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Predicting volatility of the Shanghai silver futures market: What is the role of the U.S. options market?

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ABSTRACT

This paper investigates whether the CBOE Silver ETF Volatility Index (VXSLV), which is the implied volatility calculated from the U.S. options market, contains information for predicting the volatility of the Shanghai silver futures market. In particular, we compare its performance with variables observed in the Chinese market. We find both in-sample and out-of-sample evidence that the VXSLV significantly improves daily and weekly volatility forecasts based on realized volatilities. Moreover, when market variables including trading volume, open interest and momentum are included, the VXSLV remains significant and enhances the forecasting performance of the market variables.

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1. Introduction

Measuring and forecasting volatility has long been the core content of financial research (see, e.g., Andersen and Bollerslev, 1998; Bollerslev, 1986; Engle, 1982). There is an extensive literature on realized and option-implied volatility in equity markets. However, few studies focus on these topics in commodity markets. Martens and Zein (2004) compare the forecasting performance of realized volatility based on intraday returns and implied volatility for the WTI futures market. In a recent contribution, Haugom et al. (2014) document that the CBOE Crude Oil Volatility Index (OVX) has predictive power for realized

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Table 1
Summary statistics of RV calculated for 25-min intervals. DF is the Dickey Fuller test and PP is the Phillips–Perron test for the unit root. Values below –3.430 indicate rejection at the 1% significance level for both tests. AC(1) and AC(10) denote the autocorrelation for one and 10 lags, respectively.

	Mean	Max	Min	DF	PP	AC(1)	AC(10)
RV	0.571	2.375	0.103	−16.161	−20.536	0.404	0.254

volatility in the U.S. oil market. Furthermore, they find a V-shaped leverage effect and call for further research on the effect for other commodities.

In this paper, we investigate whether the CBOE Silver ETF Volatility Index (VXSLV), which is the implied volatility calculated from the U.S. options market, contains information for predicting the volatility of the Shanghai silver futures market[1]. We find both in-sample and out-of-sample evidence that the VXSLV significantly improves daily and weekly volatility forecasts based on realized volatilities. Furthermore, the VXSLV remains significant when market variables including trading volume, open interest and momentum are included. In fact, the VXSLV enhances the forecasting performance of the market variables. Overall, our findings indicate that the U.S. options market plays an important role in predicting the volatility of the Shanghai silver futures market and have particular implications for international investors interested in this market.

2. The data

We obtain the data from the Monopoly Financial Data Center, which has information on high-frequency trading in silver futures contracts conducted through the SHFE trading platform from May 10, 2012 to December 31, 2014, yielding a total of 620 trading days and 139,500 observations.

2.1. Realized volatility

We follow Andersen and Bollerslev (1998) and define realized volatility (RV) as follows:

$$\mathrm{RV}_t^d = \sqrt{\sum_{i=1}^{M} r_{i,t}^2}, t = 1, \ldots, T, \tag{1}$$

$$r_{i,t} = 100 \times (\ln P_{i,t} - \ln P_{i-1,t}), \tag{2}$$

where RV_t^d is the daily RV, M denotes the sampling frequency and $P_{i,t}$ stands for the closing price for period i on day t. The choice of sampling frequency affects the accuracy of estimation. A higher sampling frequency is desirable because it provides more useful information, but the results of such an approach contain more microstructure noise. In this study, we apply the method proposed by Zhang et al. (2005) and choose a sampling frequency of 25 min.[2]

Table 1 provides the descriptive statistics for the RV. Both the Dickey Fuller test and the Phillips–Perron test show that the RV time series over the sample period is stationary. However, the autocorrelation over 10 lags indicates that the RV does not exhibit long memory.

2.2. Implied volatility

Option-implied volatility is proven to contain information on future volatility (e.g., Blair et al., 2001; Busch et al., 2011; Benavides and Capistrán, 2012). On March 16, 2011, the CBOE began calculating the

[1] Although silver futures were first listed on the Shanghai Futures Exchange (SHFE) in May 2012, this exchange had the largest trading volume in 2013 and 2014 as reported by the Futures Industry Association (FIA).

[2] Based on the "two-scales estimator" approach proposed by Zhang et al. (2005), we choose the sampling frequency with lowest sum of variance and bias, from among the RV calculated for 1-, 5-, 15-, 25- and 45-min intervals.

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