

## **Stock Overreaction Behaviour in Bursa Malaysia: Does the Length of the Formation Period Matter?**

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### **Abstract**

This paper investigates whether stock overreaction behaviour in Malaysian stock market is sensitive to the length of the formation period. Using the basic framework of De Bondt and Thaler (1985), this study find that stock overreaction behaviour in this market is sensitive to the length of the formation period. Significant evidence of stock overreaction effect is documented in the longer formation period of up to 5-year, while for the medium formation period of 2-year, there is no clear evidence of stock overreaction behaviour. Evidence of stock overreaction behaviour is also reported for the shorter-term of 1-year, however, it may not be economically profitable after taken into account the transaction cost. This study also shows that size cannot explain the documented overreaction effect. However, the results suggest that the overreaction effect subsided after adjustment to time-varying risk.

### **1. Introduction**

Stock market behaviour has become a popular topic of study in finance research. Recent evidence of behavioural finance for example overreaction and underreaction (De Bondt and Thaler, 1985, 1987; Fung, 1999; Mun Vasconcellos and Kish, 2000 Lai et. al, 2003; among them), have becoming a challenge to EMH. One of them is the seminal work of De Bondt and Thaler (1985) which suggest the possibility of overreaction behaviour in the prices of stock. Many studies have been spurred from these findings such as Otchere and Chan (2003), Gaunt (2000), Fung (1999) and many others. Zarowin (1990) argues that the stock overreaction behaviour documented by De Bondt and Thaler (1985) is due to size effect whereas Chan (1988) asserts that the time-varying risk factor is the cause of stock overreaction. However, De Bondt and Thaler (1987), and Lai et. al (2003) report that overreaction effect is not a manifestation of size and risk effect. Other study by Kryzanowski and Zhang (1992), Campbell and Limmack (1997) and Saleh (2007) focus on the sensitivity of overreaction effect to the length of the formation period while Chen and Sauer (1997) stress on the persistent of overreaction behaviour overtime. In Malaysia, evidence of stock

overreaction behaviour are documented by Hameed and Ting (2000), Ahmad and Hussain (2001) and Lai, Guru and Fauzias (2003). Their results are robust in which risk, size and seasonality effects cannot explain the stock overreaction observed in Malaysian stock market. Although evidences of stock overreaction have been documented by previous studies in Malaysia, there is no study thus far that look at the sensitivity of the length of the formation period on the return behaviour of Malaysian stock market. Saleh (2007) as well as Campbell and Limmack (1997) show that stock overreaction behaviour in Jordan and UK stock market is sensitive to the length of the formation period. However, Kryzanowski and Zhang (1992) find that it does not matter in Canadian stock market. The purpose of this study is to investigate whether stock overreaction behaviour in Bursa Malaysia is sensitive to the length of the formation period. Finding of this study is important as it can help to provide guidelines for investors to take advantage on the stock overreaction behaviour in Malaysian stock market.

## 2. Methodology

The overreaction hypothesis was first applied in finance by De Bondt and Thaler (1985), suggest that investors tend to overreact to new information by over weighting recent information and under weighting prior information. Overreaction hypothesis implies that stocks that perform best (worst) over an initial period tend to perform worst (best) in the subsequent period. This is because investors tend to overreact to new information and generate such price movements that go beyond the new equilibrium level justified by the news. Later, as investors realize that they have unduly reacted to the information and trade on the overreaction, price will change to the opposite direction of the initial movements and approached its equilibrium.

Based on efficient market condition, De Bondt and Thaler (1985) explain overreaction hypothesis as:

$$E(\bar{R}_{jt} - E_m(\bar{R}_{jt}|F_{t-1}^m)|F_{t-1}) = E(\bar{u}_{jt}|F_{t-1}) = 0$$

Where  $\bar{R}_{jt}$  is the return on security  $j$  at time  $t$ ,  $F_{t-1}$  is all information at time  $t-1$ ,  $E_m(\bar{R}_{jt}|F_{t-1}^m)$  is the market expectation of the return on security  $j$  at time  $t$  conditional on the information asessed by the market at time  $t-1$ . The efficient market condition states:

$$E(\bar{u}_{w,t}|F_{t-1}) = E(\bar{u}_{l,t}|F_{t-1}) = 0$$

Where  $\bar{u}_{w,t}$  equals the mean abnormal returns of winners and  $\bar{u}_{l,t}$  equals that of losers. The winners and losers are determined from abnormal positive (negative) returns in the prior period. In contrast to efficient market condition, the overreaction hypothesis implies that:

$$E(\bar{u}_{w,t}|F_{t-1}) < 0 \text{ and } E(\bar{u}_{l,t}|F_{t-1}) > 0$$

If market has overreacted, the winner portfolio will experience a negative price adjustment during the subsequent period and the loser will experience a positive price adjustment during the test period.

The availability of data over a period from January 1987 to December 2006 provides 19, 9 and 3 non-overlapping 12-month, 24-month and 60-month portfolio formation (rank) periods and the corresponding test periods respectively. The subsequent long run rank periods and their matching test periods are presented in Table 1.

This study uses monthly closing price of all stocks listed on the main board of Bursa Malaysia collected from the *Datastream* to calculate for monthly return. Monthly returns are computed as:

$$R_{it} = [(lnP_{it}) - (lnP_{it-1})] * 100$$

Where,  $R_{it}$  represents return on security  $i$  at period  $t$ ,  $P_{it}$  and  $P_{it-1}$  represent price on security  $i$  at period  $t$  and period  $t-1$ . The same calculation is carried out for return on market with the Kuala Lumpur Stock Exchange Composite Index (KLSE CI) being used as a proxy for the market. This study computes monthly market adjusted abnormal return (AR) for stock  $i$  as:

$$AR_{it} = R_{it} - R_{Mt}$$

Where  $R_{it}$  and  $R_{Mt}$  are returns for stock  $i$  and market  $m$ , respectively. The study computes cumulative abnormal returns (CAR<sub>*i*</sub>) for every stock over the portfolio formation period (FP) of T = 12, 24 and 60.

$$CAR_i = \sum_{t=1}^T AR_{it}$$

Following De Bondt and Thaler (1985), these stocks are then ranked based on their CARs over the formation period and portfolios are formed. Firms in the top 20% are assigned to the winner portfolio (W) and in the bottom 20% to the loser portfolio (L). Buying loser and selling winner forms arbitrage portfolios. The winner, loser and arbitrage portfolios are then held for the next 12, 24 and 60 months.

In the subsequent test period, the CARs of all stocks in the winner and loser portfolios are recomputed. If firm is de-listed in a month subsequent to portfolio formation, it will be permanently dropped from the portfolio and the CARs is an average of the available returns. For every test period at the interval of 1 and 12, 1 and 24, as well as 1 and 60, the CARs for all stocks in the winner and loser portfolios are calculated as follows.

$$CAR_{p,z,t} = \sum_t \left( \frac{1}{N} \right) \sum_{i=1}^N AR_{it}$$

where  $z$  is the test period (1,2, ... Z),  $N$  is the number of stocks assigned in each portfolio for each formation period and  $CAR_{p,z,t}$  is the cumulative abnormal returns in month  $t$  of the test period  $z$  for portfolio  $p$

The study then repeats the above method for all formation periods and their subsequent test periods of 12-, 24- and 60-month. One sample t-test is used to examine whether the loser portfolio and the winner portfolio reverse their fortune in the subsequent test period. Negative significant t-values for the winner portfolio would suggest that there is evidence of stock overreaction existed in the sample, in which it implies that the winner portfolio has reversed and perform significantly badly during the test period. The reverse is true for the loser portfolio. Positive significant t-values for the loser portfolio support the overreaction hypothesis by suggesting that the loser portfolio has performed significantly better in the test period. Meanwhile, positive significant t-value for the arbitrage portfolio indicates that contrarian strategy of buying loser and selling winner portfolios would produce significant abnormal returns in the subsequent period as suggested by the overreaction hypothesis.

The study also employs the independent samples t-test to ascertain the difference in mean cumulative abnormal return (CARs) of the two portfolios over the test period. Significant t-values in the differences would suggest that the mean returns of the two portfolios are different. A positive significant t-values support the overreaction hypothesis. It implies that loser portfolio has outperformed winner portfolio in the test period.

### 2.1 Long run overreaction with adjustment to size

The study extends the investigation of the long run overreaction by controlling for firm size to ascertain if the contrarian profits are just due to small firm size effect. The study controls for firm size by constructing three sizes sorted groups, which are small, medium, and large

based on market value of the stocks at the end of the formation period. Stocks are first assigned to winner and loser portfolio based on rank period return, then each of the loser and winner portfolios are broken into three size portfolios of small, medium and large. The methodology describes in the previous section is repeated here for the small winner, small loser, large winner and large loser portfolios.

### 2.2 Long run overreaction with adjustment to time varying risk

In view of the contention by Chan (1988) that risk associated with a portfolios are more likely to change overtime, this study extends the analysis by taking into consideration the aspect of time-varying risk. Consistent with Chan (1988), this study assumes that expected returns are generated by Sharpe-Lintner Capital Asset Pricing Model (CAPM). The study also assumes that the presence of abnormal returns can be tested via examining the value of  $\alpha$  in the following equation:

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + \epsilon_{it}$$

In order to examine the change in risk from the formation period to the test period as well as the presence of abnormal returns in the formation period and the test period, the above equation is modified slightly to:

$$R_{it} - R_{ft} = \alpha_{1i} (1 - D_t) + \alpha_{2i} D_t + \beta_i (R_{mt} - R_{ft}) + \beta_{iD} (R_{mt} - R_{ft}) D_t + \epsilon_{it}$$

Where  $t$  is between 1 and 24,  $D_t$  is a dummy variable equal to zero in the ranking period ( $t \leq 24$ ) and to 1 in the test period ( $t > 24$ ). The abnormal return in the ranking period is estimated by  $\alpha_{1i}$  and that of the test period is estimated by  $\alpha_{2i}$ . The ranking period risk is  $\beta_i$  and the test period's is  $\beta_i + \beta_{iD}$ . If the risk of a portfolio unchanged, then  $\beta_{iD}$ , which indicates the change in the risk of the portfolio from the rank to the test period, should be equal to zero. Hence, the study investigates if there is any change in the beta of the winner, loser and arbitrage portfolios from the rank to the test periods.

## 3. Findings

### 3.1 12-month formation period

Table 2 and Table 3 summarize results of the differences in CARs between loser and winner in the test period for 12-month formation period. Table 2 shows that Malaysian stock market significantly overreacts in 6 out of 19 non-overlapping portfolio formation and test period. Winner and arbitrage portfolio of loser minus winner exhibit significant reversal behaviour that is consistent with the overreaction hypothesis.

The study also shows that the overreaction behaviour is more pronounced in the period prior to the 1997 Asian Financial Crisis with 4 out of 6 evidences of stock overreaction have taken place during this sub-period. After the crisis, the overreaction gradually diminishes and becomes insignificant in period 2003/2004, 2004/2005 and 2005/2006.

Table 3 shows that both loser and winner portfolio reversed in the test period. Loser portfolio has significantly reversed in month 1 to month2 of the test period while winner portfolio has significantly becomes loser in month 11 and month 12 of the test period. Arbitrage portfolio earns significantly positive abnormal returns as early as one month after portfolio formation. The results however become insignificant after two months of portfolio formation. In month 11 of the test period, the arbitrage portfolio significantly earns up to 7.74% of abnormal returns. The findings suggest that investors have overreacted by overvaluing winner portfolio over an initial period and undervaluing the loser portfolio over the same period. In the following sub-period, both loser and winner portfolio reversed and arbitrage portfolio earns significant abnormal profit. Although the study shows that there are opportunity to earn abnormal returns out of contrarian strategy, the results however is

marginally significant at 10% significant level. After taken into account the transaction cost, the strategy may not be economically profitable.

### *3.2 24-month formation period*

Table 4 displays results of differences in Cumulative Abnormal Returns (CAR) between loser and winner in the test period for 24-month portfolio formation in the Malaysian stock market over the period between January 1987 and December 2006. Table 4 presents that five out of nine test periods, mean CARs are significantly greater for loser than for winner. These results are therefore consistent with the Overreaction Hypothesis. The results also show that loser has significantly outperformed winner for portfolio formed before 1997 Asian Financial Crisis. Those that are formed after the crisis period, however does not consistent with overreaction hypothesis where winner portfolio tends to significantly outperformed loser portfolio as indicated by the mean CAR of loser - winner. The findings suggest that there exist strong overreaction phenomenon in the Malaysian stock market before the 1997 Asian Financial Crisis period. The results are also statistically significant in all the 5 periods before the crisis.

However, after the 1997 Asian Financial Crisis, evidence of overreaction behaviour diminishes. As time goes by, the stock overreaction behaviour gradually diminishes and stock market gradually becomes more “efficient”. These patterns are shown in Table 4 where the negative zero-investment returns of loser minus winner become insignificant during the 2001/2002 and 2003/2004 periods. Malaysian stock market seems to be more efficient after the 1997 Asian Financial Crisis period, a results that is consistent with Otchere and Chan (2003) for Hong Kong stock market.

Table 5 reveals that loser has becoming winner by earning positive abnormal returns 1 month to 2 months after portfolio formation; however the results are not significant. These insignificant results of mean difference indicate failing to reject the null hypothesis of  $ACAR = 0$ . This implies that there is no significant difference in ACAR for loser in the formation and the test period. Meanwhile, the winner portfolio displays a reverse in fortune in the subsequent period. Results show that winner portfolio has reversed after 13 months of portfolio formation. The arbitrage portfolio of selling winner and buying loser earned significantly positive ACAR 3.27% within one month after portfolio formation. However, as time passing by, the ACAR diminishes and sometimes the strategy gives negative ACAR. This suggests that, while confined mainly to the winner portfolio, the overreaction effect does provide a trading strategy, which appears to offer the potential for significant trading gains. The results are consistent with international evidence where the winner portfolio experienced a significant price reversal in the test period. However, the loser portfolio exhibits no such behaviour, while the difference in CAR between loser and winner portfolio is also not statistically significant. The findings of this study are coherent to those documented by Brailsford (1992) for Australian stock market and Ising et. al (2006) for German stock market. Furthermore, the findings of the current study are also in accordance with those found by McNish et al (2006).

In summary, this study finds no clear evidence of stock overreaction hypothesis in Malaysian stock market for 24-month portfolio formation period as presented by the insignificant results of the arbitrage portfolio.

### *3.3 60-month formation period*

Findings of overreaction in stock returns for 5-year formation period are presented in Table 6. Table 6 shows that stock overreaction behaviour is only significantly evidenced in the period

before the crisis. Table 7 presents the results when the CARs are calculated over a 60-month period or 5-year period. Findings suggest that there are evidences of stock overreaction existed in Bursa Malaysia when CARs are calculated over 60-month periods. Table 7 reports that evidences of overreaction behaviour could be detected even after four months up to five years of portfolio formation. Notice that evidences of overreaction behaviour are more pronounced for winner than for loser portfolio. Loser portfolio exhibits continuation behaviour in month 46 to month 51. However, in general the results show that loser portfolio has reversed in the subsequent period, which is consistent with the overreaction hypothesis. This implies that during the formation period, investors have overreacted by unduly undervalued extremely losing stocks. In the subsequent period, the prices correct themselves once investors realized the misvaluation of those stocks.

Winner portfolio on the other hand has subsequently reversed in month 4 through month 60 of test period. In the case of winner portfolio, investors may have become overly optimistic about those stocks and thus, resulting in stock prices being unreasonably overvalued. In the following period, after realizing that those stocks had overvalued, investors take corrective action and pull their prices down, resulting in the extremely winning stocks to earn negative ACAR in the test period. These behaviours are consistent with the overreaction hypothesis. The overreaction behaviour shown by the winner and loser portfolios as described above have given an opportunity for strategy that based on the overreaction hypothesis such as contrarian strategy of selling winner and buying loser to earn significant positive abnormal returns. Column three of Table 7 presents results of arbitrage portfolio of selling winner and buying loser portfolios. Findings reveal that arbitrage portfolio starts earning significant positive abnormal returns of 11.8% eight months after portfolio formation. As time passes by, abnormal returns earned increases to 20.6%, 54.7%, 39%, 27% and 32.42% after 1 year, 2 years, 3 years, 4 years and 5 years of portfolio formation respectively.

#### **4. Adjustment to size**

Results of the study after adjustment to size for 12-, 24- and 60- month formation period are presented in Table 8, Table 9 and Table 10 respectively. The findings suggest that, even after adjustment for size, stock overreaction effect still exist for the 12-month and the 60-month formation period. Both loser and winner portfolios still exhibit behaviour that are consistent with stock overreaction hypothesis. This finding implies that size cannot explain the overreaction effect documented by the study. Consistent with international evidence, evidence of overreaction behaviour are more pronounced for small stocks than large stocks for 60-month formation period.

#### **5. Adjustment to time-varying risk**

Table 11 summarised results of stock overreaction behaviour after adjustment for time-varying risk for 12-, 24-, and 60-month formation period. Overall, the findings show that overreaction effect disappears when risk is taken into account for formation period of 12-month, 24-month as well as 60-month. The study implies that time-varying risk can explain the overreaction effect documented by the study. The abnormal returns earned in the subsequent period are enough to compensate the extra risk assumed during the test period.

## 6. Investment implication and conclusion

Results of the study demonstrate that overreaction behaviour in Malaysia stock market is sensitive to the length of the formation period. In shorter formation period of 1-year, the study shows a significant positive abnormal return by resorting to contrarian strategy as early as 1-month form portfolio formation. The results however are only marginally significant at 10% significant level. The strategy may not be economically profitable if transaction cost is taken into account. For the medium term of 2-year formation period, the study finds no clear evidence of stock overreaction behaviour existed in the market. In the longer formation period namely 5-year formation period, loser and winner portfolio has reversed, and loser has significantly outperformed winner portfolio in the test period. These findings lend support to those reported by Saleh (2007), and Campbell and Limmack (1997) for Jordon and UK stock market. Their study also find that loser continue to be loser in the short term. In the longer term of up to five years, loser portfolio reversed and has outperformed winner portfolio. Loser portfolio will continue to be loser in shorter formation period such as two-year formation period. However, the significant abnormal returns earned are just enough to compensate for higher risk in the test period.

This study suggests that Malaysian investors are able to earn significant positive abnormal returns by resorting to contrarian strategy if they form portfolio based on longer past performance of up to 5-year. Significant abnormal returns could be earned as early as eight months from portfolio formation. Although contrarian strategy does not provide potential positive abnormal returns, strategy that based on winner alone may produce significant gains in the short run.

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**Table 1:** Long-run rank periods and test periods for 12-, 24- and 60-month

Period	12-month		24-month		60-month	
	Formation period	Test period	Formation period	Test period	Formation period	Test period
1	1987	1988	1987-1988	1989-1990	1987-1991	1992-1996
2	1988	1989	1989-1990	1991-1992	1992-1996	1997-2001
3	1989	1990	1991-1992	1993-1994	1997-2001	2002-2006
4	1990	1991	1993-1994	1995-1996		
5	1991	1992	1995-1996	1997-1998		
6	1992	1993	1997-1998	1999-2000		
7	1993	1994	1999-2000	2001-2002		
8	1994	1995	2001-2002	2003-2004		
9	1995	1996	2003-2004	2005-2006		
10	1996	1997				
11	1997	1998				
12	1998	1999				
13	1999	2000				
14	2000	2001				
15	2001	2002				
16	2002	2003				
17	2003	2004				
18	2004	2005				
19	2005	2006				

**Table 2:** Differences in CARs between loser and winner in the test period



Formation Period	Test Period	Mean Loser	Mean Winner	Mean Loser - Winner	t-stat
87	88	-33.63	-9.91	-23.72	-2.267**
88	89	12.53	7.27	5.26	0.313
89	90	-1.01	2.71	-3.73	-0.352
90	91	1.33	-8.13	9.47	1.050
91	92	-10.45	7.55	-18.012	-1.735*
92	93	67.44	26.05	41.39	3.087***
93	94	16.87	-6.32	23.19	2.457***
94	95	-22.36	-8.63	-13.73	-1.744*
95	96	13.44	11.22	2.22	0.228
96	97	-60.64	-94.63	33.99	2.606***
97	98	43.13	-32.30	75.43	7.677***
98	99	-6.78	-9.63	2.85	0.318
99	00	-18.63	-38.04	19.40	2.151**
00	01	-15.90	-7.96	-7.94	-1.305
01	02	-33.68	-9.80	-23.87	-2.237**
02	03	14.28	3.03	11.25	1.512*
03	04	-29.98	-34.62	4.63	0.535
04	05	-47.68	-34.94	-12.73	-1.449
05	06	10.66	5.82	4.83	0.597

Note: \*, \*\* and \*\*\* indicate significant at 10%, 5% and 1% respectively

**Table 3:** CARs for loser, winner and arbitrage portfolios for 12-month formation period.

Month	Loser		Winner		Arbitrage	
	Mean Difference	t-value	Mean Difference	t-value	Mean Difference	t-value
1	2.89	1.722*	-0.57	-0.352	3.42	1.515*
2	6.15	1.917*	0.52	0.243	5.63	1.348*
3	3.17	0.953	-0.14	-0.052	3.31	0.929
4	2.85	0.848	-0.75	-0.305	3.61	1.251
5	0.037	0.010	-0.08	-1.029	3.12	0.935
6	-0.62	-0.169	-2.43	-0.856	1.80	0.527
7	1.88	0.045	-2.66	-0.851	4.55	1.188
8	0.82	0.178	-3.50	-1.236	4.33	1.157
9	1.20	0.217	-3.36	-1.071	4.56	1.031
10	-0.79	-0.137	-4.68	-1.319	3.88	0.827
11	0.77	0.114	-15.69	-1.676*	7.74	1.393*
12	-5.34	-0.754	-12.11	-2.004*	6.76	1.206

Note: \* indicates significant at 10% .

**Table 4:** Differences in CARs between loser and winner portfolios

Formation Period	Test Period	Mean CAR			
		Loser	Winner	Loser - Winner	t-value
87-88	89-90	33.14	6.09	27.09	1.957**
89-90	91-92	7.53	-27.82	20.29	1.761*
91-92	93-94	66.31	16.94	49.37	5.073***
93-94	95-96	1.10	-13.02	14.19	1.801*
95-96	97-98	-38.35	-57.22	18.87	1.993**
97-98	99-00	-37.49	-20.04	-17.45	-2.151**
99-00	01-02	-35.75	-14.31	-21.44	-2.430**
01-02	03-04	-15.76	-10.75	-5.00	-0.652
03-04	05-06	-38.51	-31.45	-7.06	-0.861

Notes : \*,\*\* and \*\*\* denotes significant at 10% , 5% and 1% respectively.

**Table 5:** CARs for Loser, Winner and Arbitrage Portfolios

Month	Loser		Winner		Arbitrage	
	Mean Difference	t-value	Mean Difference	t-value	Mean Difference	t-value
1	1.31	1.267	-1.97	-1.259	3.27	1.623*
2	2.06	1.030	-1.49	-0.677	3.57	1.327
3	-1.41	-0.373	-3.31	-1.168	1.90	0.532
4	-2.59	-0.500	-2.29	-0.966	-0.29	-0.88
5	-6.00	-0.750	-4.04	-1.076	-1.97	-0.312
6	-4.05	-0.594	-4.16	-1.104	0.12	0.020
7	-0.49	-0.068	-3.21	-0.779	2.72	0.494
8	-0.44	0.058	-0.80	-0.148	1.24	0.195
9	1.30	0.154	-2.65	-0.495	3.95	0.678
10	-0.42	-0.045	-2.20	-0.354	1.78	0.227
11	-2.50	-0.234	-1.74	-0.245	-0.76	-0.071
12	-6.36	-0.480	-5.00	-0.737	-1.37	-0.101
13	-7.19	-0.532	-6.75	-1.335	-0.44	-0.035
14	-0.66	-0.048	-8.16	-1.583*	7.50	0.721
15	-0.28	-0.022	-9.23	-1.717*	8.50	1.011
16	0.15	0.011	-5.74	-1.197	5.89	0.591
17	-2.38	-0.193	-8.91	-1.724*	6.53	0.745
18	-4.33	-0.360	-9.28	-1.839*	4.96	0.535
19	-3.79	-0.299	-11.83	-1.893*	8.04	1.046
20	-5.54	-0.425	-8.08	-1.339	2.54	0.241
21	-5.22	-0.359	-5.94	-0.906	0.72	0.060
22	-10.07	-0.674	-9.43	-1.691*	-0.64	-0.052

Month	Loser		Winner		Arbitrage	
	Mean Difference	t-value	Mean Difference	t-value	Mean Difference	t-value
23	-11.09	-0.670	-10.53	-1.964*	-0.56	-0.040
24	-19.86	-0.993	-13.13	-2.522**	-6.73	-0.374

Note: \*, and \*\* indicate significant at 10%, and 5% respectively

**Table 6:** Differences in CARs for 5-year portfolio formation

Formation Period	Test Period	Mean CAR			
		Loser	Winner	Loser - Winner	t-value
87-91	92-96	47.33	4.88	42.45	2.534***
92-96	97-01	-57.99	-93.48	35.49	2.117**
97-01	02-06	15.39	2.97	18.36	0.815

Notes : \*,\*\* and \*\*\* denotes significant at 10% , 5% and 1% respectively.

**Table 7: CARs** for 5-Year formation period

Month	Loser		Winner		Arbitrage	
	Mean Difference	t-value	Mean Difference	t-value	Mean Difference	t-value
1	3.24	0.912	0.35	0.306	2.89	1.008
6	-0.25	-0.046	-1.05	-0.247	0.80	0.180
12	-6.66	0-.337	-21.23	-0.901	14.57	1.809
18	19.12	0.625	-20.52	-0.798	39.64	3.406**
24	40.14	1.185	-13.69	-0.747	53.83	3.207*
30	19.15	0.785	-14.22	-0.893	33.37	2.460*
36	21.92	0.683	-13.45	-0.664	35.36	2.831*
42	1.29	0.047	-18.97	-0.860	20.26	1.888
48	-8.12	-0.258	-29.08	-0.956	20.96	2.256*
54	5.46	0.150	-28.07	-0.853	33.53	4.558**
60	0.86	0.026	-30.34	-0.994	31.20	4.389**

Note: \*, and \*\* indicate significant at 10%, and 5% respectively. Statistical significant is reduced due to smaller size.

**Table 8:** CARs for 12-month formation period with adjustment to size.

Month	Loser		Winner	
	Small	Large	Small	Large
1	4.40 (1.892*)	1.28 (0.961)	0.69 (0.331)	-1.74 (-1.100)
2	8.77 (2.230**)	3.50 (1.508*)	1.92 (0.682)	-1.69 (-0.690)

3	4.58 (1.060)	1.93 (0.736)	0.44 (0.116)	-3.28 (-1.005)
4	3.52 (0.842)	2.95 (1.086)	-0.73 (-0.192)	-4.50 (-1.227)
5	-0.04 (-0.009)	0.57 (0.184)	-3.03 (-0.714)	-8.56 (-1.659*)
6	0.06 (0.015)	-1.06 (-0.356)	-1.43 (-0.355)	-9.83 (-1.494*)
7	2.29 (0.462)	0.09 (0.028)	-0.46 (-0.108)	-11.68 (-1.437*)
8	2.64 (0.455)	-1.63 (-0.487)	0.79 (0.170)	-15.03 (-1.684*)
9	2.56 (0.402)	-1.31 (-0.362)	2.57 (0.504)	-17.23 (-1.857*)
10	-0.50 (-0.078)	-2.64 (-0.641)	4.35 (0.686)	-19.70 (-1.931*)
11	0.54 (0.067)	-0.57 (-0.124)	4.09 (0.511)	-22.84 (-1.992*)
12	-5.99 (-0.722)	-5.10 (-1.055)	-0.40 (-0.042)	-29.30 (-2.213**)

Note: \* and \*\* indicate significant at 10% and 5% respectively

**Table 9a:** CARs for 24-month FP of small firms.

Month	Loser		Winner		Arbitrage	
	Mean Difference	t-value	Mean Difference	t-value	Mean Difference	t-value
1	0.38	0.292	1.04	0.476	-0.65	-0.428
2	0.69	0.266	2.29	0.696	-1.59	-0.504
3	-1.63	-0.404	-0.34	-0.085	-1.28	-0.362
4	-1.54	-0.350	-1.07	-0.250	-0.46	-0.157
5	-2.86	-0.244	-3.07	-0.487	0.21	0.048
6	-2.15	-0.489	-1.02	-0.156	-1.12	-0.263
7	2.69	0.508	2.13	0.249	0.56	0.118
8	4.15	0.607	-0.58	-0.069	4.73	1.105
9	5.47	0.658	-0.74	-0.080	6.22	1.315
10	3.51	0.373	-2.47	-0.224	5.99	1.133
11	3.64	0.317	-3.53	-0.318	7.18	1.177
12	0.66	0.045	-11.65	-1.047	12.31	1.609*
13	0.65	0.048	-8.79	-0.793	9.44	1.386
14	6.52	0.448	-4.91	-0.441	11.43	1.568*
15	6.27	0.446	-6.02	-0.505	12.29	1.929*
16	7.78	0.534	-3.81	-0.333	11.59	1.785*
17	3.88	0.293	-6.95	-0.598	10.83	1.827*
18	2.13	0.166	-8.71	-0.773	10.85	1.572*
19	1.65	0.123	-7.29	-0.674	8.94	1.282
20	1.46	0.103	-7.36	-0.608	8.82	1.163
21	4.71	0.308	-5.34	-0.430	10.06	1.359
22	1.86	0.135	-10.03	-0.939	11.89	1.762*
23	2.60	0.202	-8.99	-0.850	11.58	1.923*
24	-2.25	-0.169	-14.12	-1.419*	11.87	1.693*

Note: \*, and \*\* indicate significant at 10%, and 5% respectively

**Table 9b:** CARs for 24-month FP of large firms.

	Loser	Winner	Arbitrage
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Month	Mean		Mean		Mean	
	Difference	t-value	Difference	t-value	Difference	t-value
1	3.75	1.857*	0.76	0.602	2.99	1.704*
2	2.21	0.642	2.32	1.030	-0.12	-0.054
3	-0.99	-0.216	2.49	0.785	-3.48	-0.986
4	2.16	0.458	1.13	0.455	1.03	0.257
5	2.60	0.421	-0.76	-0.258	3.37	0.682
6	4.88	0.945	-0.68	-0.221	5.55	1.093
7	7.87	1.188	-0.71	-0.233	8.58	1.360
8	2.27	1.168	-3.29	-1.012	10.57	2.001*
9	6.34	1.024	-3.88	-1.130	10.23	2.860**
10	8.34	0.915	-5.23	-1.393	13.58	2.137*
11	6.72	0.635	-9.40	-1.767*	16.12	2.400**
12	1.71	0.145	-14.91	-1.738*	16.62	2.611**
13	7.88	0.493	-14.33	-1.714*	22.21	1.991*
14	10.81	0.690	-12.18	-1.933*	22.99	1.902*
15	10.84	0.691	-12.74	-1.970*	23.58	2.004*
16	11.35	0.761	-12.94	-1.527	24.30	2.398**
17	7.53	0.523	-15.04	-1.761*	22.57	2.404**
18	7.41	0.541	-15.60	-1.916*	23.00	2.646**
19	10.37	0.715	-15.28	-1.933*	25.65	2.752**
20	7.38	0.580	-14.95	-2.148*	22.33	2.886**
21	6.35	0.522	-13.29	-1.942*	19.65	2.547**
22	6.09	0.515	-14.39	-2.213**	20.49	2.702**
23	9.05	0.822	-11.32	-2.233**	20.37	2.796**
24	2.90	0.231	-15.67	-2.486**	18.56	2.067*

Note: \*, and \*\* indicate significant at 10%, and 5% respectively

**Table 10a:** CARs for 60-month FP of large firms.

Month	Loser		Winner		Arbitrage	
	Mean Difference	t-value	Mean Difference	t-value	Mean Difference	t-value
1	1.98	0.491	-0.16	-0.201	2.15	0.568
12	-0.38	-0.403	-11.83	-0.914	11.44	0.761
18	20.69	0.986	-14.11	-0.877	34.80	1.728
21	34.83	1.442	-12.71	-0.833	47.55	2.772*
22	35.73	1.463	-14.52	-0.967	50.25	2.956*
23	27.62	1.919	-11.40	-0.944	39.01	4.086**
24	19.90	1.910	-16.08	-1.036	35.98	7.042**
25	17.98	1.858	-16.62	-1.207	34.60	8.362***
26	26.30	1.717	-15.76	-1.111	41.96	36.244***
27	20.18	1.371	-17.46	-1.114	37.64	13.552***
28	7.82	1.161	-16.47	-1.081	24.28	1.949*
36	-14.14	-0.994	-12.84	-1.056	-1.29	-0.78

Month	Loser		Winner		Arbitrage	
	Mean Difference	t-value	Mean Difference	t-value	Mean Difference	t-value
48	-38.75	-2.060*	-22.87	-1.039	-15.88	-0.558
60	-33.07	-6.509*	-23.80	-1.049	-9.27	-0.518

Note: \*, and \*\* indicate significant at 10%, and 5% respectively

**Table 10b:** CARs for 60-month FP of small firms.

Month	Loser		Winner		Arbitrage	
	Mean Difference	t-value	Mean Difference	t-value	Mean Difference	t-value
1	2.60	0.714	-2.21	-1.068	4.82	2.052*
12	-10.08	-0.387	-34.93	-1.319	24.85	1.624
18	15.47	0.401	-23.94	-0.761	39.42	2.250*
24	44.43	1.114	-7.01	-0.301	51.43	3.102*
30	21.26	0.718	-14.20	-0.675	35.48	2.814*
36	27.91	0.733	-18.70	-0.685	46.61	4.198**
42	12.81	0.425	-39.01	-1.909*	51.83	5.294**
54	18.44	0.439	-55.15	-1.617	73.59	6.237**
60	21.55	0.606	-52.80	-1.947*	75.96	9.385***

Note: \*, and \*\* indicate significant at 10%, and 5% respectively

11: Overreaction effect with adjustment to risk

Aggregate	Loser				Winner				Arbitrage	
	AR FP	AR TP	Beta FP	Change d in Beta fr. FP to TP	AR FP	AR TP	Beta FP	Change d in Beta fr. FP to TP	AR FP	AR TP
12-month	-5.07 (-12.408)** *	-0.11  (-0.233)	1.162  (19.470)* **	0.10  (1.953)* *	4.58  (14.484)* **	-0.41  (-1.044)	1.20  (27.118)** *	-0.12  (-1.389) *	-9.95 (-25.258)** *	0.35  (-0.088)
24-month	-8.815 (-12.291*** )	-2.75  (-3.282*** )	0.87  (19.190** )	0.21  (2.471** )	4.98  (12.209** )	-0.07  (-1.391)	0.92  (26.183*** )	-0.02  (-0.118) )	-13.79 (-23.908*** )	-2.40  (-1.850*)
60-month	-1.59 (-2.734)***	-0.36  (-0.610)	1.15  (1.969)**	0.21  (0.368)	1.27  (2.181)**	-0.35  (-0.601)	1.13  (1.942)**	-0.10  (-0.177)	-2.86  (4.926)***	0.00  (-0.027)