

CITY UNIVERSITY OF HONG KONG
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**Trading Strategies of Option Portfolio –
Design & Risk Analysis**
期權組合的交易策略設計及風險分析

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Abstract

Derivatives are an important class of financial instruments that are central to today's financial markets. They offer various types of risk protection and allow innovative investment strategies. The derivatives segment of the financial market is associated with almost all other segments, including equities, bonds, foreign exchange, real estate, commodities and numerous other asset classes and financial instruments. The derivatives market has seen the highest growth among all segments of financial markets in recent years. Derivatives have become a key contributor to the stability of the financial system. According to the Bank for International Settlements (BIS), as of March 2013, the global derivatives market amounts to \$53 trillion for the organized exchanges and \$639 trillion for over-the-counter (OTC) market in terms of notional outstanding amount. Since 1995, the size has increased by more than 20% per year in terms of notional outstanding amount, far outpacing equity market (around 10%) and bonds (around 9%).

An option, belonging to the derivatives family, is a contract that gives the buyer the right, but not the obligation, to buy or sell an underlying asset at a specific price on or before a certain date. Option is widely used in risk management, investment and speculation. According to the study published by Summa (2003) in *Futures* magazine, three of every four options held to expiration expires without being exercised (the exact percentage was 76.5%). Therefore, this research aims to develop profitable option selling strategies. First, derivative and option markets are reviewed in Chapter 1.

Chapter 2 discusses the benefits and drawbacks of different option selling strategies. First, time value of option contracts is analyzed. Then some experienced option traders are interviewed and their advices are taken into consideration when developing option selling strategies. Six typical option selling strategies, covered call, naked put, straddle, strangle, vertical credit spread and vertical ratio spread are discussed in this research. Reward/risk characteristics of these strategies are analyzed and compared. The unique profit & loss (P&L) outcomes of these strategies make option selling strategies totally different from traditional equity investment.

In Chapter 3, the performance of four typical option selling strategies (covered call, naked put, straddle and strangle) is examined, using the Hong Kong stock market index, Hang Seng Index (HSI), option data of the past 10 years. It is found that the compound annualized return of selling naked at-the-money puts is more profitable than out-of-the-money puts, and it is nearly equal to that of HSI but with much lower volatility. In addition, the covered call strategy can generate the highest annualized return; strangle selling has the highest Sharpe ratio; and the straddle selling strategy has the lowest correlation with HSI.

Chapter 4 introduces a variable representing investors' sentiment, called implied volatility index, which improves the performance of option selling strategies. Previous studies (Giot, 2005; Banerjee et al., 2007) have proposed a quantitative method of defining the "high" and "low" levels of implied volatility index. Under the proposed quantitative definition, it shows that in the US market implied volatility index levels and future stock market returns have a positive relationship, i.e. "high" implied volatility index indicates a high expected future stock market return, i.e. the market can be oversold in extremely high volatility. In this research, the results are re-examined using longer data (up to 2013) and

more markets (e.g. US, UK, Germany, France, Japan and Hong Kong). The results show that the positive relationship observed in previous studies is disappearing in US, Europe and Japanese markets but still holds in Hong Kong. The previous quantitative definition of “high” and “low” levels of implied volatility index has two obvious drawbacks: 1) under the definition, the positive relationship is disappearing; 2) it is not easy to use it to improve option selling strategies. Therefore, a new quantitative method describing the levels of implied volatility index is proposed. Due to the mean-reverting property of the implied volatility index, the implied volatility level above the long-term median value is defined as “high” volatility and that below the long-term median value is defined as “low” volatility. Based on the new quantitative definition, a new property that the expected future stock market return in a “low” volatility market is equal to or even greater than that in a “high” volatility market can be found in most markets except France. This property can be used to improve the near-the-money option selling strategy, especially call options. Moreover, it can be used to improve covered call and strangle strategies.

In Chapter 5, risk measurement and management methods are discussed. For the sake of simplicity, the modified notional amount approach is adopted, but with some modifications. Unlike traditional equity investment, the loss stopping rules are fixed by profit zones at maturity. Three levels, 0%, -5% and -10% of stop loss rules are proposed and applied to option selling strategies. It can be concluded that 1) the proposed risk management rules for downside risks always reduce the profit; 2) hedging upside risks can sometimes earn extra profits; 3) the costs for upside risks hedging are far less than the downside.