Chapter 11 Problems

11.2

$\widehat{Var}(b_2+b_3+b_4+b_5)=$¿ (0.57141+0.31377+0.006351+0.17265) + 2(-0.058721 – 0.007871 – 0.010922 + 0.004369 – 0.10199 – 0.055405)
= 0.549912 + 2(0.23054)=0.549912-0.46108=0.088832

11.3

a) Model becomes $y=\beta_1(x_1+x_2+x_3)+e$ Let $z=(x_1+x_2+x_3)$

$\hat{\beta}_1=\sum zy/\sum z^2=24/26=12/13$

b)

SSER = 11.85

c) $F_6^2=\frac{(SSER-SSEUR)/2}{\hat{\sigma}^2}=\frac{(11.85-8.84)/2}{1.47}=1.505/1.47=1.024$ fail to reject Ho.

d)

Standard error unrestricted b1 = 0.54
Standard error restricted b1 = 0.24
The restriction reduced the variability of the estimate.

11.4

a)

i) $y_t=\beta_1+\beta_2 x_{t2}+\beta_4 x_{t4}+e_t$

ii) $y_t-x_{t2}=\beta_1+\beta_3(x_{t3}-x_{t2})+\beta_4(x_{t4}-x_{t2})+e_t$

iii) $y_t=\beta_1(1+x_{t4})+\beta_3(x_{t4}+3x_{t2})+e_t$

iv) $y_t+2x_{t3}-6x_{t4}=\beta_2(3+x_{t2}+x_{t3})+e_t$

b)

i) $R=(0\,0\,1\,0), r=(0)$

ii) R = (0 1 1 1), r = (1)

iii) $R=\begin{bmatrix}1 & 0 & 0 & -1\\ 0 & 1 & -3 & 0\end{bmatrix}, r=\begin{bmatrix}0\\0\end{bmatrix}$

iv) $R=\begin{bmatrix}0 & 1 & -1 & 0\\ 0 & 0 & 0 & 1\\ 1 & -3 & 0 & 0\end{bmatrix}, r=\begin{bmatrix}2\\6\\0\end{bmatrix}$

11.9

SHAZAM OUTPUT

```
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Hello/Bonjour/Aloha/Howdy/G Day/Kia Ora/Konnichiwa/Buenos Dias/Nee Hau/Ciao
Welcome to SHAZAM - Version 10.0 -  JUL 2004 SYSTEM=LINUX    PAR=   781
|_ sample 1 25
|_ read y m i
   3 VARIABLES AND       25 OBSERVATIONS STARTING AT OBS       1

|_ sample 1 24

|_ ols m y i

REQUIRED MEMORY IS PAR=       2 CURRENT PAR=     781
 OLS ESTIMATION
       24 OBSERVATIONS     DEPENDENT VARIABLE= M
...NOTE..SAMPLE RANGE SET TO:      1,     24

 R-SQUARE =   0.9953     R-SQUARE ADJUSTED =   0.9949
VARIANCE OF THE ESTIMATE-SIGMA**2 =   66.123
STANDARD ERROR OF THE ESTIMATE-SIGMA =   8.1316
SUM OF SQUARED ERRORS-SSE=   1388.6
MEAN OF DEPENDENT VARIABLE =   269.71
LOG OF THE LIKELIHOOD FUNCTION = -82.7504


VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR      21 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
Y         0.13594     0.3959E-02   34.33     0.000 0.991     1.0554     0.7276
I         -2.5771      1.189      -2.167     0.042-0.427    -0.0666    -0.0605
CONSTANT   89.777      4.104       21.88     0.000 0.979     0.0000     0.3329

|_ fc / list beg=25 end=25

REQUIRED MEMORY IS PAR=       1 CURRENT PAR=     781
DEPENDENT VARIABLE = M                1 OBSERVATIONS
REGRESSION COEFFICIENTS
  0.135940256320      -2.57707198602       89.7773541337
```

```
    OBS.   OBSERVED     PREDICTED   CALCULATED  STD. ERROR
     NO.    VALUE        VALUE       RESIDUAL
     25   600.00       471.83       128.17        8.881               I    *
SUM OF ABSOLUTE ERRORS=   128.17
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.0000
MEAN ERROR =   128.17
SUM-SQUARED ERRORS =   16428.
MEAN SQUARE ERROR =   16428.
MEAN ABSOLUTE ERROR=   128.17
ROOT MEAN SQUARE ERROR =   128.17
MEAN SQUARED PERCENTAGE ERROR=   456.34
THEIL INEQUALITY COEFFICIENT U = 0.000
  DECOMPOSITION
     PROPORTION DUE TO BIAS =   1.0000
     PROPORTION DUE TO VARIANCE =  0.24740E-15
     PROPORTION DUE TO COVARIANCE = -0.24741E-15
  DECOMPOSITION
     PROPORTION DUE TO BIAS =   1.0000
     PROPORTION DUE TO REGRESSION =  0.24740E-15
     PROPORTION DUE TO DISTURBANCE = -0.24741E-15
|_ end
|_ STOP
```

Note there is 21.36% error in the prediction. That is too big for what we are interested in forecasting.

11.16

a) Y contains ln(L/K)
X contains a column of 1s, a column of ln(W/R) and a column of ln(y)

b) Expect coefficient of Ln(W/R) to be negative and coefficient of ln(y) to be any sign as the ratio may increase as Y expands, decrease as Y expands or not change at all if we have a homothetic production function.

SHAZAM OUTPUT

```
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**************************************************************************
Hello/Bonjour/Aloha/Howdy/G Day/Kia Ora/Konnichiwa/Buenos Dias/Nee Hau/Ciao
Welcome to SHAZAM - Version 10.0 -  JUL 2004 SYSTEM=LINUX    PAR=   781
|_ sample 1 32
```

```
 |_ read year Y R K W L
    6 VARIABLES AND       32 OBSERVATIONS STARTING AT OBS       1

 |_ genr lnLK = log(L/K)
 |_ genr lnWR = log(W/R)
 |_ genr lny = log(y)

 |_ ols lnLK lnWR lny

 REQUIRED MEMORY IS PAR=       4 CURRENT PAR=     781
  OLS ESTIMATION
        32 OBSERVATIONS     DEPENDENT VARIABLE= LNLK
 ...NOTE..SAMPLE RANGE SET TO:      1,     32

  R-SQUARE =   0.9300     R-SQUARE ADJUSTED =   0.9252
 VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.25117E-01
 STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.15848
 SUM OF SQUARED ERRORS-SSE=  0.72838
 MEAN OF DEPENDENT VARIABLE =  0.38301
 LOG OF THE LIKELIHOOD FUNCTION =  15.1166


 VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
   NAME    COEFFICIENT   ERROR      29 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
 LNWR     -0.58018     0.7285E-01  -7.964     0.000-0.828    -0.6404    -0.8251
 LNY      -0.23792     0.5109E-01  -4.657     0.000-0.654    -0.3744    -1.2236
 CONSTANT   1.1677     0.7852E-01   14.87     0.000 0.940     0.0000     3.0487
```

C) Labor-capital ratio is negatively related to the relative cost of labor to the cost of capital. As output expands, the airline industry is able to decrease the ratio of labor to capital.

D) The standard errors are in the table above.

```
 |_ confid lny
 USING 95% AND 90% CONFIDENCE INTERVALS

 CONFIDENCE INTERVALS BASED ON T-DISTRIBUTION WITH  29 D.F.
      - T CRITICAL VALUES =   2.045 AND   1.699
 NAME   LOWER 2.5%   LOWER 5%   COEFFICIENT   UPPER 5%   UPPER 2.5%   STD. ERROR
 LNY      -0.3424     -0.3247     -0.23792     -0.1511     -0.1334         0.051
```

E) No because the entire confidence interval is in the negative range. It does not cover zero which is what is needed for a straight line expansion path.

```
 |_ test
 |_ test lnWR = 1
 |_ test lny = 0
 |_ end
 F STATISTIC =   873.63560     WITH    2 AND   29 D.F.  P-VALUE= 0.00000
 WALD CHI-SQUARE STATISTIC =   1747.2712     WITH    2 D.F.  P-VALUE= 0.00000
 UPPER BOUND ON P-VALUE BY CHEBYCHEV INEQUALITY = 0.00114
 |_ STOP
```

F) We reject Ho. We don't expand labor capital ratio when labor cost go up relative to capital and we can reject the straight line expansion path.
G) Rsq = 0.93 93% of variation is explained by the two variables.