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Study on Dynamic Adjustment Models of the Price Limit Level and Margin Level of Futures Contracts
期貨漲跌停板與保證金動態調整方案研究

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摘要

保證金制度是期貨市場管理風險的重要制度，是實現其杠杆交易、每日無負債結算、T+0 多空交易的基礎。保證金水準的高低一方面決定了交易所控制市場風險和對手方違約風險的能力，另一方面也影響著投資者的資金利用率。過低的保證金水準在市場波動增加時將使交易所（或清算機構）面臨對手方違約風險，而過高的保證金水準將降低投資者的資金利用率，增加企業參與交易的資金成本。

漲跌停板制度是與保證金制度緊密關聯的價格限制制度，自 1987 美國股災之後，受到監管機構和交易所的重視。但是，最佳實踐表明，中國的漲跌停板制度和境外的漲跌停板制度存在較大差別，境外交易所的保證金與漲跌停板之間大多沒有必然聯繫，但是在國內的期貨市場中，漲跌停板結合保證金的制度設計，對期貨市場的風險防範具有重要的意義，因此，漲跌停板水準都低於保證金水準。

組合保證金模型自 OCC 1986 年推出 TIMS 系統以後，得到全球各衍生品市場的高度關注，陸續出現 SPAN 系統和 TIMS 相關優化系統。這些系統和模型的應用，提高了市場中投資者的資金使用效率，增加了市場的流動性，對投資者和交易所是一個雙贏的結果。就國內期貨市場來說，2013 年以前，仍然採用全額保證金制度，沒有採用任何組合保證金模型和系統，隨著市場需求的增加，我們結合中國期貨市場的實際情況，提出了一種單向大邊組合保證金收取模型，能夠在提高投資者資金使用效率的同時，滿足監管和風控的要求。

近年來，由於地緣政治風險、國際供需變化，使得商品衍生品市場、外匯市場的波動明顯加大。特別是 2015 年以來，國內股票市場大幅波動；商品市場經

歷了過山車一樣的價格走勢。衍生品市場的大幅波動，給參與其中的企業和投資者帶來巨大的市場風險，對交易所而言，也面臨較大的風險管理壓力。適時調整漲跌停板和保證金水準，既能夠為釋放市場風險提供合理的波動空間，又能夠控制好投資者的違約風險。

回顧漲跌停板制度的發展歷史，從 1989 年的熔斷機制再到 2012 年的價格上下限（即漲跌停板）制度，這種變化表明，隨著市場的發展，特別是程式化交易的比重越來越高，原有的熔斷機制已經不能滿足監管風控的需求，其主要原因是熔斷機制（狹義）是由成交單觸發，屬於事後的風控措施，難以有效預防閃電崩盤(Flash crash)等事件。2012 年 SEC 啟用價格上下限制度也表明，屬於事前風控手段已經成為當前預防市場異常風險的主要手段。

國內的期貨市場的漲跌停板制度和保證金制度目前還處於根據市場波動變化，不定期進行人工調整的手工管理階段。國內往往將保證金和漲跌停板作為一對參數進行設置，在波動率加大時，提高漲跌停板同時提高保證金比例（保證金比例大於漲跌停板水準）。這種模式下，一般交易所會採用較歷史波動率和 VaR 方法測算出的數值更高的漲跌停板和保證金比率，這樣做的好處是可以覆蓋大多數市場波動風險，但卻提高了投資者和企業的資金佔用率，降低了市場的流動性，往往受到市場的詬病。另外，在市場波動加劇時，這種方式更不利於提前對市場波動做出反應，往往導致出現連續停板的現象，使市場風險不斷積聚；同時，在市場波動較低的時候，不能做出及時調整，從而增加了投資者的資金成本。

通過分析比較現有的漲跌停板調整制度，結合我國期貨市場目前的制度情況，我們提出應當根據市場的波動變化情況，適時調整漲跌停板制度，並提出了根據

日內最大振幅、累積波動率變化和日間最大振幅等方法動態調整漲跌停板和保證金的方案。

通過實證比較分析，發現累積波動率方法優於日內最大振幅方法。究其原因，在於日內最大振幅反映的還是日內的波動變化，而漲跌停板和保證金的計算都是以前一交易日的價格為基礎計算得出。因此，我們使用日間價格波動指標來代替日內累積最大振幅方法。通過風險覆蓋率、風險靈敏度、漲跌停板調整頻率和資金使用效率等四個方面的比較，我們發現動態調整方案明顯優於現行制度。在動態調整方案中，累計波動率向上調整方法和日間最大振幅模型的實證效果更優。

本文提出的動態調整模型，可以作為國內期貨交易所未來優化漲跌停板和保證金調整制度的參考模型。在此模型上，可以增加監管風險偏好變數，以適應不同監管理念的需求。從模型的適應性來看，對歷史資料的依賴還較強，還沒有考慮異常波動對後期市場的過度反應造成的影響，後續我們將對模型進行優化，提高模型的適應性。

關鍵字：漲跌停板；保證金；波動率；流動性

Abstract

Margin mechanism is one of the most important risk-control methods in the futures market. It is also the basis of leverage trading, mark-to-market , long/short trading, etc. Margin level reflects the exchange's ability to control market risk and counter-party risk, and also affects investors' capital efficiency. With lower margin level, exchanges and clearing houses are subject to counter-party risk while the market is volatile. However, higher margin level lowers the capital efficiency of the investors.

Price limit mechanism is closely related to margin mechanism. Since Black Monday in 1987, Government noticed the importance of the price limit. Best practice in China shows that price limit in China is very different with that in U.S. and Europe. In mature futures market, price limit level has little correlation with margin level. However, in Chinese futures market, price limit is used as the first line of defense. Usually, price limit level is lower than margin level.

Portfolio margin model was accepted by global exchanges since 1986 when OCC first launched its TIMS system. After TIMS, SPAN, STANS are proposed. These systems increased the capital efficiency of investors and enhanced the market liquidity. For domestic futures market, before 2013, gross margin model was used. Market needs for portfolio margin model pushed us to propose the Sigle-side margin model which can meet the requirement of risk-control and regulation.

Recent years, geopolitical instability, change in supply and demand lead to great volatility in the futures market and FX market. Since 2015, the prices of commodities jumped up and down with the stock market crash. With the high volatility in the commodity futures prices, enterprises and investors had to bear higher market risk. The exchange also had the pressure on risk-control. For those problems, with a reasonable margin level and price limit level, the market risk can be released within the normal daily price movement, and the exchange can also reduce the default rate of the investors.

From the historical view, circuit breaker introduced in 1989 is replaced by the price up and down limit in 2012. This shows that with the rapid development of algo-trading, the existing circuit-breaker is not able to meet the risk-control requirement of the government for the reason that circuit breaker is a post-event risk measure triggered by price. It is ineffective to prevent events like flash crash. The up and down limit introduced by SEC in 2012 shows pre-event risk control has been the main method to deal with abnormal market conditions.

In the domestic futures market, the price limit level and margin level is adjusted manually according to the price movement. Mostly exchanges refer the historical volatility and VaR methods to measure the price movement, but the result indicates much higher risk levels. The high level can cover most price movement, but reduce the capital efficiency of the investors. And the higher the margin level is, the lower the market liquidity is. In addition, the current adjustment method cannot react promptly to a sudden increase in market volatility. The worst situation is that the price hits the price limit level in continuous trading days, and the market risk elements are accumulated. While, the exchange will not adjust the margin level in time when the market volatility reduces, and this will raise the cost of investors.

On the comparison with current price limit and margin model, we think the margin level and price limit level should be adjusted according to the change of volatility. Therefore, we proposed several models to adjust the price limit level and margin level on the basis of intra-day maximum price movement, accumulated volatility change, and inter-day maximum price change.

Empirical analysis shows that the accumulated volatility change model performs better than intra-day maximum price movement model. The reason is that intra-day maximum price movement reflects only the intra-day volatility, while the price limit level and margin level are computed on the basis of daily price movement. Therefore, we use inter-day price change to replace the intra-day maximum price movement. After comparison from four different views, risk-coverage, risk- sensitivity, price-limit change rate and capital efficiency, the results show that the dynamic model we proposed is much better than current model used by the exchange.

The proposed dynamic model could serve as a reference for setting price limit and margin levels for futures trading in China. For regulatory purposes, risk preference variables could be added to the model to meet different regulatory requirements. From adaptability perspective, the model highly relies on historical data, bypassing the subsequent market overreaction caused by unusual fluctuations. This article will seek to improve model adaptability through optimization.

Key Words: Price Limit, Margin level, Margin adjustment, Volatility

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