109-1 證券市場微結構

SECURITIES MARKETS MICROSTRUCTURE PRACTICE

HW5

OIB,

Order Flow Autocorrelation and

Variance Ratio

組員

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<< 作業五 >>

Select 50 diverse stocks, use at least one year daily data to estimate the following.

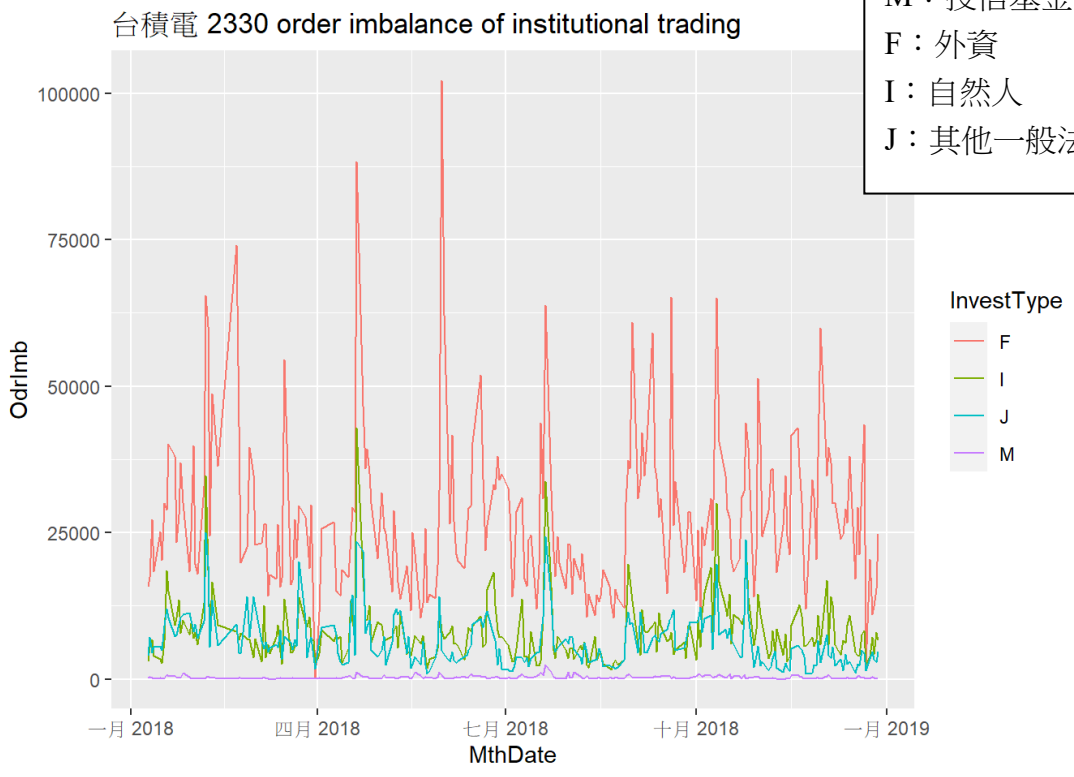
我們挑選了大型股票共 50 家來分析，公司舉例如下：

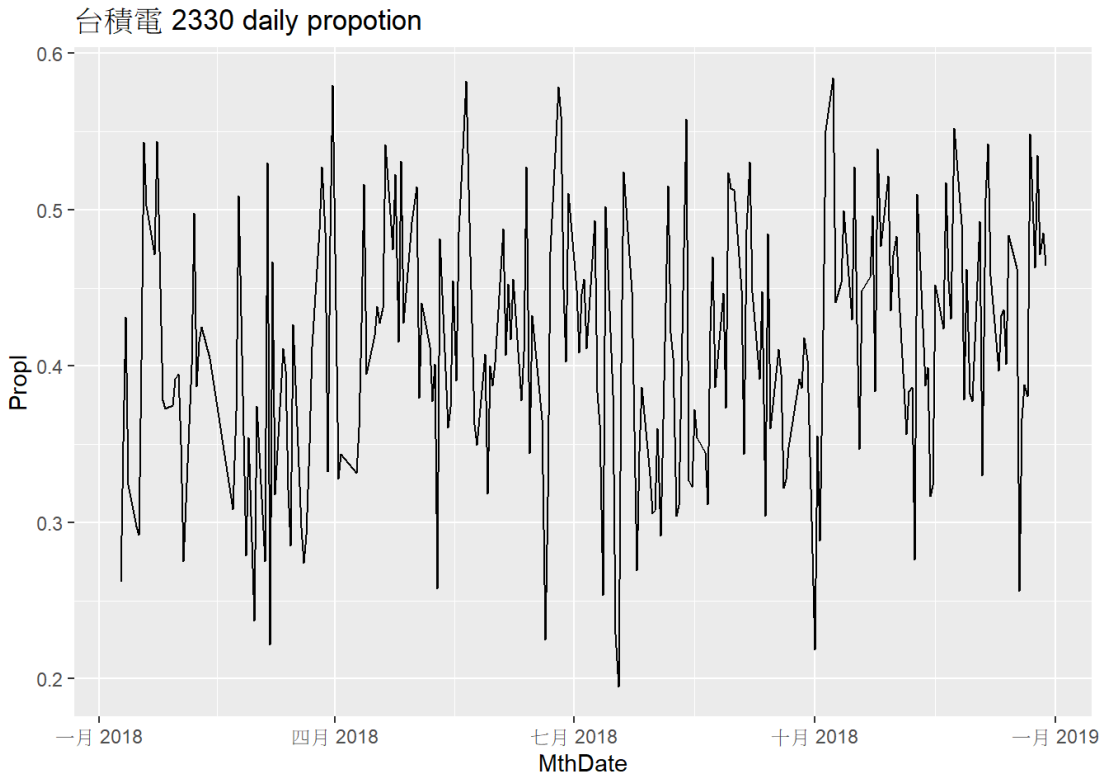
台積電(2330)
台塑(1301)
鴻海(2317)
富邦金(2881)
中華電(2412)
統一超(2912)

第 1 題 calculate the order imbalance of institutional trading (三大法人) as well as retail trading for each stock each day. Estimate the daily proportion of retail trading for each stock. What can you observe? (use your brain and graphic display).

我們舉 2330 台積電為例。

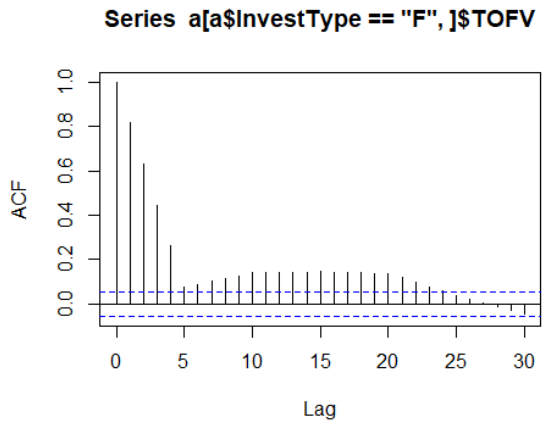
代號說明
M：投信基金
F：外資
I：自然人
J：其他一般法人

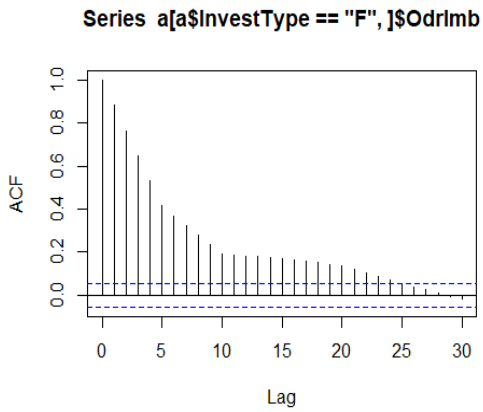


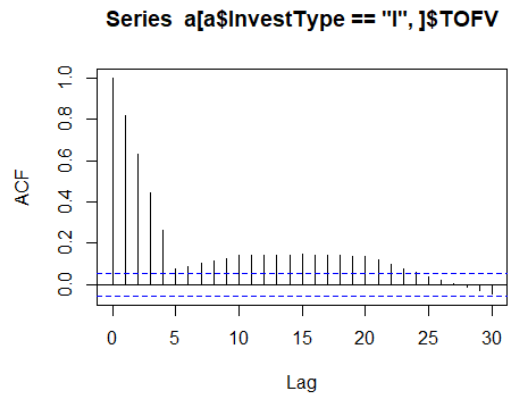


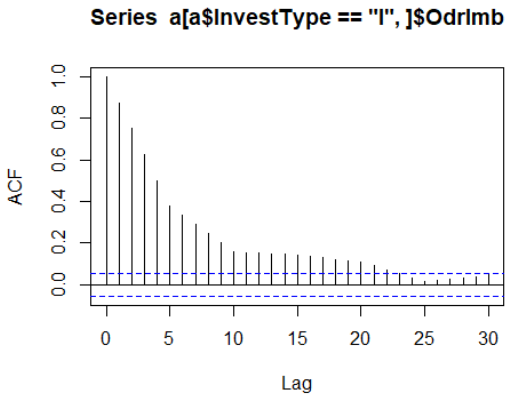
➔ **可以從上面圖看出在台積電這檔個股幾乎在外資(F)佔據了絕大部分，相對外資而言，自然人與投信基金則較少，所以外資的買賣超足以影響並且可以主導這檔個股的走勢，且自然人比例與 Order Imbalance 有很大的關聯。**

第 2 題 Calculate the autocorrelation of order flows(both total order flow volume and order imbalance) of each stock. What is the difference between the auto correlations of institutional OIB and retail OIB? What can you observe? (display in a Meaningful way）









➔ 可以從上面多圖看出自然人與法人的 order flows 的自回歸結果是相似的，可以觀察出法人和自然人行為是相似的。

第 3 題 what should be the relations between the percentage of retail trading and the autocorrelations of order flows(OIBs and total volume).? why? empirically test your thought. Use graphics and regression analysis, explain your findings. Do not forget to control other variables in the regression.

```
Call:
lm(formula = a$OdrImb ~ a$PropI + a$lastPr + a$lagPr)

Residuals:
   Min     1Q Median     3Q    Max
-12289  -7206  -3439   3232  77414

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -1242.98    6588.17  -0.189  0.85039
a$PropI     11163.40    4230.76   2.639  0.00846 **
a$lastPr     -137.99      78.43  -1.759  0.07882 .
a$lagPr       161.05      78.20   2.060  0.03971 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 10580 on 979 degrees of freedom
Multiple R-squared:  0.01165,   Adjusted R-squared:  0.008623
F-statistic: 3.847 on 3 and 979 DF,  p-value: 0.009396


Call:
lm(formula = a$TOFV ~ a$PropI + a$lastPr + a$lagPr)

Residuals:
    Min      1Q  Median      3Q     Max
-854.10 -268.90  -35.26  277.16 1209.69

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -588.061    238.252  -2.468   0.0137 *
a$PropI      361.625    153.000   2.364   0.0183 *
a$lastPr       3.300      2.836   1.164   0.2449
a$lagPr        1.562      2.828   0.552   0.5809
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 382.6 on 979 degrees of freedom
Multiple R-squared:  0.02969,   Adjusted R-squared:  0.02672
F-statistic: 9.985 on 3 and 979 DF,  p-value: 1.74e-06
```

➔ 自然人的比例和 Order flows 有相關

第 4 題 estimate the variance ratio of weekly to daily return. Group the sample by whether the value is greater, equal or less than one. What is the relationship between variance ratio and order flow autocorrelation? Does the relationship differ among the three variance ratio groups? Explain your findings.

a$VR

```
     Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
-31.6929   -0.2125    0.2128    0.2591    0.6484   25.2374


Call:
lm(formula = a$OdrImb ~ a$VR, na.action = na.omit)

Residuals:
   Min     1Q Median     3Q    Max
-12115  -9451  -4311   3823  91658

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 10588.61     186.00  56.927   <2e-16 ***
a$VR           78.23      54.97   1.423    0.155
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 12710 on 4693 degrees of freedom
Multiple R-squared:  0.0004314, Adjusted R-squared:  0.0002184
F-statistic: 2.026 on 1 and 4693 DF,  p-value: 0.1547
```

```
Call:
lm(formula = a$TOFV ~ a$VR, na.action = na.omit)

Residuals:
    Min      1Q  Median      3Q     Max
-795.27 -286.53  -53.84  262.66 1043.91

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)  708.167      5.633 125.709  < 2e-16 ***
a$VR          10.833      1.665   6.507 8.47e-11 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 384.9 on 4693 degrees of freedom
Multiple R-squared:  0.008942,  Adjusted R-squared:  0.00873
F-statistic: 42.34 on 1 and 4693 DF,  p-value: 8.466e-11
```

➔ **Order Imbalance 具有正負方向性，所以可能 相較 Total order flow 關聯程度較小。**

第 5 題 what is the relationship between lagged institutional OIB and current retail OIB? Do you observe a herding behavior of retail trading following institutional trading?

MthDate	Retail	OIB
Min. :2018-01-09	Min. : 8316	Min. : 9481
1st Qu.:2018-04-16	1st Qu.: 23028	1st Qu.:118698
Median :2018-07-11	Median : 34446	Median :159239
Mean :2018-07-09	Mean : 40318	Mean :171463
3rd Qu.:2018-10-04	3rd Qu.: 48337	3rd Qu.:206795
Max. :2018-12-28	Max. :214735	Max. :564606

```
lm(formula = a_OIB$Retail ~ a_OIB$LagOTB)

Residuals:
    Min      1Q  Median      3Q     Max
-43329 -14605  -5685   7740 175104

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 2.313e+04  3.849e+03   6.009 6.93e-09 ***
a_OIB$LagOTB 1.008e-01  2.030e-02   4.966 1.30e-06 ***
---
```

第 6 題 Does stock with higher order flow autocorrelation have higher return volatility? what determines the OIB autocorrelations (do multiple regression analysis, control other factors that may be related)?

```
a.2003 Order flows 10608.88 return 0.0007437879
b.1301 Order flows 2418.556 return 0.001421336
c.2881 Order flows 3906.456 return 0.0005568801
```

b 台塑 **> a** 台積電 **> c** 富邦金

```
                Estimate Std. Error t value Pr(>|t|)
(Intercept)      10886.4      342.1  31.826   <2e-16 ***
a$Volatility   -443687.7   391525.4  -1.133    0.257

               Estimate Std. Error t value Pr(>|t|)
(Intercept)      2371.4      122.4  19.382   <2e-16 ***
b$Volatility     1348.3    82993.5   0.016    0.987

                 Estimate Std. Error t value Pr(>|t|)
(Intercept)        4916.1      208.8  23.550  < 2e-16 ***
c$Volatility   -1578511.6   359971.4  -4.385 1.18e-05 ***
```

第7題 summarize the key "economical" messages based on your results above. Can you devise any strategy based on your findings? What are the takeaways from this exercise?

公司產業別的不同可能會導致收盤價和波動度的影響程度不同。
法人行為確實會有顯著羊群效應引領散戶，可以利用相關指標例如 **VPIN** 一類去預測走勢。