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A note on skewness and kurtosis adjusted option pricing models under the Martingale restriction*

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Abstract

Several authors have proposed series expansion methods to price options when the risk-neutral density is asymmetric and leptokurtic. Among these, Corrado and Su (1996) provide an intuitive pricing formula based on a Gram–Charlier Type A series expansion. However, their formula contains a typographic error that can be significant. Brown and Robinson (2002) correct their pricing formula and provide an example of economic significance under plausible market conditions. The purpose of this comment is to slightly modify their pricing formula to provide consistency with a martingale restriction. We also compare the sensitivities of option prices to shifts in skewness and kurtosis using parameter values from Corrado and Su (1996) and Brown and Robinson (2002), and market data from the French options market. We show that differences between the original, corrected and our modified versions of the Corrado and Su (1996)

original model are minor on the whole sample, but could be economically significant in specific cases, namely for long maturity and far-from-the-money options when markets are turbulent.

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Notes

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See Jurczenko et al (2002b) for a complete comparison between the various models using statistical expansions.

We explicitly refer here to the standard notations used for instance by Baxter and Rennie (1996) or Hull (2003). We thank the second referee for pointing out some possible confusions with other notations.

See also Brenner and Ecom (1997) in the context of option pricing with Laguerre polynomial series.

Adopting a very similar approach, Kochard (1999) indeed obtains an equivalent formula to equation (10).

In the Figures (1–4), skewness and kurtosis have been fixed at −0.7 and 3.53 for the modified Corrado and Su (1996) model parameter representations (which are mean parameter values of implied moments when backed out from French CAC 40 long term options market for the period 01/97 through 12/9 using the Jarrow and Rudd (1982) model–see Capelle-Blancard et al 2001 for details). Other parameters are those of the Corrado and Su (1996) case study, also reported in Brown and Robinson (2002).

See Corrado and Su (1996), p 180 and Brown and Robinson (2002), p 9.

These values are realistic in the sense that they correspond to mean parameter values when backing-out implied moments corresponding to the Jarrow and Rudd (1982) model on the CAC 40 options on the French market for the period 1997–1999 (see Capelle–Blancard et al 2001, for details).

See Capelle–Blancard et al 2001, for details on the database, filters, optimization criterion and routines.

In Figures 5 and 6 French CAC 40 long term options for the period 10/97 through 12/98 have been used to estimate the error terms and related density probabilities (see Capelle–Blancard et al 2001 for details on the database, filters, optimization criterion and routines). For easy representations, Figure 7 and 8 illustrate estimations on sub-samples.

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