JUMPING RISK IN TAIWAN AND TAIEX OPTION RETURN IN TAIWAN

Wen-I Hsiao [1], Jung-Fan Chen [1], Jui-Chan Huang [*2], Tzu-Jung Wu[3]

[1]Department of Business Administration, National Kaohsiung University of Applied Science, Kaohsiung, Taiwan.

[2]Yango College, Fuzhou, 350015, China.

[3]/Institute of Human Resource Management, National Sun Yat-Sen University, Taiwan.

ABSTRACT

With low-interest environment in recent years, investment of financial commodity was unable to meet the requirements of necessary paid by society. Therefore, the traditional financial tool were replacing with derivative financial commodity which were high risk, high lever, and high complex; including option, forward contract, futures, credit default swap, and collateralized debt obligations. Global Board Options Exchanges were founded in 1983 that S&PS00 (SPX) index option which launched by the Chicago Board Options Exchange (CBOE). Moreover CBOE was the option which target on trade index at the earliest, and CBOE was the most popular exchange with option trade. Taiwan Futures Exchange (TFE) launched Taiwan weighted index options (TXO) in December 2001 and, and launched stock options in 2003. Currently TXO was the most actively traded options market in Taiwan, but almost had no stock options trading volume due to the release of warrants market. However warrants market and individual stock options had higher homogeneous and better mobility to influence the stock options market. Although Taiwan options market started lately, develops quite fast, the option of Taiwan index was the sixth volume in the global select token name in 2013, that showed that Taiwan index options was a good target on the options-related research. Due to the globalization of financial markets, the single original market waved turn into the global storm which that affected financial asset prices were no longer continuous fluctuations, and it showed a leaps of change by the Butterfly Effect. Because the price process included continuity and discontinuity, the spread and jump process was more accurate than Brownian motion (BM). Currently the derivatives study biased on interest rate futures, foreign futures or foreign exchange futures options and Taiwan index futures options. By the way, the study about the jumping risks related to Taiwan index options effects is rare.

KEYWORDS

Jumping risk, TAIEX Option Return, TXO, TFE, CBOE

I. INTRODUCTION

A. Research Purpose

This research focuses on the domestic Taiwan Stock Exchange Weighted Index (TAIEX) Option for the object; using regression model analysis in order to explore the influence on market

reaction by jumping risk agent variable. According to this background and motivation, the purpose of this study was to discuss that when Taiwan weighted index options (TXO) which was target assets occurs jumping risk, the influence of option price and the rate of return.

Index options were first launched by the Chicago Board Options Exchange (CBOE) on March 11, 1983. Originally, index options trading as a name of CBOE 100 which was an American-style index options on the market; the index of CBOE 100 selected and calculated 100 type of stock price which had stock options at CBOE. Later, the Chicago Board Options Exchange change name as S&P100, which was trading S&P100 stock index options currently. S&P100 stock index options was a first trading stock index options, and the code of market trading was OEX. Moreover, CBOE launched S&P500 index options on July 3. At the beginning, S&P500 stock index options trading as American style, but changed style to European options in April 1986.

On December 16, 2001, Taiwan Futures Exchange launched Taiwan stock index options which was the first option on the open market in Taiwan, then lunched stock options On January 20, 2003. Moreover, TFE launched the MSCI index of dollar-denominated options on March 27, 2006. October 8, 2007 cabinet choices and the non-payment of electricity options listed. On January 19, 2009, TFE launched the NT dollar-denominated gold options which were the Taiwan first product options.

B. Research Motives

Stock index option was cash settlement when contracted, the seller delivers the embedded value of option at due date (difference between the index and the contract index) without delivery of stock. Instead, stock options were stock delivery mostly. Generally, stock indexes did not had the trouble of exclude right (XR) and exclude dividend (XD), stock index containing a lot of stock and proportion of stocks was limited.

Therefore, the influence of exclude right and exclude dividend on a single unit stock was lesser. The target asset of stock index options was stock, and the target asset of stock options was stock. Comparing with stock, stoke index did not trading generally; therefore, the operation of index options arbitrage was weaker than the operation of stock options. Index could not be trade, so if the price of index options violates an equivalent theory or limit of called option and put option, or B-S evaluation of the formula; the power of arbitrage could not be fully used. Therefore, the market price and the theoretical values of price difference would still exist; and this price difference would be powerful than stock options.

In domestic relative research papers, most of options concentrated on trading strategies. Practical analysis of its time, Taiwan stock index changed from 4,000 lowest points up to 10000 points nearly before Subprime crisis 2008. Therefore, across-parts which were higher than the price even would have a better profit. From January 2003 to December 2005, Strangle Strategy could not have effective profit no matter sold out by 200 points or even 800 points. But if used stop-loss strategy and reversed sold strategy after sold out would improve profit strategy.

2. LITERATURE REVIEW

A. Influence of Financial Derivatives Jumping Risk

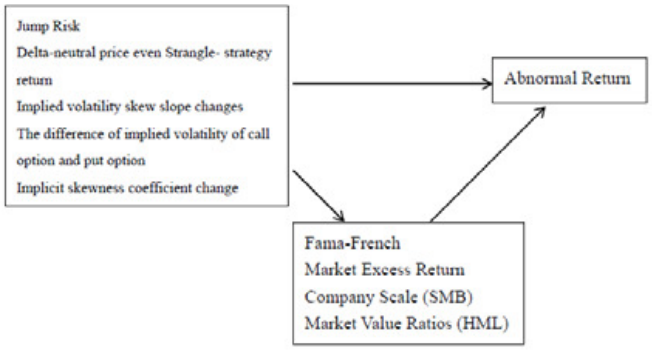
Reference [1] discussed Markov Switching Model, used Markov chain to describe the transition conditions in different economic boom. However, consider that stock would have abnormal changed by the influence of unexpected incident. So emerge Regime-Switching model with jump risk; one was a jump process that apart from state, another was a jump process with state-dependent.

The explanation effectiveness performance of symmetry implied volatility was better than asymmetric implied volatility model. The evaluation showed that fixed volatility model in the HJM model was most stable and the evaluation result of HJM model and ad hoc method was inconsistent before comparing with variable effect. In HJM model, took into account the effect of curvature and the due date would have a better evaluation of performance, and in the ad hoc methods consider the linear effect made a good evaluation of performance. Compared with the evaluate performance of samples, found HJM model stability evaluation was higher than method evaluation.

B. Frame Work

This study investigated the effects of volatility risk and the risk of jumping on abnormal returns; used regression to explore the effects of regression and information content, as shown in Figure 1.

Fig 1. Research Framework of Risk Reaction Influence on Market



3. RESEARCH METHOD

This study used assets pricing model that proposed by Ang, **[2]** who considers relative data and return factors that affected stock, found investors disagree that the loss risk more than profit. Individual stock which held paid and high crash sensitivity of major market would require risk premium to control pricing factors such as company's market value, scale factor, liquidity risk and so on; found individual expected paid could reflect 6% years paid rate of risk premium. The control factors from empirical research by **[3],** confirmed that the obviously positive relationship between stock return and ,supports the theory of CAPM. **[4]** made " values were irrelevant to long term average rewards of stock", which means the appropriateness of the capital asset pricing model, began to be addressed.

[5] explore the relationship between cross section value, company scale, price-to-sales ratio, benefit- cost ratio, leverage level (A/ME, A/BE) and average return on non-financial company stock. Considering that company scale and price-to- sales ratio catch the variation of rate of return effectively and company scale and paid rate was negative relationship; book market and paid rate was positive relationship, and the paid rate of value type stock (high BE/ME) was higher than growth type stock (Low BE/ME). And book market ratio could replace the explanation ability of benefit ratio and leverage degree on the average rate of return; therefore, value stocks took on a greater financial risk, and investors require higher return ration of this kind of stock. Because the benefit- cost ratio and leverage level could replaced by price-to-sales ratio on the explanation ability of average return on stock; therefore, value stocks took on a greater financial risk, and investors require higher return ration of this kind of stock.

During 30 years (1963-1990), [4] used common stock of non-financial company as a research object included NYSE, AMEX and the NASDAQ, found there were no obviously relationship between value and average rate of return on stock; no matter value itself or combine with other variable, the statistics volume by Fama-Mac Beth method were not significantly. However, found company scale (SMB) and price-to-sales ratio (HML) had significantly effected on stock average paid ratio, and market factor (market excess return) also had strong explanation ability. To sum up, that general risk factor (common risk factors) such as market factor, company scale and book market could effective found out risk premium which derivative out from non-system risk, and this was so called Fama-French three factor model.

Reference [6] consider that generally ignored the CAPM theory during the study of CAPM was static, assuming that investors ' behavior was a period, this Beta values were constant throughout the period, and the behavior of investor was a period in reality. Therefore Beta values were affected by market circle fluctuations. CAPM assumes all rewards in the stock market to replace the aggregate wealth pay of society; however, there was other which not covered. Reference [6] consider that measuring Beta market indexes had to combine human resource, forming conditional CAPM (conditional CAPM). The results showed scale affect and net market value had no explanatory power on stock return. Combining past research data, this study used Fama-Mac Beth two-phase multiple regression methods, used factor analysis on first stage to identify factors which influencing the reward factor, and then substituted into the regression model on second stage.

Using multiple regression model, [7] combined one or two period of decline and advance market to explain returns of single stock, and the sum of each coefficient. The main reason was that the Beta coefficient comes from historical data which used day-record mostly and used closing price to calculate stock price and rate of return on stock. At that time, there might be market index but not necessary to had closing price for single stock; and period that on record was unequal because the real trading record may happened earlier. Therefore, used this data to estimate value with least squares, would cause error problem in variable. So used [7] proposed that estimate each period of Beta with current and last period of stock ratio, and then added up those Beta coefficients to estimate the Beta coefficients of total market risk.

$$AR_{i,t} = \beta_{i,0} + \beta_{i,MP_t} \cdot MP_t + \beta_{i,MP_{t-1}} \cdot MP_{t-1} + \beta_{i,JR_t} \cdot JR_t + \beta_{i,JR_{t-1}} \cdot JR_{t-1} + \varepsilon_{i,t}$$

JR_t = Jump risk

Reference [8] used that based on the market skewed in order to consider the data option, and the market price was a negative. The reasons that jump risk inconsistent with economic instincts that under the consideration of market skewed were that the market price of jump risk was positive. The implied expected return and systematic risk had been calculated and analyzing the results rationality and forecast ability for future. The research of **[9]** explored deeply about implied skewness coefficient and the influence of kurtosis coefficients on volatility smile curve curvature effects. Based on jump risk, this research considers [9] proposed the implied skewness coefficient variation as a proxy variable (BKM).

A. Data Setting

To receive the results of Zero-Bata by **[10],** Delta-neutral trading strategy must be used; therefore, it must be assumed that the trading number of choosing right could be infinitely divided. We hoped through the Taiwan weighted index options (TXO) for the transaction object, built a buying across the site. Buy in due date within 28 days of the price level for investment in cross-site. For example, if there was a document on June 16,2015 the market maturity of June 15 day option, you used the June 16 closing price bought by Delta-neutral added up to a price level strategy.

Table1 Taiwan Weighted Index Option Transaction Data On June 2015

Due Month	Strike Price	Call Delta	Put Delta
201506	8950	0.963	-0.037
201506	9050	0.852	-0.148
201506	9150	0.635	-0.365
201506	9250	0.365	-0.635
201506	9350	0.148	-0.852
201506	9450	0.037	-0.963

Using the same conditional sale and purchase the right characteristics of Delta-phase was equal to one, in order to get Delta-neutral buys right to buy weights for the right to sell the absolute value of the Delta, Delta to buy weights for the right to buy the right to sell. Using Delta-neutral to avoid the forecast of policy on index change, achieve the Zero-Bata effect.

Using a month option in June 16, 2015 as an example could be seen that the Taiwan index option called Delta and put Delta of 9150 or 9250 strike price were closest modulus. According to the characteristic of three options strike price of choosing right, 9150 was closest to the price level. Therefore we would have long call 0.365 and long put 0.635 to building trading strategies based on previous experiment design.

B. Data Source and Principles of Sample Selection

This study investigated the jump risk, during study cover the financial markets from January 2, 2002 to December 31,2014 that including 2002 SARS, 2007 high oil prices, 2008 United States subprime storm, and 2011 the European debt crisis.

This study discusses the change of Taiwan index options prices and return ratio; also, prove the Taiwan index changes of target asset and domestic and foreign economic changes, following two types are the data source:

(1) Taiwan Futures Exchange Web site: futures settlement price monthly.
(2) Taiwan Economic News Database: the option data, stock indexes, and trading volume of derivatives. For example, per capita income, the interest rate and so on.

Taiwan economic news only got the closing database of option, each trading transactions were assumed to be closed at the moment. Taiwan Futures Exchange closed from 1:45 P.M., therefore all trading assumptions are sold at 1:45.

The table 2 showed that the trading volume of option right from 2005 was become stably, because of simple cross- site only used near the price level to the nearest option, sample period refers to the right to choose by Taiwan officially in TFE from January 2002 to December 2014.

Table 2 Annual Trading Volume Of Taiex Options

Year	Trading volume	Days	Average volume/day
2001	5,137	6	856
2002	1,566,446	248	6,316
2003	21,720,083	249	87,229
2004	43,824,511	250	175,298
2005	80,096,506	247	324,277
2006	96,929,940	248	390,847
2007	92,585,637	247	374,841
2008	92,757,254	249	372,519
2009	72,082,548	251	287,181
2010	95,666,916	251	381,143
2011	125,767,624	247	509,181
2012	108,458,103	250	433,832
2013	109,311,515	246	444,356
2014	151,620,546	248	611,373

4. ESTIMATION RESULTS

We used multiple regression models of **[3]** in order to measure the overall jump risk. Overall risk factor proxy variables: DNS means Delta-neutral price levels across policy rewards, ΔIV means implied volatility skew slope changes, and the differences between OTM95 put out the money, and called at the money; moreover, ΔBKM means **[11]** proposed implicit skewness coefficient change. Using method of estimation by **[12]** to fix the collinearity of independent variable, which caused by regression analysis of time series; violated independence assumptions, and self-related errors term.

$$AR_{i,t} = \beta_{i,0} + \beta_{i,DNS_t} \cdot DNS_t + +\beta_{i,\Delta IV_t} \cdot \Delta IV_t + \beta_{i,OTM95_t} \cdot OTM95_t + \beta_{i,\Delta BKM_t} \cdot \Delta BKM_t + \varepsilon_{i,t}$$

$$AR_{i,t} = \beta_{i,0} + \beta_{i,DNS_t} \cdot DNS_t + +\beta_{i,\Delta IV_t} \cdot \Delta IV_t + \beta_{i,OTM95_t} \cdot OTM95_t + \beta_{i,\Delta BKM_t} \cdot \Delta BKM_t + \beta_{i,MP_t} \cdot MP_t + \varepsilon_{i,t}$$

$$AR_{i,t} = \beta_{i,0} + \beta_{i,DNS_t} \cdot DNS_t + +\beta_{i,\Delta IV_t} \cdot \Delta IV_t + \beta_{i,OTM95_t} \cdot OTM95_t + \beta_{i,\Delta BKM_t} \cdot \Delta BKM_t + \beta_{i,MP_t} \cdot MP_t + \beta_{i,HML_{N_1}} \cdot HML_t + \beta_{i,SMB_t} \cdot SMB_t + \varepsilon_{i,t}$$

Due to the adoption of multiple regression model analysis, analyze it's explanatory power before analyze the results of variable; therefore used adjusted R2 values to determine the explanatory power of independent variable(total volatility risk, market risk premium, the three-factor of **[4]** to dependent variable.

Table 3 showed the explanatory power of the model followed by 2.1%, 21.8%, 29.3%, and the F value showed the explanatory power of three regression model was significant and had statistics meaning; moreover, combine with risk premium of market factor would increase the explanatory power of abnormal returns.

Four proxy variables were negatively correlated with abnormal returns in the analysis of company jump risk factor. And this result was consistent with total risk model, because risk-avoided investors using option market and stock market as a hedging tool. So when volatility risk increases, made abnormal returns decline. Joining the market risk premium or [4] three-factor, bringing the total jumping risks increase and significant increases, among them, the implied volatility skew slope changes (IV) was the most obvious and a greater impact than the other three jumps risk proxy variables.

Table 3 Total Jump risk premium

Variable	$AR_{i,t}$	$AR_{i,t}$	$AR_{i,t}$
β_0	3.688 (1.673)*	2.344 (1.694)*	1.982 (1.685)*
$DNS_{i,t}$	-0.325 (-1.655)*	-0.267 (-1.236)	-0.433 (-2.261)**
$\Delta IV_{i,t}$	-0.587 (-2.035)**	-0.625 (-2.734)***	-0.610 (-2.653)***
$OTM95_{i,t}$	-0.354 (-1.875)*	-0.220 (-3.239)***	-0.061 (-1.161)
$\Delta BKM_{i,t}$	-0.345 (-0.895)	-0.026 (-2.293)**	-0.561 (-2.161)**
$MP_{i,t}$		0.237 (2.193)**	0.621 (3.153)***
$HML_{i,t}$			0.241 (2.431)**
$SMB_{i,t}$			0.251 (1.731)*
Adj R^2(%)	3.6	25.1	39.1
F value	2.622*	20.634***	26.257***

PS. 1. ( ) means t value. 2.* 10% Significant Levels, ** 5% Significant Level, *** 1% Significant Level.

In summary, those factors affect the abnormal returns including **[4]** three-factor, return strategy of Delta-neutral strangle at the money, implied volatility skew slope and the difference of implied volatility of put out of the money; moreover, the implied skew-ness coefficient variation that proposed by **[11].**

The tables 3 showed that when the average Beta values of Delta-neutral-price level across the policy paid (DNS) was -0.0446 and it's standard deviation of Beta values is -0.0326, combining regression analysis to estimates the market risk premium (price volatility) was -0.433. The result estimates that beneath the two standard deviations, Delta-neutral return strategy decreased the return rate of 2.823% annual (-0.433×2×0.0326= - 0.02823)

The average Beta value of implied volatility skew slope change (IV) was -0.1367, and the standard deviation is 0.0721; combining regression analysis to estimates the market risk premium (price volatility) was -0.610 which shows that implied volatility skew slope change expected to bring down the return rate of 8.796% beneath the two standard deviations per year. The average Beta value of implied volatility difference (OTM95) between put out the money (exercise price and spot price is 0.95) and called at the money was 0.0612, and the standard deviation was 0.0417. Combining regression analysis to estimates the market risk premium (price volatility) was -0.061 which showed that the implied volatility skew slope change of put out the money (exercise price and spot price is 0.95) and called at the money were expected to bring down the return rate of 0.509% (−0.061×2×0.0417=−0.00509) beneath the two standard deviations per year. The average Beta value of implicit skew-ness change(∆BKM) is -0.0095, and the standard deviation is 0.0154; combining regression analysis to estimates the market risk premium (price volatility) was -0.561 which showed that implicit skew-ness change expected to bring down the return rate of 1.728%(−0.561×2×0.0154= −0.01728) beneath the two standard deviations per year.

Table 4 The Average Value And Standard Deviation Of Overall Jump Risk

Variables	Average Value	Standard Deviation
$DNS_{i,t}$	-0.0446	0.0326
$\Delta IV_{i,t}$	-0.1367	0.0721
$OTM95_{i,t}$	0.0612	0.0417
$\Delta BKM_{i,t}$	-0.0095	0.0154

5. CONCLUSIONS AND SUGGESTIONS

The study proposed to measure the pricing of Taiwan index option jump risk, using cross-sectional data on a 12-month study period, and used the iteration method to study effected on abnormal returns; moreover, the result showed that different factors of jump risk occurs same effect. However, in traditional financial theories consider that high risk should had high returned which was in contrast to the result of this study. In behavioral finance of modern financial theory, investors didn't act rationally and had no specific trading behavior ; moreover, the financial market was ineffective. Therefore high risk produced instead of low paid.

The suggestions for future research direction, due to different group investors by preference industry category (electronic, financial, biography produced, and health technical medical),

investment type (value type or growth type), and standard of assets scale different (high unit or low price unit); the trading volume of each stock option so far was low in domestic, and lack of research data, so waited to trading volume upgrade in the future could classify, analysis and increased different kind of data connotation. According to the prospect theory the proposed by [13] as a decided model which used when people face the unsure situation. When investors under the situation that corresponding profit and loss, the marginal loss were sensitive than marginal profits. When profit was diminishing, investor risk aversion tendency; instead, increasing losses for utility, investor risk appetite. If loss of a unit marginal pain greater than getting a unit profit margins, people had a tendency to loss aversion. Later could explore about over the earnings risk and lower the risk of loss. In behavioral finance theory, disposition effect means when investment goods benefit a lot investors appearance; and framing effect refers to the use of different ways (framework) to describe the same problem, you could let the same person made a different decision. These would increase the explanatory power of the model.

REFERENCES

[1] J. D. Hamilton, A new approach to the economic analysis of nonstationary time series and the business cycle , Econometrica, vol. 57, pp.357–384. 1989

[2] G., C. Bakshi, Cao, and Z. Chen, "Do call prices and the underlying stock always move in the same direction?", Review of Financial Studies, vol. 13, pp.549–584. , 2000

[3] E.,Fama, and J. MacBeth, "Risk, return, and equilibrium: Empirical tests", Journal of Political Economy, vol. 71, pp.607–636. , 1973

[4] E. F . Fama,;K. R. French, Common risk factors in the returns on stocks and bonds".Journal of Financial Economics.33, 1993.

[5] Fama, E. F.;French, K. R.. The Cross-Section of Expected Stock Returns. The Journal of Finance.7(2): 427, 1992.

[6] Jagannathan, Ravi, and Zhenyu Wang, The Conditional CAPM and the Cross-Section of Expected Returns, Journal of Finance, vol. 51, pp.3-54, 1996

[7] Dimson, E., Risk measurement when shares are subject to infrequent trading, Journal of Financial Economics, vol. 7, pp.197-226, 1979

[8] B. Y., Chang, P., Christoffersen, and K. Jacobs, Market Skewness and the Cross-Section of Stock Returns,Working Paper, McGill University., 2009

[9] G., Bakshi, and N. Kapadia. Delta-Hedged Gains and the Negative Volatility Risk Premium. Review of Financial Studies, 16 (2) p 527-566, 2003

[10] Coval, J., and T. Shumway, ,"Expected option returns", Journal of Finance, vol. 56, pp.983–1009. 2001

[11] Bakshi, G. and N. Kapadia, Delta-Hedged Gains and the Negative Market Volatility Risk Premium, The Review of Financial Studies, vol. 16 (2), pp.527-566, 2003.

[12] W. Newey, and K. West, A simple positive, semidefinite, heteroskedasticity and autocorrelation consistent covariance matrix, Econometrica, vol. 29, pp.229-256, 1987.

[13] Lopez-de-Silanes, Florencio, Andrei Shleifer, and R. W. Vishny, Privatization in the United States, Rand Journal of Economics 28, 1997.