Worksheet 4

Practical Lab Numerical Computing

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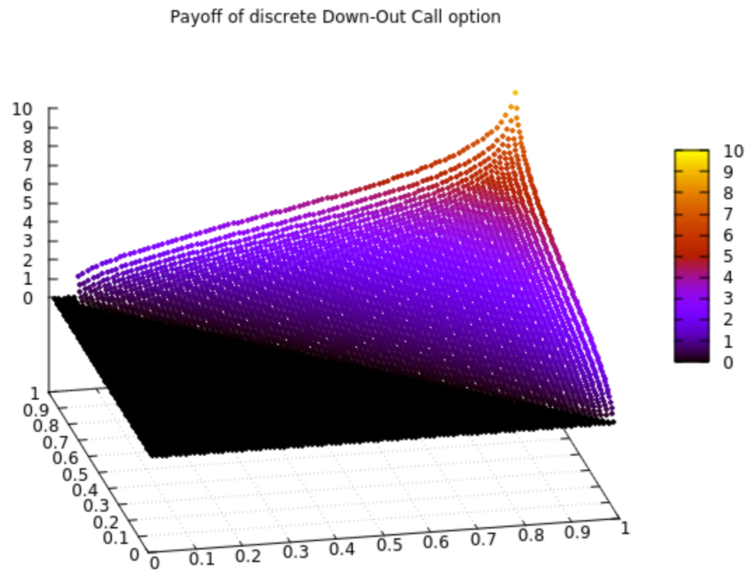
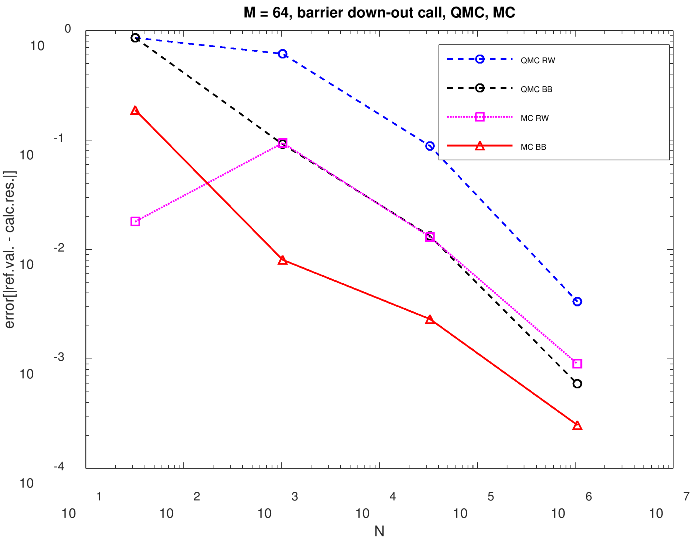
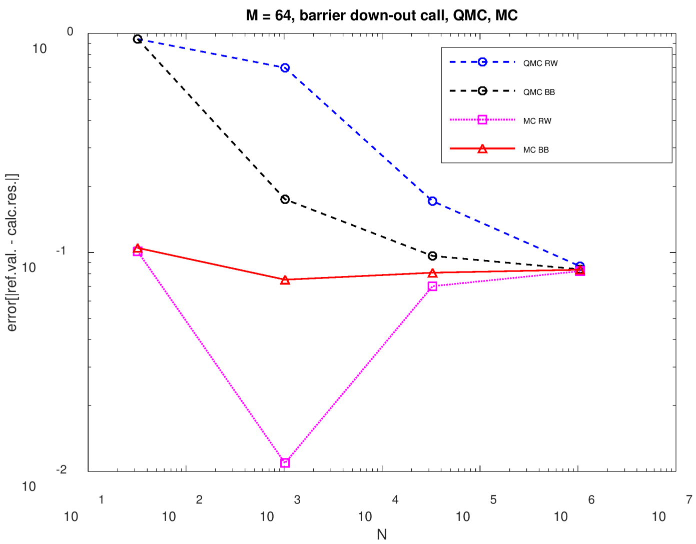
Task 1



Task 2



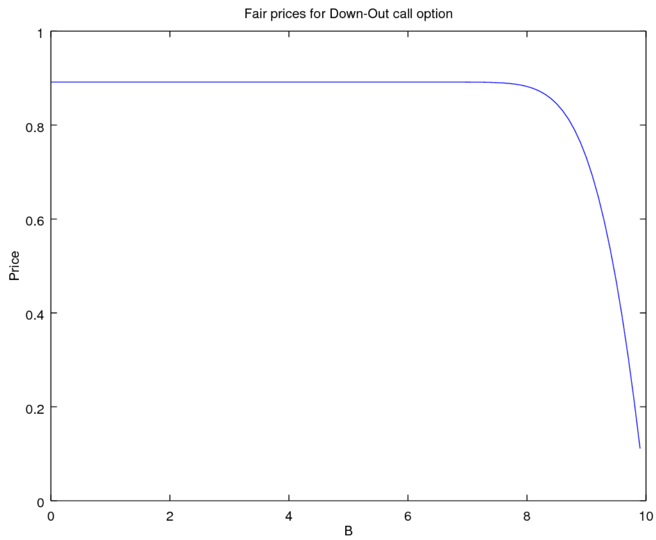
- On this figure the absolute error: $|ref.val. - calc.val.|$ using different methods(QMC,MC) for Barrier Down-Out Call Option is plotted in loglog-scala against number of points.
- From the plots, one can observe that there is no really difference between using Brownian-Bridge or Random-Walk constructions.



- On this figure the absolute error: $|ref.val. - calc.val.|$ using different methods(QMC,MC) for Barrier Down-Out Call Option is plotted in loglog-scala against number of points. However now, reference value was computed using far more lower precision, where-from there is no convergence.

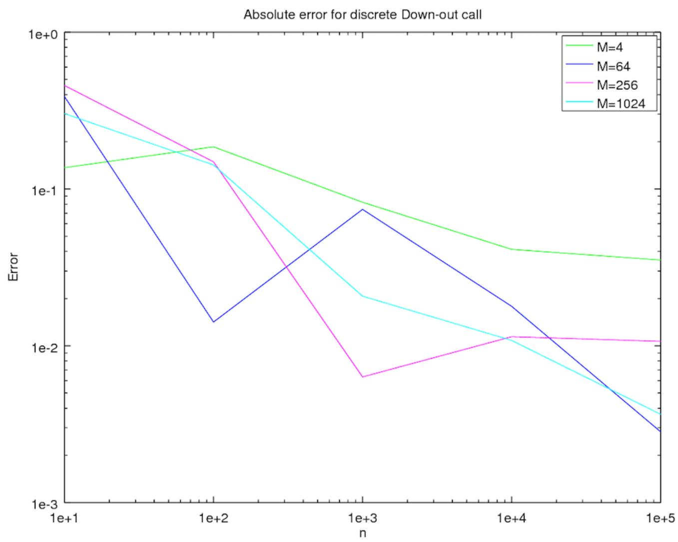
Task 3

The picture below shows the fair price for a Down-Out call option with barrier B. One can see that the fair price is going down if the barrier is larger then about $B = 8$. This makes sense, because when the barrier is high, the payoff is 0 in many cases (because for this value of B it happens more often that the price of the underlying is below the barrier).

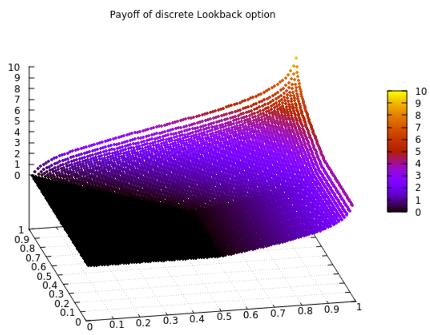


Task 4

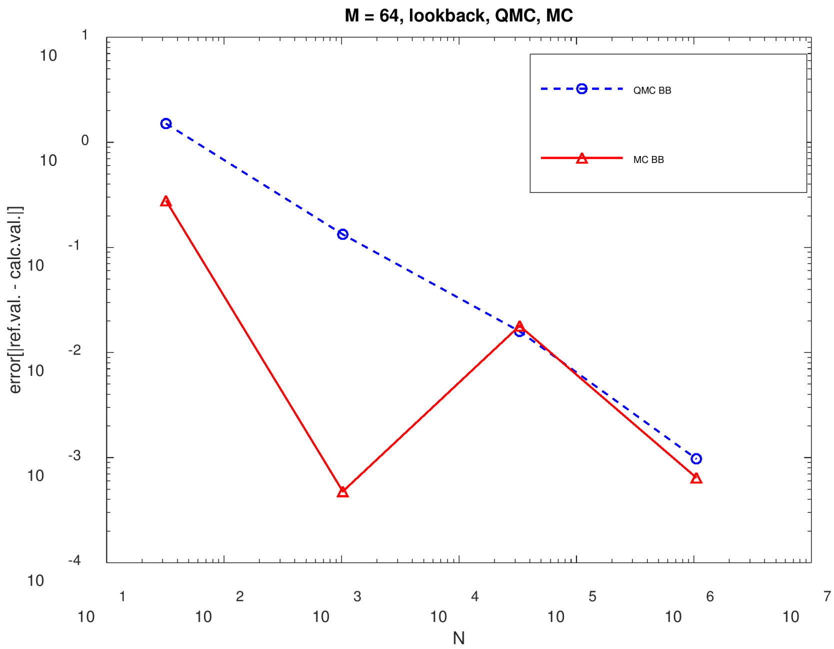
The next plot shows the absolute error for the discrete Down-Out call option for different values of M. One can see that for $M \geq 64$ the convergence is much better then for $M = 4$.



Task 5

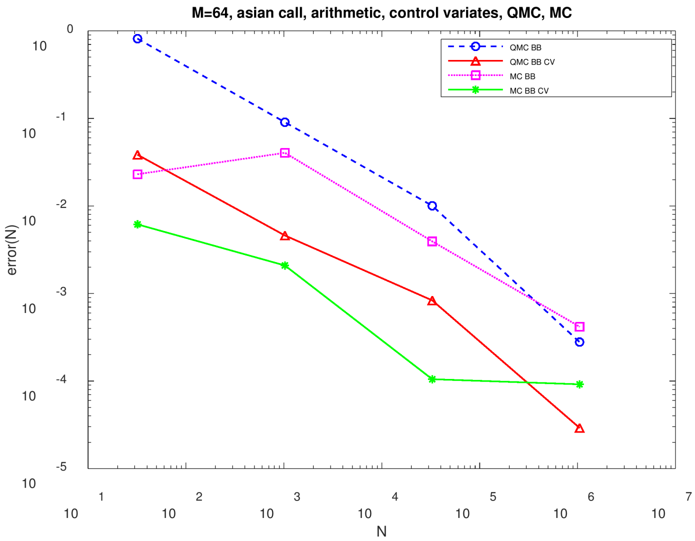


Task 6



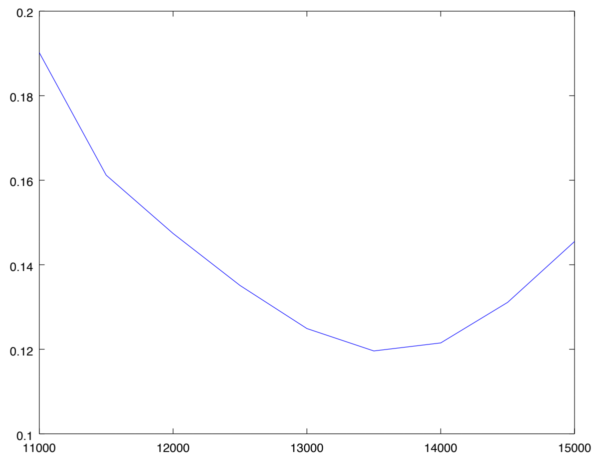
- On this figure the absolute error: $|ref.val. - calc.val.|$ using different methods(QMC,MC with Brownian-Bridge) for Lookback Call Option is plotted in loglog-scala against number of points.

Task 7



- On this figure, results of the **control variate** method are presented.

Task 9



Volatility of Call-Options for DAX, expiring in December, 2017. In this case, the volatility smile is clearly visible. The current value of the DAX is at about 12450 points.