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Modeling Asymmetry and Excess Kurtosis in Stock Return Data

Illinois Research & Reference Working Paper No. 00-123

25 Pages

Posted: 12 Feb 2001

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Date Written: November 2000

Abstract


This paper develops a flexible parametric approach to capture asymmetry and excess kurtosis along with conditional heteroskedasticity with a general family of distributions for analyzing stock returns data. Engle's (1982) autoregressive conditional heteroskedastic (ARCH) model and its various generalizations can account for many of the stylized facts, such as fat tails and volatility clustering. However, in many applications, it has been found that the conditional normal or Student's t ARCH process is not sufficiently heavy-tailed to account for the excess kurtosis in the data. Moreover, asymmetry in financial data is rarely modeled systematically. Therefore, there is a real need to find an asymmetric density that can be easily estimated and whose tails are heavier than the Student's t-distribution. Pearson type IV density is such a distribution, and it is much easier to handle than those that have been used in the literature, such as non-central t and Gram-Charlier distributions, to account for skewness and excess kurtosis simultaneously. Pearson type IV distribution has three parameters that can be interpreted as variance, skewness and kurtosis; and they can also be considered as different components of the risk premium. Modeling simultaneously time-varying behavior of mean, variance, skewness and kurtosis produces a better explanation of risk than mean-variance analysis only. These methodologies can also be used to analyze other financial data such as exchange rates, interest rates and spot and future prices.

Keywords: Pearson type IV, Excess Kurtosis, Skewness, GARCH

JEL Classification: C5

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