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The Death of the Overreaction Anomaly? A Multifactor Explanation of Contrarian Returns

Adam Clements[*], Michael E. Drew[*,#]
Evan M. Reedman[*], and Madhu Veeraraghavan[^]

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Abstract:

Are the returns accruing to De Bondt and Thaler's (1985) (DT) much celebrated overreaction anomaly pervasive? Using the CRSP data set used by for the period 1926 through 1982, and, for the first time, an additional two decades of data (1983 through 2003), we provide preliminary support for the original work of DT, reporting that the overreaction anomaly has not only persisted over the past twenty years but has increased, on a risk-unadjusted basis. However, using the three factor model of Fama and French (1993) (FF), we find no statistically significant alpha can be garnered via the overreaction anomaly, with contrarian returns driven by the factors of size and value, not the behavioral biases of investors. It is our conjecture that the anomaly is not robust under the FF framework, with 'contrarian' investors following such a scheme simply compensated for the inherent portfolio risk held.

JEL Classifications: G11, G12, G14

Keywords: Overreaction, anomaly, multifactor asset pricing model

*[#] Corresponding author: Corresponding author: Tel: 07 3138 1481; Fax 07 3138 1500; Email: m.drew@qut.edu.au; Mail: School of Economics and Finance, QUT, GPO Box 2434, Brisbane, Queensland, Australia, 4001. *Queensland University of Technology (Clements, Drew & Reedman) and ^Monash University (Veeraraghavan).* *Reedman acknowledges support provided by the School of Economics and Finance, QUT and the Brian Gray Scholarship (jointly funded by the Australian Prudential Regulation Authority and the Reserve Bank of Australia). The authors thank participants at the FIRN Doctoral Tutorial 2005, the 18th Australasian Finance & Banking Conference, the 5th Global Conference on Business & Economics and the 2006 Business & Economics Society International Conference for helpful comments. All errors remain the sole responsibility of the authors.*

The debate surrounding investor overreaction and contrarian investing is one of the most extensive and controversial areas of research in finance. Despite the fact that there is a general agreement on the evidence of price reversal, there is no consensus about what is driving these reversals. From an investment management perspective, the concern regarding contrarian strategies relates to issues of portfolio risk and the ability of the anomaly to generate alpha. In the spirit of recent work scrutinizing or 'dissecting' anomalies (see Fama and French, 2006), we revisit the overreaction anomaly reported by De Bondt and Thaler (1985), updating the initial study with a further two decades of data. Using a multifactor asset pricing framework, we find that contrarian returns, particularly past 'losers', consistently load on size and the value factors at economically meaningful levels (with past 'winners' loading predominantly on the value factor). It is our conjecture that investors following such a scheme are simply compensated for the inherent portfolio risk held.

The Overreaction Controversy

The overreaction anomaly, evidenced by long-term reversals in stock returns, was first identified by De Bondt and Thaler (1985), who showed that stocks which perform poorly in the past three to five years demonstrate superior performance over the next three to five years compared to stocks that have performed well in the past. The original study performed by De Bondt and Thaler (1985), hereafter DT, entitled "Does the stockmarket overreact?", provided evidence that abnormal excess returns could be gained by employing a strategy of buying past losers and selling short past winners, or the 'contrarian' strategy. Using an array of data for different time periods and in different markets, support for the findings of DT has been provided by, among others, Howe (1986), Fama and French (1988), Poterba and Summers (1988), Chopra, Lakonishok and Ritter (1992) and Campbell and Limmack (1997).

Soon after the publication of DT, Chan (1988) argued that the work lacked appropriate risk adjustment, and demonstrated that the single-factor CAPM had some explanatory power for the returns generated by DT. As asset pricing models developed, Fama and French (1993, 1995, and 1996) showed the relevance of size and value factors in explaining the cross-section of stock returns, however, to this day overreaction studies continue to ignore this work in their methodological approach to the anomaly. This appears to be a vital concern, and one which this work seeks to rectify. Further consideration of the literature following DT reveals that overreaction studies are subject to two a number of criticisms. First, there is a lack of risk adjustment in the original study (Chan, 1988; Ball and Kothari, 1989). Second, the impact of the January effect on returns is not adequately dealt with (Zarowin, 1990). Finally, there is an ongoing discussion around the role of measurement biases in the sorting and testing periods (Conrad & Kaul, 1993). Our paper directly considers the impact of each of these issues for the U.S. setting from 1926 through 2003 (a further two decades of data following DT's observation window), finding that, on risk-adjusted basis, no statistically significant alpha can be garnered through the various approaches that attempt to exploit the overreaction anomaly.

To analyse the evidence for long-term reversals, we use the monthly return data from the Centre for Research in Security Prices (CRSP), the same data set used in the original DT study, for the period of January 1926 through December 2003 and build portfolios every period of the best (winner) and worst (loser) performing stocks in the previous *n* months.

The equally-weighted CRSP market index is used as our market proxy (a description of the sorting approach is provided in Figure 1, Appendix A.) We then record the cumulative average monthly return to these self-financing portfolios over our sample period.

Decomposing Contrarian Returns

A. Out-of-sample test of De Bondt and Thaler (1985)

The results from the recent sub-period (1983-2003) provide corroborating evidence of the overreaction hypothesis, and, interestingly, demonstrate that the magnitude of the anomaly, on a risk-unadjusted basis, has actually increased through time. During the period January 1983 to December 2003, the loser portfolios outperform the market, on average, by 53.7%, 36 months after formation. The winner portfolios underperform the market by, on average, 4.03%. These results are displayed in Figure 2.

Figure 2
Average CAR of portfolios formed for three-year sort and test periods
for recent sub-period January 1983 and December 2003

Examining the full dataset from 1926 to 2003 shows amplification of the anomaly on a risk-unadjusted basis, and reveals that if DT were to present the results of their study today, they would report a difference in the ACAR's of the winner and loser portfolios of 42.5%, over 50% larger than that reported in 1985! This amplification of the overreaction anomaly suggests that suggests that the overreaction anomaly is, perhaps, 'alive and well'.

B. Evidence in Favour of Risk Adjustment

Understandably, DT has been extensively criticized for focusing on market-adjusted returns. By any metric, portfolio managers are constantly focusing on the risk-adjusted return of their investments. Hence, the core of our study applies various techniques to adjust for risk using four techniques: first, by appraising a suitable asset pricing model; second, through an investigation of the appropriateness of beta estimates; third; by allowing for the well accepted return premium to small companies; and, finally, considering the results in light of the January effect.[1].

In examining overreaction, Chan (1988) proposes that the risks of winner and loser stocks do not remain constant over the combined time period of sorting and testing.[2] This line of argument suggests that striking changes in the risks of the portfolios, which are not accounted for in the DT study, assist in explaining the returns from the strategy. Research by such as Chan (1988), Brown, Harlow and Tinic (1988) and Ball and Kothari (1989) show that the when beta is estimated on the appropriate test period, rather than the formation period, the strategy earns economically insignificant abnormal returns. Using this method, we model the time-varying risk coefficients in the data, with the results presented in Table 1. Our results corroborate the findings of earlier work, for all time periods examined, and hence the asset pricing tests for our study are run with the coefficients estimated from the test period.

Table I

Risk-Change Test for a 35 stock portfolio against an index constructed from the CRSP dataset for the period 1926 – 2003.

Tests for abnormal returns under the assumption that the sort-period and test-period betas are not equal Intercept estimates with t-statistics from the Chan (1988) model:

$(R_{i,t} - Rf_t) = {}_{1,i} \quad D \quad {}_iD_t + {}_i(Rm_t - Rf_t)(1-D) + {}_{2,i} \quad Rm_t - Rf_t \quad D_t + {}_i \, {}_t.$

T-statistics are in parentheses. Statistical significance is denoted at: 1% - **; 5% - *; 10% - #.

Sort Period	Test Period	Losers				
			$_i$	$_i$	$_{iD}$	Adj R^2
3	3	-0.038**	0.002	1.028**	0.417*	0.753
		(-5.324)	(-0.026)	(10.377)	(2.505)	
4	4	-0.032**	0.004	1.044**	0.307*	0.731
		(-5.209)	(0.344)	(12.260)	(2.060)	
5	5	-0.024**	0.005	1.088**	0.305	0.667
		(-3.710)	(0.409)	(10.379)	(1.730)	

Sort Period	Test Period	Winners				
			$_i$	$_i$	$_{iD}$	Adj R^2
3	3	0.045**	-0.003	1.707**	-0.473*	0.806
		(6.025)	(-0.422)	(15.285)	(-2.047)	
4	4	0.036**	-0.004	1.632**	-0.389*	0.810
		(5.928)	(-0.791)	(17.392)	(-2.161)	
5	5	0.033**	-0.003	1.395**	-0.170	0.699
		(4.817)	(-0.623)	(13.044)	(-0.875)	

[1] A summary of the size effect is provided by Schwert (1983), with further detail in Banz (1981), Reginganum (1981). Keim (1983), Reginganum (1983) and Haug and Hirschey (2006) provide a discussion of the January effect.

[2] The premise of the criticisms in Chan's (1988) paper are that if beta is estimated in the sort-period an there is no attempt to model changes in risk, the estimated beta will be a biased estimate of the beta in the test-period. Since the risk of the loser portfolio increases in the sort-period, the sort-period beta underestimates the test-period beta.

C. Evidence in Favour of the Three-Factor Model

The work of Fama and French (1993, 1996) has demonstrated the relevance of size and value factors when pricing risky assets. Investment managers are justly mystified as to why researchers over the last decade continue to ignore this in their methodological approach to the anomaly.[3] This study implements the three-factor model developed by Fama and French (1993) (hereafter FF) on the original dataset used by DT, both in-sample and out-of-sample. We consider performance with the following equation:

$$\left[R_{i,t} - R_{f,t}\right] \quad = \quad \alpha_i + \beta_i\left[R_{m,t} - R_{f,t}\right] + \sigma_i\left[SMB_t\right] + \eta_i\left[HML_t\right] + \varepsilon_{i,t} \qquad (1)$$

Table II

Three-Factor Regressions of Performance for a 50 stock portfolio against a geometric average index, 1926-2003.

Fama French 3-factor regressions for monthly excess returns on equal-weighted CRSP portfolios of 50 stocks formed on the basis of past returns: Non-overlapping portfolios for the period January 1926 to December 2003. Intercept estimates with *t* statistics (the regression coefficient divided by its standard error) from the Fama French 3-Factor model:
$(R_{it} - Rf_t) = \ _i + \ _i(Rm_t - Rf_t) + \ SMB_t + \ HML_t + \ _{i,t}$.
The regression R^2's are adjusted for the degrees of freedom. T-statistics are in parentheses. Statistical significance is denoted at: 1% - **; 5% - *; 10% - #.

Sort Period	**Test Period**		$_i$	$_{SMB}$	$_{HML}$	Adj R^2
		Losers				
3	3	0.002	1.173**	0.695#	0.648*	0.784
		(-0.132)	(7.954)	(1.677)	(2.328)	
3	4	0.005	0.954**	1.546**	0.870**	0.744
		(0.334)	(8.386)	(6.381)	(3.481)	
3	5	0.002	0.993**	1.644**	0.944**	0.733
		(0.026)	(8.654)	(7.736)	(4.752)	
4	5	0.001	1.216**	0.558*	0.643**	0.783
		(0.011)	(9.925)	(2.333)	(2.978)	
5	5	0.002	1.142**	0.504*	0.595**	0.773
		(0.226)	(9.392)	(1.977)	(2.869)	
		Winners				
Sort Period	**Test Period**		$_i$	$_{SMB}$	$_{HML}$	Adj R^2
3	3	-0.002	1.112**	-0.103	-0.338*	0.857
		(-0.474)	(12.329)	(-0.952)	(-1.965)	
3	4	-0.003	1.201**	0.809**	0.092	0.874
		(-0.835)	(14.496)	(5.564)	(1.110)	
3	5	-0.002	1.159**	0.679**	0.080	0.888
		(-0.559)	(18.338)	(6.227)	(1.359)	
4	5	-0.002	1.153**	-0.310**	-0.295*	0.893
		(-0.677)	(18.398)	(-2.636)	(-2.564)	
5	5	-0.002	1.171**	-0.293*	-0.296*	0.889
		(-0.761)	17.628	(-2.270)	(-2.350)	

[3] A view held by Bowman and Iverson (1998), Bauman *et al.* (1999), Schiereck *et al.* (1999), Gaunt (2000), Kang *et al.* (2002), Forner and Marhuenda (2003), Hirschey (2003), Lai *et al.* (2003) and Ma *et al.* (2005).

Table II shows that the three-factor model does an admirable job of explaining the return behavior of the contrarian portfolios. For the loser portfolios, we obtained uniformly positive, statistically significant loadings on both the size and value factors. For the winner portfolios, the size and value coefficients are, on the whole, statistically significant and negative. These findings suggest that long-term past losers tend to be small, distressed stocks and that the winner portfolios comprise larger, growth stocks and therefore the three-factor model predicts that the long-term past winners will necessarily not produce higher average returns.[4] Importantly for our study, the FF model is doing a better job than the CAPM (results not shown) in explaining the future returns generated by a contrarian strategy.[5] The average R^2 for the loser portfolios is 0.769 for the three-factor model, up from 0.648 in our single-factor results. Similarly, the winner portfolios the average R^2 increases from 0.831 in the CAPM model to 0.882 in the three-factor model.

D. Evidence of the January Effect

The findings of the original overreaction study were also challenged on the basis of the well-known January effect. The critique by Zarowin (1990) includes substantial discussion of seasonality in the overreaction phenomenon. This explanation is supported by Pettengill and Jordan (1990), who show that almost half of the average cumulative abnormal return for the year in their 90-stock loser portfolio is generated in January.[6] Similarly, Chopra, Lakonishok and Ritter (1992) demonstrate that the overreaction effect was “disproportionately concentrated in January [pp. 249].” In order to study the consequences of the January effect in combination with the three-factor pricing model, and to ensure the robustness of the tests of persistence of the overreaction anomaly, our models were adjusted to allow for a January coefficient. The three-factor model with the January coefficient is specified:

$$\left[R_{i,t} - R_{f,t}\right] \quad = \quad \alpha_i + \beta_i\left[R_{m,t} - R_{f,t}\right] + \sigma_i\left[SMB_t\right] + \eta_i\left[HML_t\right] + \gamma_i\left[\theta_i\right] + \varepsilon_{i,t} \qquad (2)$$

Results from these tests are presented in Table III, and show that the loser stocks are still small, distressed stocks and the January effect only has a marginal influence on some of the portfolios. Interestingly, for the winner portfolios, the market beta coefficients appear to be capturing the majority of the returns from these portfolios, and the January effect is not statistically significant in any portfolios. The explanatory power of the models increases only marginally with the addition of January, in the loser portfolios by 3.4% and in the winner portfolios by only 0.3%.

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[4] Analysis of the two sub-periods presents similar results to those detailed for the full study.
[5] These results are available on request.
[6] De Bondt and Thaler (1987) concede that they have no satisfactory explanation for the January effects.

Table III
Three-Factor Regressions of Performance for a 50 stock portfolio against a geometric average index, with January Coefficient, for the full study period

Fama French 3-factor regressions for monthly excess returns on equal-weighted CRSP portfolios of 50 stocks formed on the basis of past returns: Non-overlapping portfolios for the period January 1933 to December 2003. Intercept estimates with *t* statistics (the regression coefficient divided by its standard error) from the Fama French 3-Factor model:

$(R_{i,t} - Rf_t) = \ _i + \ _i(Rm_t - Rf_t) + \ SMB_t + \ HML_t + \ _i(\ _i) + \ _{i,t}$

where the dummy variable is set to 1 for January and 0 for all other months. The regression R^2's are adjusted for the degrees of freedom. T-statistics are in parentheses. Statistical significance is denoted at: 1% - **; 5% - *; 10% - #.

Sort Period	Test Period	Losers					
			i	SMB	HML	JAN	Adj R^2
3	3	-0.002	1.086**	0.618	0.501#	0.068#	0.809
		(-0.586)	(7.698)	(1.505)	(1.732)	(1.834)	
3	4	0.004	0.913**	1.507**	0.750**	0.097	0.775
		(0.231)	(8.397)	(6.354)	(3.252)	(1.556)	
3	5	0.000	0.962**	1.543**	0.806**	0.096*	0.770
		(-0.296)	(8.946)	(7.483)	(4.272)	(2.489)	
4	5	0.000	1.178**	0.461*	0.520**	0.094*	0.822
		(-0.102)	(10.189)	(2.063)	(2.590)	(2.069)	
5	5	-0.001	1.069**	0.485^	0.536*	0.049	0.797
		(-0.086)	(9.030)	(1.936)	(2.488)	(1.417)	

Sort Period	Test Period	Winners					
			i	SMB	HML	JAN	Adj R^2
3	3	-0.001	1.136**	-0.082	-0.289	-0.016	0.861
		(-0.222)	(12.16)	(-0.746)	(-1.533)	(-1.030)	
3	4	-0.003	1.193**	0.816**	0.105	-0.008	0.877
		(-0.82)	(14.549)	(5.570)	(1.312)	(-0.574)	
3	5	-0.001	1.154**	0.701**	0.091	-0.012	0.888
		(-0.418)	(18.157)	(6.320)	(1.474)	(-0.958)	
4	5	-0.002	1.153**	-0.280*	-0.276*	-0.024	0.895
		(-0.581)	(18.433)	(-2.407)	(-2.345)	(-1.283)	
5	5	-0.001	1.191**	-0.271*	-0.250#	-0.017	0.896
		(-0.353)	(17.743)	(-2.066)	(-1.869)	(-1.625)	

E. Robustness Tests

The focus of our study so far, has been on the DT non-overlapping portfolios. Portfolio managers are able to more effectively operationalize the contrarian strategy by forming portfolios on the basis of overlapping or rolling windows. Additionally, it is recognised that properly specified tests of time series data can achieve greater efficiency by the use of overlapping data.[7] In order to account the problem of autocorrelation that overlapping observations induces, all results are appropriately modified via the heteroskedasticity and autocovariance consistent estimator of Newey and West (1987) in order to obtain asymptotically valid hypothesis tests. Table IV reports the average results for the three-factor model rolling windows tests carried out on all the portfolio combinations previously discussed.[8]

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[7] In his work on testing the efficient market hypothesis, Gilbert (1986) recognized the importance of using a full sample of overlapping data, along with the inherent problems of heteroskedasticity.

[8] That is, an average of the 20, 35, and 50 stock portfolios. A full presentation of these tests would be too voluminous for this paper; however, the results presented in this section are representative of those obtained from the implementation of the individual tests of robustness.

TABLE IV

Rolling Window Tests of Robustness for the Three-factor model

Fama French 3-factor regressions for monthly excess returns on equal-weighted CRSP portfolios averaged across 20, 35 and 50 stocks formed on the basis of past returns: Rolling Window Portfolios for the period January 1933 to December 2003. Intercept estimates with *t* statistics (the regression coefficient divided by its standard error) from the Fama French 3-Factor model:

$(R_{i,t} - Rf_t) = \ _i + \ _i(Rm_t - Rf_t) + \ SMB_t + \ HML_t + \ _{i,t}$.

The standard errors are appropriately modified via the heteroskedasticity and autocovariance consistent estimator of Newey and West (1987) in order to obtain asymptotically valid hypothesis tests on the overlapping data. The regression R^2's are adjusted for the degrees of freedom. T-statistics are in parentheses. Statistical significance is denoted at: 1% - **; 5% - *; 10% - #.

Sort Period	Test Period	Losers				
				SMB	HML	Adj R^2
3	3	0.002	1.289**	0.799	0.861*	0.727
		(-0.093)	(6.406)	(1.547)	(2.026)	
3	4	0.003	0.961**	0.870*	1.013**	0.699
		(-0.019)	(6.803)	(1.929)	(3.296)	
3	5	0.002	0.994**	0.787*	0.985**	0.708
		(-0.057)	(8.032)	(1.662)	(3.676)	
4	5	0.001	1.204**	0.662^	0.693*	0.738
		(-0.027)	(8.786)	(1.835)	(2.478)	
5	5	0.002	1.087**	0.689*	0.735**	0.706
		(0.011)	(8.447)	(1.983)	(2.586)	

Sort Period	Test Period	Winners				
				SMB	HML	Adj R^2
3	3	-0.003	1.181**	-0.120	-0.357^	0.845
		(-0.572)	(10.729)	(-0.630)	(-1.760)	
3	4	-0.002	1.175**	-0.863	-0.216^	0.848
		(-0.664)	(12.746)	(-0.922)	(-1.743)	
3	5	-0.002	1.166**	-0.856	-0.365^	0.846
		(-0.750)	(14.32)	(-0.958)	(-1.879)	
4	5	-0.002	1.174**	-0.167	-0.299*	0.855
		(-0.683)	(14.307)	(-1.062)	(-2.047)	
5	5	-0.001	1.121**	-0.187	-0.258^	0.826
		(-0.603)	(14.198)	(-1.337)	(-1.934)	

These results show that an investor employing a contrarian investment strategy using rolling windows will only earn returns to compensate for the market risk of the portfolios, combined with the risks of small, value companies, as captured by the SMB and HML coefficients.[9]

[9] Such findings are corroborated by using the FF model, incorporating the impact of the January effect, which, again for reasons of space, are not shown here, but are available on request.

Conclusion

In revisiting the overreaction anomaly we have shown that implementing a contrarian strategy for U.S. stocks does not produce alpha. The analysis suggests that the factors of size and value play a central role in explaining the future returns generated by a strategy of forming portfolios based on past returns. Perhaps the most interesting finding is that past losers consistently load on the size and value factor at statistically significant levels, and at levels consistently higher then their winner counterparts. Moreover, for past winners, this loading is primarily towards the value factor. The long-term past winners either load negatively on the value factor at statistically significant levels, or produce no loadings other than on the market factor, confirming previous research that categorizes overreaction as a 'loser-effect' rather than a 'loser-and-winner-effect'. These conclusions remain robust, even after adjusting for the January effect. Our study shows that portfolio managers could earn returns above the market by constructing portfolios based on the contrarian investment strategy; however this additional return would come simply at the expense of increased risk – a win for proponents of standard finance theory.

Appendix A. Constructing Contrarian Portfolios

The first stage of our study we follow an approach almost identical to that of DT, who demonstrate that most reversal evidence is contained in portfolios constructed for a 3-year time frame. We use data on stock returns from January 1927 through December 2003 for all stocks listed on the CRSP tapes. We follow the steps:

1. At every month-end, we rank all stocks according to their return above the market over the previous *m* months (period t-m + 1 to t) where t is on months.
2. Winner and loser portfolios are formed conditional upon past excess returns, with the top 35 stocks (those with the greatest cumulative excess returns) forming the winner portfolio, and the bottom 35 stocks (those with the smallest cumulative excess returns) forming the loser portfolio.
3. We then measure the return to each of these portfolios in every month for the next n months (period t + 1 to n + 1). Over a n-year period, the cumulative abnormal (monthly) return (CAR) for each stock is calculated as:

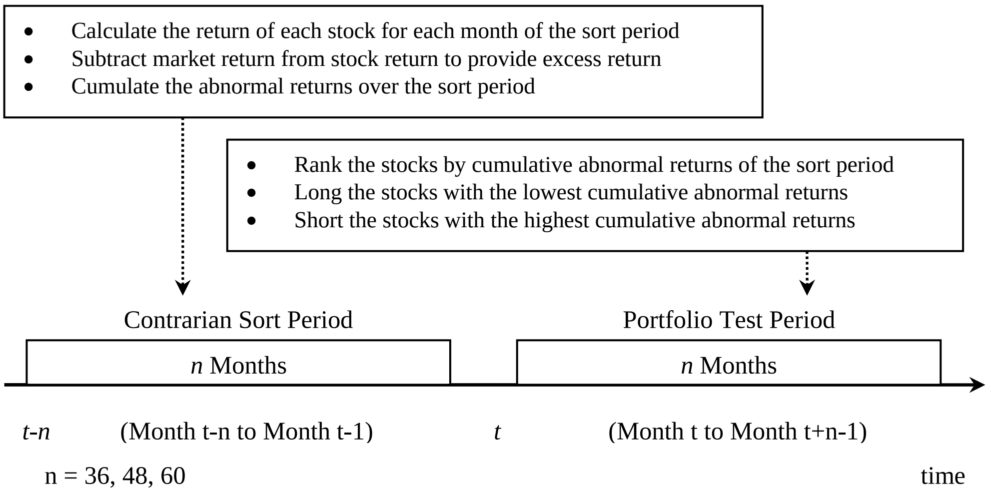
$$CAR_i = \sum_{n=1}^{36} AR_{i,n} \qquad (3)$$

where $AR_{i,t}$ is measured by $\alpha_{1,i}$.

4. This step is repeated for all following non-coincident n-month periods. Variations to the DT strategy that we use include non-equal values for m and n.

5. The cumulative average residual returns of all securities in the portfolios are calculated for the following *n* months. Following this, the average cumulative abnormal returns (ACAR) are calculated for months *t-m* + 1 to *t*. T-statistics are then calculated to determine if these ACAR's are statistically significant. In summary, Figure 1 provides a 'snapshot' of the methodological approach central to the study.[10]

Figure 1. Trading Method for Contrarian Investment Strategy



In this study, we also examined the contrarian investment strategy with the following variations to Step 2:

2a Portfolios were formed containing 20 stocks and 50 stocks.

Additionally, our methodology acknowledges the numerous papers that have replicated, examined, extended and critiqued the original overreaction study by also conducting tests on many alternate portfolio compositions.[11] These alternatives are not so much areas of criticism, rather a sensible procedure for providing more robust results.[12] To overcome the perceived measurement shortcomings in the earlier work our methodology includes:

- portfolios that were examined on the basis of 20, 35 and 50 stocks;
- portfolios that were formed for both symmetrical windows (e.g. 3 year sort; 3 year test), and non-symmetrical windows, (e.g. 3 year sort; 4, and 5 year test); and,
- testing undertaken for the DT time period (1926-1982), the recent period (1983-2003) and the full sample (1926-2003).

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[10] See De Bondt and Thaler (1985) for a more detailed description of the portfolio formation technique.

[11] For example, Pettingill and Jordan (1990) examine 90 stock portfolios, Chopra, Lakonishok and Ritter (1992) use 20 stocks, many studies use decile portfolios, Levis and Liodakis (2001) examine top and bottom one-third, De Bondt and Thaler (1987) use 50 stocks and Schiereck, De Bondt and Weber (1999) use portfolios ranging from 10 to 40 stocks. For sort and test periods, Kryzanowski and Zhang (1992) who use periods ranging from 1 to five years, Campbell and Limmack (1997) who maintain a three year sort period but test over 1 to 5 years, and Schiereck, De Bondt and Weber (1999) who use much smaller sort periods of 1, 3, 6 and 12 months.

[12] In fact Schiereck, De Bondt and Weber (1999) concede the points made in Ball, Kothari & Shaken (1995) and, when referring to the original DT study, state that "profits may be illusory, a product of methodological and measurement problems [p104]".

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