On Commodity Price Limits

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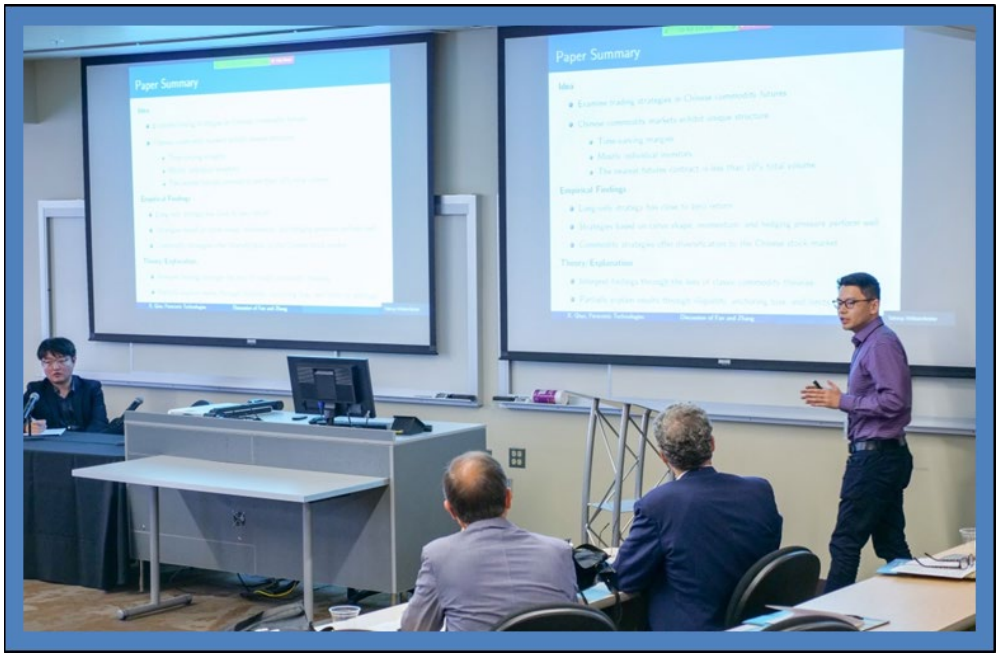
This paper examines the behavior of futures prices and trader positions around price limits in commodity futures markets. The authors ask whether limit events are the result of shocks to fundamental volatility or the result of temporary volatility induced by the trading of non-commercial market participants (speculators). The authors find little evidence that limit events are the result of speculative activity, but instead are associated with shocks to fundamentals that lead to persistent price changes. When futures trading halts, price discovery migrates to options markets, but option prices provide a biased estimate of subsequent futures prices when trading resumes.



The author of this digest article, **Dr. Xiao Qiao**, Ph.D. (right) of Paraconic Technologies US Inc., is shown here presenting at the JPMCC's 3rd Annual International Commodities Symposium, which was held at the University of Colorado Denver Business School in August 2019. On the far left is Dr. John Hua Fan, Ph.D., Senior Lecturer in Finance, Griffith Business School (Australia). Dr. Fan, in turn, also contributed an article to this issue of the *GCARD*.

This digest article was written by Xiao Qiao, Ph.D., Co-Head of Research at Paraconic Technologies US Inc.

Introduction

Exchanges use different methods to curb volatility, such as circuit breakers, price controls, and price limits. In commodity futures markets, price limits are used to restrict price movements from rising above or falling below preset levels. Historically, price limits are viewed as a tool to reduce volatility caused by speculation. An alternative view is that price limits curb volatility induced by news about fundamentals and postpone inevitable price changes to slow down price discovery.

On the one hand, if price limits reduce speculation, speculative activity is expected to decrease around limit events. Speculators ought to cut their long positions after a limit up and reduce their short positions after a limit down occurs. Price changes are likely to reverse and volatility is likely to decrease after limit events as speculation wanes (Ma *et al.*, 1989).

On the other hand, if price limits are driven by fundamental volatility, speculators are not expected to change their trading behavior on limit days compared to non-limit days. Following limit events, prices are likely to continue in the same direction and volatility should not decrease.

The two views presented above are not necessarily mutually exclusive; volatility may contain both speculative and fundamental components. The net impact of price limits on market participants, as well as the behavior of prices and positions, is an empirical question. It is against this background that the authors investigate the behavior of price limits through three research questions. They use a large sample of more than 5,000 limit events in 12 commodity futures markets over a 25-year period.

Why the Paper's Research Questions are Important

The authors attempt to answer three questions. First, do price limits mitigate speculative activity of market participants? This is an old question that is often used to justify the existence of price limits. This paper provides an independent evaluation across 12 commodity markets. Second, what causes limits to occur? The answer to this question relates to the effectiveness of price limits. Third, do price limits affect price discovery in futures markets? If market participants can easily switch between commodity futures and other financial instruments, price discovery is expected to migrate to other related markets when participants cannot trade futures.

All three questions can help market participants improve their understanding of market microstructure so they can make more informed trading decisions, especially around price limits. The research questions also shed light on the efficacy of the current implementation of price limits and have implications of how futures markets could potentially be better regulated. It is in the interest of policymakers and regulators to understand the answers to these questions.

Data Description

The authors gather price limits occurrences for 12 commodities: soybean oil, corn, cotton, feeder cattle, Kansas City wheat, live cattle, lean hogs, oats, rough rice, soybean, soybean meal, and soft red winter wheat. Price data are from Bloomberg. The sample is from January 1991 to May 2016.

Price limits information is from the CME Group. Exchange price limits are compared to close-to-close price changes to identify limit days. Options data are from the Commodity Research Bureau (CRB). Commitments of Traders (COT) and Disaggregated COT (DCOT) reports of market participant positions are from the Commodity Futures Trading Commission (CFTC).

Methodology

To uncover the trading behavior of market participants, the authors use the change in positions from the CFTC COT reports. In particular, non-commercial traders are commonly associated with providers of speculative capital (Bessembinder, 1992; De Roon *et al*., 2000; Moskowitz *et al*., 2012). The change in non-commercial positions is taken as a proxy for change in speculative positions.

Changes in non-commercial positions around limit events are used to understand whether price limits dampen speculation. Changes in non-commercial positions before limit events are used to test whether speculation leads to price limits. Panel regressions allow for statistical tests of position changes while controlling for confounding factors such as past position changes or past returns, as well as latent differences across limit events with fixed effects.

Several other variables shed light on the effect of price limits. The shape of the futures curve - whether the front end is in backwardation or contango - reveals information about storage. If the curve is in backwardation, stock out risk is likely to be higher (Deaton and Laroque, 1992) than if the curve is in contango. By comparing the curve shape with limit occurrences, the authors can relate fundamentals of storable commodities to limits. Implied volatility and returns around limit events can inform whether these key quantities are affected by limits. If limits dampen speculation, implied volatility likely decreases and returns reverse after limit events. If limits slow down price discovery, implied volatility should not change and returns continue after limit events.

Put-call parity (Black, 1976) can be used to relate the price of options and futures. The authors compute the option-implied futures prices using put-call parity. They run Mincer and Zarnowitz (1969) forecasting regressions - forecasting subsequent futures prices using option-implied prices. The regressions are done in return space to avoid spurious relationships from regressing one price on another.

Results

The authors find that limits do not appear to curb speculation. The CFTC positions data provide direct evidence against reduced speculation after price limits: non-commercial traders do not change their long positions following limit up events. Instead, they reduce their short positions, which lead to an increase in their *net* long positions. Following limit down events, non-commercials do not change their short positions and they reduce their long positions, resulting in an increase of net short positions. In both instances, net positions increase in the direction of the limit, thereby amplifying the speculative pressure.

There is little evidence that limit events are the result of speculative activity. Elevated volatility around limit events does not appear to be associated with higher speculation, as the change in non-commercial positions does not lead to limits. Long and short positions of non-commercials do not materially change before limits happen. High price volatility appears to be related to low levels of physical inventories. Just before limit events, the front end of the futures curve is often in steep backwardation, reflecting low inventories (Deaton and Laroque, 1992). These results suggest limit events are mostly driven by fundamental rather than speculative volatility. A further implication of these results is that price limits prevent futures prices from fully reflecting information when large shocks to fundamentals occur - a time when price efficiency arguably matters the most.

Price discovery in futures markets partially migrates to options markets when price limits are hit. A comparison of option-implied futures at the time of limit events with subsequent prices when trading reopens in the underlying futures markets shows that option-implied futures prices are biased but informative predictors of subsequent futures prices. A 1% increase in the return calculated from the limit-day closing price to the option-implied price is associated with a 0.80% increase in the close-to-open futures returns. Furthermore, the open interest in options markets increases relative to the open interest in futures market after limit events, adding to the evidence that price discovery moves from the futures to the options markets.

Conclusion

The historical justification for the existence of price limits is to curb speculation. The authors re-examine the role of price limits by studying trader positions and price behavior around limit events for 12 commodities over a 25-year period. They offer three main findings. First, limits do not appear to be effective in reducing speculative trading behavior. Second, price limits are mostly driven by elevated fundamental volatility, rather than speculation. Third, price limits hamper price discovery. Normal price discovery in futures markets moves to options markets following price limits.

These findings are important for both policymakers and market participants in commodity futures markets. Policymakers may incorporate the findings for their own thinking when designing future policies, whereas market participants could use these ideas to refine their trading.

Endnotes

The views expressed herein are those of the individual authors and do not necessarily reflect official positions of SummerHaven Investment Management, LLC ("SummerHaven") or Paraconic Technologies US Inc. ("Paraconic") nor are the views endorsed by SummerHaven or Paraconic. This paper is not an offer to sell, or a solicitation of an offer to buy any investment product or services offered by SummerHaven or Paraconic. Neither SummerHaven nor Paraconic guarantee the accuracy or completeness of the information contained herein and any information provided by third parties has not been independently verified by SummerHaven or Paraconic.

Dr. Qiao is a member of the Editorial Advisory Board of the *Global Commodities Applied Research Digest*.

Dr. Qiao's co-author, Professor K. Geert Rouwenhorst, presented a version of this paper at the JPMCC's 2nd International Commodities Symposium during the "Commodity Futures Trading and Regulation" session on August 14, 2018. The

symposium, in turn, was organized by Professor Jian Yang, Ph.D., CFA, the J.P. Morgan Endowed Chair and JPMCC Research Director at the University of Colorado Denver Business School.

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Keywords

Commodity futures, price limits, speculation, commodity options, circuit breakers, speculative trading.