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Hedging with Chinese metal futures ☆

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ABSTRACT

This paper evaluates different hedging strategies for aluminum and copper futures contracts traded at Shanghai Futures Exchange. In addition to usual candidates such as the traditional regression hedge ratio and the hedging strategy constructed from bivariate fractionally integrated generalized autoregressive conditional heteroskedasticity (BFIGARCH) model, two advanced specifications are proposed to account for impacts of the basis on market volatility and co-movements between spot and futures returns. Empirical results suggest that the basis has asymmetric effects and optimal hedging strategy constructed from the asymmetric BFIGARCH model tends to produce the best in-sample and out-of-sample hedging performance.

1. Introduction

Copper and aluminum forward/futures contracts began trading in China in 1991. Over the last 15 years, Chinese futures markets have experienced tremendous development. In the early stage, regulators in China struggled with duplicative exchanges and products, large speculative interest, and market manipulations. With implementation of many regulatory reforms on the futures market, the number of exchanges has been reduced to only three and the market has become more efficient, transparent, and integrated into international futures markets in recent years. Currently, copper and aluminum futures contracts can only be traded at Shanghai Futures Exchange (SHFE), one of three remaining exchanges in China, and their prices display a certain degree of integration with the prices of copper and aluminum futures traded in London

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Metal Exchange (LME) (see, for example, Zhang (2003)) and therefore can be used to predict spot price movements.[1]

Using daily price data of September and December 1994 copper futures contracts, Tung (1997) showed that the variability of the basis (i.e., difference between spot and futures prices) is smaller than the variability of the spot price, suggesting that copper futures market can provide a hedging tool to domestic users. Although China's State Council has given approval for eight Chinese nonferrous metal producers to engage in hedging in overseas futures markets (Platt's Metals Week, Vol. 75, Issue 33, page 6), the number is limited as the government only grants approvals to companies with large output capacities and good performance. Therefore, a more careful study of optimal hedging strategy and hedging effectiveness using futures contracts traded in the SHFE is needed for the majority of domestic producers and consumers.

Academic studies of Chinese copper and aluminum futures markets are limited, and in particular we can identify no studies of hedging strategies and hedging effectiveness for these markets when we initiated the current research. This paper presents the first attempt to fill in the gap. Several hedging strategies including naïve strategy, constant strategy, and different dynamic strategies are investigated for Chinese copper and aluminum futures. In addition to usual candidates such as the traditional regression hedge ratio and the hedging strategy constructed from bivariate fractionally integrated generalized autoregressive conditional heteroskedasticity (BFIGARCH) model, two advanced specifications are proposed to account for impacts of basis on market volatility and co-movements. Empirical results suggest that basis has asymmetric effects on market behaviors. Moreover, optimal hedging strategy constructed from the asymmetric BFIGARCH model tends to produce the best in-sample and out-of-sample hedging performance.

The remainder of the paper is organized as follows. The immediately following section discusses the development of copper and aluminum futures trading in China. Thereafter, optimal hedging strategy and several model specifications are presented, including the OLS regression model, the BFIGARCH model, and the symmetric and asymmetric BFIGARCH models. We then turn to data descriptions and provide preliminary data analysis. The following section presents the estimated results for each model and discusses their implications. From which we construct dynamic hedged portfolios and evaluate hedging performance accordingly. The conclusion is given in the final section.

2. Development of copper and aluminum futures trading in China

Copper and aluminum forward/futures contracts have been traded in China since 1991. A forward contract of copper was first introduced in Jin Peng Copper Exchange (JPCE) after the exchange was established in May 15, 1991. Copper was the only metal product traded on the exchange. The trading took place on every Friday morning, the only official trading day. The exchange took no responsibility when buyers and sellers failed to deliver.

With establishment of Shenzhen Nonferrous Metal Exchange (SNME), both copper and aluminum forward contracts were then introduced to trade in SNME on January 18, 1992. The trading hours were from 9:00 am to 11:00 am Monday through Friday, which was much longer than those offered in JPCE. Unlike JPCE, SNME took default risk of either side of a transaction. In addition, initial margin is lower than that required in JPCE. The benefits of trading in SNME resulted in a very low trading volume of copper contracts in JPCE and eventually the closure of JPCE in 1993.

On March 31, 1993, a standardized copper contract made its debut in Shanghai Metal Exchange (SHME) founded on May 28, 1992. A few months later, a standardized aluminum contract was listed in SHME. The terms and specifications of these contracts are stipulated by the exchange in spot market trading. Besides copper and aluminum futures contracts, lead, zinc, tin and nickel futures contracts were also introduced to trade in SHME.

Due to regulatory slackness, several other exchanges opened up and traded their own copper and aluminum futures contracts within a short period of time. Nonetheless, the SHME still accounted for a large share of total trading volume. Copper futures trading peaked at 1994–95. Aluminum futures trading gained its momentum after June 1997 when the exchange reduced commission fees and margin requirements.

On January 1, 1999, a new government regulation prescribed that both copper and aluminum futures contracts could only be traded at Shanghai Futures Exchange (SHFE, renamed from the SHME). Despite that

[1] The LME is the major international spot and futures markets for non-ferrous metals including copper and aluminum. Approximately 95% of the total world trade in copper futures occurs through LME (Watkins and McAleer, 2003). The settlement prices determined on LME are used internationally as reference prices for valuation of activities relating to non-ferrous metals.