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Modeling calendar spread options

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Abstract

Purpose

The purpose of this paper is to derive a new option pricing model for options on futures calendar spreads. Calendar spread option volume has been low and a more precise model to price them could lead to lower bid-ask spreads as well as more accurate marking to market of open positions.

Design/methodology/approach

The new option pricing model is a two-factor model with the futures price and the convenience yield as the two factors. The key assumption is that convenience follows arithmetic Brownian motion. The new model and alternative models are tested using corn futures prices. The testing considers both the accuracy of distributional assumptions and the accuracy of the models' predictions of historical payoffs.
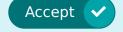
Findings

Panel unit root tests fail to reject the unit root null hypothesis for historical calendar spreads and thus they support the assumption of convenience yield following arithmetic Brownian motion. Option payoffs are estimated with five different models and the relative performance of the models is determined using bias and root mean squared error. The new model outperforms the four other models; most of the other models overestimate actual payoffs.

Research limitations/implications

The model is parameterized using historical data due to data limitations although future research could consider

Practical implications

The over 30-year search for a calendar spread pricing model has not produced a satisfactory model. Current models that do not assume cointegration will overprice calendar spread options. The model used by the Chicago Mercantile Exchange for marking to market of open positions is shown to work poorly. The model proposed here could be used as a basis for automated trading on calendar spread options as well as marking to market of open positions.

Originality/value

The model is new. The empirical work supports both the model's assumptions and its predictions as being more accurate than competing models.
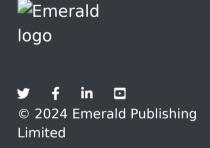
Keywords

Futures   Options   Corn   Panel unit root tests

Calendar spreads   C58   G12   Q13

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