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Does the early bird catch the worm? The information content of Taiwan's index option trading in the early 15-min pre-opening session ☆

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ABSTRACT

We examine the information content of index options trading during the pre-opening session. Using data from the Taiwan market, we find that variables constructed based upon option implied volatility and option volume imbalance in the pre-opening session can predict spot index and ETF returns for up to ten minutes after the spot market opening. This finding remains robust, even after controlling for the pre-opening returns of index futures, which suggests that pre-opening trading in index options plays a critical and unique role in price discovery prior to the opening of the spot market. Such predictive ability is stronger for short-term options, near-the-money options, and for options that are away from expiration days. We also find that pre-opening options trading reflects the uncertainty transmitted from overseas markets, showing lower predictive ability on days with less definite overnight information (greater CBOE VIX).

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1. Introduction

Derivatives markets often open earlier and/or close later than the underlying spot markets. Cheng, Jiang, and Ng (2004) suggested that the extended trading sessions in these markets facilitate hedging and portfolio rebalancing during periods when the spot markets are closed. What is of greater significance is the fact that these extended periods of trading allow informed traders to exploit their private information earlier, indeed, before most trading begins. As a result, after-hours derivatives trading provides price discovery by revealing information that may explain, or even predict, subsequent spot returns (Hiraki, Maberly, & Takezawa, 1995). In this study, we set out to investigate whether pre-opening trading in the index options market has useful information content which may have predictive ability on the subsequent spot index returns.

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Numerous prior related studies have provided evidence on the activities of informed traders in the options markets. Examples include: [Chakravarty, Gulen, and Mayhew \(2004\)](#) who noted that non-trivial private information was disclosed on equity options; [Ahn, Kang, and Ryu \(2008\)](#) who found a significant proportion of adverse-selection costs in the options spread to conclude that informed investors used index options as their trading vehicles; [Pan and Poteshman \(2006\)](#) and [Chang, Hsieh, and Lai \(2009\)](#) who observed that option volume information variables had significant predictive power on future spot returns, equity options and index options; and [Xing, Zhang, and Zhao \(2010\)](#) and [Yan \(2011\)](#) who found that volatility-related information variables had significant predictive power on equity returns.

As demonstrated by the above mentioned studies, the extant literature provides general support for the price discovery ability of options trading during regular sessions. However, index options have rarely been explored for their informational role during the pre-opening session. If the extended trading sessions in the derivative markets do contain useful information, then there is a very strong likelihood that the pre-opening options trading will help to predict subsequent changes in spot market prices. We provide rare evidence on the predictive ability of options trading in the pre-opening session.

We examine all TAIEX index option (TXO) contracts traded on the Taiwan Futures Exchange. The TAIEX, which is a capitalization-weighted index including almost all listed stocks on the Taiwan Stock Exchange (TWSE), is the primary Taiwanese equity index, serving as the underlying index of index futures (TXF) and TXO contracts.¹ According to a World Federation of Exchanges report, trading volume of the TWSE during our sample period was ranked fifteenth in the world, with TXOs ranking as the fourth most frequently traded index option on a global scale. The index option market opens at 8:45 am, 15 min earlier than the stock market of the underlying index in the morning session, which opens at 9:00 am. The option market also closes 15 min later than the spot market, which have respective closing times of 1:45 pm and 1:30 pm ([Fig. 1](#)).

We extract information embedded in the pre-opening option transactions (8:45–9:00 am) and carry out predictive regressions to examine whether the option information variables calculated during the pre-opening session have predictive ability on the subsequent spot index returns during the regular session. Two types of information variables are used; firstly, the volatility-based signals developed by [Cremers and Weinbaum \(2010\)](#), [Xing et al. \(2010\)](#) and [Yan \(2011\)](#); and secondly, the volume-based information variables developed by [Cao, Chen, and Griffin \(2005\)](#). We find that both types of information variables have significant predictive power on spot market returns after the opening, with the results indicating that pre-opening options trades contain useful information predicting subsequent spot index and ETFs movements.

The literature on the extended trading hours in the derivatives markets can be categorized into two strands. The first strand is concerned with the impacts on the spot markets arising from the extension of futures trading hours, pre-open or post-close, beyond the regular spot trading session. To investigate these impacts, several of the prior related studies have carried out comparisons of spot market returns, volume, volatility, return autocorrelations and reversals before and after the implementation of extended trading hours on futures markets. The findings generally indicate that extended futures trading has had significant impacts on the spot markets, in terms of reducing spot volatility, improving pricing accuracy and lowering the relative price discovery in the cash market. The effects on the spot markets are found to be stronger for pre-opening trading than for post-closing trading, thereby indicating that informed trading is more concentrated during the pre-opening trading sessions ([Cheng et al., 2004](#); [Lee, Chien, Chen, & Huang, 2009](#)).

The second strand of the literature deals with the explanatory or predictive power of the information content of extended futures trading on spot market returns. [Hiraki et al. \(1995\)](#) examined the information content of Nikkei 225 index futures during the post-closing period, employing a GARCH process to extract the unexpected futures returns along with a second GARCH model to explore the influence of the unexpected futures post-closing returns on subsequent index returns in the overnight interval and the regular trading session. The information content showed surprisingly strong influences of futures post-closing returns, with the impact on spot returns lasting more than a full trading day.

Using a similar approach, [Cheng et al. \(2004\)](#) documented that the pre-opening return innovations of Hang Seng Index futures had longer impacts on the spot index than post-closing innovations. Their results implied that information-driven trading was more prevalent in the pre-opening session as opposed to the post-closing session. A similar investigation undertaken by [Lee et al. \(2009\)](#) on Taiwan index futures showed that the futures return innovations during the pre-opening sessions affected subsequent overnight spot returns.

Given that we examine the information content during the pre-opening session, our study relates closely to the second strand of the literature. Whilst the prior related studies have tended to focus on the informational role of index futures in the pre-opening sessions, our interest lies in index options, a market also deemed to have rich information. Some studies have suggested that the options markets attract informed trading essentially because traders benefit from high leverage ([Black, 1975](#)), low transaction costs ([Fleming, Ostdiek, & Whaley, 1996](#)) and the flexibility to engage in a variety of volatility trading strategies that are not available in the futures markets ([Chaput & Ederington, 2005](#); [Ni, Pan, & Poteshman, 2008](#)).

Options can also provide forward-looking information on the implied distributions of the underlying asset prices beyond the first and second moments ([Jackwerth & Rubinstein, 1996](#)). [Gemmill and Saflekos \(2000\)](#) suggested that the implied distributions revealed in index options reflect investor sentiment, and thus, may be related to future index returns. Both [Pan and Poteshman \(2006\)](#) and [Ni et al. \(2008\)](#) empirically demonstrated that some categories of options traders were able to

¹ The Taiwan Futures Exchange offers TXO for spot month, the next two calendar months, and the next two quarter months, plus a wide range of strike prices. TXOs are small contracts, with notional value of approximately NT\$ 400,000 (USD 17,000), and as a result of their small contract size, they attract a large amount of retail trading; indeed, according to [Chang et al. \(2009\)](#), retail trading accounts for about 50 per cent of all TXO volume.

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