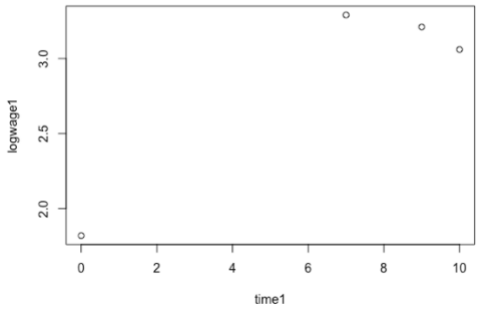
HW4

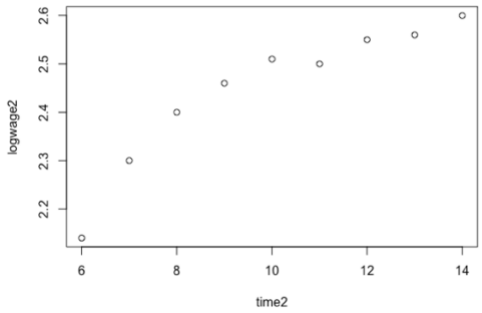
1. **Exercise 1 Data**

   Represent the panel dimension of wages for 5 randomly selected individuals.

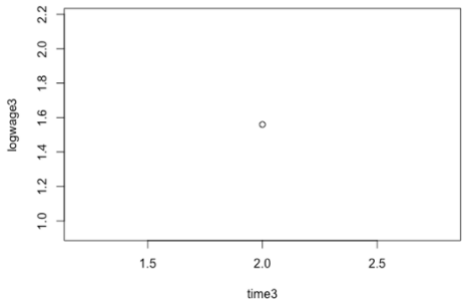
   # personid = 1



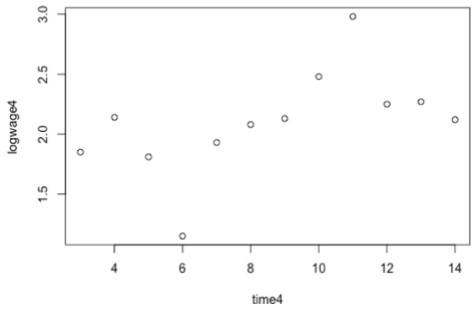
   #personid = 2



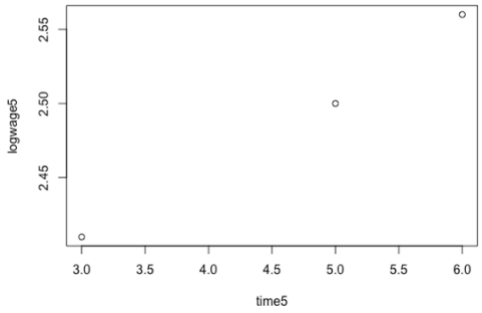
   #personid = 3



   #personid = 4



#personid = 5



2. Exercise 2 Random Effects

#Estimate the random effect model under the normality assumption of the disturbance terms.

```
Coefficients:
(Intercept)        educ    potexper
 0.79419112  0.09386374  0.03740530
```

From the coefficients listed above, we could see that both education and potential experience have positive effect on log wage.

3. Exercise 3 Fixed Effects Model

3.1 Between Estimator

```
Coefficients:
(Intercept)         edu     potexper
     0.8456      0.0931       0.0260
```

3.2 Within Estimator

```
Coefficients:
     edu  potexper
 0.12366   0.03856
```

3.3 First time difference Estimator

```
Coefficients:
(Intercept)          edu      potexper
   0.049464     0.038352     0.003989
```

Compare the estimates of β_1 and β_2 under different models:

For β_1 , within estimator > between estimator > first time difference estimator

For β_2 , within estimator > between estimator > first time difference estimator

Generally, within estimator and between estimator are almost the same, but the first time difference estimator has significant difference from the other two models.

4. Exercise 4 Understanding Fixed Effects

4.1 Write and optimize the likelihood associated to the problem and estimate the individual fixed effect parameters

```
> print(betar)
[1]  0.028775911 -0.002261693
```

4.2 Run a regression of estimated individual fixed effects on the invariant variables.

```
Coefficients:
(Intercept)      ability     mothered     fathered     brknhome     siblings
   0.913649     0.100666    -0.004147     0.001647    -0.145571     0.016016
```

4.3 The standard errors in the previous may not be correctly estimated. Explain why, and propose an alternative method to compute standard errors.

1) Explain: Because the previous model made an assumption that the variables are independent from time, but in practice, they are possibly positive correlated over time, which means in practice there might exist heteroskedasticity. Therefore, the standard error might not be correctly estimated.
2) Propose an alternative method : use bootstrap to calculate corrected standard error.

```
> se_boot
                  intercept    ability   mothered   fathered  brknhome
corrected_se_bot 0.2141776 0.07171648 0.01964735 0.01707218 0.1214619
                    siblings
corrected_se_bot 0.02355908
```