Project 9

MGMTMFE 405
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You will need to write codes for all the parts of the project. Make sure the codes work properly and understand the ideas behind each problem below. You may be asked to demonstrate how the codes work, by running them, and interpret the results. Code quality, speed, and accuracy will determine the grades.

Consider a 30-year MBS with a fixed $WAC = 8\%$ (monthly cash flows starting in January of this year). The Notional Amount of the Loan is $\$100{,}000$. Use the CIR model of interest rates $dr_t = \kappa(\bar{r} - r_t)dt + \sigma\sqrt{r_t}dW_t$ with $r_0 = 0.078, k = 0.6, \bar{r} = 0.08, \ \sigma = 0.12$.

1. Consider the ***Numerix Prepayment Model***.

   (a) Compute the price of the MBS using this model for prepayments. The code should be generic: the user is prompted for inputs and the program runs and gives the output.

   (b) Compute the price of the MBS for the following range of k: in [0.3, 0.9] range, in increments of 0.1. Draw the graph of the price with respect to k.

   (c) Compute the price of the MBS for the following range of $\bar{r}$: in [0.03, 0.09] range, in increments of 0.01. Draw the graph of the price with respect to $\bar{r}$.

   (d) Compute the price of the MBS for the following range of σ: in [0.10, 0.20] range, in increments of 0.01. Draw the graph of the price with respect to σ.

2. Compute the Option-Adjusted-Spread (***OAS***) for the Numerix-Prepayment Model above with the Market Price of MBS being *$110,000*.

3. Compute the ***OAS-adjusted Duration and Convexity*** of the MBS, considered in the previous question.

[Optional Not for grading]

Consider the MBS described above and the IO and PO tranches.
Use the ***Numerix-Prepayment Model*** and price the IO and PO tranches for the following range of σ: in [0.10, 0.20] range, in increments of 0.01. Draw the graph of the price with respect to σ.