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Short Note on Market Efficiency in KOSPI 200 Index Option Market

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Abstract

In this paper we test whether KOSPI 200 Index Option Market in Korea is weakly efficient. KOSPI 200 Index Option Market tends to have shown the interesting pattern of increasing and then decreasing number of open- interest accounts or volatility during a day. In our test Long and Short Straddle trading strategy taking advantage of this pattern is found to have a chance to produce a positive return after commission fees or transaction costs. This finding reveals that KOSPI 200 Index Option Market may be not weakly efficient enough to reflect the past price/Index information.

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Key words: KOSPI 200 Index, Option, Weak form efficiency, Korea

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1. Introduction

Since Fama (1965, 1970) introduced the market efficiency hypothesis, it has been one of major hypotheses tested in finance. Especially weak form efficiency has been intensively tested in developed and developing (stock) markets. Weak form efficiency says that current security price has already reflected the past information. Trading strategy using the past security price information may not generate profits. In literature, the weak form efficiency test tends to take mainly two types. One type is to test the profitability of trading strategies or the predictability of security price, using the past security price information. The other type is fundamental analysis exploring whether the past price determinants relate to the current or future security price. Various testing methods such as autocorrelation, unit root, variance ratio, nonparametric tests, etc have been employed. It has been found that in general the markets of developed countries are weakly efficient. However due to efficiency-decreasing factors such as thin trading, illiquidity, size of capitals, etc. scholars have found mixed evidence for weak form efficiency in the markets of developing countries (Gilmore and McManus (2003), Asiri (2008), Lagoarde-Segot and Lucey (2008), Awad and Daraghma (2009), Hasanov (2009), Abdmoulah (2010), Jeffrey (2010), Milionis (2011)).

Extending these findings of literature, we explore the market efficiency of KOSPI (Korean Composite Stock Price Index) 200 Index Option Market in Korea. KOSPI 200 Index Option Market has been noticed to be very liquid but interestingly dominated by uninformed/unsophisticated individual investors rather than institutional investors (Ahn, Kang, and Ryu, 2008). In literature these individual investors have been found to be limited to access or capitalize information (Grinblatt and Keloharju (2000) and Barber, Lee, Lui, and Odean (2007)). Thus it is believed that with their speculation or over/under-reaction to news, these individual investors may make KOSPI 200 Index Option Market depart from market efficiency, especially weak form efficiency.

In this paper we test this possible weak form market efficiency in KOSPI 200 Index Option Market. KOSPI 200 Index Option Market has been noticed to show a pattern of increasing and then decreasing number of open interest accounts and index volatility during a day. Exploring the profitability of Long and Short Straddle trading taking advantage of this pattern, we test whether Long and Short Straddle can make money after commission fees or transaction costs. KOSPI 200 Index Option during 301- trading days (March 23, 2009 to May 31, 2010) and ATM (at the money) and OTM (out of money) options are used. Our test result reveals that even though commission fees or transaction costs are considered, Long and Short Straddle trading has a

chance to generate a positive return to investors. KOSPI 200 Index Option Market may be not weakly efficient enough to reflect the past price behaviors.

2. KOSPI 200 Index Option Market

The option market in Korea began on July 7 1997. An underlying asset of the option market is KOSPI 200 Index (Korean Composite Stock Price Index) which is composed of 200 stocks listed in KOSPI (Korea Composite Stock Price Index). KOSPI 200 Index began in May 3, 1996, setting the base value of 100 in January 2, 1990. Since then, options and futures markets on KOSPI 200 Index have grown dramatically in Korea.

According to the statistics of Korea Exchange (KRX), the daily average trading volume of KOSPI was only 3 trillion won (Korean currency unit) in January 2000. In May 2010 it has reached to five to six trillion won. However the average daily KOSPI 200 Index futures trading volume was 3 trillion won in January 2000. In May 2010 it has reached to 50 trillion won. For KOSPI 200 index options, the daily average trading volume was 25 billion won in January 2000 and has reached to 800 billion won in May 2010. With the growth of options and futures markets in Korea, various portfolio strategies composed of stock index, futures, options, or/and regular stocks have been introduced.

Figure 1 shows the increasing daily trading volume of options, futures, and Korean security market (KOSPI) during the last 10 years.

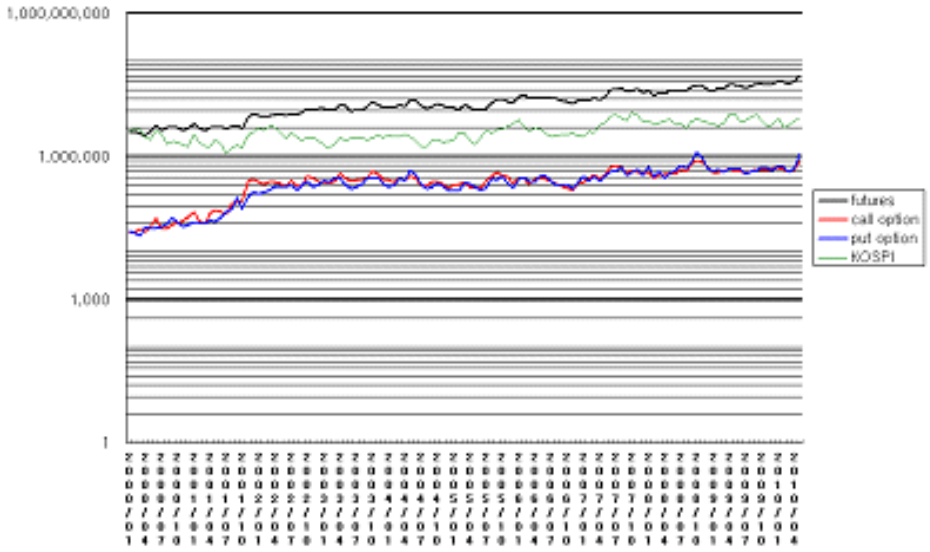

Figure 1. average daily trading volume (million won – Korean currency)

KOSPI 200 Index options are traded during the period of 9 am to 3 pm each day. Due to order processing between 3:05 pm and 3:15 pm, investors can not know the asking and bid prices. Buy and sell orders determine the closing price at 3:15 pm. Therefore, any negative news or information regarding underlying assets after 3 pm to 9 am next day can generate huge losses to investors who held options overnight. For this reason of uncertainty, most investors are trying to avoid this overnight risk and tend to focus on daily trading. It tends to produce a concave shape – increasing and then decreasing number of open-interest (unsettled) account and index volatility – in a day.

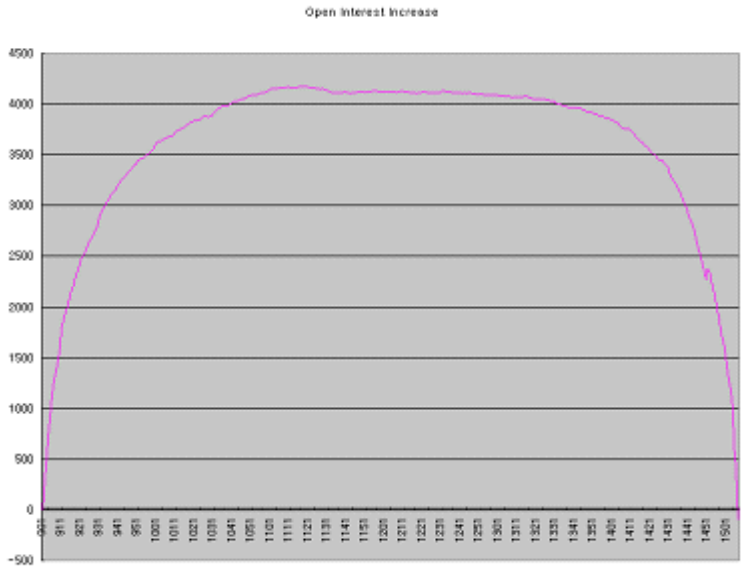

Figure 2. Average open-interest (unsettled) contract from the start time

Figure 2 shows every 10 minute open-interest (unsettled) option contracts of KOSPI 200 Index during the years of 2009 and 2010. The value of Y-axis indicates the increase or decrease of open-interest (unsettled) options, starting at 9:00 am. The open-interest increase at 9:00 am is 0 and increases to over 4,000 by around noon. Then it reduces down to about 0 at 3 pm. It is also noticed that the open-interest option contracts of KOSPI 200 Index and their volatility in the option market are closely related. When the number of the open-interest option contracts increases (decreases) before (after) the noon, the volatility of KOSPI 200 Index Option also tend to increases (decreases).

In this paper, the profitability of Long and Short Straddle strategies capitalizing this property – past information - is explored in order to test weak form market efficiency in the KOSPI 200 Index Option Market.

3. Long and Short Straddle and Programming

Long Straddle is a trading strategy buying both call and put options on KOSPI 200 Index around 9 am and to liquidate both options at noon. Short Straddle is a trading strategy selling both call and put options on KOSPI 200 Index at noon and then to liquidate both options at 2:45 pm. Both Long and Short Straddles mainly use at-the-money (ATM) or out-of-money (OTM) options with opening/initial KOSPI 200 Index. Due to a high purchasing price and a lack of availability, in-the

money (ITM) options are not considered. For example, if the opening/initial KOSPI 200 Index is 240 and an investor decides to use ATM options, the investor in Long Straddle would buy both call and put options with an exercise price (KOSPI 200 Index) of 240 at a starting time and then liquidate the trading position at noon. Then in order to implant Short Straddle trading strategy, the investor sells both call and put options at an exercise price (KOSPI 200 Index) of 240 at noon and then closes the trading position at 2:45 pm. However, if the investor decides to use OTM 2.5 (OTM option of 2.5 point), the investor would buy a call option with an exercise price (KOSPI 200 Index) of 242.5 (=240+2.5) and a put option with an exercise price (KOSPI 200 Index) of 237.5 (=240-2.5). The trading position closes at noon. Then in order to set up Short Straddle trading strategy, the investor sells a call option with an exercise price (KOSPI 200 Index) of 242.5 (=240+2.5) and a put option with an exercise price (KOSPI 200 Index) of 237.5 (=240-2.5) at noon. Then the position closes at 2:45 pm. The profitability of Long and Short Straddle trading strategies is determined by the market price changes of call and put options on KOSPI 200 Index.

We use multichart program to run these trading strategies. Multichart is a program for a system trading (Ko (2009)). It has many interesting characteristics. It can use multi-instance and multi-monitor. You can use multiple monitors for separated jobs. Symbols are up to 100 per a chart. And plots are up to 999 per a chart. So it is very useful for complicated strategies. In particular, unlike other systems to give the data manually, multichart exchanges data automatically and gives very convenient working environments. Feeding data is providing data of the symbol from server to client in an internet connection.

Especially in multi-core CPU, the CPU is allocated by chart because the chart can be used independently and through the maximum utilization of the resource, can handle fast signals. Furthermore it assists investors to set up an optimal portfolio with additional tools to extract the parameters available. First of all, feeding data to the receiver via a network connection is saved by the symbol. The program is a symbol of the administration which is called quote manager. The symbols are linked to charts and portfolio for real-time automated orders and analysis of strategies. In the chart, there are the numbers of symbols, signals, and the indicators. Signals and indicators are edited by the power language editor and saved at the storage pool after compiled. Figure 3 shows the flow chart and block diagram of multichart program is shown below.

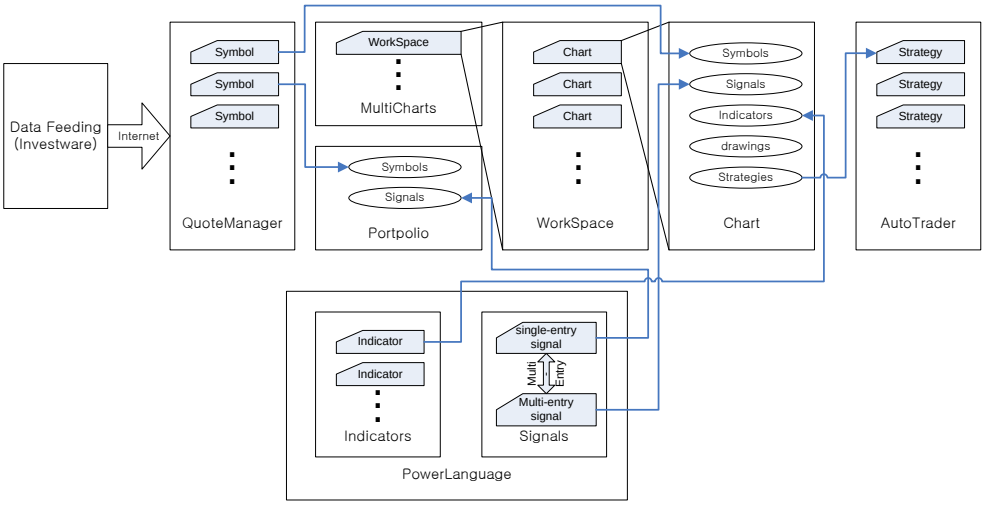

Figure 3. Multicharts' Block Diagram

In the multichart program, when options are bought for Long Straddle trading strategy, market position changes to 1 and get back to 0 when Long Straddle trading position is closed/liquidated. When Short Straddle trading strategy sells both call and put options, the market position goes to -1. When Short Straddle trading position is closed/liquidated, cover signal is on and then market position returns to 0.

To test the profitability of Long and Short Straddle strategies, we use multichart program. Every minute option price information during the period of 301- trading days (March 23, 2009 to May 31, 2010) is used. After multichart program first figures out ATM (at-the-money), OTM 2.5 (out-of-money index option of 2.5 points), OTM 5 (OTM of 5 points), OTM 7.5 (OTM of 7.5 points), and OTM 10 (OTM of 10 points), then it executes Long and Short Straddle trading strategy and estimates daily profitability.

4. Test Result

Table 1 shows the profitability of Long and Short Straddle trading strategies is estimated.

Table 1 Profits of two strategies

	Long Straddle (Unit: Won, Korean Currency)			Short Straddle (Unit: Won, Korean Currency)		
	total profit	average daily profi	daily return	total profit	average daily profit	daily return
ATM	1,071,000	3,558	0.51%	1,244,000	4,133	0.56%
OTM 2.5	63,000	2,867	0.41%	1,167,000	3,877	0.53%
OTM 5	39,000	1,458	0.21%	1,040,000	3,455	0.47%
OTM 7.5	21,000	1,066	0.15%	827,000	2,748	0.38%
OTM 10	87,000	953	0.14%	650,000	2,159	0.30%

An average daily profit of Long Straddle at ATM is 3,558 won and 0.51 % daily return. The profit of ATM is generally higher than the profits of OTMs. Short Straddle trading strategy at ATM has 4,133 won which is higher than the profits of Short Straddle trading at other OTMs and Long Straddle trading strategy. Even though short trading position needs deposit money, it will be returned when the short trading position is closed. So we ignore it. The daily return of Short Straddle trading strategy is 0.56% without the commission or transaction fee. As Long and Short Straddle strategies at ATM are applied, the average daily profit rate is about 1.07%. With both ATM and OTMs, Long and Short Straddle trading strategy tends to generate returns ranging of 0.44% to 1.07%. However buying and selling both options make 8 trades a day. The profitability of Long and Short Straddle strategies will depend on the amounts of commissions or transaction fees.

Table 2 shows the commissions or transaction fees per trade in Korea. When we consider the commissions or transaction fees, Long and Short Straddle trading strategies will have a chance to make money at ATM or OTM 2.5. For example, if investors select eTrade and set up Long and Short Straddle at ATM, they will get an average return of 0.27% (=1.07% - 0.8%) per day or 81.27% (= 0.27%*301) for 301 days.

Table 2 Index option Commissions in Korea

Brokerage company	Commission per a trade
B*G	0.026%~0.075%
Kiwoom, KB, WooriFuture	0.15 %
DongBu, eTrade	0.1%
Mirae	0.2 %

Though not statistically sophisticated or free from commissions or transaction fees issues, this profitability test result indicates that KOSPI 200 Index Option Market may not be weakly efficient to reflect the past price pattern.

In literature, thin trading, liquidity, trading system, etc in the markets of developing countries has been quoted as potential reasons to slow down the market efficiency. Due to its high liquidity and growing trading volume of KOSPI 200 Option Index Market (Ahn, Kang, and Ryu (2008)), however, departure of efficiency in KOSPI 200 Option Index Market may relate to uninformed or unsophisticated individual investors.

5. Conclusion and discussion

In this paper we explore whether KOSPI 200 Index Option Market is weakly efficient enough to reflect past price information. KOSPI 200 Index Option Market tends to show a concave shape of trading volatility during a day. If KOSPI 200 Index Option Market is weakly efficient, Long and Short Straddle trading strategy taking advantage of the trading volatility pattern will not generate a positive return after transaction costs.

Using every minute option index data and multichart program, we test the profitability of Long and Short Straddle trading strategy. The test result reveals that Long and Short Straddles at ATM and OTM 2.5 have a chance to make money depending on the amount of commission fees or transaction costs. It implies that KOSPI 200 Index Option Market may not be weakly efficient enough to reflect past price/index information.

In this test, it is not easy to clearly tell why the weak efficiency is not achieved. However we believe it may relate to trading behavior of uninformed/unsophisticated investors. Their limited accessibility to information or capability of capitalizing information is believed to cause KOSPI 200 index Option Market to depart from market efficiency. This information argument posts interestingly questions regarding the roles of individual or institutional investors in forming market efficiency of KOSPI 200 Index Option Market.

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