Trabajo regresión lineal múltiple

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Asignatura

Analisis de Regresion

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Se realizará una análisis de regresión lineal múltiple(RLM):

$$y_i = \beta_0 + \beta_{1i}x_1 + \beta_2 x_{2i} + \cdots + \beta_k x_{ki} + \varepsilon_i,\ \varepsilon \overset{iid}{\sim} N(0, \sigma^2)$$

Con la intencion de validar si dicho modelo es adecuado para

1. Base de datos

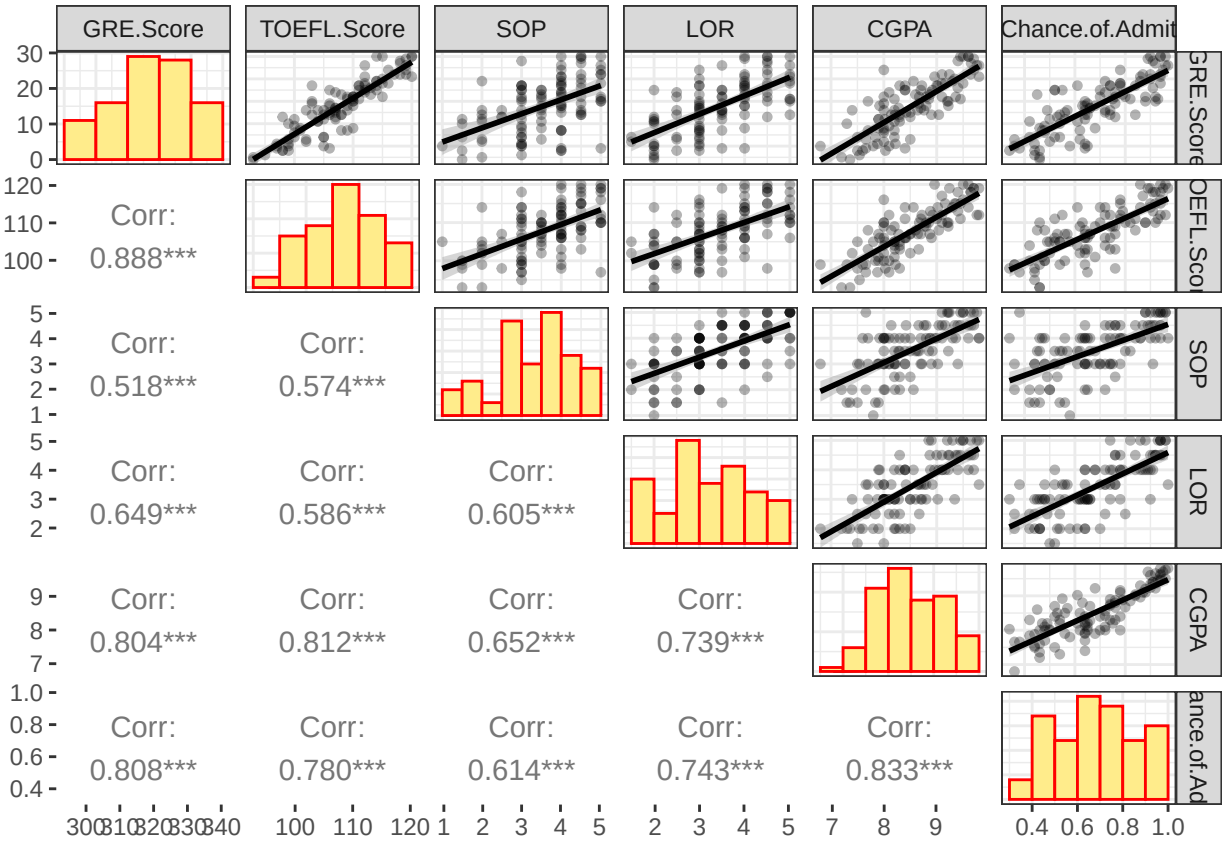
1.1. Breve Descripción de los Datos

La base de datos corresponden al puntaje de admision de estudiantes de posgrados pertenecientes a universidades de la India. Cuenta con 400 observaciones y 9 variables. De las cuales vamos a analizar un total de 100 estudiantes y 6 variables de interes.

Variables	**Descripción**
Chance.of.Admit:	Posibilidad de ser admitido.
GRE Score:	Examen que tiene como finalidad medir la capacidad de razonamiento verbal, razonamiento cuantitativo, y habilidades para pensar y escribir de forma analítica.
TOEFL Score:	Prueba estandarizada de dominio del idioma inglés.
SOP:	Ensayo de admisión o solicitud de postgrado.
LOR:	Carta de recomendación.
CGPA:	Promedio general acumulado en el pregrado.

2. Análisis descriptivo

2.1. Grafico de dispersión con Matriz de Correlaciones



Cuadro 3: Tabla ANOVA para el modelo

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
FO(GRE.Score, TOEFL.Score, SOP, LOR, CGPA)	5	2.3674478	0.4734896	65.99381	0
Residuals	94	0.6744272	0.0071748	NA	NA

3. Modelo Ajustado de Regresion Lineal Multiple(MRLM)

3.1. Tabla de parámetros ajustados

Cuadro 2: Resumen de los coeficientes

	Estimación	Error estándar	T_0	Valor P
β_0	-1.7723	0.3007	-5.8939	0.0000
β_1	0.0041	0.0017	2.4400	0.0166
β_2	0.0029	0.0031	0.9417	0.3488
β_3	0.0120	0.0119	1.0098	0.3152
β_4	0.0428	0.0143	3.0023	0.0034
β_5	0.0757	0.0263	2.8756	0.0050

3.2. Ecuación Ajustada

Con base en la tabla de parámetros estimados se obtiene la ecuación de regresión ajustada:

$$\widehat{Y}_i = \widehat{\beta}_0 + \widehat{\beta}_1 X_{i1} + \widehat{\beta}_2 X_{i2} + \cdots + \widehat{\beta}_5 X_{i5}, \quad i = 1, 2, \ldots, 100$$

$$\widehat{Y}_i = -1.7723 + 0.0041 X_{i1} + 0.0029 X_{i2} - 0.0120 X_{i3} + 0.0428 X_{i4} + 0.0757 X_{i5}, \quad i = 1, 2, \ldots, 100$$

3.3. Tabla Anova

3.4. Prueba de significancia del Modelo

$$\begin{cases} H_0 : \beta_1 = \cdots = \beta_5 = 0 \\ H_1 : \text{Al menos un } \beta_j \neq 0 \end{cases}$$

3.5. Coeficiente de determinación

$$R^2 = \frac{\text{SSR}}{\text{SST}} = 1 - \frac{\text{SSE}}{\text{SST}}$$

$$R^2 = \frac{2.3674478}{2.3674478 + 0.6744272} = 0.7782857$$

4. Coeficientes de regresión estandarizados

```
## Coeficientes estimados, sus I.C, Vifs y Coeficientes estimados estandarizados
```

	Estimación	Limites.2.5..	Limites.97.5..	Vif	Coef.Std
(Intercept)	-1.7722651	-2.3693009	-1.1752294	0.000000	0.0000000
GRE.Score	0.0041091	0.0007654	0.0074528	5.691210	0.0495542
TOEFL.Score	0.0029116	-0.0032277	0.0090508	5.858052	0.0194023
SOP	0.0120402	-0.0116343	0.0357148	1.928844	0.0119389
LOR	0.0428307	0.0145058	0.0711556	2.519579	0.0405706
CGPA	0.0757081	0.0234330	0.1279833	4.615227	0.0525903

5. Significancia individual de los parámetros del modelo

5.1. Tabla de la significancia individual de los parámetros

Cuadro 4: Resumen de los coeficientes

	Estimación	Error estándar	T_0	Valor P
β_0	-1.7723	0.3007	-5.8939	0.0000
β_1	0.0041	0.0017	2.4400	0.0166
β_2	0.0029	0.0031	0.9417	0.3488
β_3	0.0120	0.0119	1.0098	0.3152
β_4	0.0428	0.0143	3.0023	0.0034
β_5	0.0757	0.0263	2.8756	0.0050

5.2. Pruebas de hipotesis

$$\begin{cases} H_0 : \beta_1 = 0 \\ H_1 : \beta_1 \neq 0 \end{cases}$$

$$\begin{cases} H_0 : \beta_2 = 0 \\ H_1 : \beta_2 \neq 0 \end{cases}$$

$$\begin{cases} H_0 : \beta_3 = 0 \\ H_1 : \beta_3 \neq 0 \end{cases}$$

$$\begin{cases} H_0 : \beta_4 = 0 \\ H_1 : \beta_4 \neq 0 \end{cases}$$

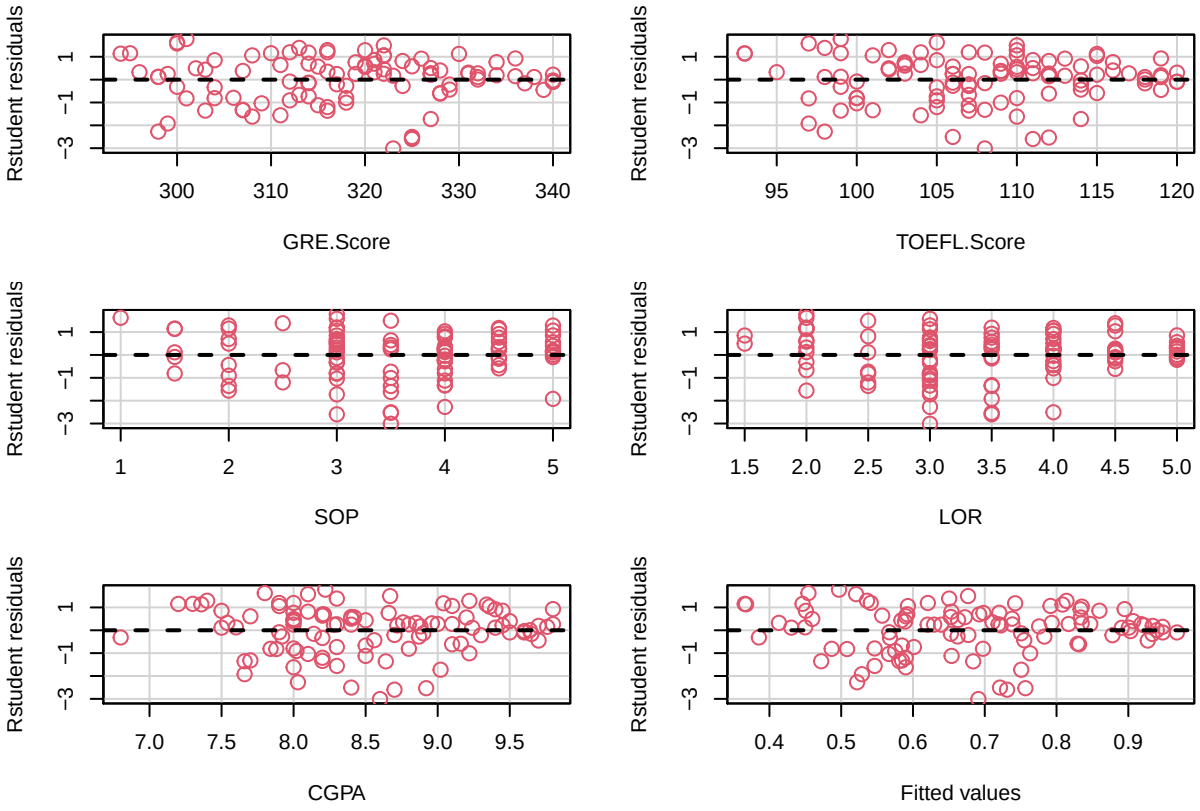
$$\begin{cases} H_0 : \beta_5 = 0 \\ H_1 : \beta_5 \neq 0 \end{cases}$$

6. Ejercicio6

7. Ejercicio7

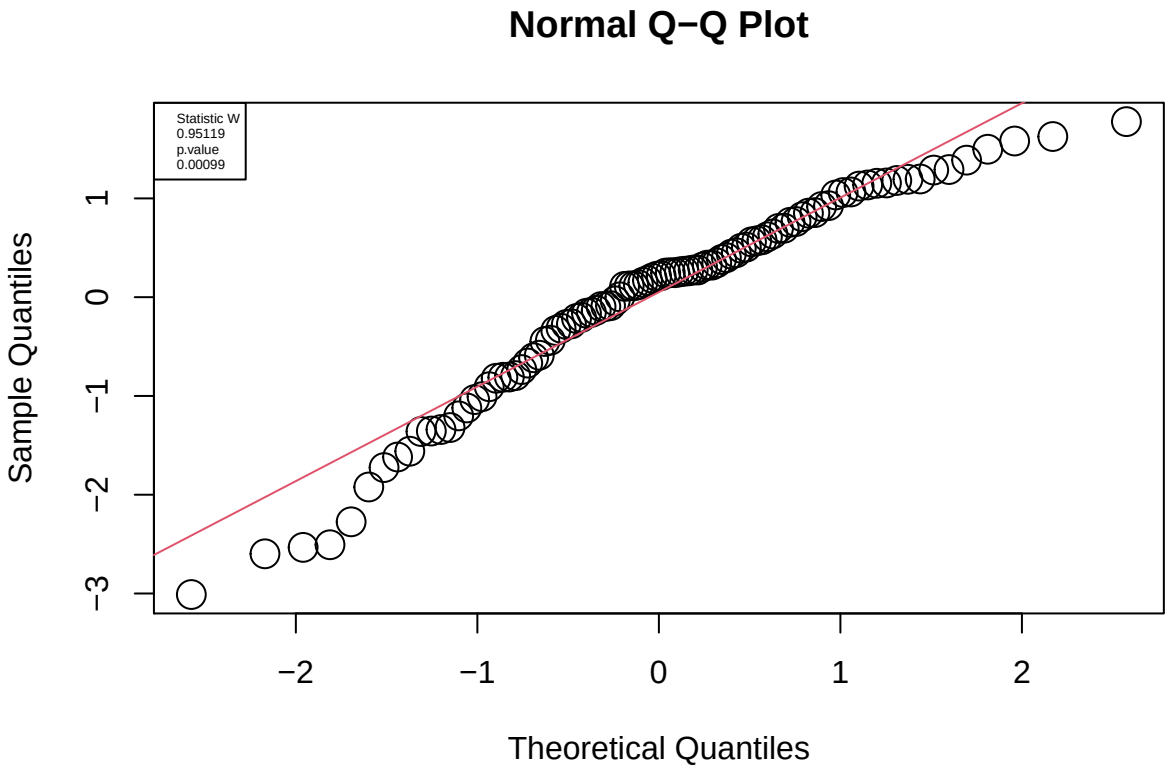
8. Residuales estudentizados vs. Valores ajustados

8.1. Gráfico de los residuales estudentizados vs. Valores ajustados



9. Prueba de normalidad para los residuales estudentizados

9.1. Gráfico q-norm residuales estudentizados



10. Diagnostico sobre la presencia de observaciones atipicas, de balanceo y/o influenciales

```
## Influence measures of
##   lm(formula = data$Chance.of.Admit ~ ., data = data) :
##
##        dfb.1_  dfb.GRE.  dfb.TOEF   dfb.SOP   dfb.LOR  dfb.CGPA     dffit cov.r
## 1    0.015973 -0.005271 -0.000885  1.31e-03  0.002340 -8.90e-03 -0.032882 1.108
## 2    0.010661 -0.024639  0.034326 -4.49e-03 -0.022518 -1.79e-03 -0.056504 1.105
## 3   -0.024402  0.089374 -0.049594 -2.27e-02  0.092619 -1.18e-01  0.213646 1.005
## 4   -0.146856  0.086964 -0.039096  3.90e-02 -0.271542  1.05e-01  0.319520 0.966
## 5   -0.021116  0.031828 -0.043631 -1.08e-01  0.005196  3.90e-02  0.150002 1.081
## 6   -0.141724  0.061166 -0.037386  9.77e-02 -0.252847  1.41e-01  0.313284 1.060
```

```
## 7   -0.000457  0.008477  0.050364 -5.48e-02  0.107665 -1.05e-01  0.157786 1.087
## 8    0.114484 -0.026751 -0.010652 -4.42e-02  0.206779 -1.07e-01  0.260972 1.052
## 9    0.030175 -0.047175  0.017687 -5.13e-02 -0.085702  7.61e-02  0.149108 1.145
## 10   0.331213 -0.336547  0.264130 -7.77e-02  0.323458 -1.01e-01 -0.519954 0.629
## 11   0.274899 -0.435231  0.332579 -3.85e-02 -0.156837  2.08e-01 -0.582385 0.759
## 12  -0.008881  0.010344 -0.008548 -3.61e-03  0.022573 -3.28e-03  0.044150 1.088
## 13   0.020921 -0.015918  0.011308  1.51e-02 -0.044372 -2.35e-03 -0.096725 1.067
## 14   0.066481 -0.074405  0.087449  3.07e-02  0.015934 -4.92e-02  0.114265 1.151
## 15  -0.020685  0.026567 -0.041123  5.93e-02 -0.128505  4.48e-02  0.151365 1.097
## 16   0.025571 -0.034946  0.043923 -4.62e-02  0.097394 -3.15e-02 -0.128213 1.062
## 17   0.004144 -0.004799  0.013229 -1.55e-02  0.024002 -1.68e-02 -0.035468 1.095
## 18  -0.019400  0.032642 -0.014545  3.59e-02 -0.011729 -3.35e-02  0.057146 1.119
## 19  -0.004595  0.032455 -0.017848 -3.99e-02  0.089071 -5.98e-02 -0.139737 1.053
## 20   0.064999 -0.057361 -0.007345  3.40e-03 -0.017908  6.56e-02  0.103144 1.112
## 21  -0.013257 -0.014360  0.095139  2.85e-02 -0.145174 -5.83e-02  0.260675 1.019
## 22  -0.077504  0.023602  0.061565 -1.24e-02 -0.115764 -1.39e-02  0.179340 1.143
## 23   0.023989 -0.039710  0.031889  1.38e-02  0.040631  5.31e-03  0.092445 1.112
## 24  -0.006252 -0.008693  0.012712  8.08e-03 -0.003257  1.02e-02  0.042630 1.116
## 25  -0.124820  0.008542  0.016489 -5.15e-02 -0.163031  1.71e-01  0.282553 1.103
## 26   0.011731 -0.004207 -0.004059  8.36e-04  0.000665 -3.30e-04 -0.021018 1.117
## 27  -0.011184  0.014573 -0.017092  3.03e-02 -0.018890  5.01e-03  0.043659 1.093
## 28   0.015479 -0.011365  0.005564 -1.95e-02  0.008679  3.29e-04  0.030514 1.140
## 29   0.089603  0.028826 -0.115292 -2.49e-02 -0.022679 -3.50e-03  0.295331 1.043
## 30  -0.113045  0.181667 -0.099887 -1.10e-01 -0.047718 -9.79e-02  0.340113 1.063
## 31   0.198657 -0.079822 -0.166260 -1.05e-02  0.006879  1.78e-01  0.375503 0.961
## 32  -0.051491  0.085395 -0.076129  3.43e-02  0.005311 -2.82e-02  0.100998 1.219
## 33  -0.013715  0.003431  0.007064 -2.34e-02  0.008446  2.70e-03  0.033081 1.155
## 34   0.009161 -0.008044  0.007108  4.24e-04  0.004706 -4.90e-03 -0.011655 1.171
## 35  -0.011816  0.006516 -0.031057 -2.48e-02  0.014565  4.89e-02  0.076932 1.150
## 36   0.061927 -0.049089  0.000340  4.18e-02  0.074195  1.17e-02  0.140805 1.111
## 37   0.088374 -0.089525  0.058479 -1.43e-03  0.046613 -6.19e-04  0.099095 1.232
## 38   0.289491 -0.429309  0.423333 -4.91e-01  0.031771  9.97e-02  0.694648 1.066
## 39   0.052161 -0.066482  0.122254  5.63e-02 -0.113521 -7.53e-02  0.251884 1.107
## 40  -0.255487  0.232718 -0.326200 -1.17e-01 -0.215678  3.35e-01 -0.477976 1.079
## 41  -0.277706  0.346912 -0.434158 -4.85e-03 -0.106308  2.07e-01 -0.497296 0.988
## 42   0.084137 -0.082768  0.058895  7.84e-02  0.108972 -4.59e-02 -0.218716 1.004
## 43   0.013603  0.026640 -0.011987  6.10e-02  0.123882 -1.05e-01 -0.180700 1.112
## 44  -0.018278  0.003128  0.021003  1.30e-02 -0.003311 -1.48e-02  0.051596 1.099
## 45  -0.014287 -0.021290 -0.016245  3.08e-02 -0.048117  1.02e-01  0.167914 1.044
## 46   0.007463  0.004356 -0.059844  1.46e-01 -0.041006  5.42e-02  0.213723 1.031
## 47  -0.002662  0.008571 -0.008722  1.63e-02 -0.031293 -9.99e-04 -0.046295 1.112
## 48   0.068405 -0.029890  0.004641 -5.31e-03  0.049188 -3.87e-02 -0.108445 1.114
## 49   0.029021 -0.027530  0.021785 -3.67e-02  0.075908 -1.40e-02  0.086286 1.134
## 50  -0.037297  0.035597  0.020621 -4.45e-02  0.057919 -6.79e-02  0.115376 1.103
## 51   0.026081  0.140218 -0.290453 -1.84e-01  0.285638  3.97e-02  0.516553 1.074
```

```
## 52   0.000729 -0.005882  0.007035  1.86e-02 -0.012222  1.43e-03 -0.026790 1.169
## 53  -0.160106  0.142206  0.082089  9.95e-02 -0.034187 -2.55e-01  0.327963 1.215
## 54  -0.093182  0.076644  0.053409  1.11e-01 -0.101269 -1.33e-01  0.237963 1.109
## 55  -0.018067  0.018214  0.043723 -1.96e-02  0.043928 -8.83e-02  0.109819 1.115
## 56  -0.087691  0.138606 -0.077528  3.09e-02  0.000688 -1.02e-01  0.177323 1.129
## 57  -0.118490  0.211814 -0.059031 -1.04e-01  0.122542 -2.61e-01  0.407980 1.054
## 58   0.014636 -0.005705 -0.002282  2.59e-02 -0.015036 -3.71e-03  0.037494 1.159
## 59  -0.022431 -0.005830 -0.021343 -4.07e-02 -0.005099  8.32e-02 -0.107246 1.183
## 60   0.047541  0.003836  0.048042  2.08e-01  0.240416 -2.42e-01 -0.420743 0.980
## 61  -0.012294 -0.055765  0.124552 -2.84e-03  0.018216 -4.29e-02 -0.182073 1.026
## 62  -0.081901 -0.008995  0.126685 -1.66e-01  0.069436 -4.59e-02 -0.272327 0.990
## 63  -0.057222  0.062205 -0.042738  2.05e-02 -0.012725 -1.06e-02 -0.073869 1.109
## 64  -0.012667  0.005902  0.017642 -9.38e-02  0.090919 -2.98e-02 -0.167268 1.006
## 65   0.175776 -0.087560 -0.048097  2.40e-01  0.000367 -1.04e-02 -0.407973 0.718
## 66   0.129238 -0.019008 -0.046649  1.14e-01  0.100351 -1.12e-01 -0.353366 0.728
## 67   0.155795  0.000649 -0.086083  1.89e-01  0.195107 -1.67e-01 -0.403104 0.931
## 68  -0.039722  0.037537  0.014270  2.48e-02 -0.001391 -6.70e-02 -0.157145 0.960
## 69  -0.064875  0.096831  0.005195  9.56e-02 -0.019210 -1.69e-01 -0.224471 1.049
## 70   0.014708  0.012221 -0.030933 -2.56e-02  0.009103 -2.35e-03 -0.093566 1.069
## 71   0.000075 -0.000283  0.000299  8.24e-05  0.000287  6.69e-05  0.000828 1.122
## 72  -0.020166  0.023640 -0.032527  1.13e-02 -0.001191  1.77e-02  0.046797 1.167
## 73   0.094859 -0.092866 -0.001896  4.41e-02  0.088543  7.29e-02  0.222919 1.086
## 74   0.137421 -0.136186  0.004666  6.64e-02  0.017041  1.22e-01  0.252313 1.020
## 75  -0.021091  0.018772 -0.003615  2.49e-02 -0.034008 -8.94e-03 -0.045077 1.188
## 76   0.028506  0.001118 -0.061666  1.17e-01 -0.066943  4.16e-02 -0.151314 1.180
## 77  -0.025741  0.014689  0.001279 -1.50e-02 -0.019196  5.39e-03  0.041335 1.104
## 78   0.127688 -0.081097 -0.172463  3.78e-02 -0.310500  3.46e-01  0.509345 0.944
## 79   0.030019 -0.000635 -0.033715  2.78e-02 -0.030049  1.39e-02  0.082230 1.127
## 80   0.111463 -0.020275 -0.100074 -1.26e-01 -0.016872  7.94e-02  0.320202 1.060
## 81  -0.026938  0.032904 -0.054656  1.47e-01 -0.053523  1.93e-02 -0.188881 1.055
## 82   0.008637 -0.003825 -0.005465 -4.43e-03 -0.006818  7.62e-03 -0.023089 1.130
## 83   0.098485 -0.084766 -0.026844  1.24e-01  0.054883  7.97e-02  0.281096 1.005
## 84   0.119641 -0.198210  0.158992 -9.28e-02  0.100847  7.59e-02  0.269832 1.063
## 85  -0.042854  0.040413 -0.028288  8.92e-03 -0.006532  3.63e-03  0.055436 1.132
## 86  -0.060438  0.124849 -0.180635  1.27e-01 -0.070342  4.58e-02  0.218606 1.113
## 87   0.016725  0.009047 -0.022808  8.29e-02 -0.008040 -2.18e-02  0.103772 1.079
## 88  -0.006190  0.008571 -0.001700  8.79e-03 -0.010627 -8.03e-03  0.030202 1.078
## 89  -0.011000  0.006249 -0.012024 -2.30e-02 -0.006780  2.29e-02 -0.035760 1.122
## 90   0.020258 -0.021429  0.007697  3.48e-02 -0.013044  1.02e-02  0.059259 1.089
## 91  -0.001317 -0.019541 -0.000741 -2.70e-02 -0.038467  6.19e-02 -0.074524 1.142
## 92  -0.342180  0.033477  0.170196 -5.82e-01 -0.145039  2.59e-01 -0.776410 0.982
## 93  -0.396022  0.201905  0.139874 -2.95e-01  0.018618 -1.16e-01 -0.605135 0.825
## 94  -0.086032  0.013961  0.078864 -1.12e-02 -0.022405 -3.13e-02 -0.172054 1.066
## 95  -0.084618  0.025508  0.023474  1.32e-01 -0.021645 -7.56e-03 -0.267881 0.985
## 96  -0.050721  0.039164 -0.001385  1.53e-01 -0.013264 -5.24e-02 -0.203312 1.086
```

```
## 97  -0.049015  0.000753  0.053381  2.65e-04 -0.008551 -1.66e-02 -0.126933 1.050
## 98  -0.002882 -0.028471  0.071999 -1.24e-02  0.017486 -3.54e-02  0.087095 1.146
## 99  -0.000438 -0.006485  0.015672  7.69e-03  0.005817 -9.51e-03  0.026547 1.128
## 100  0.004924 -0.011130  0.015630 -1.58e-03  0.008346 -4.14e-03  0.025468 1.088
##       cook.d    hat inf
## 1   1.82e-04 0.0393
## 2   5.37e-04 0.0401
## 3   7.57e-03 0.0310
## 4   1.68e-02 0.0435
## 5   3.77e-03 0.0441
## 6   1.63e-02 0.0720
## 7   4.17e-03 0.0489
## 8   1.13e-02 0.0572
## 9   3.74e-03 0.0831
## 10  4.15e-02 0.0290   *
## 11  5.35e-02 0.0512   *
## 12  3.28e-04 0.0251
## 13  1.57e-03 0.0243
## 14  2.20e-03 0.0823
## 15  3.84e-03 0.0530
## 16  2.75e-03 0.0297
## 17  2.12e-04 0.0292
## 18  5.50e-04 0.0507
## 19  3.27e-03 0.0290
## 20  1.79e-03 0.0530
## 21  1.13e-02 0.0453
## 22  5.40e-03 0.0871
## 23  1.44e-03 0.0507
## 24  3.06e-04 0.0465
## 25  1.33e-02 0.0851
## 26  7.44e-05 0.0463
## 27  3.21e-04 0.0283
## 28  1.57e-04 0.0657
## 29  1.45e-02 0.0615
## 30  1.92e-02 0.0796
## 31  2.31e-02 0.0534
## 32  1.72e-03 0.1291   *
## 33  1.84e-04 0.0778
## 34  2.29e-05 0.0892
## 35  9.96e-04 0.0769
## 36  3.33e-03 0.0594
## 37  1.65e-03 0.1379   *
## 38  7.90e-02 0.1543
## 39  1.06e-02 0.0806
## 40  3.78e-02 0.1160
```

```
## 41  4.05e-02 0.0863
## 42  7.94e-03 0.0321
## 43  5.47e-03 0.0684
## 44  4.48e-04 0.0342
## 45  4.71e-03 0.0324
## 46  7.60e-03 0.0387
## 47  3.61e-04 0.0441
## 48  1.98e-03 0.0553
## 49  1.25e-03 0.0662
## 50  2.24e-03 0.0493
## 51  4.40e-02 0.1218
## 52  1.21e-04 0.0885
## 53  1.80e-02 0.1550   *
## 54  9.47e-03 0.0786
## 55  2.03e-03 0.0563
## 56  5.28e-03 0.0776
## 57  2.75e-02 0.0907
## 58  2.37e-04 0.0810
## 59  1.94e-03 0.1044
## 60  2.91e-02 0.0678
## 61  5.52e-03 0.0299
## 62  1.23e-02 0.0397
## 63  9.18e-04 0.0458
## 64  4.65e-03 0.0218
## 65  2.61e-02 0.0241   *
## 66  1.97e-02 0.0191   *
## 67  2.65e-02 0.0518
## 68  4.08e-03 0.0132
## 69  8.40e-03 0.0473
## 70  1.47e-03 0.0247
## 71  1.15e-07 0.0499
## 72  3.69e-04 0.0880
## 73  8.31e-03 0.0635
## 74  1.06e-02 0.0436
## 75  3.42e-04 0.1035
## 76  3.85e-03 0.1076
## 77  2.88e-04 0.0367
## 78  4.23e-02 0.0759
## 79  1.14e-03 0.0604
## 80  1.70e-02 0.0736
## 81  5.96e-03 0.0416
## 82  8.98e-05 0.0566
## 83  1.31e-02 0.0455
## 84  1.21e-02 0.0637
## 85  5.17e-04 0.0608
```

```
## 86  8.00e-03 0.0767
## 87  1.81e-03 0.0320
## 88  1.54e-04 0.0150
## 89  2.15e-04 0.0510
## 90  5.91e-04 0.0283
## 91  9.35e-04 0.0708
## 92  9.77e-02 0.1403   *
## 93  5.84e-02 0.0661
## 94  4.95e-03 0.0421
## 95  1.19e-02 0.0376
## 96  6.91e-03 0.0591
## 97  2.70e-03 0.0249
## 98  1.28e-03 0.0755
## 99  1.19e-04 0.0552
## 100 1.09e-04 0.0221
```

```
##     dfb.1_ dfb.GRE. dfb.TOEF dfb.SOP dfb.LOR dfb.CGPA dffit cov.r cook.d   hat
## 1    FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 2    FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 3    FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 4    FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 5    FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 6    FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 7    FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 8    FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 9    FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 10   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE  TRUE  FALSE FALSE
## 11   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE  TRUE  FALSE FALSE
## 12   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 13   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 14   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 15   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 16   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 17   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 18   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 19   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 20   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 21   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 22   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 23   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 24   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 25   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 26   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 27   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 28   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
```

```
## 29   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 30   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 31   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 32   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE  TRUE  FALSE FALSE
## 33   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 34   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 35   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 36   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 37   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE  TRUE  FALSE FALSE
## 38   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 39   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 40   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 41   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 42   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 43   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 44   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 45   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 46   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 47   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 48   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 49   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 50   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 51   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 52   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 53   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE  TRUE  FALSE FALSE
## 54   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 55   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 56   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 57   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 58   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 59   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 60   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 61   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 62   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 63   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 64   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 65   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE  TRUE  FALSE FALSE
## 66   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE  TRUE  FALSE FALSE
## 67   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 68   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 69   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 70   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 71   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 72   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
## 73   FALSE   FALSE   FALSE   FALSE   FALSE   FALSE FALSE FALSE  FALSE FALSE
```

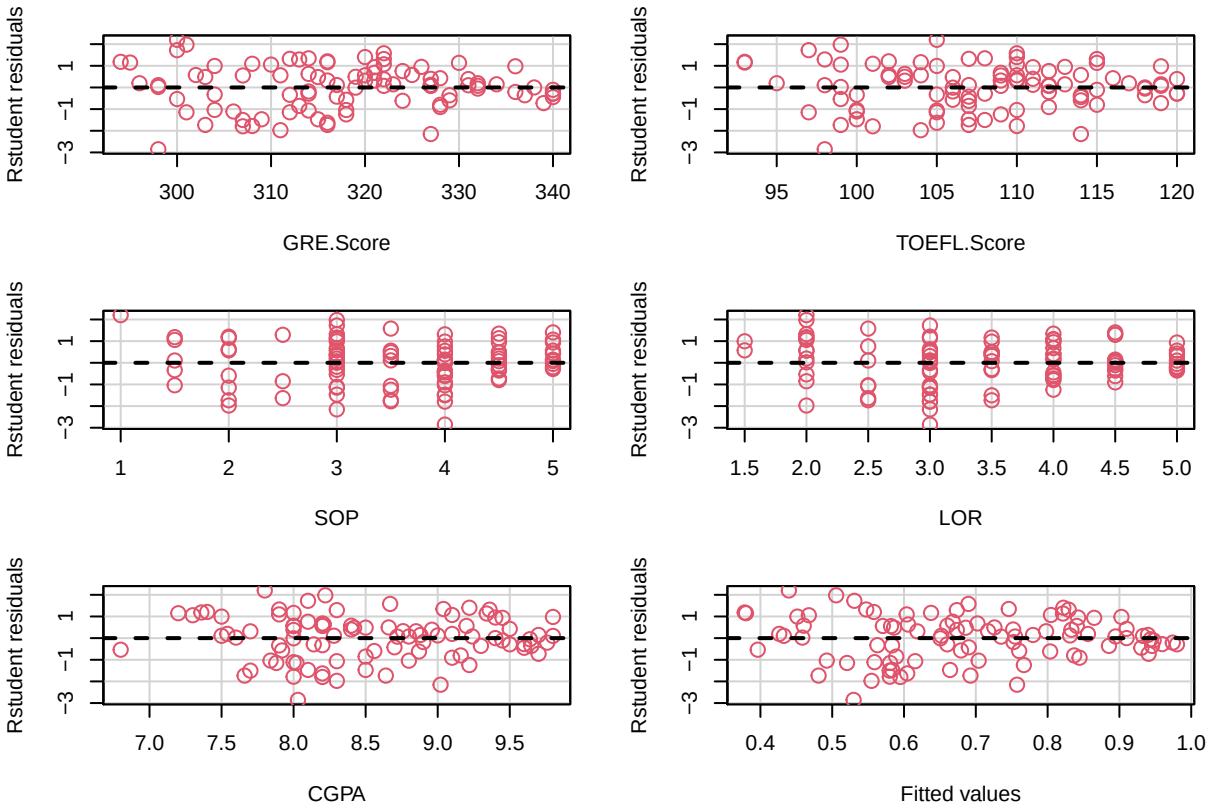
```
## 74   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 75   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 76   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 77   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 78   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 79   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 80   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 81   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 82   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 83   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 84   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 85   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 86   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 87   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 88   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 89   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 90   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 91   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 92   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE  TRUE FALSE  FALSE FALSE
## 93   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 94   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 95   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 96   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 97   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 98   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 99   FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
## 100  FALSE    FALSE    FALSE   FALSE   FALSE    FALSE FALSE FALSE  FALSE FALSE
```

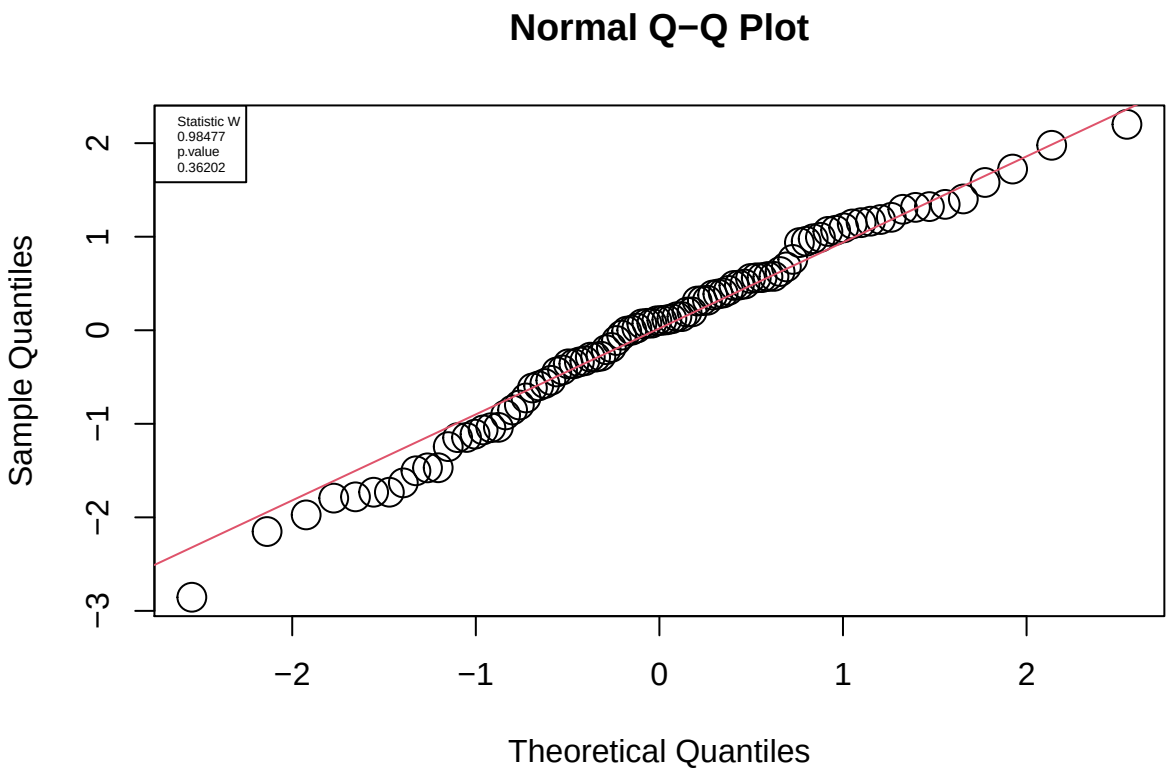
11. Ejercicio11

```
## Analysis of Variance Table
##
## Response: Chance.of.Admit
##                                           Df  Sum Sq Mean Sq F value    Pr(>F)
## FO(GRE.Score, TOEFL.Score, SOP, LOR, CGPA)  5 2.35558 0.47112  90.573 < 2.2e-16
## Residuals                                  86 0.44733 0.00520
##
## FO(GRE.Score, TOEFL.Score, SOP, LOR, CGPA) ***
## Residuals
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##
```

```
## Call:
## lm(formula = Chance.of.Admit ~ ., data = AdmissionPredict_sin_influencias)
##
## Residuals:
##       Min         1Q     Median         3Q        Max
## -0.189817 -0.041224  0.007218  0.045167  0.140378
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept) -1.9798608  0.2948862  -6.714 1.93e-09 ***
## GRE.Score    0.0057790  0.0016903   3.419 0.000963 ***
## TOEFL.Score  0.0002077  0.0028940   0.072 0.942945
## SOP          0.0153807  0.0108883   1.413 0.161385
## LOR          0.0403174  0.0125305   3.218 0.001823 **
## CGPA         0.0728150  0.0241848   3.011 0.003420 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.07212 on 86 degrees of freedom
## Multiple R-squared:  0.8404, Adjusted R-squared:  0.8311
## F-statistic: 90.57 on 5 and 86 DF,  p-value: < 2.2e-16
```





12. Ejercicio 12

```
##                  GRE.Score TOEFL.Score       SOP       LOR      CGPA
## GRE.Score        1.0000000   0.8883788 0.5183744 0.6493865 0.8040898
## TOEFL.Score      0.8883788   1.0000000 0.5739543 0.5855924 0.8117425
## SOP              0.5183744   0.5739543 1.0000000 0.6050348 0.6515129
## LOR              0.6493865   0.5855924 0.6050348 1.0000000 0.7393324
## CGPA             0.8040898   0.8117425 0.6515129 0.7393324 1.0000000
## Chance.of.Admit 0.8078850   0.7800010 0.6136879 0.7428750 0.8326816
##                  Chance.of.Admit
## GRE.Score              0.8078850
## TOEFL.Score            0.7800010
## SOP                    0.6136879
## LOR                    0.7428750
## CGPA                   0.8326816
## Chance.of.Admit        1.0000000

##   GRE.Score TOEFL.Score         SOP         LOR        CGPA
##    5.691210    5.858051    1.928844    2.519579    4.615227
```

```
##                 GRE.Score TOEFL.Score       SOP       LOR      CGPA
## GRE.Score       1.0000000   0.9061621 0.5769656 0.6945897 0.8381136
## TOEFL.Score     0.9061621   1.0000000 0.6269824 0.6213013 0.8266527
## SOP             0.5769656   0.6269824 1.0000000 0.6153549 0.6986389
## LOR             0.6945897   0.6213013 0.6153549 1.0000000 0.7571056
## CGPA            0.8381136   0.8266527 0.6986389 0.7571056 1.0000000
## Chance.of.Admit 0.8595873   0.8077359 0.6683703 0.7845642 0.8677695
##                 Chance.of.Admit
## GRE.Score             0.8595873
## TOEFL.Score           0.8077359
## SOP                   0.6683703
## LOR                   0.7845642
## CGPA                  0.8677695
## Chance.of.Admit       1.0000000
```

```
##   GRE.Score TOEFL.Score         SOP         LOR        CGPA
##    7.229071    6.690216    2.147637    2.640310    5.224542
```

13. Ejericio13

14. Selección del modelo