Project 9
MFE 405: Computational Finance
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This is a summary of the project for data visualisation, for detail implementation and result,

please refer to the print out of the program

Qn 1. Numerix Prepayment Model

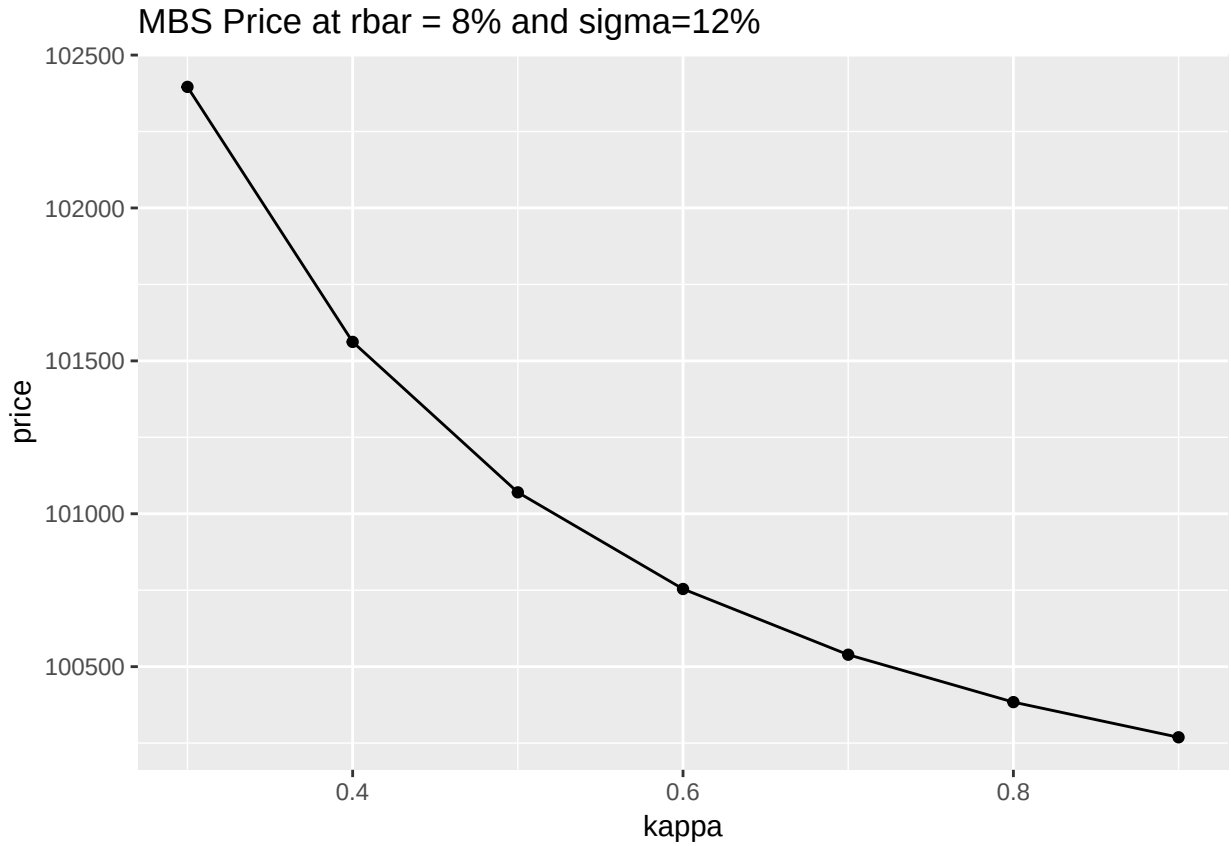
Implementation in C++

(a)

Function in `MortgageBackedSecurities::getNumerixPrepaymentModel` is created. MBS Price at rbar = 8%, kappa = 0.6, and sigma=12% is 100754

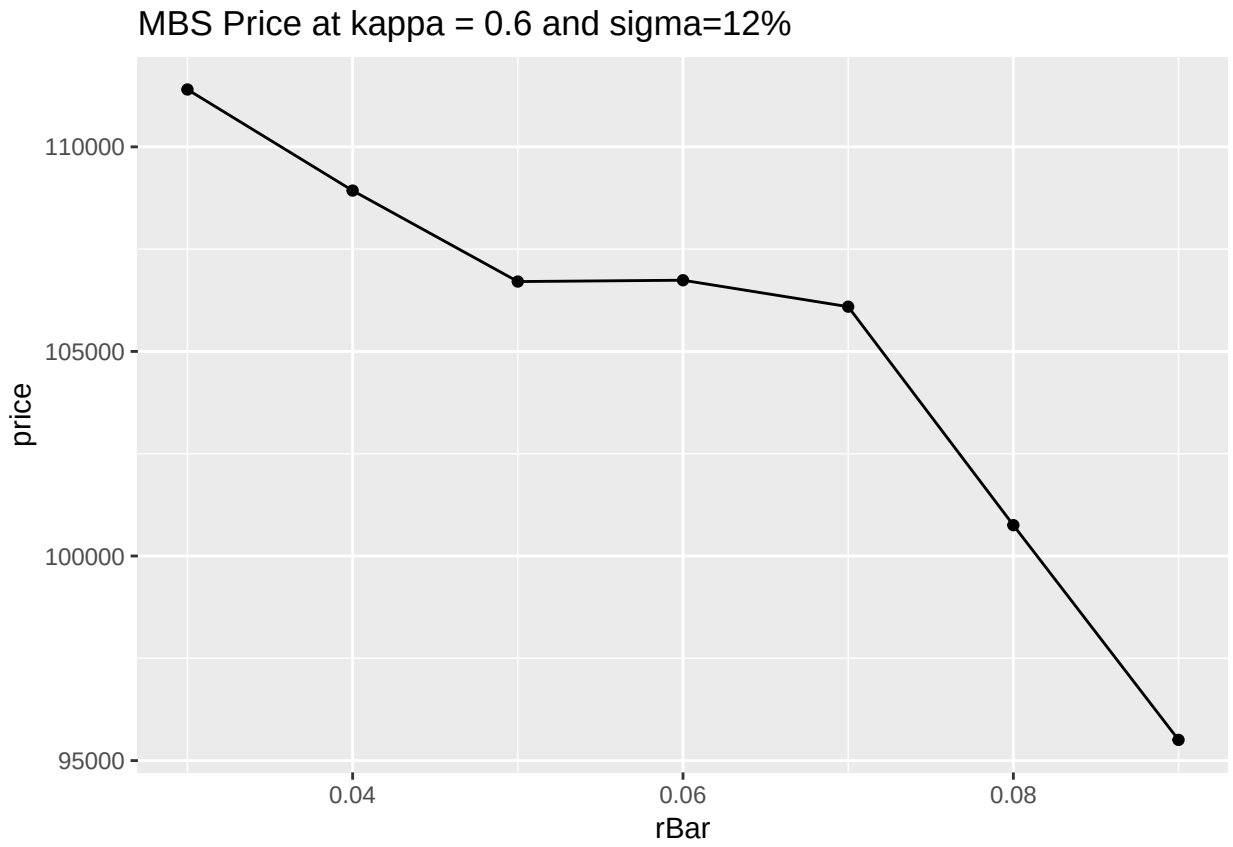
(b)

```
library(ggplot2)
kappa <- seq(0.3,0.9,0.1)
priceB <- c(102396, 101562, 101070, 100754, 100539, 100384, 100269)
df1b <- data.frame(kappa = kappa, price = priceB)
ggplot(data=df1b, aes(x=kappa, y=price)) + geom_line()+ ggtitle("MBS Price at rbar = 8% and sigma=12%")
```



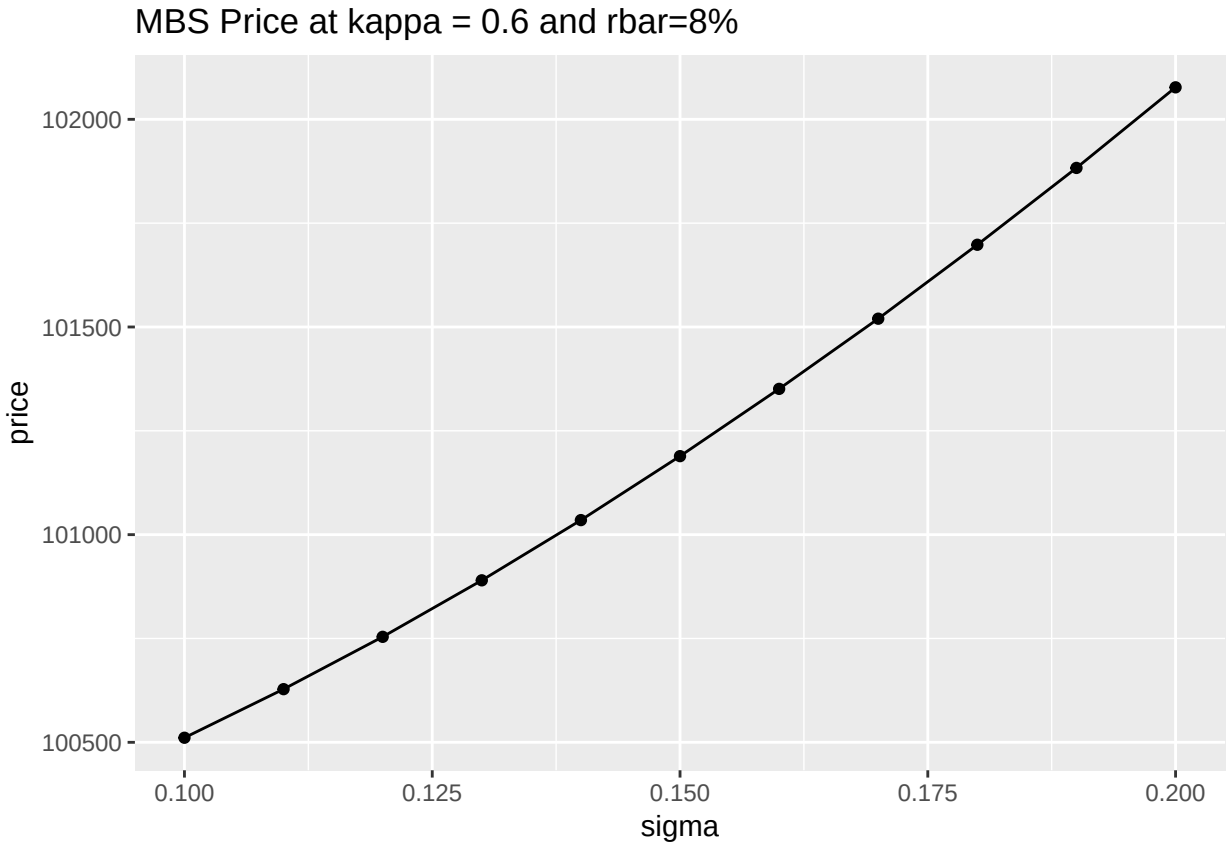
(c)

```
rBar <- seq(0.03, 0.09, 0.01)
priceC <- c(111402, 108931, 106708, 106740, 106094, 100754, 95506)
df2c <- data.frame(rBar = rBar, price = priceC)
ggplot(data=df2c, aes(x=rBar, y=price)) + geom_line()+ ggtitle("MBS Price at kappa = 0.6 and sigma=12%")
```



(d)

```
sigma <- seq(0.10, 0.20, 0.01)
priceD <- c(100511, 100628, 100754, 100890, 101035, 101189, 101351, 101520, 101698, 101883, 102077)
df2d <- data.frame(sigma = sigma, price = priceD)
ggplot(data=df2d, aes(x=sigma, y=price)) + geom_line()+ ggtitle("MBS Price at kappa = 0.6 and rbar=8%")
```



Qn 2. OAS Spread

Implementation in C++ Assume rbar = 0.08, kappa = 0.6, sigma = 0.12 when the spread is -0.012811, the price of the MBS is 110,000, which is equal to the market price of 110,000

Qn 3. OAS-adjusted Duration and Convexity

Implementation in C++

Duration: 7.28974 Convexity: 51.2725