

Take Home Final

MATH G6071: Numerical Methods in Finance

Dave Bayer, April 26, 1999

[1] List each programming assignment that you have submitted for this course. Indicate roughly when it was submitted, whether it was submitted by email or physically, and whether it was an individual or group project. If you are expecting to submit an assignment shortly, indicate when I can expect it, and how I can reach you to find out its status.

[2] Report as many typos and errors in our text, [WDH], as you can. Give the corrections in a succinct form, suitable for a web site for next year's class.

What percentage of your final grade would you like to be determined by the programming assignments? Please choose a percentage between 33% and 99%.

Work a selection of the following problems, taking into account the programming percentage you have selected. (If you have elected 99% for programming, you need only answer [1] and [2] above.)

[3] Describe various ways that a poor random number generator can cause unintended problems in use. How would you select and test a random number generator for production use?

[4] Explain the stochastic differential equation

$$\frac{dS}{S} = \sigma dX + \mu dt$$

in the context of finance.

[5] Compare the explicit, implicit, and Crank-Nicolson finite difference methods for pricing options.

[6] Explain what a free boundary problem is, and how one prices an American option using the Projected SOR algorithm.

[7] Explain how numerical methods for pricing options take into account dividends.

[8] Explain the singular value decomposition (SVD) and its applications.

[9] Explain the fast Fourier transform (FFT) and its applications.