

Anexo 3

La serie de comandos que fueron necesarios para realizar el modelo de regresión lineal general que sí considera la estacionalidad de las ventas fue:

a) `a<-read.table("tesis.txt", header=TRUE)`

b) `j=13:60`

```
b<-data.frame(Ventas = a$Ventas[j], Ventas12 = a$Ventas[j-12], Clie1 =
a$Clie1[j], Clie2 = a$Clie2[j], Clie3 = a$Clie3[j], Clie4 = a$Clie4[j], Clie5
= a$Clie5[j], Clie6 = a$Clie6[j], Clie7 = a$Clie7[j])
```

```
modell<-
lm(Ventas~Ventas12+Clie1+Clie2+Clie3+Clie4+Clie5+Clie6+Clie7,
data=b)
```

c) `summary(modell)`

Call:

```
lm(formula = Ventas ~ Ventas12 + Clie1 + Clie2 + Clie3 + Clie4 + Clie5 +
Clie6 + Clie7, data = b)
```

Residuals:

```
Min      1Q  Median      3Q      Max
-9524.9 -2636.6 -158.3  2171.9  9479.3
```

Coefficients:

```
Estimate Std. Error t value Pr(>|t|)
(Intercept) 1.238e+03  3.522e+03  0.352 0.727016
Ventas12    1.894e-01  5.007e-02  3.783 0.000520 ***
Clie1       5.724e-01  1.766e-01  3.242 0.002436 **
Clie2       1.362e+00  5.909e-01  2.305 0.026577 *
Clie3       8.608e-01  6.829e-01  1.261 0.214971
Clie4       1.345e+00  2.807e-01  4.790 2.42e-05 ***
Clie5       8.009e-01  2.134e-01  3.753 0.000569 ***
Clie6       1.009e+00  2.829e-01  3.565 0.000979 ***
Clie7       1.845e+00  4.103e-01  4.496 6.05e-05 ***
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Residual standard error: 4538 on 39 degrees of freedom

Multiple R-Squared: 0.9591, Adjusted R-squared: 0.9507

F-statistic: 114.2 on 8 and 39 DF, p-value: < 2.2e-16

d) `anova(model1)`

Analysis of Variance Table

Response: Ventas

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Ventas12	1	4437501161	4437501161	215.480	< 2.2e-16 ***
Clie1	1	5751723370	5751723370	279.297	< 2.2e-16 ***
Clie2	1	5087214466	5087214466	247.029	< 2.2e-16 ***
Clie3	1	430410023	430410023	20.900	4.788e-05 ***
Clie4	1	1089245798	1089245798	52.892	9.075e-09 ***
Clie5	1	1331349894	1331349894	64.649	8.360e-10 ***
Clie6	1	267655076	267655076	12.997	0.0008736 ***
Clie7	1	416327629	416327629	20.216	6.048e-05 ***
Residuals	39	803148935	20593562		

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

e) `predict(model1, newdata = data.frame(Ventas12 = 91029.58, Clie1 = 8283.42, Clie2 = 15272.76, Clie3 = 12106.93, Clie4 = 3373.79, Clie5 = 20159.77, Clie6 = 10575.75, Clie7 = 4629.49), interval = "prediction", level=.95)`

```
      fit      lwr      upr
[1,] 94339.02 83442.28 105235.8
```

f) `plot(predict(model1)~residuals(model1), xlab = "Residuos", ylab = "Predicción", main = "Modelo de Regresión Lineal")`

g) `qqnorm(residuals(model2), xlab = "Cuantiles Teóricos", ylab = "Cuantiles de Muestra", main = "Gráfica QQ-Norm")`

h) `shapiro.test(residuals(model2))`

Shapiro-Wilk normality test

```
data: residuals(model2)
W = 0.9858, p-value = 0.8245
```

i) `acf(residuals(model2), main = "Autocorrelaciones del Modelo de Regresión Lineal")`

```
pacf(residuals(model2), main = "Autocorrelaciones parciales del Modelo Regresión Lineal")
```

j) `dwtest(model2)`

Durbin-Watson test

data: model2

DW = 1.3074, p-value = 0.003107

alternative hypothesis: true autocorrelation is greater than 0