Rubax, a US manufacturer of athletic shoes, estimates the following linear trend model for shoe sales:

$$Qt = a + bt + c1D1 + c2D2 + c3D3$$

Where

Qt = sales of athletic shoes in the tth quarter
T + 1, 2,….., 28[j2001(I), 2001(II)….,2007{IV}
D1 = 1 if t is quarter I (winter); 0 otherwise
D2 = 1 if t is quarter II (spring); 0 otherwise
D3 = 1 if t is quarter III (summer); 0 otherwise

The regression analysis produces the following results:

Dependent Variable: QT	R-Square	F-Ration	P-Value on F
Observations: 28	0.9651	159.01	0.0001

Variable	Parameter Estimate	Standard Error	T-Ratio	P-Value
Intercept	184500	10310	17.90	0.0001
T	2100	340	6.18	0.0001
D1	3280	1510	2.17	0.0404
D2	6250	2220	2.82	0.0098
D3	7010	1580	4.44	0.0002

a.   Is there sufficient statistical evidence of an upward trend in shoe sales?

Ans. Yes , there sufficient statistical evidence of an upward trend in shoe sales as all parameter estimates are positive and so Qt increases as t increases.

b.   Do these data indicate a statistically significant seasonal pattern of sales for Rubax shoes? If so, what is the seasonal pattern exhibited by the data?

Ans.
Yes , these data indicate a statistically significant seasonal pattern of sales for Rubax shoes as all parameter estimates for seasonal variables D1,D2 and D3 are statistically significant at 5%.
Seasonal pattern exhibited by the data is that the sales increases from Quarter 1 to quarter 3 and then decreases in Quarter 4.

c.   Using the estimated forecast equation, forecast slates of Rubax shoes for 2008(III) and 2009 (II).

Ans.

The estimated regression is
$Qt = 184500 + 2100t + 3280D1 + 6250D2 + 7010D3$

For 2008(III) putting t=31 ,D1=D2=0 and D3=1 we get
$Qt = 184500 + 2100*31 + 7010*1 = 256610$

For 2009(II) putting t=34 ,D1=D3=0 and D2=1 we get
$Qt = 184500 + 2100*34 + 6250*1 = 262150$

d.   How might you improve this forecast equation?

Ans. We can improve this model by using more years data and also by including some more independent variables in the model.