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Updates on the numerical smoothing project

Christian Bayer <christian.bayer1979@gmail.com> Mon, Apr 1, 2019 at 1:34 PM
To: Chiheb Ben Hammouda <chiheb.benhammouda@kaust.edu.sa>
Cc: "Raul F. Tempone" <raul.tempone@kaust.edu.sa>

Dear Chiheb,

Many thanks for your hard work! I answer some of your questions below,
but I have more comments as annotations in the attached pdf-file.

> To update you: Attached I update you with the new results for basket option (case d=2) (see Section 6.2 for detailed results), I am waiting for the results of d=4 and will update you once I got them. As for now, for the two-dimensional basket option with the way that we are using it seems that Richardson extrapolation is not needed if we want to have a relative tolerance below 1% and also we have MISC outperforming significantly MC and requires approximately 5% of MC work to achieve a total relative error of about 0.9%. See also table 6.1 for summary of results that we have up to now.
>

This looks very good.

> Also in the attached I expand little on the continuous time formulation (see Section 2.1) and motivate assumption 1 made there by proving it for a particular case (see Section 2.1.1)

I have also commented a bit on similar aspects in the pdf -- in the
context of the optimization problem (2.5). I am a bit sceptical of
over-emphasizing these assumptions. They are, by and large,
motivations for our work, and it is even somewhat hard to formulate
the assumptions precisely. If we emphasize the assumptions too much,
we invite referees to ask us to prove them or otherwise check them
numerically, and this may be hard to do. (Ok, this is possibly a
bigger problem for (2.5) than for Assumption 1.) More precisely,
statements such as Assumption 1 (some term dominates another term) are
typically understood as asymptotic statements. But then it is unclear
for which type of problems Assumption 1 is actually true. (Sure, it is
trivially true for Black-Scholes. But then why do we even discretize
in time?)

In my option, we should make clear that these assumptions motivate the
algorithms and are not meant to be precise mathematical statements.

Some further comments:

I notice that, once again, the MISC seems to drastically overestimate
actual errors. But then we again run into the issue about when to stop
MISC (or, rather, which MISC-tolerance to choose for a given actual
error tolerance).

Finally, I think that for the actual paper, the Heston example is
clearly the most important one and should be in the focus. This does
not mean that the GBM examples should be removed, but it must be clear
that the Heston example is the main example.

Best regards,

Christian