Essays on long-term contrarian strategies

Kong, Yoon Kee

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Essays on Long-Term Contrarian Strategies

Kong Yoon Kee

Nanyang Business School

A thesis submitted to the Nanyang Technological University
in fulfilment of the requirement for the degree of
Doctor of Philosophy

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ABSTRACT

This dissertation consists of three essays. Essay 1 investigates whether a long-term contrarian strategy of buying industry losers and selling industry winners is profitable. The results show that industry contrarian strategies are profitable for the whole sample period, first and second half sub-periods. Contrarian investment period profits increase as prior losses increase, consistent with overreaction. Microstructure effects affect the returns of industry contrarian, losers and winners portfolios, particularly those of the losers but for longer tenors, industry contrarian profits remain economically significant. Excluding January decreases contrarian profits, consistent with tax loss selling, but they still remain.

The CAPM betas of the losers are less (more) sensitive than the winners in down-(up-) market, suggesting that losers are less risky than winners. This accounts for a large portion of the contrarian profits. In Fama-French regressions, the losers market beta and SMB loadings are also less (more) sensitive when the corresponding factor returns are negative (positive) in a down- (up-) market.

Essay 2 examines the impact of trading volume on stock contrarian strategies. We hypothesize that a late stage contrarian strategy, which buys low volume losers and sells high volume winners, will be more profitable than an early stage contrarian strategy, which buys high volume losers and sells low volume winners. Results for stock portfolios provide strong support and are robust to risk, size, exclusion of January returns (to test tax loss selling) and microstructure adjustments, choice of stock exchange, prior volume evaluation periods and different partitioning of the return-volume portfolios.

Essay 3 investigates how stock contrarian strategies are affected by prior market performance. We hypothesize that contrarian strategies will be more profitable following market downturn (DOWN state) than following positive market performance (UP state).

The results show that DOWN state contrarian raw profits are higher than UP state profits for stock portfolios and are robust to microstructure adjustments. Contrarian profit increases as prior market return decreases. CAPM (Fama-French) risk-adjusted profits are higher (lower) in DOWN state. As the DOWN state contrarian portfolios are characterized by higher SMB and HML loadings, they can be proxies for characteristics of small and high book-to-market stocks. This may explain contrarian's lower Fama-French alphas, consistent with Daniel and Titman (1997)'s characteristics-based model.

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ESSAY 1

PROFITABILITY OF LONG-TERM INDUSTRY CONTRARIAN STRATEGIES

1.1 Introduction and Literature Review

1.1.1 Introduction

Industry rotation is commonly practiced among investment professionals and industry analysis is an integral part of equity valuation. However study on the profitability of long-term contrarian portfolios formed by buying past losing industries and shorting past winning industries is greatly lacking. Gropp (2004) finds that industries have a long reversion speed. He investigates industry contrarian portfolios which invest over 3-year periods and documents only a small (insignificant) raw profit for NYSE stocks and negative (insignificant) raw profits for stocks listed on AMEX and Nasdaq. In view of the long half-lives for industry return reversals, he infers that “it is possible that maximizing portfolio returns from the Contrarian investment strategy requires the use of a longer formation period”.

This paper examines the profitability of long-term industry contrarian strategy. Previous stock contrarian strategy literature typically uses ranking and investment periods of 3 to 5 years. We are not aware of stock contrarian studies beyond 5 years and industry contrarian studies beyond 3 years. Our investigation includes tenor of 3 and 5 years, and makes a pioneering study of the 6- and 7-year horizon in view of the long half-lives of industry portfolios. Our results show that contrarian profits have a direct relationship with the length of the ranking and investment periods. The investment period profits for 3, 5, 6 and 7 years are 8.38%, 17.09%, 32.54% and 54.22% respectively, while their ranking period returns are -104.77%, -168.51%, -196.55% and -233.86% respectively. The investment period profits have a direct relation with their prior losses.

Losers betas from an unconditional CAPM and unconditional Fama-French regressions are marginally higher than winners betas. This difference can only explain a very small portion of the raw contrarian profits. Conditional CAPM regressions show that beta of losers exhibit a very attractive characteristic; it is higher than the winners beta in an up market and lower than the winners beta in a down market. This means that losers chalk up higher returns (or less losses) during up market and suffer less losses (or sustain higher profits) in down market when compared to winners. Similarly, in a conditional Fama-French framework, the contrarian's betas and SMB loadings are more (less) responsive when the corresponding factor returns are positive (negative) during up (down) markets, while the HML loadings are higher when the HML returns are higher in up markets. This favourable characteristic of the conditional factor loadings of the contrarian strategy is derived from the losers' favourable conditional factor loadings. Similar to the reasoning used in Pettengill, Sundaram and Mathur (2002), the favorable characteristics of the conditional FF loadings mean that losers cannot be considered more risky than winners. Return estimation based on the conditional CAPM and conditional Fama-French models can explain a significant portion of the raw profits of contrarian portfolios.

Excluding January reduces the raw and risk-adjusted profits of industry losers and winners, consistent with tax loss selling documented in George and Hwang (Journal of Finance, forthcoming) and Grinblatt and Moskowitz (2004). Excluding January reduces the raw profit of losers more than winners. We also document that microstructure effects have greater impact on the losers compared to the winners. Contrarian profits remain substantial even after factoring microstructure effects.

1.1.2 Literature Review

The importance of industry effects in corporate finance is well documented. (see Shleifer and Vishny (1992), Mitchell and Mulherin (1996), Andrade, Mitchell and Stafford (2001) for example). In asset pricing, Baca, Garbe and Weiss (2000) document that recently, industry effects are about the same as country effects in the major equity markets. Cavaglia, Brightman and Aker (2000)'s finding suggests that industry factors are becoming more important for active equity managers. Stock market players tend to focus on stocks within "hot" industries and sell out of those becoming "cold" pushing these industries beyond their fundamental values. Nofsinger and Sias (1999) document institutional herding and positive feedback trading while Bange (2000) documents the same for individual investors. Institutional investors mostly adopt a top-down investment approach that emphasizes industry or sector allocation before stock picking within selected industries. Hence, we expect institutional herding to have an industry bias. Individual investors often rely on analysts' reports for information and analysis and analysts often make recommendations by industries

Industry misvaluation takes a long time to correct. Fama and French (1988) document a U-shaped relation between first-order autocorrelation of industry portfolios and the return horizons. The autocorrelations turn negative for 2-year returns and reach their minimum for the 3- to 5-year horizon and remain negative for up to the 10-year horizon for some industries. Regulations and structural changes in specific industries could take a long time, e.g. it would take years to set up new wafer fabrication plants to meet increasing demand. This leads to slow diffusion of the impact of demand-supply situations and regulatory changes. We

infer that contrarian strategies based on industry portfolios need long ranking and investment periods to capture industry misvaluation and their reversals.

For stock portfolios formed based on the prior performance of individual stocks, it is well documented that short-term momentum strategies (3 to 12 months) and long-term contrarian strategies (3 to 5 years) are profitable. Jegadeesh and Titman (1993) find that momentum strategies are profitable for holding periods up to a year, followed by reversal thereafter. Jegadeesh and Titman (2001) and Lee and Swaminathan (2000), show that momentum profits reverse at long horizon, consistent with delayed overreaction. Over long horizon, DeBondt and Thaler (1985) and Chopra, Lakonishok and Ritter (1992) find stock contrarian strategies to be profitable in the U.S. stock market. Balvers, Wu and Gilliland (2000) report mean reversion across 18 national stock markets with long reversion half-life. This supports the case for longer time horizon when investigating contrarian strategies.

Dreman and Lufkin (1997) find that a short-term contrarian strategy that buys value stocks and sells growth stocks within industries is profitable. Moskowitz and Grinblatt (1999) find that industry momentum strategies that buy winning industries, and sell losing industries, are highly profitable for short to medium term. They document strong industry momentum profits in the U.S. over holding periods of 3 to 12 months, which reverse after a year. For ranking period of 2 years and an investment horizon of 3 years, the momentum portfolios show small losses, indicating intermediate term reversals. Pan, Liano and Huang (2004) attribute industry momentum mainly to own-autocorrelation of industry portfolio returns and not to cross-autocorrelation. The intermediate-term reversal of industry momentum suggests that prior momentum could be due to overreaction (see Barberis, Shleifer and Vishny (1998, hereafter BSV), Hong and Stein (1999) and

Daniel, Hirshleifer and Subrahmanyam (1998)). Hence, long-term industry contrarian profits can be expected as the ranking period increases, allowing overreaction to start reversing soon after the ranking period ends.

Are higher losers' returns in a contrarian portfolio compensation for bearing higher risk? DeBondt and Thaler (1985) conclude that the losers portfolio is less risky than the winners portfolios on the basis of the losers' lower ranking period beta. Chan (1988) argues that as the risk of losers increases from ranking period to test period, ranking period betas would underestimate their test period beta. Further, he reasons that it is not necessary for the losers betas to be bigger than the winners beta throughout the test period for CAPM to explain the contrarian profits. They are only required to be higher when the expected market premium is high. From his analysis, Chan infers that the (losers, winners) beta is (positively, negatively) correlated with the market risk premium. DeBondt and Thaler (1987) perform a dual-beta time series regression on test period returns and show that the losers beta is (higher, lower) than the winners beta in an (up, down) market. They reason that the positive covariance between the losers beta and the realized market return means that the losers cannot be considered more risky than the winners.

Conditioning upon whether the market return is positive or negative, Fabozzi and Francis (1977, 1979) document changes in beta over up and down market. Wiggins (1992), building on the dual-beta model, finds higher power of dual-beta to explain returns of portfolios formed on basis of prior return, size and past beta. Howton and Peterson (1998) could not find a significant relation between a constant-risk beta and returns. However, when beta is conditioned upon market return, they document that both up-market and down-market betas exhibit a significant relation with returns. Pettengill, Sundaram and Mathur (1995, 2002)

argue that CAPM only predicts a positive relationship between beta and expected return while empirical finance uses realized return. They reason that a constant beta should have a (positive, negative) relation with realized return in an (up, down) market and document such a conditional relation between a constant beta and observed returns.

Ball, Kothari and Shanken (1995) adjust the price of 5-year stock losers upward by $\frac{1}{8}$ and find that the return of losers declines by a substantial 25% from 163%. To alleviate microstructure effects of nonsynchronous trading and bid-ask bounce, studies like Jegadeesh and Titman (1993), Moskowitz and Grinblatt (1999) and Chui, Titman and Wei (2003) include momentum strategies that incorporate a lag before investment. Jegadeesh and Titman (1993) find that momentum strategies that skipped a week are mostly more profitable, whereas Moskowitz and Grinblatt (1999) studying industry momentum, do not find material difference in the returns. Keim (1989) document that low-priced stocks tend to be recorded at their bid prices at the end of December.

1.2 Data Sources, Identification of Sample and Sample Period

Monthly data on stock return, SIC (Standard Industry Classification) codes, month-end closing price, number of shares outstanding, share trading volume are obtained from the monthly stock returns file of CRSP. The monthly return we use is the Holding Period Return with dividends reinvested. In addition, delisting data like Delisting Code, Delisting Return with dividends are obtained from the CRSP monthly stock file.

Monthly Value Weighted and Equal Weighted Index Return of stocks listed in NYSE/AMEX/Nasdaq are obtained from CRSP monthly index file. The one-

month and one-year US Treasury Bill rates are obtained from Stocks, Bonds, Bills and Inflation: Valuation Edition 2004 Yearbook (Ibbotson Associates, 2004).

The returns of Fama and French three-factors; namely market excess return, HML (mimicking portfolio for risk related to book-to-market) and SMB (mimicking portfolio for risk related to size) are extracted from Kenneth R. French's website.¹ Due to the updating of the CRSP prior data, we now use the updated Fama-French factor returns downloaded from French's website in July 2006.² Market excess return is the difference between the value-weighted return of all New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and National Association of Securities Dealers Automated Quotation market (Nasdaq) stocks available on CRSP, and the Treasury bill rate (from Ibbotson Associates). HML is the difference in the returns of value-weighted portfolios of high book-to-market firms and low book-to-market firms, while SMB is the difference in the returns of value-weighted portfolios of small stocks and large capitalization stocks.

The initial sample consists of all ordinary common stocks listed on NYSE, AMEX and Nasdaq. The data is available on the Center for Research in Security Prices (CRSP) monthly returns file. As the sample consists only of ordinary common stocks (share code 10 and 11), it excludes American Depositary Receipts (ADRs), Real Estate Investment Trusts (REITs), prime, foreign companies and closed-end funds.

The sample selection criteria are as follows:

- 1) The stocks must be continuously listed for a prior number of years equal to the length of the ranking period chosen for a particular analysis.

¹ http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

² The results are not materially affected using these revised factor returns.

- 2) They are ordinary common shares listed in one of the following three exchanges: NYSE (data since 1926), AMEX (from July 1962) and Nasdaq (from 1973).
- 3) Firms which are delisted during the investment period are included. (This criteria is similar to DeBondt and Thaler (1985, 1987), Chopra et al. (1992), and Ball et al. (1995). Excluding stocks delisted during the investment period would introduce an upward bias to our results.

We set the investment period to be the same as the ranking period. Our analysis uses overlapping periods instead of nonoverlapping periods to increase the number of data available for investigation and to enhance the precision of point estimates of the coefficients of the regressions that we study. Each run of overlapping period is a year later than the preceding run. Even though using nonoverlapping periods will lead to results that are not autocorrelated, their limited number means that findings would be very dependent on the choice of the actual starting point of the nonoverlapping periods.

For the 3-year period, the first ranking period, first investment period, last investment period and number of runs are (1926 – 1928, 1929 – 1931, 1999 – 2001, 71) respectively with a year starting in January and ending in December. The corresponding periods and runs for the 5-year, 6-year and 7-year periods are (1926 – 1930, 1931 – 1935, 1997 – 2001, 67), (1926 – 1931, 1932 – 1937, 1996 – 2001, 65) and (1926 – 1932, 1933 – 1939, 1995 – 2001, 63) respectively.

To test microstructure effects, we also study investment periods which skip a month from the end of the ranking period. Hence the last data month is January 2002.

1.3 Methodology

1.3.1 Formation of Industry Portfolios

The basis for industry formation selection criteria are: 1) a manageable number of industries, and 2) each industry should contain a reasonably large number of firms to ensure that the industry portfolio is reasonably diversified and has negligible idiosyncratic risk. To maximize coverage, we select stocks from all three major U.S. national exchanges (NYSE, AMEX and Nasdaq).

Based on the above criteria, our industry classification chosen is similar to that used by Moskowitz and Grinblatt (1999). Two-digit Standard Industrial Classification (SIC) codes from the monthly CRSP stock file are used to form the 20 industries. The details are given in Table 1.1, which also lists some basic summary statistics of these industries.

Insert Table 1.1 here.

Industry 14 (Railroads) has the smallest average number of stocks (34) while Industry 20 (Other) has the highest average number of stocks (607). The average number of stocks across all industries is 141. This implies that on average, the industry portfolios consist of a reasonable number of stocks. This would lower the level of firm specific risks in the portfolios. The mean return for each industry reported is the time-series average of the monthly industry returns. The F-statistic indicates that the average monthly returns of the different industries are not

significantly different across industries because of the high value of the time-series standard deviation of the monthly returns vis-à-vis the mean return. (The ratio of this standard deviation to the mean return (not reported in the table) ranges from 5.1 to 7.7). The insignificant F-statistic implies that cross-sectional differences in mean returns do not materially impact profitability of contrarian strategies. The average of the median monthly returns of all industries (0.3624%) is lower than the corresponding mean monthly return (1.3066%). The average of the cross-sectional skewness is positive for all industries, leading to the mean return being much higher than the median return. Further, the time-series average of the cross sectional standard deviation of the monthly returns of all industries is at least six times the corresponding average monthly return. This wide dispersion of monthly returns within each industry suggests that industry portfolios are well diversified. From the average market capitalization column, we note that market capitalization is quite well spread out, except for the Petroleum industry which dominates.

1.3.2 Formation of Industry Winners, Losers and Contrarian Portfolios

The construction of our overlapping contrarian portfolios is similar in spirit to that described in Ball et al (1995). Let T be the number of years in a chosen ranking period (3-, 5-, 6- or 7-year). For each year, we find the buy-and-hold return of the industry portfolios over the preceding T years, also called the ranking period. The equal weighted buy-and-hold returns of the various industries during the ranking period are sorted. The industry winners portfolio is made up of equal weights in the top three industries. The industry losers portfolio consists of equal weights in the bottom three industries. The stocks within the industry are also equally weighted. The contrarian portfolio is formed by buying the losers portfolio

and shorting an equal amount in the winners portfolio, and it is invested over the investment period which follows immediately after the ranking period. The contrarian portfolio profit is the buy-and-hold return of the losers portfolio minus the buy-and-hold return of the winners portfolio.

Since we use overlapping investment periods, the buy-and-hold returns of each portfolio are not independent through time. Hence, we use the Newey and West (1987) autocorrelation consistent standard errors to derive the p-value (t-distribution) of our mean return.

1.3.3 Return Metric and Delisting of Stocks

Two common return metric used for studying momentum and contrarian strategies are cumulative (simple arithmetic sum) of the monthly returns and the buy-and-hold or holding period return. We decide to use the buy-and-hold return as the return metric for both ranking and investment periods for several reasons. Loughran and Ritter (1996) find that using buy-and-hold return during the ranking period results in greater difference in price and market capitalization at the end of the holding period between the winners and the losers, compared to using Cumulative abnormal return.

There is also greater dispersion in prior performance and investment period returns. Lesmond, Schill and Zhou (2004) find that frequent trading required in momentum strategies involves stocks with high trading costs. This prevents profitable execution of such strategies. Buy-and-hold return reduces trading costs significantly as cost is only incurred at the initial and final execution. This is unlike cumulative monthly returns, which is associated with monthly rebalancing and hence, much higher transaction costs and increased monitoring effort. Unlike

Chopra et al. (1992), which use annual buy-and-hold return with its concomitant annual rebalancing of portfolios and higher transaction costs, we use the buy-and-hold return for the entire investment period because of its lower costs.

Buy-and-hold return also factors in the compounding of returns which has material impact in long-term studies. Further, Conrad and Kaul (1993) reason that holding period raw or abnormal return should be used instead of the corresponding cumulative raw or abnormal return because, in cumulating single-period returns, the upward bias in the single-period return is also cumulated in cumulative return. The investment strategy based on buy-and-hold return has the advantage of minimizing transaction costs.

Similar to DeBondt and Thaler (1985, 1987), Chopra et al. (1992) and Ball et al. (1995), stocks delisted during the investment period are included. This avoids a survivor bias which would have led to an upward bias in the contrarian profits found in studies like Ball and Kothari (1989). This bias arises because more of the loser stocks (compared to the winner stocks) are delisted during the investment period due to financial distress. Excluding such stocks (with their bad investment period performance) will upwardly bias the contrarian profits. Chopra et al (1992) do not include the final return or delisting dividend of stocks delisted in their computation of the returns of the individual stocks while DeBondt and Thaler (1985, 1987) assume a 100% loss if the liquidating return is not available from the CRSP stock files. As suggested in Ball et al. (1995), we include liquidating returns in the buy-and-hold return of the stock if they are available from the CRSP monthly stock file. After delisting, Chopra et al. (1992) delete the stock from its portfolio and this requires rebalancing all the other remaining stocks in the portfolio. We do not delete a delisted stock from its portfolio but assume its residual funds earn the

market return until the end of the investment period. This means that the other stocks remaining in its portfolio need not be rebalanced.

1.4 Empirical Results

1.4.1 Raw Contrarian Profits

If industry portfolios overreact, prior losers would be oversold and prior winners would be overbought during the ranking period. This should lead to a positive profit for a contrarian arbitrage portfolio which buys industry losers and sells industry winners. Here, we test the Overreaction Hypothesis that the buy-and-hold return of the contrarian arbitrage portfolio is positive. For robustness, we analyze our results for the whole sample periods and two sub-periods: first half and the second half.

The ranking period performance of the contrarian portfolios are -104.77%, -168.51%, -196.55% and -233.86% for the 3-, 5-, 6- and 7-year ranking periods respectively. There is a positive relation between the length of the ranking period and the prior losses sustained.

Insert Table 1.2 here.

Panel A, B and C of Table 1.2 reports the investment period return of the arbitrage, losers and winners portfolio respectively. Within each panel, the returns for the full, first half and second half samples and the difference in returns between the first half and second half are reported. Panel A shows that for the full sample period, the buy-and-hold raw return of the contrarian arbitrage portfolios are

positive and significant (3-year = 8.38%, 5-year = 17.09%, 6-year = 32.54% and 7-year = 54.22%).

The arbitrage portfolio's profitability increases with the ranking/investment period with the 3-year whole sample raw return being lowest at 8.38% and the 7-year raw return being highest at 54.22%. This shows that the reversal is stronger the longer the prior ranking period. As prior losses increases with the length of the ranking period, reversal is stronger the greater the losses sustained during the prior ranking period.

For the first half sub-period, the arbitrage portfolio raw return for 3-, 5-, 6- and 7-year investment period are 9.22%, 20.25%, 36.55% and 66.34% respectively. For the second half sub-period, the corresponding raw returns are 7.55%, 14.04%, 28.65% and 42.48% respectively, with the return of 6- and 7-year periods being statistically significant at 3% and 1% confidence level respectively. The profits in the first half is higher than that of the second half but the difference in profits between the two sub periods is statistically insignificant. Hence, we document that contrarian strategy is profitable for both sub-periods.

From Panels B and C, we note that the raw return of both losers and winners are positive for all investment periods, with the losers outperforming the winners for all full sample periods and first half and second half sub-periods. Further, the lowest returns by both winners and losers for the whole sample period and two sub-periods are recorded when the ranking/investment period is shortest (3 years), while the highest returns correspond to the longest ranking/investment period of 7 years. For the full sample period, the lowest return for losers and winners is 58.77% and 50.39% respectively, and these correspond to a ranking/investment period of 3 years. The highest whole sample return for losers and winners are 198.27% and

144.05% respectively, and they are both earned over an investment period of 7 years. Hence, the returns of both losers and winners increase with the investment period, with losers chalking up more gains. The difference between the first half and second half period returns is consistently greater for losers than for winners. This leads to the arbitrage portfolio returns being higher for the first half compared to the second half periods.

1.4.2 Risk Adjustments (CAPM and Fama and French three-factor models)

1.4.2.1 Unconditional and Conditional Time-Series Regressions

Unconditional CAPM

For each run, we obtain the annual return of the industry winners and losers portfolios for each event year $\tau = 0, 1, 2, \dots, T$, where T is the number of years in the investment period. The number of occurrence for each event year depends on the number of runs (overlapping periods) we have corresponding to each choice of T years (71 for 3-year, 67 for 5-year, 65 for 6-year and 63 for 7-year). To capture the time variation of risk across event years, we obtain the CAPM alpha and beta for each of the event years by adopting a procedure similar to that used in Chopra et al. (1992). For a given event year, τ is fixed and we run a time-series regression by varying t , the calendar year. The regression is done for each event year in turn. The annual excess return of the industry losers and winners portfolio is regressed against the annual market excess returns as follows:

$$R_{p_t}(\tau) - R_{f_t}(\tau) = \alpha_p(\tau) + \beta_p(\tau) [Mkt_t - R_{f_t}] + e_{p_t}(\tau) \quad (1.1)$$

where with respect to an event year τ and calendar year t , $R_{p_t}(\tau)$ is the annual return of the portfolio under study (which is equal to the return of the industry losers portfolio ($R_{Ind L}$), or the return of the industry winners portfolio ($R_{Ind W}$) as the case may be), $R_{f_t}(\tau)$ is the risk free rate, $\alpha_p(\tau)$ is the CAPM alpha (a measure of CAPM risk-adjusted return in event year τ and is equal to zero if there is no mispricing), $\beta_p(\tau)$ is the CAPM beta while $Mkt_t(\tau)$ is the annual return of the value-weighted index of stocks listed on NYSE, AMEX and Nasdaq at time t and $e_{p_t}(\tau) \sim N(0, \sigma_p(\tau))$. For the contrarian portfolio, the annual return of the contrarian portfolio (equals to $R_{Ind L} - R_{Ind W}$) is regressed against the annual market excess return.

CAPM conditional upon contemporaneous Up- and Down-Market

An up-market is defined as one when the contemporaneous 1-year market premium is non negative while a down-market is one when it is negative. For industry losers and winners portfolios, we run the following time-series regression to obtain the CAPM α and the betas conditional upon whether the market premium is positive or not:

$$R_{p_t}(\tau) - R_{f_t}(\tau) = \alpha_p(\tau) + \beta_{UP}(\tau) [Mkt_t - R_{f_t}] D + \beta_{DN}(\tau) [Mkt_t - R_{f_t}] (1 - D) + e_{p_t}(\tau) \quad (1.2)$$

where D is a dummy variable which equals one when the market premium is non-negative and zero if the market premium is negative. β_{UP} is the beta of the portfolio

under consideration when the market premium is non-negative and β_{DN} is the beta when the market premium is negative. For the contrarian portfolio, the regressand is the return of the contrarian portfolios, defined to be the difference between the return of the losers and winners.

1.4.2.2 Risk-Adjusted Return and Profit due to Risk: CAPM

Insert Table 1.3 here.

For brevity, Table 1.3 presents the CAPM alphas and betas of the contrarian portfolios for the 3-, 5-, 6- and 7-year investment periods in both unconditional and conditional CAPM settings. The alphas and betas are averaged across all event years. For the unconditional CAPM, the alphas are 1.76%, 1.67%, 2.18% and 2.41% for the 3-, 5-, 6- and 7-year investment periods respectively and significant for all investment period except the 3-Year. Chopra et al. (1992) document contrarian alpha of 2.5% per year for their 5-year stock contrarian portfolios. The betas are also slightly positive, seemingly suggesting the slightly higher risk of the losers compared to the winners. The annual profit due to beta risk is calculated to be the product of beta and the average annual market risk premium. The Total Profit is obtained by compounding the annual profit by the number of years in the investment period. The table shows that beta risk can only account for very little of the contrarian profit (1.41%, 2.20%, 3.18% and 6.11% for the 3-, 5-, 6- and 7-year investment periods respectively). This inability of the unconditional CAPM beta to explain the contrarian profits is consistent with the findings of Chan (1988) which uses portfolios formed based on prior performance of individual stocks.

For the conditional CAPM, the alphas are mostly negative. The conditional CAPM regressions show that industry contrarian portfolios possess the same appealing up- and down-market betas documented earlier by DeBondt and Thaler (1987) and Ball et al. (1995) for stock contrarian. They are more responsive (positive beta) when the market premium is positive and less responsive (negative beta) when the market premium is negative. The annual profit due to beta risk is obtained by computing the product (fraction of years in a state $\times$ beta of that state $\times$ average market premium in that state) and summing over the 2 market states. Again the Total Profit is obtained by compounding the annual profit. Conditional beta risk accounts for a much higher portion of raw contrarian profits. The conditional Total Profit is 14.01%, 20.96%, 23.33% and 19.08% for the 3-, 5-, 6- and 7-year investment periods respectively. The corresponding raw profits are 8.38%, 17.09%, 32.54% and 54.22%. This shows that the attractive beta covariance of the contrarian portfolio can explain a large portion of the raw contrarian profits.

It is often argued that the higher return to losers is due to their risk. We have documented that though losers have slightly higher unconditional beta than winners, the difference in unconditional beta is insufficient to explain any material portion of the contrarian profits documented. However, if the beta is conditioned upon up- and down-market, the difference in conditional beta can explain a material portion of the contrarian profits. If losers are undervalued, their price will tend to move upward towards their intrinsic value and this will cause them to be more responsive to up-market and less responsive to down-market. Similarly, if winners are overvalued, their price will tend to move downward towards their intrinsic value and this will cause them to be less responsive to up-market and less responsive to down-market.

Lakonishok et al. (1994) reason that for a portfolio (A) to be deemed riskier than another portfolio (B), it has to underperform portfolio B with some probability, especially in bad states of the world where the marginal utility of wealth is high. Penttengill et al. (2002) argue vigorously that a security that has a higher beta than another in up markets but a smaller beta in down markets, is less risky than the latter security. A high beta in bull market does imply greater risk, but higher realized return. The industry losers display such a favorable conditional beta characteristic and should be actually deemed less risky than the industry winners.

The above estimation of profits attributable to risk works best when there is an equal and opposite amount of dollars invested in the losers and winners portfolio for each year. However, this is a rough approximation in our case, as this assumption is true only in the beginning; because the better average performance of losers over winners will cause the absolute dollar amount of losers to be bigger than that of winners. If we factor this difference in investment amount at the beginning of each event year, the amount of profit accounted for by beta covariance with the market is expected to be higher.

1.4.2.3 Unconditional and Conditional Fama-French (FF) Time-Series Regressions

Unconditional Fama-French

Again, we compound the monthly return of industry winners and losers portfolios to obtain their respectively annual return for each event year $\tau = 0, 1, 2, \dots, T$, where T is the number of years in the investment period. For a given event year, τ is fixed and we run a time-series regression by varying calendar year t . The

number of occurrence for each event year depends on the number of runs (overlapping periods) we have corresponding to each choice of T years (71 for 3-year, 67 for 5-year, 65 for 6-year and 63 for 7-year). The regression is done for each event year in turn. The annual excess return of the industry losers and winners portfolio is regressed against the annual market excess returns as follows:

$$R_{P_t}(\tau) - R_{f_t}(\tau) = \alpha_P(\tau) + \beta_{P,Mkt}(\tau) [Mkt_t - R_{f_t}] + \beta_{P,SMB}(\tau) SMB_t + \beta_{P,HML}(\tau) HML_t + e_{P_t}(\tau) \quad (1.3)$$

where with respect to an event year τ and calendar year t , $R_{P_t}(\tau)$ is the annual return of the portfolio under study (equals to the return of the industry winners portfolio $R_{Ind W}$ or $R_{Ind L}$, the return of the industry losers portfolio as the case may be), $R_{f_t}(\tau)$ is the risk free rate, $\alpha_P(\tau)$ is the FF alpha (a measure of FF risk-adjusted return in event year τ and is equal to zero if there is no mispricing), $\beta_{P,Mkt}(\tau)$ is the FF factor loading for the market excess return, $\beta_{P,SMB}(\tau)$ is the factor loading for $SMB_t(\tau)$ (return on the mimicking portfolio for risk related to size), $\beta_{P,HML}(\tau)$ is the factor loading for $HML_t(\tau)$ (return on the mimicking portfolio for risk related to book-to-market equity), while $Mkt_t(\tau)$ is the annual return of the value-weighted index of stocks listed on NYSE, AMEX and Nasdaq and $e_{P_t}(\tau) \sim N(0, \sigma_P(\tau))$. For the contrarian portfolio, the annual return of the contrarian portfolio (equals to $R_{Ind L} - R_{Ind W}$) is regressed against the annual return of the 3 Fama-French factors.

FF conditional upon contemporaneous Up- and Down-market

The FF factor loadings are allowed to vary depending on whether the contemporaneous or current market premium is positive or negative. An up-market is defined as one when the contemporaneous 1-year market premium is non-negative. A down-market is one when it is negative. For the industry losers and winners portfolios, their respective annual excess returns are regressed against the returns of the 3 Fama-French factors using time-series regressions as follows:

$$\begin{aligned}
 R_{P_t}(\tau) - R_{f_t}(\tau) = & \alpha_p(\tau) + \beta_{Mkt, UP}(\tau) [Mkt_t - R_{f_t}]D + \beta_{Mkt, DN}(\tau) [Mkt_t - R_{f_t}](1 - D) \\
 & + \beta_{SMB, UP}(\tau) SMB_t D + \beta_{SMB, DN}(\tau) SMB_t (1 - D) + \\
 & \beta_{HML, UP}(\tau) HML_t D + \beta_{HML, DN}(\tau) HML_t (1 - D) + e_{P_t}(\tau) \quad (1.4)
 \end{aligned}$$

where D is a dummy variable that takes a value of 1 when the 1-year market premium is non-negative and zero otherwise. For event year τ , $\beta_{Mkt, DN}(\tau)$ is the FF factor loading for the market risk premium, $\beta_{SMB, DN}(\tau)$ is the FF factor loading on the SMB portfolio, $\beta_{HML, DN}(\tau)$ is the FF factor loading on the HML portfolio, all for the case of a down-market. $\beta_{Mkt, UP}(\tau)$ is the FF factor loading for the market risk premium, $\beta_{SMB, UP}(\tau)$ is the FF factor loading on the SMB portfolio, $\beta_{HML, UP}(\tau)$ is the FF factor loading on the HML portfolio, all for the case of an up-market. $\alpha_p(\tau)$ is the intercept of the regression and is a measure of mispricing with respect to the FF three-factor model. For the contrarian portfolios, the annual returns of the contrarian portfolios are regressed against the annual return of the three Fama-French factors.

1.4.2.4 Risk-Adjusted Return and Profit due to Risk: Fama-French

Insert Table 1.4 here.

The risk-adjusted return and profit due to risk of the Unconditional (Conditional) Fama-French regressions for investment period of 3-, 5-, 6- and 7-years are given in Panel A (Panel B) of Table 1.4. For brevity, the table reports the results for the contrarian portfolios only. The alphas and the factor loadings reported are the averages across all event years. For the unconditional framework in Panel A, the contrarian alpha is positive for the 3-, 5- and 7-year periods but negative for the 6-year period, with all being statistically insignificant. The contrarian market beta is mostly negative (3-, 5- and 7-year) indicating that the losers betas are mostly smaller than the winners beta. For all investment periods, SMB and HML factor loadings for losers are all greater than that for winners, resulting in positive contrarian SMB and HML factor loadings. This suggests that in an unconditional setting, losers have greater risk as measured by the SMB and HML factor loadings. The annual profit attributable to risk is obtained by summing over the three factors, the product of the factor loadings and the corresponding factor returns. Unconditional Total Profit of the contrarian portfolios is calculated by compounding the annual profit over the number of years in the investment period. They are 4.67%, 10.48%, 14.73% and 18.83% for the 3-, 5-, 6- and 7-year periods respectively. They are small compared to the raw contrarian profits and this shows the inadequacy of the unconditional Fama-French three-factor model in explaining the time-series of contrarian profits.

For the conditional Fama-French framework reported in Panel B, the alphas are negative (insignificant) for the various investment periods. Contrarian up-

market betas are small and positive or negative depending on the investment period. Contrarian down-market betas are negative and much bigger in magnitude than those of the up-market betas. This arises from the favourable relative lack of response of the losers to down-market compared to the winners. This implies that losers are less sensitive to down markets than winners and account partly for their higher profit. Contrarian SMB loadings are positive in an up-market when the SMB returns are also positive. They are negative in a down-market when the SMB returns are negative. Hence, the SMB factor loadings of contrarian portfolios also possess favorable characteristics of being more (less) responsive when the SMB factor return is positive (negative). The HML loadings are positive in both up- and down-markets when the corresponding factor returns are also positive, again showing favorable characteristic of being positive when factor returns are positive.

To obtain the annual profit under the conditional framework, the product of factor loadings and factor returns and fraction of years in specified state (up- or down-market as applicable) is first calculated for each factor and then summed over the three factors. The result is then summed over the up- and down-market states to obtain the annual profit. The conditional Total Profit is obtained by compounding the annual profit over the number of years in the investment period. The Total Profit due to factor risk is 15.83%, 22.50%, 27.22% and 24.24% for the 3-, 5-, 6- and 7-year period respectively. These are much higher than the corresponding figures under the unconditional framework, indicating the superiority of the time-varying factor loadings in explaining the time-series of contrarian profits.

1.5 January Effects and Tax Loss Selling

Insert Table 1.5 here.

Table 1.5 presents the monthly raw returns and risk-adjusted returns (CAPM and FF) for all months of the investment period and also for all months excluding January. Panel A, B and C reports the results for losers, winners and contrarian portfolios respectively. As the results are similar for the various investment periods, we discuss only the results for the 7-year period. For losers, the raw return falls from 1.37% to 1.08% when January is excluded. For CAPM alpha, the losers risk-adjusted return declines from 0.22% to 0.00% when January is excluded, while the corresponding FF alpha drops from -0.01% for all months to -0.02% when January is excluded. Similarly, January effects are observed for the raw and risk-adjusted returns (CAPM and FF) of the winners. The drop in raw profit and CAPM alpha is bigger for the losers. However, the drop in FF alpha is smaller for the losers as the losers have higher Fama-French size factor loading and this corresponds closely to the predictable component of return related to tax loss selling. As a result of the impact of January on losers and winners, the raw return of the contrarian portfolio falls from 0.24% to 0.17% when January is excluded. For CAPM alpha, the contrarian risk-adjusted return declines from 0.22% to 0.16% when January is excluded, while the corresponding FF alpha increases from 0.08% for all months to 0.11% when January is excluded.

The drop in raw profits of the losers and winners when January returns are excluded are consistent with that of George and Hwang (Journal of Finance, forthcoming) and Grinblatt and Moskowitz (2004) who attribute their results to the impact of tax loss selling in December followed by subsequent price recovery, on losers with spillover effects on winners.

1.6 Microstructure Effects

Similar to the procedure used in Ball et al. (1995), the prices of all stocks from industry winners and losers used to obtain the raw profits in Section 3.3.2 are adjusted upwards by $\$1/8$. This upward adjustment is based on the price of the stock as at the end of the ranking period. The buy-and-hold returns of the industry winners and losers and contrarian arbitrage portfolio are recomputed to study the impact of this $\$1/8$ upward adjustment.

Further, a 1-month lag is incorporated between the end of the ranking period and the beginning of the investment period. For instance, if the 5-year ranking period ends at the end of December 1990, the investment period skips a month and starts from February 1991. The end date of the investment period is also pushed one month later to Jan 1996. The buy-and-hold returns of the industry winners and losers and contrarian arbitrage portfolio are recomputed to study the impact of incorporating this one-month lag.

Insert Table 1.6 here.

Panel A of Table 1.6 documents the raw return, return after $\$1/8$ price adjustment, and return after 1-month lag effect for the whole sample period. For all investment periods, the return adjusted for $\$1/8$, and that adjusted for 1-month lag, results in lower contrarian, losers and winners return. For the 7-year period, $\$1/8$ price adjustment leads to a drop of 5.32%, 8.10% and 2.77% for the arbitrage portfolio, losers and winners respectively. The 1-month lag effect leads to a bigger

drop of 7.56%, 10.64% and 3.07% respectively. The same pattern is observed for the 3-, 5- and 6-year investment period, other than for the 3-year and 5-year winners.

These results show that microstructure effect connected with price has consistently lower impact than that due to 1-month lag due to January (except for 3-year and 5-year winners). The lower contrarian profits due to a 1-month lag is consistent with the higher momentum profits after a 1-week lag adjustment documented in Jegadeesh and Titman (1993), as contrarian strategies are the reverse of momentum strategies. Bid-ask bounce reduces momentum profits as it causes observed returns to reverse. Having a lag would hence increase momentum profit and decrease contrarian profits, as the two strategies take opposite positions in winners and losers. The impact of price and 1-month lag adjustment is more evident in the losers portfolio compared to the winners portfolio; e.g. for the 7-year period, losers decline by 8.10% and 10.64% after $\frac{1}{8}\%$ and 1-month lag adjustment respectively. The corresponding declines for winners are a much smaller 2.77% and 3.07% respectively. This is expected as losers tend to comprise stocks that are lower-priced and/or have lower liquidity, and these are more susceptible to higher bid-ask bounce, transaction cost and price adjustment effect. In summary, contrarian profits for the whole sample periods are significantly positive, even after a $\frac{1}{8}\%$ and 1-month lag adjustments at 10% confidence (except 3-year investment period after 1-month lag adjustment), with the two microstructure adjusted returns for the 6- and 7-year periods being statistically significant at 1%.

As the results for 3-, 5- and 6-year period are largely similar to that of the 7-year period, Panel B of Table 1.6 shows the whole sample, first half and second half period performance for the 7-year period only. The raw return and the two microstructure adjusted returns are almost always higher in the first half than the

second half for the arbitrage portfolio, losers and winners, and across all investment periods. The arbitrage profits for the first half are mostly statistically significant. The arbitrage profits for the second half based on the raw return and two microstructure adjusted returns are statistically significant for the 6- and 7-year period. The differences between the arbitrage profits of the first half and second half are not significantly different from zero, indicating the absence of data-snooping bias across sample periods.

For industry losers, there is greater impact of the $\frac{1}{8}$ adjustment for the first half than the second half; the $\frac{1}{8}$ adjustment for the losers in the first half is -8.54% versus the second half effect of -7.67%. This could be due to the possibly lower average price of stock in the first half of the sample period. Similarly, the 1-month lag adjustment for the losers has greater impact in the first half than the second half; e.g. for the 7-year period, the 1-month lag adjustment for the losers in the first half is -11.71%, while the second half adjustment is a smaller -9.60%. This suggests the impact of January is stronger in the first half for the losers.

For the winners, there is greater impact of the $\frac{1}{8}$ adjustment for the first half than the second half; the $\frac{1}{8}$ adjustment for the winners in the first half is -2.89% versus the second half effect of -2.66%. This again could possibly be due to lower average stock price in the first half. However, the impact of 1-month lag is smaller for the first half than the second half for the winners e.g. for the 7-year period, first half 1-month lag adjustment is -1.43%, much smaller than the second half adjustment of -4.67%. This is puzzling as it indicates a greater impact of January on winners in the second half, the opposite of that observed for the losers.

There is still material amount of contrarian profits even after adjusting for microstructure effects for the longer investment periods. This is true for the whole

sample and the two sub-periods. Even though microstructure effects do cause the returns of industry contrarian and losers portfolios to be lower after adjusting for $\$1/8$ and 1-month lag, their impact is much more muted than that found in the corresponding portfolios for individual stocks. For the 5-year investment period (result not reported in this table), the raw return of the industry losers for the full sample period drops from 118.72% to 111.80% and 110.29% after $\$1/8$ and 1-month lag adjustment respectively. The decrease is just 6.92% and 8.43%. In contrast, Ball et al. (1995) find that for individual stock losers portfolio, a $\$1/8$ price adjustment causes the losers return to decline by a more substantial 25%, from 163% to 138%. This could be because stocks in industry losers are not bunched up as closely in the lowest price range as the losers among all stocks and hence, are affected less by microstructure effects.

1.7 Very Long-Term Investment Horizon

For robustness, we investigate the time series of the performance of the contrarian, losers and winners over 10 years, keeping the ranking period constant. However, with the longer investment periods, the number of runs for the 3-, 5-, 6- and 7-year ranking periods is reduced to 64, 62, 61 and 60 respectively.

Insert Table 1.7 here.

From Table 1.7, we note that as ranking period increases, the ranking period loss of the arbitrage portfolio increases in magnitude. For the same holding period, the contrarian return increases as we increase the ranking period (except for the first year of investment). For example, for the 5-year investment horizon, the contrarian

profits are 21.28%, 22.32%, 33.63% and 38.24% for the 3-, 5-, 6- and 7-year ranking period respectively. For the same ranking period, the contrarian profit increases with longer holding period. For example, for the 5-year ranking period, the contrarian profit starts at 5.41% for the first year and then increases steadily to 13.50%, 22.32%, 51.44% and 84.20% for the third, fifth, eighth and tenth year respectively.

To understand what contributes to contrarian profits, we study the returns of losers and winners separately. Controlling for the holding period, the returns of the losers mostly increase as we increase the ranking period. For the winners, there is no distinct pattern of increasing or decreasing returns when the investment period is kept constant. For both winners and losers, returns increase as the investment period increases, with losers outperforming winners (except for ranking period of 3 years and investment period of 1 year), thus contributing to contrarian profitability.

For all ranking periods, the contrarian profit does not reverse over the next ten years³. The best contrarian investment strategy is based on a ranking period of 7 years and holding the contrarian portfolio until the tenth year. Among the losers, the losers based on a ranking period of 7 years perform best throughout the 10-year investment period.

Insert Figure 1.1 here.

³ We test the returns of the losers and winners beyond ten years and find that the yearly return of the losers is not statistically significant from that of the winners after 13 or 14 years. As the losers gain more in the earlier years and we are considering buy-and-hold contrarian returns, the contrarian return can theoretically continue to increase even if the yearly return of the losers in the later years is the same as that of the winners, as the losers are gaining from a bigger base, having outperformed in the earlier years.

For the 5-year ranking period, the graph of the buy-and-hold return of the contrarian, losers and winners portfolios over ten years is presented in Figure 1.1. It shows that the return of all three portfolios increases monotonically over time. The increase in losers is faster than the increase in winners, leading to the contrarian return increasing steadily over time and showing no reversal over these ten years.

1.8 Conclusion

Contrarian raw profits are found in the whole sample period, first half and second half sub-periods. Even though profits in the second half sub-period are lower than the corresponding first half period, they are not significantly different. The profits in the second half sub-period are still positive, showing that it is robust to sub-period sampling. The lower contrarian profits in the second half is due to the greater underperformance of losers in the second half, compared to the first half, relative to the corresponding underperformance of winners. The returns of both industry winners and industry losers are consistently positive for all investment periods and across whole, first half and second half sample periods. Hence, contrarian profitability arises from losers outperforming winners, and not because winners sustain losses. Prior losses are greater for longer ranking periods. Contrarian investment period profits increase directly with the ranking period, showing that overreaction is stronger the longer the prior ranking period and hence, the bigger the prior losses. In expanding the investment period to 10 years, we document that there is no contrarian reversal up to 10 years. A contrarian strategy based on a 7-year ranking period and an investment period of 10 years is most profitable.

Ball et al. (1995) use the 5-year buy-and-hold return as a measure of contrarian profit. In evaluating the CAPM betas and alphas (Table 6, Page 101), they use the annual return of the losers and winners. Their contrarian beta (alpha) is the difference between the losers beta (alpha) and winners beta (alpha). This is correct only for an arbitrage portfolio that is rebalanced annually. Caution must be exercised in using annual buy-and-hold excess return in any risk-adjustment regression done to explain the risk of a buy-and-hold contrarian portfolio that is held for the entire investment period without any annual rebalancing. Strictly, the difference in the losers and winners beta (alpha) in such analysis does not correspond to the risk (risk-adjusted return) of the long-term buy-and-hold contrarian portfolio, as the absolute dollar amount in losers and winners is the same only in the beginning of the first event year for a long-term portfolio that is not rebalanced annually. To obtain the contrarian beta (alpha), the losers and winners beta (alpha) must be weighted first by the respective dollar amount of losers and winners before their difference is taken to arrive at the contrarian beta (alpha).

For the unconditional CAPM regression, the difference in unconditional beta of losers and winners is too small to account for any material portion of contrarian profits. In a conditional setting, the CAPM betas of industry losers exhibit an attractive feature: being less sensitive than industry winners in down-market and more responsive in up-market. This is consistent with similar findings (DeBondt and Thaler (1987) and Ball et al. (1995)) in the context of stock contrarian. It supports the notion that industry losers are less risky than industry winners. The difference in covariation of beta with market premium between losers and winners accounts for at least half of the contrarian profits documented. There is as yet no

solid theoretical explanation for this unique time variation of the beta of losers and winners, and much fruitful research can be done in this area.

Similarly, a conditional Fama-French framework can explain contrarian profits better than an unconditional Fama-French framework. In a conditional Fama-French setting, the losers market beta and SMB loadings also exhibit the same appealing characteristics: being less sensitive when the corresponding factor returns are negative in a down-market, and more responsive to their positive factor returns in up-market.

Raw and risk-adjusted profits of both losers and winners are reduced after January returns are excluded, with a greater drop in raw return of losers compared to winners. These results are consistent with tax loss selling of losers in December together with the subsequent rebound of prices in January.

Microstructure effects do materially affect the returns of industry contrarian, losers and winners portfolio. However, industry contrarian remains economically significant for longer tenors, even after adjusting for these effects via skipping a month and a $\$1/8$ price adjustment. The 1-month lag effect is stronger than the impact of $\$1/8$ price adjustment. As expected, microstructure effects affect industry losers more than industry winners. However, the effect is more muted when compared to that found in individual stock losers. This is expected as industry losers are expected to have a higher average price than individual stock losers. NYSE started moving from fractional to decimal pricing in 2000 for seven selected stocks and completed this pricing for all stocks in 2001. Although this has not affected our sample, a $\$1/8$ price adjustment for future out-of-sample studies of long-term contrarian may be an over-adjustment in view of the lower microstructure impact caused by decimalization.

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Table 1.1 Formation of Industry Portfolios and Summary Statistics of Industries

Industries are formed using CRSP SIC Codes based on two-digit SIC Code industry grouping with details as given. The table provides details of the average number of stocks, average percentage of total market capitalization, mean and median monthly returns (%), average standard deviation (%) and average skewness of returns of each industry. The averages are obtained by averaging across monthly data from Jan 1925 to December 2001. Average standard deviation and skewness are the time-series average of the monthly cross sectional standard deviation and skewness of stocks within each industry respectively. We also report F-statistic that the mean monthly returns are equal across industries. The p-values for the F-statistic are in parentheses.

	Industry	SIC Codes	Avg. no. of Stocks	Avg. % Market Cap	Mean Returns	Median Returns	Standard Deviation	Skewness
1	Mining	10-14	134	2.36	1.4393	0.0045	14.1370	1.2294
2	Food	20	94	4.56	1.2266	0.4238	10.4182	0.8647
3	Apparel	22-23	74	0.78	1.0584	0.1276	11.8495	0.7463
4	Paper	26	37	4.42	1.4524	0.6977	10.0060	0.4950
5	Chemical	28	142	7.91	1.3939	0.4685	11.4011	1.0155
6	Petroleum	29	35	24.28	1.3465	0.6312	9.2473	0.6803
7	Construction	32	35	2.98	1.2402	0.5031	9.9516	0.5433
8	Prim. Metals	33	75	3.62	1.3038	0.3782	10.7444	0.8533
9	Fab. Metals	34	73	2.22	1.2662	0.3200	11.0870	0.8665
10	Machinery	35	176	3.52	1.3485	0.3483	12.0293	1.0746
11	Electrical Eq.	36	191	4.85	1.4728	0.1902	12.9708	1.0932
12	Transport Eq.	37	90	5.78	1.3255	0.2965	11.4813	0.9289
13	Manufacturing	38-39	144	2.99	1.3524	0.1592	12.8232	1.0175
14	Railroads	40	34	4.80	1.4029	0.6069	10.2417	0.5322
15	Other Transport.	41-47	59	1.36	1.2448	0.0541	12.4467	0.7455
16	Utilities	49	119	7.01	1.1430	0.7274	7.5751	0.7779
17	Dept. Stores	53	41	7.80	1.2152	0.5390	10.2124	0.5076
18	Retail	40-52, 54-59	242	1.47	1.2069	0.1403	12.6997	1.2685
19	Financial	60-69	413	2.67	1.3490	0.5184	10.6894	1.1889
20	Other	other	607	4.63	1.3431	0.1123	13.7106	1.6319
	Average		141	5.00	1.3066	0.3624	11.2861	0.9031
	F-statistic (all the same)				0.1541			
	(p-value)				(1.00)			

Table 1.2 Buy-and-hold returns for Industry Contrarian, Losers and Winners portfolios for whole sample period and two sub periods

This table reports the average of the investment period buy-and-hold returns of the industry arbitrage, losers and winners portfolios for the whole sample period and two sub periods. The (losers, winners) are formed by taking equal weights of the three industries with the (lowest, highest) buy-and-hold returns during the ranking period. Stocks are equally weighted within each industry portfolio. The arbitrage portfolio invests in the losers and shorts the same dollar amount in the winners at the beginning of the investment period. For the whole sample period, there are altogether 71, 67, 65 and 63 overlapping ranking and investment periods of 3-, 5-, 6- and 7-year duration respectively. The full sample investment period is 1929-2001, 1931-2001, 1932-2001, 1933-2001 for the 3-, 5-, 6- and 7-year investment period respectively. As there are odd numbers of overlapping ranking/investment periods, the whole sample is divided into two almost equal sub periods with the second half sample having 1 more ranking/investment period. Panel A, B and C reports the average buy-and-hold return of the arbitrage, losers and winners portfolio respectively. The p-values are in parentheses testing if the arbitrage portfolios are profitable, the returns of the losers and winners are different from zero and whether there is a significant difference in the returns of the arbitrage, winners and losers portfolios in the 2 sub periods. They are adjusted for autocorrelation using the Newey and West (1987) correction.

Panel A: Buy-and-hold Return of Arbitrage Portfolio				
Ranking/Investment Period	3-Year	5-Year	6-Year	7-Year
Full Sample	8.38%	17.09%	32.54%	54.22%
	(0.04)	(0.03)	(0.00)	(0.00)
First Half Sample	9.22%	20.25%	36.55%	66.34%
	(0.07)	(0.04)	(0.00)	(0.00)
Second Half Sample	7.55%	14.04%	28.65%	42.48%
	(0.15)	(0.14)	(0.03)	(0.01)
First Half - Second Half	1.67%	6.21%	7.90%	23.86%
	(0.86)	(0.72)	(0.67)	(0.32)
Panel B: Buy-and-hold Return of Losers Portfolio				
Full Sample	58.77%	118.72%	152.55%	198.27%
	(0.00)	(0.00)	(0.00)	(0.00)
First Half Sample	60.82%	127.93%	158.70%	210.95%
	(0.00)	(0.00)	(0.00)	(0.00)
Second Half Sample	56.77%	109.78%	146.58%	185.98%
	(0.00)	(0.00)	(0.00)	(0.00)
First Half - Second Half	4.05%	18.14%	12.12%	24.97%
	(0.83)	(0.53)	(0.71)	(0.53)
Panel C: Buy-and-hold Return of Winners Portfolio				
Full Sample	50.39%	101.62%	120.01%	144.05%
	(0.00)	(0.00)	(0.00)	(0.00)
First Half Sample	51.60%	107.68%	122.15%	144.61%
	(0.00)	(0.00)	(0.00)	(0.00)
Second Half Sample	49.22%	95.75%	117.93%	143.50%
	(0.00)	(0.00)	(0.00)	(0.00)
First Half - Second Half	2.38%	11.93%	4.22%	1.11%
	(0.88)	(0.63)	(0.87)	(0.97)

Table 1.3 Risk-Adjusted Return and Profit due to Risk: CAPM

The yearly excess returns of the portfolio $p =$ (losers, winners) are regressed against the market premium in both unconditional and conditional CAPM settings. The unconditional model is based on the following regression:

$$R_{p_t}(\tau) - R_{ft}(\tau) = \alpha_p(\tau) + \beta_p(\tau) [Mkt_t - R_{ft}(\tau)] + e_{p_t}(\tau)$$

The conditional model is based on the following regression:

$$R_{p_t}(\tau) - R_{ft}(\tau) = \alpha_p(\tau) + \beta_{UP}(\tau) [Mkt_t - R_{ft}(\tau)] D + \beta_{DN}(\tau) [Mkt_t - R_{ft}(\tau)] (1 - D) + e_{p_t}(\tau)$$

where with respect to an event year τ and calendar year t , $R_{p_t}(\tau)$ is the annual return of the portfolio under study, $R_{ft}(\tau)$ is the risk free rate, $\alpha_p(\tau)$ is the CAPM alpha, $\beta_p(\tau)$ is the CAPM beta, $Mkt_t(\tau)$ is the annual return of the value-weighted index of stocks listed on NYSE, AMEX and Nasdaq, $e_{p_t}(\tau) \sim N(0, \sigma_p(\tau))$. D is a dummy variable which equals one when the market premium is non-negative and is zero otherwise, $\beta_{UP}(\tau)$ is the beta of the portfolio when the market premium is non-negative and $\beta_{DN}(\tau)$ is the beta when the market premium is negative. For contrarian portfolios, the regressand is the annual contrarian return. For brevity, the table reports the results only for the contrarian portfolios. The alphas and betas reported here are the averages of the contrarian portfolios' alphas and betas across all event years in an investment period. The p -values of the alphas are in parentheses. RP_M is the average annual market excess return while $(RP_{M,UP}, RP_{M,DN})$ is the corresponding return when the market premium is (positive, negative). $(\%UP, \%DN)$ is the fraction of years in the regression when the market premium is (positive, negative). The yearly profit for the unconditional case is $(\beta_p \times RP_M)$ and the corresponding Total Profit is obtained by compounding it. $Profit_{UP}$ and $Profit_{DN}$ is $(\beta_{UP} \times RP_{M,UP})$ and $(\beta_{DN} \times RP_{M,DN})$ respectively. The conditional annual profit is $(\%UP \times \beta_{UP} \times RP_{M,UP})$ and $(\%DN \times \beta_{DN} \times RP_{M,DN})$ respectively and the unconditional Total Profit is obtained by compounding it.

Tenor	Unconditional				Conditional									
	Contrarian				Contrarian									
	α_P	β_P	RP_M	Total Profit	α_P	β_{UP}	% UP	$RP_{M,UP}$	PROFIT _{UP}	β_{DN}	% DN	$RP_{M,DN}$	PROFIT _{DN}	Total Profit
3-Year	1.76% (0.36)	0.0555	8.45%	1.41%	-2.41% (0.16)	0.2535	0.6761	18.63%	4.72%	-0.2659	0.3239	-14.83%	3.94%	14.01%
5-Year	1.67% (0.00)	0.0457	9.55%	2.20%	-1.82% (0.32)	0.2071	0.6985	19.34%	4.01%	-0.2732	0.3015	-13.13%	3.59%	20.96%
6-Year	2.18% (0.00)	0.0559	9.35%	3.18%	-0.89% (0.67)	0.1966	0.6974	18.97%	3.73%	-0.2462	0.3026	-12.83%	3.16%	23.33%
7-Year	2.41% (0.01)	0.0929	9.16%	6.11%	0.68% (0.75)	0.1711	0.6961	18.63%	3.19%	-0.0809	0.3039	-12.51%	1.01%	19.08%

Table 1.4 Risk-Adjusted Return and Profit due to Risk: Fama-French

The yearly excess returns of the portfolio $p = (\text{losers, winners})$ are regressed against the market premium in both unconditional and conditional Fama-French three-factor model (hereinafter “FF”) settings. The unconditional FF model is based on the following regression:

$$R_{p_t}(\tau) - R_{ff_t}(\tau) = \alpha_p(\tau) + \beta_{p,Mkt}(\tau) [Mkt_t - R_{ff_t}(\tau)] + \beta_{p,SMB}(\tau) SMB_t + \beta_{p,HML}(\tau) HML_t + e_{p_t}(\tau)$$

The conditional model is based on the following regression:

$$R_{p_t}(\tau) - R_{ff_t}(\tau) = \alpha_p(\tau) + \beta_{Mkt,UP}(\tau) [Mkt_t - R_{ff_t}(\tau)] D + \beta_{Mkt,DN}(\tau) [Mkt_t - R_{ff_t}(\tau)] (1 - D) + \beta_{SMB,UP}(\tau) SMB_t D + \beta_{SMB,DN}(\tau) SMB_t (1 - D) + \beta_{HML,UP}(\tau) HML_t D + \beta_{HML,DN}(\tau) HML_t (1 - D) + e_{p_t}(\tau)$$

where, with respect to an event year τ and calendar year t , $R_p(\tau)$ is the annual return of the portfolio under study, $R_{ff}(\tau)$ is the risk free rate, $\alpha_p(\tau)$ is the CAPM alpha, $\beta_{p,Mkt}(\tau)$ is the FF factor loading for the market excess return, $Mkt_t(\tau)$ is the annual return of the value-weighted index of stocks listed on NYSE, AMEX and Nasdaq, $\beta_{p,SMB}(\tau)$ is the factor loading for $SMB_t(\tau)$ (return on the mimicking portfolio for risk related to size), $\beta_{p,HML}(\tau)$ is the factor loading for $HML_t(\tau)$ (return on the mimicking portfolio for risk related to book-to-market equity) and $e_{p_t}(\tau) \sim N(0, \sigma_p(\tau))$. D is a dummy variable which equals one when the market premium is non-negative and is zero otherwise. The subscripts (*up, down*) associated with the three-factor loadings are used to indicate the factor loadings when the market is (non-negative, negative) respectively. For contrarian portfolio, the regressand is the annual contrarian return. For brevity, we report the results only for the contrarian portfolios. The alphas, market betas, SML and HML factor loadings reported here are the averages of the alphas, market betas, SML and HML factor loadings across all event years in an investment period respectively. The p -values of the alphas are in parentheses. RP_M is the average annual market excess return while $RP_{M,UP}$ ($RP_{M,DN}$) is the corresponding return when the market premium is positive (negative). Panel A (Panel B) shows the summary of the results for the unconditional, (conditional) FF regressions. Unconditional Total Profit is calculated by compounding the annual profit, which is the sum of three (factor loadings x corresponding factor returns). Conditional Total Profit is calculated by compounding the annual profit, which is the sum of the total of the three (factor loadings x factor returns x fraction of years in specified state), over the 2 states.

Tenor	Panel A: Unconditional Fama-French time-series regression							
	α_p	β_{Mkt}	RP_M	β_{SMB}	SMB	β_{HML}	HML	Total Profit
3-Year	0.63% (0.63)	-0.0639	0.0845	0.3321	0.0386	0.1596	0.0494	4.67%
5-Year	-0.06% (0.76)	-0.0918	0.0955	0.3219	0.0375	0.3067	0.0549	10.48%
6-Year	0.24% (0.53)	-0.0614	0.0935	0.2187	0.0341	0.3804	0.0564	14.73%
7-Year	0.62% (0.35)	0.0104	0.0916	0.1309	0.0320	0.3450	0.0574	18.83%

Table 1.4 - Continued

Panel B: Conditional Fama-French time-series regression														
Tenor	α_P	$\beta_{Mkt, UP}$	$RP_{M, UP}$	$\beta_{Mkt, DN}$	$RP_{M, DN}$	$\beta_{SMB, UP}$	SMB_{UP}	$\beta_{SMB, DN}$	SMB_{DN}	$\beta_{HML, UP}$	HML_{UP}	$\beta_{HML, DN}$	HML_{DN}	Total Profit
3-Year	-2.75% (0.14)	0.0754	0.1863	-0.2710	-0.1483	0.3894	0.0748	-0.0244	-0.0369	0.1460	0.0535	0.1819	0.0409	15.83%
5-Year	-2.27% (0.24)	-0.0215	0.1934	-0.1841	-0.1313	0.3947	0.0708	-0.1294	-0.0398	0.3066	0.0581	0.2469	0.0474	22.50%
6-Year	-1.61% (0.47)	-0.0002	0.1897	-0.1668	-0.1283	0.2681	0.0673	-0.0759	-0.0422	0.3792	0.0600	0.3501	0.0480	27.22%
7-Year	-0.12% (0.96)	0.0243	0.1863	-0.0554	-0.1251	0.1506	0.0644	-0.0002	-0.0420	0.3665	0.0614	0.2598	0.0483	24.24%

Table 1.5 : Impact of excluding January on Raw- and Risk-Adjusted Returns

Panel A, B, C reports the monthly raw and risk-adjusted returns for investment period of 3-year, 5-year, 6-year and 7-year for losers, winners, and contrarian respectively. Raw Return is the average across all months and all runs and is reported for All Months and All Months excluding January. Risk-adjusted Return (CAPM) and Risk-adjusted Return (Fama-French) is the regression intercept when the monthly excess returns of the portfolios are regressed against the market excess returns and the Fama-French three-factor returns respectively, over the months specified and across all runs. The p-values are in parentheses.

Panel A: Losers						
Period	Raw Return		Risk-Adjusted Return (CAPM)		Risk-Adjusted Return (Fama-French)	
	All Months	All Months excluding Jan	All Months	All Months excluding Jan	All Months	All Months excluding Jan
3-year	1.32% (0.00)	0.89% (0.00)	0.20% (0.02)	-0.12% (0.15)	-0.03% (0.65)	-0.12% (0.06)
5-year	1.38% (0.00)	1.02% (0.00)	0.19% (0.00)	-0.08% (0.18)	-0.03% (0.47)	-0.08% (0.09)
6-year	1.36% (0.00)	1.05% (0.00)	0.19% (0.00)	-0.04% (0.40)	-0.03% (0.41)	-0.04% (0.25)
7-year	1.37% (0.00)	1.08% (0.00)	0.22% (0.00)	0.00% (0.95)	-0.01% (0.75)	-0.02% (0.62)
Panel B: Winners						
Period	Raw Return		Risk-Adjusted Return (CAPM)		Risk-Adjusted Return (Fama-French)	
	All Months	All Months excluding Jan	All Months	All Months excluding Jan	All Months	All Months excluding Jan
3-year	1.14% (0.00)	0.88% (0.00)	0.02% (0.68)	-0.13% (0.02)	-0.10% (0.03)	-0.12% (0.01)
5-year	1.23% (0.00)	0.97% (0.00)	0.02% (0.66)	-0.15% (0.00)	-0.08% (0.01)	-0.11% (0.00)
6-year	1.17% (0.00)	0.91% (0.00)	-0.01% (0.85)	-0.18% (0.00)	-0.09% (0.00)	-0.13% (0.00)
7-year	1.13% (0.00)	0.90% (0.00)	-0.01% (0.86)	-0.16% (0.00)	-0.10% (0.00)	-0.13% (0.00)
Panel C: Contrarian						
Period	Raw Return		Risk-Adjusted Return (CAPM)		Risk-Adjusted Return (Fama-French)	
	All Months	All Months excluding Jan	All Months	All Months excluding Jan	All Months	All Months excluding Jan
3-year	0.18% (0.02)	0.01% (0.91)	0.18% (0.02)	0.01% (0.85)	0.07% (0.35)	0.00% (0.99)
5-year	0.15% (0.01)	0.05% (0.38)	0.17% (0.00)	0.07% (0.21)	0.05% (0.36)	0.04% (0.48)
6-year	0.19% (0.00)	0.14% (0.01)	0.20% (0.00)	0.14% (0.01)	0.06% (0.21)	0.09% (0.08)
7-year	0.24% (0.00)	0.17% (0.00)	0.22% (0.00)	0.16% (0.00)	0.08% (0.06)	0.11% (0.02)

Table 1.6 Industry buy-and-hold return and return adjusted for \$½ upward price adjustment and incorporating a one-month lag

Raw Return represents the buy-and-hold return of the industry arbitrage, losers and winners portfolios. Return: adjusted for \$½ is the return after adjusting the end of ranking period's price of the stocks within a portfolio upward by \$½. Return: 1-Month Lag Effect represents the return after incorporating a 1-month lag between the end of the ranking period and the beginning of the investment period. For the whole sample period, there are altogether 71, 67, 65 and 63 overlapping ranking and investment periods of 3-, 5-, 6- and 7-year duration respectively. The full sample investment period is 1929-2001, 1931-2001, 1932-2001, 1933-2001 for the 3-, 5-, 6- and 7-year investment period respectively. As there are odd numbers of overlapping ranking/investment periods, the whole sample is divided into two almost equal sub periods with the second half sample having 1 more ranking/investment period. Panel A shows the raw and adjusted returns for the full sample period ("Full") and the 3- to 7-year ranking/investment period. Panel B shows the whole sample, first half sample ("H1") and second half sample ("H2") period results for the 7-year ranking/investment period. The p-values are in parentheses testing if the arbitrage portfolios are profitable and if the return of the losers and winners are different from zero.

Panel A: Whole Sample Period									
Full Period	Arbitrage Portfolio Return			Losers Return			Winners Return		
	Raw	Adjusted for \$½	Skip 1-Month	Raw	Adjusted for \$½	Skip 1-Month	Raw	Adjusted for \$½	Skip 1-Month
3-year	8.38% (0.04)	6.52% (0.08)	4.83% (0.14)	58.77% (0.00)	54.01% (0.00)	53.90% (0.00)	50.39% (0.00)	47.49% (0.00)	49.07% (0.00)
5-year	17.09% (0.03)	13.66% (0.05)	11.21% (0.08)	118.72% (0.00)	111.80% (0.00)	110.29% (0.00)	101.62% (0.00)	98.13% (0.00)	99.07% (0.00)
6-year	32.54% (0.00)	28.50% (0.00)	27.06% (0.00)	152.55% (0.00)	145.56% (0.00)	143.13% (0.00)	120.01% (0.00)	117.07% (0.00)	116.06% (0.00)
7-year	54.22% (0.00)	48.90% (0.00)	46.66% (0.00)	198.27% (0.00)	190.17% (0.00)	187.63% (0.00)	144.05% (0.00)	141.27% (0.00)	140.97% (0.00)
Panel B: Full Sample, First Half (H1) and Second Half (H2) Periods for Ranking Period / Investment Period of 7 Years									
Period	Arbitrage Portfolio Return			Losers Return			Winners Return		
	Raw	Adjusted for \$½	Skip 1-Month	Raw	Adjusted for \$½	Skip 1-Month	Raw	Adjusted for \$½	Skip 1-Month
Full	54.22% (0.00)	48.90% (0.00)	46.66% (0.00)	198.27% (0.00)	190.17% (0.00)	187.63% (0.00)	144.05% (0.00)	141.27% (0.00)	140.97% (0.00)
H1	66.34% (0.00)	60.69% (0.00)	56.06% (0.00)	210.95% (0.00)	202.41% (0.00)	199.24% (0.00)	144.61% (0.00)	141.72% (0.00)	143.18% (0.00)
H2	42.48% (0.01)	37.47% (0.02)	37.55% (0.02)	185.98% (0.00)	178.31% (0.00)	176.38% (0.00)	143.50% (0.00)	140.84% (0.00)	138.83% (0.00)
H1-H2	23.86% (0.32)	23.21% (0.31)	18.51% (0.40)	24.97% (0.53)	24.10% (0.53)	22.86% (0.51)	1.11% (0.97)	0.89% (0.97)	4.35% (0.87)

Table 1.7 Time-Series of Arbitrage, Losers and Winners over 10 years for various Ranking Periods

This table presents the year-by-year return of the Industry Arbitrage, Losers and Winners portfolios over ten years. The ranking period ranges from 3 years to 7 years. There are 64, 62, 61 and 60 runs for the 3-year, 5-year and 6-year and 7-year ranking period respectively. Their corresponding investment periods cover 1929–2001, 1931–2001, 1932–2001, and 1933–2001. P-values are in parentheses.

Rank Period	Ranking Period = 3 Year			Ranking Period = 5 Year			Ranking Period = 6 Year			Ranking Period = 7 Year		
	Arbitrage Portfolio	Losers	Winners	Arbitrage Portfolio	Losers	Winners	Arbitrage Portfolio	Losers	Winners	Arbitrage Portfolio	Losers	Winners
Rank Period	-105.16% (0.00)	10.27% (0.14)	115.42% (0.00)	-169.53% (0.00)	30.63% (0.00)	200.15% (0.00)	-200.73% (0.00)	42.63% (0.00)	243.36% (0.00)	-238.49% (0.00)	57.77% (0.00)	296.27% (0.00)
1 Year	-0.65% (0.37)	14.86% (0.00)	15.51% (0.00)	5.41% (0.05)	20.11% (0.00)	14.70% (0.00)	4.26% (0.13)	20.69% (0.00)	16.43% (0.00)	6.39% (0.08)	22.29% (0.00)	15.90% (0.00)
2 Year	4.46% (0.11)	37.36% (0.00)	32.90% (0.00)	8.96% (0.03)	43.13% (0.00)	34.17% (0.00)	11.00% (0.03)	45.54% (0.00)	34.54% (0.00)	12.80% (0.03)	45.96% (0.00)	33.16% (0.00)
3 Year	10.34% (0.02)	60.39% (0.00)	50.04% (0.00)	13.50% (0.03)	67.06% (0.00)	53.56% (0.00)	17.02% (0.02)	69.08% (0.00)	52.06% (0.00)	22.39% (0.01)	71.99% (0.00)	49.60% (0.00)
4 Year	16.51% (0.01)	90.30% (0.00)	73.80% (0.00)	18.69% (0.03)	94.15% (0.00)	75.45% (0.00)	27.05% (0.01)	100.58% (0.00)	73.54% (0.00)	32.95% (0.00)	103.02% (0.00)	70.07% (0.00)
5 Year	21.28% (0.01)	118.33% (0.00)	97.05% (0.00)	22.32% (0.01)	122.87% (0.00)	100.55% (0.00)	33.63% (0.00)	128.85% (0.00)	95.22% (0.00)	38.24% (0.00)	128.80% (0.00)	90.56% (0.00)
6 Year	25.53% (0.01)	145.95% (0.00)	120.42% (0.00)	27.60% (0.00)	153.38% (0.00)	125.78% (0.00)	37.96% (0.00)	157.11% (0.00)	119.15% (0.00)	45.83% (0.00)	162.90% (0.00)	117.07% (0.00)
7 Year	32.68% (0.00)	182.22% (0.00)	149.54% (0.00)	35.12% (0.00)	186.59% (0.00)	151.47% (0.00)	51.27% (0.00)	197.09% (0.00)	145.83% (0.00)	57.59% (0.00)	201.50% (0.00)	143.91% (0.00)
8 Year	46.62% (0.00)	227.79% (0.00)	181.17% (0.00)	51.44% (0.00)	232.74% (0.00)	181.30% (0.00)	68.66% (0.00)	243.54% (0.00)	174.88% (0.00)	78.40% (0.00)	250.11% (0.00)	171.71% (0.00)
9 Year	61.84% (0.00)	272.10% (0.00)	210.26% (0.00)	68.64% (0.00)	279.37% (0.00)	210.73% (0.00)	85.31% (0.00)	295.85% (0.00)	210.54% (0.00)	98.37% (0.00)	303.19% (0.00)	204.82% (0.00)
10 Year	79.71% (0.00)	324.81% (0.00)	245.10% (0.00)	84.20% (0.00)	331.83% (0.00)	247.63% (0.00)	100.67% (0.00)	353.02% (0.00)	252.35% (0.00)	112.59% (0.00)	359.13% (0.00)	246.55% (0.00)

Figure 1.1 10 Year investment period returns of Contrarian, Losers and Winners Portfolios

This figure shows the year-by-year buy-and-hold return of Contrarian, Losers and Winners over ten years which have a ranking period of 5 years. The returns are the average of 62 runs with the investment period covering 1931 – 2001.

ESSAY 2

TRADING VOLUME AND CONTRARIAN PROFITABILITY

2.1 Introduction and Literature Review

2.1.1 Introduction

A growing body of literature focuses on the relationship between trading volume and stock returns. Trading volume serves many functions: it reflects divergence of opinion, reveals private information, is used as a measure of liquidity and facilitates the price discovery process. Volume can be used to predict stock returns (Hvidkjaer (2006), Lee and Swaminathan (2000), and Llorente, Michaely, Saar and Wang (2002)) and is in turn predicted by it (Gallant, Rossi and Tauchen (1992), and Statman, Thorley and Vorkink (2006)). Pastor and Stambaugh (2003) document that their liquidity measure can help account for volume-related return reversals.

Lee and Swaminathan (2000) find that short-term winners with high prior volume and short-term losers with low prior volume experience faster reversals. Momentum portfolios which buy high volume winners and sell low volume losers are profitable in the first year and start reversing from the second year while momentum portfolios which buy low volume winners and sell high volume losers are profitable for the first four years but start reversing in the fifth year. The return reversals increase monotonically with the length of the formation period. This finding suggests that contrarian strategy, which buys losers and sells winners (the reverse of momentum strategy), is expected to be profitable when the return ranking period is extended. Prior research on trading volume focuses on the interaction of short-term prior return and short-term lagged volume and their effects on asset pricing, with prior return and lagged volume typically evaluated up to a year.

This paper studies the pivotal role that long-term trading volume plays in enhancing the profitability of long-term contrarian profits. Enhancing contrarian profits is crucial as they are lower in the more recent past (Ball, Kothari and Shanken (1995), Fama and French (1996)). To enhance its profits using trading volume, we need to differentiate the performance of losers and winners when conditioned upon trading volume. As high (low) volume short-term winners (losers) reverse faster when prior volume is measured over the short-term, we test the hypothesis that when prior volume is evaluated over longer periods, it provides similar information on long-term portfolios and predicts faster reversal for high volume long-term winners and low volume long-term losers.

Our study documents that low volume losers outperform high volume losers by 44.03%, while low volume winners outperform high volume winners by 12.94% for a return ranking and investment period of 5 years and when prior volume is evaluated over 2 years. This suggests that a long-term contrarian strategy that buys low volume losers and sells high volume winners (“early stage contrarian strategy” or “early contrarian strategy” for short) can significantly outperform an alternative strategy which buys high volume losers and sells low volume winners (“late stage contrarian strategy” or “late contrarian strategy” for short). Indeed, over a 5-year investment horizon, the early stage contrarian strategy’s average profit is a high 74.22%, while the late stage contrarian strategy chalks up a meager 17.26%. The early stage strategy outperforms the late stage strategy by a huge 56.96% and outperforms the simple contrarian strategy by 19.90%. Similarly, for ranking and investment period of 3, 6 and 7 years, the early strategy outperforms the late stage strategy by 58.89%, 57.44% and 40.93% respectively.

To control for microstructure influences, the price of stocks at the end of the ranking period is adjusted upward by $\frac{1}{8}$ and also a one-month lag is instituted between the ranking and investment periods. Though contrarian profits are reduced, the 5-year early stage strategy still commands a respectable 42.39% and 51.53% after the $\frac{1}{8}$ and one-month lag adjustments respectively. It still outperforms the unconditional contrarian strategy, which in turn outperforms the early stage strategy. Qualitatively similar results are obtained after adjusting for size and risk (CAPM, Fama and French three factors, and Fama-French three factors augmented by a liquidity factor). Consistent with tax loss selling, raw and risk-adjusted returns of losers that exclude January are lower than those that include all months. Our results are also robust to choice of stock exchange, different prior volume evaluation periods and ways of partitioning the return-volume portfolios. We investigate performance when the prior trading volume is evaluated over the past 1 year and 3 years and reach similar conclusions.

Typical long-term contrarian studies use a 3- or 5-year time frame. We contribute to the literature by both extending the maximum time horizon to 7 years and also evaluating the impact of information contained in volume data. We find that early stage contrarian strategy outperforms late stage contrarian strategy across all time horizons (3, 5, 6 and 7 years). The overreaction models contained in Barberis, Shleifer and Vishny (1998), Hong and Stein (1999), and Daniel, Hirshleifer and Subrahmanyam (1998) predict stock price reversal following overreaction but do not give a time frame as to when it occurs. Our study shows that for a given ranking period (3 to 7 years), trading volume predicts faster reversal for low volume losers and high volume winners.

2.1.2 Literature Review

In this sub section, we review related literature on long-term contrarian profits, importance of trading volume, studies on momentum-volume interaction, and impact of tax loss selling.

In one of the pioneering papers on long-term contrarian profits, DeBondt and Thaler (1985) find that past losers outperform past winners when stocks are ranked based on prior 3- to 5-year returns. Chopra, Lakonishok and Ritter (1992), DeBondt and Thaler (1985, 1987) and Lakonishok, Shleifer and Vishny (1994) ascribe long-term reversals to investor overreaction. Using CAPM, DeBondt and Thaler (1987) perform a dual-beta time series regression on test period returns and show that the losers beta is (higher, lower) than the winners beta in an (up, down) market. They reason that the positive covariance between the losers' beta and the realized market return means that the losers cannot be considered more risky than the winners. Fama and French (1996) document that long-term reversals can be captured by their three-factor model. They form winners and losers every month, based on their prior long-term returns but hold the portfolios only for a single month. Our volume-based early stage contrarian strategy is held for years and is robust to both CAPM and Fama and French three-factor risk adjustments. The long reversion half-life documented in Gropp (2004) and Balvers, Wu and Gilliland (2000) suggests that longer formation periods should be explored to enhance contrarian profits. We extend the typical 3- to 5-year ranking period of prior contrarian studies to 7-year and find that profits of conditional, early stage and late stage contrarian strategies increase with length of ranking and investment periods.

To gauge microstructure effects, Ball, Kothari and Shanken (1995) adjust the price of stocks at the end of the ranking period upward by $\frac{1}{8}\%$. Though the

return of their 5-year contrarian portfolio is reduced by a substantial 23%, it is still high at 65%.

Differences in opinions between market participants is reflected in trading volume (Odean (1998a), Harris and Raviv (1993), and Hong and Stein (2003)). Further, sequences of prices and volume have important information content if prices do not react quickly to new information (Blume, Easley and O'Hara (1994)) and trading reveals investors' private information (Chae (2005), and He and Wang (1995)). Datar, Y. Naik and Radcliffe (1998) and Chordia, Subrahmanyam and Anshuman (2001), using turnover, and dollar trading volume and share turnover respectively as proxy for liquidity, document that stock returns are negatively related to liquidity.

Based on U.S. sample, Lee and Swaminathan (2000) find that for a 6-month return and volume ranking period, firms with high prior volume underperform low volume firms over the next few years but outperform them over the prior few years. They document that past trading volume can be used to forecast both the strength and persistence of return momentum. They propose a Momentum Life Cycle hypothesis that identifies low volume winners and high volume losers as early stage momentum stocks, and high volume winners and low volume losers as late stage momentum firms which experience faster reversals. Based on volume and return ranking period of up to 1-year and a 5-year investment horizon, they find that an early stage momentum strategy is more profitable than a late stage momentum strategy. Their study also shows that losers with high prior volume lose more and for longer than low volume losers but winners with high prior volume underperform low volume winners over the next two to five years. They ascribe the returns behavior observed to portfolios of stocks going through a cycle of gaining favor

(accompanied by increasing volume) and losing favor (accompanied by decreasing volume). Based on the reversals observed, they conclude that part of initial momentum profits can be attributed to overreaction. Using information embedded in trading volume, they show the link between short-term momentum and longer-term return reversals. Corroborating evidence that volume can be used as a proxy for investor sentiment is documented in Hvidkjaer (2006).

Using weekly returns of seven Asian countries, Ding, McNish and Wongchoti (2005) find international evidence supporting Lee and Swaminathan's Momentum Life Cycle hypothesis. Wang and Chin (2004) find that in China, low-volume stocks exhibit momentum, whereas high-volume stocks' momentum strategies are unprofitable, due to the return reversal of high-volume winners. Lee and Swaminathan (2000) focus on short-term momentum strategies based on individual stocks' prior performance and trading volume measured over a maximum of 1 year. As the reversals of momentum in prior momentum studies which have short ranking period occur quite some time into the investment period, a longer ranking period is required to improve the chance of a contrarian strategy being profitable almost immediately after the start of the investment period. Hence, this study focuses on long-term contrarian strategies based on stocks' performance over prior 3-year to 7-year ranking periods and their trading volume over the prior 2 years.

Based on weekly returns, Connolly and Stivers (2003) document large momentum (positive autocorrelation) when the latter week turnover is unexpectedly high, and substantial reversal (negative autocorrelation) when the subsequent week turnover is unexpectedly low. Chui, Titman and Wei (2005) find that more individualistic countries tend to have higher trading volume, and that momentum is

positively related to individualism. They also document that stronger momentum tends to be followed by stronger long-term reversal, consistent with overreaction.

Chan and Kot (2005) also evaluate early stage and late stage momentum strategies, but their study is based on the interaction between momentum and contrarian. They find that raw and risk-adjusted profits from an early stage momentum strategy of buying short-term winners (which are also long-term losers) and shorting short-term losers (which are also long-term winners) is bigger than a late stage momentum strategy of buying short-term winners (which are also long-term winners) and shorting short-term losers (which are also long-term losers). Short-term winners (long-term losers) and short-term losers (long-term winners) indicate the beginning of the reversal of the long-term price trends. Hence, their respective short-term gains and losses are expected to continue for longer.

Asness (1997) documents that value strategies perform best among low-momentum stocks and are weakest among high-momentum stocks. He documents that momentum strategy performs better among low-value stocks compared to high-value stocks, indicating an interaction between value and momentum strategies. As a result, we expect higher contrarian profit (closely related to value strategies) when momentum profits are weak (high volume winners, low volume losers) or beginning to show reversals and lower contrarian profits when momentum strategies exhibit strong continuation (low volume winners, high volume losers).

George and Hwang (Journal of Finance, forthcoming) and Grinblatt and Moskowitz (2004) document impact of tax loss selling on losers (which cause losers price to fall near year-end and recover in January) and its spillover effect on winners. To study the impact of tax loss selling, our analysis compares returns over all months with those that exclude January.

The rest of this paper is organized as follows: Section 2.2 discusses data sources, sample identification and sample period while Section 2.3 describes the formation of the various return-volume and contrarian portfolios, and adjustments for microstructure, risk and January effects. Our empirical findings and various robustness tests are reported in Section 2.4 while Section 2.5 concludes the paper and discusses behavioral explanations for our findings.

2.2 Data Sources, Identification of Sample and Sample Period

Data sources are the same as that described in Essay I. In addition, the returns of the liquidity factor to be used for some of the time-series regressions are obtained from Wharton Research Data Services (WRDS). We use the updated value-weighted traded factors as a proxy for the non-traded liquidity factor of Pastor and Stambaugh (2003). The returns of the traded factors are the value-weighted average return on stocks with high sensitivities to the Pastor-Stambaugh liquidity measure less the value-weighted average return on stocks with low sensitivities to that measure. This is same value-weighted traded liquidity factor used to augment the Fama-French three-factors in Avramov and Chordia (2006). We use the buy-and-hold return metric and treatment of delisted stocks as adopted in Essay 1.

The initial sample consists of all ordinary common stocks listed on NYSE, AMEX or Nasdaq. As the sample consists only of ordinary common stocks (share code 10 and 11), it excludes American Depositary Receipts (ADRs), Real Estate Investment Trusts (REITs), prime, foreign companies and closed-end funds. The sample for our baseline study is based on stocks listed on NYSE/AMEX/Nasdaq. For robustness, we replicate our study on stocks listed only on NYSE/AMEX and

also investigate those listed on Nasdaq. Hence, only stocks which remain in the same exchange throughout the sample period are included.

For the 3-year period, the first ranking period, first investment period, last investment period and number of runs are (1963 – 1965, 1966 – 1968, 1999 – 2001, 34) respectively with a year starting in January and ending in December. The corresponding periods and runs for the 5-year, 6-year and 7-year periods are (1963 – 1967, 1968 – 1972, 1997 – 2001, 30), (1963 – 1968, 1969 – 1974, 1996 – 2001, 28) and (1963 – 1969, 1970 – 1976, 1995 – 2001, 26) respectively. To test microstructure effects, we also study investment periods which skip a month from the end of the ranking period. Hence the last data month is January 2002.

The sample for our baseline study is based on stocks listed on NYSE, AMEX and Nasdaq. Reported trading volumes on Nasdaq are incompatible with that on NYSE and AMEX as Nasdaq's reported trading volumes are much higher. This is because Nasdaq includes trades among dealers (Gould and Kleidon (1994)). The apparent higher reported trading volumes on Nasdaq are consistent with Atkins and Dyl (1997)'s finding that for firms which change listing from Nasdaq to NYSE from 1988 to 1990, their median volume dropped by about half. Those that switch from AMEX to NYSE experience a small but insignificant increase in trading. To make Nasdaq volume compatible with NYSE volume, Elyasiani, Hauser and Lauterbach (2000) reduces Nasdaq volume by half. Due to changes in order handling and trade-reporting rules by the Securities and Exchange Commission starting 1997 and newer rules relating to riskless principal transactions (effective February 2001), Anderson and Dyl (2005) document that though Nasdaq volumes remain overstated, the reduction in median reported volume is less than half when firms switch from Nasdaq to NYSE. In view of these findings on volume changes,

we adjust our Nasdaq volume by a factor of $(1 - 0.5)$, $(1 - 0.3791)$ and $(1 - 0.3442)$ for the periods January 1982 – Dec 1996, January 1997 – February 2001, and Mar 2001 – December 2002 respectively.

2.3 Methodology

2.3.1 Formation of Early Stage and Late Stage Contrarian Strategies.

We adopt the procedure similar to Lee and Swaminathan (2000) for assigning stocks based on their past returns and trading volumes. For our baseline study, stocks are assigned to one of 10 deciles based on their ranking period returns, and one of three portfolios based on their average monthly trading volumes for the last 2 years of the ranking period. We adopt ranking period of 3, 5, 6 and 7 years. Only stocks that are continuously listed for the whole ranking period are used. Similar to DeBondt and Thaler (1985, 1987), Chopra, Lakonishok and Ritter (1992), and Ball, Kothari and Shanken (1995), firms that are delisted during the investment period are included. Excluding post-ranking delisted stocks would introduce an upward bias to our contrarian results. Trading volume is proxied by the monthly turnover, defined here as the ratio of the monthly number of shares traded to the number of shares outstanding. Raw trading volume is not used as a liquidity measure because it is unscaled and likely to be highly correlated to firm size. Using raw dollar volume would confound the effects of volume and size.

Stocks in the worst performing deciles are grouped in the losers portfolio (R1). Those in the best performing decile are grouped in the winners portfolio (R10). Those in the sixth decile are grouped together and labeled the R6 portfolio. Similarly, stocks with the lowest prior trading volume are grouped in the V1

portfolio, and those with the highest trading volume are grouped in the V3 portfolio. Those whose volumes are in the middle-third are grouped in the V2 portfolio. For the baseline study, prior trading volume is measured over the 2 years before investment. For robustness, prior trading volume is also measured over 1 year and 3 years. The independent sorting by prior return and trading volume gives rise to 30 return-volume portfolios.

A simple contrarian strategy is one that buys the losers (R1) and sells the winners (R10). An early stage contrarian portfolio buys low volume losers (R1V1) and sells high volume winners (R10V3), while a late stage contrarian portfolio buys high volume losers (R1V3) and sells low volume winners (R10V1). The profits of the simple, early stage and late stage contrarian strategies are computed as the difference between the buy-and-hold returns of the losers and winners in these respective portfolios.

For the 3-, 5-, 6- and 7-year ranking period, this process is repeated for a total of 34, 30, 28 and 26 runs respectively.

2.3.2 Microstructure Effects

Similar to the procedure used in Ball, Kothari and Shanken (1995), the prices of all stocks from the winners and losers used to obtain the raw profits in Section 3.1 are adjusted upward by $\$1/8$. This upward adjustment is based on the price of the stock at the end of the ranking period. The buy-and-hold returns of various return-volume portfolios, early stage and late stage contrarian arbitrage portfolio are recomputed to study the impact of this $\$1/8$ upward adjustment.

Further, a one-month lag is incorporated between the end of the ranking period and the beginning of the investment period e.g. if the 3-year ranking period

ends at the end of December 1990, the investment period starts from beginning of February 1991 and the end date of the investment period is also pushed one month later to January 1994. The buy-and-hold returns of the various return-volume portfolios, early stage and late stage contrarian arbitrage portfolios are recomputed to study the impact of incorporating this one-month lag.

2.3.3 Risk Adjustments

Fama and French (1996) report that the three-factor model in Fama and French (1993) can account for many apparent average return anomalies that could not be explained by CAPM. The Fama and French three-factor model is based on the framework that common stocks returns can be ascribed to three common risk factors; namely, market factor, firm size and book-to-market equity. The return of common stock can be expressed as follows:

$$R_{it} - R_{ft} = \alpha_i + \beta_{i, Mkt} (Mkt_t - R_{ft}) + \beta_{i, SMB} SMB_t + \beta_{i, HML} HML_t + e_{it} \quad (2.1)$$

where R_{it} is the return of the stock, R_{ft} is the risk free rate, Mkt_t is the return of the market portfolio, SMB_t is the return on SMB portfolio (mimicking portfolio for risk related to size), HML_t is the return on HML portfolio (mimicking portfolio for risk related to book-to-market-equity). If contrarian profit cannot be explained by the Fama and French factors (i.e. cannot be explained by the Fama and French risk-based asset pricing model), the alpha of the regression of stock excess return on excess market return, return of the SMB and portfolios will be significantly

different from zero. This will then indicate a positive or negative risk-adjusted return. However, the behavioral school does not consider the Fama and French three-factor model as a full risk-based model because they regard the return to the HML mimicking portfolio to be a measure of overall market mispricing, and not as a risk premium related to book-to-market equity risk factor. Hence, the behavioral school would consider the CAPM alpha, rather than the Fama and French alpha, as a more suitable measure for residual returns after controlling for risk.

Based on the above considerations, we subject 30 return-volume portfolios to CAPM risk adjustment. However, we also make risk adjustment, based on the Fama and French's three-factor model, for completeness and to maintain some consistency with many current papers.

2.3.3.1 CAPM Alpha and Beta

For each run, we obtain the annual return of a return-volume portfolio by compounding its monthly returns over the year. To obtain the CAPM alpha and beta, we regress, using Ordinary Least Squares, its annual return against the annual market excess returns as follows:

$$R_{Pt} - R_{ft} = \alpha_P + \beta_P [Mkt_t - R_{ft}] + e_{Pt} \quad (2.2)$$

where, for the month t , R_{Pt} is the annual return of the return-volume portfolio under study, R_{ft} is the risk free rate, α_P is the CAPM alpha (a measure of CAPM risk-adjusted return and is equal to zero if there is no mispricing), β_P is the CAPM beta

and Mkt_t is the annual return of the value-weighted index of stocks listed on NYSE, AMEX or Nasdaq and $e_{Pt} \sim N(0, \sigma_P)$.

2.3.3.2 Fama-French (FF) Alpha and Factor Loadings

Again, we compound the monthly return a volume-return portfolio to obtain its annual return. Using Ordinary Least Squares, we perform the following regression:

$$R_{Pt} - R_{ft} = \alpha_P + \beta_{P,Mkt} [Mkt_t - R_{ft}] + \beta_{P,SMB} SMB_t + \beta_{P,HML} HML_t + e_{Pt} \quad (2.3)$$

where, for the month t , R_{Pt} is the annual return of the return-volume portfolio under study, R_{ft} is the risk free rate, α_P is the FF alpha (a measure of FF risk-adjusted return and is equal to zero if there is no mispricing), $\beta_{P,Mkt}$ is the FF factor loading for the market excess return, $\beta_{P,SMB}$ is the factor loading for SMB_t (return on the mimicking portfolio for risk related to size), $\beta_{P,HML}$ is the factor loading for HML_t (return on the mimicking portfolio for risk related to book-to-market equity), while Mkt_t is the annual return of the value-weighted index of stocks listed on NYSE, AMEX or Nasdaq and $e_{Pt} \sim N(0, \sigma_P)$.

2.3.3.3 Fama-French and Liquidity Factor

Monthly excess returns of the return-volume portfolio (P) are regressed against the market premium, SMB and HML return, and liquidity factor return as follows:

$$R_{pt} - R_{ft} = \alpha_p + \beta_{p,Mkt} [Mkt_t - R_{ft}] + \beta_{p,SMB} SMB_t + \beta_{p,HML} HML_t + \beta_{p,LIQ} LIQ_t + e_{pt} \quad (2.4)$$

where LIQ_t is the return of the updated value-weighted liquidity factor (as described in Section 2.2) in month t and $\beta_{p,LIQ}$ is its factor loading. The regressions are done across all months and all runs during the investment period.

2.3.4 January Effects and Tax Loss Selling

To test the effect of tax loss selling, we obtain the monthly raw and risk-adjusted returns of the various return-volume portfolios when all months are included and when January is included.

2.4 Empirical Results

2.4.1 Stock Characteristics

Table 2.1 presents the prior return, investment period return (test return), volume, price, size and number of stocks as at the end of the ranking period. Similar to Lee and Swaminathan (2000), we perform independent sorting of the stocks by their prior return over the ranking period and prior trading volume, proxied by monthly turnover. The trading volume is evaluated over 2 years before investment. Stocks are sorted into 10 prior return portfolios (R1 to R10) and 3 volume portfolios (V1 to V3). R1 represents the Losers portfolio, R10 the Winners portfolio, and R6 the intermediate return portfolio (“middles”). V1 is the lowest volume portfolio, V2, the intermediate volume portfolio, and V3 is the highest

volume portfolio. Stocks are selected from three exchanges; namely, NYSE, AMEX and Nasdaq.

Prior return and returns are the buy-and-hold return of the equally weighted portfolios during the ranking and investment periods respectively. “Volume” is the average monthly trading turnover (in decimal) of the stocks in the portfolio over the 2 years prior to the ranking period. “Price” is the time-series average of the median stock price of the portfolio as of the end of the ranking period. “Size” is the time-series average of the median stock size rank of the portfolio as of the end of the ranking period, where the rank size is the rank of the stock when all stocks in the sample are ranked and divided into 10 deciles. “N” is the time-series average of the number of stocks in the portfolio. Panel A, B, C and D present the results for the 3-, 5-, 6- and 7-year investment periods respectively.

Insert Table 2.1 here.

When the sample is not conditional upon volume, the ranking period returns of the losers are about the same for all ranking/investment periods, while those of the winners increase with ranking period. The investment period returns of the losers are higher than that of the winners for all ranking and investment periods, confirming earlier findings on stock contrarian profitability of up to 5 years. Our study extends the findings to cover 6- and 7-year ranking periods. Consistent with Lakonishok and Smidt (1986) and Lee and Swaminathan (2000), the prior trading volume of winners is higher than the volume of the losers for all ranking periods.

We focus next on the various return-volume portfolios. For all ranking periods, the prior returns of the losers are about the same for all volume portfolios,

but the prior returns of the winners increase as trading volume increases. For almost all ranking/investment periods, the losers test returns decrease as trading volume increases. An example is Panel B, where the 5-year losers test return decreases from 149.3% to 133.3%, and then decreases further to 105.2% as the trading volume increases.

For the winners, the same mostly holds true, e.g. in Panel B, we see that winners test return at low volume starts at 88.0%, decreases to 79.1% and then decreases further to 75.1%. The above two findings are consistent with Amihud and Mendelson's liquidity hypothesis of higher return for lower liquidity. However, as prior volume increases, the prior returns of the winners increase but their test returns decrease. Thus prior outperformance of the winners with increasing volume leads to underperformance during the investment period, which is also consistent with the overreaction hypothesis.

Except for the prior return of the losers, which is approximately the same across different volume portfolios, our findings are consistent with Lee and Swaminathan (2000)'s finding that high volume firms underperform low volume firms over the next few years, but outperform them over the prior few years. Controlling for volume, the losers outperform the middles, while the middles outperform the winners (except for Panel A: 3-year, V3 column, where losers still outperform winners but the middles give the highest returns).

The prior trading volume for all V1 portfolios is about 0.1, and about 0.6 to 0.8 for the V3 portfolios, depending on the ranking periods. The difference in volume of about 0.7 is not that big. There is no clear discernable relationship between price and volume portfolios after controlling for prior return. As expected, price increases as prior return increases, keeping prior volume the same. This

indicates that there are more lower-priced stocks among the losers. For the same volume, size typically increases as prior return increases, indicating the predominance of small capitalization stocks among the losers. Controlling for prior return, size increases with increasing volume for losers, middles and winners.

For robustness, we investigate the prior return, test return and stock characteristics of prior return portfolios and return-volume portfolios based on stocks traded on NYSE/AMEX only, and stocks traded on Nasdaq.

The results are qualitatively the same as those in Table 2.1, namely:

- 1) For prior return portfolios, the ranking period returns of the losers are about the same for all ranking/investment periods, while those of the winners increase with ranking period. The investment period returns of the losers are higher than those of the winners for all ranking and investment periods, indicating contrarian profitability.
- 2) For all ranking periods of the prior return portfolios, the prior trading volume of the winners is higher than the volume for the losers.
- 3) For the various return-volume portfolios, the prior returns of the losers are about the same for all volume portfolios, but the prior returns of the winners mostly increase as trading volume increases, with the prior returns of the V1 winners always lower than those of the V3 winners. For all ranking/investment periods, the losers test returns decrease as the prior trading volume increases. For the winners, the test returns of the V1 winners are always higher than those of the V3 winners. Except for the prior returns of the losers, which are approximately the same across different volume portfolios, we document that high volume firms underperform low volume firms over the next few years, but outperform them over the prior

few years. Controlling for volume, the losers mostly outperform the middles, while the middles mostly outperform the winners (except for V3 columns of Table 2.3, where there is no clear relationship between losers, middles and winners).

- 4) Price increases as prior return increases, keeping prior volume the same. For the same volume, size also typically increases as prior return increases.

Losers formed from NYSE/AMEX stocks experience less prior losses than that for all 3 exchanges. The winners gain less. This implies that losers (winners) based on Nasdaq stocks perform worse (better) than those based on NYSE/AMEX. The volume of the NYSE/AMEX stocks is higher than the corresponding ones in Table 2.1 (All Exchanges). This is due to the lower volume for stocks listed on Nasdaq, confirming earlier findings of lower liquidity for Nasdaq stocks. Similarly, prices for stocks listed on NYSE/AMEX are higher than those listed on Nasdaq. This again confirms that Nasdaq stocks are typically lower-priced.

2.4.2 Time-Series of Return-Volume Portfolios

Table 2.2 shows the time-series of the various return-volume portfolios for the ranking period of 5 years. We focus on the 5-year ranking period as it is the most common period covered by earlier long-term contrarian studies and for the sake of brevity. The Lagged 5-year results are the fifth year returns of the various return-volume portfolios when a month is skipped between the end of the ranking period and the start of the investment period. P-values indicated are adjusted for Newey and West (1987)'s correction for heteroskedasticity and autocorrelation up to lag 4. Stocks are allocated to 10 size deciles according to their market capitalization at the end of the formation period. Size-adjusted return is obtained by

subtracting the return of the size-decile the stock is in from its raw return. $\frac{1}{8}$ -adjusted returns are obtained when raw returns are recalculated after a $\frac{1}{8}$ adjustment is made to the price of the stock at the end of the ranking period.

Insert Table 2.2 here.

Panel A shows the 'V1 – V3' columns are always positive. This means that controlling for prior return, the raw returns of the V1 portfolio is always greater than the raw returns of the V3 portfolio for every year in the investment period. This difference is greater for losers than for winners. This means that lower volume stocks outperform higher volume stocks, especially among stocks which have performed poorly. As for the arbitrage portfolio (losers – winners), the contrarian profit is higher for low volume stocks (61.28% at the end of 5 years) than for high volume stocks (30.19%). These findings are consistent with Amihud and Mendelson (1986)'s liquidity hypothesis and the empirical findings of Datar, Y. Naik and Radcliffe (1998). The higher contrarian profits for low volume stocks is consistent with the smaller momentum profits of low volume stocks documented in Lee and Swaminathan (2000), since a contrarian strategy is the reverse of a momentum strategy. The high contrarian profit of low volume stocks compared to high volume stocks is driven by the high return of the low volume losers, especially in the first year (28.74%, compared to the 10.95% return of the high volume losers). Skipping a month causes losers return to drop sharply and winners return to go up, causing the contrarian profits for all volume portfolios to decrease in the fifth year. The contrarian profits for the V1, V2 and V3 portfolios at the end of 5 years drop from 61.28%, 54.23% and 30.19% to 38.2%, 30.77% and 7.26% respectively after

skipping a month. This indicates the significant impact of microstructure effects, particularly in the first January of the investment period.

Panel B shows the size-adjusted returns of the various return-volume portfolios. Holding prior return constant, the size-adjusted returns of high volume stocks (V3) are negative after size adjustment. The results for size-adjusted returns are qualitatively the same as those using raw returns. After controlling for prior return, the size-adjusted returns for the low volume portfolios are always higher than that of the high volume portfolios for the Losers and the Winners (see columns 'V1 – V3'). Again, the size-adjusted contrarian profits of low volume stocks (V1) are higher than those of high volume stocks (V3), and is driven mainly by the much higher return of low volume losers vis-à-vis those of the high volume losers.

Panel C shows the effects of $\$1/8$ price adjustment. The results are qualitatively the same as those for raw returns shown in Panel A. The fifth year return of the arbitrage portfolios for the various volume categories show that the $\$1/8$ adjustment reduces contrarian profits substantially.

2.4.3 Time-Series of Simple, Early and Late Contrarian Strategies

A simple contrarian strategy is a dollar-neutral portfolio formed by buying the losers (R1) portfolio and shorting the same dollar amount in the winners (R1) portfolio. An early stage contrarian portfolio buys low volume losers (R1V1) and sells high volume winners (R10V3). A late contrarian strategy is one that buys high volume losers (R1V3) and sells low volume winners (R10V1).

Insert Table 2.3 here.

Table 2.3 shows the time-series of the returns of the simple, early, late, early-simple and late-simple strategies. The stocks are selected from NYSE, AMEX and Nasdaq, with prior return measured over the whole ranking period, and prior volume measured over the last 2 years of the ranking period. Panel A, B, C and D show the raw, size-adjusted and $\frac{1}{8}$ -adjusted returns for the 3-, 5-, 6- and 7-year ranking/investment period. The Lagged 'nth' year shows the last year return of the strategy when the investment starts a month later. P-values indicated are adjusted for Newey-West (1987) correction for heteroskedasticity and autocorrelation up to a lag, which is one less than the total number of years in the investment period.

For illustration, we focus on the 5-year ranking period. From the raw return of the 5-year simple strategy in Panel B, we see that (1) the simple contrarian strategy is profitable from the first year and (2) profits keep increasing and do not reverse. This contrasts with longer-term reversal of momentum profit documented in Lee and Swaminathan (2000) and Jegadeesh and Titman (2001). At the end of the investment period, the profit of the simple, early and contrarian strategy is 54.32%, 74.22% and 17.26% respectively. The early stage strategy outperforms the late stage strategy by a huge 56.96% and outperforms the simple contrarian strategy by 19.90%. Skipping a month causes profits of simple, early and late strategies to reduce, showing the importance of microstructure effects. In its fifth year, the late strategy is unprofitable (-6.00%) after skipping a month, but the early strategy is still very profitable (51.53%), even though profit has dropped substantially from 74.22%. There is some indication that the greater profitability of the early strategy is due to overreaction. The prior loss of the early strategy is the greatest (635.11%), while the prior loss of the late strategy is the least (537.50%).

The size-adjusted returns reveal the same pattern; the early strategy outperforms the simple strategy and the simple strategy outperforms the late strategy throughout the whole investment period. In fact, the size-adjusted return of the late strategy is negative throughout the investment period. The same outperformance by the early strategy and underperformance by the late strategy throughout the investment period is obtained using the $\frac{1}{8}$ -adjusted returns. By the end of the investment period, the early strategy still registers a high 42.39% after the $\frac{1}{8}$ adjustment, while the late strategy records a meager 3.34%.

For ranking and investment period of 3, 6 and 7 years (Panel A, C and D), the early strategy outperforms the late stage strategy by 58.89%, 57.44% and 40.93% respectively. The other results for the 3-, 6- and 7-year ranking and investment period are qualitatively the same as those for the 5-year period.

Insert Figure 2.1 here.

Figure 2.1 shows the 5-year investment period buy-and-hold returns to the simple, early and late contrarian strategy with ranking period of 5 years, prior volume evaluation period of 2 years and stocks selected from NYSE/AMEX/Nasdaq. It is clear from the graph that the raw profits of the 5-year simple, early and late contrarian strategies increase with time. The early strategy outperforms the simple strategy, which in turn, outperforms the late strategy.

Insert Figure 2.2 here.

Figure 2.2 presents the 5-year investment period buy-and-hold returns to the early – simple and late - simple contrarian strategy with ranking period of 5 years, prior volume evaluation period of 2 years and stocks selected from NYSE/AMEX/Nasdaq. The return of the early – simple contrarian strategy is the difference between the return of the early and simple contrarian strategies. The return of the late – simple contrarian strategy is the difference between the return of the late and simple contrarian strategies. The graph shows that the early – simple strategy is profitable and increasing throughout the investment period, but the rate of increase slows down with time. The late – simple strategy sustains losses from the first year and even more losses with time. However, the rate of decline slows down with time but no reversal is detected.

Insert Figure 2.3 here.

Figure 2.3 shows the 7-year investment period buy-and-hold returns to the simple, early and late contrarian strategy with ranking period of 7 years. Similar to that of the 5-year period, the raw profits of the 7-year simple, early and late contrarian strategies increase with time. The early strategy outperforms the simple strategy, which in turn, outperforms the late strategy.

Insert Figure 2.4

Figure 2.4 presents the 7-year investment period buy-and-hold returns to the early – simple and late - simple contrarian strategy with ranking period of 7 years. The graph shows that the early – simple strategy is profitable throughout the investment

period. However, the return peaks in the second year and declines steadily thereafter, indicating some form of reversal. The late – simple strategy sustains losses from the first year and even more losses with time. However, the rate of decline mostly slows down with time but no reversal is detected.

In sum, for all ranking/investment periods, the early strategy outperforms the simple strategy, which in turn, outperforms the late strategy. However, as the length of the investment period increases, the difference between the early – simple strategy starts showing some reversal even though its return remains positive.

2.4.4 Robustness Test: Stocks listed on NYSE/AMEX only and Nasdaq only

Our earlier studies are based on stocks listed on NYSE/AMEX/Nasdaq. For robustness, we test the results of restricting the stocks to those listed on NYSE/AMEX, and to those listed only on Nasdaq.

The results show that outperformance of the early strategy and underperformance of late strategy is robust to choice of stock exchange.

2.4.5 Risk Adjustments

Insert Table 2.4 here.

Table 2.4 reports the results of the CAPM risk adjustments for the various stock return-volume portfolios, where R is the number of years in the ranking period and I is the number of years in the investment period. Regressions are based on annual returns. Panels A, B, C and D show the results for (R=3, I=3), (R=5, I=5),

($R=6$, $I=6$) and ($R=7$, $I=7$) respectively. The p-values are in parenthesis and are adjusted for White heteroskedasticity. For all ranking/investment periods, the risk adjusted return α is highest for the R1V1 (low volume losers) portfolio, while α for the R10V3 (high volume winners) portfolio is the worst. For the 5-year period (Panel B), α for the R1V1 portfolio is highest at 6.35%, while α for the R10V3 portfolio is lowest at -3.82%. This means there is a very high risk adjusted profit for an early contrarian strategy that buys R1V1 and sells R10V3; 12.94%, 10.18%, 9.10% and 7.80% per year for the 3-, 5-, 6- and 7-year strategy respectively.

The risk adjusted profit for a late contrarian strategy that buys R1V3 (high volume losers) and sells R10V1 (low volume winners) is much lower, or even negative. For the 3-, 5-, 6- and 7-year period, it is -3.86%, 0.20%, 0.69% and 2.54% per year respectively. This shows our hypothesis of higher early strategy profits and lower late strategy profits is robust to CAPM risk adjustment. Risk as measured by CAPM β is lower for R1V1 vis-à-vis R10V3, indicating a negative β for the early strategy. For the 3-, 5-, 6- and 7-year investment periods, β for the early strategy is -0.0084, -0.2730, -0.2790 and -0.3243 respectively. For the 3-, 5-, 6- and 7-year investment periods, β for the late strategy is 0.3896, -0.0422, -0.0089 and 0.0047 respectively. For the same investment period, β for the early strategy is lower than the β for the late strategy. This implies the former has a lower risk. This is despite the fact that the early strategy has more raw and CAPM-adjusted profits.

Insert Table 2.5 here.

Table 2.5 shows the results of the Fama-French three-factor (FF) risk adjustments for the various return-volume portfolios. Regressions are based on

annual returns. Panel A, B, C and D show the results for (R=3, I=3), (R=5, I=5), (R=6, I=6) and (R=7, I=7) respectively. For all ranking/investment periods, the risk adjusted return α is highest for R1V1, while α for R10V3 is almost always the worst. For the 5-year period, α for R1V1 is highest at 3.22%, and α for R10V3 is lowest at -1.72%. This means the risk adjusted profit of a early contrarian strategy that buys R1V1 and sells R10V3 has the highest risk-adjusted return. The early strategy FF-adjusted profit is computed as 8.31%, 4.94%, 3.32% and 2.60% per year for the 3-, 5-, 6- and 7-year investment respectively. This implies that the high raw early stage contrarian strategy cannot be explained by the Fama-French three-factor model.

The risk adjusted profit of a late contrarian strategy that buys R1V3 and sells R10V1 is much lower, or even negative. For the 3-, 5-, 6- and 7-year period, it is -1.07%, -0.95%, -0.49% and 1.47% per year respectively. This shows our hypothesis of higher early strategy profits and lower late strategy profits is robust to FF risk adjustment.

We next focus on estimated factor loadings for HML, SMB and market premium. Low volume stocks (V1) have much higher HML factor loading, after controlling for prior return. This observation applies for losers (R1), middles (R6) and winners (R10). This finding is consistent with Lee and Swaminathan (2000)'s study of momentum-return portfolios. R1V1 typically has one of the highest positive HML loading among the various return-volume portfolios, and R10V3 has the lowest (most negative). This means low volume losers behave more like value stocks, i.e. stocks with high book-to-market values. Conversely, high volume winners behave like growth stocks, i.e. stocks with small book-to-market values.

Controlling for prior return, return-volume portfolios have increasing SMB factor loadings when volume increases. This shows that differences in trading

volume affect the sensitivity of return-volume portfolio to firm size effect. Higher volume firms behave more like small capitalization stocks. Since high volume stocks have lower return, if we associate small stocks with higher illiquidity, we will find that this result is inconsistent with the liquidity hypothesis. Risk, as measured by β , is lower for R1V1 vis-à-vis R10V3, indicating a negative β for the early strategy.

Insert Table 2.6 here.

Panel A shows the regression of the monthly returns of the various return-volume portfolios on Fama-French's three factors. The alpha of the low volume losers (R1V1) is the highest at 0.19% and is significant while the alpha of the high volume losers at -0.18% is the lowest and significant. This implies an early contrarian strategy's alpha of 0.37% per month. The high volume losers (R1V3) has an alpha of -0.21%, while the low volume winners (R10V1) has an alpha of 0.05%. This means that a late strategy has a negative 0.26% return per month. The characteristics of the three-factor loadings are similar to those using yearly regressions. Hence the results are largely similar using monthly or yearly Fama-French regressions.

Panel B shows the regression of the monthly returns on Fama-French's three factors augmented by a proxy for the Pastor and Stambaugh (2003) liquidity factor. The results are not materially affected by the introduction of the liquidity factor. The alpha of the low volume losers remains the highest (0.23%) and is significant while the lowest alpha is that of the high volume winners (-0.13%). This implies

that the early contrarian strategy's alpha is a high 0.36% (low volume losers alpha of 0.23% subtract high volume winners alpha of -0.13)) per month, while the alpha of the late contrarian strategy is -0.16% (high volume losers alpha of -0.14% subtract low volume losers alpha of 0.02%), again showing the superior risk-adjusted performance of the early contrarian strategy. The liquidity factor loading of the low volume losers and high volume winners are about the same, indicating a low sensitivity of the early contrarian strategy to the liquidity factor. The corresponding loading of the late contrarian strategy is -0.1317 ($= -0.0954 - 0.0363$).

In sum, our hypothesis of higher early strategy profit and lower late strategy profit is robust to risk adjustment using CAPM, FF (monthly and yearly regressions), and FF augmented by liquidity factor models.

2.4.6 January Effect and Tax Loss Selling

Insert Table 2.7 here.

To study the impact of tax loss selling on the performance of the various return-volume portfolios, Table 2.7 evaluates the impact of excluding January on the raw and risk-adjusted returns of the low volume losers, high volume losers, low volume winners and high volume winners. Risk adjusted is performed using the FF three factors, and FF three factors augmented by the liquidity factor. Panels A, B, C and D report the results for raw and risk-adjusted returns for the 3-, 5-, 6- and 7-year period respectively. Returns are reported for all months, and all months excluding January. For brevity, we focus the discussion on the 5-year period. The raw returns of all four portfolios decline when January is excluded. Controlling for

volume, the drop is larger for losers compared to winners. Excluding January causes the low volume losers return to drop by 0.67% (from 1.55% to 0.88%), the low volume winners return to drop by 0.18% (from 1.10% to 0.92%), while the high volume losers return drops by 0.72% (from 1.18% to 0.46%) and the high volume winners return drops by 0.31% (from 0.92% to 0.61%). The larger loss of the losers can be attributed to tax loss selling of losers near the end of the year and the subsequent price rebound in January. Our results are consistent with those of George and Hwang (Journal of Finance, forthcoming) and Grinblatt and Moskowitz (2004). Raw profits still remain large and significant for the losers after January is excluded, especially those of the low volume losers. The FF risk-adjusted profits are lower than the raw profits with the drop being bigger for losers and for portfolios with high volume. When January is excluded, the FF alphas drop for all return-volume portfolios except the low volume winners whose alpha remains unchanged. The drop for losers is greater than the drop for winners and the drop for high volume portfolios is steeper than the drop of the low volume portfolios. This can be attributed to the higher SMB loading of the losers (compared to the winners) and the higher SMB loading of the high volume portfolios vis-à-vis that of the low volume portfolios (see Panel A of Table 2.6 for SMB loading for all months)¹, as the size factor of the Fama-French three-factor model captures well the predictable component of returns linked to tax loss selling. Even when January is excluded, the raw and risk-adjusted returns of the low volume losers are higher than those of high volume winners, and the returns of high volume losers are lower than those of low volume winners. This indicates that early contrarian has more FF risk-adjusted

¹ In results unreported, the pattern of SMB loadings of the various return-volume portfolios for all months excluding January follows the same pattern of SMB loadings for all months.

profits than late contrarian strategy. Similar results are obtained using the FF three factors augmented with the liquidity factor.

2.4.7 Other Robustness Tests

The baseline length of evaluation period for trading volume is 2 years. For robustness, we test our results for volume evaluation period of 1 year and 3 years. The return-volume portfolios are also subjected to different ways of partitioning by prior return and prior trading volume (5 return and 5 volume portfolios, and 3 return and 10 volume portfolios).

For all these robustness test cases, the early contrarian strategy always outperforms the simple contrarian strategy, while the late contrarian strategy underperforms both. This applies for raw, size-adjusted and β -adjusted returns.

In sum, our hypothesis is robust to length of the prior volume evaluation period, different ways of partitioning by prior return and prior volume, and different return measures.

2.5 Conclusion

Volume plays an important role in the price discovery process and relays important information about future returns. According to Thaler (1980)'s "mental accounting" framework, investors set up different mental accounts with their own reference levels to evaluate paper gain/loss. Kahneman and Tversky (1979)'s "prospect theory" assumes investors are risk averse when faced with gain, but risk seeking when faced with loss. Shefrin and Statman (1985) combine mental accounting and prospect theory to derive the disposition effect, which causes

investors to hold on to losing investments and sell winning ones too soon. In Grinblatt and Han (2005)'s model, turnover or volume is a mechanism where the investor's reference price is brought closer to market price. This reduces the impact of the disposition effect. The importance of turnover and other liquidity measures is extensively studied in finance literature (see Blume, Easley and O'Hara (1994), Lee and Swaminathan (2000), Chordia, Subrahmanyam and Anshuman (2001), and Connolly and Stivers (2003), for example).

Our results show that for longer ranking periods of returns and volumes, low volume winners (losers) outperform high volume winners (losers) in the future but low volume winners underperform high volume winners in the past, consistent with the findings of Lee and Swaminathan (2000), which use shorter ranking periods.

We hypothesize that an early long-term contrarian strategy of buying low volume losers and selling high volume winners is more profitable than a late strategy of buying high volume losers and selling low volume winners. Our findings provide strong evidence in support of our hypothesis. Similar conclusions are reached using size-adjusted returns, returns adjusted for S¹/₈ price adjustment and skipping a month to take into account microstructure effects. Our results are also robust to choice of stock exchange, different prior volume evaluation periods and different ways of partitioning return-volume portfolios.

The early contrarian strategy also outperforms the late contrarian strategy on a risk-adjusted basis regardless of whether the risk adjustment uses CAPM, Fama-French's three factors, or Fama-French's three factors augmented with a liquidity risk factor. Further, CAPM β for the early strategy is lower than that for the late strategy, implying that the early strategy is less risky. Our long-term study finds that low volume losers behave like value stocks, while high volume winners behave

like glamour stocks, consistent with Lee and Swaminathan (2000). They find that for the shorter time horizon (ranking period not exceeding a year), a late momentum strategy of buying high volume winners and selling low volume losers underperforms an early strategy of buying low volume winners and selling high volume losers. Jointly, our finding and theirs confirm the interaction between contrarian and momentum strategies (see Asness (1997), Chan and Kot (2005)): where momentum strategy underperforms or is reversing, contrarian strategy outperforms. It should be noted, however, that the ranking and investment periods of both types of strategies differ markedly. Our findings are also consistent with tax loss selling of losers leading to their subsequent price rebound. In spite of the reduction in raw and risk-adjusted profits when January is excluded, low volume losers still outperform high volume winners, and high volume losers continue to underperform low volume winners. This indicates that early contrarian outperforms late contrarian both on raw and risk-adjusted basis.

The disposition effect may provide an explanation on why high volume losers underperform low volume losers. Odean (1998b) confirms that investors tend to realize gains but are hesitant to realize losses. If a stock is a recent loser, it has probably just started its price reversal, compared to a stock that has been losing value for a long time. A recent loser most likely implies a recent correction from higher prices. Thus, a number of investors will still have paper gain on this stock. We expect them to sell the stock while they still have profits, thus leading to its higher volume. In contrast, investors with long-term loser stock will have paper loss on it and be reluctant to sell. This leads to lower turnover of long-term losers, and these are expected to experience faster and longer reversals. Hence, high

volume arising from the disposition effect can be used to differentiate short-term losers from long-term losers.

Baker and Stein (2004) assume short-sales constraint and predict that overconfidence of irrational investors will cause stocks to be overvalued. These investors are overconfident and tend to overreact when they receive private signals. However, short-sale restrictions mean that they can only act upon their positive signals. Their mispricing due to their overconfidence will cause winner stocks to be overvalued in high volume. Their cognitive bias cannot lead to the opposite result of underpricing of losers in high volume due to short-sale constraint. This may account for the gross overpricing of high volume winners. Hence, they are a good candidate for shorting. This accounts for the higher profits of the early strategy as it involves shorting of high volume winners.

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Table 2.1 Prior Return, Test Return and Stock Characteristics (NYSE/AMEX/Nasdaq)

Table 2.1 presents the prior return, investment period return (test return) and stock characteristics for prior return portfolios and return-volume portfolios formed from stocks listed on NYSE/AMEX/Nasdaq. The sample investment period is 1966-2001, 1968-2001, 1969-2001, 1970-2001 for the 3-, 5-, 6- and 7-year investment period respectively. The corresponding number of runs is 34, 30, 28 and 26. Stocks are independently sorted into 10 equally-weighted prior return portfolios and 3 volume portfolios. Average monthly turnover over the prior two years is taken as a proxy for trading volume. R1 represents the Losers portfolio. R10 is the Winners portfolio. V1 (V3) is the lowest (highest) trading volume portfolio. The intersections of the stocks in these two types of portfolios give rise to the return-volume portfolios. Prior return and test returns are the buy-and-hold return of the equally weighted portfolios during the ranking and investment periods respectively. Volume is the average monthly trading turnover (in decimal) of the stocks in the portfolio over the 2 years prior to the ranking period. Price is the time-series average of the median stock price of the portfolio as of the end of the ranking period. Size is the time-series average of the median stock size rank of the portfolio as of the end of the ranking period, where rank size is the rank of the stock when all stocks in the sample are ranked and divided into 10 deciles. N is the time-series average of the number of stocks in the portfolio. Panel A, B, C and D show the results for the 3-, 5-, 6- and 7-year investment periods respectively.

Panel A: Ranking/Investment Period of 3 Years with 34 Runs												
Portfolio	Prior Return	Test Return	Vol.	Price	Size	N	Prior Return	Test Return	Vol.	Price	Size	N
Not Conditional Upon Volume							V1					
R1	-63.6%	68.0%	0.35	5.08	2.1	191	-62.3%	86.1%	0.10	4.11	1.1	64
R6	40.5%	55.7%	0.31	21.12	5.8	200	40.4%	57.2%	0.10	20.19	4.9	72
R10	325.7%	40.7%	0.54	25.29	5.5	194	274.8%	54.2%	0.11	25.18	5.0	39
V2							V3					
R1	-63.5%	72.4%	0.26	5.44	2.0	65	-64.9%	46.8%	0.69	5.15	2.7	63
R6	40.5%	55.5%	0.26	23.03	6.2	71	40.7%	54.8%	0.64	21.24	6.2	57
R10	291.3%	47.2%	0.27	24.97	5.4	55	354.2%	34.7%	0.82	25.35	5.8	100
Panel B: Ranking/Investment Period of 5 Years with 30 Runs												
Portfolio	Prior Return	Test Return	Vol.	Price	Size	N	Prior Return	Test Return	Vol.	Price	Size	N
Not Conditional Upon Volume							V1					
R1	-61.5%	132.8%	0.31	5.82	1.9	157	-60.7%	149.3%	0.10	5.92	1.4	62
R6	75.0%	106.6%	0.31	22.60	5.6	161	74.8%	106.4%	0.10	20.47	4.9	54
R10	548.7%	78.5%	0.49	27.58	5.7	157	475.3%	88.0%	0.10	27.49	5.4	33
V2							V3					
R1	-61.4%	133.3%	0.25	5.95	1.8	50	-62.2%	105.2%	0.63	5.81	2.7	46
R6	75.2%	109.6%	0.25	22.94	5.7	56	75.0%	102.6%	0.61	23.04	6.0	51
R10	514.7%	79.1%	0.26	28.37	5.7	45	574.4%	75.1%	0.75	27.98	5.9	80

Table 2.1 – Continued

Panel C: Ranking/Investment Period of 6 Years with 28 Runs												
Portfolio	Prior Return	Test Return	Vol.	Price	Size	N	Prior Return	Test Return	Vol.	Price	Size	N
Not Conditional Upon Volume						V1						
R1	-60.7%	176.6%	0.30	5.30	1.6	145	-61.2%	196.1%	0.10	4.59	0.9	58
R6	91.2%	143.0%	0.31	22.19	5.5	149	90.9%	145.1%	0.10	20.33	4.8	52
R10	641.0%	103.8%	0.45	28.71	5.9	146	552.4%	114.2%	0.10	29.33	5.4	33
V2						V3						
R1	-59.6%	169.3%	0.25	5.93	1.8	45	-61.3%	151.7%	0.61	5.76	2.7	43
R6	91.5%	148.2%	0.25	22.69	5.8	52	91.0%	136.6%	0.60	22.84	5.8	46
R10	612.9%	101.5%	0.25	29.48	5.9	44	674.9%	101.2%	0.72	28.81	5.9	70
Panel D: Ranking/Investment Period of 7 Years with 26 Runs												
Portfolio	Prior Return	Test Return	Vol.	Price	Size	N	Prior Return	Test Return	Vol.	Price	Size	N
Not Conditional Upon Volume						V1						
R1	-61.9%	228.5%	0.30	4.31	1.3	134	-62.8%	235.4%	0.10	3.25	0.6	52
R6	108.6%	187.9%	0.31	22.39	5.5	137	108.6%	173.3%	0.10	20.01	4.7	48
R10	759.3%	139.0%	0.40	29.87	6.0	135	684.1%	147.3%	0.10	29.46	5.6	34
V2						V3						
R1	-60.6%	238.8%	0.25	4.80	1.4	39	-61.5%	202.3%	0.60	6.03	2.8	42
R6	109.2%	208.1%	0.25	22.70	5.7	46	108.0%	179.5%	0.60	23.66	6.0	43
R10	741.4%	134.6%	0.25	31.03	6.1	43	797.8%	139.4%	0.67	30.01	6.2	58

Table 2.2 Stock Raw-, Size-Adjusted and \$%-Adjusted Returns of Return-Volume Portfolios

This table shows the time-series of the various return-volume portfolios for the ranking period of 5 years for stocks listed on NYSE/AMEX/Nasdaq. Stocks are independently sorted into 10 equally-weighted prior return portfolios and 3 volume portfolios. Average monthly turnover over the prior two years is taken as a proxy for trading volume. R1 represents the Losers portfolio, R10 is the Winners portfolio. V1 (V3) is the lowest (highest) trading volume portfolio. The intersections of the stocks in these two types of portfolios give rise to the return-volume portfolios. The Lagged 5-year results are the fifth year returns of the various return-volume portfolios when a month is skipped between the end of the ranking period and the start of the investment period. Stocks are allocated to 10 size deciles, according to their market capitalization at the end of the formation period. Size-adjusted return is obtained by subtracting the return of the size-decile the stock is in from its raw return. \$%-adjusted returns are obtained when raw returns are recalculated after a \$% adjustment is made to the price of the stock at the end of the ranking period. P-values are in parentheses and are adjusted for Newey and West (1987)'s correction for heteroskedasticity and autocorrelation up to lag 4.

Panel A : Raw Returns																				
Time	Losers					Middle					Winners					Losers - Winners			Arbitrage	
	V1	V2	V3	V1-V3		V1	V2	V3	V1-V3		V1	V2	V3	V1-V3		V1	V2	V3	V1-V3	
0 Year	-60.68% (0.00)	-61.39% (0.00)	-62.24% (0.00)	1.56% (0.16)		74.82% (0.00)	75.15% (0.00)	75.02% (0.00)	-0.20% (0.39)		475.26% (0.00)	514.68% (0.00)	574.42% (0.00)	-99.16% (0.00)		-535.95% (0.00)	-576.08% (0.00)	-636.66% (0.00)	100.72% (0.00)	
1 Year	28.74% (0.00)	25.39% (0.00)	10.95% (0.10)	17.79% (0.00)		17.77% (0.00)	18.46% (0.00)	13.63% (0.00)	4.15% (0.06)		14.97% (0.00)	14.13% (0.00)	9.81% (0.04)	5.15% (0.08)		13.77% (0.04)	11.26% (0.08)	1.14% (0.83)	12.63% (0.02)	
2 Year	57.53% (0.00)	46.18% (0.00)	24.54% (0.04)	33.00% (0.00)		36.05% (0.00)	35.95% (0.00)	29.44% (0.00)	6.61% (0.09)		30.43% (0.00)	26.70% (0.00)	20.09% (0.01)	10.34% (0.05)		27.10% (0.03)	19.48% (0.04)	4.44% (0.64)	22.66% (0.01)	
3 Year	83.31% (0.00)	70.55% (0.00)	46.00% (0.00)	37.31% (0.00)		56.23% (0.00)	56.29% (0.00)	49.02% (0.00)	7.22% (0.28)		50.46% (0.00)	40.91% (0.00)	35.97% (0.00)	14.49% (0.09)		32.85% (0.04)	29.64% (0.01)	10.03% (0.44)	22.82% (0.05)	
4 Year	111.18% (0.00)	98.13% (0.00)	73.97% (0.00)	37.21% (0.00)		77.27% (0.00)	80.66% (0.00)	75.03% (0.00)	2.24% (0.81)		69.38% (0.00)	57.27% (0.00)	53.29% (0.00)	16.09% (0.16)		41.80% (0.04)	40.86% (0.01)	20.67% (0.24)	21.13% (0.14)	
5 Year	149.27% (0.00)	133.31% (0.00)	105.24% (0.00)	44.03% (0.00)		106.43% (0.00)	109.64% (0.00)	102.63% (0.00)	3.80% (0.74)		87.99% (0.00)	79.08% (0.00)	75.05% (0.00)	12.94% (0.28)		61.28% (0.01)	54.23% (0.00)	30.19% (0.17)	31.09% (0.06)	
Lagged	128.85% (0.00)	110.22% (0.00)	84.58% (0.00)	44.27% (0.00)		104.87% (0.00)	104.90% (0.00)	99.79% (0.00)	5.08% (0.65)		90.58% (0.00)	79.45% (0.00)	77.32% (0.00)	13.26% (0.28)		38.27% (0.04)	30.77% (0.02)	7.26% (0.64)	31.01% (0.05)	
5 Year																				

Table 2.2 - Continued

Panel B : Size-Adjusted Returns																
Time	Losers			Middle			Winners			Losers - Winners			Arbitrage			
	V1	V2	V3	V1-V3	V1	V2	V3	V1-V3	V1	V2	V3	V1-V3	V1	V2	V3	V1-V3
1 Year	4.89% (0.03)	3.64% (0.25)	-8.37% (0.00)	13.26% (0.00)	1.45% (0.36)	3.18% (0.00)	-2.12% (0.07)	4.60% (0.12)	-0.02% (0.99)	-0.75% (0.65)	-4.62% (0.02)	4.60% (0.12)	4.91% (0.13)	4.39% (0.30)	-3.75% (0.31)	8.66% (0.05)
2 Year	12.16% (0.00)	4.83% (0.29)	-12.82% (0.01)	24.99% (0.00)	2.94% (0.29)	4.81% (0.00)	-3.16% (0.17)	9.32% (0.07)	-0.13% (0.97)	-3.18% (0.21)	-9.45% (0.00)	9.32% (0.07)	12.30% (0.05)	8.01% (0.14)	-3.37% (0.60)	15.66% (0.05)
3 Year	14.01% (0.00)	6.10% (0.24)	-13.02% (0.02)	27.03% (0.00)	3.43% (0.44)	5.89% (0.03)	-3.76% (0.28)	13.31% (0.10)	1.63% (0.78)	-5.82% (0.09)	-11.68% (0.02)	13.31% (0.10)	12.38% (0.14)	11.91% (0.09)	-1.34% (0.87)	13.72% (0.18)
4 Year	18.05% (0.00)	7.64% (0.19)	-10.51% (0.16)	28.57% (0.00)	1.40% (0.82)	7.95% (0.02)	-2.09% (0.67)	16.26% (0.12)	0.46% (0.95)	-10.36% (0.02)	-15.80% (0.01)	16.26% (0.12)	17.59% (0.12)	18.00% (0.02)	5.29% (0.63)	12.31% (0.37)
5 Year	22.81% (0.00)	9.25% (0.21)	-10.81% (0.28)	33.62% (0.00)	3.31% (0.70)	9.23% (0.04)	-4.39% (0.47)	13.55% (0.22)	-6.19% (0.45)	-12.45% (0.02)	-19.74% (0.01)	13.55% (0.22)	29.00% (0.02)	21.70% (0.04)	8.93% (0.50)	20.07% (0.20)

Panel C: \$% Adjusted Returns																
Time	Losers			Middle			Winners			Losers - Winners			Arbitrage			
	V1	V2	V3	V1-V3	V1	V2	V3	V1-V3	V1	V2	V3	V1-V3	V1	V2	V3	V1-V3
1 Year	35.48% (0.00)	33.40% (0.00)	14.90% (0.15)	20.58% (0.00)	34.42% (0.00)	34.64% (0.00)	28.32% (0.00)	6.09% (0.13)	29.42% (0.00)	25.77% (0.00)	19.34% (0.01)	10.08% (0.06)	6.06% (0.48)	7.63% (0.34)	-4.43% (0.61)	10.50% (0.13)
2 Year	59.03% (0.00)	55.50% (0.00)	34.75% (0.02)	24.28% (0.00)	54.31% (0.00)	54.81% (0.00)	47.77% (0.00)	6.54% (0.33)	49.31% (0.00)	39.89% (0.00)	35.14% (0.00)	14.16% (0.10)	9.73% (0.42)	15.61% (0.13)	-0.39% (0.97)	10.12% (0.30)
3 Year	84.34% (0.00)	81.14% (0.00)	60.95% (0.00)	23.39% (0.00)	75.13% (0.00)	79.01% (0.00)	73.56% (0.00)	1.57% (0.87)	68.10% (0.00)	56.15% (0.00)	52.39% (0.00)	15.71% (0.17)	16.25% (0.31)	24.99% (0.05)	8.56% (0.60)	7.68% (0.55)
4 Year	116.42% (0.00)	113.61% (0.00)	89.88% (0.00)	26.54% (0.00)	103.82% (0.00)	107.67% (0.00)	100.94% (0.00)	2.87% (0.81)	86.54% (0.00)	77.81% (0.00)	74.02% (0.00)	12.52% (0.29)	29.88% (0.13)	35.80% (0.03)	15.85% (0.44)	14.03% (0.33)
5 Year	103.23% (0.00)	97.04% (0.00)	73.93% (0.00)	29.30% (0.00)	102.65% (0.00)	103.27% (0.00)	98.19% (0.00)	4.47% (0.70)	89.13% (0.00)	78.17% (0.00)	76.01% (0.00)	13.12% (0.29)	14.10% (0.38)	18.87% (0.14)	-2.08% (0.89)	16.19% (0.24)

Table 2.3 Times-Series of Simple, Early and Late Contrarian Strategies

This table shows the time-series of the returns of the simple, early, late, early-simple and late-simple strategies. The return-volume portfolios are defined as the intersections of 10 return portfolios and 3 volume portfolios (see Table 1 for details). The stocks are selected from NYSE, AMEX and Nasdaq, with prior return measured over the whole ranking period, and prior volume measured over the last 2 years of the ranking period. A simple strategy buys R1 and sells R10. An early strategy buys low volume losers, R1V1, and sells high volume winners, R10V3. A late strategy buys high volume losers, R1V3, and sells low volume winners, R10V1. Panel A, B, C and D show the raw, size-adjusted, and $\$/\$$ -adjusted returns for the 3-, 5-, 6- and 7-year ranking/investment periods respectively. "Year 0" row reports the ranking period returns of the various contrarian portfolios. The Lagged Year 'nth' row shows the last year return of the strategy when the investment starts a month later. Stocks are allocated to 10 size deciles, according to their market capitalization at the end of the formation period. Size-adjusted return is obtained by subtracting the return of the size-decile the stock is in from its raw return. $\$/\$$ -adjusted returns are returns after $\$/\$$ adjustment is made to prices of the stock at the beginning of the investment period. P-values indicated are in parentheses and are adjusted for Newey-West (1987) correction for heteroskedasticity and autocorrelation up to a lag, which is one less than the number of years in the investment period.

Panel A : Raw-, Size-Adjusted and $\\$/\\$-Adjusted Returns for 3-Year Investment Period					
Time	Simple	Early	Late	Early - Simple	Late - Simple
Raw>Returns for 3-Year Investment Period					
Year 0	-389.34%	-416.46%	-339.73%	-27.12%	49.62%
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Year 1	10.51%	19.96%	-5.22%	9.46%	-15.73%
	(0.05)	(0.00)	(0.22)	(0.01)	(0.00)
Year 2	23.04%	41.93%	-3.61%	18.89%	-26.64%
	(0.03)	(0.01)	(0.38)	(0.01)	(0.00)
Year 3	27.23%	51.43%	-7.46%	24.20%	-34.69%
	(0.02)	(0.00)	(0.29)	(0.00)	(0.00)
Lagged Year 3	9.59%	29.81%	-20.87%	20.21%	-30.47%
	(0.17)	(0.01)	(0.03)	(0.00)	(0.00)
Size-Adjusted Returns for 3-Year Investment Period					
Year 1	4.65%	11.15%	-7.12%	6.50%	-11.77%
	(0.07)	(0.00)	(0.07)	(0.06)	(0.00)
Year 2	10.08%	24.51%	-10.24%	14.43%	-20.32%
	(0.04)	(0.01)	(0.09)	(0.03)	(0.00)
Year 3	12.41%	30.78%	-14.05%	18.37%	-26.46%
	(0.02)	(0.00)	(0.09)	(0.00)	(0.00)
$\\$/\\$-Adjusted Returns for 3-Year Investment Period					
Year 1	-2.07%	2.77%	-12.81%	4.85%	-10.74%
	(0.37)	(0.34)	(0.02)	(0.12)	(0.00)
Year 2	7.87%	20.01%	-11.69%	12.14%	-19.56%
	(0.24)	(0.10)	(0.14)	(0.07)	(0.00)
Year 3	10.72%	27.33%	-16.20%	16.61%	-26.92%
	(0.19)	(0.03)	(0.10)	(0.01)	(0.00)

Table 2.3 – Continued

Panel B : Raw-, Size-Adjusted and $\$/\%$ -Adjusted Returns for 5-Year Investment Period					
Time	Simple	Early	Late	Early - Simple	Late - Simple
Raw-Returns for 5-Year Investment Period					
Year 0	-610.14%	-635.11%	-537.50%	-24.97%	72.64%
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Year 1	10.91%	18.92%	-4.02%	8.01%	-14.93%
	(0.03)	(0.00)	(0.24)	(0.00)	(0.00)
Year 2	21.18%	37.44%	-5.89%	16.26%	-27.07%
	(0.02)	(0.00)	(0.28)	(0.00)	(0.00)
Year 3	30.24%	47.34%	-4.46%	17.10%	-34.69%
	(0.01)	(0.00)	(0.38)	(0.00)	(0.00)
Year 4	39.80%	57.89%	4.59%	18.09%	-35.21%
	(0.01)	(0.00)	(0.41)	(0.00)	(0.00)
Year 5	54.32%	74.22%	17.26%	19.90%	-37.06%
	(0.00)	(0.00)	(0.25)	(0.00)	(0.01)
Lagged	31.20%	51.53%	-6.00%	20.32%	-37.20%
Year 5	(0.01)	(0.00)	(0.38)	(0.00)	(0.00)
Size-Adjusted Returns for 5-Year Investment Period					
Year 1	3.45%	9.51%	-8.34%	6.06%	-11.79%
	(0.11)	(0.00)	(0.02)	(0.01)	(0.00)
Year 2	8.44%	21.62%	-12.69%	13.18%	-21.13%
	(0.02)	(0.00)	(0.04)	(0.00)	(0.00)
Year 3	11.90%	25.69%	-14.65%	13.79%	-26.55%
	(0.02)	(0.00)	(0.06)	(0.00)	(0.00)
Year 4	16.99%	33.85%	-10.97%	16.87%	-27.96%
	(0.01)	(0.00)	(0.19)	(0.00)	(0.01)
Year 5	23.32%	42.55%	-4.62%	19.23%	-27.93%
	(0.00)	(0.00)	(0.38)	(0.00)	(0.03)
$\$/\%$ -Adjusted Returns for 5-Year Investment Period					
Year 1	-1.62%	2.23%	-11.67%	3.85%	-10.05%
	(0.38)	(0.34)	(0.02)	(0.09)	(0.00)
Year 2	5.83%	16.14%	-14.52%	10.31%	-20.35%
	(0.23)	(0.03)	(0.06)	(0.00)	(0.00)
Year 3	12.93%	23.89%	-14.55%	10.96%	-27.48%
	(0.11)	(0.02)	(0.13)	(0.01)	(0.00)
Year 4	20.46%	31.95%	-7.14%	11.50%	-27.60%
	(0.07)	(0.01)	(0.35)	(0.02)	(0.02)
Year 5	30.99%	42.39%	3.34%	11.40%	-27.65%
	(0.04)	(0.01)	(0.44)	(0.05)	(0.03)

Table 2.3 – Continued

Panel C : Raw-, Size-Adjusted and \$%-Adjusted Returns for 6-Year Investment Period					
Time	Simple	Early	Late	Early - Simple	Late - Simple
Raw-Returns for 6-Year Investment Period					
Year 0	-701.65%	-736.12%	-613.71%	-34.48%	87.94%
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Year 1	10.48%	19.86%	-7.22%	9.37%	-17.70%
	(0.03)	(0.00)	(0.08)	(0.00)	(0.00)
Year 2	21.32%	36.72%	-8.15%	15.40%	-29.47%
	(0.03)	(0.00)	(0.21)	(0.00)	(0.00)
Year 3	31.47%	46.49%	-2.71%	15.02%	-34.18%
	(0.01)	(0.00)	(0.43)	(0.01)	(0.00)
Year 4	42.71%	56.95%	6.51%	14.24%	-36.20%
	(0.01)	(0.00)	(0.38)	(0.02)	(0.00)
Year 5	59.76%	76.30%	23.37%	16.54%	-36.39%
	(0.01)	(0.00)	(0.22)	(0.01)	(0.01)
Year 6	72.81%	94.88%	37.44%	22.07%	-35.37%
	(0.01)	(0.00)	(0.18)	(0.00)	(0.03)
Lagged Year 6	44.45%	65.65%	8.32%	21.20%	-36.13%
	(0.01)	(0.00)	(0.38)	(0.00)	(0.01)
Size-Adjusted Returns for 6-Year Investment Period					
Year 1	1.52%	7.32%	-10.69%	5.80%	-12.21%
	(0.29)	(0.03)	(0.00)	(0.02)	(0.00)
Year 2	3.92%	14.07%	-16.84%	10.14%	-20.76%
	(0.21)	(0.02)	(0.01)	(0.01)	(0.00)
Year 3	7.88%	18.73%	-17.11%	10.85%	-24.99%
	(0.08)	(0.01)	(0.03)	(0.02)	(0.00)
Year 4	11.53%	22.07%	-15.56%	10.54%	-27.08%
	(0.04)	(0.01)	(0.10)	(0.05)	(0.01)
Year 5	19.20%	32.83%	-6.96%	13.63%	-26.16%
	(0.01)	(0.00)	(0.33)	(0.02)	(0.04)
Year 6	27.05%	48.31%	0.65%	21.26%	-26.40%
	(0.01)	(0.00)	(0.49)	(0.00)	(0.11)
\$%-Adjusted Returns for 6-Year Investment Period					
Year 1	-2.25%	2.87%	-13.98%	5.12%	-11.73%
	(0.31)	(0.30)	(0.00)	(0.03)	(0.00)
Year 2	5.18%	14.64%	-16.10%	9.45%	-21.28%
	(0.27)	(0.06)	(0.04)	(0.01)	(0.00)
Year 3	13.43%	22.34%	-12.20%	8.91%	-25.62%
	(0.12)	(0.04)	(0.21)	(0.06)	(0.00)
Year 4	22.43%	30.14%	-4.31%	7.71%	-26.75%
	(0.08)	(0.03)	(0.42)	(0.15)	(0.01)
Year 5	35.07%	43.05%	10.36%	7.98%	-24.71%
	(0.04)	(0.01)	(0.35)	(0.15)	(0.04)
Year 6	46.22%	59.70%	22.37%	13.47%	-23.85%
	(0.04)	(0.01)	(0.28)	(0.05)	(0.12)

Table 2.3 - Continued

Panel D : Raw-, Size-Adjusted and \$1/-Adjusted Returns for 7-Year Investment Period					
Time	Simple	Early	Late	Early - Simple	Late - Simple
Raw-Returns for 7-Year Investment Period					
Year 0	-821.19%	-860.59%	-745.56%	-39.41%	75.63%
	(0.00)	(0.00)	(0.00)	(0.02)	(0.01)
Year 1	9.90%	19.54%	-5.65%	9.64%	-15.55%
	(0.06)	(0.01)	(0.10)	(0.00)	(0.00)
Year 2	21.25%	35.43%	-2.24%	14.19%	-23.49%
	(0.04)	(0.01)	(0.41)	(0.01)	(0.00)
Year 3	34.29%	47.57%	6.07%	13.28%	-28.22%
	(0.01)	(0.01)	(0.34)	(0.06)	(0.00)
Year 4	49.36%	60.94%	22.11%	11.58%	-27.25%
	(0.01)	(0.00)	(0.14)	(0.17)	(0.00)
Year 5	66.97%	77.60%	39.03%	10.63%	-27.94%
	(0.01)	(0.00)	(0.08)	(0.32)	(0.01)
Year 6	78.20%	89.60%	47.50%	11.39%	-30.70%
	(0.01)	(0.00)	(0.10)	(0.28)	(0.03)
Year 7	89.54%	96.00%	55.07%	6.47%	-34.46%
	(0.01)	(0.00)	(0.08)	(0.59)	(0.05)
Lagged Year 7	58.87%	66.02%	25.28%	7.15%	-33.59%
	(0.01)	(0.00)	(0.19)	(0.53)	(0.04)
Size-Adjusted Returns for 7-Year Investment Period					
Year 1	2.09%	9.30%	-8.86%	7.21%	-10.94%
	(0.22)	(0.01)	(0.00)	(0.00)	(0.00)
Year 2	5.33%	16.01%	-10.71%	10.68%	-16.04%
	(0.14)	(0.01)	(0.04)	(0.01)	(0.00)
Year 3	11.35%	20.61%	-8.48%	9.25%	-19.84%
	(0.02)	(0.01)	(0.18)	(0.11)	(0.01)
Year 4	19.38%	27.21%	0.41%	7.83%	-18.97%
	(0.00)	(0.01)	(0.49)	(0.32)	(0.05)
Year 5	26.40%	33.66%	9.06%	7.26%	-17.33%
	(0.00)	(0.00)	(0.26)	(0.46)	(0.11)
Year 6	33.47%	45.40%	8.92%	11.93%	-24.55%
	(0.00)	(0.00)	(0.30)	(0.23)	(0.06)
Year 7	39.08%	50.42%	7.27%	11.34%	-31.82%
	(0.00)	(0.00)	(0.36)	(0.32)	(0.06)
\$1/-Adjusted Returns for 7-Year Investment Period					
Year 1	-2.30%	2.65%	-12.03%	4.95%	-9.73%
	(0.31)	(0.33)	(0.00)	(0.04)	(0.00)
Year 2	5.54%	13.38%	-9.80%	7.83%	-15.34%
	(0.27)	(0.11)	(0.13)	(0.06)	(0.00)
Year 3	16.55%	23.37%	-3.10%	6.82%	-19.66%
	(0.09)	(0.05)	(0.41)	(0.27)	(0.00)
Year 4	29.52%	33.94%	11.56%	4.43%	-17.96%
	(0.04)	(0.02)	(0.27)	(0.56)	(0.02)
Year 5	42.36%	43.61%	26.40%	1.25%	-15.96%
	(0.03)	(0.02)	(0.15)	(0.89)	(0.06)
Year 6	52.58%	55.19%	33.45%	2.61%	-19.13%
	(0.03)	(0.02)	(0.17)	(0.80)	(0.12)
Year 7	61.67%	59.28%	39.13%	-2.39%	-22.54%
	(0.03)	(0.02)	(0.15)	(0.84)	(0.14)

Table 2.4 CAPM Regression of Return-Volume Portfolios (Yearly)

The yearly excess returns of the stock return-volume portfolios (P) are regressed against the market premium as follows:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p [Mkt_t - R_{ft}] + e_{pt}$$

where, R_{pt} is the annual return of the portfolio under study, R_{ft} is the risk free rate, α_p is the CAPM α , β_p is the CAPM β , Mkt_t is the annual return of the value-weighted index of stocks listed on NYSE, AMEX or Nasdaq and $e_{pt} \sim N(0, \sigma_p)$. The regression is done across all event years during the investment period. R is the number of years in the ranking period. I is the number of years in the investment period. Panel A, B, C and D show the results for (R=3, I=3), (R=5, I=5), (R=6, I=6) and (R=7, I=7) respectively. The numbers in parenthesis are p-values which are adjusted for White heteroskedasticity.

Panel A: CAPM Regression of Return-Volume Portfolios (R=3, I = 3)									
Portfolio	V1	V2	V3	V1	V2	V3	V1	V2	V3
	α			β			Adjusted R ²		
R1	8.96%	5.22%	-0.85%	1.3343	1.5713	1.4614	0.3029	0.3515	0.4063
	(0.00)	(0.07)	(0.75)	(0.00)	(0.00)	(0.00)			
R6	4.30%	2.91%	1.63%	0.8732	1.1032	1.2803	0.6039	0.6278	0.6982
	(0.00)	(0.03)	(0.23)	(0.00)	(0.00)	(0.00)			
R10	3.01%	0.50%	-3.97%	1.0718	1.1575	1.3426	0.5308	0.6669	0.6560
	(0.07)	(0.73)	(0.01)	(0.00)	(0.00)	(0.00)			
Panel B: CAPM Regression of Return-Volume Portfolios (R=5, I = 5)									
Portfolio	V1	V2	V3	V1	V2	V3	V1	V2	V3
	α			β			Adjusted R ²		
R1	6.35%	4.91%	0.59%	1.0053	1.1076	1.0188	0.3910	0.4457	0.4098
	(0.00)	(0.00)	(0.74)	(0.00)	(0.00)	(0.00)			
R6	2.75%	2.40%	0.94%	0.8900	1.0338	1.0791	0.6852	0.7283	0.7024
	(0.00)	(0.01)	(0.37)	(0.00)	(0.00)	(0.00)			
R10	0.39%	-1.74%	-3.82%	1.0610	1.0954	1.2783	0.6855	0.7486	0.7861
	(0.70)	(0.06)	(0.00)	(0.00)	(0.00)	(0.00)			
Panel C: CAPM Regression of Return-Volume Portfolios (R=6, I = 6)									
Portfolio	V1	V2	V3	V1	V2	V3	V1	V2	V3
	α			β			Adjusted R ²		
R1	5.98%	4.19%	0.69%	1.0219	1.0614	1.0431	0.4175	0.4643	0.4952
	(0.00)	(0.01)	(0.65)	(0.00)	(0.00)	(0.00)			
R6	3.18%	2.66%	1.13%	0.8922	1.0218	1.0429	0.6881	0.7115	0.6868
	(0.00)	(0.00)	(0.25)	(0.00)	(0.00)	(0.00)			
R10	0.00%	-1.30%	-3.12%	1.0521	1.0874	1.3009	0.7446	0.7466	0.7891
	(1.00)	(0.13)	(0.00)	(0.00)	(0.00)	(0.00)			
Panel D: CAPM Regression of Return-Volume Portfolios (R=7, I = 7)									
Portfolio	V1	V2	V3	V1	V2	V3	V1	V2	V3
	α			β			Adjusted R ²		
R1	5.47%	4.61%	2.49%	0.9784	1.0828	1.0158	0.3607	0.4487	0.4820
	(0.00)	(0.00)	(0.07)	(0.00)	(0.00)	(0.00)			
R6	2.42%	3.53%	1.78%	0.8545	1.0086	1.0644	0.6971	0.7021	0.7102
	(0.00)	(0.00)	(0.05)	(0.00)	(0.00)	(0.00)			
R10	-0.05%	-0.92%	-2.32%	1.0111	1.0659	1.3027	0.7336	0.7570	0.8013
	(0.95)	(0.22)	(0.00)	(0.00)	(0.00)	(0.00)			

Table 2.5 Fama-French three-factor Regression of Return-Volume Portfolios (Yearly)

The yearly excess returns of the Stock return volume portfolio (P) are regressed against the market premium, SMB and HML return as follows:

$$R_{Pt} - R_{ft} = \alpha_P + \beta_{P,Mkt} [Mkt_t - R_{ft}] + \beta_{P,SMB} SMB_t + \beta_{P,HML} HML_t + e_{Pt}$$

where R_{Pt} is the annual return of the volume-return, R_{ft} is the risk free rate, α_P is the FF alpha, $\beta_{P,Mkt}$ is the FF factor loading for the market excess return, $\beta_{P,SMB}$ is the factor loading for SMB_t (return on the mimicking portfolio for risk related to size), $\beta_{P,HML}$ (τ) is the factor loading for HML_t (return on the mimicking portfolio for risk related to book-to-market equity), while Mkt_t is the annual return of the value-weighted index of stocks listed on NYSE, AMEX or Nasdaq and $e_{Pt} \sim N(0, \sigma_P)$. The regression is done across all event years during the investment period. R is the number of years in the ranking period. I is the number of years in the investment period. Panel A, B, C and D show the results for (R=3, I=3), (R=5, I=5), (R=6, I=6) and (R=7, I=7) respectively. The numbers in parenthesis are p-values which are adjusted for White heteroskedasticity.

Panel A: Fama-French Regression on Return-Volume Portfolios (R=3, I=3)												
	V1	V2	V3	V1	V2	V3	V1	V2	V3	V1	V2	V3
	α			β			β_{SMB}			β_{HML}		

Table 2.5 – Continued

Panel C: Fama-French Regression on Return-Volume Portfolios (R=6, I =6)													
α			β			β_{SMB}			β_{HML}			Adjusted R ²	
V1	V2	V3	V1	V2	V3	V1	V2	V3	V1	V2	V3		
R1	1.83% (0.14)	0.70% (0.52)	-1.94% (0.08)	0.9975 (0.00)	1.0024 (0.00)	0.9496 (0.00)	0.8619 (0.00)	0.9264 (0.00)	0.4675 (0.00)	0.3773 (0.00)	0.2646 (0.00)	0.6396 0.6945	0.7356
R6	-0.42% (0.47)	-0.64% (0.34)	-0.72% (0.39)	0.9434 (0.00)	1.0350 (0.00)	0.9723 (0.00)	0.3661 (0.00)	0.5132 (0.00)	0.4340 (0.00)	0.3845 (0.00)	0.1843 (0.00)	0.8646 0.8813	0.8628
R10	-1.45% (0.14)	-1.70% (0.04)	-1.49% (0.03)	1.0370 (0.00)	1.0079 (0.00)	1.1201 (0.00)	0.3363 (0.00)	0.4895 (0.00)	0.1612 (0.03)	0.0145 (0.84)	-0.2597 (0.00)	0.7960 0.8197	0.8954

Panel D: Fama-French Regression on Return-Volume Portfolios (R=7, I =7)													
α			β			β_{SMB}			β_{HML}			Adjusted R ²	
V1	V2	V3	V1	V2	V3	V1	V2	V3	V1	V2	V3		
R1	1.05% (0.38)	1.37% (0.25)	-0.40% (0.70)	0.9562 (0.00)	1.0088 (0.00)	0.9379 (0.00)	0.8976 (0.00)	0.9616 (0.00)	0.4056 (0.00)	0.2506 (0.01)	0.2133 (0.01)	0.5831 0.6643	0.7178
R6	-1.33% (0.01)	0.27% (0.69)	0.12% (0.86)	0.9180 (0.00)	1.0142 (0.00)	0.9895 (0.00)	0.3278 (0.00)	0.5449 (0.00)	0.4109 (0.00)	0.3163 (0.00)	0.0979 (0.04)	0.8795 0.8757	0.8757
R10	-1.87% (0.05)	-1.33% (0.10)	-1.55% (0.02)	1.0207 (0.00)	1.0047 (0.00)	1.1592 (0.00)	0.2716 (0.00)	0.3930 (0.00)	0.1826 (0.02)	-0.0112 (0.87)	-0.1911 (0.00)	0.7812 0.8083	0.8956

Table 2.6 Fama-French, and Fama-French and Liquidity Factor Regression of Return-Volume portfolios (Monthly)

For the Fama-French regression, monthly excess returns of the return-volume portfolio (P) are regressed against the market premium, SMB and HML return as follows:

$$R_{Pt} - R_{ft} = \alpha_P + \beta_{P,Mkt} [Mkt_t - R_{ft}] + \beta_{P,SMB} SMB_t + \beta_{P,HML} HML_t + e_{Pt}$$

where R_{Pt} is the annual return of the volume-return, R_{ft} is the risk free rate, α_P is the FF alpha, $\beta_{P,Mkt}$ is the FF factor loading for the market excess return, $\beta_{P,SMB}$ is the factor loading for SMB, (return on the mimicking portfolio for risk related to size), $\beta_{P,HML}$ (γ) is the factor loading for HML, (return on the mimicking portfolio for risk related to book-to-market equity), while Mkt_t is the annual return of the value-weighted index of stocks listed on NYSE, AMEX or Nasdaq and $e_{Pt} \sim N(0, \sigma_P)$.

For the Fama-French and liquidity factor regression, monthly excess returns of the return-volume portfolio (P) are regressed against the market premium, SMB and HML return, and liquidity factor as follows:

$$R_{Pt} - R_{ft} = \alpha_P + \beta_{P,Mkt} [Mkt_t - R_{ft}] + \beta_{P,SMB} SMB_t + \beta_{P,HML} HML_t + \beta_{P,LIQ} LIQ_t + e_{Pt}$$

where LIQ_t is the updated value-weighted liquidity factor of Pastor and Stambaugh (2003) in month t . The regressions are done across all months and all runs during the 5-year investment period. Prior volume is measured over 2 years while stocks are classified into 10 return deciles (R1 is the lowest, R10 the highest) and 3 volume partitions (V1 is the smallest, V3 the biggest). Panel A reports the regression results for the Fama-French regressions while Panel B reports those for the Fama-French and Liquidity factor regressions. The numbers in parenthesis are p-values.

Panel A: Monthly Fama-French Three-Factor Regression of Return-Volume Portfolios														
	α			β			β_{SMB}			β_{HML}			Adjusted R ²	
	V1	V2	V3	V1	V2	V3	V1	V2	V3	V1	V2	V3	V1	V2
R1	0.19% (0.07)	0.09% (0.41)	-0.21% (0.03)	0.9308 (0.00)	1.0612 (0.00)	1.1039 (0.00)	1.0496 (0.00)	1.2193 (0.00)	1.2573 (0.00)	0.5871 (0.00)	0.5592 (0.00)	0.4001 (0.00)	0.6302	0.6906
R6	0.05% (0.21)	0.01% (0.83)	-0.07% (0.15)	0.7937 (0.00)	0.9732 (0.00)	1.0776 (0.00)	0.4768 (0.00)	0.4853 (0.00)	0.6458 (0.00)	0.3448 (0.00)	0.3325 (0.00)	0.2301 (0.00)	0.8594	0.8907
R10	0.05% (0.42)	-0.10% (0.05)	-0.18% (0.00)	0.8517 (0.00)	0.9630 (0.00)	1.0952 (0.00)	0.4352 (0.00)	0.5134 (0.00)	0.6283 (0.00)	0.0387 (0.10)	-0.0591 (0.00)	-0.2019 (0.00)	0.7505	0.8651

Table 2.6 – Continued

Panel B: Monthly Fama-French Three-Factor and Liquidity Factor Regression of Return-Volume Portfolios																		
PS	V1	V2	V3	α			β			β_{SMB}			β_{HML}			β_{LIQ}		
				V1	V2	V3	V1	V2	V3	V1	V2	V3	V1	V2	V3	V1	V2	V3
R1	0.23% (0.03)	0.19% (0.07)	-0.14% (0.16)	0.9084 (0.00)	1.0079 (0.00)	1.0665 (0.00)	1.0169 (0.00)	1.1416 (0.00)	1.2028 (0.00)	0.5489 (0.00)	0.4683 (0.00)	0.3363 (0.00)	-0.0572 (0.02)	-0.1360 (0.00)	-0.0954 (0.00)			
R6	0.05% (0.25)	0.08% (0.04)	0.00% (0.95)	0.7952 (0.00)	0.9375 (0.00)	1.0392 (0.00)	0.4789 (0.00)	0.4332 (0.00)	0.5898 (0.00)	0.3473 (0.00)	0.2716 (0.00)	0.1645 (0.00)	0.0038 (0.69)	-0.0911 (0.00)	-0.0981 (0.00)			
R10	0.02% (0.73)	-0.09% (0.09)	-0.13% (0.01)	0.8659 (0.00)	0.9578 (0.00)	1.0735 (0.00)	0.4559 (0.00)	0.5058 (0.00)	0.5967 (0.00)	0.0629 (0.01)	-0.0680 (0.00)	-0.2389 (0.00)	0.0363 (0.02)	-0.0133 (0.27)	-0.0554 (0.00)			

Table 2.7 Impact of excluding January on Raw- and Risk-Adjusted Returns

This table reports the monthly raw and risk-adjusted returns of the low volume losers, high volume losers, low volume winners and high volume winners for the 5-year investment period. Raw Return is the average of monthly portfolio return, with averaging across all runs and is reported for All Months and All Months excluding January. Risk adjustment is based on the Fama-French three-factors (FF), and Fama-French three-factors and a liquidity factor (FF + Liq). The liquidity factor used is the updated value-weighted liquidity factor of Pastor and Stambaugh (2003). Risk-adjusted Return (Fama-French) and Risk-adjusted Return (Fama-French and Liquidity Factor) are the regression intercepts when the monthly excess returns of the portfolios are regressed against the corresponding factors respectively. The regressions are performed over the months specified and across all runs. Prior volume is measured over 2 years while stocks are classified into 10 return deciles and 3 volume partitions. Panel A, B C and D reports the returns for the 3-, 5-, 6- and 7-year investment period respectively. The p-values are in parentheses.

Panel A: 3-Year Investment						
Period	Raw Return		Risk-Adjusted Return (FF)		Risk-Adjusted Return (FF + Liq)	
	All Months	All Months excl. Jan	All Months	All Months excl. Jan	All Months	All Months excl. Jan
Low Volume Losers	1.76% (0.00)	0.79% (0.00)	0.26% (0.10)	-0.16% (0.26)	0.26% (0.11)	-0.17% (0.24)
High Volume Losers	1.13% (0.00)	0.15% (0.54)	-0.30% (0.02)	-0.77% (0.00)	-0.27% (0.05)	-0.76% (0.00)
Low Volume Winners	1.25% (0.00)	1.05% (0.00)	0.16% (0.13)	0.13% (0.21)	0.21% (0.05)	0.17% (0.10)
High Volume Winners	0.88% (0.00)	0.64% (0.00)	-0.18% (0.00)	-0.22% (0.00)	-0.19% (0.00)	-0.24% (0.00)
Panel B: 5-Year Investment						
Period	Raw Return		Risk-Adjusted Return (FF)		Risk-Adjusted Return (FF + Liq)	
	All Months	All Months excl. Jan	All Months	All Months excl. Jan	All Months	All Months excl. Jan
Low Volume Losers	1.55% (0.00)	0.88% (0.00)	0.19% (0.07)	-0.03% (0.75)	0.23% (0.03)	0.02% (0.83)
High Volume Losers	1.18% (0.00)	0.46% (0.01)	-0.21% (0.03)	-0.48% (0.00)	-0.14% (0.16)	-0.41% (0.00)
Low Volume Winners	1.10% (0.00)	0.92% (0.00)	0.05% (0.42)	0.05% (0.46)	0.02% (0.73)	0.01% (0.90)
High Volume Winners	0.92% (0.00)	0.61% (0.00)	-0.18% (0.00)	-0.26% (0.00)	-0.13% (0.01)	-0.21% (0.00)

Table 2.7 – Continued

Panel C: 6-Year Investment						
Period	Raw Return		Risk-Adjusted Return (FF)		Risk-Adjusted Return (FF + Liq)	
	All Months	All Months excl. Jan	All Months	All Months excl. Jan	All Months	All Months excl. Jan
Low Volume Losers	1.56% (0.00)	0.92% (0.00)	0.16% (0.08)	-0.03% (0.76)	0.17% (0.07)	-0.02% (0.83)
High Volume Losers	1.24% (0.00)	0.55% (0.00)	-0.21% (0.02)	-0.45% (0.00)	-0.14% (0.11)	-0.39% (0.00)
Low Volume Winners	1.09% (0.00)	0.92% (0.00)	0.01% (0.91)	0.01% (0.85)	-0.02% (0.65)	-0.03% (0.58)
High Volume Winners	1.00% (0.00)	0.69% (0.00)	-0.17% (0.00)	-0.24% (0.00)	-0.12% (0.01)	-0.17% (0.00)
Panel D: 7-Year Investment						
Period	Raw Return		Risk-Adjusted Return (FF)		Risk-Adjusted Return (FF + Liq)	
	All Months	All Months excl. Jan	All Months	All Months excl. Jan	All Months	All Months excl. Jan
Low Volume Losers	1.57% (0.00)	0.92% (0.00)	0.11% (0.24)	-0.11% (0.18)	0.06% (0.48)	-0.16% (0.05)
High Volume Losers	1.42% (0.00)	0.76% (0.00)	-0.16% (0.05)	-0.37% (0.00)	-0.07% (0.40)	-0.27% (0.00)
Low Volume Winners	1.14% (0.00)	0.98% (0.00)	-0.03% (0.44)	-0.02% (0.63)	-0.04% (0.32)	-0.04% (0.37)
High Volume Winners	1.14% (0.00)	0.87% (0.00)	-0.13% (0.00)	-0.17% (0.00)	-0.08% (0.06)	-0.10% (0.01)

Figure 2.1 Simple, Early and Late Contrarian Strategy Returns (5 Year)

This graph presents the 5-year investment period buy-and-hold returns to the simple, early and late contrarian strategy with ranking period of 5 years, prior volume evaluation period of 2 years and stocks selected from NYSE/AMEX/Nasdaq. The simple contrarian strategy buys the top decile losers and sells the top decile winners (R1 – R10). The early contrarian strategy buys low volume losers and sells high volume winners (R1V1 – R10V3), while the late contrarian strategy buys high volume losers and sells low volume winners (R1V3 – R10V1).

Figure 2.2 Early – Simple and Late – Simple Contrarian Strategy Returns (5 Year)

This graph presents the 5-year investment period buy-and-hold returns to the early – simple and late - simple contrarian strategy with ranking period of 5 years, prior volume evaluation period of 2 years and stocks selected from NYSE/AMEX/Nasdaq. The simple contrarian strategy buys the top decile losers and sells the top decile winners (R1 – R10). The early contrarian strategy buys low volume losers and sells high volume winners (R1V1 – R10V3), while the late contrarian strategy buys high volume losers and sells low volume winners (R1V3 – R10V1). The return of the early – simple contrarian strategy is the difference between the return of the early and simple contrarian strategies. The return of the late – simple contrarian strategy is the difference between the return of the late and simple contrarian strategies.

Figure 2.3 Simple, Early and Late Contrarian Strategy Returns (7 Year)

This graph presents the 7-year investment period buy-and-hold returns to the simple, early and late contrarian strategy with ranking period of 7 years, prior volume evaluation period of 2 years and stocks selected from NYSE/AMEX/Nasdaq. The simple contrarian strategy buys the top decile losers and sells the top decile winners (R1 – R10). The early contrarian strategy buys low volume losers and sells high volume winners (R1V1 – R10V3), while the late contrarian strategy buys high volume losers and sells low volume winners (R1V3 – R10V1).

Figure 2.4 Early – Simple and Late – Simple Contrarian Strategy Returns (7 Year)

This graph presents the 7-year investment period buy-and-hold returns to the early – simple and late - simple contrarian strategy with ranking period of 7 years, prior volume evaluation period of 2 years and stocks selected from NYSE/AMEX/Nasdaq. The simple contrarian strategy buys the top decile losers and sells the top decile winners (R1 – R10). The early contrarian strategy buys low volume losers and sells high volume winners (R1V1 – R10V3) while the late contrarian strategy buys high volume losers and sells low volume winners (R1V3 – R10V1). The return of the early – simple contrarian strategy is the difference between the return of the early and simple contrarian strategies. The return of the late – simple contrarian strategy is the difference between the return of the late and simple contrarian strategies.

ESSAY 3

CONTRARIAN PROFITS AND MARKET STATES

3.1 Introduction

In recent years, there have been a number of behavioral models based on investor underreaction and/or overreaction to explain asset mispricing (see Barberis, Shleifer and Vishny (1998, hereafter BSV), Daniel, Hirshleifer and Subrahmanyam (1998) and Hong and Stein (1999), for example). These models have been tested or used to explain short-term momentum and its subsequent reversal (Jegadeesh and Titman (2001), Hong, Lim and Stein (2000), Daniel and Titman (1999) and others). Most models focus on investors' underreaction and/or overreaction as a source of short-term momentum profit, and the correction of overreaction as a driver in reversing the earlier profit. We focus on the immediate correction of prior overreaction which could lead to contrarian profit, and analyze the impact of conditioning these contrarian strategies on whether the prior market return is negative (DOWN state) or non-negative (UP state). In order to observe the almost immediate correction to prior overreaction, a longer ranking period is used.

This study documents that raw contrarian returns are positive for both market states, with the DOWN state raw profits higher than those in the UP state. These results are robust to microstructure adjustments of skipping a month, and adjusting the starting price of stocks by $\$1/8$ effects. Contrarian profit increases as prior market return decreases. CAPM risk-adjusted profits are higher in DOWN state. Fama-French alphas are lower for DOWN state. As the DOWN state contrarian portfolios are characterized by higher SMB and HML loadings, they can be proxies for characteristics of small and high book-to-market stocks and this may explain their lower Fama-French alphas. This is consistent with Daniel and Titman (1997)'s characteristics-based model which suggests that portfolios with high HML factor loadings are expected to have lower Fama and French alphas than portfolios

with low HML factor loadings, and that high HML factor loadings need not be interpreted as compensation for factor risk.

BSV's model relies on the conservatism and representativeness heuristic in cognitive psychology. Conservatism will lead to an investor being slow to change his prior beliefs or changing them by too little as he perceives the earnings announcement or other information he receives to have a large temporary component. This will lead to his underreaction to the information content of the announcement. However, if an investor receives a series of good or bad news, the representativeness heuristic reasons that he will forecast that this string of good or bad news will continue, even though they may just have been an occurrence with a small probability under a random distribution. This will then lead the investor to overreact. In their simulation, BSV find that as the number of consecutive years (n) in which winners and losers experience consistently good or bad news increases, the contrarian profit is initially negative (when $n = 1$, consistent with momentum profits documented in Jegadeesh and Titman (1993)) and turns positive (when $n = 4$, consistent with empirical results in DeBondt and Thaler (1985)). Hence, a test of contrarian profitability should use longer ranking periods than those used in momentum strategies.

In DHS's model, an investor overreacts to private information due to overconfidence, and underreacts to public information. When a public signal is consistent with the private information he receives, this increases his confidence as he attributes it to his own ability, while conflicting public signals causes confidence to fall moderately as they are attributed to noise. This biased self-attribution causes further overreaction, which leads to reversal in the long term as further public news brings prices back to their fundamental levels. Cooper, Gutierrez and Hameed

(2004) extend DHS's model to differentiate momentum profitability in different market states. They reason that as investors generally buy stocks rather than short them, their confidence would increase in the aggregate following a bull run as they ascribe their increased wealth to their own capabilities (see Gervais and Odean (2001), and Odean (1998)). This increase in aggregate overconfidence after positive market performance would result in overreaction, leading to further momentum profit. They document that momentum profits are positive following market gains and negative after market losses. Statman and Thorley (2003) provide corroborating evidence of greater overconfidence following high market returns. Chordia and Shivakumar (2002) document that momentum strategies are more profitable during economic expansions compared to recessions. They infer that the momentum profitability is related to the business cycle and propose a macroeconomic-based multifactor model to explain it. Asness (1997) documents that value strategies work best among low-momentum stocks and are less profitable among high-momentum stocks. Similarly, he documents that momentum strategy performs better among low-value stocks compared to high-value stocks. This indicates a clear interaction between momentum and value strategies. Hence, we expect contrarian strategies (which are opposite of momentum strategies but closely linked to value strategies) to be more profitable following market downturn, when momentum strategies are less profitable.

HS model divides investors into two categories: newswatchers and momentum traders. Newswatchers rely solely on their private information which is assumed to diffuse gradually. This leads to an initial underreaction in response to information. Momentum traders, on the other hand, rely exclusively on public information contained in historical price movements. They are involved in trend

chasing. Those in the early stage would be profitable while those in the late stage are not, as late momentum buyers purchase overvalued stocks and push them further beyond their fundamental value. They are not able to determine if they are in the early stage or late stage as it is assumed that they rely on price patterns and not news. HS model predicts that lower risk aversion leads to greater momentum profits as it causes more delayed overreaction. Wealth increases with aggregate market levels and as risk aversion declines when wealth increases (see Barberis, Huang and Santos (2001), Campbell and Cochrane (1999), and Routledge and Zin (2003)), HS model indicates higher momentum profits after the market has risen. This again suggests lower (higher) contrarian profits following market gains (losses).

Baker and Wurgler (2005) document that when investor sentiment is low, future returns are relatively high for smaller stocks, unprofitable stocks, non-dividend-paying stocks and distressed stocks. The characteristic of such stocks is often the characteristic of losers. Investor sentiment is expected to be low following significant aggregate market declines as they suffer losses or see the value of their investments plunge substantially. Hence, we expect losers to be profitable after protracted market declines. Stivers and Sun (2004) propose a two-state regime switching model to explain momentum profitability with one regime lasting much longer than the other. Their model predicts that if the ranking and holding periods are within the same regime, momentum profits would be higher than that of a model with constant mean returns. On the other hand, if ranking and holding periods are in different regimes, profits would be lower or possibly negative as the realized ranking period returns would likely be different from that of the holding period. Taking economic recessions and expansions as the two regimes, they find that,

consistent with their model, medium-term momentum profits are insignificant in both regimes after adjusting for regime-specific average returns. Ang, Chen and Xing (2004) document that stocks, which have high beta conditioned upon a down market (high β), have high average returns. They also find that the return of most stocks exhibit a positive relation with their past β . Losers are expected to have high β , while winners are expected to have low β if the prior market return is negative. Hence, the return of losers is expected to be high following a down market while winners are expected to underperform. Therefore, we expect contrarian profits to be higher after a down market.

3.2 Data Sources and Identification of Samples

Data sources are the same as that described in Essay I. The sample is taken from common stocks listed on the NYSE, AMEX or Nasdaq. We also adopt the same buy-and-hold return metric and treatment of delisted stocks.

3.3 Methodology

3.3.1 Raw Profits of Contrarian Strategies in UP and DOWN markets

We evaluate ranking period of 3, 5, 6 and 7 years. Only stocks which are continuously listed for the whole ranking period are used. Similar to DeBondt and Thaler (1985, 1987), Chopra, Lakonishok and Ritter (1992), and Ball, Kothari and Shanken (1995), firms which are delisted during the investment period are included. Excluding post-ranking delisted stocks would introduce an upward bias to our contrarian results. The investment period return of the winners (losers) portfolio is

the equal-weighted buy-and-hold investment period return of the 50 best (worst) performing stocks during the ranking period.

To determine the “UP” and “DOWN” states of the market, we use the CRSP value-weighted index of all NYSE/AMEX/Nasdaq stocks (with dividends reinvested) over the ranking period of 3 years for our initial analysis. An “UP” (“DOWN”) market state is defined as one where the prior market return is non-negative (negative). We obtain the returns of the winners and losers, and the profits of the contrarian portfolios (losers – winners) conditioned upon the two market states. For robustness, we also analyze the results over prior market evaluation period of 6 months, 1 year and 2 years.

3.3.2 Risk Adjustments

Fama and French (1996) report that many apparent average return anomalies that cannot be explained by CAPM can be accounted for by the three-factor model in Fama and French (1993). Their results are based on the first month of investment only. The Fama and French three-factor model is based on the framework that common stocks' returns can be ascribed to three common risk factors; namely, market factor, firm size and book-to-market equity. The return of common stock can be expressed as follows:

$$R_{it} - R_{ft} = \alpha_i + \beta_{i, Mkt} (Mkt_t - R_{ft}) + \beta_{i, SMB} SMB_t + \beta_{i, HML} HML_t + e_{it} \quad (3.1)$$

where R_{it} is the return of the stock, R_{ft} is the risk free rate, Mkt_t is the return of the market portfolio, SMB_t is the return on SMB portfolio (mimicking portfolio for risk

related to size), HML_i is the return on HML portfolio (mimicking portfolio for risk related to book-to-market-equity). If contrarian profit cannot be explained by the Fama and French factors (i.e. cannot be explained by the Fama and French risk-based asset pricing model), the alpha of the regression of stock excess return on excess market return, return of the SMB and portfolios will be significantly different from zero. This will then indicate a positive or negative risk-adjusted return.

However, the behavioral school does not regard the Fama and French three-factor model as a full risk-based model as they regard the return to the HML mimicking portfolio as a measure of overall market mispricing and not as a risk premium related to book-to-market equity risk factor. Lakonishok, Shleifer and Vishny (1994) argue that the higher return of value strategies is not due to risk but is caused by behavioral bias of investors who incorrectly extrapolate past earnings growth patterns of firms. Daniel and Titman (1997) document that after controlling for firm characteristics, portfolios with different Fama-French factor loadings do not have different returns. They conclude that high returns of portfolios with high Fama-French factor loadings cannot be interpreted as compensation for factor risk. Their characteristics-based model suggests that portfolios with high HML factor loadings are expected to have lower Fama and French alphas than portfolios with low HML factor loadings. Hence the behavioral school would regard the CAPM alpha rather than the Fama and French alpha as a more suitable measure for residual returns after controlling for risk.

Based on the above considerations, we subject our winners (UP winners and DOWN winners) and losers (UP losers and DOWN losers) portfolios to risk adjustment based on CAPM. However, for completeness and to maintain some

consistency with many current papers, we also make risk adjustment based on the Fama and French's three-factor model.

Grundy and Martin (2001) devise a dynamic risk adjustment that allows for variation in factor loadings in calendar time instead of event time. The methodology for their 2-factor model is detailed in Section 3.3.2.3.

3.3.2.1 CAPM Time-Series Regressions

For each run, we obtain the annual return of the winners (UP winners and DOWN winners) and losers (UP losers and DOWN losers) portfolios by compounding their monthly returns over a year. We regress using Ordinary Least Squares the annual return of the winners and losers portfolio against the annual market excess returns as follows:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p [Mkt_t - R_{ft}] + e_{pt} \quad (3.2)$$

where, R_{pt} is the annual return of the portfolio under study (equals to the return of the UP / DOWN winners portfolio or of the UP / DOWN losers portfolio as the case may be), R_{ft} is the risk free rate, α_p is the CAPM alpha (a measure of CAPM risk-adjusted return and is equal to zero if there is no mispricing), β_p is the CAPM beta while Mkt_t is the annual return of the value-weighted index of stocks listed on NYSE, AMEX or Nasdaq and $e_{pt} \sim N(0, \sigma_p)$. For the contrarian portfolio, the regressand is its annual return. The resultant alphas and betas from these regressions are computed and analyzed.

3.3.2.2 Fama-French (FF) Time-Series Regressions

Again, we compound the monthly return of the winners and losers portfolios to obtain their respectively annual return. Using Ordinary Least Squares, we perform the following regression:

$$R_{Pt} - R_{ft} = \alpha_p + \beta_{P,Mkt} [Mkt_t - R_{ft}] + \beta_{P,SMB} SMB_t + \beta_{P,HML} HML_t + e_{Pt} \quad (3.3)$$

where R_{Pt} is the annual return of the portfolio under study (equals to the return of the UP / DOWN winners portfolio or of the UP / DOWN losers portfolio as the case may be), R_{ft} is the risk free rate, α_p is the FF alpha (a measure of FF risk-adjusted return and is equal to zero if there is no mispricing), $\beta_{P,Mkt}$ is the FF factor loading for the market excess return, $\beta_{P,SMB}$ is the factor loading for SMB_t (return on the mimicking portfolio for risk related to size), $\beta_{P,HML}$ is the factor loading for HML_t (return on the mimicking portfolio for risk related to book-to-market equity), while Mkt_t is the annual return of the value-weighted index of stocks listed on NYSE, AMEX or Nasdaq and $e_{Pt} \sim N(0, \sigma_p)$. For the contrarian portfolio, the regressand is its annual return.

3.3.2.3 2-Factor Time-Series Regressions

For the UP and DOWN state (as appropriate) and for the month t , the monthly excess returns ($r_{p, \tau}$) of the stock portfolio $p = (\text{losers}, \text{winners})$ are regressed using the 2-factor model as follows:

$$r_{p, \tau} = \alpha_p + \beta_p r_{EW\tau} - s_p OMT_\tau + e_{p, \tau} \quad \tau = t, \dots, t+11 \quad (3.4)$$

where r_{EW} is the monthly excess return of the equally weighted CRSP index and OMT_τ (One Minus Ten) is the month τ difference in returns on the CRSP indices of stocks ranked in the first (One) and tenth (Ten) deciles of market capitalization, where One and Ten is the decile containing the smallest and largest firms respectively. For the contrarian portfolio, the regressand is its monthly return. The estimated market and size factor loadings for the month t are $\hat{\beta}_{p,t}$ and $\hat{s}_{p,t}$. The risk-adjusted profit in month t ($AdjPft_t$) is given by $r_{p,t} - \hat{\beta}_{p,t} r_{EW,t} - \hat{s}_{p,t} OMT_t$. The risk-adjusted profit for month t is then averaged over all months.

3.3.3 Microstructure Effects

Similar to the procedure used in Ball, Kothari and Shanken (1995), the prices of all stocks from the winners and losers used to obtain the raw profits in Section 3.3.1 are adjusted upward by $\$1/8$. This upward adjustment is based on the price of the stock as at the end of the ranking period. The buy-and-hold returns of the winners (UP / DOWN winners) and losers (UP / DOWN losers) and the UP and DOWN contrarian arbitrage portfolio are recomputed to study the impact of this $\$1/8$ price adjustment.

Further, a 1-month lag is incorporated between the end of the ranking period and the beginning of the investment period e.g. if the ranking period ends at the end of December 1990, the investment period starts from beginning of February 1991 and the end date of the investment period is pushed one month later. The buy-and-hold returns of the winners (UP / DOWN winners) and losers (UP / DOWN losers),

UP and DOWN contrarian arbitrage portfolios are recomputed to study the impact of incorporating this 1-month lag.

3.3.4 Robustness Tests and Further Analysis

We also obtain results where the UP and DOWN states are defined based on prior market return over 6 months, 1 year and 2 years.

Using the prior return of the market index as a criterion to divide their sample period into quintiles, CGH obtain the average profits of their momentum portfolios in these quintiles. They document that mean raw profit, CAPM alpha, and Fama-French alpha are smallest for the quintile with the lowest prior market return, while these returns are highest for the median quintile, showing that momentum profits peak at some point in the continuum of prior market returns. Similarly, we split our contrarian profits sample into quintiles based on the prior return of the market as a continuum and observe where the contrarian profit is at the lowest and at the peak.

3.4 Empirical Results

3.4.1 Raw Returns

Insert Table 3.1 here.

Table 3.1 presents the raw return, return adjusted for $S^{1/8}$ and skipping a month, of the arbitrage, losers and winners portfolios. The criterion for prior return classification is based on the returns of individual stocks. These returns are

reported for the full sample period, and the UP and DOWN market states. The UP and DOWN market states are evaluated over $\frac{1}{2}$ -year, 1-year, 2-year and 3-year, where a UP (DOWN) state is defined as one when the return of the CRSP value-weighted index of all NYSE/AMEX/Nasdaq stocks over the specified market evaluation period is non-negative (negative).

Panel A, B, C and D present results for the 3-, 5-, 6- and 7-year ranking/investment periods respectively. The holding periods are 1929 to 2001, 1931 to 2001, 1932 to 2001 and 1933 to 2001 for the 3-, 5-, 6- and 7-year period respectively. The holding period after skipping a month, starts and ends one month later.

For brevity, we will focus on the 5-year ranking and investment period reported in Panel B. There are less DOWN states than UP states. The number of DOWN states also becomes smaller as the evaluation period of the prior market return is extended, e.g. the number of DOWN (UP) states for prior market return over $\frac{1}{2}$ -year is 20 (47), whereas the corresponding number of states is 10 (57) for market evaluation period of 3 years. This is because it is less common for the market to have poor performance over extended periods.

The raw returns of the arbitrage, losers and winners portfolios in DOWN states are all higher than the corresponding ones for the full period, e.g. the raw return of the arbitrage, losers, and winners in the 2-year DOWN state is 261.53%, 355.99% and 94.46% respectively. They are higher than the corresponding values of 83.68%, 162.14% and 78.46% for the full period.

The returns of the arbitrage, losers and winners portfolios in UP states are all lower than the corresponding ones for the full period, e.g. the raw return of the

arbitrage, losers and winners in the 2-year UP state is 40.86%, 115.47% and 74.61% respectively. They are lower than the corresponding returns for the full period.

The returns of all portfolios (independent of their prior returns) are higher in a DOWN state. However, the losers chalked up much higher returns than the winners, resulting in higher contrarian profits in a DOWN state. This suggests that prior return of the value-weighted index is a very good predictor of market reversals, with asymmetric effect on prior return portfolio: losers outperforming winners during the investment period.

The evidence of higher (lower) stock contrarian profits in DOWN (UP) state is consistent with the lower (higher) stock momentum profits found in CGH, as contrarian and momentum are opposite strategies.

Similar conclusions are obtained for returns adjusted for $\frac{1}{8}$ and skipping a month. For the DOWN state (except for the 1-year DOWN), skipping a month reduces contrarian profits more than the $\frac{1}{8}$ price adjustment. For instance, for the 2-year DOWN state, skipping a month causes contrarian profit to drop from 261.53% to 184.11%, whereas the $\frac{1}{8}$ price adjustment causes it to drop by a smaller amount, to 193.05%.

The opposite is true for the UP state. For the UP state, skipping a month has less effect in reducing contrarian profits than the $\frac{1}{8}$ price adjustment. For instance, for the 2-year UP state, skipping a month causes contrarian profit to drop from 40.86% to 20.58%, whereas the $\frac{1}{8}$ price adjustment causes it to drop by a bigger amount, to 11.73%.

The $\frac{1}{8}$ adjustment causes a greater drop in losers return in the DOWN state vis-à-vis the UP state, but has minimal impact on winners for both states. For the 2-year DOWN state, $\frac{1}{8}$ adjustment results in a drop of 69.76% (355.99% - 286.23%)

for the losers. A much smaller drop of 30.19% (115.47% - 85.28%) is seen in the UP state. For the winners, the $\frac{1}{8}$ adjustment in both DOWN and UP states causes a drop in return of only about 1%. The higher impact of $\frac{1}{8}$ adjustment for losers, particularly in the DOWN state, is expected, because we expect losers to be lowly-priced, especially after a down market.

Despite the $\frac{1}{8}$ price adjustment causing a bigger drop in losers in the DOWN state, the contrarian profit after this adjustment is still high and significant (e.g. 193.05% for the 2-year DOWN). In sum, though contrarian profits drop when we factor in microstructure effects (which has greater impact on losers), they are still economically substantial, especially in the DOWN state. The results are qualitatively the same for the other ranking/investment periods.

Comparing the effectiveness of different prior market evaluation periods in differentiating arbitrage returns between the two states and causing the highest contrarian profit in the DOWN state, the 2-year period is the best for the 5-year ranking period, and the 3-year period is the most effective for the 3-, 6- and 7-year ranking period. To illustrate, for the 5-year ranking period, the 2-year DOWN state's contrarian profit is highest at 261.53%. The $\frac{1}{2}$ -year DOWN state's contrarian profit of 148.62% is the lowest among the DOWN states.

Insert Figure 3.1 here.

Figure 3.1 shows the 5-year investment period buy-and-hold return of contrarian strategy conditional upon DOWN and UP state when the ranking period is 5 years. Here, a DOWN (UP) state is defined as one when the prior market return is negative (non-negative) over the 3 years before investment. There are 10 DOWN states and

57 UP states. The contrarian strategy in the DOWN state clearly outperforms that in the UP state for every month in the investment period. There is a clear January effect for the DOWN state as the return spikes up each January. The contrarian return in the DOWN state increases over time and peaks in the 49th month at 362.02% and corrects downward to 256.71% at the end of the 5-year period.

In sum, the results show that our hypothesis of higher contrarian profits following market declines is robust to microstructure effects ($\frac{1}{8}$ price adjustment and skipping a month) and is true for all ranking/investment periods evaluated. Hence, stock contrarian profits (not risk-adjusted yet) are more profitable in DOWN state compared to UP state. There is a clear, economically significant January effect in the DOWN state contrarian.

3.4.2 CAPM Risk-Adjusted Profit and Beta

Panel A of Table 3.2 shows summary results of the CAPM time-series regressions on the returns of the contrarian, losers and winners portfolios, conditioned upon prior market returns. Prior market returns are measured over $\frac{1}{2}$ -year, 1-year, 2-year and 3-year periods. The alphas are averaged over all investment periods for a given market evaluation period and market state. Panel B shows detailed results for the DOWN and UP states for various market evaluation periods and investment periods. CAPM regression is performed using yearly portfolio return across all event years because the number of DOWN states is rather limited.

Insert Table 3.2 here.

Panel A shows that the alphas of contrarian and losers are always positive, whereas the alphas of winners are mostly negative. Furthermore, the alphas are more positive for contrarian and losers in the DOWN state, vis-à-vis the UP state, and typically negative for winners in the UP state; with the winners alphas being lower in the UP state. As the alphas of losers are positive in both states, but bigger in the DOWN state, we conclude that there is more underpricing of losers in the DOWN state. A possible explanation could be the incorrect extrapolation of the negative earnings of losers into the future by investors (see La Porta (1996)), with the strength of the incorrect extrapolation being particularly stronger following broad market declines. As most of the alphas of winners are negative in both states, with the alphas being lower in the UP state, we conclude that winners are often overpriced, particularly those in the UP state. This is consistent with prior momentum of winners being caused by investors' overreaction, particularly in the UP state, leading to subsequent reversals.

The positive alphas of winners occur only in the 2-year DOWN and 3-year DOWN states. This may be caused by sentiments being so negative after a protracted period of bad overall market performance that even buying demand for winners is dampened. This leads to their trading below fundamental value. Panel A, reports that the contrarian alphas are 6.89%, 3.83%, 9.25%, 3.31%, 10.04%, 3.79%, 5.85% and 4.50% for the ½-year DOWN, UP, 1-year DOWN, UP, 2-Year DOWN, UP and 3-Year DOWN, UP states respectively. The positive alphas indicate that contrarian strategies are profitable even after adjusting for risk for both DOWN and UP states.

The difference between the DOWN and UP state contrarian alphas is 3.06%, 5.94%, 6.25% and 1.35% for the ½-year, 1-year, 2-year and 3-year market evaluation periods respectively. This indicates that contrarian alphas are higher for the DOWN state, vis-à-vis the UP state. The difference between the alphas of losers in DOWN and UP states is 4.16%, 8.20%, 9.77% and 8.94% for the ½-year, 1-year, 2-year and 3-year market evaluation period respectively. The corresponding difference for winners is 1.11%, 2.25%, 3.51% and 7.59%. Thus the difference in the alphas of losers for the DOWN and UP states is higher than the difference in the alphas of winners. The higher contrarian alphas in the DOWN states are due to this.

In sum, the evidence confirms that stock contrarian portfolios are more profitable in DOWN states, even after CAPM risk adjustment.

Insert Table 3.3 here.

Panel A reports the summary of Down and Up Market β s for the various prior market evaluation tenors, averaged over different investment periods. It shows the large change in betas of the three portfolios between the ranking and investment periods. For illustration, we focus on the 2-year market evaluation period. There are substantial changes in the betas of the portfolios from ranking period to investment period. For the DOWN state, losers beta increases from 1.1962 to 1.9122, much more than the corresponding increase from 1.3193 to 1.5467 in the UP state. For the winners, the beta decreases from the ranking period to the investment period by about 0.70 for both DOWN and UP state. This leads to the contrarian beta increasing from -0.5816 to 0.8306 in the DOWN state, and increasing by a smaller amount from -0.7479 to 0.2197. The higher contrarian beta

in the DOWN state vis-à-vis the UP state partly accounts for the higher raw contrarian profit in the DOWN state.

3.4.3 FF Risk-Adjusted Profit and Factor Loadings

Panel A of Table 3.4 shows the summary results of the FF time-series regressions on the returns of contrarian, losers and winners portfolios conditioned upon prior market returns. Prior market returns are measured over ½-year, 1-year, 2-year and 3-year periods. The alphas are averaged over all investment periods for a given market evaluation period and market state. Panel B shows detailed results for the DOWN and UP states for various market evaluation periods, and investment periods. FF regression is performed using yearly portfolio return across all event years because the number of DOWN states is rather limited.

Insert Table 3.4 here.

Panel A shows that the alphas of losers and winners are mostly negative for the various prior market evaluation periods, and for both DOWN and UP states. The contrarian alpha is 0.34%, 0.28%, -0.37%, 0.33%, -2.22%, 0.96%, -7.49% and 1.47% for the ½-year DOWN, UP, 1-year DOWN, UP, 2-Year DOWN, UP and 3-Year DOWN, UP states respectively. This shows mostly negative risk-adjusted contrarian profits in the DOWN states and positive risk-adjusted contrarian profits for the various market evaluation periods. The difference between the DOWN and UP state contrarian alphas is 0.07%, -0.71%, -3.18% and -8.96% for the ½-, 1-, 2- and 3-year period respectively. This negative difference indicates relatively weaker

risk-adjusted performance of contrarian portfolio in the DOWN state, vis-à-vis the UP state, based on the assumption that the Fama and French's three-factor model is correct.

Insert Table 3.5 here.

Panel A of Table 3.5 shows the summary results of the factor loadings obtained from FF time-series regressions on the returns of contrarian portfolios conditioned upon prior market returns. Prior market returns are measured over ½-year, 1-year, 2-year and 3-year periods. The factor loadings are averaged over all investment periods for a given market evaluation period and market state. Panel B shows detailed results for the DOWN and UP states for various market evaluation periods, and investment periods. FF regression is performed using yearly portfolio return across all event years because the number of DOWN states is rather limited.

Panel A reports large changes in contrarian factor loadings from the ranking period to the investment period. For the DOWN state, all factor loadings are negative during the ranking period but are positive and large (for the SMB and HML loadings) during the investment period. For the UP state, market beta is negative during the ranking period but is less negative for the investment period. Further, the SMB loading changes from negative to positive from the ranking period to the investment period while the HML loading increases.

During the investment period, the SMB loading increases substantially from 0.9743 to 1.4512 in the DOWN state when the prior market period is increased from ½- year to 3-year, while the HML loading increases from 0.8036 to 1.1710. This is not surprising as the contrarian portfolios buy losers and they tend to be smaller and

have higher book-to-market value especially after a protracted period of broad market decline. The contrarian SMB and HML loadings are higher in the DOWN state compared to those in the UP state. This implies that contrarian portfolios are behaving more like value stocks in the DOWN state and more like growth stocks in the UP state. Our finding of lower contrarian FF alphas in the DOWN state is consistent with Daniel and Titman (1997)'s finding of lower FF alphas for portfolios with higher HML loadings. The difference in investment period HML loading of the contrarian portfolios in the DOWN and UP states for the ½-year and 1-year prior market evaluation period is 0.0282 and 0.2517 respectively and they are not substantial. However, this difference is huge for the 2-year and 3-year period, being 0.5675 and 0.5268 for the 2-year and 3-year period respectively. The alphas of the contrarian portfolios in the DOWN states for the 2- and 3-year market evaluation period are negative while those in the corresponding UP states are positive (see Panel A of Table 3.4), again consistent with Daniel and Titman (1997)'s characteristics-based model. This partially explains why the contrarian alphas are much lower in the DOWN states than in the UP states for the 2- and 3-year market evaluation periods.

The findings of Daniel and Titman (1997) imply that the results of Fama and French (1993) is not incompatible with a behavioral model involving mispricing, and that it is stock characteristics, and not covariance with some proxies for size and book-to-market risk, that explains the cross-section of returns.

The higher SMB and HML loadings of contrarian portfolios, particularly in the DOWN state, may be due to their possessing more small size and high book-to-market characteristics. Once these are taken into account, the FF alpha will naturally be lower, or even negative. Hence, from the behavioral point of view, the

results here are not necessary inconsistent with our hypothesis of higher contrarian profits in DOWN states, because the Fama-French regressions hamper the detection of behavioral mispricing associated with stock characteristics.

3.4.4 2-Factor Risk Adjustment

Insert Table 3.6 here.

Panel A shows the summary of risk-adjusted profit (AdjPft, in %) for a given prior market tenor, averaged across all investment period horizons, where the risk-adjustment is a dynamic adjustment for the changing factor loadings using Grundy and Martin’s 2-factor model. Panel B reports AdjPft for different investment period tenors, prior market evaluation periods, and for the DOWN and UP states. Panel A reports that contrarian AdjPfts are more negative for the DOWN state (-0.26%, -0.20%, -0.50% and -0.95% for the ½-year, 1-year, 2-year and 3-year prior market period respectively) compared to those in the UP state (-0.12%, -0.15%, -0.08% and -0.03% for the 1-year, 2-year and 3-year period respectively). Losers AdjPfts are negative in the DOWN state while they are mostly positive in the UP state. Winners AdjPfts are mostly more positive in the DOWN state compared to the UP state.

Grundy and Martin report that the above dynamic risk-adjustment hedges out the momentum’s “strategy often disastrous bet against the January effect” and this accounts for momentum’s positive risk-adjusted profits. As contrarian strategy is opposite of momentum strategy, our results are not surprising as the above risk adjustment has hedged out the contrarian’s favourable bet on the January effect

hence causing positive raw profits to turn negative after the risk adjustment. In further detailed analysis (results available from the author upon request), the contrarian strategies in January are typically negative in the DOWN state while they are mostly positive in the UP state. This may be caused by losers in the DOWN state being more sensitive to the January effect leading to their mostly negative risk-adjusted profits compared to the mostly positive risk-adjusted profits in the UP state.

3.4.5 Lagged Market Return as a Continuous Variable

Using lagged market return as a continuous variable to proxy for market states, CGH document that their momentum profit is an increasing function of the lagged market return. However, this is not a monotonic relation, and the profits peak at a certain level of lagged market return.

Insert Table 3.7 here.

Adopting their procedure, the raw contrarian profits are regressed on lagged market returns, and the square of lagged market returns, where we use the prior 3-year CRSP value-weighted index return as our lagged variable. Panel A, B, C and D of Table 3.7 present results of the regression for the 3-, 5-, 6- and 7-year ranking/investment period. In the second portion of each panel, contrarian portfolios for each run are allocated into quintiles, based on their associated lagged 3-year market return. The average of the investment period returns within each quintile is reported. Simple p-values are reported in parentheses. We analyze the result for the 5-year ranking period reported in Panel B.

The coefficient of the lagged market return is -2.2375, while the coefficient of the square of the lagged market return is positive. This indicates that contrarian profits decrease as lagged market return increases, but the positive coefficient of the square of the lagged market return shows that this decrease is at a slower rate as lagged market return increases.

In the second portion of Panel B, we observe that as we move to the higher quintiles, contrarian profit dips, rises again, and then continues its decline. Across the different investment periods, we note that for 3 out of 4 investment periods, the lowest contrarian profit is from the highest lagged market return quintile. For all investment periods, the highest stock contrarian return is obtained from the lowest quintile. The results of Table 3.7 reaffirm our earlier findings of higher stock contrarian profits in the DOWN state vis-à-vis the UP state.

For robustness, we test the results for prior market evaluation period of 1 and 2 years, and arrive at similar conclusions for the regressions. For the quintiles, we again find that the highest contrarian profit is obtained from the lowest lagged market return quintile. However, the quintile for lowest contrarian profit varies, according to the length of the investment period, and the market evaluation period.

3.5 Conclusion

Our results confirm earlier finding of stock contrarian profits (DeBondt and Thaler (1985, 1987), Chopra, Lakonishok and Ritter (1992) and Ball, Kothari and Shanken (1995)). Though microstructure effects lower these profits, they remain economically significant for contrarian strategies, after adjustments of $\$1/8$ to the price of stocks, and skipping a month.

Stock contrarian strategies are profitable in both DOWN and UP states and raw profits are higher for contrarian strategies in the DOWN state. These results are robust to adjustment for microstructure effects.

Our results also show that contrarian profits increase with declining market returns. Longer evaluation periods of prior market returns (2-year and 3-year) are more effective in bringing out higher contrarian profits in the DOWN state.

CAPM alphas are positive for both DOWN and UP states of stock and industry contrarian. Contrarian shows higher risk-adjusted returns in DOWN, vis-à-vis UP state.

The Fama-French alphas are positive for UP state stock contrarian, but are mixed for the DOWN state. This can be explained from the behavioral view point, by the higher SMB and HML loadings of the DOWN state contrarian portfolios, characteristic of small and high book-to-market stocks. As argued in Daniel and Titman (1997), “factor loadings do not explain the high returns associated with small and high book-to-market stocks beyond the extent to which they act as proxies for these characteristics”. Risk adjustment using Grundy and Martin (2001)’s 2-factor model results in lower risk-adjusted profits in the DOWN state as the risk adjustment hedges out the contrarian’s favorable bet in January and losers in the DOWN state are more sensitive to the January effect.

In sum, DOWN state contrarian raw profits are higher than UP state profits. These are robust to microstructure adjustments of skipping a month, and adjusting the starting price of stocks by $\$1/8$ effects. Contrarian profit increases as prior market return decreases. CAPM risk-adjusted profits are higher in DOWN state. Fama-French alphas are lower for DOWN state. This can be explained by the higher SMB and HML loadings of DOWN losers being proxies for characteristics

of small and high book-to-market stocks, which tend to earn high returns and be underpriced.

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Table 3.1 Returns of Arbitrage, Losers and Winners conditional upon Market States

This table reports the average of the buy-and-hold returns of Stock Arbitrage (Losers-Winners), Losers, and Winners portfolios for the full sample period. It also reports the results conditional upon whether the market state for the past 1/2-, 1-, 2- and 3-years are DOWN or UP. DOWN (UP) state is when the CRSP VW index over the stated prior period is negative (non-negative). The table also shows the corresponding returns adjusted for 1/4 change in price at the end of the ranking period, and also returns obtained after skipping a month before investment. These two adjustments are to take into account microstructure effects. The investment period for the full sample ranges from 1929:01 to 2001:12, 1931:01 to 2001:12, 1932:01 to 2001:12, 1933:01 to 2001:12 for the 3-, 5-, 6- and 7-year investment periods respectively. The corresponding periods covered when we skip 1-month starts and ends a month later. Panel A, B, C and D present the results for 3-, 5-, 6- and 7-year investment periods. The number of runs is indicated by "Frequency". The numbers in parentheses are p-values.

Panel A: 3-Year Ranking/Investment Period											
Market State	Frequency	Arbitrage Returns			Losers Returns			Winners Returns			Skip 1-Month
		Raw	1/4 Adj	Skip 1-Month	Raw	1/4 Adj	Skip 1-Month	Raw	1/4 Adj	Skip 1-Month	
Full Period	71	51.76% (0.00)	24.41% (0.04)	26.78% (0.02)	93.61% (0.00)	64.99% (0.00)	68.55% (0.00)	41.85% (0.00)	40.58% (0.00)	41.76% (0.00)	
1/2-Year Down	21	90.80% (0.01)	54.17% (0.02)	44.09% (0.03)	140.35% (0.00)	102.13% (0.00)	91.91% (0.00)	49.55% (0.00)	47.96% (0.00)	47.82% (0.00)	
1/2-Year Up	50	35.37% (0.01)	11.91% (0.17)	19.51% (0.07)	73.99% (0.00)	49.39% (0.00)	58.73% (0.00)	38.62% (0.00)	37.48% (0.00)	39.22% (0.00)	
1-Year Down	18	130.78% (0.00)	86.89% (0.00)	86.39% (0.01)	183.27% (0.00)	137.66% (0.00)	138.61% (0.00)	52.49% (0.00)	50.77% (0.00)	52.22% (0.00)	
1-Year Up	53	24.93% (0.03)	3.19% (0.38)	6.54% (0.26)	63.17% (0.00)	40.31% (0.01)	44.75% (0.00)	38.24% (0.00)	37.12% (0.00)	38.21% (0.00)	
2-Year Down	13	132.74% (0.01)	91.20% (0.02)	85.40% (0.03)	187.21% (0.01)	144.27% (0.01)	143.10% (0.02)	54.47% (0.01)	53.08% (0.01)	57.69% (0.01)	
2-Year Up	58	33.61% (0.01)	9.44% (0.19)	13.64% (0.09)	72.63% (0.00)	47.22% (0.00)	51.84% (0.00)	39.02% (0.00)	37.78% (0.00)	38.19% (0.00)	
3-Year Down	10	196.75% (0.01)	140.85% (0.01)	129.74% (0.02)	291.40% (0.01)	232.96% (0.01)	223.66% (0.01)	94.65% (0.00)	92.10% (0.00)	93.93% (0.00)	
3-Year Up	61	27.99% (0.01)	5.32% (0.27)	9.90% (0.13)	61.19% (0.00)	37.45% (0.00)	43.12% (0.00)	33.20% (0.00)	32.13% (0.00)	33.21% (0.00)	

Table 3.1 – Continued

Panel B: 5-Year Ranking/Investment Period											
Market State	Frequency	Arbitrage Returns			Losers Returns			Winners Returns			Skip 1- Month
		Raw	\$1/8 Adj	Skip 1- Month	Raw	\$1/8 Adj	Skip 1- Month	Raw	\$1/8 Adj	Skip 1- Month	
Full Period	67	83.68% (0.00)	46.91% (0.02)	52.31% (0.01)	162.14% (0.00)	124.27% (0.00)	130.86% (0.00)	78.46% (0.00)	77.36% (0.00)	78.55% (0.00)	
1/2-Year Down	20	148.62% (0.01)	95.71% (0.02)	89.56% (0.01)	233.67% (0.00)	179.54% (0.00)	177.49% (0.00)	85.05% (0.00)	83.83% (0.00)	87.93% (0.00)	
1/2-Year Up	47	56.04% (0.01)	26.15% (0.08)	36.46% (0.04)	131.70% (0.00)	100.75% (0.00)	111.02% (0.00)	75.66% (0.00)	74.60% (0.00)	74.56% (0.00)	
1-Year Down	17	206.81% (0.01)	144.12% (0.02)	146.38% (0.01)	310.66% (0.00)	246.69% (0.00)	255.33% (0.00)	103.85% (0.00)	102.58% (0.00)	108.95% (0.00)	
1-Year Up	50	41.81% (0.01)	13.87% (0.11)	20.33% (0.06)	111.64% (0.00)	82.65% (0.00)	88.54% (0.00)	69.83% (0.00)	68.79% (0.00)	68.21% (0.00)	
2-Year Down	13	261.53% (0.01)	193.05% (0.01)	184.11% (0.01)	355.99% (0.01)	286.23% (0.00)	284.86% (0.01)	94.46% (0.00)	93.19% (0.00)	100.75% (0.00)	
2-Year Up	54	40.86% (0.01)	11.73% (0.16)	20.58% (0.06)	115.47% (0.00)	85.28% (0.00)	93.79% (0.00)	74.61% (0.00)	73.55% (0.00)	73.20% (0.00)	
3-Year Down	10	256.71% (0.02)	180.15% (0.03)	152.07% (0.03)	388.62% (0.01)	310.34% (0.01)	279.00% (0.01)	131.92% (0.00)	130.18% (0.00)	126.93% (0.00)	
3-Year Up	57	53.32% (0.00)	23.54% (0.06)	34.81% (0.02)	122.41% (0.00)	91.63% (0.00)	104.87% (0.00)	69.08% (0.00)	68.09% (0.00)	70.06% (0.00)	

Table 3.1 – Continued

Panel C: 6-Year Ranking/Investment Period											
Market State	Frequency	Arbitrage Returns			Losers Returns			Winners Returns			Skip 1- Month
		Raw	\$1/8 Adj	Skip 1- Month	Raw	\$1/8 Adj	Skip 1- Month	Raw	\$1/8 Adj	Skip 1- Month	
Full Period	65	77.64% (0.00)	42.49% (0.02)	42.92% (0.01)	178.42% (0.00)	142.14% (0.00)	145.35% (0.00)	100.77% (0.00)	99.65% (0.00)	102.43% (0.00)	
1/4-Year Down	19	142.69% (0.01)	89.88% (0.03)	73.03% (0.02)	255.33% (0.00)	201.13% (0.00)	181.79% (0.00)	112.63% (0.00)	111.25% (0.00)	108.75% (0.00)	
1/2-Year Up	46	50.78% (0.00)	22.92% (0.07)	30.49% (0.03)	146.65% (0.00)	117.78% (0.00)	130.30% (0.00)	95.87% (0.00)	94.86% (0.00)	99.82% (0.00)	
1-Year Down	16	193.72% (0.00)	133.28% (0.01)	108.48% (0.01)	315.29% (0.00)	253.46% (0.00)	235.02% (0.00)	121.57% (0.00)	120.18% (0.00)	126.54% (0.00)	
1-Year Up	49	39.74% (0.01)	12.85% (0.17)	21.52% (0.05)	133.73% (0.00)	105.80% (0.00)	116.07% (0.00)	93.98% (0.00)	92.95% (0.00)	94.56% (0.00)	
2-Year Down	12	256.35% (0.00)	192.04% (0.00)	157.39% (0.00)	364.88% (0.00)	299.11% (0.00)	266.51% (0.00)	108.53% (0.00)	107.07% (0.00)	109.12% (0.00)	
2-Year Up	53	37.18% (0.01)	8.63% (0.26)	17.01% (0.10)	136.20% (0.00)	106.61% (0.00)	117.92% (0.00)	99.02% (0.00)	97.97% (0.00)	100.91% (0.00)	
3-Year Down	9	282.08% (0.01)	204.43% (0.01)	152.52% (0.02)	437.96% (0.00)	358.54% (0.00)	300.70% (0.00)	155.88% (0.00)	154.11% (0.00)	148.18% (0.00)	
3-Year Up	56	44.79% (0.00)	16.47% (0.10)	25.31% (0.03)	136.71% (0.00)	107.37% (0.00)	120.39% (0.00)	91.92% (0.00)	90.90% (0.00)	95.08% (0.00)	

Table 3.1 – Continued

Panel D: 7-Year Ranking/Investment Period										
Market State	Frequency	Arbitrage Returns			Losers Returns			Winners Returns		
		Raw	\$1/8 Adj	Skip 1-Month	Raw	\$1/8 Adj	Skip 1-Month	Raw	\$1/8 Adj	Skip 1-Month
Full Period	63	81.07% (0.00)	50.13% (0.01)	47.42% (0.00)	204.68% (0.00)	172.49% (0.00)	172.89% (0.00)	123.61% (0.00)	122.35% (0.00)	125.47% (0.00)
½-Year Down	18	108.09% (0.02)	61.38% (0.07)	47.21% (0.06)	252.71% (0.00)	204.27% (0.00)	191.92% (0.00)	144.61% (0.00)	142.89% (0.00)	144.72% (0.00)
½-Year Up	45	70.26% (0.00)	45.63% (0.01)	47.50% (0.00)	185.47% (0.00)	159.77% (0.00)	165.28% (0.00)	115.21% (0.00)	114.14% (0.00)	117.77% (0.00)
1-Year Down	15	134.52% (0.01)	80.48% (0.05)	64.98% (0.03)	286.53% (0.00)	230.86% (0.00)	217.04% (0.00)	152.01% (0.00)	150.38% (0.00)	152.07% (0.00)
1-Year Up	48	64.37% (0.00)	40.65% (0.01)	41.93% (0.00)	179.10% (0.00)	154.24% (0.00)	159.09% (0.00)	114.73% (0.00)	113.60% (0.00)	117.16% (0.00)
2-Year Down	11	215.15% (0.00)	161.04% (0.00)	134.14% (0.00)	370.54% (0.00)	314.54% (0.00)	287.59% (0.00)	155.39% (0.00)	153.50% (0.00)	153.44% (0.00)
2-Year Up	52	52.71% (0.00)	26.67% (0.05)	29.07% (0.02)	169.59% (0.00)	142.44% (0.00)	148.63% (0.00)	116.89% (0.00)	115.76% (0.00)	119.55% (0.00)
3-Year Down	8	256.97% (0.01)	185.09% (0.01)	134.75% (0.01)	438.10% (0.00)	364.03% (0.00)	306.48% (0.00)	181.13% (0.00)	178.94% (0.00)	171.73% (0.00)
3-Year Up	55	55.48% (0.00)	30.50% (0.02)	34.72% (0.01)	170.73% (0.00)	144.62% (0.00)	153.46% (0.00)	115.24% (0.00)	114.12% (0.00)	118.74% (0.00)

Table 3.2 Risk-Adjusted Profit using CAPM model conditioned upon Prior Market Performance

The yearly excess returns of the stock portfolio $p = (\text{losers}, \text{winners})$ are regressed against the market premium for the UP and DOWN state (as appropriate) using the following equation:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p [Mkt_t - R_{ft}] + e_{pt}$$

where, R_{pt} is the annual return of the portfolio under study (equals to the return of the DOWN / UP winners portfolio or of the DOWN / UP losers portfolio as the case may be), R_{ft} is the risk free rate, α_p is the CAPM alpha (risk-adjusted profit), β_p is the CAPM beta. Mkt_t is the annual return of the value-weighted index of stocks listed on NYSE, AMEX or Nasdaq and $e_{pt} \sim N(0, \sigma_p)$. For contrarian portfolios, the regressand is the annual contrarian return. The regression is done across all event years and all runs of the investment period. Panel A shows the summary of the risk-adjusted profits (α), averaged across all investment period tenors. Panel B reports the risk-adjusted profits for different investment period tenors, prior market evaluation periods, and for the DOWN and UP states. The numbers in parentheses are the p-values.

Panel A: Summary of CAPM Analysis averaged across all investment periods						
Prior Mkt Tenor	Down Market α			Up Market α		
	Contrarian	Losers	Winners	Contrarian	Losers	Winners
½-Year	6.89%	5.43%	-1.46%	3.83%	1.27%	-2.57%
1-Year	9.25%	8.71%	-0.55%	3.31%	0.51%	-2.80%
2-Year	10.04%	10.62%	0.58%	3.79%	0.85%	-2.93%
3-Year	5.85%	10.32%	4.47%	4.50%	1.38%	-3.12%
Avg All Mkt Tenors	8.01%	8.77%	0.76%	3.86%	1.00%	-2.86%
Panel B shows detail CAPM Analysis conditional upon Prior Market Performance over ½-Year, 1-Year, 2-Year and 3-Year						
Prior ½-Year Down and Up Market						
Tenor	Down Market α			Up Market α		
	Contrarian	Losers	Winners	Contrarian	Losers	Winners
3-Year	11.99%	12.00%	0.01%	6.12%	3.17%	-2.95%
	(0.02)	(0.03)	(1.00)	(0.05)	(0.32)	(0.04)
5-Year	7.95%	6.02%	-1.93%	4.68%	1.25%	-3.42%
	(0.02)	(0.07)	(0.22)	(0.04)	(0.56)	(0.00)
6-Year	4.95%	2.89%	-2.06%	2.50%	0.29%	-2.21%
	(0.11)	(0.31)	(0.13)	(0.17)	(0.87)	(0.00)
7-Year	2.68%	0.80%	-1.88%	2.04%	0.35%	-1.69%
	(0.30)	(0.73)	(0.08)	(0.20)	(0.82)	(0.01)
Average	6.89%	5.43%	-1.46%	3.83%	1.27%	-2.57%
	(0.01)	(0.02)	(0.06)	(0.01)	(0.12)	(0.01)

Table 3.2 – Continued

Prior 1-Year Down and Up Market						
Tenor	Down Market α			Up Market α		
	Contrarian	Losers	Winners	Contrarian	Losers	Winners
3-Year	17.17%	17.58%	0.41%	4.93%	1.97%	-2.96%
	(0.00)	(0.01)	(0.85)	(0.09)	(0.50)	(0.03)
5-Year	10.27%	9.40%	-0.88%	4.28%	0.57%	-3.71%
	(0.01)	(0.02)	(0.62)	(0.04)	(0.78)	(0.00)
6-Year	6.54%	5.03%	-1.50%	2.15%	-0.23%	-2.38%
	(0.07)	(0.14)	(0.32)	(0.20)	(0.89)	(0.00)
7-Year	3.04%	2.83%	-0.21%	1.86%	-0.29%	-2.15%
	(0.33)	(0.34)	(0.86)	(0.21)	(0.84)	(0.00)
Average	9.25%	8.71%	-0.55%	3.31%	0.51%	-2.80%
	(0.00)	(0.01)	(0.32)	(0.01)	(0.40)	(0.01)
Prior 2-Year Down and Up Market						
Tenor	Down Market α			Up Market α		
	Contrarian	Losers	Winners	Contrarian	Losers	Winners
3-Year	12.72%	15.21%	2.48%	7.03%	3.85%	-3.18%
	(0.04)	(0.02)	(0.26)	(0.01)	(0.20)	(0.02)
5-Year	11.82%	12.52%	0.70%	4.65%	0.65%	-3.99%
	(0.03)	(0.01)	(0.69)	(0.02)	(0.72)	(0.00)
6-Year	9.73%	9.24%	-0.49%	2.03%	-0.58%	-2.61%
	(0.03)	(0.03)	(0.75)	(0.20)	(0.70)	(0.00)
7-Year	5.89%	5.52%	-0.37%	1.44%	-0.52%	-1.96%
	(0.14)	(0.13)	(0.78)	(0.30)	(0.70)	(0.00)
Average	10.04%	10.62%	0.58%	3.79%	0.85%	-2.93%
	(0.00)	(0.00)	(0.40)	(0.02)	(0.32)	(0.01)
Prior 3-Year Down and Up Market						
Tenor	Down Market α			Up Market α		
	Contrarian	Losers	Winners	Contrarian	Losers	Winners
3-Year	11.00%	19.42%	8.42%	6.96%	3.72%	-3.24%
	(0.17)	(0.03)	(0.01)	(0.01)	(0.19)	(0.01)
5-Year	5.47%	10.65%	5.18%	5.85%	1.58%	-4.26%
	(0.40)	(0.10)	(0.00)	(0.00)	(0.37)	(0.00)
6-Year	4.38%	7.42%	3.05%	3.15%	0.24%	-2.92%
	(0.49)	(0.22)	(0.08)	(0.03)	(0.87)	(0.00)
7-Year	2.55%	3.80%	1.25%	2.05%	0.00%	-2.05%
	(0.63)	(0.46)	(0.42)	(0.12)	(1.00)	(0.00)
Average	5.85%	10.32%	4.47%	4.50%	1.38%	-3.12%
	(0.01)	(0.00)	(0.01)	(0.01)	(0.12)	(0.01)

Table 3.3 Beta using CAPM model conditioned upon Prior Market Performance

The yearly excess returns of the stock portfolio $p = (\text{losers, winners})$ are regressed against the market premium for the UP and DOWN state (as appropriate) using the following equation:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p [Mkt_t - R_{ft}] + e_{pt}$$

where, R_{pt} is the annual return of the portfolio under study (equals to the return of the DOWN / UP winners portfolio or of the DOWN / UP losers portfolio as the case may be), R_{ft} is the risk free rate, α_p is the CAPM alpha (risk-adjusted profit), β_p is the CAPM beta. Mkt_t is the annual return of the value-weighted index of stocks listed on NYSE, AMEX or Nasdaq and $e_{pt} \sim N(0, \sigma_p)$. For contrarian portfolios, the regressand is the annual contrarian return. The regression is done across all event years and all runs of the ranking and investment period (as appropriate). Panel A shows the summary of the beta (β) during ranking and investment periods, averaged across all ranking and investment tenors respectively. Panel B reports the β for different ranking and investment period tenors, prior market evaluation periods, and for the DOWN and UP states.

Panel A: Summary of CAPM Analysis averaged across all investment periods							
Prior Market Tenor	Period	Down Market β			Up Market β		
		Contrarian	Losers	Winners	Contrarian	Losers	Winners
½-Year	Rank	-0.7200	1.2617	1.9817	-0.7778	1.2785	2.0563
	Invest	0.5053	1.6984	1.1931	0.3284	1.6272	1.2988
1-Year	Rank	-0.7492	1.2070	1.9562	-0.7488	1.3074	2.0562
	Invest	0.7311	1.8521	1.1210	0.2274	1.5542	1.3268
2-Year	Rank	-0.5816	1.1962	1.7779	-0.7479	1.3193	2.0672
	Invest	0.8306	1.9122	1.0816	0.2197	1.5467	1.3270
3-Year	Rank	-0.4624	1.1733	1.6357	-0.7537	1.3313	2.0850
	Invest	1.1053	2.0042	0.8989	0.1705	1.5221	1.3516
Avg : All Tenors	Rank	-0.6283	1.2096	1.8378	-0.7571	1.3091	2.0662
	Invest	0.7931	1.8667	1.0736	0.2365	1.5625	1.3260
Panel B shows detail CAPM Analysis conditional upon Prior Market Performance over ½-Year, 1-Year, 2-Years and 3-Years							
Prior ½-Year Down and Up Market							
Tenor	Period	Down Market β			Up Market β		
		Contrarian	Losers	Winners	Contrarian	Losers	Winners
3-Year	Rank	-1.4693	1.0427	2.5120	-1.4691	1.1200	2.5891
	Invest	0.7137	1.8418	1.1282	0.2553	1.6627	1.4074
5-Year	Rank	-0.5791	1.2811	1.8602	-0.7790	1.2896	2.0686
	Invest	0.5101	1.6643	1.1542	0.2911	1.6123	1.3212
6-Year	Rank	-0.4794	1.3246	1.8040	-0.5099	1.3354	1.8452
	Invest	0.4892	1.6829	1.1936	0.3435	1.6102	1.2667
7-Year	Rank	-0.3521	1.3983	1.7504	-0.3533	1.3690	1.7223
	Invest	0.3082	1.6046	1.2965	0.4239	1.6237	1.1998
Average	Rank	-0.7200	1.2617	1.9817	-0.7778	1.2785	2.0563
	Invest	0.5053	1.6984	1.1931	0.3284	1.6272	1.2988

Table 3.3 - Continued

Prior 1-Year Down and Up Market							
Tenor	Period	Down Market β			Up Market β		
		Contrarian	Losers	Winners	Contrarian	Losers	Winners
3-Year	Rank	-1.3136	1.0400	2.3536	-1.5051	1.1368	2.6419
	Invest	0.9660	2.0174	1.0514	0.1180	1.5592	1.4412
5-Year	Rank	-0.6978	1.2127	1.9105	-0.7082	1.3275	2.0357
	Invest	0.6487	1.7258	1.0770	0.2098	1.5656	1.3558
6-Year	Rank	-0.5403	1.2619	1.8022	-0.4706	1.3651	1.8357
	Invest	0.7168	1.8679	1.1512	0.2499	1.5311	1.2811
7-Year	Rank	-0.4449	1.3134	1.7583	-0.3113	1.4001	1.7114
	Invest	0.5931	1.7974	1.2043	0.3317	1.5607	1.2290
Average	Rank	-0.7492	1.2070	1.9562	-0.7488	1.3074	2.0562
	Invest	0.7311	1.8521	1.1210	0.2274	1.5542	1.3268
Prior 2-Year Down and Up Market							
Tenor	Period	Down Market β			Up Market β		
		Contrarian	Losers	Winners	Contrarian	Losers	Winners
3-Year	Rank	-0.5585	1.0979	1.6563	-1.5849	1.1455	2.7304
	Invest	1.0890	2.0737	0.9847	0.1548	1.5848	1.4300
5-Year	Rank	-0.5891	1.1913	1.7804	-0.7116	1.3365	2.0481
	Invest	0.7867	1.8150	1.0283	0.1681	1.5294	1.3613
6-Year	Rank	-0.6746	1.2165	1.8911	-0.4088	1.3828	1.7915
	Invest	0.7971	1.8834	1.0863	0.2378	1.5337	1.2959
7-Year	Rank	-0.5044	1.2793	1.7836	-0.2863	1.4123	1.6987
	Invest	0.6495	1.8764	1.2269	0.3180	1.5388	1.2208
Average	Rank	-0.5816	1.1962	1.7779	-0.7479	1.3193	2.0672
	Invest	0.8306	1.9122	1.0816	0.2197	1.5467	1.3270
Prior 3-Year Down and Up Market							
Tenor	Period	Down Market β			Up Market β		
		Contrarian	Losers	Winners	Contrarian	Losers	Winners
3-Year	Rank	-0.8449	1.0635	1.9084	-1.4304	1.1875	2.6180
	Invest	1.2523	2.0786	0.8264	0.1249	1.5547	1.4298
5-Year	Rank	-0.2189	1.1761	1.3950	-0.7801	1.3437	2.1238
	Invest	1.0722	1.9082	0.8360	0.1159	1.5044	1.3885
6-Year	Rank	-0.2528	1.2246	1.4774	-0.5188	1.3752	1.8940
	Invest	1.0895	1.9864	0.8968	0.1762	1.5073	1.3311
7-Year	Rank	-0.5329	1.2291	1.7619	-0.2855	1.4187	1.7042
	Invest	1.0072	2.0434	1.0363	0.2650	1.5222	1.2571
Average	Rank	-0.4624	1.1733	1.6357	-0.7537	1.3313	2.0850
	Invest	1.1053	2.0042	0.8989	0.1705	1.5221	1.3516

Table 3.4 Risk-Adjusted Profit using Fama-French three-factor model conditioned upon Market States

The yearly excess returns of the Stock portfolio $p = (\text{losers, winners})$ are regressed against the market premium, SMB and HML return for the UP and DOWN state (as appropriate) using the following equation:

$$R_{Pt} - R_{ft} = \alpha_p + \beta_{p,Mkt} [Mkt_t - R_{ft}] + \beta_{p,SMB} SMB_t + \beta_{p,HML} HML_t + e_{Pt}$$

where R_{Pt} is the annual return of the portfolio under study (equals to the return of the DOWN / UP winners portfolio or of the DOWN / UP losers portfolio as the case may be), R_{ft} is the risk free rate, α_p is the FF, $\beta_{p,Mkt}$ is the FF factor loading for the market excess return, $\beta_{p,SMB}$ is the factor loading for SMB_t (return on the mimicking portfolio for risk related to size), $\beta_{p,HML}$ is the factor loading for HML_t (return on the mimicking portfolio for risk related to book-to-market equity). Mkt_t is the annual return of the value-weighted index of stocks listed on NYSE, AMEX or Nasdaq and $e_{Pt} \sim N(0, \sigma_p(\tau))$. For contrarian portfolios, the regressand is the annual contrarian return. The regression is done across all event years and all runs of the investment period. Panel A shows the summary of the risk-adjusted profits (α), averaged across all investment period tenor. Panel B reports the risk-adjusted profits for different investment period tenors, prior market evaluation periods, and for the DOWN and UP states. The numbers in parentheses are the p-values.

Panel A: Summary of Fama-French Analysis averaged across all investment periods						
Prior Mkt Tenor	Down Market α			Up Market α		
	Contrarian	Losers	Winners	Contrarian	Losers	Winners
1/2-Year	0.34%	-0.89%	-1.24%	0.28%	-1.17%	-1.44%
1-Year	-0.37%	-0.45%	-0.07%	0.33%	-1.37%	-1.71%
2-Year	-2.22%	-2.11%	0.11%	0.96%	-0.70%	-1.66%
3-Year	-7.49%	-4.79%	2.70%	1.47%	-0.37%	-1.84%
Avg All Market Tenors	-2.43%	-2.06%	0.38%	0.76%	-0.90%	-1.66%
Panel B shows detailed Fama-French Analysis conditional upon Prior Market Performance over 1/2-Year, 1-Year, 2-Year and 3-Year						
Prior 1/2-Year Down and Up Market						
Tenor	Down Market α			Up Market α		
	Contrarian	Losers	Winners	Contrarian	Losers	Winners
3-Year	3.51%	1.67%	-1.84%	3.85%	2.42%	-1.43%
	(0.43)	(0.70)	(0.37)	(0.16)	(0.32)	(0.26)
5-Year	1.68%	0.17%	-1.50%	0.20%	-1.87%	-2.07%
	(0.58)	(0.95)	(0.27)	(0.92)	(0.27)	(0.02)
6-Year	-0.46%	-1.65%	-1.20%	-1.49%	-2.60%	-1.10%
	(0.87)	(0.47)	(0.35)	(0.35)	(0.06)	(0.12)
7-Year	-3.35%	-3.76%	-0.40%	-1.44%	-2.61%	-1.16%
	(0.13)	(0.05)	(0.68)	(0.31)	(0.03)	(0.04)
Average	0.34%	-0.89%	-1.24%	0.28%	-1.17%	-1.44%
	(0.72)	(0.33)	(0.05)	(0.75)	(0.23)	(0.02)

Table 3.4 – Continued

Prior 1-Year Down and Up Market						
Tenor	Down Market α			Up Market α		
	Contrarian	Losers	Winners	Contrarian	Losers	Winners
3-Year	5.37%	3.59%	-1.78%	3.27%	1.61%	-1.67%
	(0.25)	(0.47)	(0.37)	(0.21)	(0.49)	(0.17)
5-Year	-0.30%	0.17%	0.47%	0.61%	-1.76%	-2.37%
	(0.92)	(0.96)	(0.76)	(0.75)	(0.28)	(0.00)
6-Year	-1.61%	-1.76%	-0.15%	-1.22%	-2.56%	-1.34%
	(0.59)	(0.53)	(0.91)	(0.42)	(0.05)	(0.04)
7-Year	-4.95%	-3.78%	1.17%	-1.33%	-2.78%	-1.46%
	(0.06)	(0.11)	(0.30)	(0.32)	(0.01)	(0.01)
Average	-0.37%	-0.45%	-0.07%	0.33%	-1.37%	-1.71%
	(0.74)	(0.65)	(0.91)	(0.68)	(0.15)	(0.02)
Prior 2-Year Down and Up Market						
Tenor	Down Market α			Up Market α		
	Contrarian	Losers	Winners	Contrarian	Losers	Winners
3-Year	0.36%	1.20%	0.83%	5.24%	3.26%	-1.97%
	(0.95)	(0.82)	(0.73)	(0.04)	(0.15)	(0.08)
5-Year	-1.92%	-1.87%	0.05%	1.26%	-1.12%	-2.38%
	(0.66)	(0.64)	(0.98)	(0.48)	(0.46)	(0.00)
6-Year	-2.17%	-2.82%	-0.65%	-1.12%	-2.40%	-1.28%
	(0.56)	(0.41)	(0.68)	(0.44)	(0.05)	(0.05)
7-Year	-5.14%	-4.95%	0.19%	-1.53%	-2.54%	-1.01%
	(0.11)	(0.10)	(0.89)	(0.23)	(0.02)	(0.06)
Average	-2.22%	-2.11%	0.11%	0.96%	-0.70%	-1.66%
	(0.06)	(0.08)	(0.80)	(0.36)	(0.46)	(0.02)
Prior 3-Year Down and Up Market						
Tenor	Down Market α			Up Market α		
	Contrarian	Losers	Winners	Contrarian	Losers	Winners
3-Year	-5.89%	-2.19%	3.70%	5.36%	3.54%	-1.83%
	(0.49)	(0.79)	(0.33)	(0.03)	(0.10)	(0.08)
5-Year	-9.15%	-5.87%	3.28%	2.07%	-0.61%	-2.69%
	(0.07)	(0.23)	(0.07)	(0.24)	(0.68)	(0.00)
6-Year	-7.61%	-4.88%	2.73%	-0.24%	-1.96%	-1.71%
	(0.11)	(0.28)	(0.11)	(0.86)	(0.09)	(0.01)
7-Year	-7.32%	-6.23%	1.09%	-1.30%	-2.45%	-1.14%
	(0.05)	(0.10)	(0.47)	(0.29)	(0.02)	(0.03)
Average	-7.49%	-4.79%	2.70%	1.47%	-0.37%	-1.84%
	(0.00)	(0.01)	(0.01)	(0.19)	(0.68)	(0.02)

Table 3.5 Risk using Fama-French three-factor model conditioned upon Market States

The yearly excess returns of the Stock portfolio $p = (\text{losers, winners})$ are regressed against the market premium, SMB and HML return for the UP and DOWN state (as appropriate) using the following equation:

$$R_{p_t} - R_{f_t} = \alpha_p + \beta_{p,Mkt} [Mkt_t - R_{f_t}] + \beta_{p,SMB} SMB_t + \beta_{p,HML} HML_t + e_{p_t}$$

where R_{p_t} is the annual return of the portfolio under study (equals to the return of the DOWN / UP winners portfolio or of the DOWN / UP losers portfolio as the case may be), R_{f_t} is the risk free rate, α_p is the FF, $\beta_{p,Mkt}$ is the FF factor loading for the market excess return, $\beta_{p,SMB}$ is the factor loading for SMB_t (return on the mimicking portfolio for risk related to size), $\beta_{p,HML}(\tau)$ is the factor loading for HML_t (return on the mimicking portfolio for risk related to book-to-market equity). Mkt_t is the annual return of the value-weighted index of stocks listed on NYSE, AMEX or Nasdaq and $e_{p_t} \sim N(0, \sigma_p)$. For contrarian portfolios, the regressand is the annual contrarian return. The regression is done across all event years and all runs of the ranking and investment period (as appropriate). Panel A shows the summary of the three-factor loadings (β_{Mkt} , β_{SMB} , β_{HML}) during ranking and investment periods, averaged across all ranking and investment tenors respectively. Panel B reports β_{Mkt} , β_{SMB} , β_{HML} for different ranking and investment period tenors, prior market evaluation periods, and for the DOWN and UP states. For brevity, only the factor loadings of the contrarian portfolios are reported.

Panel A: Summary of Fama-French Analysis averaged across all investment periods							
Prior Market Tenor	Period	Down Market			Up Market		
		β_{Mkt}	β_{SMB}	β_{HML}	β_{Mkt}	β_{SMB}	β_{HML}
½-Year	Rank	-0.4121	-0.7528	-0.0820	-0.4071	-1.3358	0.2821
	Invest	0.0804	0.9743	0.8036	-0.0142	0.9465	0.7754
1-Year	Rank	-0.3831	-1.0380	-0.2057	-0.3772	-1.1933	0.3011
	Invest	0.1712	1.1236	0.9664	-0.0489	0.8158	0.7147
2-Year	Rank	-0.1808	-0.8643	-0.5452	-0.4052	-1.2017	0.4081
	Invest	0.1034	1.1708	1.2107	-0.0432	0.8635	0.6432
3-Year	Rank	-0.2222	-0.5179	-0.4850	-0.3612	-1.2638	0.3455
	Invest	0.1888	1.4512	1.1710	-0.0741	0.8408	0.6442
Avg : All Tenors	Rank	-0.2996	-0.7933	-0.3295	-0.3877	-1.2486	0.3342
	Invest	0.1360	1.1800	1.0379	-0.0451	0.8667	0.6944
Panel B shows detail Fama-French Analysis conditional upon Prior Market Performance over ½-Year, 1-Year, 2-Year and 3-Year							
Prior ½-Year Down and Up Market							
Tenor	Period	Down Market			Up Market		
		β_{Mkt}	β_{SMB}	β_{HML}	β_{Mkt}	β_{SMB}	β_{HML}
3-Year	Rank	-0.8729	-1.5092	-0.0903	-0.8369	-2.3356	0.3218
	Invest	0.0513	1.4426	0.5476	-0.1748	1.3736	0.6107
5-Year	Rank	-0.2938	-0.6680	-0.1164	-0.3083	-1.5449	0.1571
	Invest	0.0752	0.9094	0.9503	-0.0569	0.8917	0.9538
6-Year	Rank	-0.2796	-0.4778	-0.0491	-0.2658	-0.9036	0.3278
	Invest	0.1323	0.8485	0.8180	0.0312	0.7993	0.8294
7-Year	Rank	-0.2023	-0.3562	-0.0721	-0.2172	-0.5592	0.3216
	Invest	0.0629	0.6966	0.8983	0.1436	0.7216	0.7076
Average	Rank	-0.4121	-0.7528	-0.0820	-0.4071	-1.3358	0.2821
	Invest	0.0804	0.9743	0.8036	-0.0142	0.9465	0.7754

Table 3.5 – Continued

Prior 1-Year Down and Up Market							
Tenor	Period	Down Market			Up Market		
		β_{Mkt}	β_{SMB}	β_{HML}	β_{Mkt}	β_{SMB}	β_{HML}
3-Year	Rank	-0.5885	-1.9954	-0.9793	-0.8774	-2.0996	0.6216
	Invest	0.1366	1.5435	0.8310	-0.2192	1.1867	0.4881
5-Year	Rank	-0.2546	-1.1549	-0.2481	-0.2936	-1.2764	0.1878
	Invest	0.0274	1.1775	1.1992	-0.0545	0.7290	0.8618
6-Year	Rank	-0.3356	-0.6310	0.0911	-0.2080	-0.8343	0.2414
	Invest	0.2556	0.9504	0.9293	-0.0051	0.6947	0.7849
7-Year	Rank	-0.3538	-0.3708	0.3135	-0.1298	-0.5627	0.1535
	Invest	0.2653	0.8228	0.9061	0.0833	0.6528	0.7241
Average	Rank	-0.3831	-1.0380	-0.2057	-0.3772	-1.1933	0.3011
	Invest	0.1712	1.1236	0.9664	-0.0489	0.8158	0.7147
Prior 2-Year Down and Up Market							
Tenor	Period	Down Market			Up Market		
		β_{Mkt}	β_{SMB}	β_{HML}	β_{Mkt}	β_{SMB}	β_{HML}
3-Year	Rank	-0.2478	-0.6583	-0.9613	-0.9159	-2.2658	0.6126
	Invest	0.2481	1.1982	1.1978	-0.2277	1.3930	0.4178
5-Year	Rank	-0.1252	-1.0617	-0.5688	-0.3163	-1.3215	0.3372
	Invest	-0.0350	1.2345	1.4799	-0.0740	0.7726	0.7772
6-Year	Rank	-0.1739	-1.0197	-0.5347	-0.2237	-0.7447	0.4120
	Invest	0.0537	1.2777	1.0915	0.0270	0.6505	0.7107
7-Year	Rank	-0.1763	-0.7175	-0.1159	-0.1652	-0.4746	0.2705
	Invest	0.1466	0.9729	1.0738	0.1020	0.6379	0.6671
Average	Rank	-0.1808	-0.8643	-0.5452	-0.4052	-1.2017	0.4081
	Invest	0.1034	1.1708	1.2107	-0.0432	0.8635	0.6432
Prior 3-Year Down and Up Market							
Tenor	Period	Down Market			Up Market		
		β_{Mkt}	β_{SMB}	β_{HML}	β_{Mkt}	β_{SMB}	β_{HML}
3-Year	Rank	-0.1118	-1.7183	-1.5117	-0.7226	-2.2365	0.5184
	Invest	0.4463	1.3082	0.8979	-0.2500	1.3959	0.4593
5-Year	Rank	-0.3222	0.3246	-0.0390	-0.3096	-1.4392	0.2518
	Invest	-0.0460	1.5908	1.4283	-0.0985	0.7465	0.7855
6-Year	Rank	-0.2173	-0.0728	-0.0983	-0.2559	-0.8825	0.3278
	Invest	0.0956	1.6086	1.2205	-0.0161	0.6235	0.6791
7-Year	Rank	-0.2377	-0.6050	-0.2910	-0.1569	-0.4971	0.2840
	Invest	0.2594	1.2973	1.1372	0.0680	0.5973	0.6529
Average	Rank	-0.2222	-0.5179	-0.4850	-0.3612	-1.2638	0.3455
	Invest	0.1888	1.4512	1.1710	-0.0741	0.8408	0.6442

Table 3.6 Risk-Adjusted Profit using 2-Factor Model conditioned upon Prior Market Performance

For the UP and DOWN state (as appropriate) and for the month t , the monthly excess returns ($r_{p, \tau}$) of the stock portfolio p = (contrarian, losers, winners) are regressed using the 2 factor model as follows:

$$r_{p, \tau} = \alpha_p + \beta_p r_{EW\tau} - s_p OMT_{\tau} + e_{p, \tau} \quad \tau = t, \dots, t+11$$

where r_{EW} is the monthly excess return of the equally weighted CRSP index and OMT_{τ} (One Minus Ten) is the month τ difference in returns on the CRSP indices of stocks ranked in the first (One) and tenth (Ten) deciles of market capitalization, where One (Ten) is the decile containing the smallest (largest) firms. The estimated market and size factor loadings for the month t are $\hat{\beta}_{p, t}$ and $\hat{s}_{p, t}$. The risk-adjusted profit in month t (AdjPft _{t}) is given by $r_{p, t} - \hat{\beta}_{p, t} r_{EWt} - \hat{s}_{p, t} OMT_t$. The risk-adjusted profit (AdjPft _{t}) is averaged over all t to obtain AdjPft. Panel A shows the summary of AdjPft (in %) for a given prior market tenor, averaged across all investment period horizons. Panel B reports AdjPft (in %) for different investment period tenors, prior market evaluation periods, and for the DOWN and UP states. The numbers in parentheses are the p-values.

Panel A: Summary of 2-Factor Model Analysis averaged across all investment periods						
Prior Mkt Tenor	Down Mkt AdjPft			Up Mkt AdjPft		
	Contrarian	Losers	Winners	Contrarian	Losers	Winners
½-Year	-0.26	-0.13	0.12	-0.12	0.00	0.12
1-Year	-0.20	-0.11	0.09	-0.15	-0.01	0.13
2-Year	-0.50	-0.30	0.20	-0.08	0.02	0.10
3-Year	-0.95	-0.65	0.31	-0.03	0.06	0.09
Avg All Mkt Tenors	-0.48	-0.30	0.18	-0.09	0.02	0.11
Panel B shows detail 2-Factor Model Analysis conditional upon Prior Market Performance over ½-Year, 1-Year, 2-Year and 3-Year						
Prior ½-Year Down and Up Market						
Tenor	Down Mkt AdjPft			Up Mkt AdjPft		
	Contrarian	Losers	Winners	Contrarian	Losers	Winners
3-Year	-0.15 (0.44)	-0.11 (0.56)	0.05 (0.60)	-0.14 (0.32)	-0.11 (0.37)	0.03 (0.61)
5-Year	-0.27 (0.04)	-0.17 (0.15)	0.10 (0.06)	0.00 (0.96)	0.07 (0.34)	0.07 (0.07)
6-Year	-0.18 (0.10)	-0.05 (0.58)	0.13 (0.01)	-0.15 (0.04)	0.03 (0.63)	0.17 (0.00)
7-Year	-0.42 (0.00)	-0.20 (0.01)	0.22 (0.00)	-0.18 (0.00)	0.02 (0.67)	0.20 (0.00)
Average	-0.26 (0.23)	-0.13 (0.38)	0.12 (0.41)	-0.12 (0.46)	0.00 (0.98)	0.12 (0.45)

Table 3.6 – Continued

Prior 1-Year Down and Up Market						
Tenor	Down Mkt AdjPft			Up Mkt AdjPft		
	Contrarian	Losers	Winners	Contrarian	Losers	Winners
3-Year	0.07 (0.77)	0.07 (0.77)	-0.01 (0.96)	-0.22 (0.09)	-0.16 (0.13)	0.05 (0.40)
5-Year	-0.34 (0.02)	-0.24 (0.05)	0.10 (0.14)	0.00 (0.97)	0.08 (0.25)	0.08 (0.04)
6-Year	-0.08 (0.54)	-0.02 (0.85)	0.06 (0.31)	-0.18 (0.01)	0.01 (0.82)	0.20 (0.00)
7-Year	-0.44 (0.00)	-0.24 (0.01)	0.20 (0.00)	-0.19 (0.00)	0.02 (0.67)	0.21 (0.00)
Average	-0.20 (0.48)	-0.11 (0.62)	0.09 (0.60)	-0.15 (0.43)	-0.01 (0.94)	0.13 (0.41)
Prior 2-Year Down and Up Market						
Tenor	Down Mkt AdjPft			Up Mkt AdjPft		
	Contrarian	Losers	Winners	Contrarian	Losers	Winners
3-Year	-0.56 (0.03)	-0.30 (0.20)	0.26 (0.03)	-0.05 (0.68)	-0.06 (0.57)	-0.01 (0.88)
5-Year	-0.63 (0.00)	-0.39 (0.01)	0.24 (0.00)	0.05 (0.57)	0.09 (0.18)	0.05 (0.23)
6-Year	-0.29 (0.04)	-0.19 (0.13)	0.10 (0.07)	-0.13 (0.05)	0.05 (0.37)	0.17 (0.00)
7-Year	-0.52 (0.00)	-0.32 (0.00)	0.20 (0.00)	-0.19 (0.00)	0.02 (0.70)	0.21 (0.00)
Average	-0.50 (0.08)	-0.30 (0.13)	0.20 (0.23)	-0.08 (0.65)	0.02 (0.86)	0.10 (0.56)
Prior 3-Year Down and Up Market						
Tenor	Down Mkt AdjPft			Up Mkt AdjPft		
	Contrarian	Losers	Winners	Contrarian	Losers	Winners
3-Year	-0.93 (0.00)	-0.63 (0.01)	0.30 (0.02)	-0.02 (0.90)	-0.02 (0.86)	0.00 (0.95)
5-Year	-1.17 (0.00)	-0.84 (0.00)	0.33 (0.00)	0.11 (0.18)	0.15 (0.03)	0.04 (0.29)
6-Year	-0.91 (0.00)	-0.63 (0.00)	0.29 (0.00)	-0.04 (0.58)	0.11 (0.05)	0.14 (0.00)
7-Year	-0.80 (0.00)	-0.48 (0.00)	0.32 (0.00)	-0.17 (0.00)	0.02 (0.63)	0.19 (0.00)
Average	-0.95 (0.02)	-0.65 (0.04)	0.31 (0.02)	-0.03 (0.88)	0.06 (0.67)	0.09 (0.58)

Table 3.7 Contrarian Profits and Prior Market Returns

The first part of each panel of this table shows the result of the regression of the stock contrarian profits of run on an intercept, the lagged 3-year market return (LAGMKT), and the square of the lagged 3-year market return (LAGMKT²). There are a total of 71, 67, 65 and 63 runs covering investing periods that span 1929:01 to 2001:12, 1931:01 to 2001:12, 1932:01 to 2001:12, 1933:01 to 2001:12 for the 3-, 5-, 6- and 7-year investment periods respectively. For the second part of each panel, the stock contrarian portfolios are assigned into quintiles based on their associated lagged 3-year market return. Those with the lowest (highest) contrarian returns are assigned to the LOW (HIGH) quintile. This table reports the average of the contrarian return in each quintile. Panel A, B, C and D show the results for 3-, 5-, 6- and 7-year investment period respectively. The numbers in parentheses are p-values.

Panel A: Ranking/Investment Period of 3 Years					
Regression of Returns on LAGMKT and LAGMKT ²					
	Intercept	LAGMKT	LAGMKT2	Adj-R ²	
Mean Profit	0.9968	-1.9054	0.9589	0.1513	
(p-value)	(0.00)	(0.00)	(0.11)		
Contrarian Profits by Quintiles of Lagged 3-Year Market States					
	Low	2	3	4	High
Mean Profit	1.4620	0.4695	0.1067	0.4246	0.1653
(p-value)	(0.02)	(0.04)	(0.49)	(0.23)	(0.41)
Panel B: Ranking/Investment Period of 5 Years					
Regression of Returns on LAGMKT and LAGMKT ²					
	Intercept	LAGMKT	LAGMKT2	Adj-R ²	
Mean profit	1.4318	-2.2375	0.9043	0.0787	
(p-value)	(0.00)	(0.02)	(0.38)		
Contrarian Profits by Quintiles of Lagged 3-Year Market States					
	Low	2	3	4	High
Mean Profit	2.1947	0.6645	0.4157	0.6521	0.2843
(p-value)	(0.03)	(0.28)	(0.04)	(0.19)	(0.26)
Panel C: Ranking/Investment Period of 6 Years					
Regression of Returns on LAGMKT and LAGMKT ²					
	Intercept	LAGMKT	LAGMKT2	Adj-R ²	
Mean profit	1.4401	-2.0321	0.4183	0.1229	
(p-value)	(0.00)	(0.01)	(0.63)		
Contrarian Profits by Quintiles of Lagged 3-Year Market States					
	Low	2	3	4	High
Mean Profit	2.3784	0.5262	0.3937	0.4506	0.1333
(p-value)	(0.01)	(0.21)	(0.05)	(0.24)	(0.56)

Table 3.7

Panel D: Ranking/Investment Period of 7 Years					
	Regression of Returns on LAGMKT and LAGMKT ²				
	Intercept	LAGMKT	LAGMKT2	Adj-R ²	
Mean profit	1.5218	-2.0337	0.3625	0.1350	
(p-value)	(0.00)	(0.02)	(0.68)		
Contrarian Profits by Quintiles of Lagged 3-Year Market States					
	Low	2	3	4	High
Mean Profit	2.1890	0.8911	0.6687	0.2458	0.1112
(p-value)	(0.01)	(0.05)	(0.07)	(0.44)	(0.60)

Figure 3.1 Contrarian Return conditional upon Lagged 3-Year Market Return

This graph presents the 5-year investment period buy-and-hold return of Stock Contrarian strategy conditional upon DOWN and UP state for the 5-year ranking period. Here, a DOWN (UP) state is defined as one when the prior market return is negative (non-negative) over the 3 years before investment. The results presented are for the full sample period