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Approximation of forward curve models in commodity markets with arbitrage-free finite-dimensional models. (English) [Zbl 1422.91565](#)

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Summary: In this paper, we show how to approximate Heath-Jarrow-Morton dynamics for the forward prices in commodity markets with arbitrage-free models which have a finite-dimensional state space. Moreover, we recover a closed-form representation of the forward price dynamics in the approximation models and derive the rate of convergence to the true dynamics uniformly over an interval of time to maturity under certain additional smoothness conditions. In the Markovian case, we can strengthen the convergence to be uniform over time as well. Our results are based on the construction of a convenient Riesz basis on the state space of the term structure dynamics.

MSC:

[91B74](#) Economic models of real-world systems (e.g., electricity markets, etc.)

[91B25](#) Asset pricing models (MSC2010)

[60H15](#) Stochastic partial differential equations (aspects of stochastic analysis)

Keywords:

energy markets; Heath-Jarrow-Morton modelling; nonharmonic Fourier analysis; arbitrage-free approximations

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