Summary: We present a numerical method for the frequent pricing of financial derivatives that depends on a large number of variables. The method is based on the construction of a polynomial basis to interpolate the value function of the problem by means of a hierarchical orthogonalization process that allows to reduce the number of degrees of freedom needed to have an accurate representation of the value function. In the paper we consider, as an example, a GARCH model that depends on eight parameters and show that a very large number of contracts for different maturities and asset and parameters values can be valued in a small computational time with the proposed procedure. In particular the method is applied to the problem of model calibration. The method is easily generalizable to be used with other models or problems.

MSC:

91G60 Numerical methods (including Monte Carlo methods)
91G20 Derivative securities (option pricing, hedging, etc.)
62M10 Time series, auto-correlation, regression, etc. in statistics (GARCH)

Keywords:
derivative pricing; multidimensional interpolation; Chebyshev polynomials; reduced basis functions

References:

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