

行政院國家科學委員會專題研究計畫 期中進度報告

衍生性金融資產的尖端研究--子計畫三：行為財務學對選擇權訂價的影響(2/4)
期中進度報告(完整版)

計畫類別：整合型
計畫編號：NSC 95-2752-H-004-001-PAE
執行期間：95年04月01日至96年03月31日
執行單位：國立政治大學財務管理學系

計畫主持人：劉玉珍

報告附件：國外研究心得報告

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中華民國 96年03月26日

國科會大學學術追求卓越發展延續計畫年度執行報告撰寫說明

- Program Director(PD):總體計畫主持人，負責綜合整理所的計畫（main and sub-projects）成果，並填寫此綜合成果報告。
- 內容格式：依序為封面(Cover)、計畫基本資料(Basic Information of the Program, FORM 1)、經費人力及參與機構配合表(List of Works, Expenditures, Manpower, and Matching Supports from the Participating Institutes, FORM2)、計畫成果統計(Statistics on Research Outcomes of this Program, FORM3)、計畫研究成果總結(Executive Summary on Research Outcome of this Program, FORM4)、計畫相關之會議記錄(Minutes from Program Discussion Meetings, APPENDIX I)、相關計畫成果發表資料表(Publication List, Patent List, Innovation List, List of Workshops/Conferences Hosted by the Program , List of Personal Achievements of PIs, List of Technology Transfers, List of Technology Services, APPENDIX II)、重要期刊與研討會相關資料(List of Publications in “TOP” Journals and Conferences, APPENDIX III)、重大科技與科學突破相關投影片(Slides on Science and Technology Breakthroughs, APPENDIX IV)、計畫成果評估。

(一)報告封面如格式要求。

(二)計畫基本資料 (FORM 1)：總計畫編號(serial number of the main project)、隸屬機構、主持人、聯絡人、經費和人力預期與實際花費、相關分項計畫名稱及主持人資料。

(三)經費人力及參與機構配合之表列 (FORM2)：總體計畫與分項計畫(main and sub-projects)之相關經費、人力、及參與機構之配合情形。

(四)計畫成果統計(FORM3)：僅針對總體計畫之產出，統計相關國內外成果發表數(非本計畫之產出，請勿納入)。

(五)計畫研究成果總結 (FORM4)：請總體計畫主持人針對總體計畫(main and sub-projects)之整體目標(最多三頁)、重大突破與主要成就、計畫成果發表資料 (數據填入 FORM3，並將各個研究結果編號後依序列舉在 APPENDIX II，且列出 3-5 篇在重要期刊或研討會發表之文章於 APPENDIX III)、參與機構之合作機制、未來計劃之規劃及國際合作案例加以敘述。

(六)計畫相關之會議記錄 (APPENDIX I)：請總體計畫主持人提供相關討論協調會議紀錄。

(七)相關計畫成果發表資料表列 (APPENDIX II)：請總體計畫主持人彙整總體計畫之相關成果發表資料表列 (如期刊、專利、創新……等)。

(八)重要期刊與研討會資料 (APPENDIX III)：請總體計畫主持人彙整相關分項主持人之重要期刊與學術研討會議發表資料 (請與 FORM3 與 APPENDIX II 資料一

致)，以 3-5 篇為限。

(九)突破性重大科技與科學相關投影片 (APPENDIX IV)：請總體計畫主持人摘其相關突破性重大科技與科學之簡報資料(集成投影片)2 張。

(十)計畫成果評估：計畫成果評估部份，將由國科會邀請專家就總體計畫研究內容與原計畫相符程度、達成預期目標情況、符合大學學術追求卓越延續計畫暨其他有關價值等，作一綜合評估。

- 本報告請總計畫主持人依分項計畫成果報告後撰擬，並於 2 月 28 日前繳交。

※大學學術追求卓越發展延續計畫執行報告格式

Explanation for the Form of the Annual/Midterm/Final Report “Program for Promoting Academic Excellence of Universities (Phase II) ”

※ The Annual/Midterm/Final Report contains the following sections:

| | | |
|-------------|---------------------|--|
| I | | COVER |
| II | FORM1 | BASIC INFORMATION OF THE PROGRAM |
| III | FORM2 | LIST OF WORKS, EXPENDITURES, MANPOWER, AND MATCHING SUPPORTS FROM THE PARTICIPATING INSTITUTES (REALITY) . |
| IV | FORM3 | STATISTICS ON RESEARCH OUTCOMES OF THIS PROGRAM |
| V | FORM4 | EXECUTIVE SUMMARY ON RESEARCH OUTCOMES OF THIS PROGRAM |
| VI | APPENDIX I | MINUTES FROM PROGRAM DISCUSSION MEETINGS |
| VII | APPENDIX II | 1. PUBLICATION LIST (CONFERENCES, JOURNALS, BOOKS, BOOK CHAPTERS, etc.) 2. PATENT LIST 3. INVENTION LIST 4. LIST OF WORKSHOPS/CONFERENCES HOSTED BY THE PROGRAM 5. LIST OF PERSONAL ACHIEVEMENTS OF THE PIs 6. LIST OF TECHNOLOGY TRANSFERS 7. LIST OF TECHNOLOGY SERVICES |
| VIII | APPENDIX III | LIST OF PUBLICATIONS IN “TOP” JOURNALS AND CONFERENCES |
| IX | APPENDIX IV | SLIDES ON SCIENCE AND TECHNOLOGY BREAKTHROUGHS (TWO SLIDES FOR EACH BREAKTHROUGH) |
| X | APPENDIX V | SELF-ASSESSMENT |

(Add extra lines or columns if needed.)

I. COVER

Program for Promoting Academic Excellence of Universities (Phase II)

Annual/Midterm/Final Report

衍生性金融資產的尖端研究-子計畫三：行為財務學對選擇權訂價的影響(2/4)

The Behavioral Relevance for Pricing Financial Options

95-2752-H-004-001-PAE

Overall Duration: Month 04 Year 2005 - Month 03 Year 2009

Report Duration: Month 04 Year 2006 - Month 03 Year 2007

University Name National Chengchi University

Date 2007/1/25

II. (FORM1) BASIC INFORMATION OF THE PROGRAM

| | | | | | |
|--|---------------------------------------|--|------------------------------------|--|------------------------|
| Program Title: 衍生性金融資產的尖端研究-子計畫三：行為財務學對選擇權訂價的影響(2/4) | | | | | |
| Serial No.: 95-2752-H-004-001-PAE | | | Affiliation (in English & Chinese) | | |
| Principal Investigator | Name | 劉玉珍 | | | |
| | Tel: | 02-29393091-81123 | | | |
| | Fax: | 02-29393394 | | | |
| | E-mail | yjliu@mail2000.com.tw | | | |
| Program Coordinator | Name | (in English & Chinese) | | | |
| | Tel: | | | | |
| | Fax: | | | | |
| | E-mail | | | | |
| | | Expenditures ¹ (in NT\$1,000) | | Manpower ² : Full time/Part time(Person-Months) | |
| | | Projected | Actual | Projected | Actual |
| FY XX | | 1,000,000 | | | |
| FY XX | | 950,000 | 571,708 | | - |
| FY XX | | 900,000 | - | | - |
| FY XX | | 900,000 | - | | - |
| Overall | | | | | |
| Serial No. | Project Title | | Principal Investigator | Title | Affiliation |
| Sub-Project 1 | (in English & Chinese) | | (in English & Chinese) | (in English & Chinese) | (in English & Chinese) |
| Sub-Project 2 | (in English & Chinese) | | (in English & Chinese) | (in English & Chinese) | (in English & Chinese) |
| Sub-Project 3 | 衍生性金融資產的尖端研究-子計畫三：行為財務學對選擇權訂價的影響(2/4) | | 劉玉珍 | 教授 | 政治大學 |
| ◦ ◦ ◦ ◦ ◦ ◦ ◦ | (in English & Chinese) | | (in English & Chinese) | (in English & Chinese) | (in English & Chinese) |
| Sub-Project N | (in English & Chinese) | | (in English & Chinese) | (in English & Chinese) | (in English & Chinese) |

Notes: ^{1,2} Please explain large differences between projected and actual figures.

Program Director/Principle Investigator Signature: _____

III. (FORM 2) LIST OF WORKS, EXPENDITURES, MANPOWER, AND MATCHING SUPPORTS FROM THE PARTICIPATING INSTITUTES (REALITY) .

| Serial No.: | | Program Title: (in both English & Chinese) | | | | | | | | | | |
|---|---|--|--|------------------------------|------------------------------------|---------|----------------------------|--------------------------|------------------------------------|---------------------|------------|--|
| Research Item (Include sub projects) | Major tasks and objectives | Expenditures (in NT\$1,000) | | | | | Manpower (person-month) | | | | | Matching Supports from the Participating Institutes (in English & Chinese) |
| | | Salary | Seminar/ Conference- related expenses | Project- related expenses | Cost for Hardware & Software | Total | Principal Investigators | Consultants | Research/ Teaching Personnel | Supporting Staff | Total | |
| | | 258,770 | 60,000 | 252,938 | | 571,708 | 劉玉珍 Yu-Jane Liu | 蔡知令 Chih-Ling Tsai | 王銘駿 Ming-Chu n Wang | 陳薇如 | | |
| | | | | | | | | 朱寧 Ning Zhu | | | 蔡佳芬 | |
| | What makes investors trade in options market? | | | | | | | Bing Han | | | 陳薇如 蔡佳芬 | |
| | | | | | | | | | | | | |
| SUM | | | | | | | | | | | | |

IV. (FORM 3) STATISTICS ON RESEARCH OUTCOME OF THIS PROGRAM

| LISTING | | TOTAL | DOMESTIC | INTERNATIONAL | SIGNIFICANT ¹ | CITATIONS ² | TECHNOLOGY_TRANSFER |
|---|-----------------------------|-------|----------|---------------|--------------------------|------------------------|---------------------|
| PUBLISHED ARTICLES | JOURNALS | | | | | | |
| | CONFERENCES | | | | | | |
| | TECHNOLOGY REPORTS | | | | | | |
| PATENTS | PENDING | | | | - | | |
| | GRANTED | | | | - | | |
| COPYRIGHTED INVENTIONS | ITEM | | | | | | |
| WORKSHOPS/CONFERENCES ³ | ITEM | | | | | | |
| | PARTICIPANTS | | | | | | |
| TRAINING COURSES (WORKSHOPS/CONFERENCES) | HOURS | | | | | | |
| | PARTICIPANTS | | | | | | |
| PERSONAL ACHIEVEMENTS | HONORS/ AWARDS ⁴ | | | | | | |
| | KEYNOTES GIVEN BY PIS | | | | | | |
| | EDITOR FOR JOURNALS | | | | | | |
| TECHNOLOGY TRANSFERS | ITEM | | | | | | |
| | LICENSING FEE | | | | | | |
| | ROYALTY | | | | | | |
| INDUSTRY STANDARDS ⁵ | ITEM | | | | | | |
| TECHNOLOGICAL SERVICES ⁶ | ITEM | | | | - | - | - |
| | SERVICE FEE | | | | - | - | - |

¹ Indicate the number of items that are significant. The criterion for “significant” is defined by the PIs of the program. For example, it may refer to Top journals (i.e., those with impact factors in the upper 15%) in the area of research, or conferences that are very selective in accepting submitted papers (i.e., at an acceptance rate no greater than 30%). Please specify the criteria in Appendix IV.

² Indicate the number of citations. The criterion for “citations” refers to citations by other research teams, i.e., exclude self-citations.

³ Refers to the workshop and conferences hosted by the program.

⁴ Includes Laureate of Nobel Prize, Member of Academia Sinica or equivalent, fellow of major international academic societies, etc.

⁵ Refers to industry standards approved by national or international standardization parties that are proposed by PIs of the program.

⁶ Refers to research outcomes used to provide technological services, including research and educational programs, to other ministries of the government or professional societies.

V. (FORM4) EXECUTIVE SUMMARY ON RESEARCH OUTCOMES OF THIS PROGRAM

(Please state the followings concisely and clearly)

1 General Description of the Program: Including Objectives of the Program

2 Breakthroughs and Major Achievements

3 Categorized Summary of Research Outcomes. The criteria for top conferences and journals should be given and introduced briefly in the beginning of this section. In each research area, please give a brief summary on the research outcomes associated with the area. Note that the summaries should be consistent with the statistics given in Form3. Please list and number each research outcomes in sorted order in Appendix II, and list all the publications in top conferences and journals in Appendix III.

V-1. House money effect: Evidence from Taiwan options market

1. General Description of the Program:

We document empirical support for the ‘house money’ effect proposed by Thaler and Johnson (1990). Market makers for Taiwan’ TAIEX index options take above-average risks in afternoon trading after morning gains, in their order accounts where they trade exclusively for profits. The fraction of market makers with morning gains influences market-level liquidity and volatility in the afternoon trading. Our findings confirm that prior outcomes influence subsequent risk-taking and emphasize that the way in which investors frame previous outcomes alters their subsequent attitude toward risks. Consistent with Coval and Shumway (2005), behavioral biases by market participants affect asset price formation.

2. Breakthroughs and Major Achievements

The canonical standard expected utility function in economic theory assumes that all outcomes are integrated into terminal wealth, which singularly influences economic agent behavior (Mas-Coell et al. 1995). Behavioral economics, on the other hand, contends that prior outcomes can change economic agents’ prospects and their subsequent risk-taking. In particular, the prospect theory argues that “the value function is normally concave for gains, commonly convex for losses, and is generally steeper for losses than for gains” (Kahneman and Tversky 1979). As a result, prior gains and losses should influence subsequent risk-taking in a different fashion.

One very important implication from prospect theory is loss aversion, which suggests that equal-magnitude gains and losses do *not* have symmetric impacts on decision-making. Losses hurt more than gains satisfy. Instead of pursuing the maximum expected utility, people may rather try to avoid losses (Barberis et al. 2001, Shleifer 2000). Consistent with loss aversion, several studies document the disposition effect that investors are more likely to realize winners than losers in various financial markets.¹ More recently, Coval and Shumway (2005) report more direct findings that treasury traders at the CBOE significantly increase their afternoon risk-taking after morning losses.

In contrast, little has been understood about how people behave after previous successes. Because the attitude toward risk is quite different facing prior gains vs. losses, it should not be taken for granted that people reduce risk-taking after prior gains. As a matter of fact, some recent research indeed finds that investors take more risks after prior successes, similar to their behavior after prior losses. Malmendier and Tate (2005) find that ‘super-star’ CEOs, who have garnered recent successes recognitions, are more likely to engage in risky transactions such as aggressive merger and acquisition activities. In addition, Nicolosi et al. (2005) find that individual investors, those who are usually assumed to be the least sophisticated among all, increase subsequent trading intensity and take on greater risks after making profitable trades.

¹ Odean 1999, Dhar and Zhu 2005, Genesove and Mayer 2001, Heath et al. 1999, among others.

Daniel et al. (2001) and Gervais and Odean (2001) attribute such a relationship to over-confidence and self-attribution, and contend that investors may change beliefs about their own abilities following prior successes. At the same time, it is also likely that prior gains can alter individuals' subsequent attitude toward risks. One specific example is the house money effect proposed by Thaler and Johnson (1990), which claims that people may indeed *increase* their risk-taking after prior gains under some circumstances. The authors argue that, "after a gain, subsequent losses that are smaller than the original gain can be integrated with the prior gain, mitigating the influence of loss aversion and facilitating risk-seeking" (p657, Thaler and Johnson 1990).

Clearly, the house money effect is generally consistent with prospect theory in that the framing of prior outcomes heavily influences individual behavior. What distinguishes the house money effect is that it focuses primarily on dynamic decision-making in which people have to choose how to frame prior losses vs. gains and how such choices influence future risk-taking. It is important to note how behavior shifts when researchers extend the one-stage experiments into multiple-stage versions, which arguably provide a better depiction of many real-life applications. Following laboratory experiments (Ackert et al. 2003, Battalio et al. 1990, Keasey and Moon, 1996) provided strong support for the house money effect. However, there has been little empirical support from the field so far.

The current study intends to bridge the gap by providing empirical support for the house money effect and evidence on how prior outcomes influence subsequent decision making in a dynamic context. We use the complete trading record for all TAIEX option market makers at the Taiwan Futures Exchange (TAIFEX) between 2001 and 2004, and find strong evidence that prior trading successes induce greater subsequent risk-taking. In their principal trading accounts where their decisions are least affected by the obligation to provide liquidity, market makers increase/decrease the number of orders and trades, the size of their orders and trades, and aggressiveness in getting orders filled in the afternoon trading, after obtaining morning profits/losses. Controlling for other factors, market makers with morning profits are 14 percent more likely to take above-average risks in afternoon trading. One standard deviation increase in abnormal morning profits can lead to a 0.08 standard deviation increase in market makers' afternoon risks. Additional analyses reveal that competing hypotheses such as over-confidence, career concerns, and advantageous information cannot explain the findings.

Consistent with a previous study claiming that behavioral biases influence asset prices (Coval and Shumway 2005), market makers' response to previous trading outcomes exerts significant impact on how the market evolves. An increase of one standard deviation in the fraction of market makers with above-average morning performance leads to a 0.23 to 0.35 standard deviation increase in the afternoon market-level volatility. The aggressive trades that market makers engage in after above-average-profit morning trading also improve market level liquidity. An increase of one standard deviation increase in the fraction of market makers who are above their average performance leads to a decrease of 0.14 to 0.23 standard deviation in market level spread. Hence, our findings confirm previous claims that behavioral biases affect asset prices.

Finally, we discuss several factors that may explain why existing studies generate various results on

the relationship between prior outcomes and subsequent risk-taking. Although differences in investor type, security type, market development and culture are potentially responsible for the differences in the results, we believe that none of them drives the house money effect.

Our findings that prior outcomes influence future decision-making provide additional support for the prospect theory, in that the prospect of gains and losses changes investors' attitude toward risks. More importantly, the results highlight that risk-taking behavior can be different from loss aversion in a multiple-period context, depending on how subjects frame previous outcomes. The current study calls for future research on how people frame a series of events and under what circumstances investors integrate or separate prior outcomes. The fact that market makers' responses to prior outcomes vary across countries and securities markets highlights the complexity of human behavior and calls for further studies on a broader range of financial markets.

3. Summary of Research Outcomes

The question about how people respond to risks is fundamental to understand various economic phenomena. As it becomes more accepted that individuals do not simply treat uncertainty and risks as simply probabilistic calculations, it remains unclear whether a single behavioral theory can describe decisions under uncertainty. Prospect theory and many of its implications have had great successes in explaining many circumstances in more or less static background. As a result, more efforts need be devoted to understanding how people make decisions when they face a sequence of tasks. Such dynamic decision-making process closely resembles what professional investors (i.e. day traders, market makers, and fund managers, etc.) would face, in that such market participants constantly watch the market movement, prior trading outcome, and adjust their decisions accordingly. Therefore, studying professional investors' behavior provides ways to understand decision-making in a dynamic context.

We utilize the complete order and trade record of market makers, a very important type of professional investors, at the Taiwan TAIEX option market. In addition, we document that they take on greater risks after profitable mornings and reduce risk-taking after morning losses. Behavior of this nature is at odds with the standard expected utility function and provides support for the house money effect proposed by Thaler and Johnson (1990). Our findings emphasize that it is important to study not only how the reference point is determined and influences behavior in isolated context, but also how people frame a series of related events relative to dynamic benchmarks. The fact that extant studies using different time horizons obtain different results on how investors respond to prior outcomes highlights the complexity of human decision-making and the importance of evaluation horizon (Benartzi and Thaler 1995) and framing. Consequently, future studies on behavioral decision-making from a broader spectrum of financial markets, securities and investors are needed to generate a more generalized framework of investor behavior.

Consistent with Coval and Shumway (2005), such behavioral biases exert significant impact on asset prices. We find that the shift in market makers' afternoon risk-taking behavior, in response to their morning trading performance results, changes subsequent liquidity and volatility at the market level. Two current findings distinguish our study and call for future research in behavioral

finance. First, we find a different mechanism by which professional investors bias their decisions from Coval and Shumway (2005), although such a different bias (the house money effect) influences volatility and liquidity in a similar fashion as reported by the previous study. Such findings confirm Thaler and Johnson (1990)'s assertion that "making generalization about risk-taking preferences is difficult" and calls into study a wider range of behavioral patterns in the financial market.

Secondly, different from the results drawn from competitive market maker mechanism (in which price distortions are quickly reversed by other peer investors), our findings show that the biases exhibited by designated market makers can collectively influence return properties in a persisting fashion. Professional traders such as market makers are often assumed to behave rationally and eliminate impacts generated by individual investors' biases. Our findings are important since they reveal that market makers indeed exhibit behavioral biases themselves and can shift asset price formation through their behavior. Such findings motivate future studies to incorporate behavioral patterns into asset price formation process.

V-2 What makes investor trade in options?

1. General Description of the Program:

Option investing is a zero-sum game which is different from stock investment. We analyze what make investors trade in options for different types of investors and the welfare implication of trading relying on traders' performance. By utilizing a unique data that investor accounts and all trading records are available, we address the payoff functions for the two parties and combine investors' realized returns to try to differentiate reasons for trading. Our primary results document a wealth transfer from individuals to institutions. Foreign investors are the most profitable group. The result does not support market segmentation theory, information based trading and hedging motivation. Therefore, we propose some behavioral bias (gambling) to explain our results. Our preliminary findings show that the profits or returns distributions for the individual investors are the most extreme (skewed), especially on the down side. In future study, we will examine whether individuals fail to perceive small probabilities and focus on large size of rewards. This is like playing lottery, and will be crucial in understanding what drives the difference in the returns/profits for individuals.

2. Breakthroughs and Major Achievements

Trading volume in options is huge. Option trading is now the world's biggest business, with an estimated daily turnover of over 2.5 trillion US dollars and an annual growth rate of around 14%.² By June 2004, financial derivatives contracts totaling \$273 trillion were outstanding worldwide, an astonishing figure that corresponds to roughly \$45,000 for every human being on earth.

² From Building the Global Market: A 4000 Year History of Options by Edward Swan (2000), Bank for International Settlements, www.bis.org, December 10, 2004.

The options market appears particularly attractive for investors, even though options can be more expensive to trade due to higher transaction costs. Therefore, it is an interesting question regarding what makes investors trade in options. In particular, we focus on the trading motivations of individual investors in options market, given that they are well-documented as losers by trading in equities markets. There are several studies in the stock market, but no such empirical study yet in the options market.

Option investing is a zero-sum game which is different from stock investment. For options trading, the preferences of the two parties are diametrically opposed, and the payoff functions for the two parties involved in the contract sum to zero. That is, one party wins exactly what the other loses. The main purpose of this paper is to compare the trading performance for types of investors in options. By utilizing a unique data that investor accounts and all trading records are available, we address the payoff functions for the two parties by tracing who initiates the trades.

The risky outcome and zero-sum payoffs involved in option trading characterize lottery purchases. Gambling is a hope for a better life with very low cost (Pope (1983) and Simon (1998)), and it is likely that individuals with preference for gambling trade with options. Some individuals may like to take large chances of a small loss for a small chance of a large gain. (Markowitz(1952)). However, individuals may fail to accurately perceive very small probabilities, they tend to over-weight the reward probabilities (Tversky and Kahneman (1992)), and this may result in positive skewed payoffs of lotteries. Alternatively, people tend to ignore very small probabilities of winning, and focus on the amount of rewards (Pope(1983)).³ Our second goal is to test whether traders' behaviors are rational or not in options market, measuring investors' performance. If some investor type consistently loses money from trading in the index options, and the driving motivations are not information-based, hedging, then we claim investors may not trade options rationally. After establishing the irrationality of some investor type, we then look at their trades about what kind of biases affect their trading. In particular, we examine whether individuals fail to perceive small probabilities and focus on large size of rewards and whether such behavior result in trading loss in trading options.

Firstly, we look at the performance across types of investors. Different from previous literature, a unique feature of our paper is to combine investors' realized returns to try to differentiate reasons for trading. This study conjectures that for small investors, neither rationality (information) nor overconfidence seems to be able to explain small investors' losses in trading options. Instead, we expect to see a link between individuals' inaccuracy in evaluating small probabilities and preference toward large reward size and trading performance. Besides, the paper expects to find that favorite/long-short bias that is well-documented in gambling markets (Ziemba and Hausch (1986)) also applies to option market.

³ Kumar (2006) provide an excellent literature review on lottery purchases.

Our primary results document a wealth transfer from individuals to institutions. Traditionally, we say people trade in options market for speculation or hedging purpose. If investors trade for speculations, they should expect to get profits by trading. We expect to see that the individuals who trade in the option market lose money from trade, suggesting a wealth transfer (quite large economically) from retail investors to institutions (including foreign). To our best knowledge, this is the first time that documents a wealth transfer from individuals to institutions (in particular foreign investors), consistent with. What Barber, Lee, Liu and Odean (2006) found in equities market.

Can market segmentation explain the return difference between institutions and small investors? Market segmentation says that large investors prefer to trade certain types of options (e.g., long maturity) while small investors concentrate their trades on other types of options. To test market segmentation hypothesis, we will compare the difference in round-trip profits depending on whether investors initiated the purchases. The finding answers the following type of questions: Do small investors make more money (lose less money) in buys initiated by themselves than when they buy in response to sells initiated by large institutions? Our result does not support market segmentation theory in that the profits/returns for the small investor group as a whole are losing money from trade.

Informed investors tend to use options because of its inherent leverage. There may be information driven trades but maybe not a lot since we are looking at index options rather than individual stock where there may be lots of information asymmetry. Poteshman and Pan (forthcoming in RFS) find that option trading volume contains information about future (individual) stock prices. They construct put-call ratios from option volume initiated by buyers to open new positions. Stocks with low put-call ratios outperform stocks with high put-call ratios by more than 40 basis points on the next day and more than one percent over the next week. The economic source of this predictability is non-public information possessed by option traders rather than market inefficiency. They find no such predictability for the U.S. stock index, which suggest that there is no (not much) informed trading in U.S. index options. We expect to see that informed trading does not drive our results of individual behaviors.

There could be trades due to different interpretation of the market. Using options data, we study investor heterogeneity by looking at the buy/sell pressure across types of investors. Specifically, when index call options open interest increase (say on date t compared to date $t-1$), do we tend to observe that index put options open interest decrease, or increase? If latter, this seem to suggest that some investors may become more bullish (and thus buy more calls), while others become more bearish (and thus buy more puts). Disagreement among investors thus was widen.

If individuals lose money from trade, what makes individuals trade in options. Investors may trade options for hedge purpose when carry large inventories in underlying markets. In this case, investors who lose money in options market, may be profitable in the underlying market. In

Taiwan, there is no TWSE index product in the stock market,⁴ yet the Taiwan futures exchange has launched indexes futures since 1998. We argue that institutions may use the index futures to hedge, and if there are losses from trading in options market, their losses in the index options are the cost of hedging program (like insurance premium paid). We test the hedging motivation by comparing the gains/losses or returns of investors who trade in both the index options and indexes futures versus those that only trade options. We try two different definitions: 1), as long as an investor appears in both futures and options database (without regards to the time difference), we classify that investor as trading in both options and futures. 2), classify an investor as trading in both options and futures only when he puts in 2 trades (one in index options and one in futures) within five minutes (or 1 minutes) of each other. Of course, we may examine whether the investor is hedging index futures position with options in the future.

If the motivations are not for information and/or hedging, then the trading loss from individuals could be trades due to behavioral biases. Some bias causes small investors to trade in options in certain ways. As a consequence (e.g., of some bias) small investors lose money in the options market. Overconfidence is a well-documented behavioral bias in stock market. Barber and Odean (1999, 2000) show investors who trade often (presumably overconfident guys) have worse performance, but there are papers arguing that overconfidence (for professionals) sometimes promote success and improve trading experience. It is possible that overconfident agents earn higher returns in the options market (especially if they take on more risks). Speculators in the options market are likely to be overconfident. After all, it is a zero sum game investing in options. However, there are papers that argue overconfidence largely go away in the financial market when real money is at stake. Therefore, it is an unanswered question whether individuals trade options because of overconfidence. Overconfident investors could be the ones who trade more/often and lose from trading, and/or investors who keep their call options position even when the market index have been moving against them, and market index has been going down.. We find that overconfidence can not explain our result since we find the relatively smaller losses for small investors that trade often.

If rationality (information) and overconfidence fail to be able to explain small investors' losses in trading options, what factors may motivate individuals' trade in options? Kumar (2006) examine the link between gambling preferences in stock investment and whether socio-economic and psychological factors lead to excess investment in lottery-type stocks. Individuals who trade only in options market may seem to be no more than gambling on future price movements. Speculators take a position in the market; they are betting that the price of the underlying asset or commodity will move in a particular direction over the life of the contract.

Hodges, Tompkins and Ziemba (2003) examine whether favorite bias/long-shot bias in horse-bet

⁴ The Taiwan stock exchange has offers EFT product (Taiwan 50) since 2003. The product contains the biggest fifty listed companies in the market, yet the liquidity is very low. Therefore, it is very hard if investors use options to hedging ETF.

markets (particularly horse racing) applies to options markets by investigating the options on the S&P 500 futures, the FTSE 100 futures and the British Pound/US Dollar futures. They find evidence consistent with the hypothesis that investors tend to overpay for all put options as an expected cost of insurance for all put options. Following the spirit of Hodges, Tompkins and Ziemba (2003), we test if (in horse racing markets) exist for individuals in some options, and do individuals tend to overpay for all put options as an expected cost of insurance. In this paper, we compare the investors' profits or returns for calls versus put options, and for options of different moneyness (investors would buy out of money options for insurance).

In addition, individuals can also speculate by selling options rather than buying options. Selling options is even more speculative. We document the trading patterns for types of traders for the first move (including buy/sell options strategies). Then, this paper examines whether individuals like gambling (returns are skewed) and tend to trade out-of-the money contracts. They are expected to lose a lot from this type of gambling, on average, yet for a small chance, some investors earn a huge return. We look at the profits and net open interests for different types of investors on different subset of options (e.g. in the money versus out of the money options.) While, in the money options have large size of rewards; out of money options have small probability of paying off, but investors may overestimate such probabilities.

Finally we examine if investors' returns are very different for liquid option than for illiquid options, separating the sample by number of trades per contract or per day to study the liquidity of options. This helps answer whether some of the returns investor receive are compensation for providing liquidity. Related to this, we can see whether individual investors are demanding or providing liquidity.

3. Summary of Research Outcomes

In summary, we use investors' position data and transaction prices to measure investors performance. By measuring investors' performance, we try to explore why investors trade in option (informational reason, hedging versus speculating, behavioral related including desire to gamble and make rich quickly). We find that the average of winners trading volume is higher than that of loser's trading volume, consistent with more sophisticated investors trades more and makes more money. Market makers have the least extreme return distributions. Their returns/profits are mostly positive. Market makers in Taiwan options are not informed; they do not have any information priority in options market. This is consistent with market makers who are not actively taking on risk (speculating), and make small amounts of profits quite consistently through earning bid-ask spreads.

Despite that institutional investors sometime lose money, but still a much higher fraction of institutions make money than lose money compared to individual investors. As a group, institutions are more successful than individuals. Foreign institutions are the most profitable group. It seems

that foreign investors are more experienced than domestic investors. This is a huge wealth transfer from individuals to institutions (especially for foreign institutions). This has never been documented in options market.

We classify trades into the ones in options market only and the ones in both futures and options with one or five minutes. The results indicate that investors who trade in both markets trade more actively in the options than investors who trade only in the options, consistent with investors who trade in both futures and options market are more sophisticated/ experienced. All investors (institutions and individuals) lose from trade when they just trade in options market. It seems that really sophisticated investors trade in both futures and options market.

The profits or returns distributions for the individual investors are the most extreme (skewed), especially on the downside, implying individuals tend to gambling in options market. To test whether individuals like playing lottery, this paper analyzes whether individuals fail to perceive small probabilities and focus on large size of rewards. To address this issue, we will present trading profits and net open interests for different types of investors in different subset of options. We conjecture that individuals prefer out of money options which have small probability of paying off, but investors may overestimate such probabilities.

We also find difference in the trading of investors and find that individuals tend to buy options while institutions tend to sell options. The former is unprofitable for individuals, while the latter is profitable for institutions. This paper conjectures that institutions may find it economically advantageous to sell options (e.g. if options tend to be overpriced). In a follow-up analysis, we explore what types of options individual tend to buy and what type of options institutions tend to sell. This may shed some light on what drives the difference in the returns/profits for different types of investors.

4 A Summary of the Post-Program Plan (Including the Detailed Description of Budget and Plan Adjustment of the next year)

I finished the paper, entitled “House money effect: Evidence from Taiwan options market” co-authored with Ming-Chu Wang, Chih-Ling Tsai and Ning Zhu this August, and it is currently under review in *Management Science*.

I also work on a second project, entitled “What makes investors trade in options market co-authored with Bing Han and Yi-Tsung Lee, and we have some preliminary results for now.

Since some of my co-authors are in the US, we use emails and skype to reach each other from time to time. Besides, Chih-Ling Tsai visited me this November, while Ning Zhu visited Taiwan last September. I also met with Ning Zhu this July by attending a conference held in China.

I may come up with most of the results of my second project with Yi-Tsung Lee and Bing Han next May. Prof. Bing Han (University of Texas at Austin) plans to visit me next April, and I also plan to visit the US next summer. If my co-authors will China or H.K., I plan to meet them over there.

X. APPENDIX V: MIDTERM/FINAL SELF-ASSESSMENT

PROGRAM TITLE: _____

| | ASSESSMENT SUBJECT | SCORE (1~5, LOW TO HIGH) |
|---|---|-----------------------------|
| PROGRAM'S CONTENTS & PERFORMANCE | Importance & Innovation of the Program's Major Tasks | |
| | Clarity and Presentation of the Report | |
| | Viability of the Program's Approaches & Methodologies | |
| | Principal Investigator's Competence for Leading the Program | |
| | Interface & Integration between Overall & Sub-Project(s) | |
| | Interface & Integration among All Sub-Projects | |
| | Manpower & Expenditures | |
| PROGRAM'S RESULTS | Contribution in Enhancing the Institute's International Academic Standing | |
| | Impact on Advancing Teaching or on Technology Development | |
| Total Score | | |

REVIEWER'S COMMENTS & SUGGESTION:

PRINCIPLE INVESTIGATOR'S FEEDBACK: (AVAILABLE)

Program Reviewer's Signature: _____

赴國外研究心得報告

| | |
|-------------------|---|
| 計畫編號 | 94-2752-H-004-001-PAE |
| 計畫名稱 | 衍生性金融資產的尖端研究--子計畫三：行為財務學對選擇權訂價的影響(2/4) |
| 出國人員姓名 服務機關及職稱 | 政治大學 財務管理學系 教授 |
| 出國時間地點 | July. 17, 2006~July. 20, 2006 中國西安，喜來登大飯店 |
| 國外研究機構 | (中文) 2006 中國金融國際年會 (英文) 2006 China International Conference in Finance(CICF2006) |

工作記要：

一、 參加會議經過

申請人於7月17日至20日參加西安 China Finance Conference，此一學術研討會吸引了許多知名的國際學者參加，也舉辦了相當長的一段期間。以此次為例，Keynote speaker 為 ROSS 教授，其演講活動吸引了數百位學者參加，筆者僅能坐在最後一排的補充椅子。ROSS 教授對行為財務學提出了許多看法與批判，也提出了許多可待驗證的假說。演講後，許多行為財務的專家紛紛提出許多質疑，之間的辯論相當精采。

2006 中國金融國際年會於 2006 年 7 月 17 日起至 7 月 20 日止舉行，歷時 4 天，主要的會場設於中國西安之喜來登大飯店。會議的主要目的是聚集全世界在財務相關領域的學者專家於一堂，相互認識，共同討論研究心得，並交換意見。這次會議的探討主題在對於財務領域具影響力的各項議題，尤其對於未來的發展提出討論。由於財務的應用領域含括許多不同的議題與應用，主辦單位也做了細心的安排與規劃，有 36 之場次由英文發表、14 場次由中文發表，所涉及的研討領域包括 Corporate Finance、Mergers and Acquisitions、Mutual Fund and Hedge Fund、Investment Management、Corporate

Governance、Empirical Corporate Finance、Risk and Return、Market Microstructure、Asset Pricing、Credit Market and Interest Rate、Financ Econometrics、Behavior Finance、Derivatives、Security Issues and Investment Decision、Market Efficiency 等。在 Corporate Finance 方面的討論有將近 11 sessions，分別為公司經理人決策、公司資本結構的議題、Corporate Governance、Equity Pricing、以及 Ownership Structure 等在 Business and Financial 議題的應用等，在研討議題上分佈頗廣，很完整的涵蓋了財務在公司治理的應用與發展。

令人印象深刻的是，此次大會上也增加了中國當前財務市場的討論”我國 A 股股票市場究竟需要什麼樣的定價模型”、“投資者群體差異與可轉換債券折價-中國市場的實證分析”，此一課題相當相當吸引人。申請人對投資人與法人在市場上交易有何異同方面的討論較有興趣，例如：Behavior and Performance of Emerging Market Investors、Behavioral Bias of Traders: Evidence for the Disposition and Reverse Disposition Effect。筆者除了在會中宣讀論文外，並積極參加各項討論，與各國研究人員交換意見，獲益良多。藉此機會與國外多位教授交流、尤其是遇到多位來自香港、與美國的資深華人教授，大家分別交換與討論有關學術議題與教學經驗，實在是相當難得的經驗。

二、 與會心得

申請人在大會中所提出的文章為 The Cost of Owning Employer Stocks: Lessons from Taiwan。主要探討台灣公司員工投資其公司的股票過多的問題。Under-diversification 此一影響其投資績效，甚至也犧牲了其薪資的一大部分。評論人為 Dong Hong(Singapore Management University)。他認為本議題相當有趣，但是他對本研究的數據提出一些可能潛在的問題，我會後也向他多所請益。

總觀之，此一研討會的論文分為兩類，一以英文發表，另一以中文發表。以英文發表者之品質頗為整齊。許多知名學者紛紛報告其研究成果。我也發現大論新興學者在研究上的精

進與研究潛力頗佳。但是針對中文發表者，許多研究著主題較為陳舊與集中，多數以公司治理，股權結構為重心，觀察其對股價行為的影響。

與會期間，晚遇見了香港大學財務系主任 Eric Chang，香港科技大學財務系主任 Kalok Chan 與北大光華管理學院財務系主任徐信忠。由於申請於將於今年八月接系主任，因此除了向其探詢未來與本系合作的意願外，也向其請益系務發展與學術研究的方向。

三、 考察參觀活動(無是項活動者省略)

大會結束後，本人轉往北大光華管理學院，由於財務系主任徐信忠舉辦行為財務學 WORKSHOP，並邀請本人與會。主要的場次有：Contribution to Behavioral Finance、Forecasted Earnings per Share and the Cross Section of Expected Return、Do Noise Traders Move Markets、我國上市公司股權分置改革中的行為金融問題、全流通下中國上市公司類內幕交易和市場操縱的任別與監管、信念偏誤、噪音交易與資產價格波動：理論與實務、換手率與股價溢價：流動性溢價還是投機性泡沫，其 KEYNOTE SPEAKER 為 SUBRA，其他兩位英文演講的貴賓為 John Wei 與 Ning ZHU，三位正好都是從事行為財務的頂尖學者，本人與三位學者也都有共同合作計畫。因此剛好趁此一機會與三位學者分別進行學術計畫的討論。

下午的演講活動則由當地的傑出學者進行演講。目前雖然行為財務學是大陸重點項目，但學者表現仍處於開始階段。此外，我與 PROF SUBRA 討論了從 CULTURE 角度出發的可行性。與 JOHN WEI 提出了從分析師推薦研究資訊價值的計畫，與 NING ZHU 分析了我們計畫中員工多角化的問題，如何考慮員工與非員工的控制問題，IPO 如何影響我們的研究結果，目前回台後，正積極修改中。與 NING ZHU 所討論的議題包括：

- 1.report the median # stocks in portfolios by public- vs. non-public-company employees.

2. run a probit regression with all 4,045,360 individuals with income and salary above basic standard. The dependent variable is whether some one invests in the stock market, the independent variable can include age, income, gender, and whether someone works for a public company.

3. The ratio of (deposits/stock investment), (stock investment/total wealth) averaged across "employee and "nonemployee" from public firms and all firms.

4. check whether we did equal-weighted but please double check.

5. In table 3, define that as the firm age is smaller than 1 year. Add a dummy-variable of whether an investor's employer is a newly IPO firm or not. We probably need re-run the regressions for p-values anyway.

6. make a case that individuals can hold something similar to a market portfolio. One way is through simulation, we can show how a portfolio consisting of randomly-selected 3/4/5 stocks can perform better than employer stocks.

建議

大陸學術研究起飛甚晚，但是進步神速。近十年來，許多大陸學子赴美求學者陸邑不絕，也產生目前許多年輕的教授在國際上均有相當傑出的表現。北大光華管理學院與清華大學經管學院均紛紛邀請這些傑出教授進行訪問，指導其年輕學者與博士班學生共同進行研究，形成重要的研究團隊。主要指導教授為光華管理學院金融學系的徐信忠、周春生教授，兩者皆有多篇研究論文發表在 Journal Financial Economics、Journal of Banking and Finance、Journal of Financial Economics、Journal of Monetary Economics、Financial Management 等重要期刊上。

目前也有國際知名學府如 MIT 與國際投資機構，如美商高盛大量補助北大光華管理學院與清華大學經管學院進行學術研究與交流項目。大陸的學術活動日益興盛，包括建立資料庫公司：清靈中國金融和經濟研究數據庫，結合清華大學中國金融研究中心專業的數據庫設計、數據清洗和金融計算等方面的技術優勢，以滿足教育學術界對金融研究數據的根本需求出發，並搭建標準的金融研究與教學工作平台，以期提供教育學術專業、準確、適時的金融數據。資料庫中主要包含的數據有上市公司之財務資料、債券市場、證券投資基金、股票市場、期貨市場、指數市場、中國宏觀經濟等相關數據。且成立數種學術性刊物，如金融學季刊、中國金融評論等。

台灣目前出國念博士者甚少，在未來如何能與大陸學術界保持密切合作，甚至吸引優秀人士來台任教，可能是可以進一步思考的方向。