

# project1

Group 4

Q2

```
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,compute.sens=1)
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

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

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

  couponTol = matrix(0,t,n)
  for(i in 1:10){
    couponTol[1:M[i],i] = 1
  }
  couponTol = couponTol %*% diag(C)

  maturityTol = matrix(0,t,n)
```

```

for(i in 1:10){
  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"

```