) price differences in Bull and Bear markets.

Daily-adjusted Portfolios	Number of firms	Mean Returns (Standard Deviation)	P value (test mean=0)
Portfolio HA	326	0.017 (2.732)	0.000***
Portfolio LA	326	0.118(3.164)	0.000***
Portfolio HA in Mining	19	0.039(2.897)	0.016**
Portfolio HA in Construction	6	0.007(3.100)	0.833
Portfolio HA in Manufacturing	149	0.017(2.628)	0.001***
Portfolio HA in Transportation	38	0.021(2.323)	0.024**
Portfolio HA in Wholesale Trade	7	0.018(0.018)	0.319
Portfolio HA in Retail Trade	25	0.018(0.487)	0.127
Portfolio HA in Finance	46	0.001(3.198)	0.896
Portfolio HA in Service	32	0.023(3.078)	0.067*
Portfolio HA in Public administration	2	0.02(1.876)	0.957
Portfolio LA in Mining	19	0.202(3.134)	0.000***
Portfolio LA in Construction	6	0.134(2.716)	0.019**
Portfolio LA in Manufacturing	149	0.113(0.014)	0.000***
Portfolio LA in Transportation	38	0.064(2.685)	0.006***
Portfolio LA in Wholesale Trade	7	0.101(2.758)	0.072*
Portfolio LA in Retail Trade	25	0.083(3.377)	0.029**
Portfolio LA in Finance	46	0.152(3.022)	0.000***
Portfolio LA in Service	32	0.113(4.340)	0.015**
Portfolio LA in Public administration	2	0.118(2.232)	0.175

Note: ***denotes significance at 1% level; **denotes significance at 5% level; *denotes significance at 10% level. Parentheses contain Standard Deviations

Table 1: Historical Performance Measures of the Portfolios Based on Stock Price Reversals.

Daily-adjusted Portfolios	Mean Returns (Bull Market)	P value (test mean=0)	Mean Returns (Bear Market)	P value (test mean=0)
Portfolio HA	0.092(2.134)	0.000***	-0.168(3.829)	0.000***
Portfolio LA	0.108(2.926)	0.000***	0.131(3.458)	0.000***
Portfolio HA in Mining	0.149(2.254)	0.158	-0.255(4.129)	0.000***
Portfolio HA in Construction	0.062(2.279)	0.019**	-0.146(4.652)	0.103
Portfolio HA in Manufacturing	0.092(2.107)	0.000***	-0.168(3.597)	0.000***
Portfolio HA in Transportation	0.093(1.594)	0.000***	-0.167(3.571)	0.000***
Portfolio HA in Wholesale Trade	0.068(1.658)	0.000***	-0.107(2.522)	0.012**
Portfolio HA in Retail Trade	0.075(1.998)	0.000***	-0.126(3.422)	0.000***
Portfolio HA in Finance	0.094(2.291)	0.000***	-0.227(4.743)	0.000***
Portfolio HA in Service	0.080(2.607)	0.000***	-0.109(3.968)	0.000***
Portfolio HA in Public Administration	0.083(1.369)	0.003***	-0.190(2.711)	0.023**
Portfolio LA in Mining	0.248(3.101)	0.000***	0.145(3.174)	0.013**
Portfolio LA in Construction	0.076(2.545)	0.286	0.210(2.926)	0.025**
Portfolio LA in Manufacturing	0.089(2.868)	0.000***	0.024(3.328)	0.000***
Portfolio LA in Transportation	0.090(2.248)	0.001***	0.027(3.192)	0.519
Portfolio LA in Wholesale Trade	0.060(2.761)	0.426	0.156(2.754)	0.069*
Portfolio LA in Retail Trade	0.016(3.247)	0.736	0.172(3.542)	0.005***
Portfolio LA in Finance	0.129(2.756)	0.000***	0.184(3.352)	0.000***
Portfolio LA in Service	0.164(3.915)	0.003***	0.041(0.080)	0.606
Portfolio LA in Public Administration	0.108(2.002)	0.281	0.135(2.561)	0.401

Note: ***denotes significance at 1% level; **denotes significance at 5% level; *denotes significance at 10% level. Parentheses contain Standard Deviations

Table 2: Historical Performance Measures of the Portfolios Based on Stock Price Reversals in Bull and Bear Markets

based on portfolio HA are significantly positive in the bull market (0.092%); however, portfolio HA in the bear market yields significantly negative returns (-0.168%) for the stocks according to the price reversal behavior. This indicates that portfolio HA based on the price reversals is not an appropriate investment strategy in the bear market. Row two shows that portfolio LA both in the bull and bear markets yields significantly positive returns (0.108% vs. 0.131%). It implies that portfolio LA based on price reversals is a good investment strategy both in the bull and bear markets. Rows three through the last row of Table 2 provide us with the practical applicability of the price reversals on investment portfolios based on a long (short) position in the intra-industry stocks. We find that portfolio HA in most industries yields

similar mean stock returns in the bull market (the mean return in the Mining industry is higher, but is not significant). Portfolio HA in the bear market yields larger negative mean stock returns in Mining and Finance. We find a large heterogeneity in the mean returns of portfolio LA across 9 industries in the bull market. Portfolio LA in Mining yields the largest and most significant mean stock returns (0.248%). We clearly find in the bull market that the mean returns of portfolio LA in the Mining and Service industries are significantly larger than the returns of portfolio LA (0.108%). In the bear market, we also find a large degree of heterogeneity in the mean returns of portfolio LA across 9 industries. Portfolio LA in Construction yields the largest and most significant mean stock returns (0.210%). In the bear market, the returns

based on portfolio LA in Construction, Finance and Retail Trade are significantly higher than portfolio LA in other industries. That is, our findings suggest that bear market investors can invest based on smaller low-to-close price differences, and invest in portfolios in Construction, Finance and Retail Trade.

Conclusions

This paper sets out to examine whether the occurrence of stock price reversals during subsequent trading days differs following the previous day's large price moves in the bull and bear markets. We find the price reversals following the previous day's prevailing high-to-close (low-to-close) price differences are more likely to occur in the bull (bear) market. Based on these findings, we construct 20 different portfolios according to the reversal patterns in the bull and bear markets. If we do not take trading commission into consideration, portfolios based on higher high-to-close price differences in the bull market, and portfolios based on lower low-to-close price differences both in the bull and bear markets constitute profitable investment strategies.

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