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# Machine learning for quantitative finance: fast derivative pricing, hedging and fitting

Jan De Spiegeleer, Dilip B. Madan , Sofie Reyners & Wim Schoutens

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## Abstract

In this paper, we show how we can deploy machine learning techniques in the context of traditional finance. We arrive at a new way of thinking about derivative pricing, hedging and fitting. Machine learning techniques are often used in the context of finance, but they are often used in a way that is not optimal. We show how we can use machine learning to improve the accuracy of derivative pricing, hedging and fitting. The paper is divided into three parts: a review of machine learning techniques, a discussion of the challenges of using machine learning in finance, and a presentation of our new machine learning framework. The framework is based on the idea of using machine learning to learn the relationship between the underlying asset price and the derivative price. This allows us to use machine learning to learn the relationship between the underlying asset price and the derivative price, which is a key component of derivative pricing, hedging and fitting. The framework is based on the idea of using machine learning to learn the relationship between the underlying asset price and the derivative price. This allows us to use machine learning to learn the relationship between the underlying asset price and the derivative price, which is a key component of derivative pricing, hedging and fitting.

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# Disclosure statement

No potential conflict of interest was reported by the authors.

# ORCID

Dilip B. Madan <http://orcid.org/0000-0002-0033-9077>

# Notes

† Matrix inversion is often implemented via a Cholesky decomposition (Benoît 1924, Rasmussen and Williams 2006), which is more stable than actually inverting the matrix. For small matrices, i.e. small values of  $n$ , ordinary matrix inversion can be performed. For the results in this paper we used the Matlab functions `fitrgp` and `predict`. However if the dimension increases, special techniques need to be deployed. We mention LU-factorization and blockwise Cholesky decomposition, which aim at solving traditional memory problems that one encounters when inverting large matrices. For future work we will employ Cholesky and blockwise Cholesky routines to handle problems with many more data points.

†  $\kappa$  = ratio of variance explained by the model to the total variance explained by the model in the long run

† For each  $\kappa$  we construct the 100



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