財務金融資訊分析期末報告

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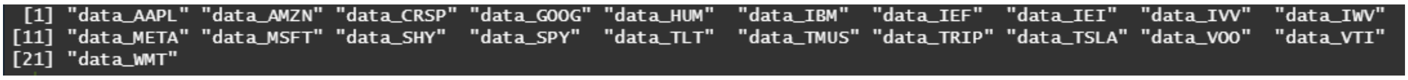
壹、　資料選取

選取Yahoo finance上Trending Tickers之美股之熱門股票作為依據，選取大型股ETF、全市場型ETF、中小型股以及美國公債，美國公債也視為一項非常重要的資產，具有很強的對抗風險性質。

資料選取時間為2017/06/21至2022/06/17共1258筆資料，選取最後一年作為Out of sample。

資料如下：

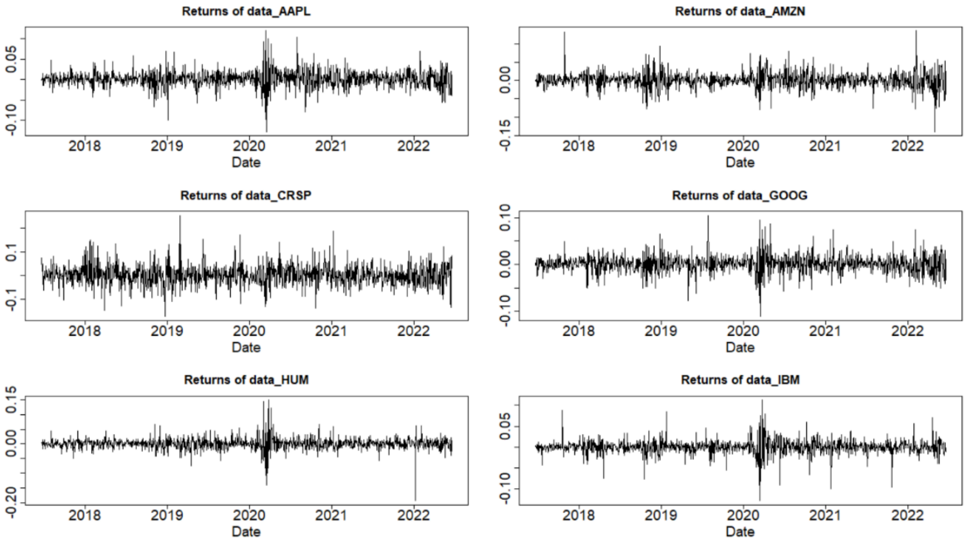


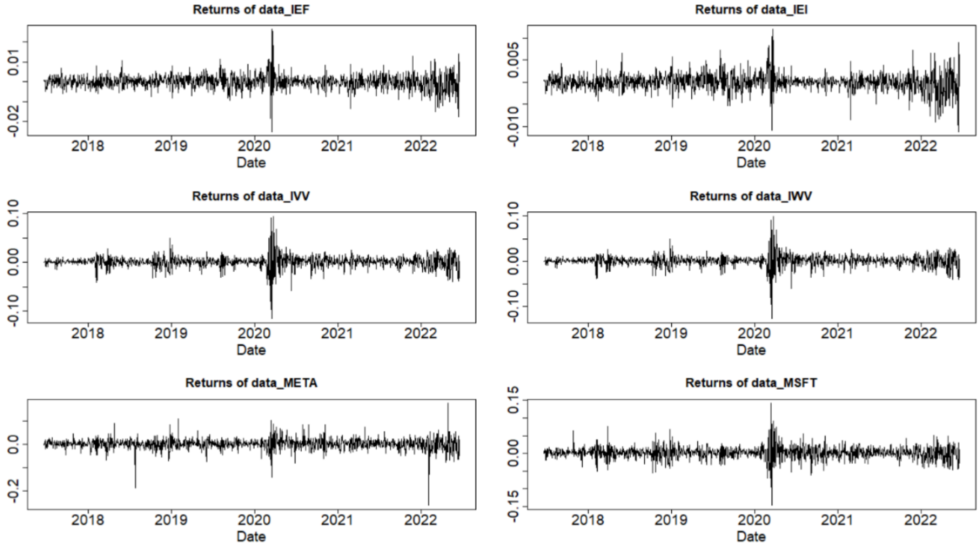
```
 [1] "data_AAPL" "data_AMZN" "data_CRSP" "data_GOOG" "data_HUM"  "data_IBM"  "data_IEF"  "data_IEI"  "data_IVV"  "data_IWV"
[11] "data_META" "data_MSFT" "data_SHY"  "data_SPY"  "data_TLT"  "data_TMUS" "data_TRIP" "data_TSLA" "data_VOO"  "data_VTI"
[21] "data_WMT"
```

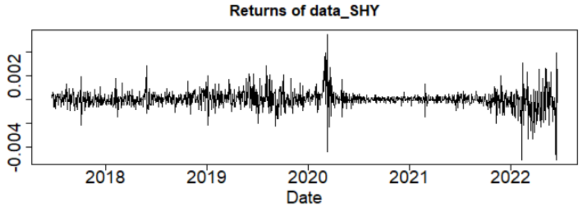
貳、個別資產（Individual Assets）

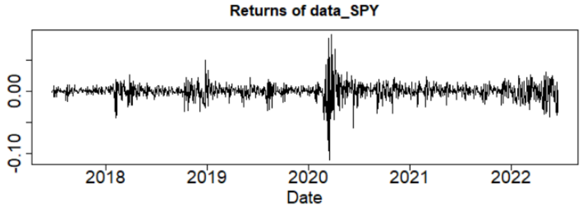
一共選取21個資產，依據課堂所學之算法計算return以及cumulative gross returns。

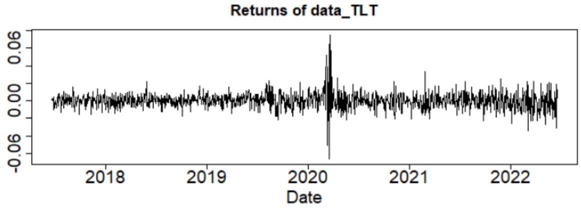
1. Time series plots of returns:

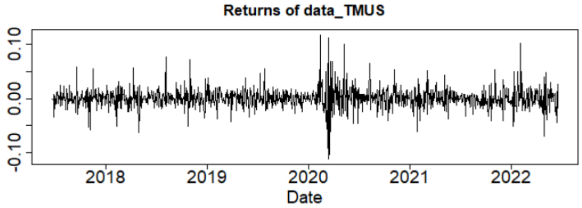


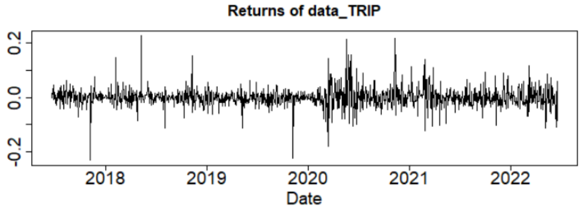


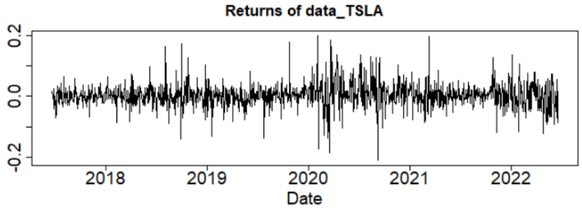

Returns of data_SHY

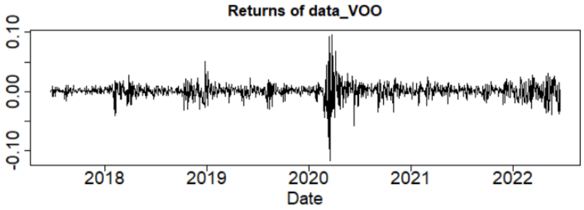

Returns of data_SPY

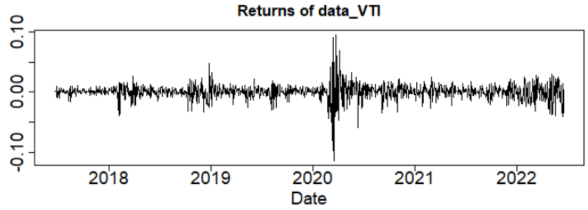

Returns of data_TLT

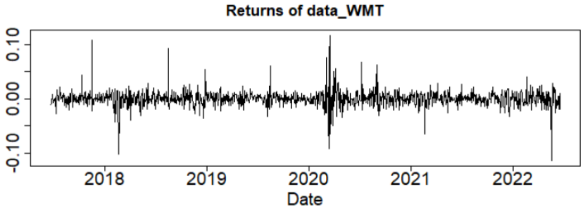

Returns of data_TMUS


Returns of data_TRIP


Returns of data_TSLA

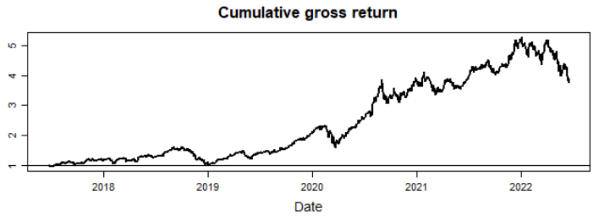

Returns of data_VOO

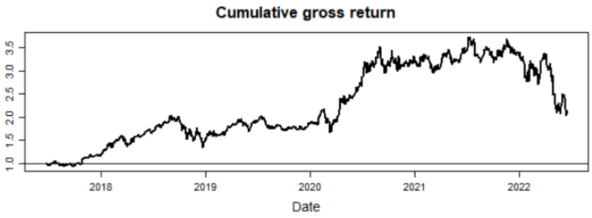

Returns of data_VTI

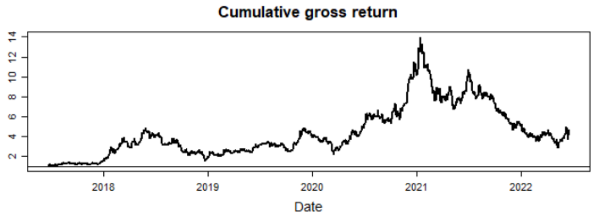

Returns of data_WMT

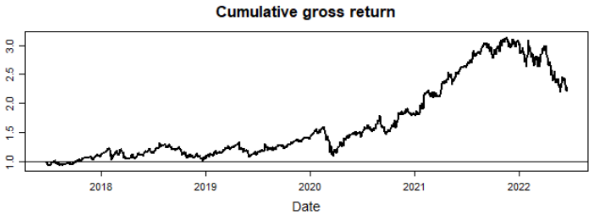
圖形在 2020 年時震盪皆顯著，可見股價受到疫情影響。

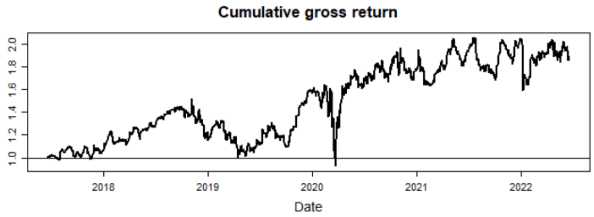
2. Time series plots of cumulative gross returns:

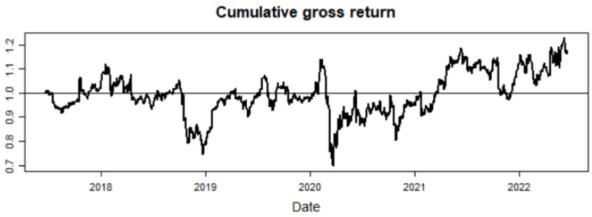

Cumulative gross return

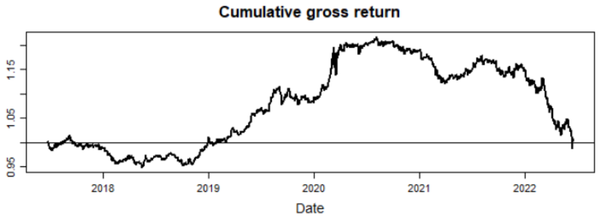

Cumulative gross return

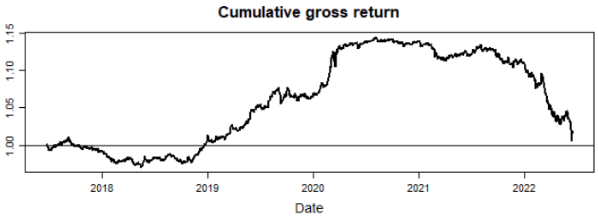

Cumulative gross return

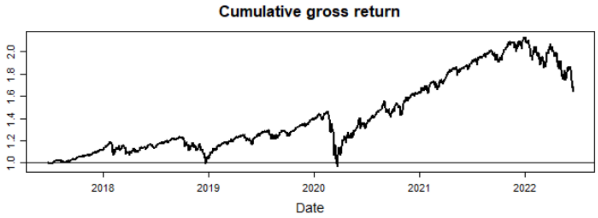

Cumulative gross return

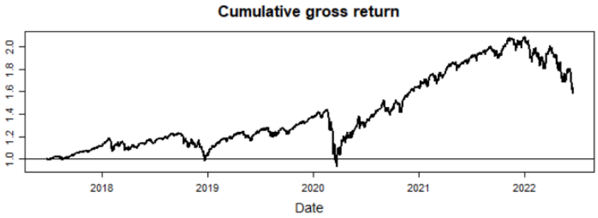

Cumulative gross return

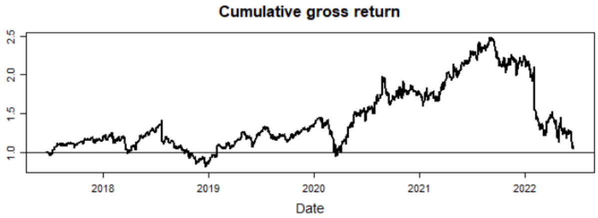

Cumulative gross return

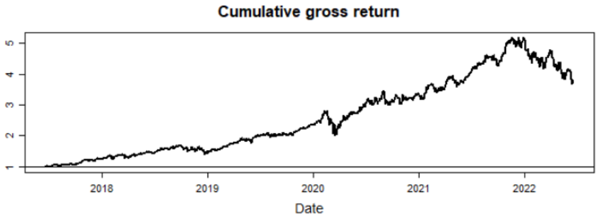

Cumulative gross return

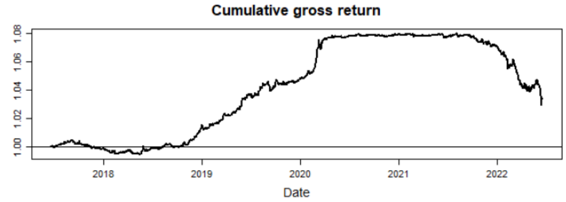

Cumulative gross return

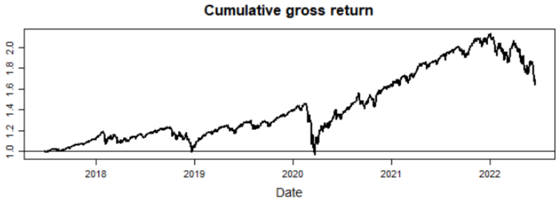

Cumulative gross return

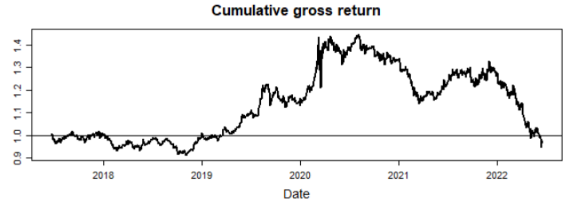

Cumulative gross return

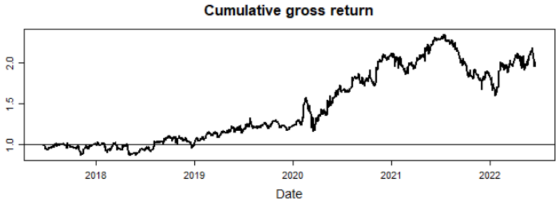

Cumulative gross return

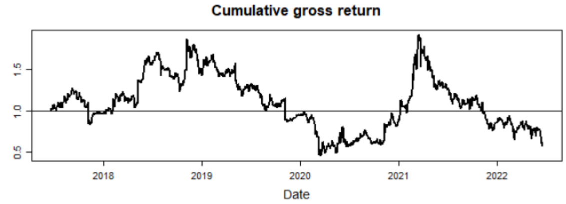

Cumulative gross return

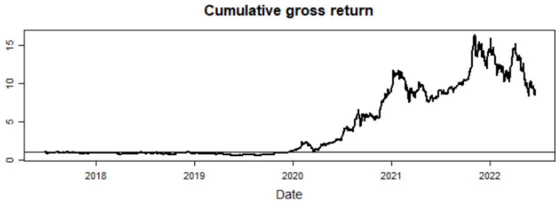

Cumulative gross return

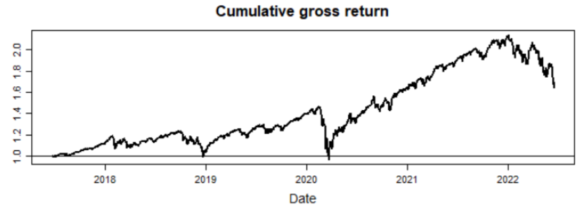

Cumulative gross return

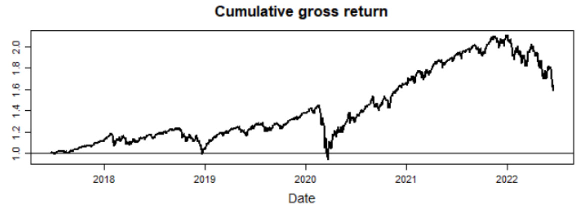

Cumulative gross return

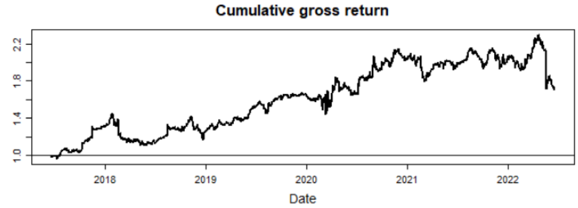

Cumulative gross return


Cumulative gross return

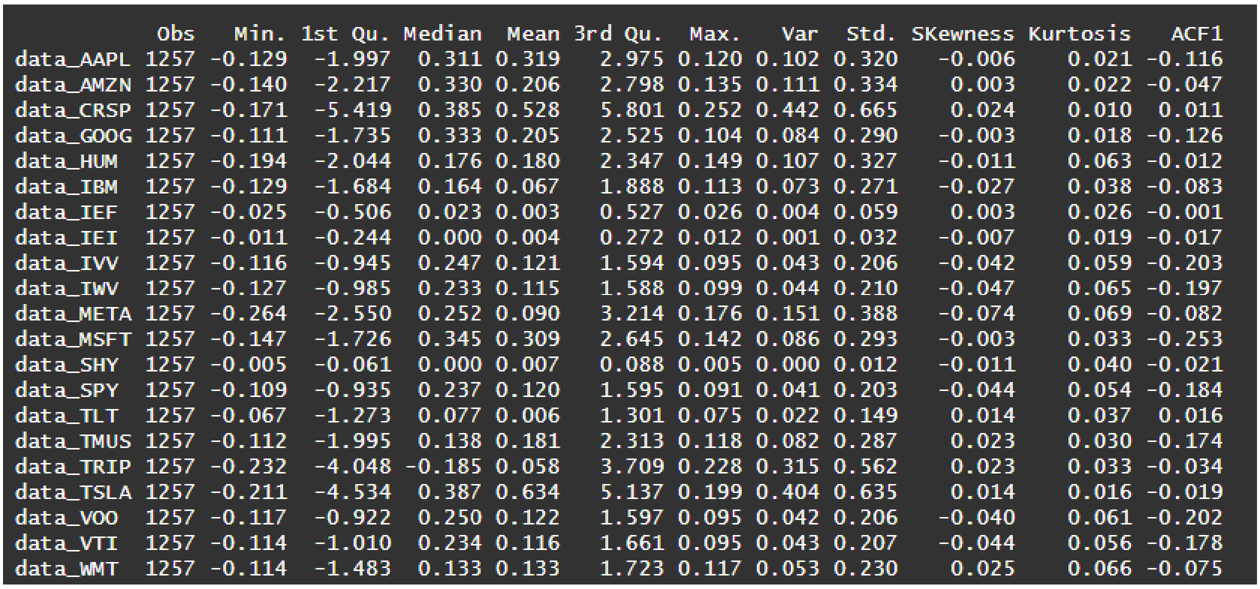

Cumulative gross return


Cumulative gross return


Cumulative gross return


Cumulative gross return

投資報酬率之敘述統計量(除Obs、Min、Max、Acf1外皆已年化處理)

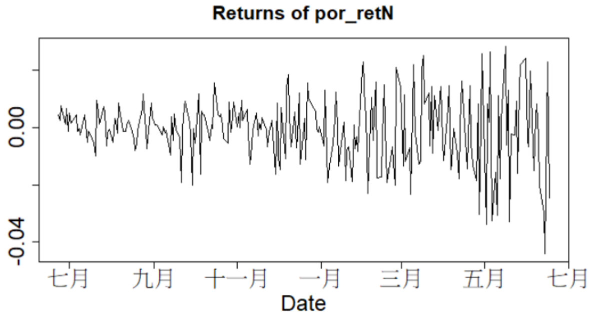


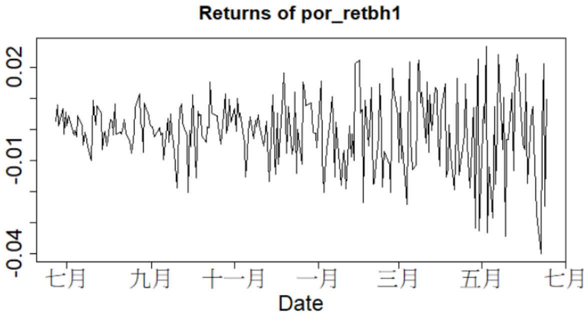
```
           Obs   Min. 1st Qu. Median  Mean 3rd Qu.  Max.   Var  Std. SKewness Kurtosis   ACF1
data_AAPL 1257 -0.129  -1.997  0.311 0.319   2.975 0.120 0.102 0.320   -0.006    0.021 -0.116
data_AMZN 1257 -0.140  -2.217  0.330 0.206   2.798 0.135 0.111 0.334    0.003    0.022 -0.047
data_CRSP 1257 -0.171  -5.419  0.385 0.528   5.801 0.252 0.442 0.665    0.024    0.010  0.011
data_GOOG 1257 -0.111  -1.735  0.333 0.205   2.525 0.104 0.084 0.290   -0.003    0.018 -0.126
data_HUM  1257 -0.194  -2.044  0.176 0.180   2.347 0.149 0.107 0.327   -0.011    0.063 -0.012
data_IBM  1257 -0.129  -1.684  0.164 0.067   1.888 0.113 0.073 0.271   -0.027    0.038 -0.083
data_IEF  1257 -0.025  -0.506  0.023 0.003   0.527 0.026 0.004 0.059    0.003    0.026 -0.001
data_IEI  1257 -0.011  -0.244  0.000 0.004   0.272 0.012 0.001 0.032   -0.007    0.019 -0.017
data_IVV  1257 -0.116  -0.945  0.247 0.121   1.594 0.095 0.043 0.206   -0.042    0.059 -0.203
data_IWV  1257 -0.127  -0.985  0.233 0.115   1.588 0.099 0.044 0.210   -0.047    0.065 -0.197
data_META 1257 -0.264  -2.550  0.252 0.090   3.214 0.176 0.151 0.388   -0.074    0.069 -0.082
data_MSFT 1257 -0.147  -1.726  0.345 0.309   2.645 0.142 0.086 0.293   -0.003    0.033 -0.253
data_SHY  1257 -0.005  -0.061  0.000 0.007   0.088 0.005 0.000 0.012   -0.011    0.040 -0.021
data_SPY  1257 -0.109  -0.935  0.237 0.120   1.595 0.091 0.041 0.203   -0.044    0.054 -0.184
data_TLT  1257 -0.067  -1.273  0.077 0.006   1.301 0.075 0.022 0.149    0.014    0.037  0.016
data_TMUS 1257 -0.112  -1.995  0.138 0.181   2.313 0.118 0.082 0.287    0.023    0.030 -0.174
data_TRIP 1257 -0.232  -4.048 -0.185 0.058   3.709 0.228 0.315 0.562    0.023    0.033 -0.034
data_TSLA 1257 -0.211  -4.534  0.387 0.634   5.137 0.199 0.404 0.635    0.014    0.016 -0.019
data_VOO  1257 -0.117  -0.922  0.250 0.122   1.597 0.095 0.042 0.206   -0.040    0.061 -0.202
data_VTI  1257 -0.114  -1.010  0.234 0.116   1.661 0.095 0.043 0.207   -0.044    0.056 -0.178
data_WMT  1257 -0.114  -1.483  0.133 0.133   1.723 0.117 0.053 0.230    0.025    0.066 -0.075
```

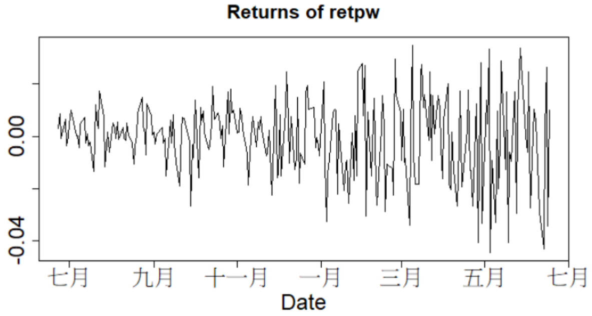
參、投資組合（Portfolios）

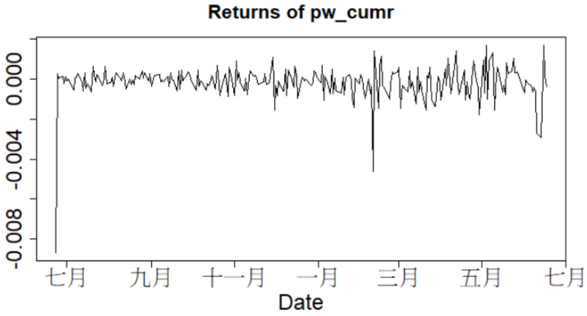
以下我們採取 7 種投資組合策略：fixed weight、buy and hold、price weighted、gmvp、mvp、tangency portfolio、no-shortsales gmvp，並選取最後一年資料(即 2021/06/17~2020/0620)作為 Oos。

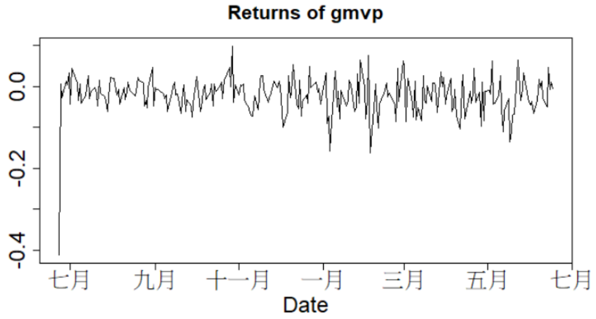
- Time series plots of the out-of-sample (oos) portfolio returns

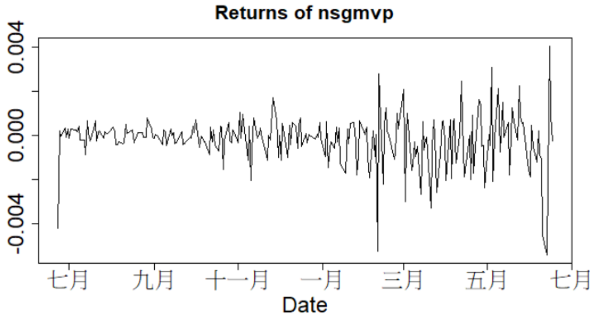

Returns of por_retN

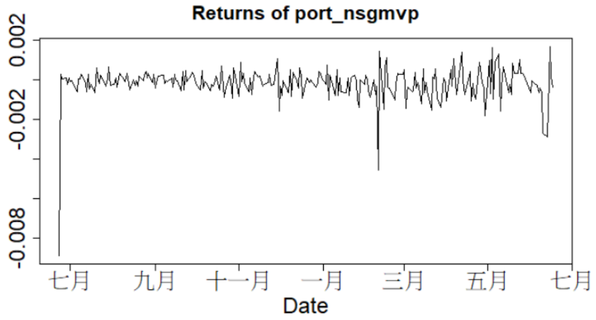

Returns of por_retbh1


Returns of retpw

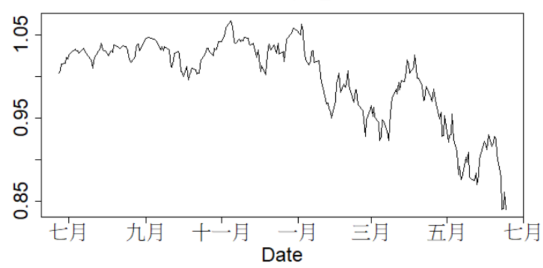

Returns of pw_cumr

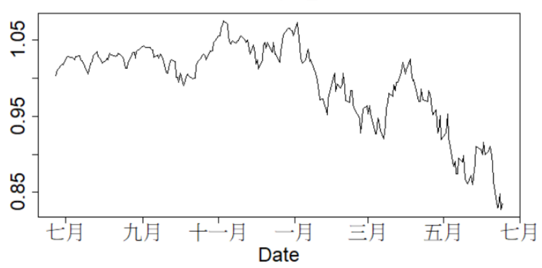

Returns of gmvp

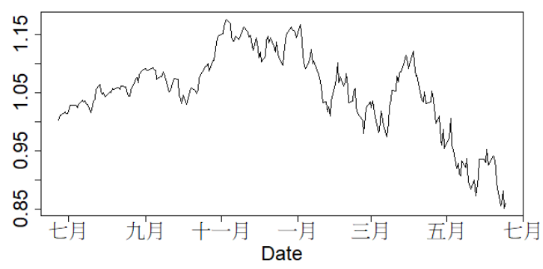

Returns of nsgmvp

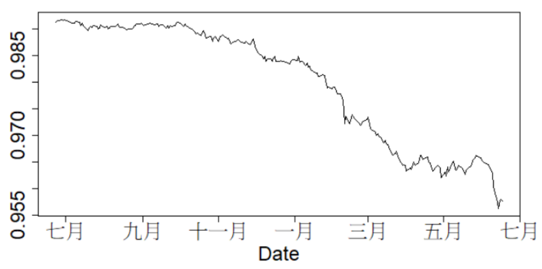

Returns of port_nsgmvp

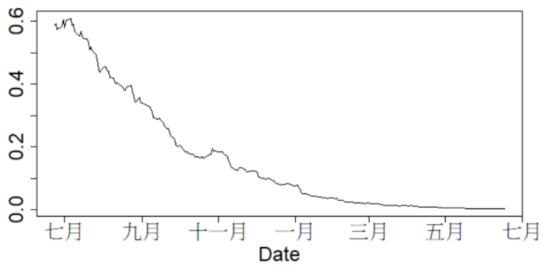
- Time series plots of the out of sample cumulative gross returns of the portfolios

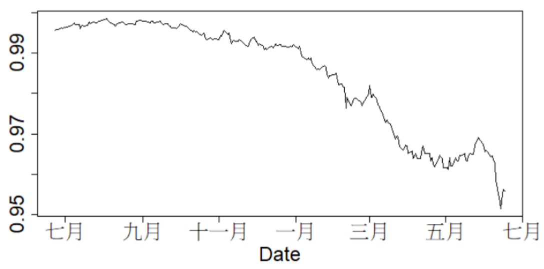

Returns of por_retN

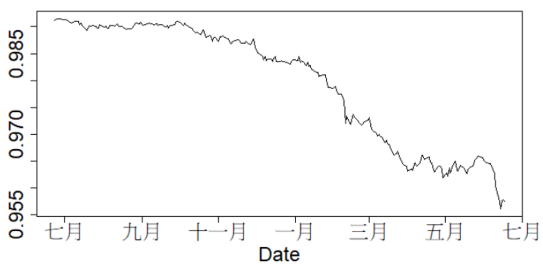

Returns of por_retbh1


Returns of retpw


Returns of pw_cumr

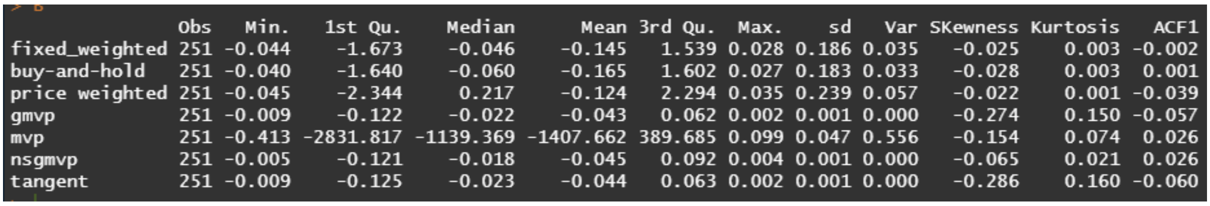

Returns of gmvp


Returns of nsgmvp


Returns of port_nsgmvp

由此類圖形可看出，認為所有投資組合近一年皆呈下降趨勢。

- Number of observations, min, median, max, mean, std, skewness, kurtosis, acf1, (annualized and percentage)（除 Obs、Min、Max、Acf1 外皆已年化處理）

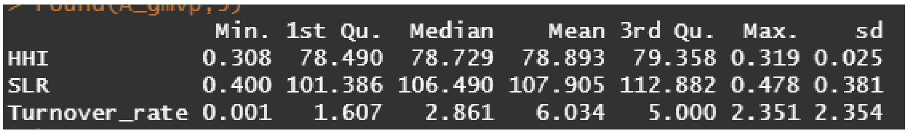


```
               Obs   Min.   1st Qu.    Median      Mean 3rd Qu.  Max.    sd   Var SKewness Kurtosis   ACF1
fixed_weighted 251 -0.044    -1.673    -0.046    -0.145   1.539 0.028 0.186 0.035   -0.025    0.003 -0.002
buy-and-hold   251 -0.040    -1.640    -0.060    -0.165   1.602 0.027 0.183 0.033   -0.028    0.003  0.001
price weighted 251 -0.045    -2.344     0.217    -0.124   2.294 0.035 0.239 0.057   -0.022    0.001 -0.039
gmvp           251 -0.009    -0.122    -0.022    -0.043   0.062 0.002 0.001 0.000   -0.274    0.150 -0.057
mvp            251 -0.413 -2831.817 -1139.369 -1407.662 389.685 0.099 0.047 0.556   -0.154    0.074  0.026
nsgmvp         251 -0.005    -0.121    -0.018    -0.045   0.092 0.004 0.001 0.000   -0.065    0.021  0.026
tangent        251 -0.009    -0.125    -0.023    -0.044   0.063 0.002 0.001 0.000   -0.286    0.160 -0.060
```

- The risk free rate (used for calculating the Sharpe ratio) risk free rate 取 0.01/252，則可以各別得到 Sharpe Ratio 如下.

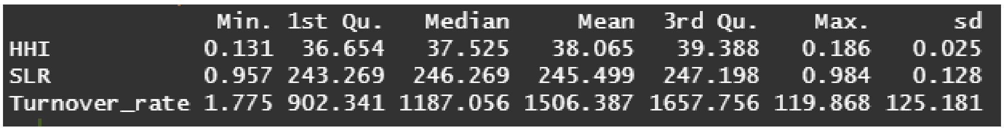
```
             fixed-weighted buy-and-hold price-weighted   gmvp    mvp nsgmvp tangent
Sharpe ratio         -0.835       -0.955          -0.56 -3.846 -7.507 -3.103  -3.826
```

- Min, median, max, mean and std of turnover rate, HHI and SLR VaR, ES, LPSD of the out-of-sample portfolio returns
- Gmvp



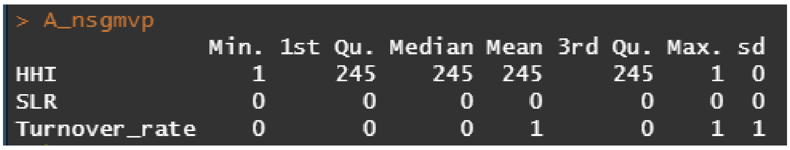
```
               Min. 1st Qu.  Median    Mean 3rd Qu.  Max.    sd
HHI           0.308  78.490  78.729  78.893  79.358 0.319 0.025
SLR           0.400 101.386 106.490 107.905 112.882 0.478 0.381
Turnover_rate 0.001   1.607   2.861   6.034   5.000 2.351 2.354
```

- Mvp



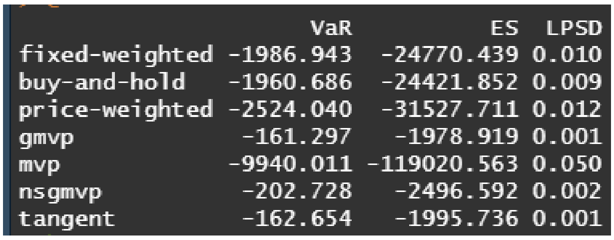
```
               Min. 1st Qu.   Median     Mean  3rd Qu.    Max.      sd
HHI           0.131  36.654   37.525   38.065   39.388   0.186   0.025
SLR           0.957 243.269  246.269  245.499  247.198   0.984   0.128
Turnover_rate 1.775 902.341 1187.056 1506.387 1657.756 119.868 125.181
```

- no-shortsales mvp



```
> A_nsgmvp
              Min. 1st Qu. Median Mean 3rd Qu. Max. sd
HHI              1     245    245  245     245    1  0
SLR              0       0      0    0       0    0  0
Turnover_rate    0       0      0    1       0    1  1
```

3. VaR, ES, LPSD of the out-of-sample portfolio returns



```
                    VaR         ES  LPSD
fixed-weighted -1986.943  -24770.439 0.010
buy-and-hold   -1960.686  -24421.852 0.009
price-weighted -2524.040  -31527.711 0.012
gmvp            -161.297   -1978.919 0.001
mvp            -9940.011 -119020.563 0.050
nsgmvp          -202.728   -2496.592 0.002
tangent         -162.654   -1995.736 0.001
```

肆、 參考資料：

https://rich01.com/how-asset-allocation-1/
https://rich01.com/bond-etf-treasuries-5/
課堂講義與 CODE