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progress

Mikhail Chernov <mchernov@london.edu> **Mon, Sep 22, 2008 at 2:29 PM**
To: David Backus <dbackus@stern.nyu.edu>

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* We need to find explain how we get the parameters for the
jump-diffusion model.  I thought we'd show what we need to match
implied vols on equity options, as in your papers (the vol plots).
Also the distribution of returns on equity.
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First, I would like to point out an omission in your draft that is related to getting the parameters. On p. 8, you start discussing approach 1, mention the P-parameters and say that to get risk-neutral parameters one can add asterisks to any parameters. This is not quite correct. First you missed \omega there. Next,

i. \mu should be changed to r

ii. \tau stays the same

iii. \omega, \delta and \psi could be changed at will

These changes introduce an interesting property that is counterintuitive for a guy who thinks of options in the context of the BS model. The intuition that one might have is that total variance does not change with the change in measure. This my point ii and the intuition work in a pure diffusive environment. However, in the jump-diffusion case total variance does not change only if we do not change items in point iii. Otherwise, total variance changes because of jump risk premia.

These points are important for getting parameters from option prices. We need to observe the time-series of the underlying to get \tau. If we know \tau, then we can use option prices to get the risk-neutral items in iii. In practice, \omega* and \delta* are not separately identified as they enter all expressions as a product (the compensator of the jump process). Therefore, it is customary to assume that one of the two does not change from P to Q. Thus, one needs the time-series of the underlying to pin down not only \tau, but either \omega or \delta also. In BCJ, we assumed that \omega does not change.

The figure that I sent you corresponds to the following values:

\tau=14.58%, \omega=0.91, r=2.5% (real)

\delta*=-4.82%, \psi*=9.81%

Where does the flat line of 15% come from? It is total variance under P:

\tau^2+\omega(\delta^2+\psi^2),

Where \delta=-3.25%, \psi=6%

Is this detailed enough?