**Statistics hw9 資管二 b00705031 李坤樸**

13.17

**Detect outliers:**



Detect outliers if its standardized residual value is < -2 or > 2, then test for outliers.

: Observation 4 is not an outlier.

: Observation 4 is an outlier.

Degree of freedom = 10-2-1 = 7, and critical value of t = 2.3646

Deleted residual:

Since t = 2.10008 < 2.3646, do not reject , there is insufficient evidence to infer that observation 4 is an outlier.

And the observation is influential if , and find no observation is influential.

**Residual analysis:**

Test for normality:

: Residual follows normal distribution.

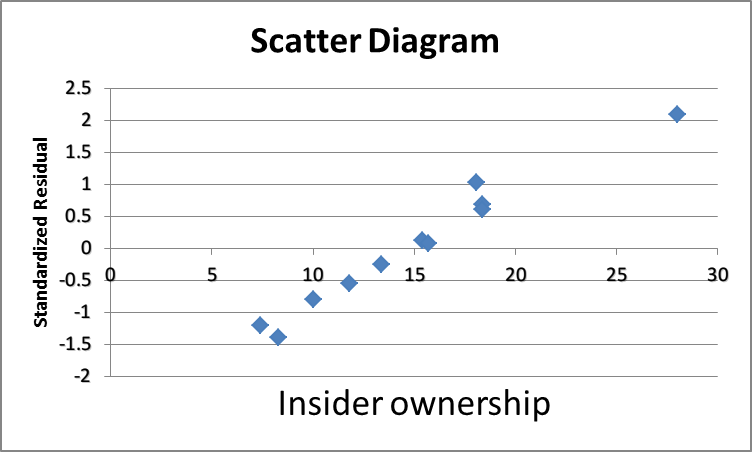
: Residual doesn’t follow normal distribution.



Since chi-squared value = 0.9201 < 3.8415, do not reject , there is insufficient evidence to infer that the residual doesn’t follow normal distribution.

* It’s normal distributed.

Test for Heteroscedasticity and homoscedasticity:



* Homoscedasticity

Test for Nonindependence of the Residual:

*H0* : Randomness exists.

*H1* : Randomness does not exist.



Do not reject *H0*, there is no evidence to infer that the sample is not random for the residual.

* It’s independent.

13.19

**Detect outliers:**



Detect outliers if its standardized residual value is < -2 or > 2, then test for outliers.

: Observation 8 is not an outlier.

: Observation 8 is an outlier.

Degree of freedom = 14-2-1 = 11, and critical value of t = -2.200985

Deleted residual:

Since t = -2.5539 < -2.2009, reject , there is sufficient evidence to infer that observation 8 is an outlier.

And the observation is influential if , and find no observation is influential.

**Residual analysis:**

Test for normality:

: Residual follows normal distribution.

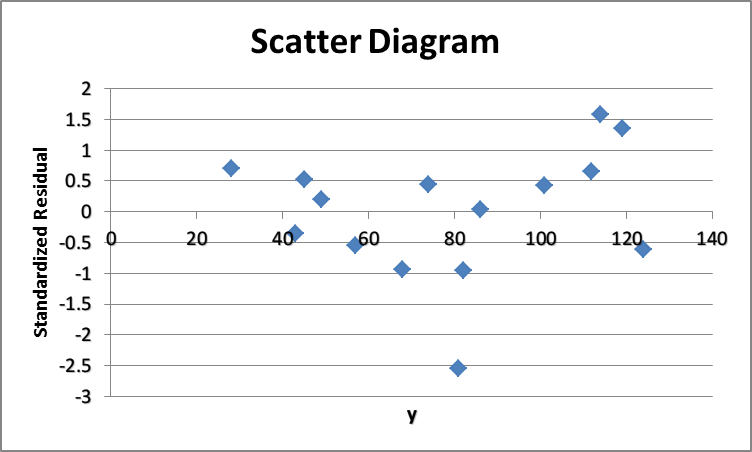
: Residual doesn’t follow normal distribution.



Since chi-squared value = 1.5536 < 3.8415, do not reject , there is insufficient evidence to infer that the residual doesn’t follow normal distribution.

* It’s normal distributed.

Test for Heteroscedasticity and homoscedasticity:



* Homoscedasticity

Test for Nonindependence of the Residual:

*H0* : Randomness exists.

*H1* : Randomness does not exist.

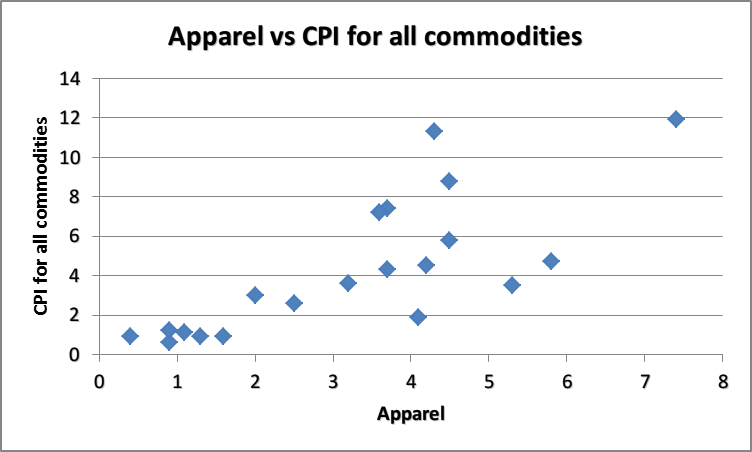
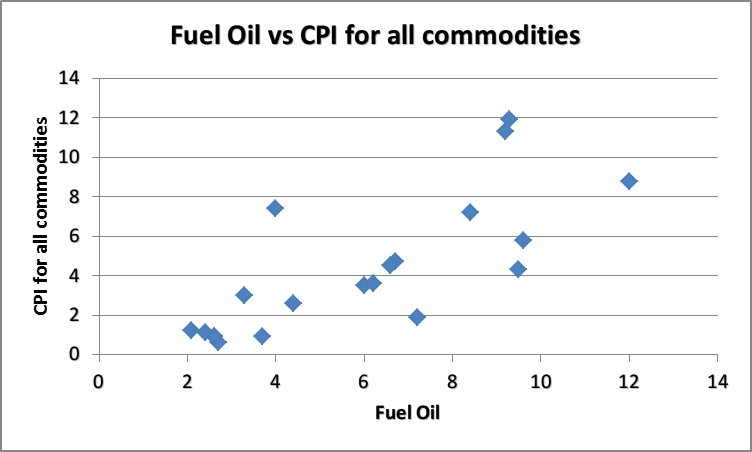
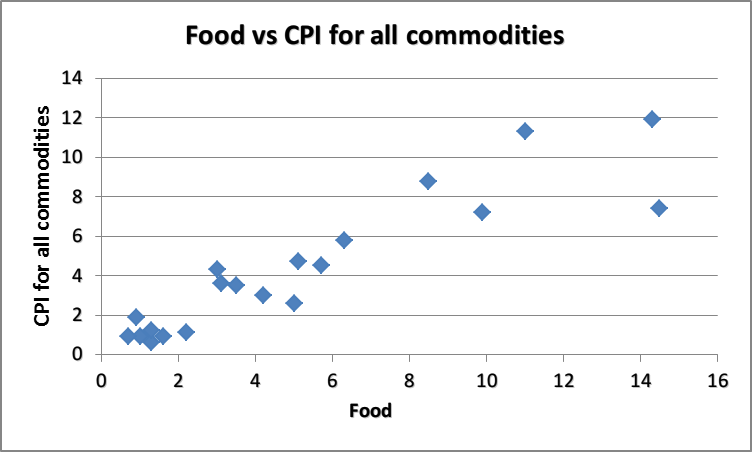
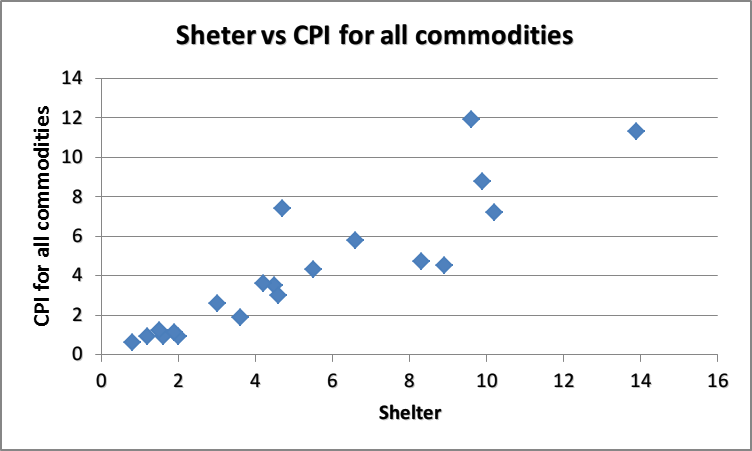


Do not reject *H0*, there is no evidence to infer that the sample is not random for the residual.

* It’s independent.

13.28

Scatter diagram:

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The regression equation is

Where = CPI for all commodities(percentage)

= Food(percentage)

= Shelter(percentage)

= Apparel(percentage)

= Fuel Oil(percentage)

**Detect outliers:**



Detect outliers if its standardized residual value is < -2 or > 2

* Observation 15 and 20 are outliers.

**Residual analysis:**

Test for normality:

: Residual follows normal distribution.

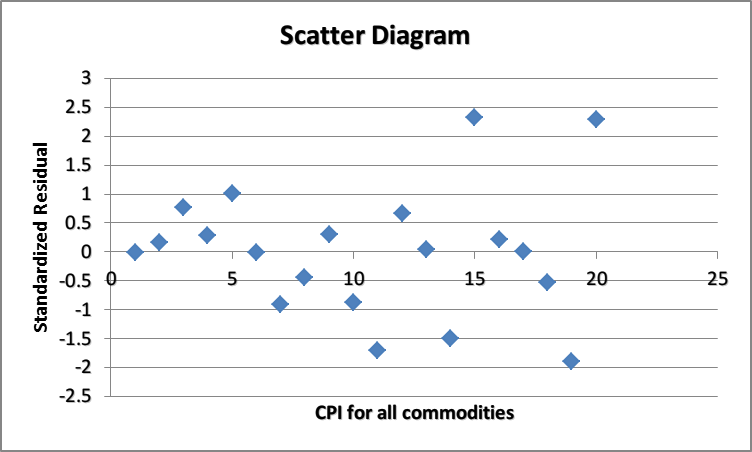
: Residual doesn’t follow normal distribution.



Since chi-squared value = 1.235 < 3.8415, do not reject , there is insufficient evidence to infer that the residual doesn’t follow normal distribution.

* It’s normal distributed.

Test for Heteroscedasticity and homoscedasticity:



* Homoscedasticity

Test for Nonindependence of the Residual:

*H0* : Randomness exists.

*H1* : Randomness does not exist.



Do not reject *H0*, there is no evidence to infer that the sample is not random for the residual.

* It’s independent.



= 0.7471, = 4.305, the standard error seems relatively small, so the multiple regression model fits good.

Interpretation of :

96.31% of the variation in the CPI for all commodities is explained by this regression line of the four independent variables . The rest (3.69%) remains unexplained by this model.

Interpretation of

*Ra*2 vs. *R*2 :

0.9533 is closed to 0.9631, which indicates that the model has no problem of over-fitting.

F TEST:

**Define:**

: the regression coefficients of food.

: the regression coefficients of shelter.

: the regression coefficients of apparel.

: the regression coefficients of fuel oil.

**Hypothesis:**

:

: At least one of the regression coefficients is 0.

**Excel output:**



Since F = 97.977 > = 3.055, reject the null hypothesis, there is significant evidence to infer that at least one of the regression coefficients is 0.

T TEST:

**Hypothesis:**

: (i=1,2,3,4)

:

**Excel output:**



For =0.05, critical value of t = 2.131

Reject : , : ,: , and there is sufficient evidence to infer that , , .

14.4

Let the original regression line be transformed to the exponential model of the form:

Then let , , .

And the new model is:

Then use excel to build the new regression model:



Then =

And =