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How to Invest Safely in Emerging Markets during the Global Financial Crisis: A Case Study of Taiwan

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How to Invest Safely in Emerging Markets during the Global Financial Crisis: A Case Study of Taiwan

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I. Introduction

In response to the rapid development and intense competition in the global financial market, the Taiwan Government had relaxed the restrictions on security lending. In 2003, the Taiwan Stock Exchange set up the security lending system. In 2005, the Taiwan Authority further allowed Qualified Foreign Institutional Investors (QFIIs) to participate in security lending. In 2007, the Authority established a security lending center and allowed security broker and securities finance companies to engage in security lending. An amendment to the Guidelines for Investment and Security Management by Foreign Investors and Overseas Chinese was also made to allow for security lending by QFIIs. In 2011, the QFIIs contribute to 1/3 of the total equity market value and the number of security lending stocks had reached 4.3 million with a total value of $239 trillion. QFIIs are the largest player in Taiwan's stock market.

With the stocks that QFIIs own and no time limit on short covering, it is very easy for QFIIs to short sell using security lending. The Taiwan stock market index crashed by 57.5% during the 2008 financial crisis from 9309 points in May 2008 to 3411 points in November 2008.Surprisingly, the degree of decline in Taiwan stock market was even greater than the US stock market, which was the starting country of the global financial crisis. Therefore, the legislators in Taiwan proposed to ban security lending for short selling by QFIIs on 24 September 2008 in order to maintain market order and stabilization. On 29 September 2008, the Authority announced more strict restrictions on security lending and short sell. On 27 July 2011, the Euro crisis again caused a crash in Taiwan stock market. The stock market index fell from 8819 points to 6877 points on 26 September, representing a decline of 22%. The investors suffered great losses. The issue of security lending for short sell by QFIIs was again put on the table and the Authority further tightened the control for security lending.

Due to the announcement by the Federal Reserve on 22 May 2013 that QE was likely to shrink, stock markets around the world had experienced a serious fall; for example, the Japanese market fell by 21%. Nasdaq fell by 4.4%. Both the Brazilian and Russian stock markets declined by 15%. However, the Taiwan stock market had a slight rise of 5.4%. Following the critique of security lending during the financial crisis (Swartz and Connolly, 2009), this study aims to examine the causality relationship between security lending by QFIIs and stock price crash. Specifically, we test if security lending by QFIIs during the financial crisis (2007.7.1~2011.11.28) has the ability to stabilize the market. The organization of this paper is as follows. The literature review is provided in Section 2. In Section 3, we discuss the methods used in this paper, including Granger Causality and EGARCH models, and the experimental design. Descriptions of the data and the results are provided in Section 4 and 5, respectively. A conclusion is provided in Section 6.

II. Literature Review

Previous research has discussed whether institutional investors have the advantage on picking stocks. Jensen (1968) first proposes that institutional investors do not have a stock-picking advantage. In contrast, recent studies by Kent et al. (1997) and Chen et al. (2000) find that institutional investors have the stock-picking advantage in US mutual funds. San (2007), however, reports that in the post-1990s,

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compared to institutional investors, individual investors have 2% abnormal returns every month. Fama and French (2010) also find that if we consider the transaction management costs, returns on equity fund is no better than the stock index, suggesting that institutional investors have no stock-picking advantage. In Asia, Kang and Stulz (1997) find that between 1975 and 1991, most foreign institutional investors have better stock-picking skills. Seasholes (2000) also suggests that the foreign institutional investors in Taiwan are able to buy (or sell) before positive (or negative) news are announced. Foreign institutional investors have better stock-picking ability. However, Choe et al. (2001) find that in Korea institutional investors does not have better stock-picking ability in medium and large trading transactions. Deng et al. (2011) show that institutional investors in China have positive (or negative) short- and long-run cumulated abnormal returns when increasing (or decreasing) their holdings. The above review reveals current conflicting findings on institutional investors' stock-picking ability among countries.

Moreover, prior studies have examined whether security lending is mostly conducted by informed investors. Seneca (1967) reports a negative relationship between security lending for short selling and stock prices, implying a bear market. McCorry and Swan (1998) find that 15 minutes after security lending for short selling, the stock prices in the Australian stock market fall. Diether, Lee and Werner (2008) prove a leading and lagging relationship between stock prices and security lending for short selling. Especially when there is a rapid rise in stock prices, the volume of short selling increases, suggesting an information advantage by short sellers.Karpoff and Lou (2010) suggest that short selling is a warning for financial problems in companies. Christophe, Ferri and Hsieh (2010) find that security lending for short selling is usually related to informed trading and investors can profit from such strategy. Boehmer, Jones and Zhang (2010) further suggest that investors can profit from security lending based on operation predictions and earnings announcements. Engelberg, Reed and Ringgenberg (2012) also argue that the advantage of security lending for short selling stems from the ability to interpret the open market information. Lakonishok and Lee (2001) study all public companies listed on NYSE, AMEX and Nasdaq between 1975 and 1995 and find that inside traders use information from the futures market. Montier (2010) advances Petitt's (2000) research and show that inside traders do not usually trade in mid-year. However, when there are negative abnormal returns, they are usually on the sell-side.

Furthermore, investors usually dislike financial uncertainties. The prospect theory of Kahneman and Tversky (1979) suggests that people will give greater weighting to events that are certain and this is called the "certainty effect". Gilboa and Schmeidler (1989) propose the maxmin expected utility. They argue that investors dislike uncertainty and when they face with uncertainty, they will make decisions in the worst scenario. Heath and Tversky (1991) propose the competence effect and argue that when facing uncertainty, investors' attitude will be influenced by their competence. That is, confident investors will be willing to participate in uncertain investment while doubtful investors will not. Coval and Moskowitz (1999) find that fund managers believe that they have an information advantage. Cao et al. (2005) hypothesize that the higher the level of uncertainty, the less likely the investors will participate in the market. Using dynamic asymmetric GARCH, Caporin and McAleer (2006) further show that the leverage effect is not only related to the type of news (good or bad news) but also the seriousness of good or bad news.

Finally, the volatility of financial asset prices has been studied

by prior research. Cox et al. (1976) and Black (1976) show that current stock market returns and future volatility are negatively related. Campbell et al. (1992), Laopodis (1997) and Yang (2000) find evidence of asymmetric volatility in the foreign exchange and stock markets. When there is positive news, the volatility of future price is smaller. In contrast, negative news has greater impact on future price volatility. This is called the leverage effect, where the negative news impact is greater than the positive news impact. This is because a fall in stock price will cause a rise in debt to equity ratio, increasing the riskiness of shareholders and of their future cash flow.

The cause of financial crisis has been a hot debate. The legislators in Taiwan had questioned that security lending by QFIIs was the cause of Taiwan stock market crash during the financial crisis. Thus, this study incorporates the security lending data by QFIIs to examine the causality relationship between the leverage effect and security lending by QFIIs using EGARCH model and program trading. The hypotheses are as follows:

H1: During the financial crisis, allowing security lending by QFIIs can reduce the leverage effect, thereby lowering the effect of negative news on investors.

H2: During the financial crisis, the leverage effect that negative news has a greater impact on investors than positive news is the Granger cause of security lending by QFIIs.

H3: Holding the information of security lending by QFIIs can reduce investment uncertainty and increase investor confidence and investment performance.

III. Research Methods

Miller (1991) argues that opening up the futures market will not increase the volatility in the spot market; instead, it is likely to lower the volatility. However, Chen

and Lee (2007) suggest that by allowing QFIIs to invest in Taiwan's futures market for non-hedging purposes, the international hot money is likely to cause uncertainty in the financial market. Hedge funds that search for short-term inequality in international financial markets are likely to carry out one-side trade in large amounts, leading to instability in that country's financial market. Therefore, this study adopts the following methods to solve this puzzle.

a) Granger Causality Model and the Estimation Method

As the relationship between stock prices and investment behavior remains inconclusive, Granger (1969, 1988) causality test can be used to analyze how they are related. Testing if the coefficients of current y series and the past values of x series have causal relationship is similar to testing if the past values of x can explain the present values of y. That is, if adding a lagged value of x can increase the degree of explanation, or similarly the correlation coefficient of x and y are statistically significant, then we can conclude that y is Granger caused by x.

$$Y_{t1} = \delta_0 + \sum_{i=1}^{m} \delta_i Y_{t1-i} + \sum_{i=1}^{m} \gamma_i Y_{t2-i} + \varepsilon_t$$
$$Y_{t2} = \lambda_0 + \sum_{i=1}^{n} \lambda_i Y_{t2-i} + \sum_{i=1}^{n} \omega_i Y_{t1-i} + \nu_t \quad (1)$$

where ε_t and ν_t in Equation (1) are white noise error terms. *m* and *n* are the optimal lag periods based on SC's minimum value. The null hypothesis is that Y_2 has a Granger lead on Y_1. The alternative hypothesis is that Y_1 has a Granger lead on Y_2. If both γ and ω do not equal to 0, this means that there is bidirectional causality.

b) GARCH Model and the Estimation Method

GARCH (generalized autoregressive conditional heteroscedasticity) model was developed by Bollerslev (1986) based on a modification of ARCH (autoregressive conditional heteroscedasticity) model developed by Engle (1982). Let $\psi_{t-1} = \{y_{t-1}, x_{t-1}, y_{t-2}, x_{t-2}, ...\}$ denote the distribution of random error term in time period t-1, and the model is as follows:

$$\varepsilon_t \left| \psi_{t-1} \sim N(0, h_t) \right.$$

$$h_t = \alpha_0 + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2$$

where $\alpha_0 > 0, \alpha_i \geq 0, i = 1, ..., n$. GARCH(p,q) model overcomes the restriction that the latter term, α, is nonnegative and the model can be represented as follows:

$$y_t = x_t' \beta + \varepsilon_t \quad (2)$$

$$\varepsilon_t = \sqrt{h_t} v_t \quad (3)$$

$$h_t = \alpha_0 + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \beta_j h_{t-j} \quad (4)$$

where h_t is the conditional variance of the GARCH model, *p* is the order of the GARCH terms h^2 and *q* is the order of the ARCH terms ε^2. Therefore, the response of conditional variance to positive error term and negative error term is symmetric. However, in Finance, negative news often has greater impact on stock prices than positive news. Therefore, to overcome this weakness in the GARCH model, Nelson (1991) develops the conditional variance of EGARCH model which is adopted in this study and is presented below:

$$\ln(h_t) = \alpha_0 + \sum_{j=1}^{p} \beta Ln(h_{t-j}) + \sum_{i=1}^{q} (\alpha_i \left| \frac{\varepsilon_t}{\sqrt{h_t}} \right| + \gamma \frac{\varepsilon_t}{\sqrt{h_t}}) \quad (5)$$

If the coefficient of leverage effect *r* does not equal to 0, this shows that the response of conditional variance on positive error term and negative error term is asymmetric. Therefore, this study analyzes the effect of security lending on the stock market from the volatility point of view. Specifically, we compare the effects when the information of security lending (as at July 2007) is adopted or not.

In order to examine the possible asymmetric effect of security lending by QFIIs, this study adopts the news impact curve (Gao, 2006; Brooks, 2002; Pagan and Schwert, 1990) that can be used to explain the

asymmetric effects of positive and negative news on stock price volatility. The asymmetry response coefficients from the stock price volatility and previous model can then be used to draw the news impact curve. The methods are described in detail below:

1. Let $z = \frac{\mu}{\sigma}$. From the EGARCH model, we can estimate the conditional variance series σ^2 and take the square root, which is then divided by the error term to derive *z*.
2. Rank *z* from the lowest to the highest and structure a new series containing *z*.
3. Use the coefficients α and γ from the EGARCH model and the following equation to drive *s*:

$$\log(s) = \alpha * abs(z) - \gamma * z \qquad (6)$$

4. Plot *z* and *s* on a graph (where the x-axis is *z*, representing the degree of market deviation; y-axis is *s*, indicating the fearfulness on the part of investors) to draw the news impact curve and observe the impact of security lending by QFIIs on the stock market. If the curve tilts upwards to the left with a large angle, it suggests a high degree of panic.

c) Experimental Design and the Estimation Method

This study uses two stages of testing to examine if the market is strong efficient during the financial crisis. First, we use program trading to obtain the optimal trading simulation. The purpose is to see if holding the security lending information of QFIIs can enhance the trading performance in the futures market. Secondly, we substitute the coefficients from the first stage of optimal transaction to Taiwan financial market data. If investors are able to make abnormal returns, this suggests that Taiwan financial market is not strong efficient.

Based on the design concept of program trading (Williams, 1999), we include a second set of data (data2) as the filter in addition to the initially proposed Taiwan index futures data (data1) to increase the trading performance. Therefore, to ensure the fairness in evaluation, the two models are estimated based on the following trading strategies. Model 1 considers only data1 and data2 (which is the net trading value in the spot market by the three largest institutional investors). The concept of program trading is to buy if the net value of data2 is greater than 0 or if the closing price of data1 is greater than the 10-day moving average price, and vice versa. The position should be closed out if the profit is greater than 300 points or the loss is greater than 100 points.

The design concept of Model 2 considers data1, data2 (the net trading value in the spot market by the two largest institutional investors), and data3 (the security lending information by QFIIs), and the following conditions: (1) the closing price of data2 is greater than the 20-day moving average price; (2) the closing price of data3 is greater than the 5-day moving average price; and (3) the 14-day RSI closing price of data1 is greater than 60. If all three conditions have been met, a long position is adopted. In contrast, if the following three conditions have been met (i.e., (1) the closing price of data2 is smaller than the 20-day moving average price; (2) the closing price of data3 is smaller than the 5-day moving average price; and (3) the 14-day RSI closing price of data1 is smaller than 25) a short position is adopted. The position is closed out if the profit is greater than 350 points or the loss is greater than 100 points.

Apart from these basic settings, this study also uses the optimal MultiCharts[1] program trading to conduct back-testing. By comparing the trading performance in the optimal condition, we can see if including the security lending information of QFIIs can enhance the trading performance of the three largest institutional investors in the futures market.

IV. Data

To analyze the effect of security lending by QFIIs in Taiwan futures market, the data used in this study includes: (1) daily closing price of Taiwan futures market, obtained from Taiwan Futures Exchange; (2) net trading value by QFIIs in the futures market, obtained from Taiwan Futures Exchange; and (3) the security lending data, obtained from Taiwan Stock Exchange. In order to standardize the estimation, each variable is calculated based on the daily closing price of the futures market using the logarithm of returns r_t, defined as $r_t = \ln(P_t / P_{t-1}) \times 100$, where P_t is the closing price at time *t* and P_{t-1} is the closing price at time *t-1*. The distribution of returns (or volatility) of each variable shows skewness. It is common to observe fat-tailed distribution in financial data. Also, all returns (or volatility) are characterized by autocorrelation. Note that this study focuses on the stock price changes after opening up for security lending, which is not necessary for the purpose of short selling.

The sample covers the pre-period from 2 July 2007 to 28 November 2011 (i.e., the global financial crisis period), including 1123 trading days and the post-period from 29 November 2011 to 20 August 2013, including 406 trading days. That is, a total of 1529 trading days over the entire sample period. As the number of security lending for each stock differs everyday, we multiply the number of security lending stocks with its market value to obtain the total value of security lending each day and to calculate the volatility. The data on net trading value of QFIIs in the futures market and the security lending by QFIIs is also divided into pre-period (i.e., the global financial crisis) and post-

[1] Please refer to http://www.multicharts.com.

period (where the Taiwan Government opened up for security lending by QFIIs from July 2007). In the empirical research, we often use daily trading volatility. If the estimated coefficient of this variable is significant, it shows that the market and thus the price reacts very quickly. The net trading value and the amount of security lending by QFIIs should then quickly reflect the change according.

V. Results

a) *Unit Root Test of EGARCH Model Variables*

To ensure the validity of empirical results, we need to ensure that the series are stationary. The results in Table 1 show that at level, the daily closing price and trading volume of the Taiwan Stock Exchange, the options in open position in the futures market and the security lending value in the Taiwan Stock Exchange all reject the null hypothesis. That is, the variables are very stable. Since I(0) is a stationary series, we can proceed with Granger causality test and EGARCH estimation.

Table 1 : Unit root test of EGARCH model variables

	Level	
Variable / Model	Intercept	Intercept and Trend
LZTXAF26063729	-33.6597(0)*	-33.6487(0)*
LZTXAF37294135	-19.8778(0)*	-19.8661(0)*
LZTXAF26064135	-39.2240(0)*	-39.2198(0)*
LOAN26063729c	-30.3924(0)*	-30.4035(0)*
LOAN37294135c	-20.5800(0)*	-20.5551(0)*
LOAN26064135	-36.5273(0)*	-35.5168(0)*
FSPOT26063729	-20.5154(0)*	-20.5337(0)*
FSPOT37294135	-7.2072(2) *	-7.2020(2)*
FSPOT26064135	-23.9105(0)*	-23.9396(0)*
FS26063729SPOTL	-34.83513(0)*	-34.92417(0)*
FS26064135SPOTL	-40.09275(0)*	-40.28587(0)*

*Note: According to Mackinnon(1991), *, **, *** shows significance level at 1%, 5% and 10%. ( ) shows the number of lag periods. LZTXAF, SPOT and LOAN represent Taiwan futures market, daily closing price of the spot market, and the security lending with the Taiwan Stock Exchange, respectively. The numbers behind each variable 2606, 3729 and 4136 shows the data period 2007.07.02, 2011.11.28, and 2013.08.20 respectively.*

b) *Granger Causality Test*

In order to simulate program trading of the time series in the next section, this section conducts the Granger Causality Test based on the security lending data from 25 November 2004 to 20 August 2013 (obtained from TEJ database). The results show that spots (FSPOT19654135)and futures (LZTXAF19654135) by QFIIs are Granger cause of each other. In addition, futures are the Granger cause of security lending (LOAN19654135C). To save space, we only report the models for QFIIs here.

Table 2 : Granger causality test of QFIIs for the entire period

Dependent variable: LZTXAF19654135			
Excluded	Chi-sq	df	Prob.
FSPOT19654135	5.521736	2	0.0632
LOAN19654135C	1.297957	2	0.5226
All	6.707912	4	0.1522
Dependent variable: FSPOT19654135			
Excluded	Chi-sq	df	Prob.
LZTXAF19654135	28.63947	2	0.0000
LOAN19654135C	0.315197	2	0.8542

All	30.59043	4	0.0000

Dependent variable: LOAN19654135C

Excluded	Chi-sq	df	Prob.
LZTXAF19654135	8.190241	2	0.0167
FSPOT19654135	0.272018	2	0.8728
All	9.112682	4	0.0583

c) EGARCH Model Estimation

i. *Entire sample period (2007.7.2~2013.8.20)*

a. *EGARCH Model Estimation excluding Security Lending by QFIIs*

All variables in this stage are significant at the 1% level. α is 0.184719, β is 0.986434 and γ is negative (-0.074005). The results suggest that the leverage effect has a greater impact on negative news, causing investors to become panic. The positive news leverage effect is represented by 0.1107=(0.1847-0.0740), whereas the negative news leverage effect can be represented by 0.2587=(0.1847+(-0.0740)*(-1)), as shown in Table 3.

Table 3 : EGARCH model estimation for the entire period (excluding security lending)

	Coefficient	Std. Error	z-Statistic	Prob.
FSPOT26063729	8.81E-07	2.26E-08	38.97324	0.0000
C	-0.00075	0.00025	-2.96067	0.0031
		Variance Equation		
C	-0.25851	0.03353	-7.70822	0.0000
|RES|/SQR[GARCH](1)	0.18471	0.01641	11.2503	0.0000
RES/SQR[GARCH](1)	-0.07400	0.01345	-5.49982	0.0000
EGARCH(1)	0.98643	0.00312	315.468	0.0000
R-squared	0.27252	Prob(F-statistic)		0.00000

b. *EGARCH Model Estimation including Security Lending by QFIIs*

All variables in this stage are significant at the 1% level. α is 0.170173, β is 0.987195 and γ is negative (-0.058180). The results suggest that the leverage effect has a greater impact on negative news, causing investors to become panic. Table 4 shows that the positive news leverage effect is represented by 0.112=(0.1847-0.0740). The negative news leverage effect is 0.2282, which is less than the leverage effect of 0.2587 when security lending by QFIIs is not included.

Table 4 : EGARCH model estimation including security lending by QFIIs

	Coefficient	Std. Error	z-Statistic	Prob.
FSPOT37294135	7.41E-07	2.28E-08	32.49105	0.0000
LOAN37294135C	1.42E-06	5.55E-08	25.62506	0.0000
C	-0.00099	0.00023	-4.21674	0.0000
		Variance Equation		
C	-0.24261	0.03461	-7.00887	0.0000
|RES|/SQR[GARCH](1)	0.17017	0.01654	10.2878	0.0000
RES/SQR[GARCH](1)	-0.05818	0.01293	-4.49734	0.0000
EGARCH(1)	0.98719	0.00294	334.750	0.0000
R-squared	0.36099	Prob(F-statistic)		0.00000

ii. *Financial Crisis Period (2007.7.2~2011.11.28)*

a. *EGARCH Model Estimation excluding Security Lending by QFIIs*

All variables in this stage are significant at the 1% level. α is 0.197811, β is 0.983400 and γ is negative (-0.091169). The results suggest that leverage effect has a greater impact on negative news, causing investors to become panic. The positive news leverage effect is represented by 0.1067=(0.1978-0.0911), whereas the negative news leverage effect is 0.2889, as shown in Table 5.

Table 5 : EGARCH model estimation during the financial crisis (excluding security lending)

	Coefficient	Std. Error	z-Statistic	Prob.
FSPOT26063729	8.44E-07	2.74E-08	30.85404	0.0000
C	-0.00091	0.00035	-2.58228	0.0098
		Variance Equation		
C	-0.28968	0.04247	-6.82049	0.0000
|RES|/SQR[GARCH](1)	0.19781	0.02291	8.63174	0.0000
RES/SQR[GARCH](1)	-0.09116	0.01711	-5.32620	0.0000
EGARCH(1)	0.98340	0.00420	233.970	0.0000
R-squared	0.26019	Prob(F-statistic)		0.00000

b. *EGARCH Model Estimation including Security Lending by QFIIs during the Financial Crisis*

All variables in this stage are significant at the 1% level. α is negative (0.206398), β is negative (0.984182) and γ is negative (-0.069186). The results suggest that leverage effect has a greater impact on negative news, causing investors to become panic. The positive news leverage effect is represented by 0.1371= (0.2063-0.0691), whereas the negative news leverage effect is 0.2755, as shown in Table 6.

Table 6 : EGARCH model estimation including security lending during the financial crisis

	Coefficient	Std. Error	z-Statistic	Prob.
FSPOT26063729	7.38E-07	2.79E-08	26.41038	0.0000
LOAN26063729C	1.55E-06	7.91E-08	19.64516	0.0000
C	-0.00094	0.00031	-2.97627	0.0029
		Variance Equation		
C	-0.29454	0.04952	-5.94691	0.0000
|RES|/SQR[GARCH](1)	0.20639	0.02472	8.34727	0.0000
RES/SQR[GARCH](1)	-0.06918	0.01751	-3.95021	0.0001
EGARCH(1)	0.98418	0.00459	214.313	0.0000
R-squared	0.35124	Prob(F-statistic)		0.00000

This study further plots the news impact curve based on the EGARCH model estimates, as shown in Figure 1

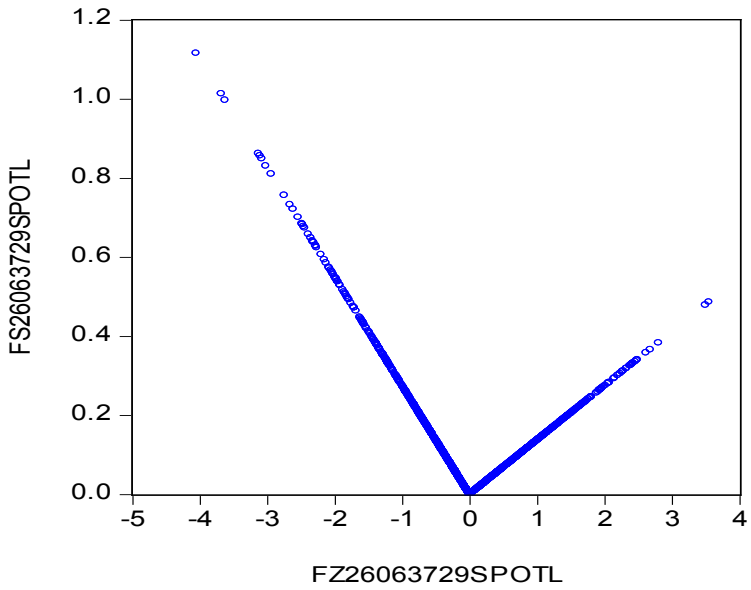

Figure 1 : News impact curve including security lending by QFIIs during the financial crisis

Figure 1 shows that when the news impact is less than 0 (i.e., when having negative impacts), the curve is steeper compared with the positive impacts. The figure suggests that negative news impact will cause greater volatility in stock prices.

iii. *Post-Financial Crisis Period (2011.11.29~2013.08.20)*

a. *EGARCH Model Estimation excluding Security Lending by QFIIs*

Only γ is significant at the 2% level. Although γ is negative (-0.125388) suggesting that leverage effect has a greater impact on negative news, α (0.092925) and β (0.365130) are not significant at the 10% level, as shown in Table 7.

Table 7 : EGARCH model estimation during the post-financial crisis period

	Coefficient	Std. Error	z-Statistic	Prob.
FSPOT37294135	1.00E-06	6.87E-08	14.55211	0.0000
C	-0.00021	0.00038	-0.55612	0.5781
		Variance Equation		
C	-6.28259	3.38290	-1.85716	0.0633
|RES|/SQR[GARCH](1)	0.09292	0.08523	1.09027	0.2756
RES/SQR[GARCH](1)	-0.12538	0.05655	-2.21723	0.0266
EGARCH(1)	0.36513	0.34671	1.05312	0.2923
R-squared	0.36472	Prob(F-statistic)		0.00000

b. *EGARCH Model Estimation including Security Lending by QFIIs during the Post-Financial Crisis Period*

In this stage, only γ is not significant at the 10% level. α (0.124766) and β (-0.553569) are negative but insignificant while γ is positive (0.078967). The results suggest that the leverage effect has a smaller impact on negative news compared to positive news, as shown in Table 8.

Table 8 : EGARCH model estimation including security lending by QFIIs during the post-financial crisis period

Dependent Variable: STO1				
	Coefficient	Std. Error	z-Statistic	Prob.
FSPOT37294135	7.27E-07	6.17E-08	11.79288	0.0000
LOAN37294135C	1.46E-06	9.32E-08	15.63370	0.0000
C	-0.00051	0.00034	-1.47547	0.1401
		Variance Equation		
C	-15.6821	3.30661	-4.74265	0.0000
|RES|/SQR[GARCH](1)	0.12476	0.07482	1.66745	0.0954
RES/SQR[GARCH](1)	0.07896	0.05796	1.36228	0.1731
EGARCH(1)	-0.55356	0.33218	-1.66645	0.0956
R-squared	0.36472	Prob(F-statistic)		0.00000

Similarly, this study plots the news impact curve based on the EGARCH model estimates in the post-financial crisis period, as shown in Figure 2.

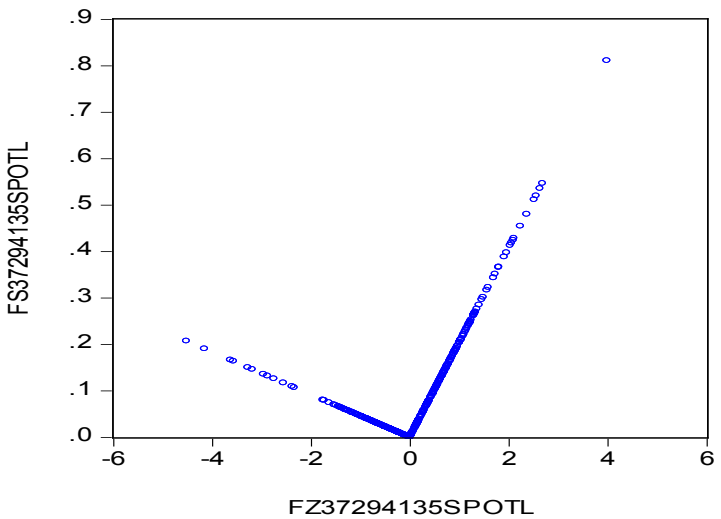

Figure 2 : News impact curve including security lending by QFIIs in the post-financial crisis period

Figure 2 shows that when the news impact is less than 0 (i.e., when having negative impacts), the curve is not as steep compared to positive impacts. The result suggests that positive news impact will cause greater volatility in stock prices.

This study also compares the effect on investor behavior when security lending variable is excluded and included by conducing γ coefficient difference test before and after the financial crisis (as shown in Table 9). The t-value is calculated as follows:

$$t = (|\gamma_2| - |\gamma_1|) / \sqrt{\frac{\hat{\sigma}_1^2}{n_1} + \frac{\hat{\sigma}_2^2}{n_2}}$$

where γ_1, γ_2 are the γ coefficients before and after the financial crisis. $\hat{\sigma}_1^2, \hat{\sigma}_2^2$ are the square of γ coefficients. n_1, and n_2 represent the sample size. As in the post-financial crisis period, the γ coefficient is a positive value. It is only necessary to conduct the γ coefficient difference test for the pre-financial crisis period. The t-value is 5.06 (as shown in Table 9). This suggests that there is a significant difference in γ coefficients in the pre-financial and post-financial crisis periods. In other words, although the financial crisis has already happened, if we do not incorporate security lending information when setting the investment strategy, investors will have greater concern about their future cash flow risk. Additionally, this study examines the difference between excluding and including security lending variable in the pre-financial crisis period. The t-value is 6.66. The result suggests that if including the security lending information when setting the investment strategy, investors have less concern about their future cash flow risk. Similarly, we can test for the financial crisis period, the t-value is 6.68. Again, the result suggests that if including the security lending information when setting the investment strategy, investors have less concern about their future cash flow risk. Overall, the evidence supports hypothesis 1 that opening up for security lending by QFIIs can reduce the leverage effect and reduce the larger impact of negative news (compared to positive news) on investors.

Table 9 : Leverage ratio of security lending variable and difference test for γ coefficients of security lending

Model	Excluding security lending		Including security lending		Difference test
	Coefficient	Std. Error	Coefficient	Std. Error	t-value
Financial crisis period (2007.07.02~2011.11.28)	-0.091169	0.017117	-0.069186	0.017515	6.66
Post-financial crisis period (2011.11.29~2013.08.20)	-0.125388	0.056552	0.078967	0.057967	---
Entire period (2007.07.02~2013.08.20)	-0.074005	0.013456	-0.058180	0.012936	6.68

d) Granger Causality Test of Security Lending and the Leverage Ratio

i. Granger Causality Test of Security Lending and the Leverage Ratio during the Financial Crisis

During the financial crisis, all variables are significant and the γ coefficient is negative, suggesting that negative news has a greater impact on investors than positive news. Also, the negative news leverage effect (0.28) during the financial crisis is greater than that in the post-financial crisis period. The negative news leverage effect over the entire sample period is 0.25 and after including the security lending information, the leverage effect reduces to 0.26 and 0.22 for the financial crisis period and the post-financial crisis period, respectively. The evidence may be explained by the ability of QFIIs to control the market using security lending.

This study examines whether QFIIs have the ability to stabilize the market during the financial crisis period (2007.7.1~2011.11.28). Therefore, we further compare the causality relationship between the security lending leverage ratio and security lending by QFIIs. As all variables are consistent with I(0) stationary relationship based on the previous unit root test, we can proceed with the causality test. After a number of VAR estimations, we find that lagging two periods is the best estimation, significant at the 5% level and we choose Model (1) with the minimum SC value. The results are presented in Table 10.

Table 10 : Causality test of security lending leverage ratio and security lending by QFIIs

Dependent variable: FS26063729SPOTL			
Excluded	Chi-sq	df	Prob.
LOAN26063729C	0.022416	2	0.9889
All	0.022416	2	0.9889

Dependent variable: LOAN26063729C			
Excluded	Chi-sq	df	Prob.
FS26063729SPOTL	5.444871	2	0.0657
All	5.444871	2	0.0657

Note: This model includes security lending variable (LOAN26063729C) and changes in security lending (FS26063729SPOTL). The latter proxies for the leverage effect after including the security lending variable.

Further, after incorporating the security lending variable, the relationship between the leverage effect and the security lending variable is significant at the 10% level (with p-value of 0.0657). This shows that the leverage effect after incorporating the security lending variable does have an impact on the stock market. That is, the impact of negative news on investors is greater than positive news. The results also suggest that investors will be concerned that the leverage effect from the future risk in cash flow is the Granger cause of security lending by QFIIs rather than the other way round. Therefore, based on this study's findings, the argument by the public that security lending by QFIIs is the cause for the crash in Taiwan stock market is incorrect. However, the story behind this phenomenal might confirm Engelberg et al. (2012) and Montier's (2010) arguments. With its huge market share, QFIIs can get profit by just following the trend. It's an interesting topic for further investigation.

The leverage effect after incorporating security lending variable falls from 0.28 to 0.26. This shows that during the financial crisis, the leverage effect will reduce as the security lending by QFIIs in Taiwan stock market increases, thereby helping to stabilize the stock market. Therefore, we find evidence supporting hypothesis 2; that is, the leverage effect that negative news has a greater impact on investors than positive news is the Granger cause of security lending by QFIIs. However, this hypothesis is valid only during the financial crisis, and we will present the evidence in the next section.

ii. *Granger Causality Test of Security Lending and the Leverage Ratio for the Entire Sample Period*

This study also investigates whether security lending by QFIIs has the ability to stabilize the market and we examine the causality relationship between the security lending leverage ratio and security lending by QFIIs by including the security lending variable. As all variables are consistent with I(0) stationary relationship based on the previous unit root test, we can proceed with the causality test. After a number of VAR estimations, we find that lagging one period is the best estimation, significant at the 5% level and we choose Model (1) with the minimum AIC value, which is then used as the estimation model to conduct the following tests. We do not find evidence of a causality relationship and the results are presented in Table 11.

Table 11 : Causality test of security lending leverage ratio and security lending by QFIIs for the entire sample period

Dependent variable: FS26064135SPOTL			
Excluded	Chi-sq	df	Prob.
LOAN26064135C	1.240269	1	0.2654
All	1.240269	1	0.2654
Dependent variable: LOAN26064135C			
Excluded	Chi-sq	df	Prob.
FS26064135SPOTL	0.385363	1	0.5347
All	0.385363	1	0.5347

e) *An Evaluation of Security Lending by QFIIs on the Taiwan Index Futures Trading Performance of the Three Largest Institutional Investors*

This section discusses whether the three largest institutional investors in Taiwan are able to make better trading profits based on the security lending information. The empirical results are presented in the following sections.

i. *QFIIs*

Based on the above experimental models, we find that in the pre-financial crisis period (2004.11.25~2007.7.1) and using Model 1 (i.e., using the data from Taiwan index futures and spot market information of QFIIs), the net trading profit of QFIIs in a 2.5 year period (i.e., the first stage) between 25 November 2004 and 1 July 2007 is -$128,000. Since the net trading is a loss, it shows that the investment strategy based on this information is ineffective. Therefore, it is not necessary to simulate the trading in the other two sample periods (2008.11.28~2011.11.28 and 2011.11.28~2013.8.16). Using the third set of information (i.e., security lending) to simulate optimal program trading in Model 2, the net trading profit in the first stage, the pre-financial crisis (2004.11.25~2007.7.1) period, is $332,200 (as shown in Table 12). If the optimal simulated variable is used in the second stage (2007.7.2~2011.11.28), the net trading profit is $502,600 (grown by 51%). Again if we use the optimal simulated variables in the third stage where QE is likely to shrink, there is a net trading profit of $664,600 (grown by 32%). Therefore, the results suggest that simulated trading strategy is effective. If investors can get hold of the security lending information, they are able to make profits. The evidence also suggests that an efficient market does not exist.

Table 12 : Trading analysis of investment trusts, dealers and QFIIs before and after the financial crisis

Unit: $, %

Net profits	2004.11.25~2007.7.1		2007.7.2~2011.11.28		2011.11.29~2013.8.20	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Investment Trusts	87,000	232,200	27,200 (-69%)	435,600 (88%)	-612,000 (-2350%)	373,400 (-14%)
Dealers	308,800	372,200	407,800 (32%)	732,800 (97%)	80,400 (-80%)	668,400 (-9%)
QFIIs	-128,000	332,200	---	502,600 (51%)	---	664,600 (32%)

Note: The number in the bracket shows the growth rate between two periods.

ii. *Investment Trusts*

Similarly, we repeat the above experiment in investment trusts. The results show that in the pre-financial crisis period (2004.11.25~2007.7.1) and using Model 1 (i.e., using the data from Taiwan index futures and spot market information of investment trusts), the net trading profit of investment trusts in a 2.5 year period (i.e., the first stage) between 25 November 2004 and 1 July 2007 is $87,000 (as shown in Table 12). Since the net trading is a loss, it shows that the investment strategy based on this information is ineffective. However, we use the optimal simulated variables till the recent date (2013.8.16 where the announcement that QE was likely to shrink was made), the net trading loss is -$612,000 (reduced by 2350%). This again shows that this set of information does not contribute toa profitable trading strategy. Using the third set of information (i.e., security lending) to simulate optimal program trading in Model 2, the net trading profit in the pre-financial crisis (2004.11.25~2007.7.1) period is $232,200. If we use the optimal simulated variables in the second stage (the financial crisis period, 2007.7.2~2011.11.28), the net trading profit is $435,600 (grown by 88%). Again if we use the optimal simulated variables in the third stage where QE is likely to shrink, the net trading profits reduce to $373,400 (declined by 14%). Therefore, the results suggest that the simulated trading strategy is effective in a volatile market. However, due to the correction after the Euro crisis in 2011 and the ease of market panic, this trading strategy becomes less effective.

iii. *Dealers*

The results show that in the pre-financial crisis period (2004.11.25~2007.7.1) and using Model 1 (i.e., the data from Taiwan index futures and spot market information of dealers), the net trading profit of dealers in a 2.5 year period (i.e., the first stage) between 25 November 2004 and 1 July 2007 is 308,800 (as shown in Table 12). When we use the optimal simulated variables till the year 2011 (i.e., the Euro crisis), the net trading profit is 407,800 (increased by 32%). If we use the optimal simulated variables till the recent date (i.e. 16 August 2013on which day an announcement for a likely withdrawn of QE was made), the net trading profit becomes $80,400 (reduced by 80%). The results suggest an effective trading strategy during the financial crisis period. Using the third set of information (i.e., security lending) to simulate optimal program trading in Model 2, the net trading profit in the pre-financial crisis (2004.11.25~2007.7.1) period is $372,200. If we use the optimal simulated variables in the second stage (the financial crisis period, 2007.7.2~2011.11.28), the net

trading profit is $732,800 (grown by 97%). Again if we use the optimal simulated variables in the third stage where QE is likely to shrink, the net trading profit reduces to $668,400 (declined by 9%). Therefore, the results suggest that the simulated trading strategy can generate profits during the financial crisis. The information on security lending of QFIIs is necessary for ensuring a positive trading performance. The results are consistent with the arguments by Kyle and Wang (1997). They suggest that in an incomplete competitive stock market, over-confident investors can simulate to trading strategies of informed traders to make profits, supporting hypothesis 3 (i.e., holding the information of security lending by QFIIs can reduce investment uncertainty and increase investor confidence and investment performance).

VI. Conclusion

Following the internationalization of financial markets, Taiwan Government opened up for security lending in July 2007 to encourage QFIIs to participate in Taiwan's securities market. Based on the security lending data in recent years and using program trading and EGARCH models, this study analyzes the volatility of returns in Taiwan's futures market to examine the effect of security lending on futures market. By using the daily closing price returns and total value of security lending, we find evidence of a leverage effect in Taiwan futures market and that opening up for security lending lessens the panic feeling of investors.

The results show that during the financial crisis, the leverage effect will be lowered caused by the increasing security lending by QFIIs in Taiwan stock market. Thus, adding security lending in the investment portfolio can help stabilize the stock market in Taiwan. In addition, we find that the leverage effect is the Granger cause of security lending by QFIIs. Moreover, based on the MultiCharts program trading experiments, we find that QFIIs buy and sell with known information and this can help increase trading performance. Meanwhile, the proportion of foreign ownership accounted for approximately 60% recently relative to the market three years also increased by about 350 billion Taiwan dollars. In conclusion, the results confirm the findings of Pope et al. (1994) that unless the market participants already hold the stocks, it is not possible for them to short sell and make arbitrage profits. Therefore, under the asymmetry of information and incomplete competition market, in order to protect the uninformed domestic investors in emerging market, the government should examine the relevant regulations and set contingency strategies for possible financial crisis before adopting financial open-door policy. For example, in Taiwan, the government limits the total order for short selling based on security lending and relies on National Stabilization Funds[2] to control the financial risk. However, the limitation of this study is that as we have adopted the security lending data, we are not able to conduct higher frequency data analysis which could be carried out by future studies.

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[2] In 1999, Ministry of Finance formally organizes the National Stabilization Fund, which basically includes four government funds: Public Service Pension Fund, the Postal Savings Fund, the Labor Insurance Fund, the labor pension fund, the scale is of five hundred billion Taiwan dollars. The National Stabilization Funds make a buy or sell order through eight government owned banks, which had over bought the stocks for four times from the end of 2009 to August 2011. It was found that when the eight government owned banks over-bought for more than 2% of the total market and changed trading strategy to over-sold, the stock market index would rise.

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