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MODELING VOLATILITY IN CRUDE OIL MARKET: A COMPARISON BETWEEN GARCH AND EXTREME-VALUE-BASED AV MODEL

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Abstract. This study evaluates the forecasting performance of extreme-value volatility estimators in comparison with the GARCH volatility. In order to properly model the dynamics of extreme-value volatility, the autoregressive volatility (henceforth, AV) model is adopted. Therefore, two types of volatility models are discussed and estimated: return-based GARCH and extreme-value -based AV model. Diagnostic tests are implemented to evaluate how well the models fit the in-sample data, and the comparison of out-of-sample forecasting ability is based on the confidence interval forecasts. Examination of in-sample and out-of-sample volatility forecasts reveals that the AV model consistently outperforms the GARCH model. Our findings confirm that extreme-value volatility can retain its superiority in forecasting volatility by properly modeling the dynamic process. It would be beneficial to encompass intraday information especially price range to do volatility forecasting and risk management in crude oil future markets.

Keywords. Volatility modeling; Extreme value; GARCH; Price range; Crude oil future

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1 Introduction

Oil, one of the most important energy resources in the world, exhibits wide price swings. These price fluctuations have significant effects on the sales and profits of major industries worldwide, and influence capital budgeting plans as well as the value of foreign-denominated asset investments. Crude oil price fluctuations could also bring about economic instability in both oil exporting and oil consuming countries in developed and developing parts of the world. Oil price shocks have often been cited as the source of adverse macroeconomic impacts on aggregate output, prices, and employment in countries around the world. Oil market volatility forecasting is, therefore, vital to economic agents and policy makers if some of these effects are to be mitigated. For academic researchers, crude oil price forecasting is also a very