Project 9

MGMT 237G
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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.

Due date: by Noon on next Wednesday

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 ranges of the parameters: k in 0.3 to 0.9 (in increments of 0.1) and draw the graph of the price vs. k.

(c) Compute the price of the MBS for the following ranges of the parameters: $\bar{r}$ in 0.03 to 0.09 (in increments of 0.01) and draw the graph of the price vs. $\bar{r}$.

2. Consider the ***PSA Model*** of prepayments.

(a) Compute the price of the MBS using the PSA 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 ranges of the parameters: k in 0.3 to 0.9 (in increments of 0.1) and draw the graph of the price vs. k.

3. Compute the Option-Adjusted-Spread (***OAS***) for the Numerix-Prepayment model case with the Market Price of MBS being \$110,000.

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

5. Consider the MBS described above and the IO and PO tranches. Use the ***Numerix-Prepayment Model*** and price the IO and PO tranches for: $\bar{r}$ in 0.03 to 0.09 range, in increments of 0.01.

6. **[*Optional, NOT for grading*]**
Which is more expensive:
(1) A payoff of \$1 if XYZ stock price (that trades at \$15/share today) hits \$20 (at any time in the future); or
(2) A payoff of \$1 if ARP stock price (that trades at \$24) hits \$32?
Assume $r = 0$. Justify your answer.