EARLY TO RISE: WHEN OPENING STOCK RETURNS ARE HIGHER THAN DAILY RETURNS?

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Abstract:

In present study, I explore intraday behavior of stock prices. In particular, I try to shed light on the relationship between the widely-documented U-shaped intraday pattern of stock returns (e.g., Wood et al. (1985), Jain and Joh (1988), Pagano et al. (2008)) and the well-known concept of stock price overreaction resulting in potentially profitable investment strategies based on short-term price reversals (e.g., Zarowin (1989), Cox and Peterson (1994), Park (1995), Nam et al. (2001)). Employing the stocks making up the Dow Jones Industrial Index, I document that for the majority of stocks, open-to-close returns tend to be significantly lower, and in most cases negative, if on that respective day their opening returns are higher than the average or median opening return on the stocks in the sample. That is, relatively high opening stock returns may serve an indication for subsequent intraday price reversals and for even more pronounced intraday U-shaped return pattern. Based on these findings, I suggest two versions of a daily-adjusted reversal-based investment strategy yielding significantly higher returns and with significantly less risk, than the strategies involving passively holding the index or an equally-weighted portfolio of stocks.

Key words: *Intraday Stock Returns; Opening Returns; Open-to-Close Returns; Overreaction; Risk and Return; Stock Price Reversals*

1. Introduction

In the last few decades, an increasing number of papers have investigated stock market anomalies, reporting strong evidence that daily stock returns show empirical regularities that are difficult to explain using standard asset pricing theories. The main bottom line of these studies suggests that the use of historical data could be of some help for predicting future returns, with obvious implications for the efficiency of equity markets.

One of the most visible stylized facts in empirical finance is the autocorrelation of stock returns at fixed intervals (daily, weekly, monthly). This autocorrelation presents a challenge to the main models in continuous-time finance, which rely on some form of

the random walk hypothesis. Consequently, there is an extensive literature on stock return autocorrelation; it occupies 55 pages of Campbell, Lo, and MacKinlay (1997). Most researchers suggest explanations based on non-synchronous trading as the cause of the positive return autocorrelation observed across international stock markets (e.g., Fisher (1966), Scholes and Williams (1977), Atchinson et al. (1987), Ahn et al. (2002)). For example, Kadlec and Patterson (1999) argue that non-synchronous trading can explain 85%, 52%, and 36% of daily autocorrelations on portfolios of small, random, and large stocks, respectively. Accordingly, since daily returns are usually computed through a stock market index, the inclusion in the index of securities that are subjected to infrequent trading could cause positive stock return autocorrelation. However, since a significant level of first-order serial correlation has been found on common stock portfolios of large and actively traded firms (e.g., Perry (1985), Safvenblad (2000)), non-synchronous trading seems to be not the only cause of correlation in daily market indexes. In this context, several studies suggest that the gradual incorporation of market-wide information may cause serial correlation in short-term stock returns (e.g., Lo and MacKinlay (1990), Sias and Starks (1997), Chordia and Swaminathan (2000)). Other potential explanations for stock return autocorrelation include, but are not limited to, bid-ask bounce (e.g., Rhee and Wang (1997)); partial price adjustment, i.e. the observation that trade takes place at prices that do not fully reflect the information possessed by traders (e.g., Campbell, Lo, and MacKinlay (1997)); and the time-varying risk premium (e.g., Anderson (2006)).

Over the last years, as increasing computer power and new statistical methods have permitted the analysis of very large datasets using intraday data, the focus has shifted to intraday patterns in stock returns and trading volumes. Blandon (2007) shows that while close-to-close stock returns are highly autocorrelated, daily returns calculated on an open-to-close basis do not exhibit significant levels of autocorrelation. Amihud and Mendelson (1987) and Stoll and Whaley (1990) report that the interday stock returns computed using open-to-open prices have greater variance and show more evidence of reversals than comparable returns computed from close-to-close prices. They attribute this result to differences in trading mechanisms between the opening and closing transactions. Gerety and Mulherin (1994) estimate transitory volatility throughout the trading day based on hourly Dow Jones sixty-five Composite price index data, and find that the interday 24-hour volatilities decline steadily, reflecting information processing. A long-standing literature on intraday stock price patterns identifies the distinct U-shaped return and return volatility pattern over the trading day (e.g., Wood et al. (1985), Harris (1986), Jain and Joh (1988), Pagano et al. (2008)). In other words, these studies indicate that average stock returns and return volatilities tend to be higher at the beginning and end of the trading day.

In present study, I make an effort to shed light on the relationship between the U-shaped intraday return pattern, on the one hand, and the widely-documented concept of overreaction, on the other hand, and on the potential implications of this relationship for the performance of stock investment portfolios.

Since the pioneering papers by Shiller (1984) and De Bondt and Thaler (1985) a large volume of theoretical and empirical research work has analyzed price overreaction in financial markets reflecting market inefficiency. Typically, the literature closely links price overreaction to forecastability of stock prices and the prospect for investors to earn above-average returns. In order to distinguish stock price overreaction and market inefficiency from predictable changes in expected returns, Lehmann (1990) suggests examining returns over short time intervals. In fact, the focus on long-term dynamics in stock returns in the papers by Shiller (1984) and De Bondt and Thaler (1985) is more recently realigned to short-run return behavior, ranging over time periods from a few days up to a month, in the major part of the subsequent literature (e.g., Zarowin (1989), Atkins and Dyl (1990), Cox and Peterson (1994), Park (1995), Bowman and Iverson (1998), Nam et al. (2001)). The major focus of these studies is on identifying potentially profitable contrarian strategies built on a reverting behavior of stock prices in the short run. For example, Lehmann (1990) and Jegadeesh (1990) show that contrarian strategies that exploit the short-run return reversals in individual stocks generate abnormal returns of about 1.7% per week and 2.5% per month, respectively. Remarkably, Conrad et al. (1994) document that reversal profitability increases with trading activity.

In the context of the above-mentioned findings, I suggest that stock price overreaction to good news in the opening trading session may amplify the U-shaped intraday return pattern. In other words, if positive overreaction is exhibited for a certain stock at the beginning of a certain trading day, then the intraday returns on this stock and on this day may have an even more pronounced U-shaped pattern. That is, I expect that relatively high opening (i.e. previous-close-to-open) stock returns may serve an indication for subsequent intraday price reversals and, therefore, for relatively low open-to-close returns.

I analyze the opening and the open-to-close returns on thirty stocks currently making up the Dow Jones Industrial Index, and find support for my research hypothesis. Namely, I detect that for the majority of stocks, open-to-close returns tend to be significantly *lower*, and in most cases negative, if on that respective day: (i) their opening returns are *higher* than the average opening return on the stocks in the sample (the latter represents, in fact, the opening return on the equally-weighted portfolio of stocks); or (ii) their opening returns are *higher* than the median opening return on the stocks in the sample. Respectively, I compose two daily-adjusted portfolios of the sample stocks based on a simple strategy which is built upon the idea of intraday price reversals. The strategy involves holding a stock for the whole day if its opening return is lower than that day's average (for Portfolio A) or median (for Portfolio M) opening return on the stocks in the sample, and selling the stock at its opening price and buying it back at the end of the day, otherwise. I document that the expected returns on Portfolios A and M are significantly higher than those on the simple, non-adjusted, equally-weighted portfolio of the sample stocks and on the Dow Jones Industrial Index itself. Moreover, the standard deviations of the daily-adjusted portfolios'

returns appear to be significantly lower than those of the non-adjusted ones, making the former strongly superior to the latter.

The rest of the paper is structured as follows: In Section 2, I describe the data sample. Section 3 comprises the research hypotheses and the results. Section 4 concludes.

2. Data description

For the purposes of present research, I employ daily opening and closing prices of thirty stocks currently making up the Dow Jones Industrial Index over the period comprised from January 2, 2002 to September 30, 2011 (overall, 2456 trading days).[1] I adjust both opening and closing prices to dividend payments and stock splits, and for each stock in the sample and for each trading day in the sampling period, calculate:

1. Stock's opening return (i.e., stock price's change from last day's closing price to today's opening price) as:

$$R_{O,it} = \frac{P_{O,it}}{P_{C,it-1}} - 1 \qquad (1)$$

where: $R_{O,it}$ is stock *i*'s opening return on day *t*; $P_{O,it}$ is stock *i*'s opening price on day *t*; and $P_{C,it-1}$ is stock *i*'s closing price on day *t-1*.

2. Stock's open-to-close return (i.e., stock price's change from today's opening price to today's closing price), as:

$$R_{O-C,it} = \frac{P_{C,it}}{P_{O,it}} - 1 \qquad (2)$$

where: $R_{O-C,it}$ is stock *i*'s open-to-close return on day *t*.

and:

3. Stock's daily return (i.e., stock price's change from last day's closing price to today's closing price), as:

$$R_{D,it} = \frac{P_{C,it}}{P_{C,it-1}} - 1 \qquad (3)$$

where: $R_{D,it}$ is stock *i*'s daily return on day *t*.

Of course, the following relation between the three types of returns must hold for each stock and for each trading day:

$$R_{D,it} = (1 + R_{O,it}) * (1 + R_{O-C,it}) - 1 \qquad (4)$$

[1] The data were taken from the Yahoo Finance website.

Table 1 comprises the basic descriptive statistics of the three types of returns for the thirty sample stocks. At this stage, we may note that, as it might be expected for the largest industrial companies of the US, 27 out of 30 stocks have positive mean daily returns, the remaining 3 showing negative, yet close to zero daily returns. Overall, the mean daily returns range from -0.005 to 0.076 percentage points, with standard deviations ranging from 1.183 to 3.568 percentage points. One should also observe that for 18 out of 30 stocks, the mean opening returns are higher than the mean open-to-close returns, 13 of the latter being negative, which seems in line with the U-shaped pattern of intraday returns, or at least, with the left-hand side of the "U". On the other hand, for all 30 stocks, the standard deviations of opening returns are lower than those of open-to-close returns and of daily returns.

3. Research hypotheses and Results

3.1. Intraday stock price reversals

The main empirical issue of present study is the analysis of the correlation between the opening and the open-to-close stock returns, and also of the mutual cross-correlations of these returns within a sample of stocks. The main idea of this research arises from the findings of a vast body of economic literature showing that, on the one hand, intraday stock returns tend to follow a U-shaped pattern, and on the other hand, stock pricing, in general, is often affected by investors' overreaction resulting in potentially profitable investment strategies based on the idea of price reversals. I suggest that there exists a relationship between the empirical finding of the U-shaped intraday return pattern, and the concept of overreaction and subsequent reversals. Namely, I expect that if overreaction to good news is exhibited for a certain stock at the beginning of a certain trading day, then the intraday returns on this stock and on this day may have even more pronounced U-shaped pattern[1], or in other words, that relatively high opening stock returns may serve an indication for subsequent intraday price reversals and, therefore, for relatively low open-to-close returns. In order to obtain a proxy for the "relatively high returns", I compare each stock's opening returns to the respective day's average and median opening returns within the total sample.

So, I hypothesize that:

Hypothesis 1a: Open-to-close day-*t* return on a stock should be lower if the stock's day-*t* opening return is higher than the average day-*t* opening return on the stocks in the sample.

and alternatively,

[1] Price overreaction to bad news may result in a less pronounced, or even reversed, U-shaped pattern.

Hypothesis 1b: Open-to-close day-*t* return on a stock should be lower if the stock's day-*t* opening return is higher than the median day-*t* opening return on the stocks in the sample.

Tables 2a and 2b present, for each stock *i* in the sample, the mean open-to-close returns ($AR_{O-C,i}$), separately for the days when the stock's opening return was higher and lower than the daily average ($AR_{O,t}$) or median ($MR_{O,t}$) opening return on the sample stocks, respectively. The Tables also report the respective mean open-to-close return differences and their statistical significance.

The results clearly support both versions of the Hypothesis. With both benchmarks, for 27 out of 30 stocks, mean open-to-close returns are *lower* following "high" opening returns, that is, on the days when the stocks' opening returns are *higher* than the average (median) opening returns on the stocks making up the sample. Out of 27 negative mean open-to-close return differences, 22 (19)[1] are statistically significant, including 20 (17) at the 5% level, and 16 (14) at the 1% level. None of the positive differences is significant. A possible interpretation of these findings is that positive overreactions in the opening trading session may lead to even more strongly pronounced U-shaped pattern in intraday stock returns.

An additional result arising from the Tables is that for 27 (26) out of 30 stocks, mean open-to-close returns are negative on the days when their opening returns are higher than the average (median) opening returns within the sample. This finding serves a foundation stone for a simple trading strategy I suggest in the next Subsection.

3.2. Intraday reversal-based trading strategy

As mentioned in the previous Subsection, stocks' open-to-close returns tend to be negative on the days of "high" opening returns. Thus, a reasonable question arising is: "Why on such days should one hold the stocks during the continuous trading sessions?" Maybe, at least if stock trading commissions are not a problem, one who holds these stocks should better sell them at their opening prices and buy them back at the end of the trading day…

This is the idea behind the simple trading strategy I formulate: to keep holding a stock if its opening return is relatively "low", and to sell the stock at the opening price and to buy it back at the closing price if its opening return is relatively "high". This strategy is built upon the expectation of intraday price reversals, that is, of high (low) open-to-close returns following low (high) opening returns.

In order to test the profitability of this strategy, I analyze its two possible versions and construct two equally-weighted portfolios comprising all the thirty sample stocks:

[1] Respectively for the two comparison conditions: average and (median).

Portfolio A: Actual stock *i*'s daily return on day *t* is equal to its daily return ($R_{D,it}$) if its day-*t* opening return ($R_{O,it}$) is lower or equal to the *average* day-*t* opening return on all the stocks in the portfolio ($AR_{O,t}$), and to its opening return ($R_{O,it}$), otherwise (i.e. if $R_{O,it} > AR_{O,t}$ holds).

Portfolio M: Actual stock *i*'s daily return on day *t* is equal to its daily return ($R_{D,it}$) if its day-*t* opening return ($R_{O,it}$) is lower or equal to the *median* day-*t* opening return on all the stocks in the portfolio ($MR_{O,t}$), and to its opening return ($R_{O,it}$), otherwise (i.e. if $R_{O,it} > MR_{O,t}$ holds).

I compare the performance of Portfolios A and M over the sampling period to that of:

1. The equally-weighted portfolio based on holding all the thirty sample stocks during all the sampling period (EWP). For each trading day, the daily return on this portfolio is simply the average daily return on the stocks making up the sample, that is $AR_{D,t}$.
2. The Dow Jones Industrial Index (DJI).

Tables 3a and 3b report the means and the standard deviations of Portfolios' A and M daily returns, respectively, over the sampling period, as well as the equality test statistics of these means and standard deviations with respect to those of the EWP and the DJI. The results indicate clear superiority of Portfolios A and M over EWP and DJI from the point of view of both return and risk. The mean daily returns on Portfolios A and M are 0.065% and 0.060%, respectively, with standard deviations of 0.963% and 0.942%, respectively, compared to mean daily returns of 0.030% and 0.012% for EWP and DJI, respectively, with standard deviations of 1.378% and 1.293%, respectively. All the mean and standard deviation differences between Portfolios A and M, on the one hand, and EWP and DJI, on the other hand, are highly statistically significant. The economic significance of the results might look not quite impressive, at the first glance, but since we are talking about daily, and also daily-compounded, returns, this first impression may be misleading. In fact, $1 invested in Portfolio A (Portfolio M) on January 2, 2002 would grow to $4.37 ($3.91) until September 30, 2011, compared to $1.62 ($1.07) only, for EWP (DJI). And at the same time, both versions of the reversal-based strategy are significantly less risky.

Overall, this Subsection demonstrates clear superiority, at least in the perfect stock market with no commissions, of the reversal-based daily-adjusted strategy over the passive strategies involving investing in the stock index or constructing the equally-weighted portfolio of stocks, with no adjustments being made.

4. Conclusion

This paper explores intraday behavior of stock prices. In particular, I try to shed light on the relationship between the widely-documented U-shaped intraday pattern of stock returns and the well-known concept of stock price overreaction resulting in potentially profitable investment strategies based on short-term price reversals. I expect that if positive overreaction is exhibited for a certain stock at the beginning of a certain trading day, then the intraday returns on this stock and on this day may have an even more pronounced U-shaped pattern, or in other words, that relatively high opening stock returns may serve an indication for subsequent intraday price reversals and, therefore, for relatively low open-to-close returns.

I employ daily opening and closing prices of thirty stocks currently making up the Dow Jones Industrial Index. Fore each stock, I calculate the opening and the open-to-close returns, and find support for my research hypothesis. Namely, I detect that for the majority of stocks, open-to-close returns tend to be significantly *lower*, and in most cases negative, if on that respective day: (i) their opening returns are *higher* than the average opening return on the stocks in the sample; or (ii) their opening returns are *higher* than the median opening return on the stocks in the sample. Respectively, I compose two daily-adjusted portfolios of the sample stocks based on a simple strategy which is built upon the idea of intraday price reversals. The strategy involves holding a stock for the whole day if its opening return is lower than that day's average (for Portfolio A) or median (for Portfolio M) opening return on the stocks in the sample, and selling the stock at its opening price and buying it back at the end of the day, otherwise. I document that the expected returns on Portfolios A and M are significantly higher than those on the simple, non-adjusted, equally-weighted portfolio of the sample stocks and on the Dow Jones Industrial Index, itself. Moreover, the standard deviations of the daily-adjusted portfolios' returns appear to be significantly lower than those of the non-adjusted ones.

Thus, at least in the perfect stock market with no commissions, the reversal-based daily-adjusted strategy looks superior to the passive strategies involving investing in the stock index or constructing the equally-weighted portfolio of stocks, both in the return and the risk dimensions. This may prove a valuable result for both financial theoreticians in their eternal discussion about stock market efficiency, and practitioners in search of potentially profitable investment strategies. Potential directions for further research may include expending the analysis to other stock exchanges and greater samples, though in the latter case some care has to be taken when defining the benchmarks for "high" opening returns, and also applying similar kind of analysis to the end-of-the-day, including closing stock prices.

5.References

Ahn, D.H., J. Boudoukh, M.P. Richardson, and R.F. Whitelaw, 2002, Partial Adjustment or Stale Prices? Implications from Stock Index and Futures Return Autocorrelations, *Review of Financial Studies*, 15, 655-689.

Amihud, Y., and H. Mendelson, 1987, Trading Mechanisms and Stock Returns: An Empirical Investigation, *Journal of Finance*, 42, 533 – 553.

Anderson, R.M., 2006, Time-Varying Risk Premia and Stock Return Autocorrelation, Working Paper, University of California at Berkeley.

Atchison, M.D., K.C. Butler, and R.R. Simonds, 1987, Nonsynchronous Security Trading and Market Index Autocorrelation, *Journal of Finance*, 42, 533-553.

Atkins, A.B., and E.A. Dyl, 1990, Price Reversals, Bid-Ask Spreads, and Market Efficiency, *Journal of Financial and Quantitative Analysis*, 25, 535–547.

Blandon, J.G., 2007, Return Autocorrelation Anomalies in Two European Stock Markets, *Journal of Economic Analysis*, 22, 59-70.

Bowman, R.G., and D. Iverson, 1998, Short-Run Overreaction in the New Zealand Stock Market, *Pacific-Basin Finance Journal*, 6, 475–491.

Campbell, J.Y., A.W. Lo, and A.C. MacKinlay, 1997, The Econometrics of Financial Markets. Princeton University Press, Princeton, NJ.

Chordia, T., and B. Swaminathan, 2000, Trading Volume and Cross-Autocorrelations in Stock Returns, *Journal of Finance*, 55, 913 – 935.

Conrad, J.S., A. Hameed, and C. Niden, 1994, Volume and Autocovariances in Short-Horizon Individual Security Returns, *Journal of Finance*, 49, 1305–1329.

Cox, D.R., and D.R. Peterson, 1994, Stock Returns Following Large One-Day Declines: Evidence on Short-Term Reversals and Longer-Term Performance, *Journal of Finance*, 49, 255–267.

De Bondt, W F.M., and R. Thaler, 1985, Does the Stock Market Overreact? *Journal of Finance*, 40(3), 793–805.

Fisher, L., 1966, Some New Stock Market Indexes, *Journal of Business*, 39, 191-225.

Gerety, M.S., and J.H. Mulherin, 1994, Price Formation on Stock Exchanges: The Evolution of Trading within the Day, *Review of Financial Studies*, 7, 609-629.

Harris, L., 1986, A Transaction Data Study of Weekly and Intraday Patterns in Stock Returns, *Journal of Financial Economy* 16, 99-117.

Jain, P.C., and G.H. Joh, 1988, The Dependence between Hourly Prices and Trading Volume, *Journal of Financial and Quantitative Analysis*, 23, 269-283.

Jegadeesh, N., 1990, Evidence of Predictable Behavior of Security Returns, *Journal of Finance*, 45, 881–898.

Kadlec, G.B., and D.M. Patterson, 1999, A Transactions Data Analysis of Nonsynchronous Trading, *Review of Financial Studies*, 12, 609-630.

Lehmann, B.N., 1990, Fads, Martingales, and Market Efficiency, *Quarterly Journal of Economics*, 105, 1–28.

Lo, A.W., and A.C. MacKinlay, 1990, An Econometric Analysis of Nonsynchronous Trading, *Journal of Econometrics*, 45, 181-212.

Nam, K., C.S. Pyun, and S.L. Avard, 2001, Asymmetric Reverting Behavior of Short-Horizon Stock Returns: An Evidence of Stock Market Overreaction, *Journal of Banking and Finance*, 25, 807–824.

Pagano, M.S., L. Peng, and R.A. Schwartz, 2008, The Quality of Price Formation at Market Openings and Closings: Evidence from the Nasdaq Stock Market, Working paper, Villanova University.

Park, J., 1995, A Market Microstructure Explanation for Predictable Variations in Stock Returns following Large Price Changes, *Journal of Financial and Quantitative Analysis*, 30, 241–256.

Perry, P., 1985, Portfolio Serial Correlation and Non-Synchronous Trading, *Journal of Financial and Quantitative Analysis*, 20, 517-523.

Rhee, S.G., and C.J. Wang, 1997, The Bid-Ask Bounce Effect and the Spread Size Effect: Evidence from the Taiwan Stock Market, *Pacific-Basin Finance Journal*, 5, 231-258.

Säfvenblad, P., 2000, Trading Volume and Autocorrelation: Empirical Evidence from the Stockholm Stock Exchange, *Journal of Banking and Finance*, 24, 1275-1287.

Sias, R.W., and L.T. Starks, 1997, Return Autocorrelation and Institutional Investors, *Journal of Financial Economics*, 46, 103 –131.

Scholes, M.S., and J. Williams, 1977, Estimating Betas from Nonsynchronous Data, *Journal of Financial Economics*, 5, 309-328.

Shiller, R.J., 1984, Stock Prices and Social Dynamics, Brookings Papers on Economic Activity, XII(2), 457–498.

Stoll, H.R., and R.E. Whaley, 1990, Stock Market Structure and Volatility, *Review of Financial Studies*, 3, 37-71.

Wood, R.A., T.H. McInish, and J.K. Ord, 1985, An Investigation of Transactions Data for NYSE Stocks, *Journal of Finance,* 40, 723–739.

Zarowin, P., 1989, Short-Run Market Overreaction: Size and Seasonality Effects, *Journal of Portfolio Management*, 15, 26–29.

Appendix: Tables

Table 1: Descriptive statistics of sample stocks' opening, open-to-close, and daily returns

The table presents for each of the 30 sample stocks and over the sampling period, the mean and the standard deviation of the opening, open-to-close, and daily stock returns calculated as follows:

$$R_{O,it} = \frac{P_{O,it}}{P_{C,it-1}} - 1; \qquad R_{O-C,it} = \frac{P_{C,it}}{P_{O,it}} - 1; \qquad R_{D,it} = \frac{P_{C,it}}{P_{C,it-1}} - 1$$

where: $R_{O,it}$ is stock *i*'s opening return on day *t*; $P_{C,it}$ is stock *i*'s closing price on day *t*; $R_{O-C,it}$ is stock *i*'s open-to-close return on day *t*; and $R_{D,it}$ is stock *i*'s daily return on day *t*.

Company (Ticker symbol)	Opening return, %		Open-to-close return, %		Daily return, %	
	Mean	St. Deviation	Mean	St. Deviation	Mean	St. Deviation
Alcoa Inc. (AA)	0.158	1.551	-0.164	2.303	-0.004	2.884
American Express (AXP)	-0.008	1.212	0.060	2.240	0.054	2.621
Boeing (BA)	0.033	1.004	0.013	1.667	0.047	1.979
Bank of America (BAC)	0.104	2.045	-0.095	2.884	0.010	3.568
Caterpillar (CAT)	0.086	1.198	-0.009	1.838	0.076	2.189
Cisco Systems (CSCO)	0.026	1.410	-0.007	1.883	0.019	2.365
Chevron Corporation (CVX)	0.032	0.808	0.025	1.489	0.058	1.762
E.I. Du Pont de Nemours (DD)	0.039	0.879	-0.010	1.636	0.029	1.867
Walt Disney (DIS)	-0.048	1.094	0.086	1.688	0.038	2.020
General Electric (GE)	0.086	1.275	-0.089	1.821	-0.005	2.120
Home Depot Inc. (HD)	0.001	1.047	0.011	1.781	0.011	2.020
Hewlett-Packard (HPQ)	-0.116	1.386	0.148	1.819	0.031	2.225
IBM (IBM)	-0.061	0.956	0.094	1.316	0.033	1.597
Intel Corporation (INTC)	0.038	1.377	-0.020	1.929	0.017	2.338
Johnson & Johnson (JNJ)	0.005	0.715	0.016	1.046	0.021	1.225

JP Morgan Chase & Co (JPM)	0.043	1.436	0.003	2.514	0.047	2.936
Kraft Foods Inc. (KFT)	-0.013	0.829	0.035	1.248	0.020	1.393
Coca-Cola (KO)	-0.009	0.663	0.043	1.149	0.033	1.304
McDonald's Corporation (MCD)	0.007	0.860	0.065	1.378	0.071	1.566
3M Company (MMM)	0.017	0.756	0.012	1.294	0.029	1.512
Merck & Company Inc. (MRK)	-0.022	1.110	0.034	1.561	0.012	1.919
Microsoft Corporation (MSFT)	0.017	1.020	-0.002	1.554	0.015	1.889
Pfizer Inc. (PFE)	0.054	1.047	-0.056	1.436	-0.004	1.693
Procter & Gamble (PG)	-0.043	0.625	0.078	1.055	0.035	1.183
AT&T Inc. (T)	0.053	0.933	-0.030	1.555	0.022	1.753
The Travelers Companies (TRV)	0.042	0.996	-0.004	1.896	0.037	2.088
United Technologies Corp. (UTX)	0.042	0.824	0.011	1.466	0.054	1.708
Verizon Communications (VZ)	0.035	0.839	-0.011	1.496	0.023	1.681
Wal-Mart Stores Inc. (WMT)	0.018	0.735	-0.006	1.235	0.011	1.391
Exxon Mobil Corporation (XOM)	-0.005	0.801	0.052	1.451	0.048	1.710

Table 2a: Open-to-close stock returns on the days of "high" and "low" opening stock returns (relatively to the *average* daily opening returns within the sample)

The table presents for each stock *i* and over the sampling period, the mean open-to-close returns ($AR_{O-C,i}$), separately for the days when the stock's opening return ($R_{O,it}$) was higher and lower than the daily *average* opening returns within the total sample of stocks ($AR_{O,t}$), and the number of days in each category.

The rightmost column of the table reports the differences between the respective mean open-to-close returns, and their statistical significance.

Company (Ticker symbol)	Mean open-to-close return ($AR_{O-C,i}$), %, for the days when:		
	$R_{O,it} > AR_{O,t}$ (No.	$R_{O,it} \leq AR_{O,t}$	Difference (t-

	of days)	(No. of days)	statistic)
Alcoa Inc. (AA)	-0.147 (1049)	-0.186 (1406)	0.039 (0.41)
American Express (AXP)	0.079 (1168)	0.044 (1287)	0.035 (0.39)
Boeing (BA)	-0.049 (1253)	0.078 (1202)	*-0.127 (-1.90)
Bank of America (BAC)	-0.170 (1291)	-0.011 (1164)	-0.159 (-1.36)
Caterpillar (CAT)	-0.076 (1378)	0.076 (1077)	**-0.152 (-2.04)
Cisco Systems (CSCO)	-0.047 (1179)	0.030 (1276)	-0.077 (-1.01)
Chevron Corporation (CVX)	0.010 (1301)	0.043 (1154)	-0.033 (-0.55)
E.I. Du Pont de Nemours (DD)	-0.166 (1294)	0.165 (1161)	***-0.331 (-5.03)
Walt Disney (DIS)	-0.028 (1075)	0.174 (1380)	***-0.202 (-2.94)
General Electric (GE)	-0.201 (1285)	0.034 (1170)	***-0.235 (-3.20)
Home Depot Inc. (HD)	-0.077 (1094)	0.082 (1361)	**-0.159 (-2.20)
Hewlett-Packard (HPQ)	-0.005 (952)	0.245 (1503)	***-0.249 (-3.33)
IBM (IBM)	-0.018 (961)	0.166 (1494)	***-0.184 (-3.39)
Intel Corporation (INTC)	-0.051 (1284)	0.014 (1171)	-0.065 (-0.85)
Johnson & Johnson (JNJ)	-0.055 (1184)	0.082 (1271)	***-0.137 (-3.23)
JP Morgan Chase & Co (JPM)	0.019 (1193)	-0.012 (1262)	0.031 (0.30)
Kraft Foods Inc. (KFT)	-0.075 (1113)	0.126 (1342)	***-0.201 (-3.98)
Coca-Cola (KO)	-0.060 (1138)	0.132 (1317)	***-0.192 (-4.14)
McDonald's Corporation (MCD)	-0.040 (1187)	0.164 (1268)	***-0.204 (-3.69)
3M Company (MMM)	-0.108 (1202)	0.127 (1253)	***-0.235 (-4.51)
Merck & Company Inc. (MRK)	-0.084 (1187)	0.145 (1268)	***-0.229 (-3.64)
Microsoft Corporation (MSFT)	-0.006 (1155)	0.007 (1300)	-0.013 (-0.10)
Pfizer Inc. (PFE)	-0.151 (1275)	0.046 (1180)	***-0.197 (-3.39)
Procter & Gamble (PG)	-0.013 (1058)	0.148 (1397)	***-0.161 (-3.74)
AT&T Inc. (T)	-0.172 (1320)	0.135 (1135)	***-0.307 (-4.90)
The Travelers Companies (TRV)	-0.089 (1217)	0.079 (1238)	**-0.168 (-2.20)
United Technologies Corp. (UTX)	-0.109 (1259)	0.138 (1196)	***-0.247 (-4.18)

Verizon Communications (VZ)	-0.116 (1292)	0.105 (1163)	***-0.221 (-3.66)
Wal-Mart Stores Inc. (WMT)	-0.051 (1192)	0.036 (1263)	*-0.087 (-1.76)
Exxon Mobil Corporation (XOM)	-0.019 (1197)	0.120 (1258)	**-0.139 (-2.38)

Asterisks denote two-tailed p-values: *p<0.10; **p<0.05; ***p<0.01.

Table 2b: Open-to-close stock returns on the days of "high" and "low" opening stock returns (relatively to the *median* daily opening returns within the sample)

The table presents for each stock *i* and over the sampling period, the mean open-to-close returns ($AR_{O-C,i}$), separately for the days when the stock's opening return ($R_{O,it}$) was higher and lower than the daily *median* opening returns within the total sample of stocks ($MR_{O,t}$), and the number of days in each category.

The rightmost column of the table reports the differences between the respective mean open-to-close returns, and their statistical significance.

Company (Ticker symbol)	Mean open-to-close return ($AR_{O-C,i}$), %, for the days when:		
	$R_{O,it} > MR_{O,t}$ (No. of days)	$R_{O,it} \leq MR_{O,t}$ (No. of days)	Difference (t-statistic)
Alcoa Inc. (AA)	-0.140 (1418)	-0.196 (1037)	0.056 (0.59)
American Express (AXP)	0.109 (1186)	0.015 (1269)	0.094 (1.03)
Boeing (BA)	-0.013 (1293)	0.042 (1162)	-0.055 (-0.81)
Bank of America (BAC)	-0.173 (1301)	-0.007 (1154)	-0.166 (-1.42)
Caterpillar (CAT)	-0.076 (1390)	0.078 (1065)	**-0.154 (-2.05)
Cisco Systems (CSCO)	-0.051 (1182)	0.034 (1273)	-0.085 (-1.11)
Chevron Corporation (CVX)	0.010 (1329)	0.043 (1126)	-0.033 (-0.55)
E.I. Du Pont de Nemours (DD)	-0.081 (1333)	0.075 (1122)	**--0.156 (-2.34)
Walt Disney (DIS)	0.040 (1110)	0.124 (1345)	-0.084 (-1.24)
General Electric (GE)	-0.161 (1301)	-0.007 (1154)	**-0.154 (-2.10)
Home Depot Inc. (HD)	-0.065 (1105)	0.073 (1350)	*-0.138 (-1.91)
Hewlett-Packard (HPQ)	0.003 (994)	0.227 (1461)	***-0.224 (-2.59)
IBM (IBM)	-0.010 (977)	0.163 (1478)	***-0.173 (-3.20)
Intel Corporation (INTC)	-0.070 (1319)	0.038 (1136)	-0.108 (-1.38)

Johnson & Johnson (JNJ)	-0.067 (1198)	0.095 (1257)	***-0.162 (-3.85)
JP Morgan Chase & Co (JPM)	0.033 (1224)	-0.026 (1231)	0.059 (0.58)
Kraft Foods Inc. (KFT)	-0.088 (1167)	0.145 (1288)	***-0.233 (-4.63)
Coca-Cola (KO)	-0.047 (1170)	0.125 (1285)	***-0.172 (-3.71)
McDonald's Corporation (MCD)	-0.057 (1216)	0.185 (1239)	***-0.242 (-4.36)
3M Company (MMM)	-0.105 (1238)	0.131 (1217)	***-0.236 (-4.55)
Merck & Company Inc. (MRK)	-0.075 (1205)	0.140 (1250)	***-0.215 (-3.42)
Microsoft Corporation (MSFT)	-0.020 (1181)	0.014 (1274)	-0.034 (-0.54)
Pfizer Inc. (PFE)	-0.164 (1303)	0.065 (1152)	***-0.229 (-3.96)
Procter & Gamble (PG)	-0.024 (1053)	0.156 (1402)	***-0.180 (-4.20)
AT&T Inc. (T)	-0.159 (1364)	0.131 (1091)	***-0.290 (-4.61)
The Travelers Companies (TRV)	-0.115 (1236)	0.108 (1219)	***-0.223 (-2.92)
United Technologies Corp. (UTX)	-0.086 (1291)	0.117 (1174)	***-0.203 (-3.43)
Verizon Communications (VZ)	-0.095 (1315)	0.085 (1140)	***-0.180 (-2.98)
Wal-Mart Stores Inc. (WMT)	-0.033 (1206)	0.019 (1249)	-0.052 (-1.04)
Exxon Mobil Corporation (XOM)	0.005 (1230)	0.100 (1225)	*-0.095 (1.65)

Asterisks denote two-tailed p-values: *p<0.10; **p<0.05; ***p<0.01.

Table 3a: Historical performance of Portfolio A, and its comparison to that of the EWP and the DJI.

The table presents the historical mean and standard deviation of Portfolio A's daily returns and compares them to those of the EWP and the DJI.

Portfolio A is the equally-weighted portfolio of all the 30 sample stocks, where for each stock *i*, day-*t* is equal to its daily return ($R_{D,it}$) if its day-*t* opening return ($R_{O,it}$) is lower or equal to the *average* day-*t* opening return on all the stocks in the portfolio ($AR_{O,t}$), and to its opening return ($R_{O,it}$), otherwise (i.e. if $R_{O,it} > AR_{O,t}$ holds).

EWP is the equally-weighted portfolio based on holding all the 30 sample stocks during all the sampling period.

DJI represents the Dow Jones Industrial Index.

Statistics	Portfolio performance over the sampling period, %

	Portfolio A	EWP	DJI
Mean, daily	0.065	0.030	0.012
Standard Deviation, daily	0.963	1.378	1.283
Equality test statistics:			
Mean = Mean for Portfolio A: t-statistic		***3.02	***5.07
St Dev = St Dev for Portfolio A: F-statistic		***2.05	***1.77

For mean equality tests, I calculate daily differences between the series and test the hypothesis: "mean difference=0", employing t-test.
For standard deviation equality tests, I employ F-test.
Asterisks denote two-tailed p-values: *p<0.10; **p<0.05; ***p<0.01.

Table 3b: Historical performance of Portfolio M, and its comparison to that of the EWP and the DJI.

The table presents the historical mean and standard deviation of Portfolio M's daily returns and compares them to those of the EWP and the DJI.
Portfolio M is the equally-weighted portfolio of all the 30 sample stocks, where for each stock *i*, day-*t* is equal to its daily return ($R_{D,it}$) if its day-*t* opening return ($R_{O,it}$) is lower or equal to the *median* day-*t* opening return on all the stocks in the portfolio ($MR_{O,t}$), and to its opening return ($R_{O,it}$), otherwise (i.e. if $R_{O,it} > MR_{O,t}$ holds).
EWP is the equally-weighted portfolio based on holding all the 30 sample stocks during all the sampling period.
DJI represents the Dow Jones Industrial Index.

Statistics	Portfolio performance over the sampling period, %		
	Portfolio M	EWP	DJI
Mean, daily	0.060	0.030	0.012
Standard Deviation, daily	0.942	1.378	1.283
Equality test statistics:			
Mean = Mean for Portfolio M: t-statistic		**2.56	***4.51
St Dev = St Dev for Portfolio M: F-statistic		***2.14	***1.85

For mean equality tests, I calculate daily differences between the series and test the hypothesis: "mean difference=0", employing t-test.
For standard deviation equality tests, I employ F-test.
Asterisks denote two-tailed p-values: *p<0.10; **p<0.05; ***p<0.01.