ISyE 6767 Sys-Computation Finance

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**Homework 2**

Due date: September 19 2018

1. Design Bond class: a bond is a security that makes fixed payments on specific dates, based on the expiration date, frequency of payments, and coupon rate. Header File should include:

* Private elements for expiration date, frequency of payments and coupon rate.
* Add the #ifndef/#define/#endif statements to avoid multiple inclusion.
* Default constructor initializing all private elements to zero, Destructor, Copy Constructor, and anoth er constructor that initializes a bond using expiration date, frequency of payments, and coupon rate.
* A *ToString()* function that returns a string description of the bond. Use the *std::string* class as return type. For example: “*Bond (01/01/2020,0.5,0.07)”* could be the return of a bond with expiration date on *01/01/2020*, a payment each 6 months, and 7% of coupon.

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| **Bond** |
| Expiration date (string)  Frequency (double)  Coupon rate (double) |
| Default Constructor  Destructor  Copy Constructor  Constructor (Time, Freq, Coup)  ToString() |

Implement the class in the main file, creating a default bond and printing its information in the command line. Then create a new semi-annually compounded bond with 7% coupon rate and expiring on November 19th, 2035 and print its characteristics using the ToString() function.

1. Design a Bond Pricing Function for your Bond Class.

When a bond is issued the price is 100, but after that, the price fluctuates according to the interest rate.

The price of a bond is defined as the present value of the cashflows:

Where

The file Bond.xlsx contains an example of how to price a **Bond (Exp Date, 0.5, 8%)** for 4.2 years to maturity and 7% interest rate, using continuous discount factors. You are asked to implement a pricing function for the Bond class using the above methodology.

1. In 2009, you purchased a security for $100, that will pay you the arithmetic average of the underlying security’s prices. The underlying security is a bond paying semi-annual coupons (Frequency=0.5) of 5%, and the time series of its interest rate data is given in the file Bond\_Ex3.csv. What will be the value of the security at its maturity?