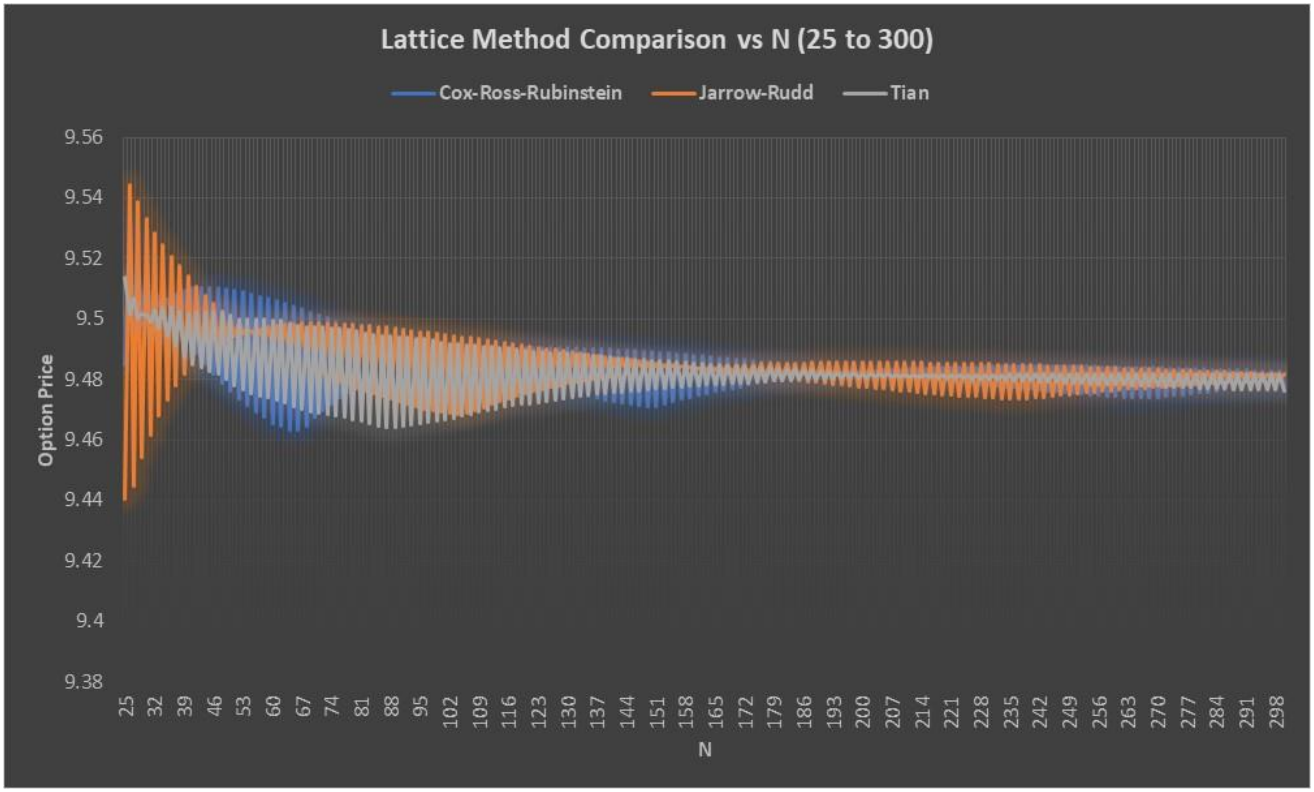
2/18/19

IE 525

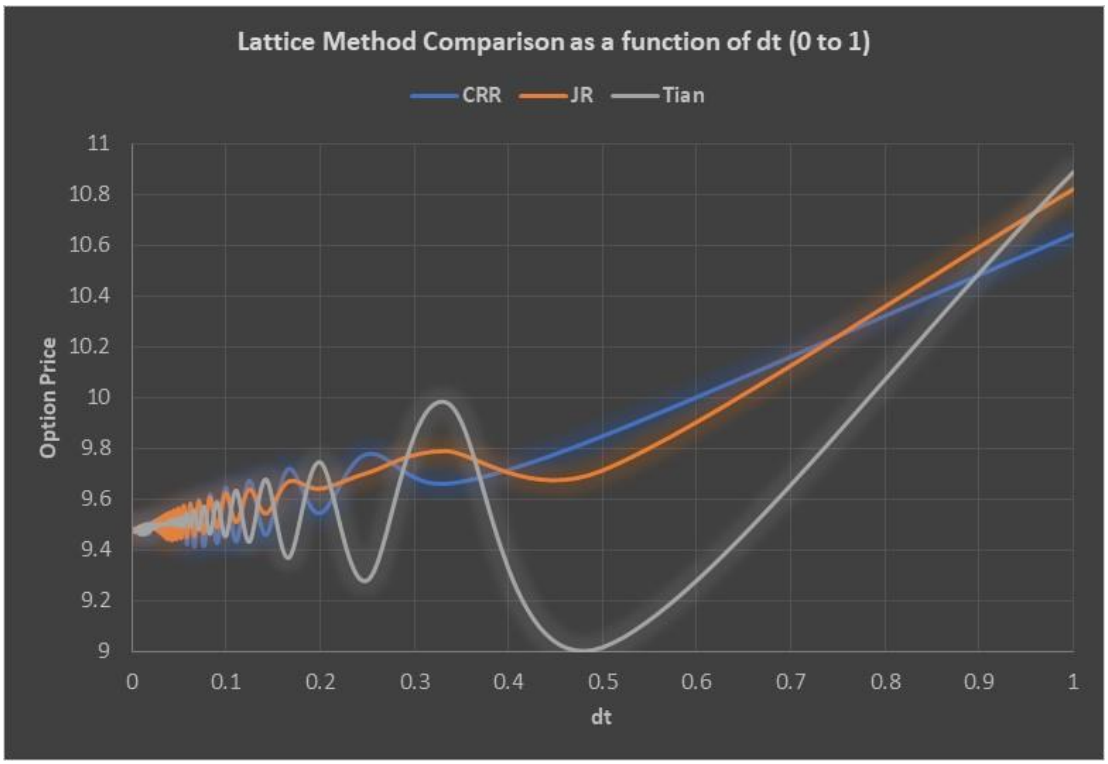
Joseph Loss (loss2)

Computational Assignment #1

1a.

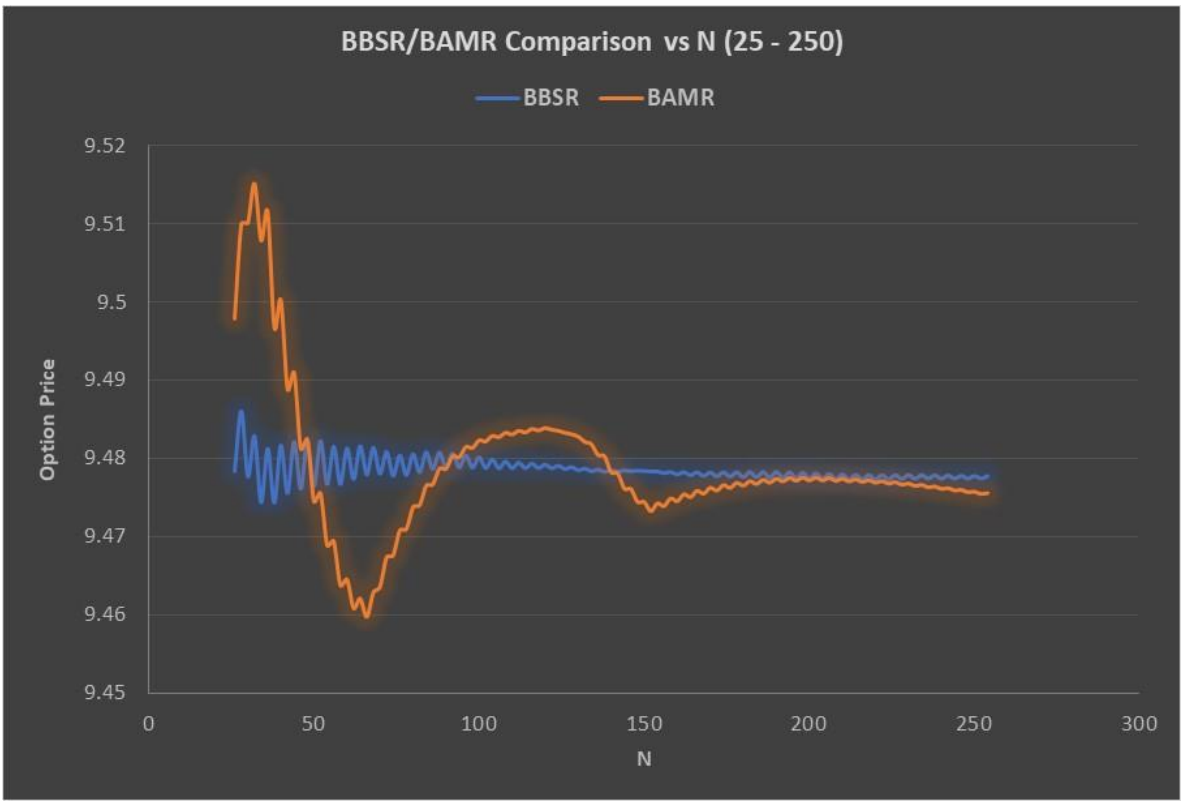


- The output of option prices for the three models converges on a price of approximately $9.48 for the American put option (N = 256).
- As can be seen in the plot above, as the number of steps increases, the spread of prices for the American put option decreases (i.e. accuracy/convergence increases).
- Additionally, note that the difference in the spread of option prices for each model (from largest to smallest) is as follows: JR > CRR > Tian.

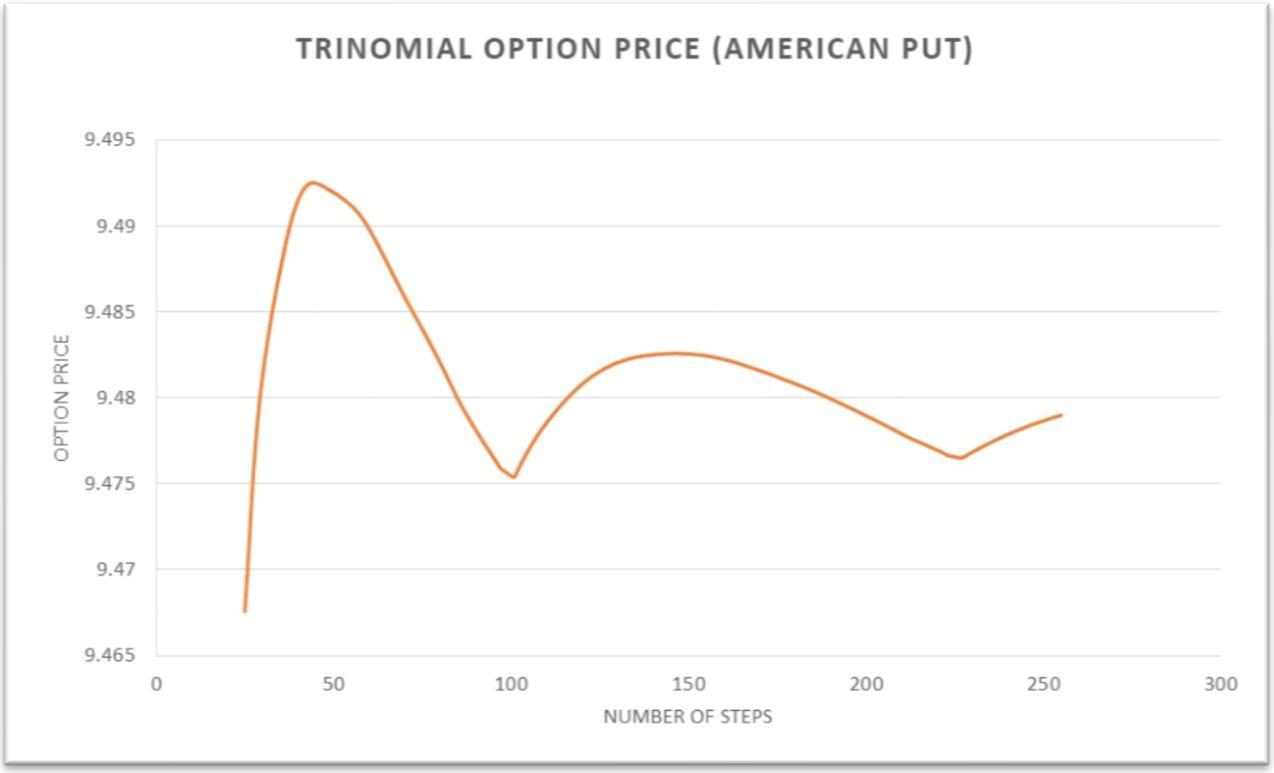


Note that the models converge as $N \to \infty \text{ and } dt \to 0$

1b.

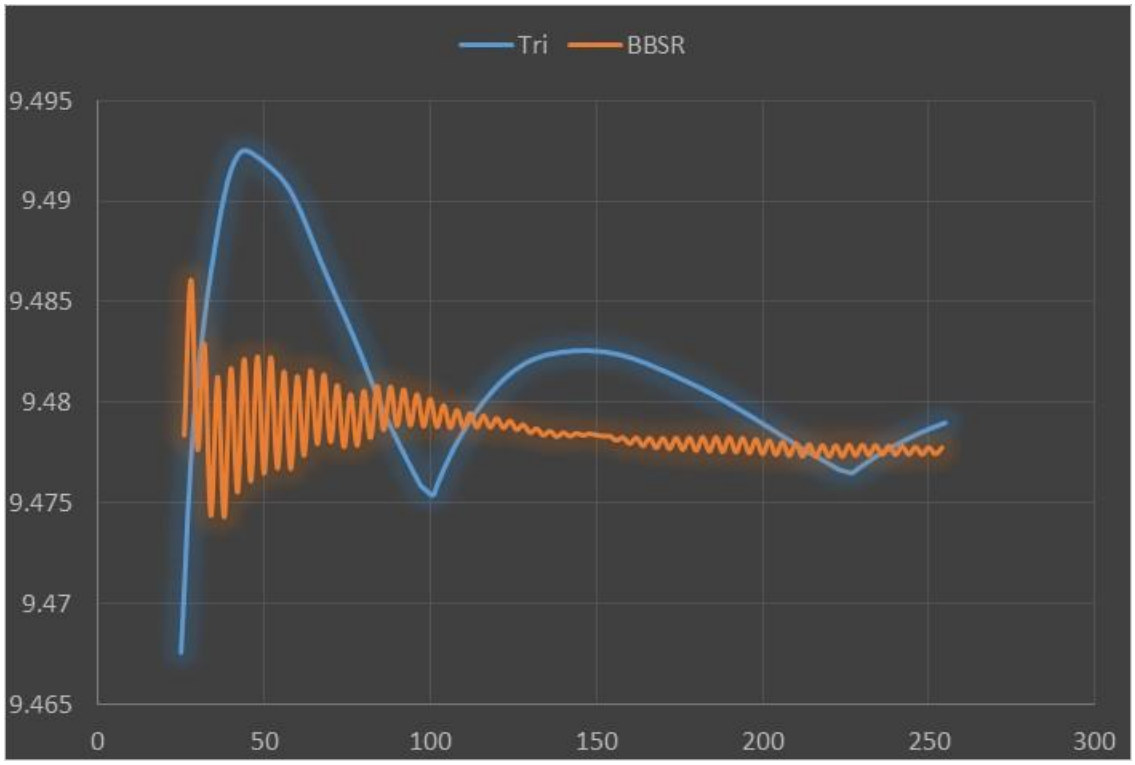


1c.



- Note that as the number of steps increases (particularly >= 250), the option price converges to ~$9.477 (approx. $9.48)

1d.



- In the graph above, we can see that the Trinomial method has a similar shape to the BAMR method (after all, these methods are pretty similar in practice).
- While the Trinomial model shows larger jumps (wider spread in option prices), the pricing model is significantly “smoother” as we increase the number of steps.
    - This contrasts with the BAMR model, which frequently bounces high/low prices as it converges (as we increase N).

2. Multi-Dimensional Options

CPU Time Table:

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CPU Duration vs Time-Steps
Steps:       15       30       60      120      240      480
CPU Time:  0.002    0.018    0.244    3.275    46.83   733.654
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- Notice that as the number of time-steps increases, the computational requirement increases exponentially.
    - For example, if we double the time-step from 240 to 480, the computational effort is 15.7 times larger!