GroupProject1

Q2

```r
library("lpSolve")
maturityYear = c(1,2,2,3,4,5,5,6,7,8)
# Price of each bond
c = c(102,99,101,98,98,104,100,101,102,94)
# Coupon rate
coupon = c(5,3.5,5,3.5,4,9,6,8,9,7)
# Liability schedule
b = c(12000,18000,20000,20000,16000,15000,12000,10000)
dir = rep("=",8)

# Matrix of cash flow from coupon
couponTol = matrix(0,8,10)
for(i in 1:10){
  couponTol[1:maturityYear[i], i] = 1
}
couponTol = couponTol %*% diag(coupon)

# Matrix of cash flow from principle at maturity
maturityTol = matrix(0,8,10)
for(i in 1:10){
  maturityTol[maturityYear[i],i] = 100
}

# Total cash inflows
A = couponTol + maturityTol

s = lp("min",c,A,dir,b)
s$solution
```

```
## [1]  62.13613   0.00000 125.24293 151.50508 156.80776 123.08007   0.00000
## [8] 124.15727 104.08986  93.45794
```

Q3

```r
dedication <- function(P,C,M,L){

  t = length(L)
  n = length(M)

  couponTol = matrix(0,t,n)
  for(i in 1:n){
    couponTol[1:M[i],i] = 1
  }
  couponTol = couponTol %*% diag(C)

  maturityTol = matrix(0,t,n)
  for(i in 1:n){
```

```
      maturityTol[j = M[i],i] = 100
  }

  dir = rep(">=",t)
  s = lp("min",P,couponTol + maturityTol,dir,L)
  if (s$status ==0){
    return(s$solution)
  }
  # Catch Exceptions
  else(
    print("No feasible solution found")
  )
}

# Test the function with Q2
dedication(c,coupon,maturityYear,b)
```

```
##  [1]  62.13613   0.00000 125.24293 151.50508 156.80776 123.08007   0.00000
##  [8] 124.15727 104.08986  93.45794
```

```
# Test with exception case
maturityYear = rep(1,10)
coupon = rep(0,10)
dedication(c,coupon,maturityYear,b)
```

```
## [1] "No feasible solution found"
```

```
## [1] "No feasible solution found"
```

Q4

```
library(rvest)
```

```
## Loading required package: xml2
```

```
## Warning: package 'xml2' was built under R version 3.3.2
```

```
library(XML)
```

```
##
## Attaching package: 'XML'
```

```
## The following object is masked from 'package:rvest':
##
##     xml
```

```
url = "http://online.wsj.com/mdc/public/page/2_3020-treasury.html"
table = readHTMLTable(url, header=T, which=3,stringsAsFactors=F)
table$Date <- as.Date(table$Maturity, format="%m/%d/%Y")
table$year  = format(table$Date,"%Y")
table$monthday  = format(table$Date,"%m%d")
```

```r
attach(table)
sub = subset(table,year > 2016)
sub = subset(sub, monthday == '1231' | monthday == '0630',select=c(Coupon,year,monthday,Asked))
rownames(sub) <- 1:nrow(sub)
detach(table)
sub
```

```
##    Coupon year monthday    Asked
## 1   0.625 2017     0630 100.0469
## 2   0.750 2017     0630 100.0938
## 3   2.500 2017     0630 100.7734
## 4   0.750 2017     1231  99.9297
## 5   1.000 2017     1231 100.1641
## 6   2.750 2017     1231 101.7188
## 7   0.625 2018     0630  99.5000
## 8   1.375 2018     0630 100.5469
## 9   2.375 2018     0630 101.8984
## 10  1.250 2018     1231 100.1641
## 11  1.375 2018     1231 100.3516
## 12  1.500 2018     1231 100.6172
## 13  1.000 2019     0630  99.1797
## 14  1.625 2019     0630 100.6250
## 15  1.125 2019     1231  99.0313
## 16  1.625 2019     1231 100.4375
## 17  1.625 2020     0630 100.0313
## 18  1.875 2020     0630 100.8984
## 19  1.750 2020     1231 100.0156
## 20  2.375 2020     1231 102.3906
## 21  1.125 2021     0630  96.9063
## 22  2.125 2021     0630 101.1250
## 23  2.000 2021     1231 100.3359
## 24  2.125 2021     1231 100.8906
## 25  2.125 2022     0630 100.4219
## 26  2.125 2022     1231  99.9453
## 27  1.375 2023     0630  95.0234
## 28  2.250 2023     1231  99.9141
```

```r
num = c(3,3,3,2,2,2,2,2,2,1,1)
maturityYear = c(1,1,1,2,2,2,3,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,11,12)
coupon = rep(0,24)
for (i in 1:24){
  coupon[i] <- as.numeric(sub$Coupon[i])
}

c = rep(0,24)
for (i in 1:24){
  c[i] <- as.numeric(sub$Asked[i])
}

# Liability schedule
b = 1000000*c(9,9,10,10,6,6,9,9,10,10,5,3)
dir = rep("=",12)

dedication(c,coupon,maturityYear,b)
```

```
##  [1]     0.00     0.00 72562.39     0.00     0.00 74376.45     0.00
##  [8]     0.00 86421.81     0.00 88474.32 49690.84     0.00 50436.21
## [15]     0.00     0.00 81255.80 82576.20     0.00 94124.51     0.00
## [22] 96359.96 48407.61 29375.76
```