THE ANALYSIS OF DISPOSITION EFFECTAND PRICE REVERSAL TAKING UNOBSERVABLE FACTORS INTO CONSIDERATION: WITH SPECIAL REFERENCE TO THE SRI LANKAN STOCK MARKET

Y. M. H. P. Madduma Bandara[1]

ABSTRACT

Disposition Effect, which has been popularized and well documented as one of the various explanations for the persistence of momentum in the returns of the stocks over various time horizons was first documented by Shefrin and Statman (1985). Accordingly, the disposition effect refers to the tendency of investors to realize their profits too early and reluctance to realize their losses that arise out of changes in stock prices. The downward pressure on the prices of winner stocks due to higher growth in trading volume could lead to a price reversal, which ultimately results in losers outperforming winners for a specific time. This price reversal tendency could be influenced by many factors of which some are observable and, some, unobservable. Consideration of observable factors while disregarding those unobservable variables may result in producing biased and counterintuitive estimates by cross sectional and time series analyses. Based on the studies by Cressy and Farag (2009, 2010) this study examines by using Fixed Effects Model which takes unobservable factors into consideration, whether past losers outperform past winners. Using daily data from the Sri Lankan stock market, a sample of 20 stocks that faced a drastic 1 day price change was taken to examine price reversals. Even though cross section and pooled regression results yield insignificant results, fixed effects model strongly supports price reversals of the winning and losing stocks. These results suggest that the unobservable time specific together with firm specific factors play a major role in explaining price reversals in the Sri Lankan stock market.

INTRODUCTION

Behaviour of stock returns has been an active area of research for the past several years. The theories, such as Capital Asset Pricing model (CAPM), Arbitrage Pricing Model (APT), and Intertemporal Capital Asset Pricing Model (ICAPM) have emerged to explain the way stock prices are determined. These theories basically show the role of risk in determining the expected returns of a stock. Nevertheless, many studies have yielded contradicted predictions to these theories. For instance Basu (1977), using a sample from April 1957 to March 1971, showed that stocks with high earnings/price ratios (or low P/E ratios) earned significantly higher returns than stocks with low earnings/price ratios. In addition, Banz (1981), in his study showed that the stocks of firms with low market capitalizations have higher average returns than firms with large capitalization. His findings

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[1] Lecturer, Department of Business Economics, University of Sri Jayewardenepura, Sri Lanka. E-mail: hmadduma@gmail.com

indicated that differences in beta do not capture return differences which arise out of these market capitalization disparities.

Among these, momentum is one of the strongest price anomalies. Momentum refers to the profits that could be obtained by the investment strategy of buying past winners and selling past losers. According to Debondt and Thaler (1985), "Losers" are the stocks that have had poor returns over the past three to five years, and, "Winners" are those stocks that had high returns over a similar period. Momentum could not persist if there is at least weak form efficiency in the market and if stock prices follow a random walk. Jagadeesh and Titman in 1993 documented this inconsistency. In the study of Jagadeesh and Titman, they show that past winners continue to outperform past losers over 3 – 12 months horizon in the US market. They also found that risk adjustments to the returns heighten momentum instead of explaining it. Haugen and Baker (1996), Rouwenhorst (1998) proves that this momentum holds in international markets too.

Many explanations have been attributed to the reasoning of this tendency in the stock markets. Although some have argued that the results provide strong evidence of "market inefficiency," others have argued that the returns from these strategies are either compensation for risk, or alternatively, the product of data mining (Jagadeesh and Titman, 2001). Conrad and Kaul (1998) argue that profitability in momentum strategy could be due to cross sectional variations in the expected returns of individual securities. These cross sectional dispersions are not related to time series patterns of the returns on which the strategies were formed. Barberis et al (1998), Daniel et al (1998) and Harrison and Stein (1999) present behavioural models to explain the profitability of momentum strategy. Kothari, Shanken, and Sloan (1995) and Brown, Goetzmann, and Ross (1995) cite survival bias as a problem that can exaggerate predictive power. Rouwenhorst (1998) taking twelve international equity markets shows that momentum persists even after the returns are corrected for risks.

Disposition Effect, which has been popularized and well documented as one of the various explanations for the persistence of momentum in the returns of the stocks over various time horizons was first documented by Shefrin and Statman (1985). Accordingly, the disposition effect refers to the tendency of investors to realize their profits too early and reluctance to realize their losses. Consequently, investors would hang on to the losing stocks and sell the winning stocks. Many empirical studies have been carried out to explore the existence of this behavioural heuristic in different markets since the work of Shefrin and Statman.

The rational decision making theory states that an investor who is compliant with the rational behaviour axioms would make decisions based on the tradeoff between the risks and returns (Chui, 2001). Such an investor would make his choices so as to get the maximum expected return for the risk level he is ready to assume. But this theory does not accommodate the possible effects of disposition effect. A number of theories have been emerged to explain the disposition effect among investors. Some of them are, prospect theory, mental accounting, mean reversion and seeking pride (avoiding regrets).

Most studies have been conducted to test the existence of disposition effect and its role in explaining the profitability of the momentum strategy. But apart from a few limited natural experiments, nobody has yet instituted an empirical relationship between irrationality of investor behaviour and changes in asset prices (Goetzman, Massa 2003). Moreover, the simultaneous analysis of the investment behaviour of all the investment categories has been limited to a few studies like Grinblatt and Keloharju (2000, 2001), Shumway et al (2006), mainly due to limitation of data. The existing studies that analyse different investor categories utilize different research methods, different data in terms of frequency and time

horizon and different institutional arrangements making it difficult to identify and compare general behaviour and performance patterns of separated investor categories (Grinblatt and Keloharju, 2000).

There are many studies that have been conducted to examine how the existence of disposition effect could be used to explain the patterns of cross sectional expected returns over different horizons. For example, Grinblatt and Han (2002) analyses how aggregate demand and equilibrium price progress over time in the presence of fixed proportion of disposition prone investors and it is shown that the disposition effect can explain the profitability of momentum strategy between three months and one year. In addition, Frazzini (2006), Barberis and Huang (2001) and Hur et al (2010) have found that prospect theory and mental accounting framework play a significant role in explaining the cross section of stock returns. However, a proper analysis of the price behaviour should be accompanied by a time dimension to the data and measures of the unobservables affecting share prices (Cressy and Farag, 2010). Despite the fact that some of these factors are unobservable, ignorance could lead to heterogeneity biases in the estimates. They have incorporated these aspects in their study in 2010 and have adopted panel data methods to investigate cross sectional and time series effects within the post event period for winners and losers.

This study applies the methodology by Cressy and Farag (2010) to study the price reversal of winning and losing stocks in the Sri Lankan stock market. Twenty stocks that experienced a one day dramatic price change during 2006-2010 have been taken as the sample in consideration. A dramatic change refers to a rise or fall of prices more than 10% on a particular day. Even though Cross Sectional and pooled OLS methods fail to provide evidence of price reversals, application of fixed effect model discloses strong price reversal of past winners and past losers emphasizing the importance of unobservable time and firm specific factors. Further, Fixed Effect model explores a negative relationship between firm size and the post event abnormal returns which is expected according to the small firm effects.

LITERATURE REVIEW

The momentum in the stock returns was first examined and discovered by Jagadeesh and Titman in 1993. They revealed that a strategy of buying stocks with high returns over the horizons of three to twelve months and selling stocks with low returns for the same time horizon would dominate buy and hold strategy. Momentum refers to the tendency of past winners continuing to outperform past losers. Many studies have provided evidence that past stock returns are related to cross sectional stock returns over short (one week to one month), intermediate (over three to 12 months) and long (three to five years) time horizons. Rouwenhorst (1998) tests for momentum in international equity markets taking a sample of 12 European countries and he finds that past winners outperform past losers by about 1 percent per month in the medium terms (for up to one year). He also finds that this price continuation is stronger for small firms. Haugen and Baker (1996) discovered that profitable momentum strategies persist in the US, Germany, France, the UK and Japan.

By contrast, Debondt and Thaler (1985, 1987) observe return reversals over long horizons. According to their studies, portfolios with loser stocks will outperform the portfolios with winning stocks about five years later (Long run). Similarly Schiereck et al (1999), using data of German stock market finds that momentum strategy is profitable in the intermediate terms where as contrarian strategy becomes profitable in the short run and in the long run. Kang et al. (2002) using data on A shares in Chinese market find the presence of abnormal profits for short term contrarian and intermediate momentum strategies. Phua et al (2010) provide evidence for the existence of momentum effect in Australian market.

Contrary to the findings of Rouwenhorst (1998), they show that profitability is higher for larger firms listed on Australian Stock Exchange.

Many explanations have been attributed to the reasoning of this tendency in the stock markets. Although some have argued that the results provide strong evidence of "market inefficiency," others have argued that the returns from these strategies are either compensation for risk, or alternatively, the product of data mining (Jagadeesh and Titman, 2001). Yet, the reasons for this are widely debated. Conrad and Kaul (1998) argue that profitability in momentum strategy could be due to cross sectional variations in the expected returns of individual securities which play a vital role in determining the profitability of either momentum or contrarian strategies. These cross sectional dispersions are not related to time series patterns of the returns on which the strategies were formed. Barberis et al (1998), Daniel et al (1998) and Harrison and Stein (1999) present behavioural models to explain the profitability of momentum strategy. Kothari, Shanken, and Sloan (1995) and Brown, Goetzmann, and Ross (1995) cite survival bias as a problem that can exaggerate predictive power. Rouwenhorst (1998) taking twelve international equity markets shows that momentum persists even after the returns are corrected for risks.

Jagadeesh and Titman (2001) shows that even though other anomalies such as small firm effects documented by Banz (1981) (which claims the superior performance of value stocks relative to growth stocks) are not observed after the time period considered in original studies, the momentum strategy remains to be profitable when they extended the test for the period of 1990-1998, which is different from the period they considered in their original study in 1993. Hence they conclude that momentum profits are not entirely due to data snooping biases. Contradictory to the hypothesis of Conrad and Kaul (1998), Grundy and Martin (2001) find that risk adjusted profitability of a total return momentum strategy is more than 1.3% per month and remarkably large and stable across sub periods, even after subtracting each stock's mean return from its return during the period. Moskowitz and Grinblatt (1999) find that industry effects on momentum could be non trivial. But again, Moskowitz and Grinblatt (1999), Grundy and Martin (2001), and Chordia and Shivakumar (2002) also show that momentum due to individual stock effect is distinct from that of industry effects (Grinblatt and Han, 2002).

Recently, researchers came up with another behavioural explanation for the momentum in stock returns, and, Shefrin and Statman (1985) defined this as the disposition effect. Mental Accounting (Thaler, 1980) and Prospect Theory (Kahneman and Tversky, 1979) have become two main motives for the investors to demonstrate such disposition oriented behaviour. Over the last few decades, many studies have been conducted to test the existence and potential influence of the disposition effect not only in capital markets but also in real estate markets. Disposition effect being one of the well documented behavioural biases that lead to momentum in stock returns, leads investors to behave contrary to the rational investment theory and they would sell their winning stocks too early and keeping their losing stocks in the hesitation to realize the losses. Consequently this will have an impact on stock prices by causing excess demand pressure on losing stocks and excess selling pressure on winning stocks which ultimately leads to stock prices being under react to information about the companies. But once this irrational behaviour is realized and possible impact is corrected, the stock prices are adjusted accordingly and this is one of the reasons why a momentum strategy could remain profitable in a financial market. The supporting empirical evidences for this notion are the studies by Grinblatt and Han (2002, 2005) and Frazzini (2006).

The degree to which different categories of investors are subject to this behavioural bias has also been investigated by several studies. Hur et al. (2005), study the role of

individual investors in disposition effect induced momentum by using US stock market data for the period of 1984 – 2005. They find that higher the presence of individual investors in a stock, more the ability of disposition effect to explain momentum. They also find that disposition effect of individual investors is more towards hard-to-value stocks complying with Kumar (2009). In addition, Odean (1998), Barber and Odean (2000, 2001, and 2002) and Brown et al. (2006) provide evidence that individual investors are more tend to be influenced by disposition effect. Choe and Eom (2009) find the existence of disposition effect in Korean stock index futures market. Moreover they find that sophistication and trading experience tend to reduce the disposition induced behaviour of investors, hence individual investors are more susceptible to disposition effect compared to foreign and institutional investors. These findings comply with the findings by Grinblatt and Keloharju (2000). Their study which relies on data from Finland suggests that the increase in sophistication level will cause investors to pursue momentum strategies. As such, the most sophisticated investors in the Finnish financial markets, the foreign investors follow a momentum strategy whereas domestic investors, households in particular, pursue a contrarian strategy displaying disposition effect.

Goetzmann and Massa (2003), based on the study by Grinblatt and Han (2002), derive several implications for volume, volatility and returns in the presence of disposition effect. They construct direct restrictions on how the returns, volatility, and volume change as the proportion of disposition investors in the market changes which is denoted by μ. Accordingly, three market variables should have a negative relationship with the proportion of disposition investors when the prices of the stocks are above the reference price. This is because when a stock is performing well, an increase in the proportion of disposition investors will cause to reduce the net demand for that stock. This in turn will reduce prices (P_{t+1}), returns, trading volume and volatility. The advantage of using this direct method is that μ is independent of the true economic value of the asset (Goetzmann and Massa, 2003). These restrictions are then empirically tested using data on individual investors obtained from a brokerage house in US. This study limits only to the individual investor category and to a sample of around 78,000 households. Hence it is examined how the market is impacted as the proportion of individual investors who are subject to the behavioural bias changes.

DATA

The dataset consists of information about top 20 stocks traded in the Colombo Stock Exchange (CSE) in Sri Lanka. The data of daily stock returns, market capitalization and trading volume were collected for the period 2006-2010. These stocks have experienced one day dramatic change in prices over this period. To estimate CAPM parameters, period of (-105, -6) was taken while the test period is (+1,+120) days. The βs estimated in CAPM are used to measure abnormal returns (AR) and cumulative abnormal returns (CAR) in the post event period. To overcome the problem of severe autocorrelation, 10 day returns have been calculated according to Cressy and Farag (2010). Accordingly the dataset consists of 10 pre-event and 12 post-event observations. The event is the situation where a stock experiences a one day dramatic price change. Winners are the stocks that experienced a price hike of more than 10% and losers are the stocks that had a price fall for more than 10% on one day.

METHODOLOGY

The study uses the methodology by Cressy and Farag (2010) which is based on their study in 2009. By using FE model, the behaviour of the Cumulative Average Abnormal Returns for winners is studied. There could be many observable as well as unobservable factors that could lead to post-event behaviour of stock prices and returns. Inclusion of observable variables while ignoring the unobservable factors could result in heterogeneity biases making OLS estimates biased. An unobservable variable could be time-specific, which varies only across time. In addition, these could be firm-specific which implies the variation across the entities concerned.

Before proceeding to the details of regression analyses, details and calculation of basic variables are explained below.

Daily Returns: Daily returns are calculated as, $r_{it} = \ln\left(\frac{P_t}{P_{t-1}}\right)$ where P is the closing price of a stock.

Abnormal Returns (AR): Abnormal returns are calculated using the equation, $AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt})$. α and β estimates are obtained using the pre-event data.

Cumulative Abnormal Returns (CAR) and Cumulative Average Abnormal Returns (CAAR): These are calculated using following equations.

$$CAR_{it} = \sum_{\tau=1}^{t} AR_{i\tau}$$

$$CAAR_t = \sum_{i=1}^{I} CAR_{it}/I$$

where, I is equal to number of stocks and it is 20 in this case.

First, Cross – Section Time Series approach has been used to explain price reversal. As per, Cressy and Farag (2009), Cox and Peterson (1994) the relevant equation is,

$$CAR_i = \mu + \beta_1 AR_{i0} + \beta_2 lnmcap_i + \beta_3 lntrol_{it} + \varepsilon_i$$
$$i = 1,2 \dots \dots .20 \qquad (1)$$

where,

$$CAR_i = \sum_{t=1}^{12} CAR_{it}/12$$

In this equation AR_{i0} is the Abnormal Return (AR) for stock i on the event day. $lnmcap_i$ is the natural log of market capitalization of the stock (i) one period before the event and $lntrol_{it}$ is the percentage change in turnover ratio (TR_t/TR_{t-1}) one period before the event. This variable is taken as a proxy to capture the change in trading activities of the stock. Secondly, Pooled OLS regression will be estimated and the relevant equation is,

$$AR_{it} = \mu + \beta_1 AR_{i0} + \beta_2 lnmcap_{it} + \beta_3 lntrol_{it} + \varepsilon_{it}$$

In this regression AR_{it} is used instead of CAR_{it} in order to avoid problems of severe autocorrelation problems (Cressy Farag, 2010).

24

Then a poolability test should be conducted in order to conclude the suitability of panel data regressions for the dataset. This involves testing the null hypothesis of poolability of panel data with respect to stocks and time.

Once the poolability is verified, there are basically two panel data analyses that can be conducted on the dataset. They are Fixed Effect (FE) and Random Effect (RE) models. The decision of whether to use FE or Re depends on a few factors. RE treats unobservable effects to be random while FE assumes them to be fixed in nature. The RE estimator requires that the individual effects must be uncorrelated with the regressors for it to be consistent. If this assumption is not tenable, the FE estimator should be used. Estimation of Hausman specification test (Hausman, 1978), permits to test the null hypothesis that the RE estimator is consistent. The rejection of null hypothesis implies the adoption of FE model in capturing time specific and firm specific effects that are unobservable in the model.

EMPIRICAL RESULTS

Table 01: Descriptive Statistics for Winners and Losers

Variable	Winners				Losers			
	Mean	Std.dev	Min	Max	Mean	Std.dev	Min	Max
CAR_{it}	-0.0600	0.1372	-0.3425	0.2549	0.0468	0.2110	-0.6564	0.3368
AR_{it}	-0.0015	0.0561	-0.2025	0.3345	0.0085	0.0648	-0.1570	0.3613
AR_{i0}	0.1027	0.0896	-0.0482	0.3108	-0.6695	0.9291	-2.8445	-0.0427
$lnmcap_{it}$	23.4474	0.7609	22.5873	25.2004	23.7751	0.7098	22.7382	25.3221
$lntrol_{it}$	12.6292	47.580	0.0013	372	6.9104	33.5119	0.0022	299.788

Source: Author constructed

The sample company period is 260, which has been constructed by of 13 post-event periods per company and 20 companies. The initial price rise for the winners is 10.27%, and, for the losers, it is -66.95%. This high value for losers is because of the drastic price change of two companies in the sample that recorded a price drop of 93% and 53% respectively. However, average cumulative abnormal returns records values of -6% and 4.68% respectively suggesting a price reversal over the period.

Table 02 reports the results of the cross sectional analysis. The model does not show any significance in terms of the regressors. The model in general is insignificant which is denoted by the $p - value$.

Table 02: Cross Sectional Regressions

	Winners	Losers
Constant	0.6362	0.8041
	(1.1182)	(2.65)
lnmcap	-0.0292	-0.0335
	(0.0484)	(0.1115)
Ar_{io}	-0.1134	0.0484
	(0.4054)	(0.1484)

lntrol$_i$	-0.0105	0.0018
	(0.0152)	(0.0419)
R^2	0.1737	0.2328
Adjusted R^2	-0.01017	-0.5343
F-test	0.63	0.3
(p-value)	0.6133	0.8232

Source: Author constructed
Note: Standard errors are in parentheses.

Even if the results are insignificant, the signs of the covariates are consistent with the ones obtained by Cressy and Farag (2010). According to a-priori expectations, small firm effects suggest a negative relationship between *lnmcap* and *CAR$_i$*. The negative coefficient for *AR$_{i0}$* suggests that the larger the initial price change, the smaller the subsequent CAR though AR remains possible and the opposite is true for the losers (Cressy and Farag, 2010). *lntrol* is negative for winners and positive for losers which shows the fact that the downward pressure on price for winners by increasing the sales volume may reduce the *CAR* and vice versa.

Table 03 reports the results of the pooled OLS regression. Here AR$_{it}$ has been regressed instead of CAR in order to avoid severe autocorrelation (Farag, Cressy, 2010).

Table 03: Pooled OLS Regression

	Winners	Losers
Constant	0.0718	0.0128
	(0.1573)	(0.2423)
lnmcap	-0.0028	-0.0006
	(0.0068)	(0.0102)
Ar$_{io}$	-0.0572	0.0144
	(0.058)	(0.0077)
lntrol	8.96E-07	5.35E-07
	(1.37E-06)	(1.17e-06)
R^2	0.0175	0.0438
Adjusted R^2	-0.0019	0.0079
F-test	0.9	1.22
(p-value)	0.4412	0.3077

Source: Author constructed
Note: Standard errors are in parentheses.

Again, as cross sectional regression, the model does not show any significance in terms of the regressors. Overall, the model is not significant either for winners or losers depicted by the F-statistics.

Despite the insignificance, the signs of the regressors in pooled regression analyses are consistent with the ones that have been obtained by Cressy and Farag (2010) and also the estimates obtained using cross section regression. However, sign for lntrol has been changed as in the results obtained by Cressy and Farag (2010). This can be a sign of heterogeneity bias that has been occurred after including time dimensions to the model.

Table 04 shows the results of the poolability test. First the pooled regression is estimated for winners and losers by including only the variables that change over time and across stocks. Those two variables are *lnmcap* and *lntrvol*. AR is regressed over those two variables. Then poolability test has been carried out by calculating the residuals in the restricted model and the unrestricted model.

Table 04: Poolability Test

	Winners	Losers
pooled sse	0.4599	0.349
Σ sse (by stock)	0.3424	0.15277
F	1.115289	1.13
P	0.325	0.3465
Σ sse (by date)	0.39261	0.255559
F	0.623242	0.531831
P	0.9413	0.9713

Source: Author constructed

With the p-values of 0.325 and 0.3465 for winners and losers respectively, we do not reject the null hypothesis of poolability by stocks. In the same manner, considering the p-values of 0.9413 and 0.9713, the null hypothesis by time is not rejected. This enables us to proceed with the panel data analysis.

In order to test for the choice between fixed effects and random effects models, Hausman statistics was considered and the results are as follows for winners and losers.

Table 05: Hausman Test Statistics

	Winners	Losers
Chi-square	62.1	10.86
(p)	0.0000	0.0044

Source: Author constructed

In both cases, the null hypothesis that the RE is consistent is soundly rejected by the data. Therefore FE model can be considered as the suitable method in analysing panel data.

When the FE model is utilized, all the time invariant and firm invariant variables should be omitted from the model. Hence, of the total variables used so far, *lnmcap* and *lntrol* will be included while omitting AR_{io} from the model. Accordingly, Table 06 details the results of the FE regression.

Table 06: FE Estimation of AR_{io}

	Winners	Losers
Constant	-2.8596	-3.4309
	(0.8542)	(0.9726)
lnmcap	-0.1219	-0.1438
	(0.0364)	(0.0409)
lntrol$_i$	1.32E-06	1.05E-06
	(1.35E-06)	(1.06E-06)
R^2	0.0794	0.1514
F-test	6.08	6.69
(p-value)	0.0029	0.0021

Source: Author constructed
Note: Standard errors are in parentheses

By utilizing FE model, a dramatic improvement has occurred in both models of winners and losers. The R^2 are 7.94% and 15.14% for winners and losers respectively. F-tests suggest that overall, the models are significant at 95% confidence level. This suggests that the unobservable time-specific and firm-specific effects play a crucial role in the behaviour of post AR_i s.

SUMMARY AND CONCLUSION

The existence of disposition effect in a market may have different implications over the performance of that market. One of the main implications is the price reversal of loser and winning stocks due to the buying and selling pressures caused on those two stocks respectively. Many factors could affect the post event behaviour of ARs. Among them, there could be some time specific and firm specific factors that are not observable. Cross Section or Time Series regression analyses may reasonably explain this behaviour by taking observable factors into consideration. But ignorance of the unobservable factors could lead those models to produce biased estimators which can reduce the validity of the model while producing counter intuitive results. This study analyses the behaviour of post event ARs of 20 stocks in the Sri Lankan Stock Exchange over the period 2006-2010. The Cross section and Pooled OLS methods that ignore the unobservable effects fail to provide significant results. But once the time and firm specific effects are accounted for by utilizing FE method, the model shows a significant improvement. This suggests that the unobservable effects play a major role towards the price reversal patterns in the Sri Lankan stock market.

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