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Journal of Money, Investment and Banking
ISSN 1450-288X Issue 11 (2009)
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http://www.eurojournals.com/JMIB.htm

Stock Overreaction and Financial Bubbles: Evidence from Malaysia

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Abstract

This paper attempts to seek linkage between stock overreaction behaviour and financial bubbles in the Malaysian stock market. Monthly data over a period between January 1987 and December 2006 shows no clear evidence of stock overreaction behaviour in the market. However, when the study split the analysis into two sub-periods, evidence of stock overreaction behaviour becomes significant in the pre-crisis sub-period, but there is no significant evidence of financial bubbles in the same sub-period. During the post crisis, evidence of stock overreaction seems to diminish, and evidence of financial bubbles however, is observed in the period. This study believes that evidence of bubbles observed in the Malaysian stock market in the post crisis period is due to stock overreaction that took place in the market prior to the crisis.

Keywords: Stock overreaction, bubbles, Duration Dependence, mean reversion.
JEL Classification Codes: G14

1. Introduction

Overreaction phenomenon was first discovered by De Bondt and Thaler (1985). Stock overreaction behaviour can be defined as a tendency for stock returns to experience reversal, thus consistent with the mean reversion behaviour. According to Chen and Sauer (1997), the underlying reasoning and trading implications derived from the mean reversion and stock overreaction are identical although the former focuses on the market portfolio while the latter concentrates on the winner-loser effect. Both phenomena imply that information based on prior performance can be used to predict future performance. Stock prices may be temporarily swing away from their fundamental values but would revert back to their means over the long run.

A financial bubble on the other hand is defined as deviations in the stocks' price from the fundamental value. Stock price bubbles are produce as a result of long run up in prices. During the period of bubbles, the probability that the price will revert is very low. Theoretically, the longer the duration of price increases, the lower the probability that price will drop in the subsequent period, thus inconsistent with the mean reversion process. It seems that during the period of stock overreaction, there is very unlikely that stock price bubbles will build up. This is because for price bubbles to sustain, stock prices should overshoot their fundamentals value over a long period of time and the mis-valuation should be explosive. If prices revert in the following period, then it is not consistent with the bubbles theory.

Potential linkage between stock overreaction behaviour and financial bubbles have been raised by earlier studies such as Komáromi (2003), Dreman and Lufkin (2000), Bremer, Hiraki and Sweeney (1997) and Ohanian (1996). They conjecture that stock overreaction can be a major cause of financial bubbles. The objective of this paper is to investigate potential linkage between stock overreaction and bubbles. This paper is divided into 5 sections. Section 2 and 3 will proceed with methodology on stock overreaction and financial bubbles respectively. Section 4 continues with discussion on the findings while section 5 summarizes the paper.

2. Methodology: Stock Overreaction

The availability of data over a period of 20 years starting on January 1987 and ending on December 2006 provides 9 non-overlapping 24-month (two-year) portfolio formation (rank) periods, namely 1987-1988, 1989-1990, 1991-1992, 1993-1994, 1995-1996, 1997-1998, 1999-2000, 2001-2002, and 2003-2004, and the corresponding test periods, which are 1989-1990, 1991-1992, 1993-1994, 1995-1996, 1997-1998, 1999-2000, 2001-2002, 2003-2004 and 2005-2006. At the end of each rank period, all companies with a complete set of return for a particular rank period are identified. The number of qualified firms in the sample is expected to gradually increase due to increase of new listing during the sampling period.

The study follows the basic framework of De Bondt and Thaler (1985) to test for stock overreaction behaviour. The study calculates returns for stock listed on Bursa Malaysia by using the following formula:

$$R_{it} = [(\ln P_{it}) - (\ln P_{it-1})] * 100$$

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 return metric used here is the natural logarithmic of the stock monthly closing price obtained from *Datastream.* 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 then 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. At the end of the formation period, for example on 31 December 1988, cumulative abnormal returns (CAR_i) for every stock over the 24-month period starting January 1987 and ending December 1988 are then computed.

$$CAR_i = \sum_{t=1}^{24} AR_{it}$$

These stocks are then ranked based on their CARs 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). Arbitrage portfolio is formed by buying loser and selling winner portfolio. The winner, loser and arbitrage portfolios are then held for the next 24 months. In the subsequent test period, January 1989 to December 1990, the CARs of all stocks in the winner and loser portfolios are recomputed. For every test period at the interval of 1 and 24, 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, ... 9*), 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 nine-formation periods and their subsequent test periods. One sample t-test and independent sample t-test of mean difference of the two portfolios (portfolio winner and portfolio loser) were then applied to identify the difference in abnormal returns of these portfolios during the test period.

One sample t-test is used to examine whether the loser portfolio and the winner portfolio reverse their fortune in the subsequent test period. To achieve this goal, the average CAR across all test periods (z) for each of the portfolio in each month between $t = 1$ and $t = 24$ are calculated

$$ACAR_{p,t} = \frac{1}{z \sum_{z=1}^{z} CAR_{p,z,t}}$$

where p could be a winner (W) or loser (L). ACAR is tested to see if they are significantly different from zero. The first part of the analysis investigates whether stocks with poor (good) price performance over a two-year period, become relatively better (worse) performers over the following two-year period. Then, the study compare the test period abnormal returns between winner and loser portfolios to see if there any potential for exploiting these patterns through arbitrage of loser minus winner (i.e. contrarian strategy). The overreaction predicts that for $t > 0$, $ACAR_{W,t} < 0$ and $ACAR_{L,t} > 0$. Alternatively, the null hypothesis can be written as:

$H_0: [ACAR_{L,t} - ACAR_{W,t}] > 0.$

In order to examine the statistical significance of the difference between the loser and the winner portfolios, the study needs a pooled estimate of the population variance in *CARs*. As in De Bondt and Thaler (1985), the actual estimate is calculated as follows:

$$\sum^{z} \left[(CAR_{W,z,t} - ACAR_{W,t})^2 + \sum_{z=1}^{z} (CAR_{L,z,t} - ACAR_{L,t})^2 \right],$$

Where z is the number of the test period, which is 9. The t-statistic is therefore:

$$t_t = \frac{[ACAR_{L,t} - ACAR_{W,t}]}{\sqrt{(2S_t^2)z}}$$

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.

3. Methodology: Stock Price Bubbles

This study performs test for duration dependence on abnormal continuously compounded real monthly returns of KLCI. The monthly closing indexes, corresponding dividend yield and consumer price index are collected from the *Datastream*. Due to availability of data (dividend yield is only available in 1989 onwards); this study covers the period between January 1989 and December 2006.

The study calculates continuously compounded nominal returns of KLCI using the following formula:

$$r_t = (LnP_t - LnP_{t-1}) * 100 \quad (1)$$

Where r_t are the continuously compounded nominal returns in month *t*; P_t and P_{t-1} are price index in month *t* and *t-1* respectively. The study then calculates continuously compounded inflation rate as:

$$Inf_t = (LnCPI_t - LnCPI_{t-1}) * 100 \quad (2)$$

Where Inf_t is the inflation rate in month *t;* CPI_t and CPI_{t-1} are the consumer price index in month *t* of the current year and consumer price index in month *t* of the previous year. Next, real returns are computed by subtracting continuously compounded inflation from continuously compounded nominal returns such as:

$$R_t = (r_t - Inf_t) \quad (3)$$

Where R_t is the real return in month *t*. The sequence of abnormal returns is defined as the residuals from the regression of real returns on its first three lags and the dividend yield. This procedure is consistent to those of McQueen and Thorley (1994), Chan et.al (1998) and Jirasakuldech et. al (2006, 2007).

In order to perform the duration dependence test, returns must first be transformed into series of run lengths on positive and negative observed abnormal returns. For example, a return series of four positive abnormal returns followed by three negatives, two positives and finally four negatives abnormal returns is transformed into two data sets, namely, a set for runs of positive abnormal returns with values 4 and 2, and a set for runs of negative abnormal returns with values 3 and 4.

Formally, the data consists of a set S_T of *T* observations on the random run length, *I*. A run is defined as a sequence of abnormal returns of the same signs. Thus, *I* is a positive valued discrete random variable generated by some discrete density function, $f_i, \equiv Prob\ (I = i)$, and corresponding cumulative density function, $F_i \equiv Prob\ (I < i)$. Test of duration dependence are implemented by examining the hazard rate (h_i) for runs of positive and negative returns. According to McQueen and Thorley (1994), the hazard rate is defined as a probability of obtaining a negative innovation given a sequence of i prior positive innovations, h_i = Prob(ε_t<0 |ε_{t-1} >0, ε_{t-2} >0, ..., ..., ε_{t-i} <0). If bubble exists, we expect hazard rate to be decreasing in *i*, and if bubble exist in runs of positive returns, $h_{i+1} < h_i$ for all *i*. Since rational expectation bubbles cannot be negative, for run of negative returns, this condition does not hold. In general, speculative bubbles are likely to exist if there is a negative relationship between the probability of a run of positive returns ending, and the length of the run, or in other words, the presence of bubbles suggest negative duration dependence and a decreasing hazard rate in positive abnormal returns, but not in negative abnormal returns.

To operate test of duration dependence, a functional form must be chosen from the hazard function. The study uses the Log Logistic and Weibull Hazard Model as a hazard function.

3.1. Log logistic Hazard Model

The log logistic hazard model is defined as:

$$lnL(\alpha,\beta) = \sum_{i=1}^{N} \{J_i ln[g(t_i)] + (1 - J_i) ln[1 - G(t_i)]\} \quad (4)$$

where α is the shape parameter of the lognormal distribution, β is the duration elasticity of the hazard function, J_i is a duration of the process or time to exit from a state, g_i is the discrete function for duration, and G_i is the corresponding distribution function. The discrete density and distribution functions for duration are related as:

$$G(t_i) = \sum_{k=1}^{t_i} g(k) \tag{5}$$

However, if the law of conditional probability is applied, the density for completed duration is: $g(k) = h(k)\prod_{m=0}^{k-1}[1-h(m)]$ (6)

In addition, McQueen and Thorley (1994) used the logistic distribution function Ψ evaluated at a linear transformation of log duration as:

$$h(k) = \Psi[\alpha + \beta\,(k)] = \{1 + \exp[-\alpha - \beta \ln(k)]\}^{-1} \tag{7}$$

Define N_i as the count of completed runs of length i in the sample. The density function of the log likelihood is:

$$L(\theta|S_T) = \sum_{i}^{\infty} N_i \ln(1 - F_i) \tag{8}$$

where θ is a vector parameters. The hazard function $h_i \equiv Prob\ (\ I = i \mid I > i\ )$, represents the probability that a run ends at i, given that it lasts at least until i. A hazard function specification describes data in terms of conditional probabilities in contrast to the density function specification, which focuses on unconditional probabilities. With regard to this study, the hazard is appropriate since it questions whether the probability that run continues depends on the length of the run. The hazard function is related to the density function by:

$$h_i = \left({f_i}/{(1-F_i)}\right) and\ f_i = h_i \prod_{j=1}^{i-1}(1 - h_i) \tag{9}$$

The hazard function version of the log likelihood is:

$$L(\theta|S_T) = \sum_{i}^{\infty} N_i \ln h_i + M_i \ln(1 - h_i) + Q_i \ln(1 - h_i) \tag{10}$$

where M_i and Q_i is the count of completed and partial runs with a length greater than i, respectively. To test the null hypothesis of no rational bubbles, a functional form of the hazard function is first defined as:

$$h_i = \frac{1}{1 + e^{-(\alpha + \beta \ln i)}} \tag{11}$$

The duration dependence test is performed by substituting equation (11) into (10) and maximizing the log likelihood function with respect to α and β. The null hypothesis of no rational bubbles implies that the probability of a positive run's ending is unrelated to prior runs, or the hazard rate should be constant *(H_0: $\beta=0$)*. The alternative hypothesis of a bubbles suggests that the probability of a positive run's ending should decrease with the length of the run, or a decreasing hazard rate *(H_1: $\beta<0$)*. According to McQueen and Thorley (1994), an estimate of β that is negative and significantly different from zero for positive runs, in conjunction with an insignificant estimate of β for negative runs, is considered evidenced of speculative bubbles. The likelihood ratio test (LRT) is asymptotically distributed χ^2 with one degree of freedom.

3.2. Weibull Hazard Model

The Weibull hazard model is defined as:

$$S(t) = \exp(-\alpha t^{b\tau+1})$$

Where $S(t)$ is the probability of survival in a state to at least time *(t)*. The corresponding hazard function is:

$$h_t = \alpha(\beta + 1)t^{\beta}$$

where α is the shape parameter of the Weibull distribution, and β is the duration elasticity of the hazard function. The fundamental assumption of the Weibull hazard model is a linear relationship between the log of the hazard function and the log of duration where:

$$ln[h(t)] = ln[\alpha(\beta + 1)] = \beta ln(t)$$

The Weibull hazard function will exhibit positive (negative) duration dependence if β is positive (negative). In the absence of rational bubbles, factor stock prices should demonstrate a random walk with no evidence of duration dependence. Negative duration dependence in positive runs would suggest the presence of rational speculative bubbles.

4. Findings
4.1. Stock Overreaction

Tables 1 and 2 summarize the results of one-sample test for stock overreaction behaviour before and after 1997 Asian Financial Crisis respectively. Table 1 shows that arbitrage portfolio of selling winner and buying loser earns significant abnormal returns from month 3 through month 7 of the test period. The results suggest that Malaysian Stock Market overreacts prior to 1997 Asian Financial Crisis. This result is in agreement to those reported by Ahmad and Hussain (2001) and Lai et al (2003). Ahmad and Hussain (2001) find evidence of stock overreaction behaviour in the Malaysian Stock Market for the period of 1986-1996. The same findings are also reported by Lai et al (2003) for the same market over the period between January 1987 and December 1999.

Table 1: Long run stock overreaction Pre-1997 Asian Financial

Month	Loser		Winner		Arbitrage	
	Mean Difference	t-value	Mean Difference	t-value	Mean Difference	t-value
1	1.67	0.925	-2.06	-0.781	3.74	1.092
2	5.90	2.365 *	0.21	0.062	5.69	1.344
3	6.56	2.311*	-0.85	-0.212	7.41	1.770*
4	6.92	1.404	1.49	0.444	5.43	1.976*
5	8.03	1.026	-0.09	-0.15	8.12	1.836*
6	5.78	1.193	-0.64	-0.107	6.41	1.710*
7	9.35	1.528	0.81	0.141	8.54	3.087**
8	10.72	1.389	5.83	0.771	4.90	0.571
9	12.68	1.263	3.39	0.465	9.29	1.084
10	11.38	0.912	4.73	0.536	6.65	0.525
11	9.37	0.608	5.79	0.557	3.58	0.191
12	5.90	0.282	3.02	0.311	2.89	0.120
13	5.38	0.256	-0.44	-0.065	5.82	0.288
14	13.02	0.612	-3.14	-0.409	16.15	1.089
15	9.56	0.451	-5.75	-0.634	15.20	1.194
16	7.11	0.310	-1.29	-0.618	8.40	0.487
17	4.63	0.215	-4.88	-0.569	9.51	0.639
18	4.49	0.217	-4.79	-0.571	9.28	0.592
19	5.78	0.266	-9.41	-0.838	15.20	1.354
20	8.38	0.399	-0.70	-0.075	9.07	0.530
21	14.19	0.671	3.36	0.353	10.83	0.598
22	11.47	0.600	-0.58	-0.076	12.05	0.810
23	15.98	0.995	-2.54	-0.339	18.52	1.868*
24	10.56	0.578	-6.12	-0.774	16.70	1.325

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

After 1997 Asian Financial Crisis, evidence of stock overreaction behaviour as described in Table 1 seems to diminish. As shown in Table 2, loser portfolio exhibits continuation behaviour whereas winner portfolio displays reversal behaviour. Furthermore, arbitrage strategy does not provide any potential abnormal returns as reported by column three of Table 2. The absent of the reversal behaviour after the crisis could be due to the reason that investors are more aware of the overreaction phenomenon and have altered their trading strategy. Another explanation may be the possible reduction of noise trader during the crisis period. De Long et. al (1990) argue that in the presence of noise trader, rational speculation can be destabilizing.

Table 2: Long run stock overreaction Post 1997 Asian Financial

Month	Loser		Winner		Arbitrage	
	Mean Difference	**t-value**	**Mean Difference**	**t-value**	**Mean Difference**	**t-value**
1	0.33	0.319	-2.85	-1.430	3.18	1.065
2	-2.44	-3.429*	-5.32	-1.957*	2.88	0.862
3	-9.48	-2.180*	-8.82	-2.027*	-0.67	-1.793
4	-15.04	-1.806	-6.68	-4.226**	-8.36	-1.212
5	-25.36	-1.844	-7.24	-1.715	-18.12	-1.301
6	-22.17	-1.466	-6.91	-1.400	-15.25	-1.112
7	-18.89	-1.198	-6.48	-8.850	-12.41	-1.007
8	-18.09	-1.217	-7.85	-0.913	-10.25	-0.946
9	-18.16	-1.236	-10.89	-1.101	-7.27	-0.883
10	-19.66	-1.294	-10.36	-0.970	-9.30	-0.908
11	-21.87	-1.318	-10.79	-0.920	-11.07	-0.905
12	-26.24	-1.457	-15.45	-1.453	-10.80	-0.720
13	-27.76	-1.445	-13.74	1.552	-14.01	-0.748
14	-25.53	-1.419	-14.32	-1.644	-11.22	-0.648
15	-21.26	-1.477	-14.27	-2.040*	-6.98	-0.508
16	-14.48	-1.143	-11.68	-1.832	-2.80	-0.249
17	-15.88	-1.329	-14.19	-2.104*	-1.70	-0.151
18	-18.12	-1.550	-15.47	-2.703*	-2.65	-0.208
19	-20.33	-1.706	-16.37	-2.860*	-3.96	-0.300
20	-26.94	-2.020	-19.49	-3.289*	-7.45	-0.695
21	-33.78	-1.947	-20.13	-3.225*	-13.65	-0.636
22	-41.51	-1.764	-21.59	-3.949*	-19.23	-0.705
23	-51.33	-1.645	-21.33	-3.514*	-30.00	-0.818
24	-64.69	-1.499	-22.51	-4.615**	-42.18	-0.887

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

4.2. Duration dependence test

4.2.1. Log logistic hazard model

The log logistic test results for the full sample period and the two sub-periods namely pre- 1997 Asian Financial Crisis and post 1997 Asian Financial Crisis are reported in Tables 3, 4 and 5 respectively. For the full sample period, this study documents a total of 106 runs comprising of 53 runs for positive and 53 runs for negative abnormal returns. Meanwhile, for the pre crisis period, there are 29 runs of positive abnormal returns and 29 runs of negative abnormal returns which make-up a total of 58 runs. During the post Asian Financial Crisis, the study reports a total of 48 runs with 24 runs of positive and negative abnormal returns. The longest positive runs last 8 months and occurring in the post 1997 Asian Financial Crisis. Relative to the positive runs of abnormal returns, the negative runs tend to have shorter lives with the longest run lasting only 6 months.

Note that one characteristic of a rational speculative bubbles is that the hazard rate should be a declining function of the length of positive runs or else, a bubble cannot be sustained. Tables 3, 4 and 5 also report the sample hazard rates, $h_i = \frac{N_i}{(M_i + N_i)}$ which estimate the probability that a run ends at *i* given that it lasts until *i*. Under the null hypothesis, the hazard rates should be constant or $\beta = 0$.

Table 3: Test of duration dependence for the full sample period.

Run length	**Positive runs**		**Negative runs**	
	Actual run counts	**Sample Hazard Rate**	**Actual run counts**	**Sample Hazard Rate**
1	29	0.5472	25	0.4717
2	12	0.5000	16	0.5714
3	3	0.2500	7	0.5833
4	5	0.5556	1	0.2000
5	1	0.2500	1	0.2500
6	1	0.3333	3	1.0000
7	1	0.5000	0	0.0000
8	1	1.0000	0	0.0000
TOTAL	**53**		**53**	
α		-0.506		-0.420
β		0.112		0.029
LRT of H_0: β = 0		2.51*		0.13
(p-value)		(0.1129)		(0.7227)

Note: * indicates significant at 10% significant level

For the full sample period, the actual hazard rates tend to decrease with run length for positive abnormal returns in the first 2 months. Table 3 shows that there is a 54.72% probability that positive abnormal returns lasting for 1 month will reverts to a negative abnormal returns in the next month, whereas there are 50% and 25% probability that positive abnormal returns lasting for 2 months and 3 months will reverse in the subsequent period respectively. This declining pattern suggests the presence of rational speculative bubbles in the associated security prices. However for runs of negative abnormal returns, there is no obvious pattern of increasing or decreasing in hazard rates that is consistent with rational speculative bubbles.

In addition to that, Table 3 reports the maximum likelihood estimates of the log logistic function parameters α and β for full sample period as well as the pre- and post Asian Financial Crisis sub-periods. As shown in Table 3, positive runs of abnormal returns exhibit positive β coefficient (β = 0.112). Positive β coefficient for the positive runs suggests positive duration dependence which is not consistent with the rational bubbles. The likelihood ratio test (LRT) of the null hypothesis of no duration dependence or constant hazard rate is rejected at the 10% significant level with the LRT of 2.51. This result is consistent to those reported earlier by Chan et. al (1998) that Malaysia stock markets is not subject to rational speculative bubbles. Also notes that rational speculative bubbles cannot occur in runs of negative abnormal returns. As a result, this study does not find any evidence of rational bubbles in the negative abnormal returns for the full sample period of January 1989 to December 2006. This study fails to reject the null hypothesis of constant hazard rate or the no bubble hypothesis of β = 0 at traditional significant levels for the full sample period.

Table 4: Test of duration dependence for the pre 1997 Asian Financial Crisis

Run length	Positive runs		Negative runs	
	Actual run counts	Sample Hazard Rate	Actual run counts	Sample Hazard Rate
1	20	0.6897	11	0.3793
2	7	0.7778	10	0.5556
3	1	0.5000	4	0.5000
4	1	1.0000	1	0.2500
5	0	0.0000	1	0.3333
6	0	0.0000	2	1.0000
TOTAL	**29**		**29**	
α		-0.548		-0.406
β		0.616		-0.089
LRT of H0: β = 0		9.19***		0.52
(p-value)		(0.0024)		(0.4722)

Note: *** indicates significant at 1% significant level

Meanwhile, the results of pre-1997 Asian Financial Crisis convey similar information to those of the full sample period. Table 4 shows that the study fails to reject the null hypothesis of no bubbles during the pre-crisis era. The β coefficient during the sub-period is positive (β = 0.616) and the LRT of 9.19 is significant at 1% level. For the negative runs, the study reports similar results to those of full sample period. The null hypothesis of no bubbles cannot be rejected at traditional significant level during the pre-Asian Financial Crisis. Unlike the hazard rate of the entire period, the hazard rate of pre-crisis sub-period shows no distinguishable increasing or decreasing pattern for positive run of abnormal returns. This pattern is therefore not consistent with rational speculative bubbles. A similar finding is also observed for the runs of negative abnormal returns.

The significantly positive β found in positive runs of abnormal returns for the full sample period and the pre-crisis sub-period indicate that as the length of the sequence of positive abnormal returns increases, the probability that the positive runs will end increases. This pattern is not consistent with rational speculative bubbles; instead, it is in line with the mean reversion process. According to Jirasakuldech et. al (2006), these findings suggest that a mean reversion process tend to characterize the return distribution during those period and sub-period.

Table 5 presents results of log logistic hazard model for the post 1997 Asian Financial Crisis. Results of sample hazard rates for post crisis sub-period demonstrates declining pattern that is consistent with evidence of rational speculative bubbles. Table 5 shows that the probability that positive abnormal returns lasting for 1, 2, and 3 months before it's revert to negative abnormal returns in the next period are 37.5%, 33.3% and 20% respectively. In other word, for the 15 runs that last at least 2 months, 2 runs or 20% end in month 3. Meanwhile, the hazard rates for negative runs are relatively constant thus consistent with rational speculative bubbles. Table 5 also reports maximum likelihood estimates of the log logistic function parameters for the post crisis era. The study reports a negative β coefficient of β = -0.094. The result however is not significant. The negative β found in positive abnormal returns sequence implies that the probability that the positive runs will end decreases as the length of the run increases, which is consistent with rational speculative bubbles. Furthermore, the negative runs of abnormal returns fail to reject the null hypothesis of no bubble at traditional level. As suggested by McQueen and Thorley (1994), an estimate of significantly negative β for positive runs, in conjunction with an insignificant estimate of β for negative runs is evidence of speculative bubbles.

Table 5: Test of duration dependence for the post 1997 Asian Financial Crisis.

Run length	Positive runs		Negative runs	
	Actual run counts	Sample Hazard Rate	Actual run counts	Sample Hazard Rate
1	9	0.3750	14	0.5833
2	5	0.3333	6	0.6000
3	2	0.2000	3	0.7500
4	4	0.5000	0	0.0000
5	1	0.2500	0	0.0000
6	1	0.3333	1	1.0000
7	1	0.5000	0	0.0000
8	1	1.0000	0	0.0000
TOTAL	24		24	
α		0.131		-0.140
β		-0.027		0.018
LRT of H0: β = 0		1.79		0.45
(p-value)		(0.1812)		(0.5035)

Note: * indicates significant at 10% significant level

4.2.2. Weibull hazard model

Besides log logistic hazard model, this study also employs the Weibull hazard model as a hazard function for duration dependence test. Results of Weibull model are presented in Table 6 for positive and negative runs for full sample period as well as pre- and post 1997 Asian financial Crisis sub-periods. These findings are consistent with those of log logistic hazard model. For the full sample period, the study shows that the β coefficient or the estimated duration elasticity is positive, but it is not significantly different from zero (LRT = 1.27, β = 0.074) at traditional level for both positive and negative runs. However, for the pre-crisis sub-period, the estimated duration elasticity, β is positive and significantly different from zero at 1% level for the positive runs.

For the negative runs, the β coefficient is negative (β = -0.149) and significant at 10% level. According to Chan et. al (1998, page 136), rational speculative bubbles cannot be negative, thus, the evidence of negative duration dependence in the negative runs of abnormal returns during the pre-crisis sub-period "must be driven by chance or some other deviation from other independent returns such as fads, but not by rational bubbles". Meanwhile, for the post crisis sub-period, results of Weibull hazard model also convey similar information to those of log logistic hazard model. The β coefficient or duration elasticity is found to be negative (β = -0.026) and significant at 10% level for the positive runs. For negative runs, the results is not significant thus consistent with rational speculative bubbles.

Table 6: Results of Weibull hazard model

	Positive runs			Negative runs		
	α	β	LRT (p-value)	α	β	LRT (p-value)
Full sample	0.705	0.074	1.27 (0.2590)	0.719	0.020	0.11 (0.7380)
Pre-crisis	0.672	0.598	10.88*** (0.0010)	0.748	-0.149	2.22* (0.1365)
Post crisis	0.159	-0.026	2.73* (0.0983)	0.167	0.031	1.70 (0.1922)

Note: * and *** indicates significant at 10% and 1% significant level

Both results of log logistic hazard model and Weibull hazard model demonstrates that rational speculative bubble does not exist before the 1997 Asian Financial Crisis sub-period. However, after the crisis sub-period, the β coefficient is found to be significantly negative, thus, suggest the presence of rational speculative bubbles during the post crisis sub-period. Notes that β coefficient is initially positive in the pre-crisis sub-period and become negative in the post crisis era as abnormal returns increases. This implies that the hazard rates are getting smaller and thus, giving more time for the market to further pushes the abnormal returns during the recovery period which later resulted in rational bubbles.

4.3. Potential linkage between stock overreaction and stock price bubbles

As mentioned earlier, a number of studies such as Komáromi (2003), Dreman and Lufkin (2000), Bremer et. al (1997) and Ohanian (1996) conjecture that stock overreaction is a major cause of stock price bubbles, thus suggest a potential linkage between stock overreaction and stock price bubbles. Table 7 summarizes results of long-run overreaction and stock price bubbles analysed earlier.

Table 7: Summary results of stock overreaction and rational bubbles

	Stock Overreaction	**Rational Bubbles**	
	2-year period	**Log Logistic Hazard model**	**Weibull Hazard model**
Full Sample	No evidence of overreaction	No evidence of price bubbles. Positive β coefficient	
Pre-Crisis	Significant evidence of overreaction	No evidence of price bubbles. Positive β coefficient	
Post Crisis	No evidence of overreaction	Significant evidence of price bubbles. Negative β coefficient	

Jirasakuldech et. al (2006) assert that evidence of rational speculative bubbles represented by significant positive β in positive runs of abnormal returns for full sample period and pre-crisis sub-period suggest that a mean reversion process tend to characterize the return distribution during those periods. Positive β in the positive runs of abnormal returns implies that as the length of the positive run increase, the probability that the run ends is also increases, thus warn price reversal behaviour in the subsequent period, which is coherent with the mean reversion process.

This finding therefore supports the earlier conclusion of stock overreaction behaviour where Malaysian stock market is found to overreact during the pre-crisis. As stated by Chen and Sauer (1997) and Brailsford (1992), stock overreaction is in agreement with the mean reversion process, where reversal behaviour is expected to take place in the next period. Therefore, as anticipated by this study, during the period where stock overreaction is present, there is very unlikely that stock price bubbles to emerge. This is because, for price bubbles to sustain, the positive run of abnormal return should exhibit continuation behaviour instead of reversal behaviour.

After the crisis sub-period, this study documents evidence suggesting the existence of rational speculative bubbles in the market. During the same period, this study shows no evidence of stock overreaction behaviour existed in the market. This finding indicates that during the post crisis sub-period, Malaysian stock market does not follow the mean reversion process. This is supported by negative β documented by the study during the period, which indicates that the probability that positive runs end as the length of the positive runs increase is declining. In light of past studies mentioned above, stock overreaction behaviour observed in the pre-crisis period may become one of the factors that cause the existence rational speculative bubbles in Malaysian stock market during the post crisis. A possible reason is, stocks that have overreact may not returns to its mean in the subsequent period. They may have reversed, but they do not come back to their mean before they overreact again. If this scenario prolongs and if the deviation is ‘wide’ enough, financial bubbles may be created in the subsequent period.

5. Summary and Conclusion

This study attempts to seek linkage between stock overreaction behaviour and financial bubbles in the Malaysian stock market. The study uses the basic framework of De Bondt and Thaler (1985) to test for stock overreaction. Duration dependence test is used to investigate evidence of bubbles. Monthly data over a period between January 1987 and December 2006 shows no clear evidence of stock overreaction behaviour in the market. However, when the study split the analysis into two sub-periods namely pre-1997 Asian Financial Crisis and post 1997 Asian Financial Crisis, evidence of stock overreaction behaviour becomes significant in the pre-crisis sub-period. During the post crisis sub-period, evidence of overreaction hypothesis seems to diminish. Results of the Duration dependence show no significant evidence that support the presence of rational speculative in Malaysian stock market in the pre-1997 Asian Financial Crisis. The significantly positive beta coefficient documented by the study is consistent with the mean reversion process, which indicates that the probability the positive abnormal returns will end is increasing with the length of the run, which is contradictory to the rational bubbles theory but consistent with the stock overreaction behaviour. During the post crisis, evidence of stock overreaction documented in the previous period seems to diminish, and evidence of bubbles becomes significant. Komáromi (2003), Dreman and Lufkin (2000), Bremer et. al (1997) and Ohanian (1996) suggest that stock overreaction is evidence of bubbles, or put it in another word, stock overreaction effect is the cause of financial bubbles. In light of that, this study believes that evidence of bubbles observed in the Malaysian stock market in the post crisis period is due to stock overreaction that took place in the market prior to the crisis. However, further study need to be done to explore the properties of stock overreaction in the pre-crisis period to determine whether it is the cause of financial bubbles.

References

[1] Ahmad, Z. and Hussain, S. (2001). KLSE long-run overreaction and the Chinese New Year effect. *Journal of Business, Finance and Accounting*, 28(1) & 2, 63-112.

[2] Brailsford (1992). "A Test for the Winner-Loser Anomaly in the Australian Equity Market: 1958-87". *Journal of Business, Finance and Accounting,* 19(2), 225-241.

[3] Bremer, M., Hiraki, T. and Sweeney, R.J. (1997). Predictable patterns after large stock price changes on the Tokyo Stock Exchange. *Journal of Financial and Quantitative analysis,* 345-365.

[4] Chan, K., Mc Queen, G. and Thorley, S. (1998). Are there rational speculative bubbles in Asian stock markets?. *Pacific-Basin Finance Journal*, 125-151.

[5] Chen, C.R. and Sauer, D.A. (1997). Is stock market overreaction persistent over time? *Journal of Business, Finance and Accounting*, 51-66.

[6] De Bondt, W.F.M. and Thaler, R.H. (1985). Does the stock market overreact? *Journal of Finance,* 793-805.

[7] De Long, J.B., Shleifer, A., Summers, L.H. and Waldmann, R.J. (1990). Positive feedback investment strategies and destabilizing rational speculation. *The Journal of Finance,* vol XIV. No. 2, 379-395.

[8] Dreman, D.N and Lufkin (2000). Investor overreaction: Evidence that its basis is psychology. *Journal of Psychology and Financial Market*, 61 -75.

[9] Jirasakuldech, B., Campbell, R. and Knight, J.R. (2006). Are there rational speculative bubbles in REITs? *J Real Estate Econ*, 32:105-127.

[10] Jirasakuldech, B., Emekter, R. and Rao, R.P. (2007). Do Thai stock prices deviate from fundamental values? *Pacific-Basin Finance Journal*, xx (2007) xx-xxx.

[11] Komáromi, G. (2003). Was there a stock market bubble in Hungary? Working paper presented at the conference on 'Institutional and Policy Diversity-Its role in Economic Development', Debreen, Hungary, 3-5 November 2003.

[12] Lai, M.M., Guru, B.K., and Fauzias, M.N., (2003). Do Malaysian investors overreact? *Journal of American Academy of Business,* 602.

[13] McQueen, G. and Thorley, S. (1994). Bubbles, stock returns and duration dependence. *Journal of Financial and Quantitative Analysis.* 29:379-401.

[14] Ohanian, L.E. (1996). When the bubble burst: Psychology or Fundamentals. Business Review-Federal Bank of Philadelphia, 3.