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## ap\_fixedasian\_thompsonlow

Output parameters:

- Price
- Delta

**Description:** Fixed Asian options are priced with Thompson lower bound[1]. The same lower bound as in Rogers-Shi[2] is given, but it is easier to compute.

/\*This is the integrand in the formula 3.4 of Thompson\*/

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/\* We obtain the optimal value of gamma using bisection method \*/

/\* This is the function to be integrated on order to get lower bound in

Thompson \*/

/\*Increment for the Delta\*/

/\*Scaling of the parameters\*/

/\*Integrate, using the Laguerre quadrature, for obtaining the lower bound

\*/

/\* Call Price \*/

Taking the Call price formula from [1].

/\* Put Price from Parity\*/

Simple calculus give the call-put parity relationship

$$P_{T,t}(K) = C_{T,t}(K) + K * \exp(-r * (T - t)) - S(t) * \exp(-r * (T - t)) * (\exp(-(r - \text{divid}) * (T - t)) - 1) * \frac{1}{(T-t)*(r-\text{divid})}$$

/\*Delta for call option\*/

The delta is obtained with finite difference

/\*Delta for put option\*/

We use again the call-put parity relation

$$\Delta_P = \Delta_C - \exp(-r * (T - t)) * (\exp(-(r - \text{divid}) * (T - t)) - 1) * \frac{1}{(T-t)*(r-\text{divid})}$$

/\*Price\*/

/\*Delta \*/

## References

- [1] G.W.P. THOMPSON. Fast narrow bounds on the value of asian options. *Working paper Judge Institute U. of Cambridge*, 1999. 1
- [2] L.C.G. ROGERS Z.SHI. The value of an asian option. *J. Appl. Probab.*, 32(4):1077–1088, 1995. 1