

Assets:

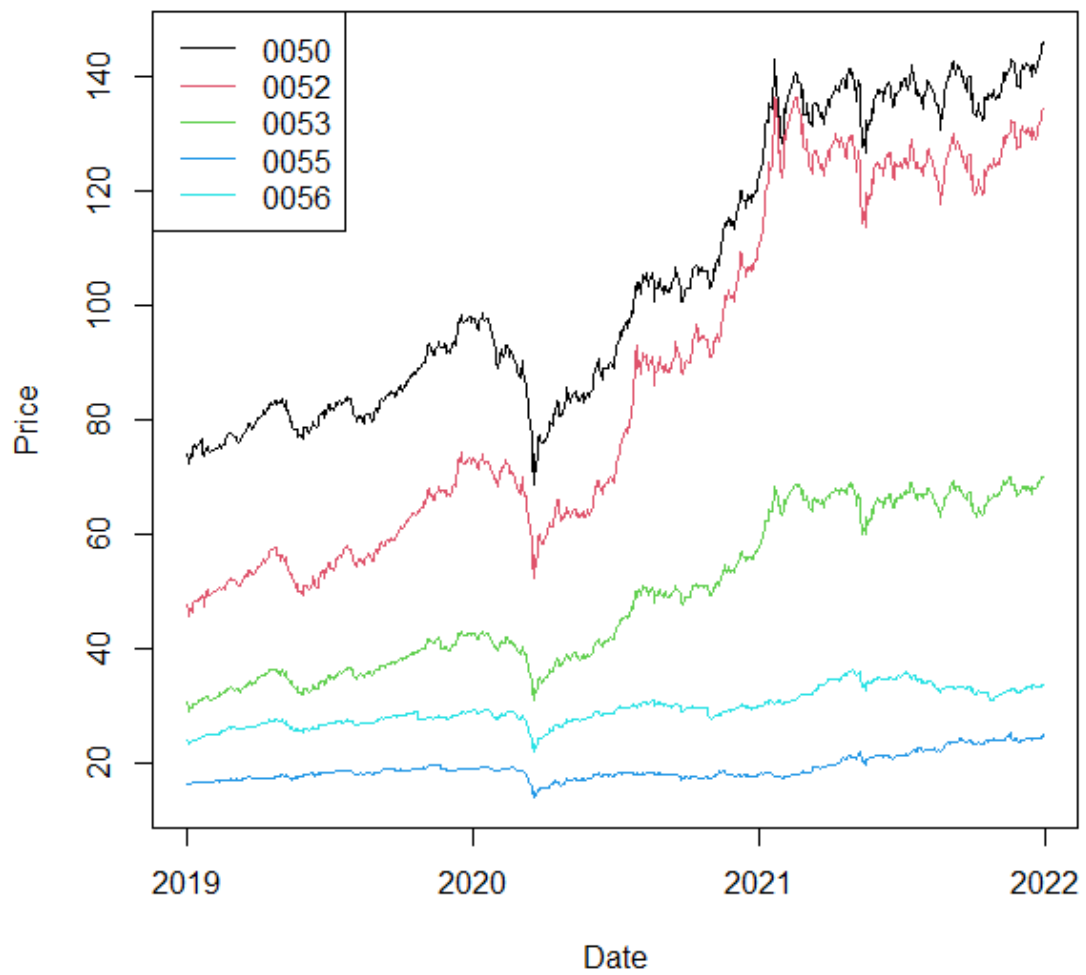
1. Quanta Computer Inc. (2382.TW)
2. Taiwan Semiconductor Manufacturing Company Limited (2330.TW)
3. Formosa International Hotels Corporation (2707.TW)
4. Novatek Microelectronics Corp. (3034.TW)
5. Hotel Royal Chihpen (5704.TWO)
6. Yuanta/P-shares Taiwan Top 50 ETF (0050.TW)
7. Hon Hai Precision Industry Co., Ltd. (2317.TW)
8. ASUSTeK Computer Inc. (2357.TW)
9. Yuanta/P-shares Taiwan Dividend Plus ETF (0056.TW)
10. Fubon FTSE TWSE Taiwan 50 ETF (006208.TW)
11. Yuanta S&P GSCI Gold ER Futures ETF (00635U.TW)
12. Fubon Taiwan Technology Tracker Fund (0052.TW)
13. Yuanta S&P 500 ETF (00646.TW)
14. Fubon NASDAQ-100 Index ETF (00662.TW)
15. Yuanta/P-shares Taiwan Electronics Tech ETF (0053.TW)
16. FSITC Taiwan Industry Elite 30 ETF (00728.TW)
17. Yuanta/P-shares MSCI Taiwan Financials ETF (0055.TW)
18. W.I.S.E. Yuanta/P-shares CSI 300 ETF (0061.TW)
19. Cathay FTSE China A50 ETF (00636.TW)
20. Cathay DJIA ETF (00668.TW)
21. Cathay Korea/Taiwan IT Premier ETF (00735.TW)

共包含 7 支股票(電子類、觀光休閒類)及 14 ETFs (股票型、商品型等等，國家有台灣、美國、中國、韓國)。

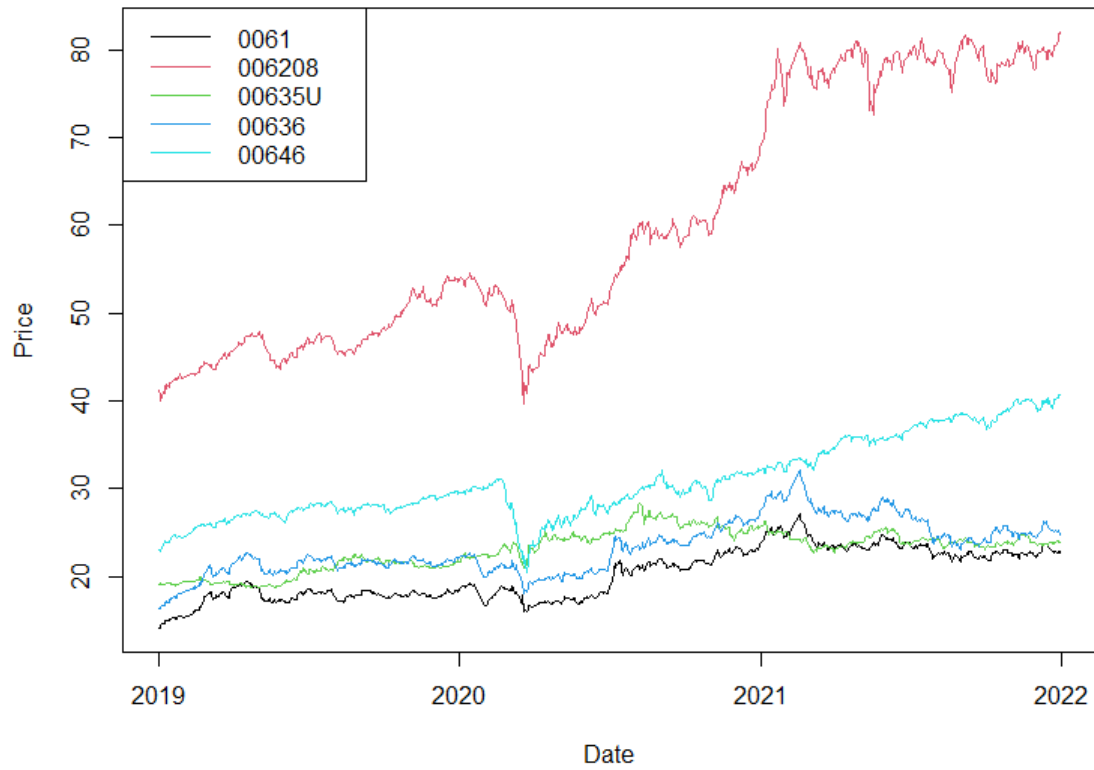
選擇這些股票及 ETF 的原因是想要看看融合親戚及自己有在觀察的資產的投資組合績效如何，配合疫情期間世界局勢的變動，觀察這樣的投資組合的績效。

這些資料的 frequency 是 daily，時間從 2019-01-01 到 2021-12-31，全部從 Yahoo Finance 下載的。

Time series plots of asset prices(0050,0052,0053,0055,0056)



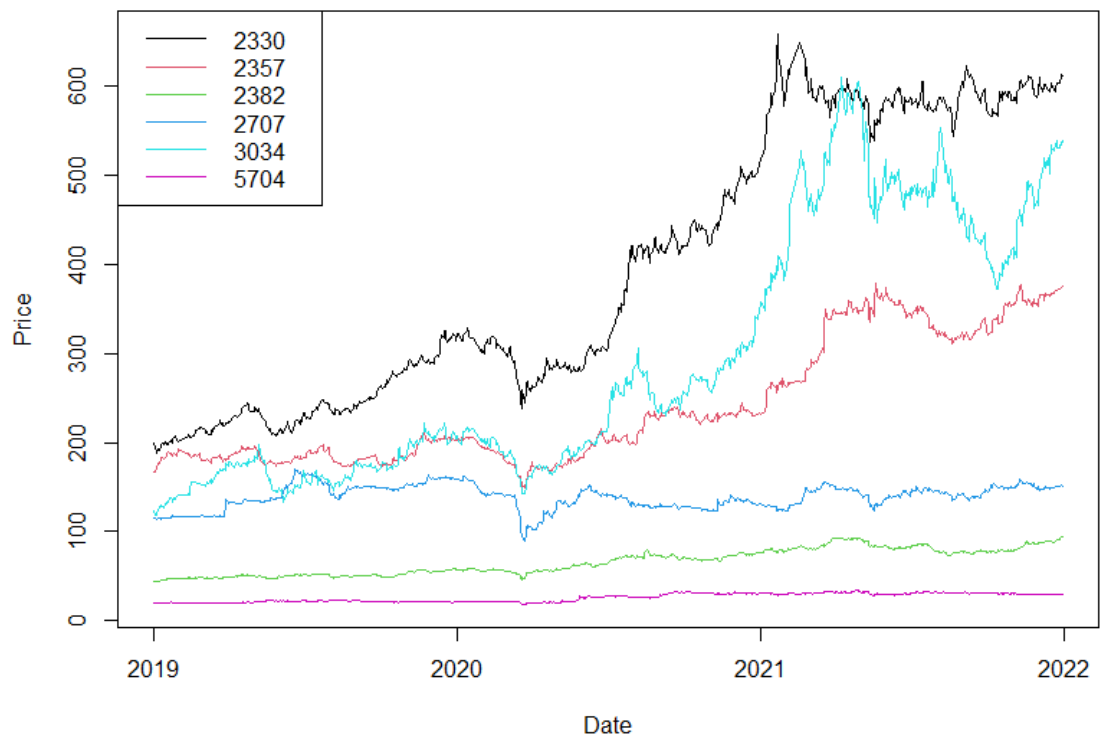
Time series plots of asset prices(0061, 006208, 00635U, 00636, 00646)



Time series plots of asset prices(00662, 00668, 00728, 00735, 2317)



Time series plots of asset prices(2330, 2357, 2382, 2707, 3034, 5704)

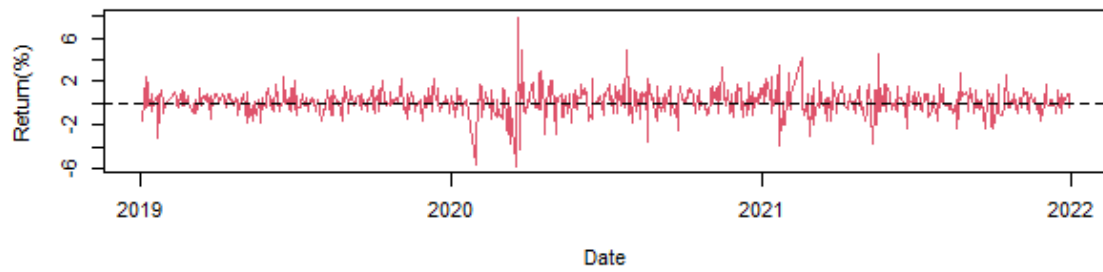


Descriptive statistics of asset returns(附檔 summary_ind.csv)

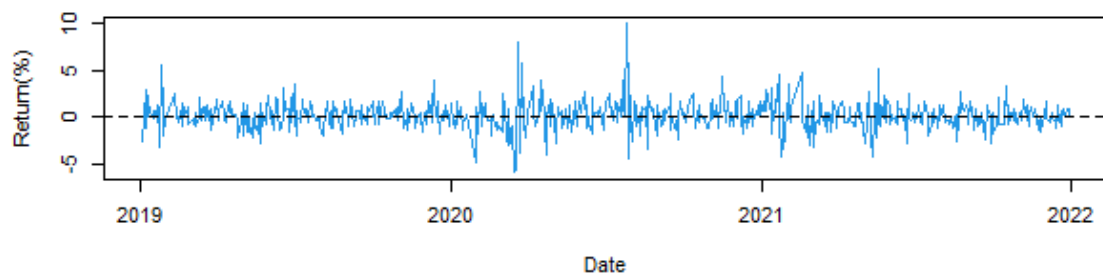
	No..of.Obs.	Min	Median	Max	Mean	Std.	SKewness	Kurtosis	ACF1
x0050	728	-5.838	30.344	7.950	25.125	18.641	0.001	0.024	-0.018
x0052	728	-5.920	36.014	10.000	38.525	23.031	0.033	0.021	0.040
x0053	728	-5.860	36.391	6.494	30.739	20.123	-0.011	0.015	0.011
x0055	728	-7.285	14.182	5.786	15.560	15.582	-0.048	0.042	0.028
x0056	728	-6.183	26.075	6.545	12.959	14.675	-0.075	0.049	0.003
x0061	728	-12.252	0.000	7.925	18.822	21.594	-0.074	0.067	-0.038
x006208	728	-4.669	11.483	6.034	25.248	17.055	0.012	0.015	0.031
x00635U	728	-6.623	4.686	6.617	8.867	16.038	-0.013	0.025	0.017
x00636	728	-11.830	10.362	7.525	17.168	21.888	-0.042	0.040	0.000
x00646	728	-8.571	34.705	4.932	21.174	17.790	-0.067	0.034	-0.062
x00662	728	-8.017	49.808	7.351	30.442	22.090	-0.025	0.016	-0.115
x00668	728	-8.613	27.222	6.594	15.397	18.998	-0.050	0.034	-0.019
x00728	728	-8.690	28.085	5.448	22.578	18.803	-0.075	0.041	0.114
x00735	728	-8.392	30.373	6.452	26.473	19.961	-0.038	0.023	-0.010
x2317	728	-9.968	0.000	9.932	22.233	27.791	0.030	0.023	0.011
x2330	728	-5.556	18.586	9.974	42.103	25.383	0.035	0.014	0.015
x2357	728	-6.989	32.602	9.985	31.221	24.396	0.038	0.020	-0.007
x2382	728	-6.000	0.000	8.935	28.977	22.644	0.039	0.021	-0.007
x2707	728	-9.955	0.000	9.818	13.315	27.964	0.039	0.037	0.098
x3034	728	-9.940	48.933	9.989	60.300	42.862	0.016	0.008	-0.036
x5704	728	-7.715	0.000	10.375	18.824	28.908	0.068	0.028	-0.104

Showing 1 to 21 of 21 entries, 9 total columns

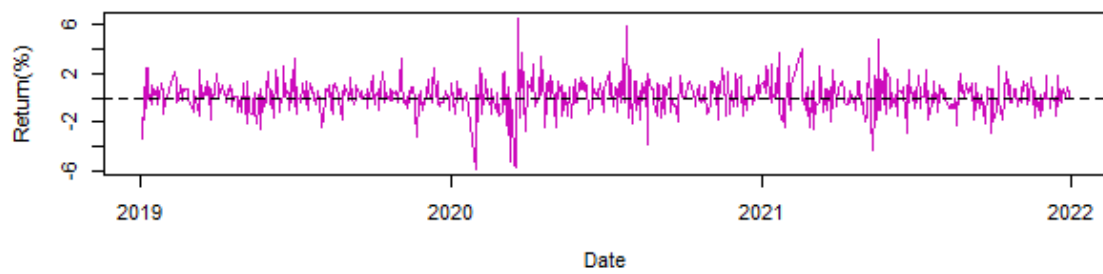
Time series plots of asset returns (0050)



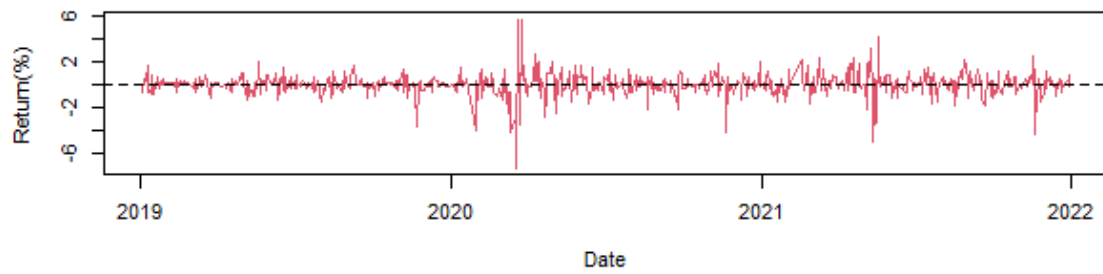
Time series plots of asset returns (0052)



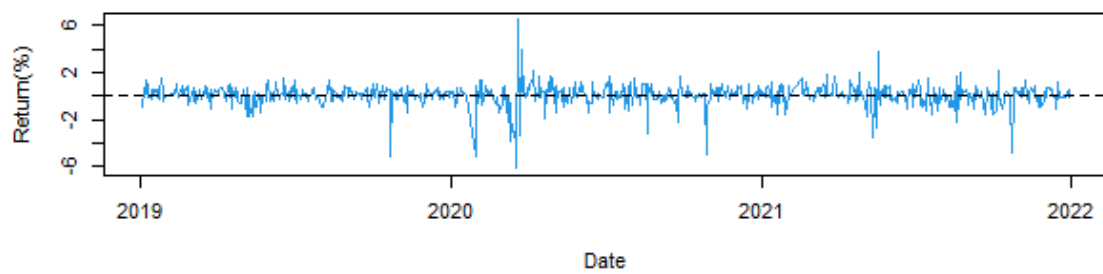
Time series plots of asset returns (0053)



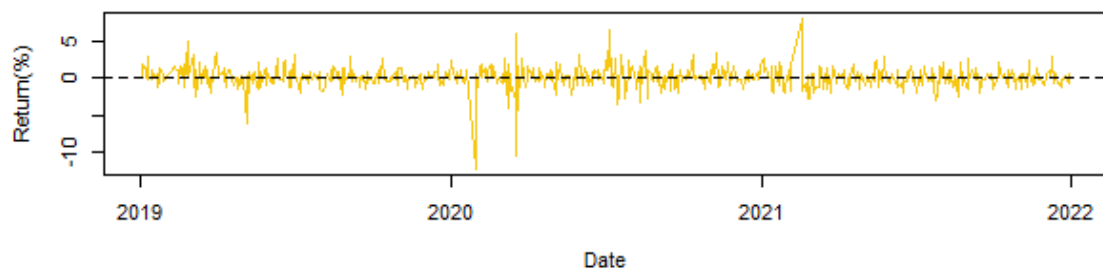
Time series plots of asset returns (0055)



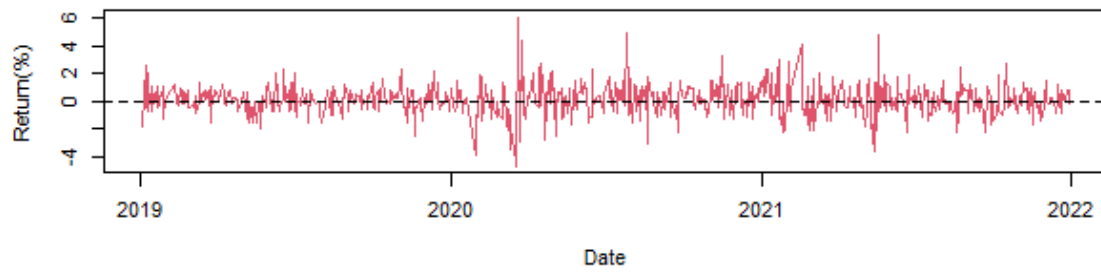
Time series plots of asset returns (0056)



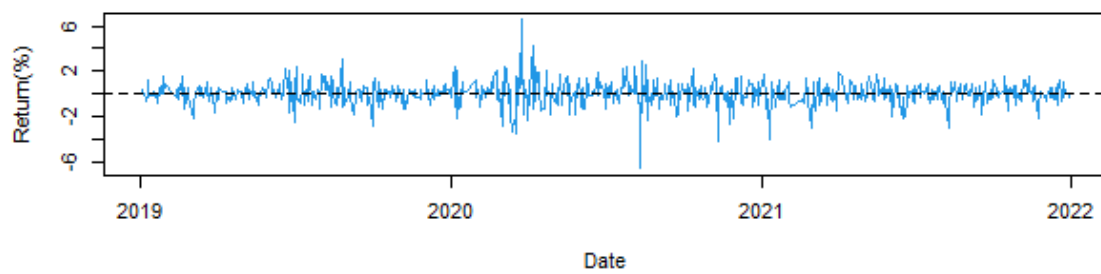
Time series plots of asset returns (0061)



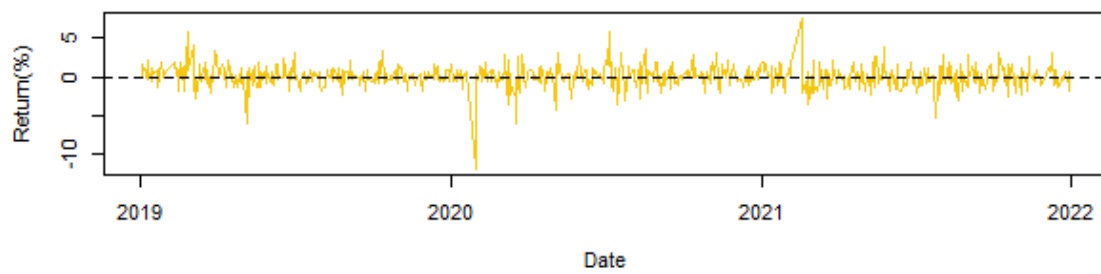
Time series plots of asset returns (006208)



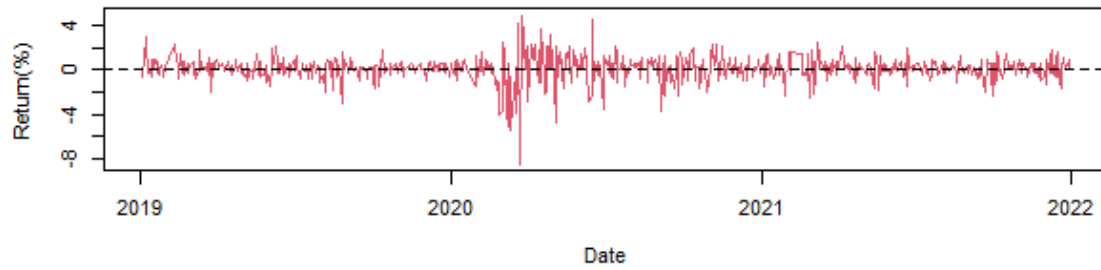
Time series plots of asset returns (00635U)



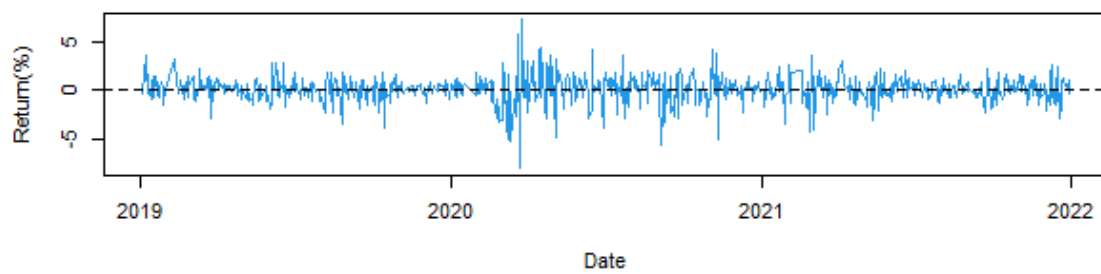
Time series plots of asset returns (00636)



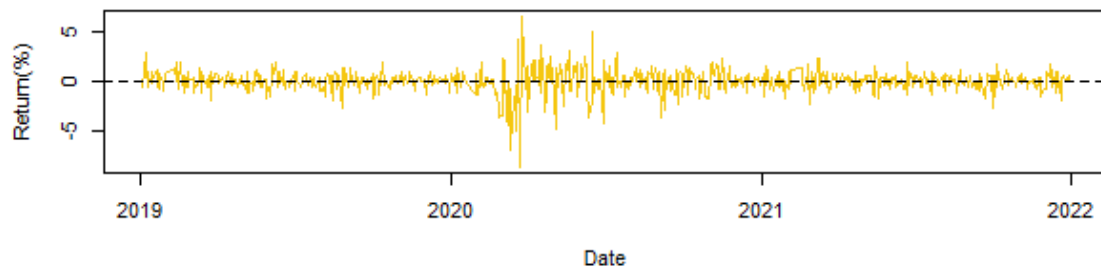
Time series plots of asset returns (00646)



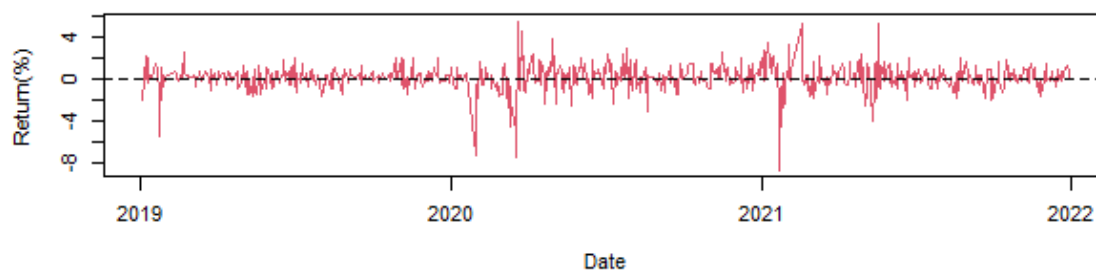
Time series plots of asset returns (00662)



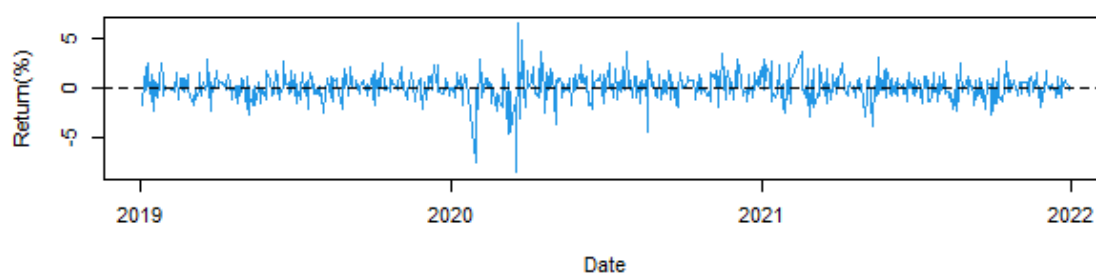
Time series plots of asset returns (00668)



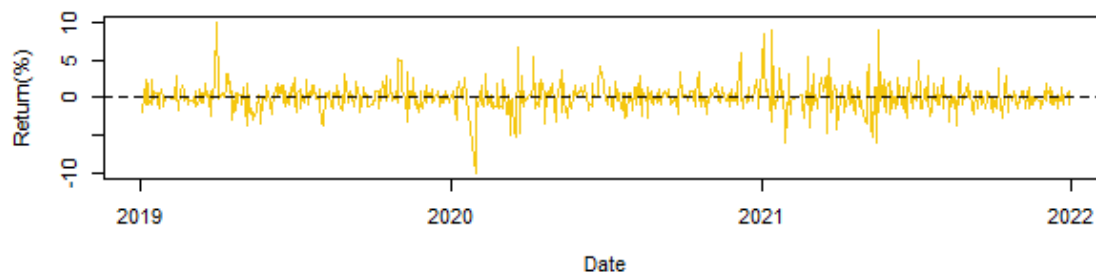
Time series plots of asset returns (00728)



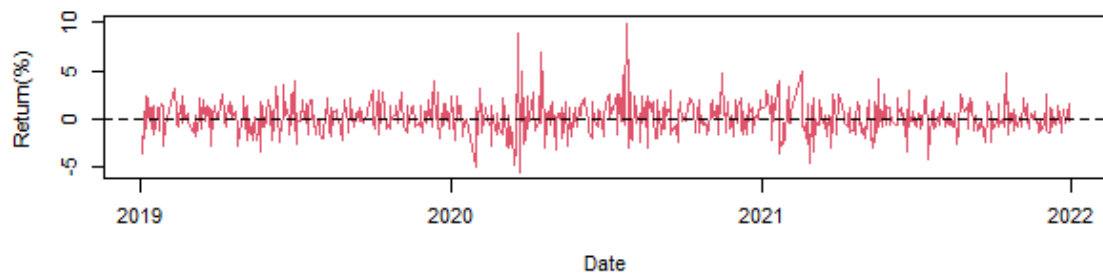
Time series plots of asset returns (00735)



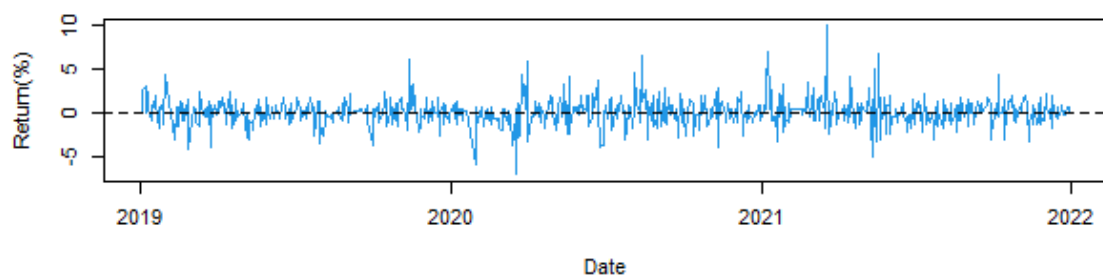
Time series plots of asset returns (2317)



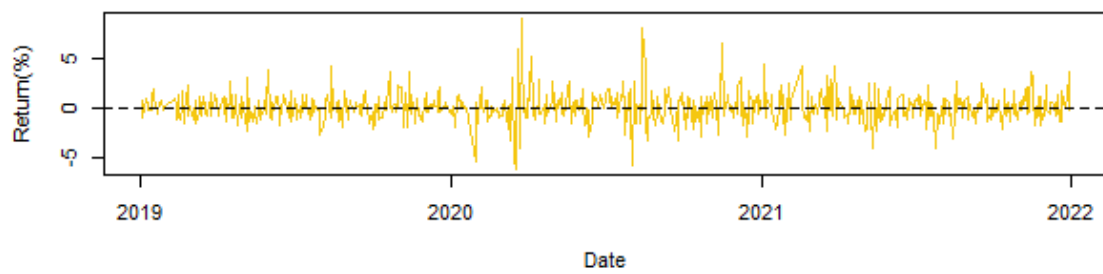
Time series plots of asset returns (2330)



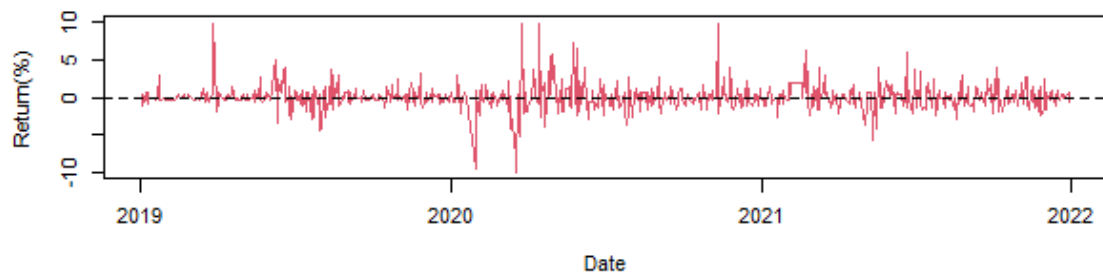
Time series plots of asset returns (2357)



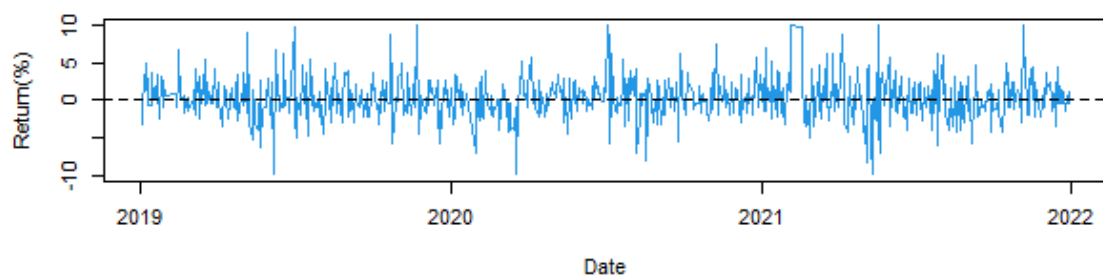
Time series plots of asset returns (2382)



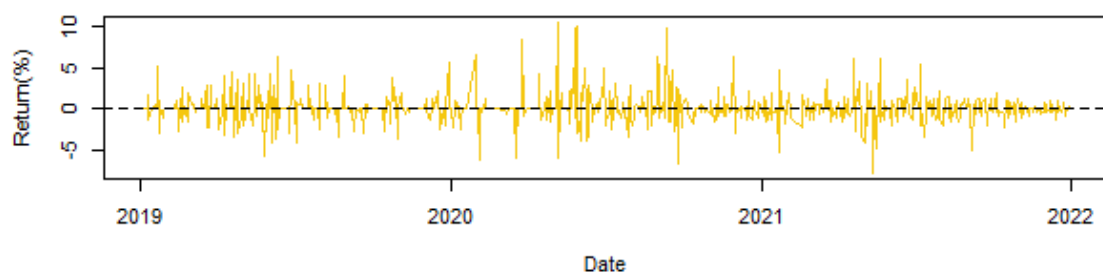
Time series plots of asset returns (2707)



Time series plots of asset returns (3034)



Time series plots of asset returns (5704)



投資組合策略：

1. **fixed weight portfolio**

固定權重：固定投資組合中每一資產在每一期的權重為 $1/21$ 。

2. **buy and hold portfolio**

每一期購買的資產單位數量固定，且在 $t=0$ 時平均分配財富在每一資產上，但權重會在接下來的期間變動。

3. **price weighted portfolio**

以每一資產的價格佔所有資產價格加總的比例為權重，因此價格較高的資產會對投資組合產生較大的影響。

4. **GMVP**

subject to full investment constraints, 在所有可能的投資組合中變異數最小的投資組合。

expected return = 0.051%, std.=0.619%

5. **tangency portfolio**

在 mean-variance frontier 有效率部分切點上的投資組合(including the risk-free asset)。

expected return 0.231%, standard deviation 1.434%

6. **mvp**

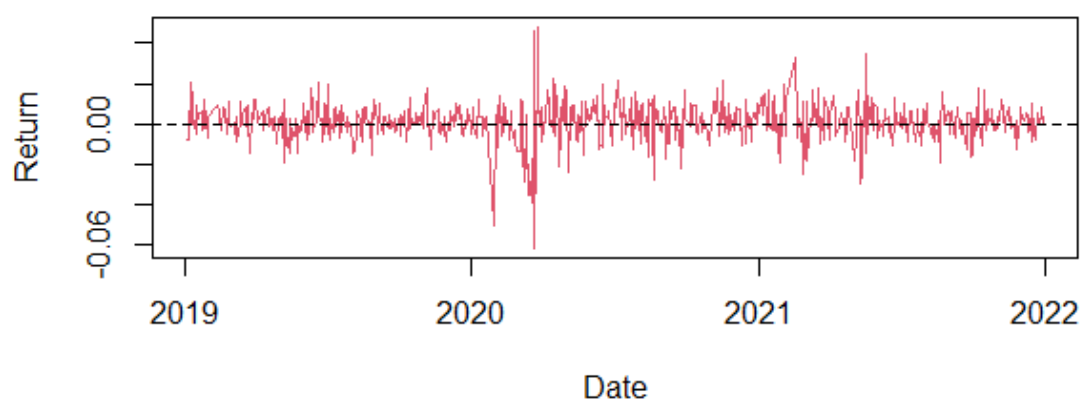
subject to the required expected return and full investment constraints, 在所有可能的投資組合中變異數最小的投資組合。

required expected return = 0.08%, std.=0.653%

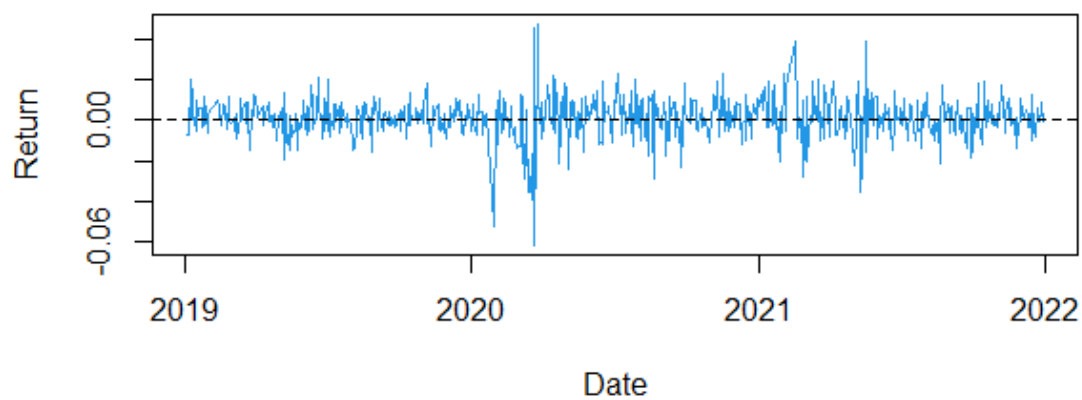
7. **no-shortsale GMVP**

所有權重都大於等於 0 的 GMVP。

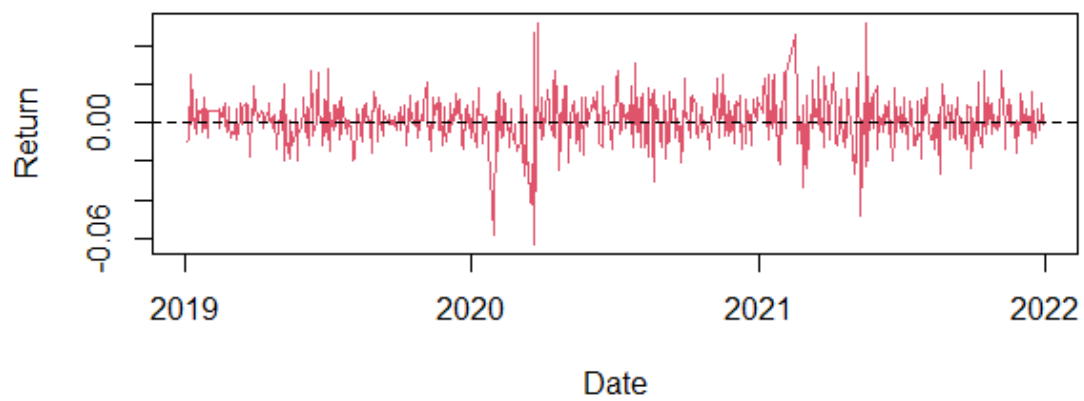
Time series plots of portfolio returns (Fixed weight)



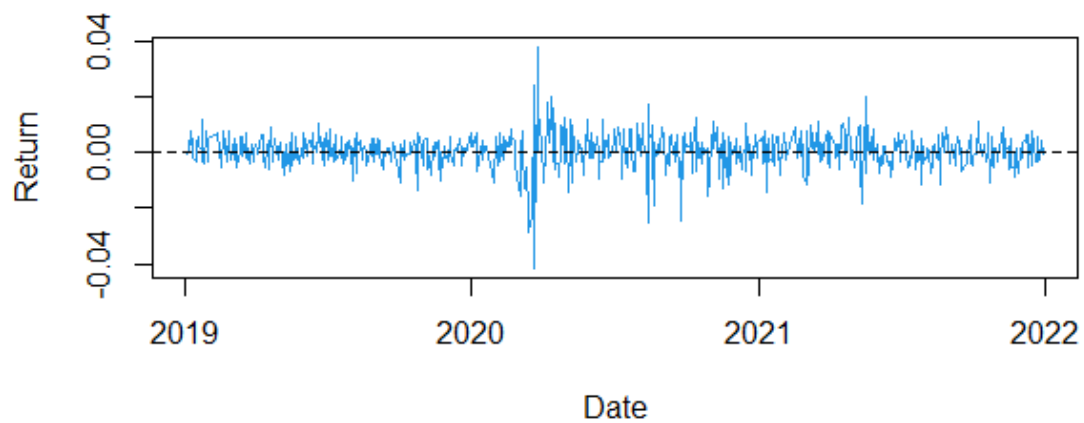
Time series plots of portfolio returns (buy-and-hold)



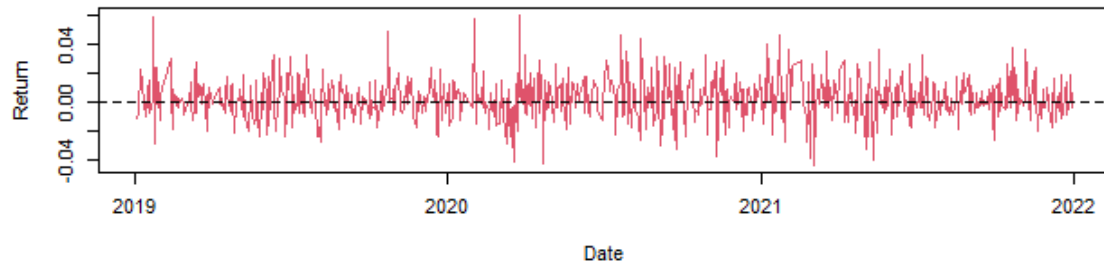
Time series plots of portfolio returns (price weighted)



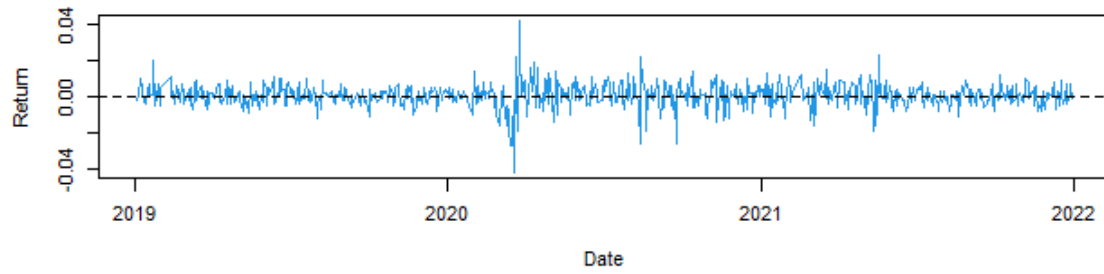
Time series plots of portfolio returns (GMVP)



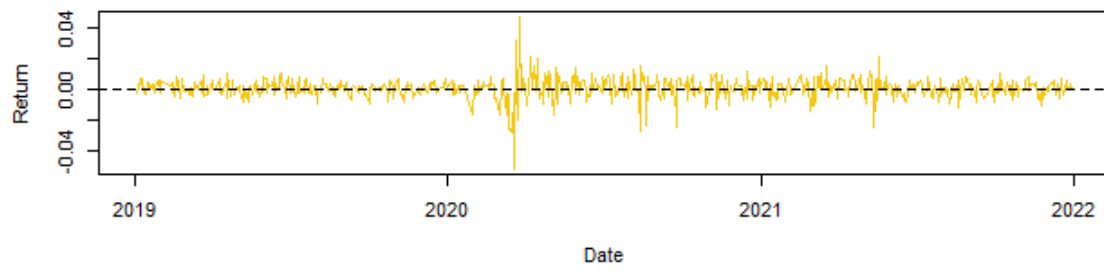
Time series plots of portfolio returns (tangency portfolio)



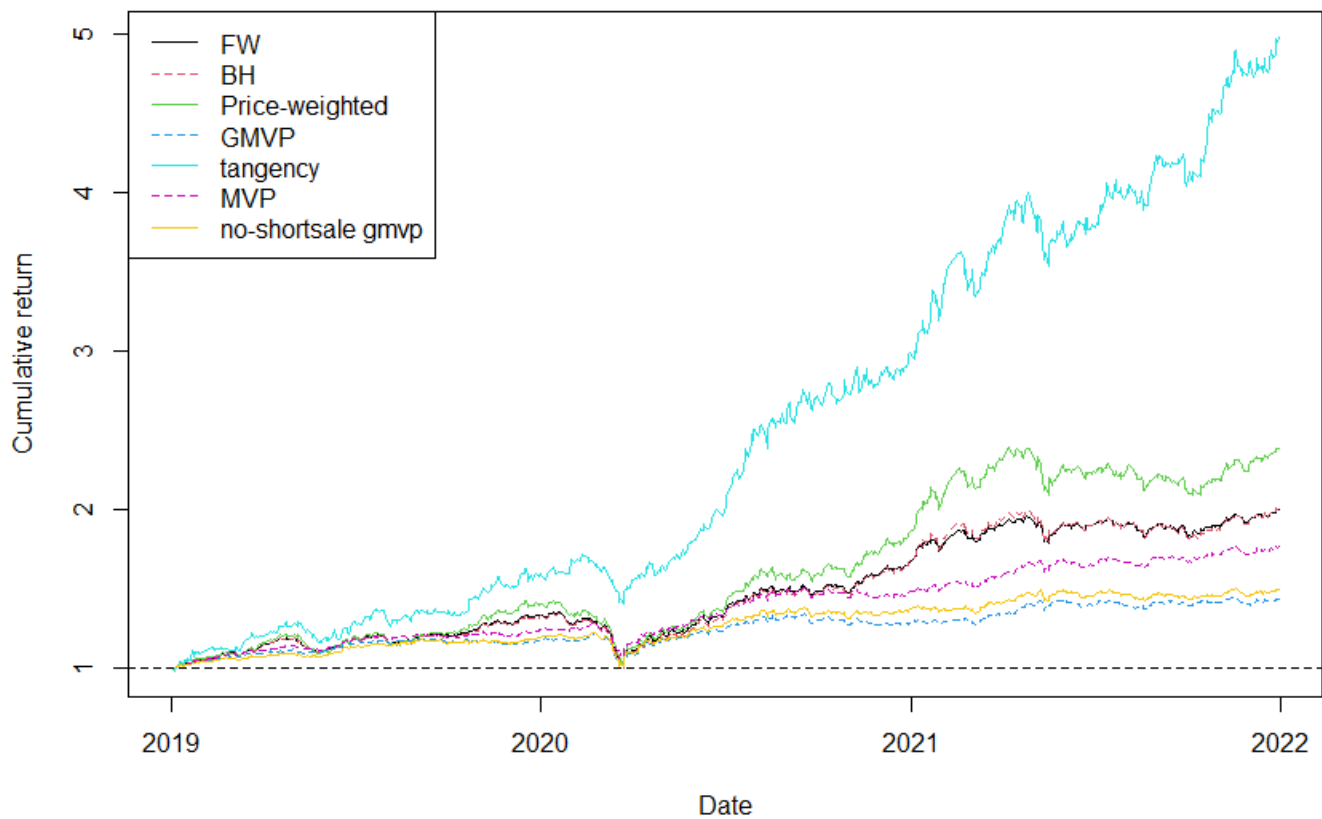
Time series plots of portfolio returns (MVP)



Time series plots of portfolio returns (no-shortsale GMVP)



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



由上圖可見，tangency portfolio 的累積總報酬明顯高於其他六種投資組合，price weighted portfolio 第二，接著是 fixed weight and buy-and-hold portfolio 差別不大。再來 mvp 設定的期望報酬高於 gmvp，因此累積總報酬也較高。最後 no-shortsale gmvp 的累積總報酬略高於 gmvp。

Descriptive statistics of the oos portfolio returns(附檔 summary_por.csv)

	No..of.Obs.	Min	Median	Max	Mean	Std.	SKewness	Kurtosis	ACF1
FW	728	-6.154	32.852	4.803	25.050	14.573	-0.038	0.028	0.014
BH	728	-6.175	31.611	4.751	25.284	15.410	-0.032	0.024	0.018
Price-weighted	728	-6.317	29.909	5.183	31.799	18.427	-0.017	0.015	0.016
GMVP	728	-4.159	18.038	3.791	12.893	9.831	-0.038	0.028	0.049
tangency	728	-4.439	48.047	6.074	58.194	22.758	0.016	0.005	-0.020
MVP	728	-4.161	22.682	4.157	20.160	10.368	-0.023	0.024	0.032
no-shortsale gmvp	728	-5.137	19.238	4.686	14.337	10.453	-0.034	0.048	0.046

Sharpe ratio (annualized)

risk free rate = 0.025/252





	FW	BH	Price-weighted	GMVP	tangency	MVP	no-shortsale gmvp
Sharpe ratio	1.547	1.478	1.59	1.057	2.447	1.703	1.132

在上表中 tangency portfolio 有最高的 Sharpe ratio，GMVP 最低，而其他投資組合都落在這兩者之間，在 mean-variance frontier 上都在有效率的部分。

turnover rate

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	std.
FW	0.003	0.006	0.007	0.010	0.009	1.000	0.046
pw	0.002	0.006	0.008	0.011	0.011	1.000	0.046
gmvp	0.016	0.050	0.082	0.134	0.139	1.831	0.175
tangency	0.150	1.440	2.294	65.131	5.567	19118.488	881.732
mvp	0.022	0.096	0.166	0.218	0.257	1.606	0.206
nsgmvp	0.001	0.009	0.018	0.033	0.032	1.000	0.062

VaR_{0.05}, ES_{0.05}, LPSD of the out-of-sample portfolio returns

	 VaR 	ES 	LPSD 
FW	-0.013	-0.022	0.006
BH	-0.014	-0.023	0.007
PW	-0.016	-0.026	0.008
GMVP	-0.009	-0.015	0.004
tangency	-0.020	-0.028	0.009
MVP	-0.009	-0.015	0.004
NSGMVP	-0.009	-0.016	0.005

在上表中 tangency portfolio 有最低的 VaR and ES 以及最高的 LPSD，代表其高報酬伴隨著高風險的特性，在較差的情境下相對有較高損失；而 GMVP, MVP, no-shortsale GMVP 則有相對於其他投資組合較高的 VaR and ES 以及較低的 LPSD，不過他們的累積總報酬也比其他投資組合低。相對來說，fixed-weighted, buy-and-hold, price-weighted 是較中間的投資組合。