Preparing to Midterm Exam

Exercises

1. Write R code that calculates the interest rate for the desired period using the given nominal interest rate. (Find 3 monthly effective interest rate using the monthly nominal interest rate equals to 0.12)

```
nom_to_eff<-function(i=nom_int,m=nom_period,n=eff_period){
j=((1+(i/m))^(m/n))-1
return(j)
}
nom_to_eff(0.12,4,12)
```

```
## [1] 0.009901634
```

2. Bruce deposits 100 into a bank account. His account is credited interest at a nominal rate of interest of %4 convertible semiannually. At the same time Peter deposits 100 into a seperate account.Peter's account is credited interest at a force of interest of δ. After 7.25 years the value of each account is the same. Calculate δ

We look at the future value in 7.25 years for each person.

<u>Bruce</u>. He is credited interest for 29 quarters. We are given that his interest rate per semiannual period is 2%. Thus his interest rate per quarter is $\sqrt{1.02}-1$, and his future value is $FV=\left(\sqrt{1.02}\right)^{29}100=133.26$

<u>Peter.</u> He earns continuous interest at a rate of δ for 7.25 years. His future value is $FV=100e^{7.25\delta}$.

To finish the problem we equate the two future values and solve.

$$133.26=100e^{7.25\delta}$$
$$1.3326=e^{7.25\delta}$$
$$\ln(1.3326)=7.25\delta$$
$$\delta=\frac{\ln(1.3326)}{7.25}=.0396$$

```
#a= amount of ivestment with nominal int ,b= amount of investment with constant int
#m1=the converted term on nominal int rate
#m2= the converted term that you want
#n=year
exa2<-function(a,b,i,m1,m2,n){
term=m2*n
j=((1+(i/m1))^(m1/m2))-1
FV1=a*((1+j)^term)
sonuc1<-log(FV1/b)
return(solve(n,sonuc1))
}
exa2(100,100,0.04,2,4,7.25)
```

```
## [1] 0.03960525
```

3. Find $\bar{a}_{\overline{n}|}$

```
exe3<-function(A,i,n){
  delta=log(1+i)
  ff<-function(t) (A*exp(-1*delta*t))
  sonuc<-integrate(ff,0,n)$value
  return(sonuc)
}
exe3(1,0.06,20)
```

```
## [1] 11.81068
```

4. An annuity immediate has a first payment of 200 and increased by 100 each year until payments reach 600. There are 5 further payments of 600. find the present value at 5.5%.

Total payment:		**200**	**300**	**· · ·**	**600**	**600**	**600**	**· · ·**	**600**
Which equals:									
$100a_{\overline{5}|}$		100	100	· · ·	100				
$100(Ia)_{\overline{5}|}$		100	200	· · ·	500				
$v^5(600)a_{\overline{5}|}$						600	600	· · ·	600
Time,	$t=0$	1	2	· · ·	5	6	7	· · ·	10

The equation of value is

$$PV = 100a_{\overline{5}|} + 100(Ia)_{\overline{5}|} + v^5 600a_{\overline{5}|}$$
$$= 100(4.270) + 100(12.3542) + 0.7651(600)(4.270)$$
$$= 3622.61$$

```
#R represents the reached specific value just before the level payments,n implies the year of level pay
#we need to calculate the how many year passed till beginning of the level payment
exe4<-function(P,Q,n,i,R){
  n1<-((R-P)/Q)+1
  pv_imm_prog<-function(P,Q,i,n){
  x=0
  y=0
  r=1/(1+i)
  for(i in 1:n) x=x+P*r^i
  for(t in 2:n) y=y+Q*(t-1)*r^t
  return(x+y)
  }
   pv_imm_ann<-function(a, i, n) {
   x = 0
   r=1/(1+i)
   for(i in 1:n) x = x + a * r^(i)
   return(x)
   }
   sonuc<-pv_imm_prog(P,Q,i,n1)+pv_imm_ann(R,i,n)*(1/(1+i)^n1)
   return(sonuc)
}
exe4(P=200,Q=100,i=0.055,n=5,R=600)
```

```
## [1] 3622.848
```