行政院國家科學委員會補助專題研究計畫成果報告

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金融商品在不同交易場所價格發現的比較：以台指期貨與現貨為例
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計畫類別：☑個別型計畫　　□整合型計畫

計畫編號：94-2416-H-004-051-

執行期間：94 年 08 月 01 日　至　95 年 12 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

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

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一、中文摘要

摘要：

本文分析台灣現貨、期貨及選擇權市場日內價格發現的情形，我們發現台灣的期貨交易對台股指數價格發現最有影響，但其交易成本較高，選擇權交易對台股指數價格發現的影響會依據選擇權價內、價外而有差異，價外選擇權相對其他選擇權對台股指數價格發現較有影響，因此可以瞭解有私有資訊的投資人對價外選擇權的高槓桿特性較為偏好。同時我們發現價內選擇權相對其他選擇權對台股指數價格發現較無影響，決定台股指數價格發現的主要因素為市場的漲跌及交易標的是否為價外選擇權。

關鍵字：價格發現，期貨市場，選擇權市場 。

ABSTRACT： We extend the understanding of information processing among spot, futures, and option markets to an emerging market. Based on data from Taiwan's stock, futures, and options markets, we examine the information processing role of each market paying attention to liquidity, option types, option moneyness, and market cycles. We find that trades on futures contribute the most to price discovery but they are also the most costly in executing information trading. The informational 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. 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: Price discovery, futures markets, option 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.

三、研究方法與結果

To analyze the information role of the three markets in the price discovery process, we conduct the information share analysis (Hasbrouck, 1995). The information share analysis estimates the information share of a market according to that market's contribution to the total variance of the common random-walk component. The information flow analysis is able to show the portion of price discovery from different markets and identifies the venue giving the most informative trades.

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Table 1

The descriptive statistics for TXI, TXF, and TXO

This table presents descriptive statistics for Taiwan index returns in one-minute interval for among the Taiwan stock spot index (TXI), the index futures (TXF), and the implied index price in the index options (TXO) . In this ex-post study, the entire sample is divided into two subperiods. Downtrend market runs from January, 2002 to April, 2003, and uptrend market runs from May, 2003 to March, 2004. We choose April 2003 as the dividing line between the downtrend and uptrend markets because the Taiwan stock index started moving up in April 2003.

	Obs.	Mean (10^{-6})	Std.	Min	Max
Entire period (01/02/2002~03/19/2004)					
TXI	120,954	1.1308	0.0010	-0.0463	0.0331
TXF	120,954	1.4999	0.0012	-0.0354	0.0362
TXO	120,954	1.7370	0.0017	-0.0516	0.0413
Downtrend (01/02/2002~04/29/2003)					
TXI	69,692	-4.0635	0.0011	-0.0463	0.0331
TXF	69,692	-3.5682	0.0013	-0.0354	0.0362
TXO	69,692	-4.5109	0.0020	-0.0516	0.0413
Uptrend (04/30/2003~03/19/2004)					
TXI	51,262	8.1926	0.0008	-0.0155	0.0193
TXF	51,262	8.3902	0.0008	-0.0190	0.0274
TXO	51,262	10.2311	0.0013	-0.0234	0.0312

Table 2

The means of the daily information shares for the TXI, TXF, and TXO

$$IS_i = C_i^2 \Sigma_{ii} / Var(\Phi) \qquad (17)$$

This table reports the means of lower bounds and higher bounds in the information share analysis for the equity, futures, and implied prices in options. IS_i is the information share of market i and Σ_{ii} is the variance of ε_i. The calculation is discussed in Section 4.3. This study uses minute-by-minute time intervals in conducting information share analysis. At the start of each trading day, as soon as an equity index observation is reported, the most recent trades for the futures and options markets are acquired to form the first matched price set for the first trading minute. This matched price set is saved and a new matched price set is formed in the same manner for the second minute on the trading day. To minimize the impact of data staleness on the test, we eliminate those matched price set with prices recording more than fifteen seconds apart. Information share bounds are computed each day using intraday transactions data. Since an estimate of the information share's standard error is difficult to obtain, the analysis follows Hasbrouck and Chakravarty et al. in using daily variation in the information share to determine the statistical significance of the estimates. Because price innovations across markets are usually dependent, the information share is not uniquely defined. This study computes a range of information shares instead of a point estimate. The upper and lower bounds of this range are obtained by trying all alternative rotations in Equation (19).

	TXI		TXF		TXO	
	IS mean	Std.	IS mean	Std.	IS mean	Std.
The entire sample period	43.86%	15.36%	46.69%	21.55%	9.46%	5.86%
The downtrend period	41.89%	17.11%	47.63%	23.06%	10.48%	6.42%
The uptrend period	46.57%	13.69%	45.39%	19.72%	8.04%	5.76%

Table 3

The means of the daily information shares for options across moneyness

$$IS_i = C_i^2 \Sigma_{ii} / Var(\Phi) \qquad (17)$$

This table reports the means of lower bounds and higher bounds in the information share analysis for the implied prices in options across moneyness. We define out-of-the-money (OTM) options as options with delta ranging between 0.45 and 0.02; at-the-money option (ATM) options as options with delta ranging between 0.45 and 0.55; and in-the-money (ITM) options as options with delta ranging between 0.55 and 0.98. IS_i is the information share of market i and Σ_{ii} is the variance of ε_i. The calculation is discussed in Section 4.3. This study uses minute-by-minute time intervals in conducting information share analysis. At the start of each trading day, as soon as an equity index observation is reported, the most recent trades for the futures and options markets are acquired to form the first matched price set for the first trading minute. This matched price set is saved and a new matched price set is formed in the same manner for the second minute on the trading day. To minimize the impact of data staleness on the test, we eliminate those matched price set with prices recording more than fifteen seconds apart. Information share bounds are computed each day using intraday transactions data. Since an estimate of the information share's standard error is difficult to obtain, the analysis follows Hasbrouck and Chakravarty et al. in using daily variation in the information share to determine the statistical significance of the estimates. Because price innovations across markets are usually dependent, the information share is not uniquely defined. This study computes a range of information shares instead of a point estimate. The upper and lower bounds of this range are obtained by trying all alternative rotations in Equation (19).

The downtrend period

	ITM		ATM		OTM	
	IS mean	Std.	IS mean	Std.	IS mean	Std.
Call options	0.57%	5.36%	8.59%	5.68%	7.03%	6.26%
Put options	1.21%	7.55%	11.26%	6.70%	14.62%	8.19%

The uptrend period

	ITM		ATM		OTM	
	IS mean	Std.	IS mean	Std.	IS mean	Std.
Call options	2.05%	4.24%	9.29%	6.41%	11.08%	5.45%
Put options	0.03%	2.71%	6.39%	6.15%	4.26%	3.61%