

2.15 Programming

Write C/C++ functions `bscall` and `bsput` to value a European call and put respectively using Black-Scholes.

```

#include <iostream>
#include <math.h>
#include "myfunctions.cpp"
double bscall(double S, double K, double rc, double t, double sigma);
double bsput(double S, double K, double rc, double t, double sigma);
double d1(double S, double K, double rc, double t, double sigma);
double d2(double S, double K, double rc, double t, double sigma);
double d1(double S, double K, double rc, double t, double sigma){
    double retval;
    retval = (log(S/K)+(rc+pow(sigma,2)/2)*t)/(sigma*sqrt(t));
    return retval;
}
double d2(double S, double K, double rc, double t, double sigma){
    double retval;
    retval = (log(S/K)+(rc-pow(sigma,2)/2)*t)/(sigma*sqrt(t));
    return retval;
}
double bscall(double S, double K, double rc, double t, double sigma){
    double d1val,d2val,retval;
    d1val=d1(S,K,rc,t,sigma);
    d2val=d2(S,K,rc,t,sigma);
    retval=S*phi(d1val)-K*exp(-rc*t)*phi(d2val);
    return retval;
}
double bsput(double S, double K, double rc, double t, double sigma){
    double d1val,d2val,retval;
    d1val=d1(S,K,rc,t,sigma);
    d2val=d2(S,K,rc,t,sigma);
    retval=-S*phi(-d1val)+K*exp(-rc*t)*phi(-d2val);
    return retval;
}
int main() {
    double S,K,rc,t,sigma;
    int isput;
    std::cout << "Enter S: ";
    std::cin >> S;
    std::cout << "Enter K: ";
    std::cin >> K;
    std::cout << "Enter rc: ";
    std::cin >> rc;
    std::cout << "Enter t: ";
    std::cin >> t;
    std::cout << "Enter sigma: ";
    std::cin >> sigma;
    std::cout << "Enter 1 if put: ";

```

```
std::cin >> isput;
if (isput==1){
    std::cout << "Put value is: " << bsput(S,K,rc,t,sigma) << std::endl;
} else {
    std::cout << "Call value is: " << bscall(S,K,rc,t,sigma) << std::endl;
}
}
```