# Assignment 1

**The due date for submitting this assignment has passed.**

**Due on 2017-02-07, 23:59 IST.**

### Submitted assignment (Submitted on 2017-02-06, 18:03 )

**1 point**

1. Which of the following transformations make the model  *y*=*xβ*0*x*−*β*1 linear in *β*0 and *β*1 ?



*y*∗=*y*−2,*x*∗=*x*−2



*y*∗=*y*−1,*x*∗=*x*−1



*y*∗=*y*2,*x*∗=*x*2



*y*∗=*y*−1/2,*x*∗=*x*−1/2

**1 point**

2. Which of the statements are correct about the model *y*=*β*0exp(*β*1*x*) ?  
Statement 1 : Model is nonlinear.   
Statement 2 : Model is linear in the parameters ln*β*0 and *β*1.  
Statement 3 : Model can be linearized using the transformed variables *y*∗=ln*y* and *x*∗=*x*..  
Statement 4 : Model is linear in the parameters ln*β*0 and exp(*β*1).

 Statements 1, 2 and 3 are correct. 

 Statements 1, 3 and 4 are correct.

 Statements 2 and 3 are correct.

 All the statements 1, 2, 3 and 4 are correct.

**1 point**

3.Consider the simple linear regression model *y*=*β*0+*β*1*x*+*ϵ* where *β*0  
is known. The ordinary least squares estimator of *β*1 based  
on the observations (*xi*,*yi*),*i*=1,2,…,*n* is



*β*0∑*ni*=1(*yi*−*y*¯)(*xi*−*x*¯)∑*ni*=1(*xi*−*x*¯)2



∑*ni*=1(*yi*−*β*0)*xi*∑*ni*=1*x*2*i*



∑*ni*=1(*yi*−*y*¯)*xi*∑*ni*=1*x*2*i*



∑*ni*=1(*yi*−*y*¯−*β*0)(*xi*−*x*¯)∑*ni*=1(*xi*−*x*¯)2

**1 point**

4.Consider the simple linear regression model *yi*=*β*0+*β*1*xi*+*ϵi*,*i*=1,2…,*n* where *ϵ*′*i*s are identically and independently distributed with mean 0, variance *σ*2 and do not necessarily follow the normal distribution. Let *x*¯=1*n*∑*ni*=1*xi*,*y*¯=1*n*∑*ni*=1*yi*. The covariance between the least squares estimators of *β*0and *β*1  is



−*σ*2∑*ni*=1(*xi*−*x*¯)2



−*x*¯*σ*2∑*ni*=1(*xi*−*x*¯)2

 Zero.



∑*ni*=1(*xi*−*x*¯)2*σ*2*x*¯2

**1 point**

5. Consider a  simple linear regression model *yi*=*β*0+*β*1*xi*+*ϵi*,*E*(*ϵi*)=0,*Var*(*ϵi*)=*σ*2*i*,*i*=1,2,…,*n*, where *σ*2*i*,*i*=1,2,…,*n* are assumed to be known. An estimator of  *β*1 based on the minimization of ∑*ni*=1*ϵ*2*i* in this case is



∑*ni*=1((*xi*−*x*¯)(*yi*−*y*¯)*σ*2*i*)∑*ni*=1((*xi*−*x*¯)2*σ*2*i*)



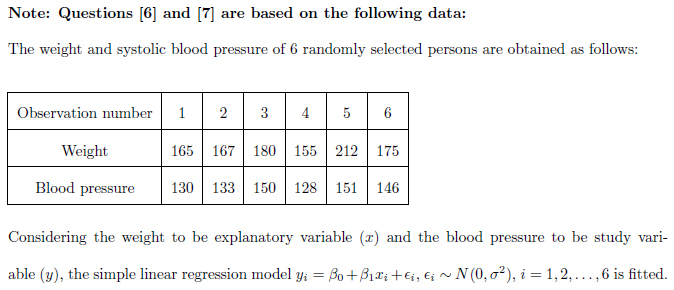
∑*ni*=1*σ*2*i*(*xi*−*x*¯)(*yi*−*y*¯)∑*ni*=1*σ*2*i*(*xi*−*x*¯)2



∑*ni*=1(*xi*−*x*¯)(*yi*−*y*¯)∑*ni*=1(*xi*−*x*¯)2



∑*ni*=1((*xi*−*x*¯)(*yi*−*y*¯)*σi*)∑*ni*=1((*xi*−*x*¯)2*σi*)



**1 point**

6. The ordinary least squares estimates of *β*0,*β*1  
and *σ*2 are obtained. Which of the following represents  
the correct results?



*β*^0=62.9,*β*^1=0.44,*σ*^2=176



*β*^0=26.5,*β*^1=0.15,*σ*^2=176



*β*^0=62.9,*β*^1=0.44,*σ*^2=44



*β*^0=26.5,*β*^1=0.15,*σ*^2=44

**1 point**

7. The standard errors (*se*) of ordinary least squares estimates  
of *β*0 and  *β*1 are obtained. Which of the  
following represents the correct results?



*se*(*β*0^)=0.15,*se*(*β*^1)=26.5



*se*(*β*0^)=176,*se*(*β*^1)=0.44



*se*(*β*0^)=0.44,*se*(*β*^1)=176



*se*(*β*0^)=26.5,*se*(*β*^1)=0.15

**1 point**

8.Which of the following test statistic is used to test *H*0:*β*0=0 in the model *y*=*β*0+*β*1*x*+*ϵ*,*ϵ*∼*N*(0,*σ*2)  for a sample of size 60 and *σ*2 is unknown?



*Z* - statistic.



*t* - statistic.



Anyone of *Z* or *t* - statistic.



*χ*2 - statistic.

**1 point**

9. Consider the simple linear regression model *yi*=*β*0+*β*1*xi*+*ϵi*,*i*=1,2,…20 where *ϵi*'s are identically and independently distributed following  *N*(0,*σ*2) where *σ*2 is unknown. The  
following outcome for testing *H*0:*β*0=6 is obtained at 5% level of significance. The value of *t*−statistic is 2.78 and  *p*-value is 0.08. Which of the following decision is correct?



Reject *H*0.



Accept *H*0.

 No decision can be concluded.

 Data is inadequate.

**1 point**

10. In the simple linear regression model, *yi*=*βxi*+*ϵi*,*ϵi*∼*N*(0,*σ*2),*i*=1,2,…,*n*, an unbiased estimator of *σ*2 is



1(*n*−2)∑*ni*=1*x*2*i*[∑*ni*=1*x*2*i*∑*ni*=1*y*2*i*−(∑*ni*=1*xiyi*)2]



1(*n*−1)∑*ni*=1*x*2*i*[∑*ni*=1*x*2*i*∑*ni*=1*y*2*i*−(∑*ni*=1*xiyi*)2]



1*n*∑*ni*=1*x*2*i*[∑*ni*=1*x*2*i*∑*ni*=1*y*2*i*−(∑*ni*=1*xiyi*)2]



1(*n*+1))∑*ni*=1*x*2*i*[∑*ni*=1*x*2*i*∑*ni*=1*y*2*i*−(∑*ni*=1*xiyi*)2]