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行政院國家科學委員會補助專題研究計畫成果期中報告

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※金融商品在不同交易場所價格發現的比較：以台指期貨與現貨及新台幣匯率為例(1/2)　※
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計畫類別：☑個別型計畫　　□整合型計畫
計畫編號：NSC 94－2416－H－004－051
執行期間：94 年 08 月 01 日　至　95 年 07 月 31 日

計畫主持人：張元晨

本成果報告包括以下應繳交之附件：
　　□赴國外出差或研習心得報告一份
　　□赴大陸地區出差或研習心得報告一份
　　□出席國際學術會議心得報告及發表之論文各一份
　　□國際合作研究計畫國外研究報告書一份

執行單位：國立政治大學財管系

中　華　民　國　95 年　5 月 25 日

行政院國家科學委員會專題研究計畫成果報告
國科會專題研究計畫成果報告撰寫格式說明
Preparation of NSC Project Reports

主持人：張元晨　國立政治大學財管系
共同主持人：
計畫參與人員： 林姿秀

一、中文摘要

　　本文嘗試利用 Hasbrouck (1995) 提出的的資訊內涵比率比較我國股價指數現貨、期貨與選擇權市場價格發現程度的差異。實證資料使用台灣經濟新報所提供的日內交易價格，同時本文也進一步分析造成性質類似商品其價格發現程度差異的原因，以提供市場參與者進行交易時的參考。本文利用我國自 2002 年 1 月 2 日到 2004 年 3 月 19 日之間的日內交易價格。本文的實證結果發現我國期貨市場較現貨市場及選擇權市場具有較大的價格發現功能，在選擇權市場交易中又以價外的選擇權交易較有資訊內涵。因此可以得知資訊較佳的投資人在選擇權交易中比較重視價外的選擇權所帶來的槓桿效果。

關鍵字：資訊內涵比率、台灣股價指數現貨、期貨與選擇權市場

Abstract: This paper examines the information processing among spot, futures, and option markets in an emerging market. Based on data from Taiwan's stock, futures, and options markets, we examine the information processing role of each market with particular attention to liquidity, option types, option moneyness, and market cycles. We conduct price effect analysis, weighted average price contribution analysis, and information share analysis to reveal the informational role of derivatives. We find that trades on futures contribute the most to price discovery and are the most costly in executing information trading. The information role of options varies with moneyness and market cycles. Options are more informative during a downtrend period. Out-pf-the-money options have higher permanent price effects, greater price contributions, and larger information shares than other options, which suggests that informed traders are more concerned about an option's leverage than its delta or vega. We also document that informed traders are more likely to buy out-of-the-money calls than sell out-of-the-money puts in an uptrend market, and vice versa during a downtrend. Our results indicate that in-the-money options are less informative, and market cycles as well as option moneyness affect the informational role of options.

Keywords: Information share, Taiwan's options and futures markets.

二、研究動機

The informational role of derivatives markets in the price discovery process has drawn great attention from academicians and practitioners. Certain market structures may generate larger or more frequent temporary price distortions, or prone to error. It is our interest to investigate the quality of transaction prices among different markets and information contained in the transaction prices across different trading venues. We

explore the role of price discovery for derivatives in the Taiwan markets. We compare information contributions among the Taiwan stock spot index (TXI), the index futures (TXF), and the implied index price derived from the index options (TXO). We use the tick-by-tick and transaction data to analyze the price discovery process under different market cycles and option moneyness. We extend Chakravarty, Gulen, and Mayhew (2004) study to the Taiwan markets.

三、研究方法與結果

We use three methods (the price effect analysis, the weighted average price contribution analysis, and the information-share analysis) to assess information flows among the equity, futures, and option markets. The price effect analysis compares the permanent, temporary, and total price effects of trades in different trading venues (e.g., Keim and Madhavan, 1996, and Booth, Lin, Martikainen, and Tse, 2002). The market with the greater permanent price effect and smaller temporary price effect should contain more information and less noise than other markets The weighted average price contribution analysis (WAPC) identifies which trades move price (e.g., Barclay and Warner, 1993, Huang, 2002) and it examines the venue contributing meaningful price movements and provides a single measure of price leadership. The information-share analysis, closely related to Hasbrouck's work (see, e.g., Hasbrouck, 1991, 1995, and 2003), estimates a trading venue's contribution to price discovery and traces the shares of information attributed to different markets. Controlling for market cycles, option types, and option's moneyness, we offer unique insights into how the information role of options varies under different options characters and different market conditions.

Consistent with the previous findings based on the mature markets, the Taiwan stock index futures market play the most significant role in price discovery. Regardless of market cycles, the futures transactions have greatest permanent price effect, the highest weighted average contribution to price discovery, and largest information share among the index markets. Trading futures, however, is most costly in executing informed trades. With respect to options, when pooling options data together irrespective of options moneyness and market cycles, we find that options have small permanent price effects, possess low contribution to price changes, and account less than ten percent of information share. However, when options are classified according to different moneyness and controlled for market cycles, the test results vary across options' moneyness and market conditions. Out-of-the-money (OTM) options have more impacts on price discovery process than other options. The finding indicates that option leverage plays an important role in determining which option segments informed traders trade in the options market. Short-sale constraints and the price change limit rule in the Taiwan Stock Exchange make options more attractive to informed traders in a downtrend market. We also find that informed traders are more likely to buy OTM calls than sell OTM puts in a uptrend market, and vice versa during a downtrend. On the contrary, in-the-money (ITM) options do not contribute to price discovery in either uptrend or downtrend market. The findings in the option markets suggest that options' sensitivity to underlying asset movements is not a major factor affecting informed trading activities in Taiwan. For robustness results, we also control for liquidity in the option market. Although the price discovery contributions of options tend be positively related to options trading volume, option moneyness and market cycles still matter.

Our results indicate that, regardless of market cycles, Taiwan's futures market has the largest permanent price effect, highest weighted average price contribution, and the largest information share. Thus, the trades on futures are the main driving force for in the price discovery process. The futures market is the price leader and it contains the greatest amount of information. However, it also has the highest total price effect. Hence, the futures market is more costly to

trade relative to other markets.

We also find that the options market contributes to price discovery as well. Nevertheless, in comparison with the futures trades, the transactions on options are less essential in price driving, have lower permanent price effects, and contribute less to price innovations. Interestingly, the empirical results suggest that the information content of options varies as market conditions change. During the downtrend period, options have greater permanent price effects, higher weighted average price contributions, and larger information shares that that of uptrend period. Thus, informed trading is more active in the option market during the downtrend period than the uptrend period. This may be due to the short-sale constraints and the price change limit rule in the Taiwan Stock Exchange.

When options are classified into different moneyness, the test results reveal that, irrespective of market cycles, OTM options have the highest permanent price effect, greatest price contribution, and largest information share among all the options. This finding is more pronounced for OTM call options during the uptrend and OTM puts during the downtrend period. These results suggest that an option's leverage outweighs its delta and vega in determining where informed traders trade. We also document that informed traders are more likely to buy OTM calls than sell OTM puts in an uptrend market, and vice versa during a downtrend market. On the other hand, ITM options are not informative. The results are robust with respect to different options' liquidity. Liquidity is positively related to the informational role of options, but it cannot fully explain all results. Moneyness and market cycles do matter for informed trading in the option market.

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Table 1

The trading activities for the Taiwan Index Options across moneyness

Call options

	All		ITM		ATM		OTM	
Transactions	Number	per. minute	Number	per. minute	Number	per. minute	Number	per. minute
The entire sample period	1,850,088	15	278,221	2	894,090	7	677,777	6
The downtrend period	466,171	7	60,629	1	261,231	4	144,311	2
The uptrend period	1,383,917	27	217,592	4	632,859	12	533,466	10
Trading volume	Number	per. minute	Number	per. minute	Number	per. minute	Number	per. minute
The entire sample period	11,134,540	92	1,223,131	10	4,836,003	36	5,075,406	42
The downtrend period	2,115,801	30	217,299	3	695,124	8	1,203,378	17
The uptrend period	9,018,739	176	1,005,832	20	4,140,879	73	3,872,028	76

Put   options

	All		ITM		ATM		OTM	
Transactions	Number	per. minute	Number	per. minute	Number	per. minute	Number	per. minute
The entire sample period	1,576,167	13	137,833	1	687,685	6	750,649	6
The downtrend period	369,641	5	42,732	1	165,450	2	161,459	2
The uptrend period	1,206,526	24	95,101	2	522,235	10	589,190	11
Trading volume	Number	per. minute	Number	per. minute	Number	per. minute	Number	per. minute
The entire sample period	9,778,435	81	644,523	5	3,748,251	31	5,385,661	45
The downtrend period	1,640,688	24	216,897	3	531,395	8	892,396	13
The uptrend period	8,137,747	159	427,626	8	3,216,856	63	4,493,265	88