

Прикладная эконометрика, 2022, т. 65, с. 77–101.

Applied Econometrics, 2022, v. 65, pp. 77–101.

DOI: 10.22394/1993-7601-2022-65-77-101

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Forecasting the Value-at-Risk of energy commodities: A comparison of models and alternative distribution functions

Economic agents need to adequately control, and measure potential financial losses associated with commodity price swings in the futures market. One of the ways to anticipate possible price swings is to measure Value-at-Risk (VaR). In its parametric form, the VaR calculation uses the volatility of a financial asset as a parameter to measure risk. Volatility is the essence of VaR calculation and should be estimated as accurately as possible. The importance of precision in volatility estimation has made heteroskedastic models and their forms of application has evolved significantly in recent years. In this context, this study aimed to verify if the incorporation of several additional parameters in the mathematical expression of the models and the use of different density functions improves the predictive capacity of the conditional variance when used in the measurement of the VaR of the energy commodities in the futures market. The results showed that the use of mathematically more complex structures is not related to better predictions of VaR. However, the use of different density functions allowed the models to fit more adequately to the data, leading to more realistic predictions of conditional variance.

Keywords: Value-at-Risk; heteroscedasticity; GARCH; distribution functions; forecast.

JEL classification: C46; C53; G13; G32; P18.

1. Introduction

Commodity futures markets represent a significant share of global financial markets, and recent fluctuations in energy commodity prices, as they play an important role in the modern economy, have generated a great deal of concern among various economic agents, such as public policy makers, investors, producers, consumers, financial institutions, and companies operating in the energy markets (Billio et al., 2018; Wang, Li, 2018). Explanations for these unusual fluctuations in energy commodity prices can be diverse. Laporta et al. (2018) point out that business cycles, public policies and the speculative behavior of some market participants can cause short-term imbalances in the supply and demand of commodities, leading to sharp price swings.

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