2011 International Conference on Economics and Finance Research
IPEDR vol.4 (2011) © (2011) IACSIT Press, Singapore

Does the Disposition Effect Exhibit during Financial Crisis?

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***Abstract*—Most studies on behavioral finance have supported that investors exhibit a bias known as the disposition effect. However, it is still ambiguous whether the bias remains when the stock market suffers from financial crises. This paper utilizes the disposition coefficient to verify whether the disposition effect exists in Taiwan and Chinese stock markets during the periods of financial crises, and to discuss the differences of the disposition effect between appreciation and depreciation periods. The empirical results show that during the 1997 Asian financial crisis, the disposition effect significantly exhibits in the both markets. On the other hand, during the 2008 global financial crisis, the disposition effect only exhibits in Chinese stock market. Nevertheless, there are no significant differences of disposition effect between A-shares and B-shares. This paper further concludes that the disposition effect would significantly exhibit in appreciation period, but not in depreciation period no matter during the global financial crisis or the Asian financial crisis.**

Keywords- behavioral finance; disposition effect; financial crisis

I. INTRODUCTION

Behavioral finance has received a highly concern and a rapid increase in researches since 1980. The influence of many irrational phenomena on investment behavior, such as the disposition effect, overconfidence and other personal psychological tendency that cannot be explained by traditional finance theory, have been widely discussed [4]. The disposition effect is the tendency of investors to realize gains and reluctance to sell those that have losses due to regret avoidance [21], which is derived from the prospect theory by Kahneman and Tversky [9]. Shefrin and Statman [19] proposed that the disposition effect is a combination of mental accounting [22] and S-shaped utility function in the domain of gains and losses, and it would lead investors to sell winning stocks too early and hold losing stocks too long. In recent years, the disposition effect has been documented in a number of studies and further compared the differences of disposition effect for a variety of investors such as individuals, institutional investors, dealers, mutual funds and foreigners [1] [4] [7] [15] [16] [25]. However, most of the earlier literature has only focused on the existence of the disposition effect over an entire research period in a specific stock market but have neglected that investors may have unpredictable investment behaviors during bull and bear markets, especially during financial crisis. Are investors still reluctant to realize losses when they are faced with a financial crisis or considerable investment losses? Or, does panicky psychology lead to a self-control mechanism [23] such that investors realize losses and further accelerate fluctuation of stock markets? These issues should be re-clarified for studying the disposition effect.

During the period of the 2008 global financial crisis, a kind of domino effect drove stock markets everywhere to plunge significantly. Even the Chinese stock market, which is viewed as one of the few stock markets that is negatively correlated with the U.S. stock market [8], also dropped 65.4%, as shown in Table 1. This volatility provides a nice backdrop for studying the disposition effect because there were periods of rapid appreciation and depreciation [1].

This paper aims to conduct a comparative study of the disposition effect in the stock markets of Taiwan and China in order to thoroughly reveal the existence of the disposition effect in different stock markets during the financial crises. Furthermore, the differences of the disposition effect between appreciation and depreciation periods in both markets are also distinguished.

TABLE I. MAJOR STOCK INDICES DURING GLOBAL FINANCIAL CRISIS

Stock Index	12/31/2007	12/31/2008	Change (%)
TAIWAN TAIEX INDEX	8506	4591	-46.0
SHANGHAI SE A SHARE INDX	5521	1912	-65.4
HANG SENG INDEX	27813	14387	-48.3
NIKKEI 225	15308	8860	-42.1
KOSPE INDEX	1897	1124	-40.8
SINGAPORE STRAITS TIMES INDEX	3482	1762	-49.4
NASDAQ COMPOSITE INDEX	2652	1577	-40.5
DOW JONES INDUS. AVG	13265	8776	-33.8

II. LITERATURE REVIEW

Based on the aspect of mental account [22] and prospect theory [9], Shefrin and Statman [19] proposed that investors are risk averters when they have obtained gains from their invested financial products. Contrarily, if an investment

position sees losses, due to loss aversion, investors will be unwilling to recognize the investment losses and will hold the losing position continuously. At this time, they become risk lovers. In other words, the investors dislike incurring losses much more than they enjoy making gains, and are willing to gamble where losses are involved, so they will hold stocks that have lost value and be eager to sell stocks that have risen in value. This phenomenon is so-called the disposition effect.

Many studies concerning the disposition effect of investors find that investors generally experience the disposition effect. For example, Bremer and Kato [3] tested the trading volume on the Tokyo Stock Exchange and found that the turnover rate of winning stocks is higher than losing stocks. Thus, they concluded that the disposition effect exists in the Japanese stock market. Odean [15] examined the transaction data of 10,000 investor accounts from 1987 to 1993 and found that investors tend to sell winning stocks too soon to recognize gains and continue to hold losing stocks. Weber and Camerer [25] employed a simulation experiment to observe investor transactions and price changes of six stocks and found that the disposition effect may caused an unwillingness to recognize losses. Locke and Mann [12] analyzed 344 traders from the Chicago Mercantile Exchange futures in 1995, finding that professional traders held losing trades longer than winning trades. This evidence also indicated that relative aversion to loss realization is related to contemporaneous and future trader relative success. Chui [5] simulated an actual investment to improve the experiment by Weber and Camerer [25]. The results indicated that the disposition effect exists and that more confident participants demonstrated signs of a more significant disposition effect. Shapira and Venezia [16] divided the investors in the Israeli stock market into common investors and specialized institutions, and found that both have the disposition effect and that common investors in particular have a stronger disposition effect. Li and Zhang [11] indicated that individual investors in the Chinese stock market have the disposition effect in appreciation periods and an inverse disposition effect in depreciation periods. Visaltanachoti, Luo, and Lu [24] examined the relation between average holding periods, stock illiquidity and investors' disposition effects in the Chinese stock markets between 1996 and 2003. The results showed that Chinese investors' holding periods are longer for illiquid stocks and are inversely associated with past stock returns. Both relations are prevalent in the Shanghai and the Shenzhen A-share stock markets, which are dominated by individual investors. Nonetheless, relatively weak evidence is found in regards to the disposition effect in the B-shares markets, which are dominated by institutional investors. Leal, Armada, and Duque [10] argued that investors in Portugal's stock market have the disposition effect, especially in bull markets.

Recently, some evidences on the disposition effect in the investment market of Taiwan are consistent with previous studies. For example, Shu, Yeh, Chiu, and Chen [20] conducted an analysis of account data of individual investors in Taiwan and found that the disposition effect is obvious. The ratio of realizing gains to losses is 2.5 times, whereas it is 1.5 times in the U.S. It is inferred that the disposition effect of individual investors in Taiwan is more significant than that of American investors. Barber, Lee, Liu, and Odean [1] found that in the Taiwanese stock market, 84% of investors sell winning stocks sooner than they sell losing stocks, and that individual investors, enterprises and dealers are unwilling to sell losing stocks. Barber, Lee, Liu, and Odean [1] found that during the Asian financial crisis, investors in the Taiwanese stock market were unwilling to realize losses; individual investors, corporation and dealers had the disposition effect in all their investments except for foreign institutional investors and mutual funds.

Contrary to the previous studies, Boebel and Taylor [2] conducted an analysis of the disposition effect, based on the account information of brokers of individual investors in New Zealand, and found that the investors tend not to exhibit characteristics of the disposition effect, when the average purchase price is used as a reference point.

III. Data and Methodology

Generally speaking, empirical data are collected from three sources: market secondary data, transaction data of individual investors, and a questionnaire survey. Although the transaction data of individual investors can be acquired directly, this approach is rather difficult due to privacy protection. Questionnaire surveys can reveal the investment attitudes decision-making processes directly, but it is time-consuming to collect the data to ensure good survey quality and recovery rates, especially for time-sensitive research. Therefore, this paper utilizes secondary data analysis to discuss whether investors of Taiwan and China exhibit disposition effects before and after major financial events (e.g., the 1997 Asian financial crisis and 2008 global financial crisis) and to understand the market reaction when the crises occur.

A. The definition of appreciation and depreciation period

This paper takes the stock markets of Taiwan and China as the subjects. The data including stock index, index return, and trading volume are picked from the database of Taiwan Economic Journal (TEJ).

During the second half of 2007, the subprime mortgage crisis resulted in global financial crisis, and Taiwanese and Chinese stock markets began to plunge bear market. Thus, this paper intercepts the period from June 1, 2006 to October 30, 2008 as the entire study period of global financial crisis. Similarly, the entire study period of Asian financial crisis is intercepted from March 10, 1996 to August 31, 1998 as shown in Figures 1 and 2. According to the argument of Lockwood and Mcinish [13], a bull market is defined as an increase of over 25% within a certain period, and a bear market is defined as a decline of over 20%. To completely contrast the disposition effect in different periods, this study further separates the entire study period into two sub-periods: appreciation and depreciation periods for the two financial crises. Thus, the appreciation periods of the Taiwan TAIEX index are defined as from June 1, 2006 to October 29, 2007 and from March 1, 1996 to July 31, 1997, respectively; the

depreciation periods defined as from October 30, 2007 to October 30, 2008 and from August 1, 1997 to August 31, 1998, respectively. Similarly, the appreciation periods of the Shanghai stock exchange composite index are defined as from June 1, 2006 to October 16, 2007 and from March 4, 1996 to May 12, 1997, respectively; the depreciation period, is from October 17, 2007 to October 31, 2008 and May 13, 1997 to August 31, 1998, respectively.

Figure 1. Taiwan TAIEX Index from Jan. 1991 to Aug. 2008

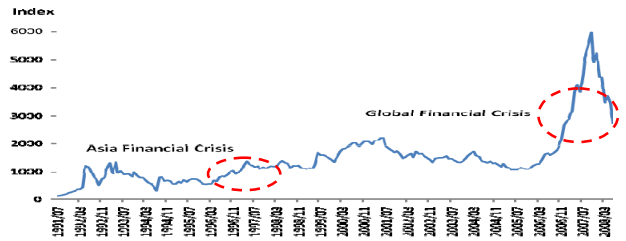

Figure 2. Shanghai Stock Exchange Composite Index from Jul. 1991 to Aug. 2008

B. *Hypotheses*

Reviewing the previous studies of the disposition effect, there is little information concerning the impact of major events on disposition effect. Most evidences only pointed out the widespread existence of the disposition effect [1] [11] [20] [24]. Grinblatt and Keloharju [7] found that investors tend to sell stocks with smaller losses and are reluctant to sell stocks with greater losses. Shefrin and Statman [18] suggested that retirees regard dividends as earnings, not assets, and are afraid of wealth overspending, so they prefer to cash dividends and are unwilling to sell stocks with capital gains. However, according to the argument of Shefrin [17], participants investing in risky capital markets have various levels of "framing dependence", and investors have different options depending upon their investment conditions. Thus, market atmosphere may affect the exhibition of the disposition effect on investors. Based on this, when the market atmosphere shows high uncertainty, or the losses of investors exceed their tolerance levels, the self-control mechanism would be triggered to prevent the spread of loss. Thus, this paper argues that when two major financial crises, the 1997 Asian financial crisis and 2008 global financial crisis occur, investors still sell the stocks in the loss because they are afraid of larger losses. As a result, the existence of disposition effect may not be significant. Thus, this paper proposes the following hypothesis

H1: Under the impact of a financial crisis, the stock markets not necessarily exhibit the disposition effect.

Investors who have suffered losses have prospective thinking of the future market and believe that the losing stocks will eventually return to gains, thus they hold on to the losing stocks [20]. De Bondt [6] found that investors would be optimistic in bull markets and pessimistic in bear markets. When positive returns continue for a longer time, investors would be nervous bullishness. Thus, bull market investors who have obtained gains would sell winning stocks because of regret avoidance [21], as they would expect a drop after continuous rises. Just as the finding of Leal, Armada, and Duque [10] that disposition effect is more significant in bull markets than bear markets.

Contrarily for bear markets, especially during the financial crisis, the investors who have obtained gains are uncertain about the future of the stock market, and tend to sell winning stocks. As the investors who have suffered losses pessimistically believe that stock prices will continue to decline, they will sell stocks to avoid the spread of loss. Thus, this paper proposes the second hypothesis.

H2: The disposition effect is more significant in appreciation periods than in depreciation periods.

C. *Measurement of the disposition effect*

Weber and Camerer [25] indicated that investors would buy the same stocks at different points in time and thus they may have different price reference points in mind. As a result, it is difficult to judge the reference point of an investment decision. This paper employs the disposition coefficient established by Weber and Camerer [25], and replaces the dynamic market price in the previous period by the return rate of the market index of the previous day. That is, based on the return rate of the market index of the previous day, the daily trading volume is S_+ or S_-, and calculates the disposition coefficient α of the stock market per week. When $\alpha > 0$, it means the disposition effect exists; on the contrary, $\alpha \le 0$ means disposition effect does not exist. When the disposition coefficient approaches 1, the disposition effect is more and more strong. The calculation of the disposition coefficient is as follows:

$$\alpha_{i+1} = \left(\sum_j^n S_+ - \sum_j^n S_- \right) \Big/ \left(\sum_j^n S_+ + \sum_j^n S_- \right) \quad (1)$$

where,

S_+ : trading volume of this day if the market index in previous day increased.

S_- : trading volume of this day if the market index in previous day decreased.

α_{i+1} : disposition coefficient of $i+1$ week, $i = 0, 1, 2, \ldots, k$.

$\sum_j^n S_+$: accumulated value of S_+ from the j day to the n day.

$\sum_j^n S_-$: accumulated value of S_- from the j day to the n day.

j : starting day, $j = 5i + 1$.

n : ending day, $n = 5(i+1)$.

IV. RESULTS

The K-S test results show that all data fit normal distribution. In Tables 2 and 3, during the two financial crises, investors involved in both stock markets exhibit inconsistent disposition effects. The Taiwanese stock market shows a significant disposition effect during the Asian financial crisis. This result is similar to [1]. The Chinese stock market shows a significant disposition effect during the two financial crises, and this is consistent with Li and Zhang [11] and Visaltanachoti, Luo, and Lu [24]. Thus, Hypothesis 1 is supported. In further comparisons, both stock markets have more significant disposition effects during the appreciation periods, but not significant during the depreciation periods. Such the results are consistent with Shefrin and Statman [19] and Leal, Armada, and Duque [10], so Hypothesis 2 is also supported. In addition, although the disposition effect during appreciation periods exists in Taiwan and Chinese stock markets, the means of the disposition coefficients α are lower than 0.5 (the highest disposition coefficient exists in the Chinese stock market during the appreciation period and is 0.405). It implies that the disposition effect in both of Taiwan and China stock market are not much strong.

TABLE II. THE TEST OF THE DISPOSITION EFFECT IN THE TAIWANESE STOCK MARKET DURING FINANCIAL CRISES

Periods of Financial Crisis		**Change (%)**	**Disposition Coefficient α of Taiwan TAIEX Index**		
			Means	*S.D.*	*t−value*
Global financial crisis	*Entire Period 2006/06/01~2008/10/30*	-31.85	0.055	1.302	1.365
	Appreciation Period 2006/06/01~2007/10/29	40.14	0.152	0.424	3.027*
	Depreciation Period 2007/10/30~2008/10/30	-52.00	-0.083	0.437	-1.346
Asian Financial Crisis	*Entire Period 1996/03/01~1998/08/31*	34.30	0.097	0.443	2.631*
	Appreciation Period 1996/03/01~1997/07/31	106.39	0.220	0.386	5.181**
	Depreciation Period 1997/08/01~1998/08/31	-34.51	-0.718	0.463	-1.203

* $p < 0.05$; ** $p < 0.01$

TABLE III. THE TEST OF THE DISPOSITION EFFECT IN CHINESE STOCK MARKET DURING FINANCIAL CRISES

The Periods of Financial Crisis		**Change (%)**	**The Disposition Coefficient α of Shanghi SE Composite INDEX**		
			Means	*S.D.*	*t–value*
Global Financial Crisis	Entire Period 2006/06/01~2008/10/30	4.71	0.190	0.480	4.307**
	Appreciation Period 2006/06/01~2007/10/16	261.72	0.405	0.392	8.501**
	depreciation period 2007/10/17~2008/10/30	-70.78	-0.097	0.436	-1.596
Asian Financial Crisis	Entire Period 1996/03/04~1998/08/31	91.07	0.131	0.457	3.179*
	Appreciation Period 1996/03/04~1997/05/12	149.24	0.233	0.399	4.490**
	Depreciation Period 1997/05/13~1998/08/31	-21.45	0.038	0.490	0.624

* $p < 0.05$; ** $p < 0.01$

Tables 2 and 3 show the inconsistent disposition effects in the stock markets of Taiwan and China, and this is related to the change rate of the appreciation or depreciation period. For the Taiwanese stock market, as shown in Table 2, the investors quitted the stock market during the depreciation period because of a panic after the 2007 subprime mortgage crisis caused a global financial crisis, which led the stock market decline up to 52% and totally drop of 31.85% during the financial crisis period. However, the decline is relatively smaller during the depreciation period in the 1997 Asian financial crisis, and is only decrease 34.51%. During entire period, the stock market still increased up to 34.3%. It shows that investors in the Taiwanese stock market were reluctant to sell losing stocks during the Asian financial crisis and expected the market to be reversed; thus, the disposition effect generally existed.

In the Chinese stock market, as shown in Table 3, it is clear that there is a considerable rise in the appreciation periods of the global financial crisis and the Asian financial crisis (261.72% and 149.24%). Based on the views of De Bondt [6], this may cause investors to frequently buy and sell in the stock market, leading to a disposition effect. Additionally, during the depreciation periods in the two financial crises, the drop of stock index is relatively smaller and moderate. The stock index totally rose by 4.71% and 91.07%, respectively. It implies that the adverse impact on China was minor during the two financial crises periods. In other words, the Chinese stock market had a significant disposition effect during the global financial crisis and the Asian financial crisis.

TABLE IV. THE DISPOSITION EFFECT OF SHANGHAI A-SHARE AND B-SHARE MARKETS TAIWANESE STOCK MARKET DURING FINANCIAL CRISES

Stock Market	**Disposition Coefficient α**		
	Means	*S.D.*	*t − value*
Shanghai A-shares	0.177	0.483	4.004**
Shanghai B-shares	0.105	0.515	2.236*

* $p < 0.05$; ** $p < 0.01$

Furthermore, the Chinese stock markets are divided into two classes of shares: A-shares, which are confined to local investors; and B-shares, which are restricted to foreign investors. After examining the disposition coefficient in China's A-share and B-share markets, the both markets show significant disposition effects, as shown in Table 4. However, the difference of the disposition effect between A-shares and B-shares is not significant by further performing one-way ANOVA (F=1.231, $p > 0.05$). Thus, the evidence implies that the difference of the disposition effect in the different composition of investors is not significant. This finding is inconsistent with the views of O'Connell and Teo [14], Shapira and Venezia [16], and Visaltanachoti, Luo, and Lu [24].

V. CONCLUSION

As the mention of Barber, Lee, Liu, and Odean [1], the sharp rises and drops of stock markets before and after financial crises provide good timing for studying the disposition effect. This paper examined the disposition effect

under the financial crises and found that inconsistent exist in the Taiwan and China stock markets during appreciation and depreciation period of financial crises. The main implications of empirical results are concluded as follows.

Under the impact of financial crises, a more significant disposition effect exists in appreciation period and that no disposition effect exists in depreciation period for the two stock markets. This finding implies that the investors may form a self-control mechanism in order to prevent loss expansion when the financial crisis occurs, and then they will sell losing assets once the losses exceed their respective limit of tolerance. On the other hand, the investors might be herding and panic to sell the losing stocks because pessimistic information is continuously released from markets during financial crisis. Thus, the crisis finally results in a greater drop and the degree of the disposition effect would be obviously offset in the appreciation period. In addition, the empirical results indicate that the disposition effect exists for A-shares and B-shares in Chinese stock market, but there are not significant differences between A-share and B-share with respect to the degree of the disposition effect. It means that the disposition effect is not related to the composition of investor. Based on this, in order to realize the relationship between the disposition effect and the composition of investors, more transaction data of individual investors should be collected and incorporated to verify whether individual investors have a stronger disposition effect than institutional investors do, as suggested by Shapira and Venezia [16] and O'Connell and Teo [14].

Behavioral finance theory has led to many studies on mental effects and behavior biases, but this paper only examines the single behavioral bias, disposition effect, in the Taiwanese and Chinese stock market without distinguishing the composition of investors. For further studies, if the limitation on data acquisition can be overcome, or further comparisons are made to focus on the antecedence and consequence of the disposition effect and the different types of investment behaviors and psychology, the full feature of the disposition effect caused by investors can be discussed more accurately and comprehensively.

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