

Fractal Dimension for Fractal Structures

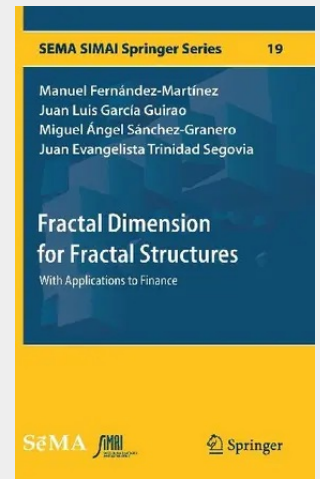
With Applications to Finance

This book provides a generalised approach to fractal dimension theory from the standpoint of asymmetric topology by employing the concept of a fractal structure. The fractal dimension is the main invariant of a fractal set, and provides useful information regarding the irregularities it presents when examined at a suitable level of detail. New theoretical models for calculating the fractal dimension of any subset with respect to a fractal structure are posed to generalise both the Hausdorff and box-counting dimensions. Some specific results for self-similar sets are also proved. Unlike classical fractal dimensions, these new models can be used with empirical applications of fractal dimension including non-Euclidean contexts.

In addition, the book applies these fractal dimensions to explore long-memory in financial markets. In particular, novel results linking both fractal dimension and the Hurst exponent are provided. As such, the book provides a number of algorithms for properly calculating the self-similarity exponent of a wide range of processes, including (fractional) Brownian motion and Lévy stable processes. The algorithms also make it possible to analyse long-memory in real stocks and international indexes.

This book is addressed to those researchers interested in fractal geometry, self-similarity patterns, and computational applications involving fractal dimension and Hurst exponent.

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