MOMENTUM CRASHES:
The Australian evidence

CLIVE GAUNT, Senior Lecturer in Finance, UQ Business School, University of Queensland

Previous studies report that significant alpha can be generated in various international equity markets by employing a momentum strategy — i.e. buying past winners and short selling past losers. However, the strategy sometimes crashes, generating large negative returns over one or more consecutive months. Using Australian data, this study generally confirms recent US findings that these crashes tend to occur following steep market declines and are characterised by large positive returns by the past Loser portfolio rather than large negative returns by the past Winner portfolio. This paper also identifies significant risk changes to a momentum strategy in bear markets but, unlike the US study, it does not find the strategy to exhibit option-like behaviour at the time of a momentum crash.

There is strong evidence of momentum in equity markets. Jegadeesh and Titman (1993) provided the first comprehensive study of momentum effects in which, using US stock returns, they demonstrated that portfolios created on the basis of prior three-to-12-month returns experienced continuation of prior high and low returns over the subsequent 12-month period. Subsequent studies have confirmed the existence of this phenomenon in other markets. For example, Fama and French (2012) find momentum for the period November 1989 to March 2011 in stock returns for three of the four regions (spanning 23 countries) they examine: North America; Europe; and Asia Pacific. In their study momentum is not evident in Japan. Asness et al. (2013) also find evidence of momentum across various international markets extending their analysis to the early 1970s and beyond portfolios of stocks to equity index futures, currencies, government bonds and commodity futures.

The Australian equity market has been the subject of a number of momentum-related studies.[1] One of the most notable features of the momentum effect in the Australian market is its prevalence among large stocks.

Vanstone et al. (2012) focus exclusively on top 100 (S&P/ASX 100) stocks in their article in *JASSA, The Finsia Journal of Applied Finance*, finding that over the 2000–11 period a portfolio of top 100 winners outperforms top 100 losers by an average of 1 per cent per month and the S&P/ASX 100 Index by 0.45 per cent per month. More recently, Vanstone and Hahn (2015) find evidence of a strong momentum effect among the S&P/ASX 200 constituents. The presence of momentum among large cap stocks makes this an anomaly which is potentially exploitable by institutional investors. While I am not aware of any Australian momentum funds currently available to investors there is a growing number of US-based mutual funds and exchange-traded funds (ETFs) that employ a momentum strategy. For example, both the AQR Large Cap Momentum Style Fund and the iShares MSCI USA Momentum Factor ETF have accumulated around US$1bn in assets. Vanstone and Hahn (2015) estimate that up to $1.5bn funds under management by listed funds is 'potentially attributable to momentum in Australia' (p. 21), and that some unlisted funds are also likely to employ momentum.

While the long-run evidence of high returns to a momentum strategy is compelling, recent research by Daniel and Moskowitz (2014) has focused on the 'infrequent and persistent strings of negative returns' (p. 1) associated with momentum. They refer to these events as *momentum crashes* which occur in a sharp recovery subsequent to large market declines and when volatility is elevated. Using US data from 1926 to 2013, they identify two periods when the momentum strategy significantly underperforms. The first is from June 1932 to December 1939, and the second is from March 2009 to March 2013, which appears to coincide with the endpoint in their sample.

The driver of this underperformance is the significant outperformance of prior losers, the short side of the momentum strategy and, to a lesser extent, the underperformance of prior winners, the long side of the strategy. Both of these periods follow notable market declines, the first prefaced by the 1929 stock market crash and the second by the global financial crisis (GFC). The two months which represent the bottom of each of these stock market crashes are June 1932 and March 2009. July and August 1932 are the two worst months for the momentum strategy in the entire sample, generating returns of −60.98 per cent and −74.36 per cent. March and April 2009 are the seventh worst and fourth worst months with returns of −42.28 per cent and −45.52 per cent. These returns are almost entirely driven by the short side of the strategy, with the past losers in 1932 returning 232 per cent in July and August and the long side (past winners) returning 32 per cent. Similarly in 2009, the past losers recorded returns of 163 per cent in March to May whereas the past winners managed just 8 per cent. So the crash in momentum returns is a product of the short portfolio crashing up rather than the long portfolio crashing down. Daniel and Moskowitz (2014) identify significant risk changes in momentum portfolios during bear market periods and contend that these risk changes cause the momentum portfolio to behave like a written call option over the market during these periods.

My aim here is to document the occurrence, if any, and nature of market crashes in Australian equity returns and to determine whether the momentum portfolio here also exhibits option-like behaviour. From an academic perspective it is important to ascertain whether phenomena documented in the world's largest equity market is present in other developed markets, thereby creating greater confidence that these crashes have some systematic driver and do not occur by chance.

So the crash in momentum returns is a product of the short portfolio crashing up rather than the long portfolio crashing down. Daniel and Moskowitz (2014) identify significant risk changes in momentum portfolios during bear market periods and contend that these risk changes cause the momentum portfolio to behave like a written call option over the market during these periods.

Practitioners here in Australia may also benefit from being aware of evidence on how the momentum strategy performs in times of great market stress, and from being able to modify the strategy to reduce underperformance in these situations. While there are few, if any, overt momentum funds in Australia, Vanstone and Hahn (2015) suggest that momentum may be the driver of a number of listed and unlisted funds.

Data and portfolio construction

This study employs the Sirca SPPR database which contains return data for Australian Securities Exchange (ASX) listed companies from January 1974 to December 2014. Using this data, decile portfolios are constructed each month beginning at the end of December 1974 and ending November 2014. The portfolios are value weighted and the portfolio comprising the highest 10 per cent of returns is dubbed the Winner portfolio and the portfolio with the lowest 10 per cent of returns is called the Loser portfolio. The portfolios are constructed based on realised returns from two months prior to the current month to 12 months prior to the current month. To maintain consistency with previous literature, the one-month gap between the ranking period and the portfolio construction date is to avoid the short-term reversal documented by Jegadeesh (1990). For example, the portfolios created at the end of December 1974 are based on realised returns from the end of December 1973 to the end of November 1974. Then, the return that is measured here is for January 1975.

To be included in the sample, companies are required to have a valid price on the last day of the month two months ago, 12 months ago and on the portfolio formation date. Following Daniel and Moskowitz (2014), each company must have at least eight valid returns over the prior 11-month period. Only 'ordinary' shares are included in the sample.

Each month, the prior 11-month returns are ranked from highest to lowest with the highest 10 per cent of returns allocated to the past Winner portfolio, the next 10 per cent to the next portfolio and so on until the lowest 10 per cent of returns are assigned to the past Loser portfolio. Portfolios are value-weighted, held for one month after the construction date and the value-weighted return calculated for that one month. The process is repeated for each of the 480 months in the period. The momentum strategy requires a long position in the past Winner portfolio and a short position in the past Loser portfolio. The return to the momentum strategy (WmL)[2] is the difference between the Winner portfolio return and the Loser portfolio return. For example, in calendar year 2010 the Winner portfolio returned 32.9 per cent and the Loser portfolio returned 12.8 per cent, so the return to the strategy for 2010 was 20.1 per cent. The focus here is on periods in which the momentum strategy does particularly badly or crashes.

Australian momentum crashes

First, let's reaffirm, in general terms, the previously documented performance of the momentum strategy. For the full 40-year sample period, Table 1 shows that the Winner portfolio returned a compound average annual return of 21.6 per cent compared to a negative 11.6 per cent return for the Loser portfolio and 13 per cent for the entire market.[3] The momentum strategy or WmL returned 33.2 per cent per annum. It is important to reiterate that the Winner and Loser portfolios are constructed on the basis of past returns and the returns in Table 1 show the return achieved after the construction date by investing in these portfolios. These returns, however, do not take into account transaction costs that with monthly portfolio reformation would be high, particularly in the early part of the sample when brokerage rates were regulated.

Table 1 also shows that the momentum strategy performs strongly when the 40-year period is divided into four 10-year periods. Also, in the most recent three of the periods, the momentum performance is driven by both the long and short side whereas in the first period it is principally the driven by the long side.[4]

TABLE 1: Average annual compound returns

Period	Winner	Loser	WmL	Market
1975–2014	21.6%	–11.6%	33.2%	13.0%
1975–1984	28.0%	12.2%	15.7%	19.0%
1985–1994	16.8%	–13.7%	30.4%	14.3%
1995–2004	23.1%	–23.9%	47.0%	11.8%
2005–2014	18.9%	–17.4%	36.2%	7.3%

Note: The Winner and Loser portfolios are constructed based on past returns from one month to 12 months prior to the portfolio formation date. The Winner portfolio comprises the highest 10% of returns and the Loser the lowest 10% of returns. The Winner and Loser returns are the average annual compound returns from investing in these portfolios constructed on past returns and holding them from one month before reforming each portfolio. The momentum strategy or WmL return is the Winner return minus the Loser return.

Table 2 lists the worst 15 months for the Momentum strategy, with the worst month being April 2000. It is interesting to note that neither April 2000 nor any other month in 2000 appears in the list of the worst 15 monthly returns reported by Daniel and Moskowitz (2014) using US data. Of the 15 worst months in the Daniel and Moskowitz (2014) study, seven occur in the 1930s which pre-dates the available ASX data here. A notable overlap between the Australian and US results is the first month following the market bottom in early 2009 with April appearing on both lists. Here, April 2009 is the second worst month with minus 37.8 per cent to the Momentum strategy. In the US, this month also ranks second (after removing the 1930s period) but performs worse with −44.5 per cent. The other notable overlap is the two months (October and November 2001) following the market slump in the wake of the 11 September 2001 terrorist attacks on US soil.

TABLE 2: Worst 15 months for Momentum strategy

		Single Month Return				Prior 2 year Return		
Year	Month	Winner	Loser	WmL	Market	Winner	Loser	Market
2000	4	-42.2%	-0.5%	-41.6%	-1.7%	212.0%	-28.7%	21.5%
2009	4	4.3%	42.1%	-37.8%	6.5%	-12.6%	-72.0%	-35.7%
1982	8	-1.1%	32.6%	-33.7%	4.1%	-27.7%	-62.1%	-19.0%
1991	2	7.7%	34.5%	-26.8%	7.4%	-26.1%	-77.1%	-0.1%
1993	5	10.6%	34.7%	-24.1%	4.0%	47.9%	44.8%	20.3%
1991	7	7.2%	28.2%	-21.0%	4.0%	-14.4%	-84.2%	9.6%
1983	9	-10.7%	10.2%	-20.9%	2.6%	94.6%	-16.3%	24.9%
2003	8	8.6%	29.1%	-20.5%	3.6%	52.6%	-53.6%	5.2%
2009	5	0.0%	20.2%	-20.2%	2.3%	-16.7%	-62.5%	-33.6%
1980	12	-17.5%	2.5%	-20.0%	-2.5%	332.8%	74.1%	143.9%
1980	3	-24.5%	-4.8%	-19.7%	-12.6%	233.1%	121.2%	137.7%
1991	9	3.5%	22.8%	-19.3%	1.7%	-20.0%	-87.0%	-3.1%
2001	11	2.9%	21.6%	-18.6%	3.3%	-13.0%	-75.0%	20.3%
1998	9	2.1%	20.2%	-18.1%	3.6%	40.9%	-52.9%	18.0%
2001	10	3.4%	21.0%	-17.6%	6.2%	-10.2%	-80.8%	13.2%

Notable among the worst months in Table 2 is the tendency for the bad month to be driven by a strong positive return on the short side of the strategy, rather than a large negative return on the long side of the strategy. A clear exception to this is the worst monthly return in April 2000 where the long-side loses 42.2 per cent and the short-side loses just 0.5 per cent.

April 2000 was at the heart of the tech stock 'crash' in the US when the NASDAQ lost 15.6 per cent of its value. While it made headline news at the time, this event had a limited impact on the broader market in the US and in Australia. Table 3 lists the largest 10 stocks by market capitalisation in the Winner portfolio constructed at the end of March 2000. Nine of the 10 stocks are technology stocks and experienced extremely large returns over the prior year along with a significant decline in April 2000.

TABLE 3: Ten largest Winner portfolio stocks by market cap, as at 31 March 2000

Company	Sector	Mkt Cap ($m)	Prior 12mth Return	April 2000 Return
ERG	Technology	2,343.04	591%	-29%
Davnet	Technology	1,773.12	1330%	-55%
GES International	Technology	1,248.05	858%	-32%
Sausage Software	Technology	822.03	646%	-51%
Securenet	Technology	820.19	836%	-59%
Keycorp	Technology	612.66	306%	-48%
New Tel	Technology	356.12	627%	-61%
Voicenet	Technology	355.65	755%	-33%
Revesco	Healthcare	314.35	290%	-21%
Senetas Corporation	Technology	276.77	2751%	-67%

The second worst month in Table 2 is April 2009, the month immediately following the GFC market bottom. In April 2009 the momentum strategy lost 37.8 per cent but this was mainly driven by the short side of the strategy, the Loser portfolio earning 42.1 per cent. The Winner portfolio earned a relatively small positive return of 4.3 per cent slightly underperforming the broad market return of 6.5 per cent. The momentum crash of early 2009 ran from March 2009 to September 2009 with monthly momentum returns through that period of −17.4 per cent, −37.8 per cent, −20.2 per cent, −11.2 per cent, −7.0 per cent, −8.2 per cent and −2.0 per cent as depicted in Table 4. $10,000 invested in the momentum strategy at the end of February 2009 would have been worth just $3,045 at the end of September 2009. Throughout this period it is the short side of the strategy driving the crash. While the long side underperforms the broader market it still generates a 29 per cent return over the period to the end of September. The short side, however, inflicts the damage generating a loss of 77.7 per cent as the share price of the stocks underlying the Loser portfolio soars.

TABLE 4: Profile of the 2009 Momentum crash

Year	Month	Winner	Loser	WmL	Market
2009	3	1.9%	19.3%	–17.4%	7.4%
2009	4	4.3%	42.1%	–37.8%	6.5%
2009	5	0.0%	20.2%	–20.2%	2.3%
2009	6	2.0%	13.1%	–11.2%	3.2%
2009	7	6.5%	13.5%	–7.0%	7.6%
2009	8	5.8%	14.1%	–8.2%	6.1%
2009	9	5.4%	7.4%	–2.0%	5.5%

Table 5 lists the largest 10 stocks by market capitalisation in the Loser portfolio created at the end of March 2009. These stocks had experienced declines over the prior year of 85 per cent or greater and the table illustrates that many of these stocks rebounded strongly in April 2009.

TABLE 5: Ten largest Loser portfolio stocks by market cap, as at 31 March 2009

Company	Mkt Cap ($m)	Prior 12mth Return	April 2009 Return
Minara Resources	467	–93%	45%
Australand Property	467	–86%	60%
Futuris Corporation	291	–85%	23%
Murchison Metals	273	–85%	48%
Ausenco	263	–86%	23%
Sunland Group	194	–86%	–7%
Boart Longyear	188	–95%	–4%
Alesco Corporation	184	–89%	100%
Lynas Corporation	131	–88%	55%
NRW Holdings	129	–88%	51%

Market risk changes and crashes

Daniel and Moskowitz (2014) note that momentum crashes tend to occur following a poor two-year period for stock returns, when stocks in the Loser portfolio have often experienced significant declines and many are at risk of bankruptcy and may offer option-like payoffs. The second column from the right in Table 2 does indicate that in many cases the Loser portfolio has suffered significant losses in the two-year lead-up to a momentum crash, but this is not the case with broad market returns.

Daniel and Moskowitz (2014) present evidence that the market beta of the momentum portfolio falls significantly in bear markets and falls even further in up-market months during a bear market, and it is this which drives momentum portfolio crashes.

Here, I will examine the risk characteristics of the Australian momentum portfolios to assess whether a similar dynamic is at work. Table 6 presents descriptive statistics indicating that the Loser, Winner and Winner-minus-Losers (WmL) portfolios have a significantly higher standard deviation of excess returns than the broader market. A simple market model regression is used to estimate the market beta of each portfolio:

$$R_{WmL,t} = \propto_0 + \beta_0 R_{m.t} \quad (1)$$

where $R_{WmL,t}$ is the WmL return in month t, and $R_{m.t}$ is the Sirca SPPR value-weighted market return for month t.

The betas of the Loser and Winner portfolios are also similarly elevated leaving the beta of the WmL portfolio close to zero. This differs from the US results reported by Daniel and Moskowitz (2014) where the Loser portfolio beta is very high, the Winner portfolio is close to 1 and WmL is −0.54. While there is some evidence of greater negative skewness in returns for the Winner portfolios, there is very little skewness in the WmL portfolio unlike the highly negatively skewed returns reported by Daniel and Moskowitz (2014).

TABLE 6: Portfolio descriptive statistics

	Loser	2	3	4	5	6	7	8	9	Winner	WmL	Market
$r - r_f$	-13.7%	-9.2%	-7.1%	-0.1%	1.4%	6.0%	6.4%	10.1%	10.9%	16.3%	22.4%	6.1%
σ	35.8%	30.1%	25.4%	22.0%	19.0%	18.9%	18.1%	19.2%	22.2%	28.3%	35.1%	15.9%
Sharpe Ratio	-0.38	-0.31	-0.28	-0.01	0.07	0.32	0.35	0.53	0.49	0.57	0.64	0.38
Skewness	0.25	-0.50	-0.92	-0.47	-0.51	-1.02	-0.96	-1.08	-0.78	-0.77	-0.28	-1.64
α	-21.3%	-16.3%	-14.0%	-6.2%	-4.5%	-0.1%	0.4%	3.8%	3.9%	8.3%	22.2%	0.0%
$t(\alpha)$	-4.71	-4.45	-4.95	-2.56	-2.61	-0.06	0.30	2.46	1.98	2.79	4.07	
β	1.27	1.17	1.12	0.99	0.98	0.99	0.97	1.04	1.15	1.30	0.03	1.00

Following Daniel and Moskowitz (2014), I run two further regressions of WmL returns on variations of the market model. Equation 2 adds a bear market indicator to assess if bear markets affect the market beta of the WmL portfolio.

$$R_{WmL,t} = (\propto_0 + \propto_B I_{B,t-1}) + (\beta_0 + \beta_B I_{B,t-1}) R_{m.t} \quad (2)$$

where $I_{B,t-1}$ equals 1 if the cumulative Sirca SPPR value-weighted return is negative over the prior two-year period, and equals 0 otherwise.

Equation 3 adds an up-market indicator to see if the occurrence of a positive market return month during a bear market affects beta, thereby confirming the momentum portfolio, in effect, as a written call option on the market.

$$R_{WmL,t} = (\propto_0 + \propto_B I_{B,t-1}) + (\beta_0 + \beta_B I_{B,t-1} + \beta_{B,U} I_{U,t} I_{B,t-1}) R_{m.t} \quad (3)$$

where $I_{U,t}$ equals 1 if the current month Sirca SPPR value-weighted return is positive, otherwise zero.

Table 7 presents the results of these tests. Equation 2 largely confirms the findings of Daniel and Moskowitz (2014) that the alpha of the WmL portfolio in bear markets is negative (here it is −1 per cent obtained by adding $\propto_0$ and $\propto_B$) and that bear markets pull the portfolio beta down 1.05 to −0.81 (obtained by adding β_0 and β_B). While Equation 3 estimates a negative coefficient for $\beta_{B,U}$ it is not statistically significant and so does not support the finding and conclusion of Daniel and Moskowitz (2014) that the WmL portfolio 'exhibits option-like behaviour relative to the market' (p. 15). However, it is worth noting that later in their paper, using a time period similar to that used here, Daniel and Moskowitz (2014) also estimate a statistically insignificant coefficient for $\beta_{B,U}$.

TABLE 7: Impact of market state on beta

		Estimated Coefficients (*t*-statistics in parentheses)		
		Regression		
Coef.	Variable	1	2	3
$\propto_0$		0.019	0.025	0.025
		(4.1)	(5.2)	(5.2)
$\propto_B$	$I_{B,t-1}$		-0.035	-0.031
			(-2.9)	(-1.6)
β_0	$R_{m,t}$	0.034	0.242	0.242
		(0.4)	(2.3)	(2.3)
β_B	$I_{B,t-1} R_{m,t}$		-1.051	-0.931
			(-4.2)	(-1.9)
$\beta_{B,U}$	$I_{U,t} I_{B,t-1} R_{m,t}$			-0.210
				(-0.3)
R^2		-0.002	0.057	0.055

Table 8 reports the results of running the third regression (Equation 3) on each of the decile portfolios. It is interesting to note the near monotonic change in β_B from positive to negative moving from Loser to Winner and also, more importantly, that the large negative β_B on the WmL portfolio is driven by an increase in the market beta of the Loser portfolio during bear markets rather than a fall in the market beta of the Winner portfolio. Again, though, there is no significance in any of the up-market $\beta_{B,U}$ coefficients across the various portfolios.

TABLE 8: Impact of market state on portfolios beta

		Momentum portfolios – regression coefficients (*t*-statistics in parentheses)										
Coef.	Variable	Loser	2	3	4	5	6	7	8	9	Winner	WmL
$\propto_0$		-0.023	-0.015	-0.012	-0.006	-0.005	-0.001	0.000	0.003	0.004	0.008	0.025
		(-5.8)	(-4.5)	(-4.7)	(-2.8)	(-3.2)	(-0.4)	(-0.3)	(2.4)	(2.2)	(2.9)	(5.2)
$\propto_B$	$l_{B,t-1}$	0.031	-0.002	0.001	0.014	0.006	0.006	-0.001	0.006	-0.004	-0.001	-0.031
		(1.9)	(-0.1)	(0.1)	(1.6)	(1.03)	(1.1)	(-0.1)	(1.1)	(-0.6)	(0.1)	(-1.6)
β_0	$R_{m,t}$	1.096	1.043	1.063	0.925	0.925	0.989	0.972	1.053	1.200	1.335	0.242
		(12.4)	(14.4)	(18.8)	(19.3)	(26.9)	(30.3)	(32.8)	(34.2)	(30.7)	(22.3)	(2.3)
β_B	$l_{B,t-1}\ R_{m,t}$	0.852	0.503	0.371	0.634	0.246	0.119	-0.174	0.162	-0.302	-0.087	-0.931
		(2.1)	(1.5)	(1.4)	(2.8)	(1.5)	(0.8)	(-1.3)	(1.1)	(-1.7)	(-0.3)	(-1.9)
$\beta_{B,U}$	$l_{U,t}\ l_{B,t-1}\ R_{m,t}$	0.014	0.280	-0.082	-0.503	0.014	-0.184	0.283	-0.380	0.069	-0.181	-0.210
		(0.0)	(0.6)	(-0.2)	(-1.5)	(0.1)	(-0.8)	(1.4)	(-1.8)	(0.3)	(-0.4)	(-0.3)
R^2		0.367	0.407	0.503	0.525	0.675	0.702	0.734	0.746	0.691	0.544	0.055

Concluding remarks

While a momentum strategy of buying a portfolio of prior winners and selling a portfolio of prior losers has been shown to generate significant alpha in a range of international equity markets, the strategy will infrequently crash generating large losses over a period of several months. In Australia, the most prominent of these crash events ran from March 2009 to September 2009 producing a cumulative loss to the strategy of 78 per cent. Consistent with US research, this GFC crash was driven by high positive Loser portfolio returns rather than high negative Winner portfolio returns, which is likely to be of comfort to asset managers who run long-only momentum funds or who take momentum into account in portfolio construction.

In conclusion, asset managers who employ a (long–short) momentum strategy should be aware that the strategy will infrequently crash, but that these crashes may to some extent be predictable as they tend to follow periods of very large losses to the loser portfolio. Understanding this, and the significant risk changes that occur, potentially offers managers the opportunity to modify the strategy at those times to mitigate losses, at least, or perhaps even generate positive returns.

These results show that during bear market periods, the market beta of the Loser portfolio increases significantly and this goes a long way to explaining the outperformance of the WmL strategy across a bear market and the underperformance or crash of the strategy in up-market months shortly after the end of a bear-market. However, further tests cannot confirm the option-like behaviour of the US implemented momentum strategy at the time of a crash.

In conclusion, asset managers who employ a (long–short) momentum strategy should be aware that the strategy will infrequently crash, but that these crashes may to some extent be predictable as they tend to follow periods of very large losses to the loser portfolio. Understanding this, and the significant risk changes that occur, potentially offers managers the opportunity to modify the strategy at those times to mitigate losses, at least, or perhaps even generate positive returns.

Notes

1. These include: Hurn and Pavlov (2003); Gaunt and Gray (2003); Demir et al. (2004); Durand et al. (2006); Brailsford and O'Brien (2008); Kassimatis (2008); Bettman et al. (2009); Galariotis (2010); O'Brien et al. (2010); Schneider and Gaunt (2012); Vanstone et al. (2012); Doan et al. (2014); Huynh and Smith (2015); and Vanstone and Hahn (2015).
2. The momentum portfolio and WmL are using interchangeably throughout this article.
3. Calculated using the Sirca SPPR value-weighted index of all listed stocks.
4. As is typical in this type of analysis, it has been assumed that any stock in the sample can be short sold. In reality there are regulatory and institutional impediments to short selling, which may mean that not all stocks included in the Loser portfolio could actually have been short sold at that time.

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