Multifractal Volatility: Theory, Forecasting, and Pricing (Academic Press Advanced Finance)

Laurent E. Calvet, Adlai J. Fisher
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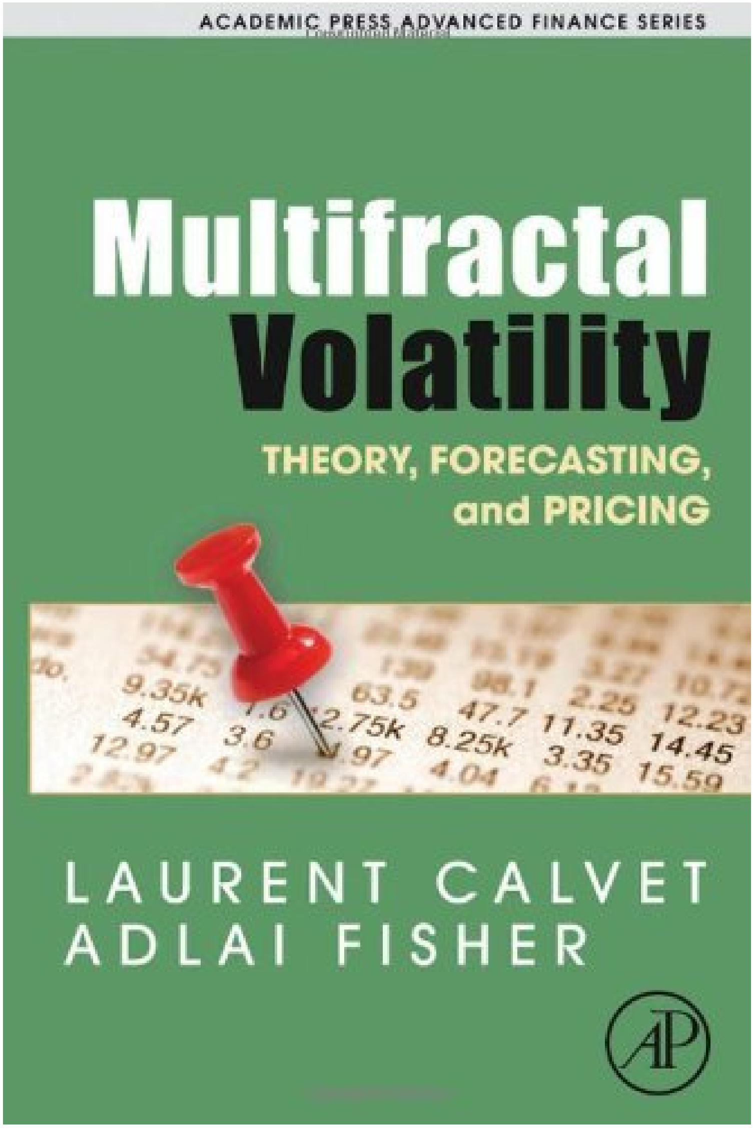

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Laurent E. Calvet, Adlai J. Fisher : Multifractal Volatility: Theory, Forecasting, and Pricing (Academic Press Advanced Finance) before purchasing it in order to gage whether or not it would be worth my time, and all praised Multifractal Volatility: Theory, Forecasting, and Pricing (Academic Press Advanced Finance):

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mathematical formulas are fuzzy and very hard to read: You can barely make them out. I would rather buy the paper version.15 of 15 people found the following review helpful. Great source on state-of-the-art volatility modeling in FinanceBy N. TuzovThis book reflects a significant step in volatility modeling with a clear focus on financial applications. It offers a nice combination of theoretical results combined with fitting the corresponding models to real financial data.From a practical point of view, it has been long known that (log) asset prices are not adequately described by Brownian Motion (BM) or Fractional BM. For instance, take the fact that typically, low-frequency (weekly or monthly) return distribution has much thinner tails than high-frequency (daily or hourly) return distribution. Such absence of "self-similarity" across frequencies is not consistent with BM or Fractional BM.To capture this effect (among many others), they propose to model the (log) asset price as a Multifractal Process. Such process is characterized by so-called "scaling function" which can be estimated from the data. One may think of Multifractal Processes as an extended class of stochastic processes that includes self-similar BM / Fractional BM. In particular, for self-similar processes the scaling function has to be linear. However, estimations based on real currency and equity data (see Chapter 8) do not produce a linear scaling function. Therefore, the hypothesis of self-similarity (also called "unifractality") of the (log) asset price doesn't hold.Apparently, the limitations of self-similar processes have been known for a while, and many popular volatility models (such as GARCH or FIGARCH) address them to a certain degree. However, numerical results show that the Multifractal Model is a better fit to the data in terms of scaling function.In practice, the multifractal approach is implemented as so-called Markov-Switching Multifractal model (MSM) in discrete time. Markov-Switching models (pioneered by Hamilton, see Time Series Analysis) are based on the idea is that volatility (and possibly drift) are dependent on the unobserved state variable that follows a Markov process. MSM extends that idea by imposing certain restrictions on the transition matrix, thus reducing the dimensionality. The physical meaning of the restrictions is that different economic factors (technology shocks, business cycles, liquidity shocks) affect the volatility on different time scales. The volatility impact from one economic factor can be a lot more lasting than that from another factor.The authors demonstrate that MSM model accounts for such data features as:1) short- and long-range dependence in volatility;2) fat tails of return distribution;3) volatility jumps.Again, many previously known models account for these effects to a certain extent, so a comparison to some benchmark models is necessary. Fitting MSM model to daily currency data via Maximum Likelihood (Chapter 3) shows that MSM is superior to:1) GARCH-t ("t" means that the error term has a t-distribution)2) Markov-Switching GARCH-t3) FIGARCH-tPersonally, I would have liked to see how well MSM competes with some models based on Extreme Value Distribution, but no examples are provided.There have been many complaints in the reviews of the popular book of Mandelbrot (see The Misbehavior of Markets: A Fractal View of Financial Turbulence) that few "implementation details" had been provided. Numerical examples in Calvet and Fisher clearly show how to apply Mandelbrot's ideas to real data and where exactly the new framework surpasses the existing volatility models.Other chapters include multivariate volatility modeling (again, MSM is superior to multivariate CC-GARCH) and application of MSM to asset pricing theory. Therefore, I can highly recommend this book to people interested in the latest advances in volatility modeling.11 of 11 people found the following review helpful. An excellent review of an important topicBy Aaron C. BrownWith all due respect to the other reviewers, there's not much point discussing how good a job this book does explaining multifractal volatility. It's the only book on that subject. I think it's more useful to describe why someone who doesn't already know what MV is might want to read this excellent book.A lot of financial data series (and non-financial as well) exhibit apparently erratic behavior such as sudden jumps or periods of high and low volatility. These have caused many disasters, but also present tempting opportunity for anyone who can understand them. The tricky part is that simple models don't provide good fits, and complicated models are too hard to calibrate.There are some standard approaches to this problem and the authors have come up with one they think is better. But you don't need to accept that to find this book useful. It lays out a general mathematical framework and covers a wide range of models, comparing them both mathematically and with financial data. The mathematics is only moderately difficult, and the clear presentation explains the main ideas for people who cannot follow each step of the formalism. Whether or not you like MV, and it is a small group so far that does, this book is the best up-to-date introduction to this field. There are extensive references to a wide range of approaches. The material is presented as a set of tools and ideas, you can take the ones you find useful and combine them as you like.It would be even better if the book included data and computer code, either on a CD or at a website. More discussion of data would be helpful, as would some applications that go beyond data fitting (for example, it would be nice to see MV make money, or warn of disasters). The charts and tables are ugly, and the charts absurdly small for the information they are intended to convey. Some of the chapters could have used better editing to smooth over their origins as journal articles.However, those are minor criticisms compared to the outstanding job the authors have done of summarizing important work in time series modeling, with rigor and depth, but without making the work inaccessible to a wide audience.

Calvet and Fisher present a powerful, new technique for volatility forecasting that draws on insights from the use of multifractals in the natural sciences and mathematics and provides a unified treatment of the use of multifractal techniques in finance. A large existing literature (e.g., Engle, 1982; Rossi, 1995) models volatility as an average of past shocks, possibly with a noise component. This approach often has difficulty capturing sharp discontinuities and large changes in financial volatility. Their research has shown the advantages of modelling volatility as subject to abrupt regime changes of heterogeneous durations. Using the intuition that some economic phenomena are long-lasting while others are more transient, they permit regimes to have varying degrees of persistence. By drawing on insights from the use of multifractals in the natural sciences and mathematics, they show how to construct high-dimensional regime-switching models that are easy to estimate, and substantially outperform some of the best traditional forecasting models such as GARCH. The goal of Multifractal Volatility is to popularize the approach by presenting these exciting new developments to a wider audience. They emphasize both theoretical and empirical applications, beginning with a style that is easily accessible and intuitive in early chapters, and extending to the most rigorous continuous-time and equilibrium pricing formulations in final chapters.Presents a powerful new technique for forecasting volatilityLeads the reader intuitively from existing volatility techniques to the frontier of research in this field by top scholars at major universitiesThe first comprehensive book on multifractal techniques in finance, a cutting-edge field of research