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MOMENTUM IN SECURITY RETURNS AND INVESTOR BEHAVIOR: EVIDENCE FROM SRI LANKA

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Abstract

This paper examines the validity of the behavioral explanations of the momentum effect. Although, the momentum effect seems to be captured by the risk based asset pricing models, there are behavioral explanations given for the existence of the momentum effect. Barberis, Shleifer and Vishny (BSV) (1998) and Daniel, Hirshleifer and Subrahmanyam (DHS) (1998) are the two most logical behavioral explanations for the existence of the momentum effect. However, it is difficult to reach any conclusion regarding the validity of theses behavioral explanations without testing them in real markets. This study introduces an event based method to test empirical validity of the behavioral explanations of the momentum effect. By applying the event based method in the Colombo Stock Exchange over the period from 2005 to 2013, it is found that investors' conservative behavior suggested by BSV (1998) seems to be contributed to the momentum effect in the Colombo Stock Exchange. However, overreaction hypothesis of DHS (1998) has been rejected.

Keywords: Biased self-attribution, Conservatism bias, Momentum effect, Overconfidence,

INTRODUCTION

The momentum effect is one of the major anomalies in asset pricing literature. As Jegadeesh and Titman (1993) have documented the momentum strategies that are based on buying the securities that have performed relatively well (winners) in the recent past and selling securities that have performed relatively poor in the recent past (losers) realize positive returns over medium term horizons. Although, capital asset pricing model (CAPM) of Sharpe (1964), Lintner (1965) and Black (1972) has failed to capture the momentum effect in security returns, the four factor model of Carhart (1997) has worked better than other asset pricing models in explaining the momentum effect. On the other hand, Barberis and Thaler (2003) have argued that investors are irrational and often influenced by psychological biases when making decisions. As the theory of bounded rationality of Simon (1955) has explained, the limited calculating power and the complexity of decision problems prevent investors to be fully rational in decision making. Therefore, investors tend to rely on several biases such as overconfidence, representativeness, conservatism, biased self-attribution in decision making (see Tversky and Kahneman, 1974). Consequently, researchers such as Grinblatt and Han (2005), Barberis, Shleifer and Vishny (BSV, henceforth) (1998), Daniel, Hirshleifer and Subrahmanyam (DHS, henceforth) (1998), and Hong and Stein (1999) provided different explanations for the existence of the momentum effect based on the cognitive biases in the way that investors interpret information. As

Fama (1998), and Subrahmanyam (2007) discussed, that BSV (1998) and DHS (1998) are the two most widely debated behavioral explanations given for the momentum effect. However, empirical validity of these behavioral explanations is not satisfactory. Although a few researchers have tested different aspects of the behavioral explanations of the momentum effect, it is hardly found any standard method to test them in real markets, (see Bloomfield and Hales, 2002; Chan, Frankel and Kothari, 2004; Doukas and McKnight, 2005; Chaung and Lee, 2006; Kausar and Taffler, 2005). Hence, two most logical behavioral explanations of the momentum effect remain as preliminary conjectures without an empirical validation. Whether these behavioral explanations of the momentum effect are observable in the real market is a question. Therefore, this study develops an event based method to test the validity of theses behavioral explanations in a real market.

The remainder of the paper is organized as follows. Section 2 discusses the theoretical framework and hypotheses of the study. Section 3 describes the event based method as the methodology used in testing the validity of the behavioral explanations of BSV(1998) and DHS (1998) in the CSE. Section 4 presents the empirical results, section 5 discuses the findings and section 6 concludes the paper.

HYPOTHESES OF THE STUDY

As BSV (1998) the momentum effect is generated from the market underreaction resulting from investor conservative behavior. In underreaction news incorporated slowly into prices, which tend to exhibit positive autocorrelations. Therefore, the average return on the company's stock in the period following an announcement of good news is higher than the average return in the period following bad news. Conservative behavior is the tendency of the investors to be slow in changing their beliefs in the presence of new information, (see Edwards, 1968). Therefore, as BSV (1998) if momentum effect is occurred from market underreaction resulting from investors' conservative behavior, following hypothesis is expected to be supported in a momentum market when tested using the winners.

H_1: Returns on a good event with low expectations are higher than on a bad event with low expectations

Similarly following hypothesis is expected to be supported in a momentum market when tested using the losers.

H_2: Returns on good event with high expectations are smaller than on a bad event with high expectations

In DHS (1998), the momentum effect is generated from market overreaction and its continuation resulting from investors' overconfidence augmented by biased self attribution behavior. As DHS (1998) have explained, the overconfidence implies strong belief of investors in their own private information, which leads to overreaction. The biased self attribution is the tendency of investors attributing success to their competence and failures to bad luck (see Bem, 1965). Therefore, the events that confirm an individual's prior beliefs tend to boost their confidence too much and disconfirming events are given less attention and weaken confidence too little. As DHS (1998) have explained, 'if investor confidence changes because of biased self-attribution and if overreaction or correction is sufficiently gradual, then security price changes exhibit momentum', (see DHS, 1998, pp. 1847). Therefore, in line with the explanation of

DHS (1998), following hypothesis is expected to be supported in a momentum market when tested using the winners.

H_4: Returns on good event with high expectations are higher than on a bad event with high expectations

Similarly, following hypothesis is expected to be supported in a momentum market when tested using losers.

H_5: Returns on a good event with low expectations are smaller than on a bad event with low expectations.

In next section, the procedure of testing the hypotheses using the event based method is explained.

The Event Based Method

Event based method is developed by adopting the standard event study methodology. Event based method follows three steps. At the first step, analysis period, recent past winners and resent past losers are identified based on the most significant momentum strategy. Winners and losers have identified based on the 12-month formation and 6-month holding strategy which is the most significant momentum strategy as identified by Anuradha and Nimal (2014) in the CSE. Consequently, 360 trading days (TD) have been used as the analysis period while assuming 20 TD per month. Winners are the securities with highest average returns over past 12-month period. Losers are the securities with lowest average returns over past 12-month period.

At the next step, winners with low expectations with good events (W_L_G), winners with low expectations with bad events(W_L_B), losers with high expectations with good events(L_H_G), losers with high expectations with bad events(L_H_B), winners with high expectations with good events (W_H_G), winners with high expectations with bad events (W_H_B), losers with low expectations with good events (L_L_G) and losers with low expectations with bad events (L_L_B) are identified to test the hypotheses. As per the work of Latane and Jones (1979) quarterly standard unexpected earnings (SUE) of winners and losers are used as the event of the analysis. Based on the sign of the resulting SUE, the good and bad events are identified in testing the hypotheses. Earnings expectations of winners and losers are measured by taking the difference between actual quarterly earnings and the expected quarterly earnings. If expected quarterly earnings are higher than the actual quarterly earnings in a quarter, it identified as higher earnings expectations while if it is lower than the actual it is a lower earnings expectation. Consistent with Foster, Olsen and Shevlin (1984) expected earnings of the winners and losers for each quarter t are estimated relative to the same quarter t-4, a quantity denoted as QE_t-QE_{t-4}. It does so by relating this growth to the growth during the most recent quarter, (t-1) relative to the comparable quarter one year before, (t-5) denoted as QE_{t-1}-QE_{t-5} which is shown Equation 1.

$$QE_t - QE_{t-4} = a(QE_{t-1} - QE_{t-5}) + b + e_t \quad (1)$$

Where, *a* and *b* in Equation 1 are the constants and e_t is the random error term. The constant are estimated using the most recent 20 quarterly earnings of the winners and losers prior to *t*. The estimated constant *a* and *b* of the Equation 1 are used in Equation 2, in estimating quarterly earnings for the forthcoming quarter.

$$EQ_t = EQ_{t-4} + a(EQ_{t-1} - EQ_{t-5}) + b + e_q \quad (2)$$

Thus, starting from the second quarter of 2010 to the third quarter of 2012 the expected earnings of the winners and losers are estimated using Equation 1 and 2. First quarterly earnings are estimated for the third quarter of 2010, using the quarterly earnings from the third quarter of 2005 to the second quarter of 2010. Following Latane and Jones (1979), the quarterly standard unexpected earnings (SUE) is computed using Equation 3.

$$SUE = \frac{\text{Un expected earnings per share for quarter t}}{\text{SE}} \quad (3)$$

Where, SE is the standard error of estimate for the estimating regression in Equation 2.

As illustrated in Figure 1, the period of analysis includes an estimation period, lag period and testing period. Since, the event is based on the announcements of quarterly earnings of the listed companies in the CSE, the announcement date is the event date. Complying with listing requirement of the CSE, listed companies required to submit its interim financial statements to the CSE within 45 days after the end of each quarter for the purpose of public release. Because of this eventuality a lag period of 45 TD is used at the end of each quarter before testing period. Test parameters of the model is applied to generate expected returns in the testing period are estimated using the data of the estimation period. Complying with Fernando and Guneratne (2009) and others, the Capital Asset Pricing Model (CAPM) of Sharpe (1964), Lintner (1965) and Black (1972) is used to generate the expected returns.

Finally, returns incurred on the event are computed over the testing period to test the hypotheses of the study. The difference between the actual returns and expected returns is termed as the return incurred due to the event. Using two independent sample t-tests, statistical significance of the difference of the average abnormal return (AAR) between the two groups of each hypotheses are tested to evaluate the validity of BSV(1998) and DHS(1998) in the CSE.

DATA AND SAMPLE

Sample includes winners and losers of the 12-month formation and 6-month holding period momentum strategy from 2005 to 2013. Anuradha and Nimal (2014) has confirmed the existence of the momentum effect in the CSE since 1991. As they have found, the momentum strategy that select securities based on their returns over past 12-month and then holds them for next 6-month is the most profitable momentum strategy in the CSE. Data are mainly from the CSE data library. As an emerging capital market with moderate performance levels compared to regional markets, CSE is a unique setting to study investor behaviors. Daily security prices, quarterly earnings announcements of the securities, government Treasury bill rate of returns and daily all share total return index (ASTRI) are the main data used in the analysis. Adjusted daily security returns are computed following Perera and Nimal (2015). Descriptive statistics of security returns for the groups of winners and losers used in testing the hypotheses are illustrated in Table 1. Since, p-value of the K-S test in some groups are less than 0.05 or 0.01 significance level, the robustness of the results have been tested using both parametric and nonparametric testing procedures.

ANALYSIS OF EMPIRICAL RESULTS

As BSV (1998), the momentum effect is generated from market underreaction resulting from the investors' conservative behavior. Consequently, H_1

and H_2 are formulated to test the validity of BSV (1998). As DHS (1998), that momentum effect is due to market overreaction and continuation resulting from the investor overconfidence augmented by biased self attribution. H_3 and H_4 formulated to test the validity of DHS (1998). All hypotheses have tested using the event based method.

The H_1 and H_3 are tested using the winners of the 12-month formation and 6-month holding momentum strategy. While H_2 and H_4 are tested using the losers of the 12-month formation and 6-month holding momentum strategy. Cumulative average abnormal returns (CAAR) of the eight groups which used in testing the hypotheses are presented in Figure 2. The CAAR of W_L_G is higher than the CAAR of W_L_B as expected in H_1, (see Figure 1(a)). Similarly, Figure 1(b) shows smaller CAAR for the L_H_G than the L_H_B while supporting the H_2. According to the Figure 1(c) CAAR of the W_H_G is smaller than the W_H_B contrast to the expectation of H_3. However, as expected in the H_4 it seems lower CAAR for L_L_G than the L_L_B. Table 2 and 3 illustrated the significance of the differences of abnormal returns between of two groups used in testing each hypothesis. As presented in Table 2 and 3, both independent sample t-test and the Mann-Whitney U test provide evidence for higher mean value for W_L_G than W_L_B as expected in H_1 and significantly lower mean value for L_H_G than L_H_B as expected in H_2. Thus, evidence supports the behavioral explanation of BSV (1998) in explaining the existence of the momentum effect in the CSE. As illustrated in Table 2, since p-values are larger in both tests of H_3 and H_4, the null hypotheses do not reject at reasonable level of significance. Hence, as expected by H_3, returns of winners on a good event with high expectation are not larger than on a bad event with high expectation. As expected in H_4, although the returns of losers on a good event with low expectation are smaller than on a bad event with low expectation, the difference of returns of two groups are not significant in case of both parametric and nonparametric tests. Hence it is suggesting that the behavioral explanation of DHS (1998) is not supported in the CSE.

DISCUSSION

Evidence on the CSE, has been consistent with the behavioral explanation given by BSV (1998) for the existence of the momentum effect. Findings make a challenge to the perfect efficient market theory of Fama (1970). Although, asset pricing theories assume that the investors are rational, it seems that investor are not rational and would be influenced by behaviors such conservatism. As explained in the theory of bounded rationality of Simon (1955), the limited calculating power and the complexity of decision problems might have prevented investors in the CSE to be fully rational in decision making. Hence, investors' conservatism in processing of information seems leading market underreaction in generating the momentum effect. When conservative biased investor believes that part of the shock will be reversed in the subsequent period, investors' initial reaction to new information is incomplete. Hence bad news would generate relatively lower future returns and good news would generate relatively higher in subsequent periods. Thus, investors' conservative behavior would generate the momentum effect in security returns. Investors' conservatism in generating the momentum effect in security returns has been supported only in few markets in US and Europe including Austria, Belgium, Denmark, France, Germany, Italy,

Netherlands, Norway, Spain, Sweden, Switzerland, Tunisia and Taiwan, (see Wu, Wu and Liu, 2009; Zoghlami and Matoussi, 2009; Frieder, 2008; Zhang, 2006; Doukas and McKnight, 2005, Durham, Hertzel and Martin, 2005; & Chan, Frankel and Kothari, 2004).

DHS (1998) seems to be not supported in the CSE. Hence, market overreaction and its continuation resulting from the investors' overconfidence and biased self attribution seems to be invalid behavioral explanation in explaining the existence of the momentum effect in the CSE. Although few studies have tested investor behaviors in explaining the momentum effect in the world, it is hardly found studies in the CSE. Studies such as Menike, Dunusinghe and Ranasinghe (2015), Peter and Senaratne (2013) and Gunasekarage and Power (2005) have documented some behavioral biases of investors in decision making except investors' conservatism behavior. The event based method developed to test the empirical validity of the behavioral explanations of BSV (1998) and DHS (1998) could be considered as a novel contribution to the empirical literature in finance. Anyone can apply this method in other markets to test the validity of the behavioral explanations in explaining the momentum effect.

CONCLUSION

This study provides an empirical support for the behavioral explanation given by BSV (1998) in explaining the existence of the momentum effect in the CSE. Consistent with BSV(1998) investors' conservative behavior seems to be contributed to generate the momentum effect in the CSE. Inconsistent with the behavioral explanation of DHS (1998), it is observed that market overreaction and continuation resulting from the investors' overconfidence augmented by biased self attribution is not valid in explaining the existence of the momentum effect in the CSE. Findings highlight the requirement of refining the asset pricing models with behavioral component in pricing assets in capital markets.

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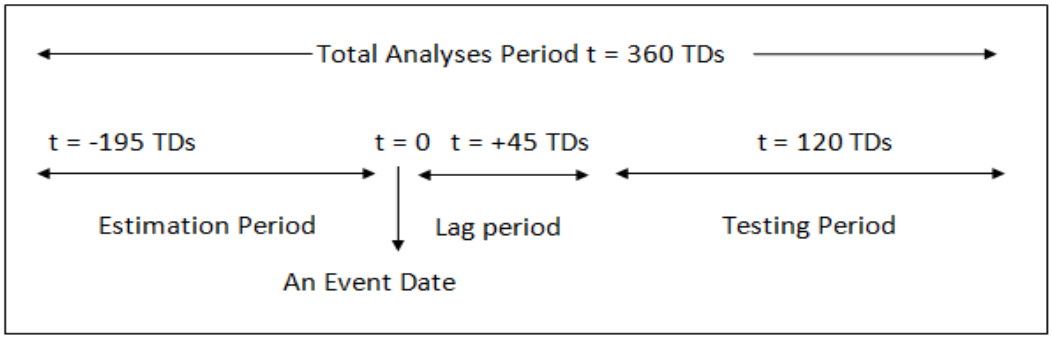
Figure 1
Time Line in the Event Based Method



This Figure illustrates the time line of the Event based method. The analyses period in the time line includes an estimation period, lag period and testing period. The period for which, data is used to estimate the test parameters of the model being applied to generate expected returns in testing period is known as the estimation period. The date of announcement of earnings information of a particular company is the event date. A lag period of 45 trading days has been used in the analyses period to capture eventualities in the CSE at the end of each quarter before the testing period. During the testing period, hypotheses are tested to evaluate the empirical validity of the behavioral explanations of BSV (1998) and DHS (1998) in explaining the existence of the momentum effect.

Source: Author compiled Based on the Literature

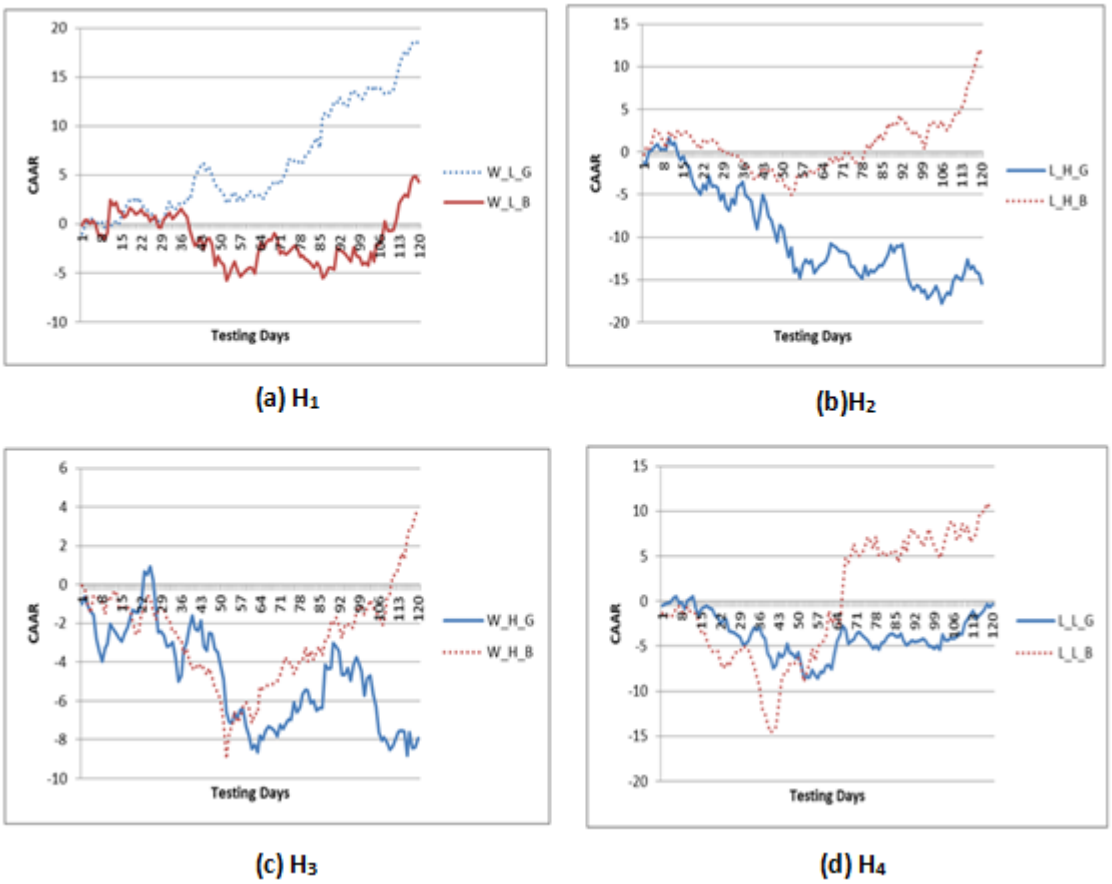
Table 1
Descriptive Statistics of the Variables

	H1		H2		H3		H4	
	W_L_G	W_L_B	L_H_G	L_H_B	W_H_G	W_H_B	L_L_G	L_L_B
Size	48	26	22	42	30	50	53	16
Mean	0.070	-0.092	-0.126	0.097	-0.067	0.034	-0.013	0.105
STD	0.314	0.162	0.318	0.373	0.406	0.216	0.348	0.286
K-S test	0.083*	0.159	0.186	0.193	0.023**	0.200	0.062*	0.021**

This Table reports summary statistics of the groups of securities used in testing the validity of BSV (1998) and DHS (1998). The validity of BSV (1998) has tested using H_1 and H_2. The winners with low expectations with good event (W_L_G) and winners with low expectations with bad events (W_L_B) are the two groups used in testing H_1. Losers with high expectations with good event (L_H_G) and losers with high expectations with bad event (L_H_B) are the groups used in testing H_2. The validity of DHS (1998) has tested using H_3 and H_4. Winners with high expectations with good event (W_H_G) and winners with high expectations with bad events (W_H_B) are the two groups used in testing H_3. Losers with low expectations with good event (L_L_G) and losers with low expectations with bad event (L_L_B) are the groups used in testing H_4. Mean return, standard deviation (STD) and K-S test of each group are presented. K-S test is used to test the normal distribution returns of each group. Test values that are significance at the 10 percent level will be marked with 1 (*), 5 percent significance level will be marked with 2 (**) and the values that are significance at the 1 percent level will be marked with 3 (***).

Source: Author compiled Based on the CSE Data from 2005-2012

Figure 2
Cumulative Average Abnormal Returns of Groups



(a) H_1 (b)H_2

(c) H_3 (d) H_4

This Figure illustrates the behavior of the cumulative average abnormal returns (CAAR) during the testing period of the groups used in testing H_1, H_2, H_3 and H_4. H_1 is tested using the winners with low expectation with good event (W_L_G) and winners with low expectations with bad events (W_L_B). H_2 is tested using the losers with high expectation with good event (L_H_G) and losers with high expectation with bad event (L_H_B). H_3 is tested using the winners with high expectation with good event (W_H_G) and winners with high expectations with bad events (W_H_B). H_4 is tested using the losers with low expectation with good event (L_L_G) and losers with low expectation with bad event (L_L_B).

Source: Author compiled Based on the CSE Data from 2005-2013

Table 1
The Independent t-test Results

	H1		H2		H3		H4	
	W_L_G	W_L_B	L_H_G	L_H_B	W_H_G	W_H_B	L_L_G	L_L_B
Mean	0.070	-0.092	-0.126	0.097	-0.067	0.034	-0.013	0.105
Mean Difference	0.162		-0.223		-0.101		-0.118	
t-value	(2.447)		(-2.379)		-1.450		-1.239	
p- value	0.017**		0.020**		0.151		0.219	

This Table presents the results of independent sample t-test on the H1, H2, H3 and H_4 in testing the BSV (1998) and DHS (1998) in explaining the existence of the momentum effect in the CSE. Mean values of each group and mean differences have presented. The figures in the parentheses are the t-values. p-values with corresponding significance levels are presented. Evaluate each t-value at a 10 percent, 5 percent and 1 percent significance level. Test values that are significance at the 10 percent level will be marked with 1 (*), 5 percent significance level will be marked with 2 (**) and values that are significance at the 1 percent level will be marked with 3 (***).

Source: Author compiled Based on the CSE Data from 2005-2013

Table 1
The Mann Whitney U Test Results

	H1		H2		H3		H4	
	W_L_G	W_L_B	L_H_G	L_H_B	W_H_G	W_H_B	L_L_G	L_L_B
Mean Rank	42.58	28.12	24.64	36.62	36.77	42.74	33.94	38.50
Asymptotic Z	(-2.763)		(-2.445)		-1.113		-0.796	
p- value	0.006***		0.014**		0.266		0.426	

This Table presents the results of the Mann Whitney U Test on the H1, H2, H3 and H_4 in testing the BSV (1998) and DHS (1998) in explaining the existence of the momentum effect in the CSE. Mean rank of each group and p-values with corresponding significance levels are presented. N.B: Evaluate each Z-value at a 10 percent, 5 percent and 1 percent significance level. Test values that are significance at the 10 percent level will be marked with 1(*), 5 percent significance level will be marked with 2 (**) and values that are significance at the 1 percent level will be marked with 3 (***).

Source: Author compiled Based on the CSE Data from 2005-2013