MFE 405 Project 9
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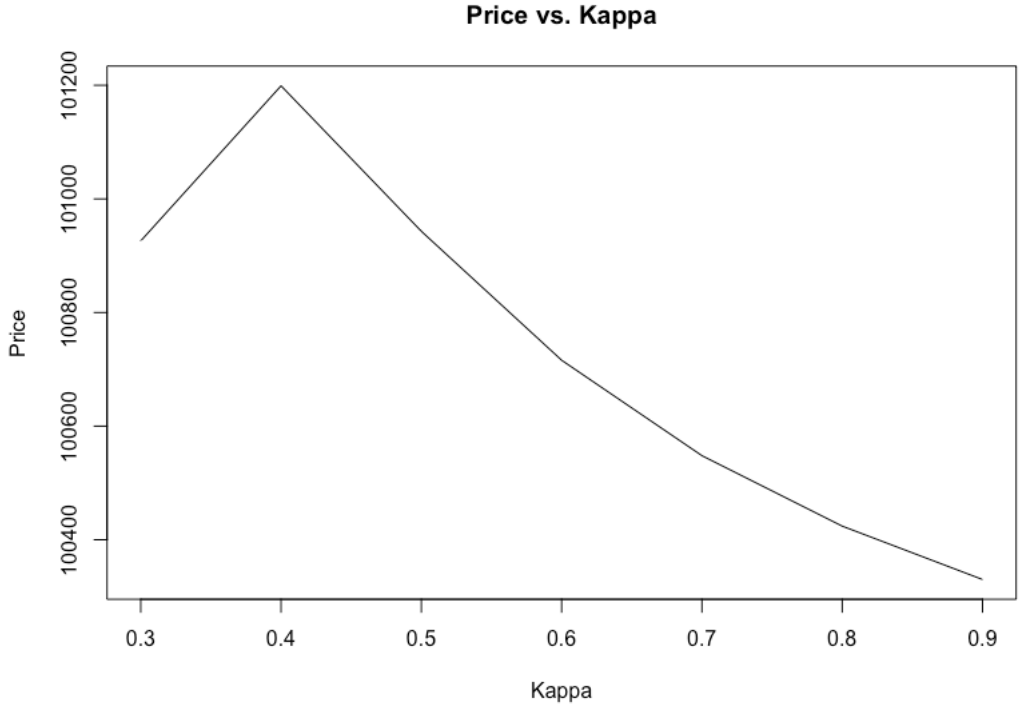
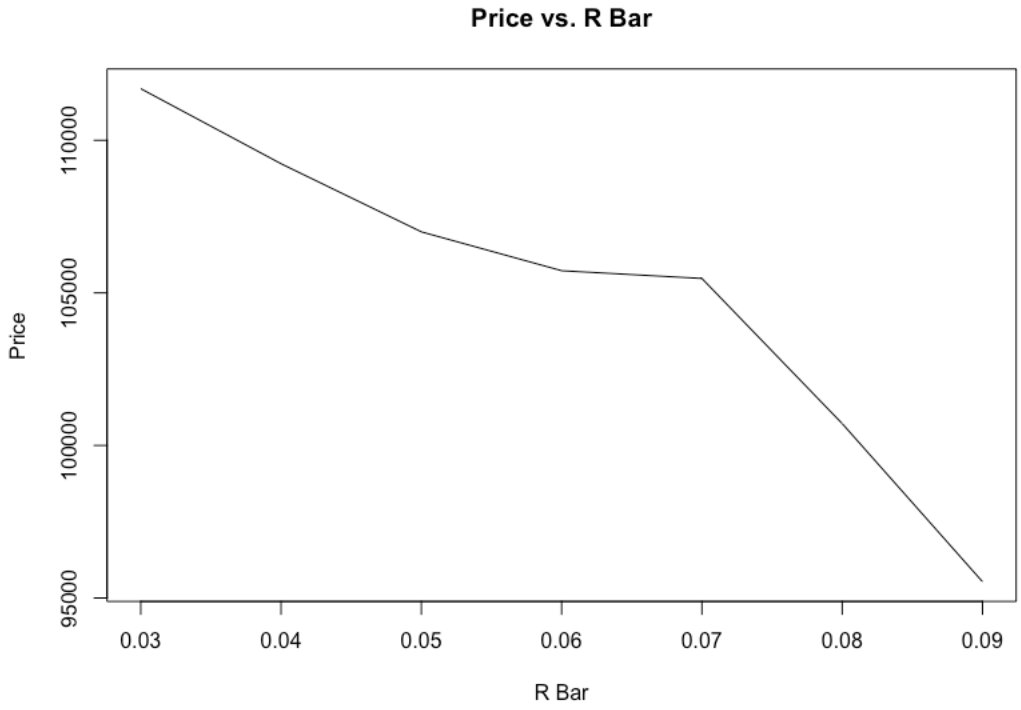
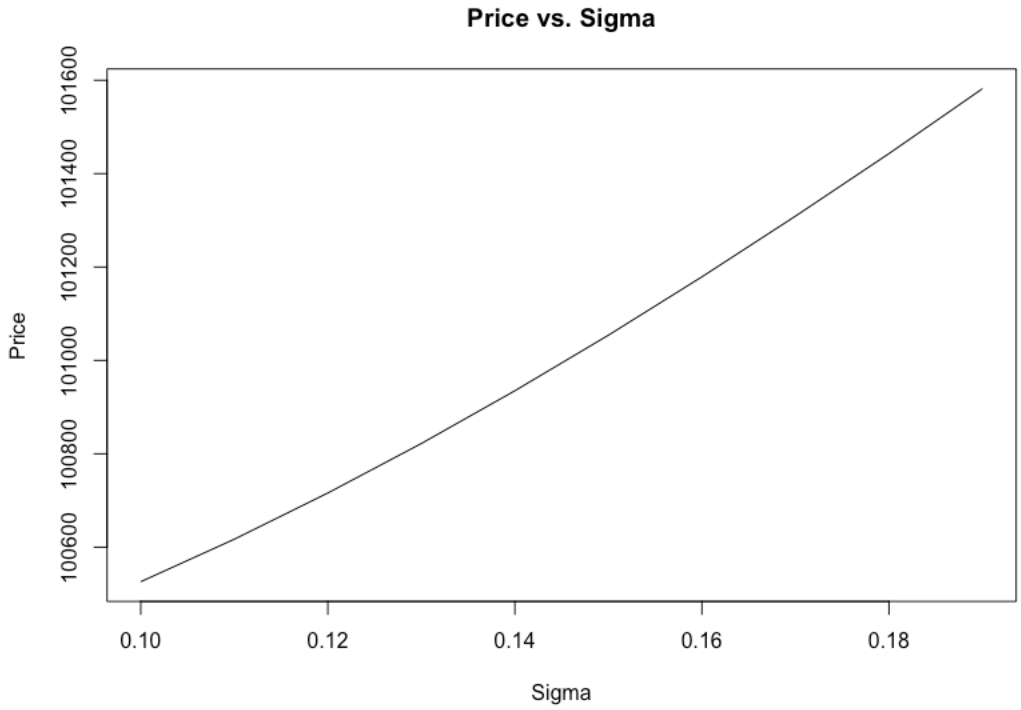
1. Numerix Prepayment Model, MBS Pricing

Using the Numerix Prepayment Model, we can calculate the CPR, which ultimately helps us find the expected cash flows for each period, including prepayment. We then discount these cash flows and find the price of the mortgage-backed security. The interest rates are simulated using the CIR model. Using a total of 10,000 paths of interest rates, we can find the price of the mortgage using Monte Carlo Simulation. The result is around **$100716**.

We now price MBS with different ranges of parameters κ, $\bar{r}$, and σ. Using the specified ranges, we compute the price variations due to variations in these parameters. The relationships of price between these factors are shown in the plots below:




Price vs. R Bar
Price
95000
100000
105000
110000
0.03
0.04
0.05
0.06
0.07
0.08
0.09
R Bar


Price vs. Sigma
Price
100600
100800
101000
101200
101400
101600
0.10
0.12
0.14
0.16
0.18
Sigma

2. Option-Adjusted-Spread (OAS) for MBS

The Option Adjusted Spread, x, makes it such that $MarketPrice = E^Q[C_t e^{-\int_0^t (r_s + x) ds}]$. We can estimate the value of x by using the bisection method, and find the value of x that would, under the previous Monte Carlo simulation, would price the MBS as equal to the market price. Here we choose to estimate x such that the precision of the price would be \$0.01. With the given market price of \$110,000, our OAS is computed to be around **-0.0126443**. This makes sense, as the computed MBS price previously is lower than the market price.

3. OAS-Adjusted Duration and Convexity

Using the formulas for OAS-adjusted duration and convexity, we find the duration to be **7.21** and the convexity to be **45.44**.