# Task 5

**Simple Linear Regression, excess (Ri-RF) returns against Mkt-RF**

SLR 1 using sklearn

a, b

[-0.00171037, 0.96466196]

SLR 2 using statsmodels

|  |
| --- |
| OLS Regression Results  ==============================================================================  Dep. Variable: Exc\_Ret R-squared: 0.975  Model: OLS Adj. R-squared: 0.975  Method: Least Squares F-statistic: 1.594e+04  Date: Sun, 11 Nov 2018 Prob (F-statistic): 0.00  Time: 22:25:43 Log-Likelihood: 1453.8  No. Observations: 404 AIC: -2904.  Df Residuals: 402 BIC: -2896.  Df Model: 1  Covariance Type: nonrobust  ==============================================================================  coef std err t P>|t| [0.025 0.975]  ------------------------------------------------------------------------------  const -0.0017 0.000 -5.112 0.000 -0.002 -0.001  Mkt-RF 0.9647 0.008 126.264 0.000 0.950 0.980  ==============================================================================  Omnibus: 86.628 Durbin-Watson: 2.056  Prob(Omnibus): 0.000 Jarque-Bera (JB): 1972.224  Skew: 0.013 Prob(JB): 0.00  Kurtosis: 13.824 Cond. No. 23.1  ============================================================================== |

Using Excel

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| R Square | 0.975404539 | |  | *df* | | | *SS* |
| Adjusted R Square | 0.975343357 | | Regression | 1 | | | 0.702346813 |
| Standard Error | 0.006637398 | | Residual | 402 | | | 0.017710132 |
| Observations | 404 | | Total | 403 | | | 0.720056945 |
|  | *Coefficients* | *Standard Error* | | | *t Stat* |
| Intercept | -0.001710373 | 0.000334602 | | | -5.111659 |
| Mkt-RF | 0.964661963 | 0.007640068 | | | 126.263532 |

where T is the sample size, K is the total number of parameter estimates, and RSS is the residual sum of squares.

AIC = T log(RSS/T) + 2K

= 404\*log(0.017710132/404) + 2\*2 = -4050.1534337111098

Manually calculated AIC is at odds with stats package

**Multiple Linear Regression, 5 factors**

MLR 1 using sklearn

a,b,c,d,e,f

[-0.00225675, 1.00901396, -0.16459171, 0.02548696, 0.05976277, 0.04363357]

['Mkt-RF','SMB','HML','RMW', 'CMA']

MLR 2 using statsmodels

|  |
| --- |
| OLS Regression Results  ==============================================================================  Dep. Variable: Exc\_Ret R-squared: 0.994  Model: OLS Adj. R-squared: 0.994  Method: Least Squares F-statistic: 1.297e+04  Date: Sun, 11 Nov 2018 Prob (F-statistic): 0.00  Time: 22:25:43 Log-Likelihood: 1735.6  No. Observations: 404 AIC: -3459.  Df Residuals: 398 BIC: -3435.  Df Model: 5  Covariance Type: nonrobust  ==============================================================================  coef std err t P>|t| [0.025 0.975]  ------------------------------------------------------------------------------  const -0.0023 0.000 -12.890 0.000 -0.003 -0.002  Mkt-RF 1.0090 0.004 230.125 0.000 1.000 1.018  SMB -0.1646 0.006 -26.268 0.000 -0.177 -0.152  HML 0.0255 0.008 3.172 0.002 0.010 0.041  RMW 0.0598 0.008 7.214 0.000 0.043 0.076  CMA 0.0436 0.012 3.720 0.000 0.021 0.067  ==============================================================================  Omnibus: 40.211 Durbin-Watson: 1.955  Prob(Omnibus): 0.000 Jarque-Bera (JB): 148.084  Skew: 0.344 Prob(JB): 6.98e-33  Kurtosis: 5.885 Cond. No. 80.6  ============================================================================== |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| R Square | 0.993902498 |  | *df* | *SS* |
| Adjusted R Square | 0.993825896 | Regression | 5 | 0.715666396 |
| Standard Error | 0.003321375 | Residual | 398 | 0.004390549 |
| Observations | 404 | Total | 403 | 0.720056945 |

|  |  |  |  |
| --- | --- | --- | --- |
|  | *Coefficients* | *Standard Error* | *t Stat* |
| Intercept | -0.002256749 | 0.000175076 | -12.89008033 |
| Mkt-RF | 1.009013957 | 0.00438464 | 230.1247198 |
| SMB | -0.16459171 | 0.006265851 | -26.26805437 |
| HML | 0.025486956 | 0.008034845 | 3.172053365 |
| RMW | 0.059762767 | 0.008284415 | 7.213878727 |
| CMA | 0.04363357 | 0.011728666 | 3.720250086 |

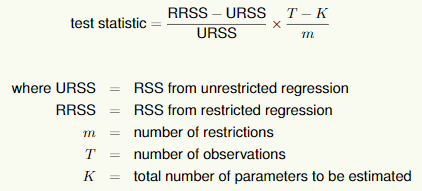
AIC = T log(RSS/T) + 2K

= 404\*log(0.004390549/404) + 2\*6 = -4605.605215813937

Manually calculated AIC is at odds with stats package

# Task 6

**F-test**



=( 0.017710132 - 0.004390549 ) / 0.004390549 \* (404-6)/4

= 301.8525720815324