

Assignment A

Common Notations

We use the following notation:

S_t	:	Stock price at time t
σ	:	Volatility of the Stock (assumed constant)
r	:	Interest rate
T	:	Time to option expiration (in years)
K	:	Strike price
W_t	:	Brownian motion process
$N(0, 1)$:	Standard normal distribution
$(A - B)^+$:	$\text{Max}(A-B, 0)$

Useful Items

Generating Random Inputs

- ▶ Where applicable, you may use the function shown below to generate input values randomly:

```
float random_data(float low, float hi)
{
    float r = (float)rand() / (float)RAND_MAX;
    return low + r * (hi - low);
}
```

- ▶ For example, you may use this function to populate the input matrices in Assignment 1, and initialize the input values in option pricing assignments.

Measuring Running Time using Chrono

- ▶ We use a timer to measure the execution times of a program.
- ▶ We have many choices to get such timing measurements.
Code snippet below shows how to use chrono in the C++ Standard Library.

```
#include <chrono>

using namespace std::chrono;

int main()
{
    high_resolution_clock::time_point t1 =
        high_resolution_clock::now();

    do_the_works();

    high_resolution_clock::time_point t2 =
        high_resolution_clock::now();

    std::cout << "Elapsed time: " <<
        duration_cast<milliseconds>(t2 - t1).count() << " ms";

}
```

- ▶ Defined in chrono header.

Assignment A (C/C++)

- ▶ Due: June 10 by 6 PM.
- ▶ Write a function to price European Call options using Black Scholes formula.
- ▶ Measure time taken to price 1 million (distinct) options. Use random data to initialize parameters for each option.
- ▶ You are not required to use techniques such as vectorization/multithreading for this assignment.
- ▶ Aim of this assignment is to get the students to think about performance and set the stage for week 1 lecture.
- ▶ As long as anyone makes a genuine and an honest attempt to solve this problem one will get full points for this assignment, even if the solution is not complete.