금융데이터분석 1차 과제

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수 강 과 목 : 금융데이터분석
담 당 교 수 :
학 과 :
학 번 :
이 름 :
제 출 일 :

1번 문제

요구조건

- 10개 국가에 대해 Global Compustat에서 월별 기업 단위 데이터 수집

풀이방향

Global Compustat에서 월별 기업 단위 데이터를 수집하기 위해 WRDS ‘comp' 라이브러리에서 'g_secm' 테이블을 사용하여 필요한 정보들을 'month_data_set'에 저장하였습니다. 하지만, 'g_secm' 테이블의 Column을 확인해본 결과 2번 문제에서 필요한 변수 중 하나인 'cshoi' (총 발행 주식 수)를 포함하지 않고 있어 기업의 회계 기초 자료들을 포함하고 있는 ‘g_funda' 테이블에서 'cshoi' 변수만 추출하였습니다.

이후에는 데이터 클리닝 과정을 통해 데이터의 결측치를 줄이고, 데이터 병합 과정을 통해 ‘cshoi_data_set과 ‘month_data_set'을 병합하여 1번 문제에서 요구하는 데이터를 포함한 'data_set'을 만들었습니다.

<data_set 예시>

	gvkey	iid	datadate	ajexm	ajpm	cshtrm	prccm	prchm	prclm
0	001932	01W	2020-03-31	1.0	1.0	167128.582	27.59	32.445	23.82
1	001932	02W	2020-03-31	1.0	1.0	38145.786	598.66	645.17	498.0
2	001932	03W	2020-03-31	1.0	1.0	57.605	30.98	37.265	25.65
3	001932	04W	2020-03-31	1.0	1.0	23539.937	27.385	32.53	23.685
4	002410	01W	2020-03-31	1.0	1.0	2421381.88	3.442	4.2265	2.337

	dvpspm	dvpsxm	fic	loc	cshoi
0	0.0	0.526	GBR	GBR	2288.191
1	0.0	10.789	GBR	GBR	2288.191
2	0.0	0.579	GBR	GBR	2288.191
3	0.0	0.526	GBR	GBR	2288.191
4	0.082	0.0	GBR	GBR	20262.135

2번 문제

요구조건

- 기업 단위 월별 수익률, 시장가치, 국가 단위 월별 수익률 계산

풀이방향

문제에서 요구하는 시장가치와 월별 수익률을 계산하기 위해 조정계수와 날짜들을 조정한 이후,

a)

조정주가 ['prccm_adj'] = 원래 주가 ['prccm'] * 조정계수 ['ajpm'] / ['ajexm']
이전 조정주가 ['prccm_adj_prev'] = 이전 시점의 조정주가 ['prccm_adj'].shift(1)
수익률 ['ret'] = (현재 조정주가 ['prccm_adj'] / 이전조정주가 ['prccm_adj_prev']) - 1
의 방식으로 기업 단위 월별 주식 수익률을 구하였고,

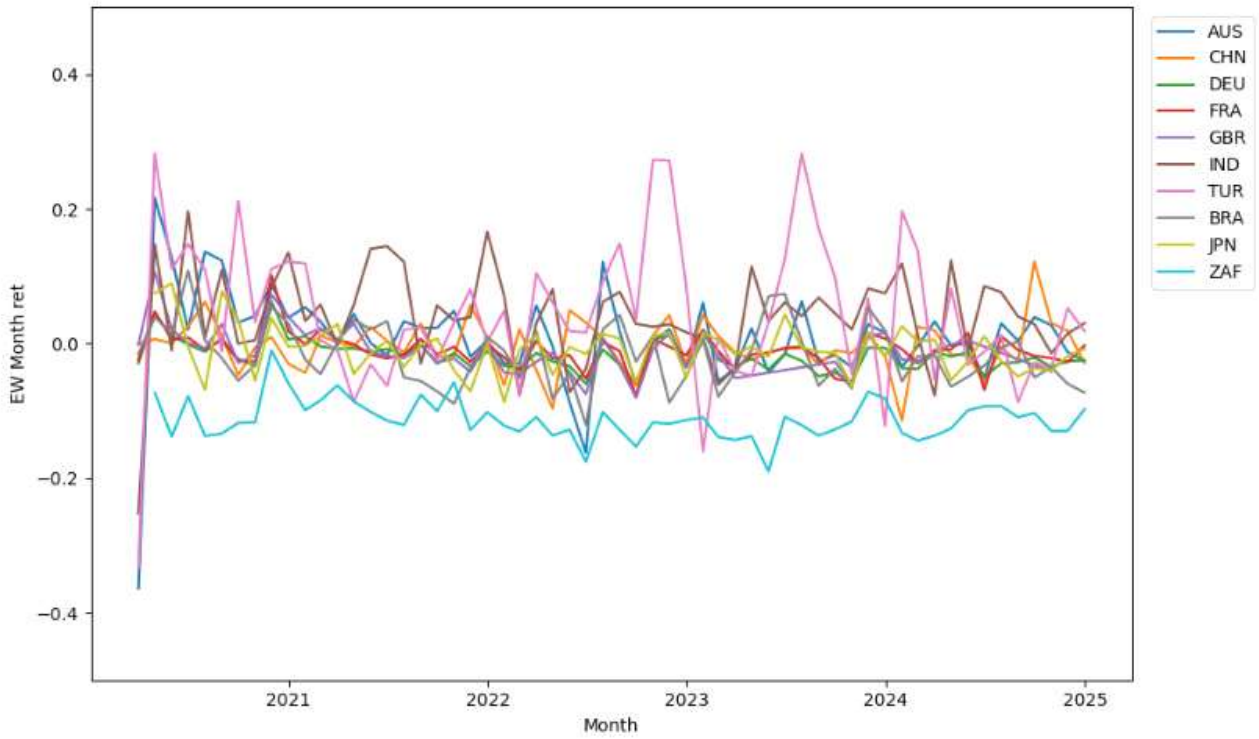
b)

시가총액 ['mktcap'] = 조정주가 ['prccm_adj'] * 발행주식수 ['cshoi']
의 방식으로 기업 단위 시장가치를 계산하였으며,

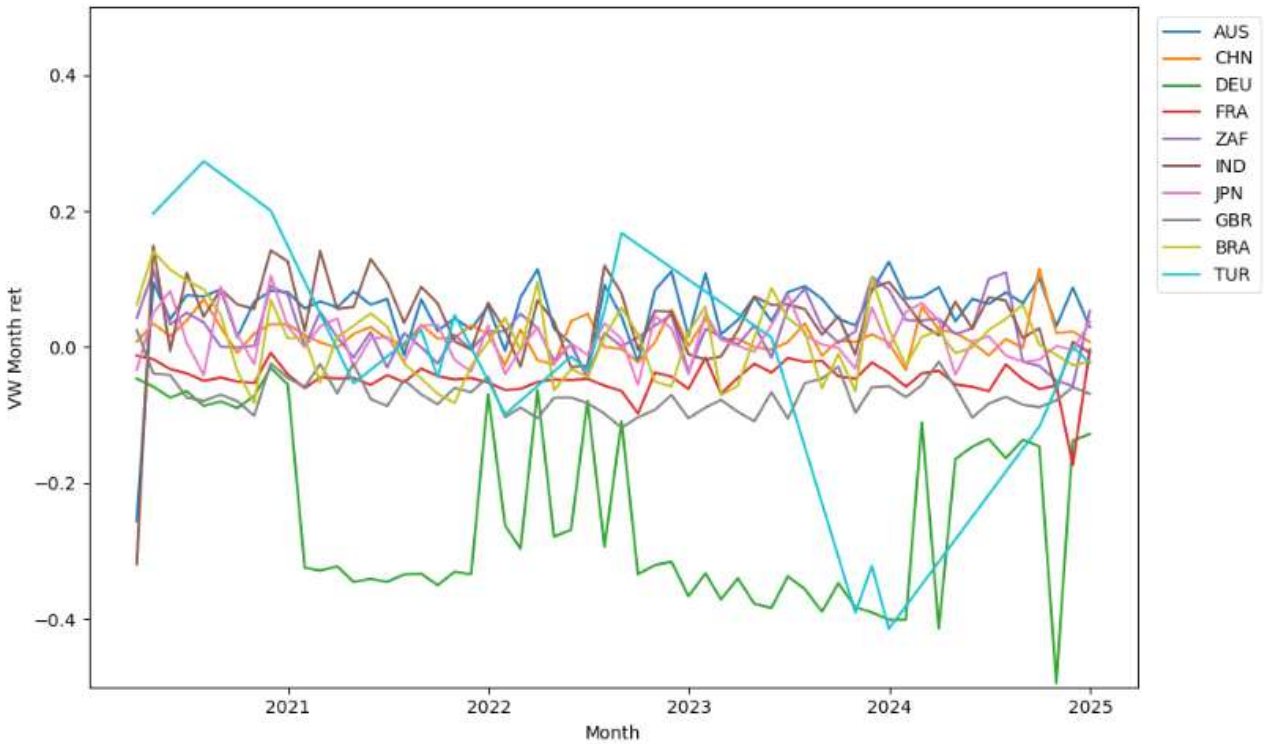
c)

ew_ret 공식과 vw_ret 공식을 이용하여 국가 단위 월별 수익률을 구하였습니다. 국가 단위 ew 수익률과 vw 수익률은 데이터 시각화를 이용하여 그래프로 표현하였습니다.

<국가별 EW 수익률>



<국가별 VW 수익률>



3번 문제

요구조건

- 코로나 시기와 이후 회복 시기 구분하기

풀이방향

2번 문제에서 구한 ew_ret와 vw_ret 데이터셋에

2020/03/01 ~ 2021/12/31: COVID-19 Crisis Period
2022/01/01 ~ 2024/12/31: Post-crisis Recovery Period

로 기간을 나누어 'period' Column을 추가해서 구분하였습니다.

<구분 예시>

```
    fic   datadate    ew_ret                  period
0   AUS 2020-03-31 -0.363848  COVID-19 Crisis Period
1   CHN 2020-03-31 -0.000695  COVID-19 Crisis Period
2   DEU 2020-03-31   -0.0292  COVID-19 Crisis Period
3   FRA 2020-03-31 -0.024308  COVID-19 Crisis Period
4   GBR 2020-03-31 -0.001958  COVID-19 Crisis Period
    fic   datadate    vw_ret                  period
0   AUS 2020-03-31 -0.255902  COVID-19 Crisis Period
1   CHN 2020-03-31  0.007591  COVID-19 Crisis Period
2   DEU 2020-03-31 -0.046432  COVID-19 Crisis Period
3   FRA 2020-03-31 -0.012695  COVID-19 Crisis Period
4   ZAF 2020-03-31  0.042781  COVID-19 Crisis Period
     fic   datadate    ew_ret                       period
564  FRA 2024-12-31 -0.002827  Post-crisis Recovery Period
565  IND 2024-12-31   0.03034  Post-crisis Recovery Period
566  JPN 2024-12-31 -0.008064  Post-crisis Recovery Period
567  BRA 2024-12-31 -0.073026  Post-crisis Recovery Period
568  ZAF 2024-12-31 -0.097649  Post-crisis Recovery Period
     fic   datadate    vw_ret                       period
575  CHN 2024-12-31  0.007445  Post-crisis Recovery Period
576  BRA 2024-12-31 -0.021119  Post-crisis Recovery Period
577  AUS 2024-12-31  0.029164  Post-crisis Recovery Period
578  TUR 2024-12-31 -0.023341  Post-crisis Recovery Period
579  ZAF 2024-12-31  0.053515  Post-crisis Recovery Period
```

4번 문제

요구조건

- 각 국가의 기간별로 EW 수익률과 VW 수익률 구하기

풀이방향

문제에서 요구하는 통계량들을 calc_summary_stats 함수에 정의한 다음, ew_ret와 vw_ret에 적용하여 계산을 하였습니다.

```
# summary statistics 함수 정의
def calc_summary_stats(x):
    return pd.Series({
        'mean': x.mean(),
        'median': x.median(),
        'std': x.std(),
        'min': x.min(),
        'max': x.max(),
        'autocorr': x.autocorr(lag=1),
        'skewness': skew(x.dropna()),
        'excess_kurtosis': kurtosis(x.dropna(), fisher=True)
    })
```

<각 국가의 기간별 EW 수익률>

fic	period	level_2	ew_ret
AUS	COVID-19 Crisis Period	mean	0.031236
AUS	COVID-19 Crisis Period	median	0.032834
AUS	COVID-19 Crisis Period	std	0.105
AUS	COVID-19 Crisis Period	min	-0.36385
AUS	COVID-19 Crisis Period	max	0.216654
AUS	COVID-19 Crisis Period	autocorr	-0.36884
AUS	COVID-19 Crisis Period	skewness	-2.21331
AUS	COVID-19 Crisis Period	excess_kurtosis	7.610695

fic	period	level_2	ew_ret
AUS	Post-crisis Recovery Period	mean	-0.00633
AUS	Post-crisis Recovery Period	median	-0.00413
AUS	Post-crisis Recovery Period	std	0.049326
AUS	Post-crisis Recovery Period	min	-0.16224
AUS	Post-crisis Recovery Period	max	0.121431
AUS	Post-crisis Recovery Period	autocorr	-0.17538
AUS	Post-crisis Recovery Period	skewness	-0.38007
AUS	Post-crisis Recovery Period	excess_kurtosis	1.953775

fic	period	level_2	ew_ret
BRA	COVID-19 Crisis Period	mean	-0.00656
BRA	COVID-19 Crisis Period	median	-0.00702
BRA	COVID-19 Crisis Period	std	0.047202
BRA	COVID-19 Crisis Period	min	-0.08942
BRA	COVID-19 Crisis Period	max	0.108458
BRA	COVID-19 Crisis Period	autocorr	0.426854
BRA	COVID-19 Crisis Period	skewness	0.372518
BRA	COVID-19 Crisis Period	excess_kurtosis	-0.13323

fic	period	level_2	ew_ret
BRA	Post-crisis Recovery Period	mean	-0.02533
BRA	Post-crisis Recovery Period	median	-0.03407
BRA	Post-crisis Recovery Period	std	0.04542
BRA	Post-crisis Recovery Period	min	-0.12099
BRA	Post-crisis Recovery Period	max	0.073624
BRA	Post-crisis Recovery Period	autocorr	0.139344
BRA	Post-crisis Recovery Period	skewness	0.358239
BRA	Post-crisis Recovery Period	excess_kurtosis	-0.3117

fic	period	level_2	ew_ret
CHN	COVID-19 Crisis Period	mean	0.003159
CHN	COVID-19 Crisis Period	median	0.00322
CHN	COVID-19 Crisis Period	std	0.027173
CHN	COVID-19 Crisis Period	min	-0.04726
CHN	COVID-19 Crisis Period	max	0.061902
CHN	COVID-19 Crisis Period	autocorr	0.067583
CHN	COVID-19 Crisis Period	skewness	0.25682
CHN	COVID-19 Crisis Period	excess_kurtosis	0.145072

fic	period	level_2	ew_ret
CHN	Post-crisis Recovery Period	mean	-0.00775
CHN	Post-crisis Recovery Period	median	-0.01151
CHN	Post-crisis Recovery Period	std	0.043026
CHN	Post-crisis Recovery Period	min	-0.11465
CHN	Post-crisis Recovery Period	max	0.121738
CHN	Post-crisis Recovery Period	autocorr	-0.01758
CHN	Post-crisis Recovery Period	skewness	0.136813
CHN	Post-crisis Recovery Period	excess_kurtosis	1.56599

fic	period	level_2	ew_ret
DEU	COVID-19 Crisis Period	mean	-0.00477
DEU	COVID-19 Crisis Period	median	-0.00799
DEU	COVID-19 Crisis Period	std	0.023154
DEU	COVID-19 Crisis Period	min	-0.03389
DEU	COVID-19 Crisis Period	max	0.062175
DEU	COVID-19 Crisis Period	autocorr	-0.04775
DEU	COVID-19 Crisis Period	skewness	1.32555
DEU	COVID-19 Crisis Period	excess_kurtosis	1.866468

fic	period	level_2	ew_ret
DEU	Post-crisis Recovery Period	mean	-0.02708
DEU	Post-crisis Recovery Period	median	-0.0272
DEU	Post-crisis Recovery Period	std	0.019545
DEU	Post-crisis Recovery Period	min	-0.07913
DEU	Post-crisis Recovery Period	max	0.018322
DEU	Post-crisis Recovery Period	autocorr	-0.08916
DEU	Post-crisis Recovery Period	skewness	-0.03918
DEU	Post-crisis Recovery Period	excess_kurtosis	0.69133

fic	period	level_2	ew_ret
FRA	COVID-19 Crisis Period	mean	0.001298
FRA	COVID-19 Crisis Period	median	-0.00154
FRA	COVID-19 Crisis Period	std	0.029008
FRA	COVID-19 Crisis Period	min	-0.02712
FRA	COVID-19 Crisis Period	max	0.101559
FRA	COVID-19 Crisis Period	autocorr	-0.02893
FRA	COVID-19 Crisis Period	skewness	2.011847
FRA	COVID-19 Crisis Period	excess_kurtosis	4.659513

fic	period	level_2	ew_ret
FRA	Post-crisis Recovery Period	mean	-0.01697
FRA	Post-crisis Recovery Period	median	-0.01235
FRA	Post-crisis Recovery Period	std	0.023272
FRA	Post-crisis Recovery Period	min	-0.07822
FRA	Post-crisis Recovery Period	max	0.020751
FRA	Post-crisis Recovery Period	autocorr	-0.21206
FRA	Post-crisis Recovery Period	skewness	-0.81116
FRA	Post-crisis Recovery Period	excess_kurtosis	0.334364

fic	period	level_2	ew_ret
GBR	COVID-19 Crisis Period	mean	0.006204
GBR	COVID-19 Crisis Period	median	-0.00103
GBR	COVID-19 Crisis Period	std	0.034764
GBR	COVID-19 Crisis Period	min	-0.04203
GBR	COVID-19 Crisis Period	max	0.106306
GBR	COVID-19 Crisis Period	autocorr	0.203535
GBR	COVID-19 Crisis Period	skewness	1.264537
GBR	COVID-19 Crisis Period	excess_kurtosis	1.51885

fic	period	level_2	ew_ret
GBR	Post-crisis Recovery Period	mean	-0.02441
GBR	Post-crisis Recovery Period	median	-0.02687
GBR	Post-crisis Recovery Period	std	0.02774
GBR	Post-crisis Recovery Period	min	-0.08044
GBR	Post-crisis Recovery Period	max	0.018545
GBR	Post-crisis Recovery Period	autocorr	-0.04128
GBR	Post-crisis Recovery Period	skewness	-0.15694
GBR	Post-crisis Recovery Period	excess_kurtosis	-0.71175

fic	period	level_2	ew_ret
IND	COVID-19 Crisis Period	mean	0.056408
IND	COVID-19 Crisis Period	median	0.056933
IND	COVID-19 Crisis Period	std	0.094854
IND	COVID-19 Crisis Period	min	-0.25256
IND	COVID-19 Crisis Period	max	0.196148
IND	COVID-19 Crisis Period	autocorr	-0.3704
IND	COVID-19 Crisis Period	skewness	-1.37537
IND	COVID-19 Crisis Period	excess_kurtosis	3.158293

fic	period	level_2	ew_ret
IND	Post-crisis Recovery Period	mean	0.030905
IND	Post-crisis Recovery Period	median	0.030427
IND	Post-crisis Recovery Period	std	0.053333
IND	Post-crisis Recovery Period	min	-0.0774
IND	Post-crisis Recovery Period	max	0.123757
IND	Post-crisis Recovery Period	autocorr	-0.05221
IND	Post-crisis Recovery Period	skewness	-0.43436
IND	Post-crisis Recovery Period	excess_kurtosis	-0.34618

fic	period	level_2	ew_ret
JPN	COVID-19 Crisis Period	mean	-0.0291
JPN	COVID-19 Crisis Period	median	-0.00236
JPN	COVID-19 Crisis Period	std	0.147882
JPN	COVID-19 Crisis Period	min	-0.66073
JPN	COVID-19 Crisis Period	max	0.089555
JPN	COVID-19 Crisis Period	autocorr	-0.33988
JPN	COVID-19 Crisis Period	skewness	-3.72476
JPN	COVID-19 Crisis Period	excess_kurtosis	13.65543

fic	period	level_2	ew_ret
JPN	Post-crisis Recovery Period	mean	-0.01379
JPN	Post-crisis Recovery Period	median	-0.0105
JPN	Post-crisis Recovery Period	std	0.028644
JPN	Post-crisis Recovery Period	min	-0.08718
JPN	Post-crisis Recovery Period	max	0.042919
JPN	Post-crisis Recovery Period	autocorr	-0.13649
JPN	Post-crisis Recovery Period	skewness	-0.49657
JPN	Post-crisis Recovery Period	excess_kurtosis	-0.17519

fic	period	level_2	ew_ret
TUR	COVID-19 Crisis Period	mean	0.038634
TUR	COVID-19 Crisis Period	median	0.027868
TUR	COVID-19 Crisis Period	std	0.122146
TUR	COVID-19 Crisis Period	min	-0.33328
TUR	COVID-19 Crisis Period	max	0.282849
TUR	COVID-19 Crisis Period	autocorr	-0.16319
TUR	COVID-19 Crisis Period	skewness	-0.85677
TUR	COVID-19 Crisis Period	excess_kurtosis	2.448847

fic	period	level_2	ew_ret
TUR	Post-crisis Recovery Period	mean	0.047119
TUR	Post-crisis Recovery Period	median	0.033509
TUR	Post-crisis Recovery Period	std	0.106898
TUR	Post-crisis Recovery Period	min	-0.16083
TUR	Post-crisis Recovery Period	max	0.282757
TUR	Post-crisis Recovery Period	autocorr	0.272452
TUR	Post-crisis Recovery Period	skewness	0.488214
TUR	Post-crisis Recovery Period	excess_kurtosis	-0.08879

fic	period	level_2	ew_ret
ZAF	COVID-19 Crisis Period	mean	-0.11373
ZAF	COVID-19 Crisis Period	median	-0.10101
ZAF	COVID-19 Crisis Period	std	0.092815
ZAF	COVID-19 Crisis Period	min	-0.50457
ZAF	COVID-19 Crisis Period	max	-0.00995
ZAF	COVID-19 Crisis Period	autocorr	-0.13133
ZAF	COVID-19 Crisis Period	skewness	-3.53082
ZAF	COVID-19 Crisis Period	excess_kurtosis	12.78742

fic	period	level_2	ew_ret
ZAF	Post-crisis Recovery Period	mean	-0.12262
ZAF	Post-crisis Recovery Period	median	-0.12408
ZAF	Post-crisis Recovery Period	std	0.023607
ZAF	Post-crisis Recovery Period	min	-0.18993
ZAF	Post-crisis Recovery Period	max	-0.07144
ZAF	Post-crisis Recovery Period	autocorr	0.208668
ZAF	Post-crisis Recovery Period	skewness	-0.46526
ZAF	Post-crisis Recovery Period	excess_kurtosis	0.996945

<각 국가의 기간별 VW 수익률>

fic	period	level_2	vw_ret
AUS	COVID-19 Crisis Period	mean	0.043987
AUS	COVID-19 Crisis Period	median	0.064464
AUS	COVID-19 Crisis Period	std	0.07191
AUS	COVID-19 Crisis Period	min	-0.2559
AUS	COVID-19 Crisis Period	max	0.094755
AUS	COVID-19 Crisis Period	autocorr	-0.34233
AUS	COVID-19 Crisis Period	skewness	-3.49782
AUS	COVID-19 Crisis Period	excess_kurtosis	12.14579

fic	period	level_2	vw_ret
AUS	Post-crisis Recovery Period	mean	0.058121
AUS	Post-crisis Recovery Period	median	0.070892
AUS	Post-crisis Recovery Period	std	0.039627
AUS	Post-crisis Recovery Period	min	-0.04651
AUS	Post-crisis Recovery Period	max	0.125495
AUS	Post-crisis Recovery Period	autocorr	-0.08189
AUS	Post-crisis Recovery Period	skewness	-0.60494
AUS	Post-crisis Recovery Period	excess_kurtosis	-0.02297

fic	period	level_2	vw_ret
BRA	COVID-19 Crisis Period	mean	0.016205
BRA	COVID-19 Crisis Period	median	0.014093
BRA	COVID-19 Crisis Period	std	0.063779
BRA	COVID-19 Crisis Period	min	-0.08235
BRA	COVID-19 Crisis Period	max	0.140475
BRA	COVID-19 Crisis Period	autocorr	0.631929
BRA	COVID-19 Crisis Period	skewness	0.124288
BRA	COVID-19 Crisis Period	excess_kurtosis	-0.88277

fic	period	level_2	vw_ret
BRA	Post-crisis Recovery Period	mean	0.004484
BRA	Post-crisis Recovery Period	median	0.00873
BRA	Post-crisis Recovery Period	std	0.047148
BRA	Post-crisis Recovery Period	min	-0.07092
BRA	Post-crisis Recovery Period	max	0.101449
BRA	Post-crisis Recovery Period	autocorr	0.048686
BRA	Post-crisis Recovery Period	skewness	0.189066
BRA	Post-crisis Recovery Period	excess_kurtosis	-0.71892

fic	period	level_2	vw_ret
CHN	COVID-19 Crisis Period	mean	0.02143
CHN	COVID-19 Crisis Period	median	0.019258
CHN	COVID-19 Crisis Period	std	0.016918
CHN	COVID-19 Crisis Period	min	-0.00863
CHN	COVID-19 Crisis Period	max	0.070636
CHN	COVID-19 Crisis Period	autocorr	0.159269
CHN	COVID-19 Crisis Period	skewness	0.807822
CHN	COVID-19 Crisis Period	excess_kurtosis	1.487684

fic	period	level_2	vw_ret
CHN	Post-crisis Recovery Period	mean	0.012649
CHN	Post-crisis Recovery Period	median	0.007429
CHN	Post-crisis Recovery Period	std	0.028583
CHN	Post-crisis Recovery Period	min	-0.03421
CHN	Post-crisis Recovery Period	max	0.115504
CHN	Post-crisis Recovery Period	autocorr	-0.08628
CHN	Post-crisis Recovery Period	skewness	1.274786
CHN	Post-crisis Recovery Period	excess_kurtosis	2.98967

fic	period	level_2	vw_ret
DEU	COVID-19 Crisis Period	mean	-0.20075
DEU	COVID-19 Crisis Period	median	-0.20613
DEU	COVID-19 Crisis Period	std	0.138513
DEU	COVID-19 Crisis Period	min	-0.35019
DEU	COVID-19 Crisis Period	max	-0.03052
DEU	COVID-19 Crisis Period	autocorr	0.806158
DEU	COVID-19 Crisis Period	skewness	0.017682
DEU	COVID-19 Crisis Period	excess_kurtosis	-1.95887

fic	period	level_2	vw_ret
DEU	Post-crisis Recovery Period	mean	-0.27711
DEU	Post-crisis Recovery Period	median	-0.31815
DEU	Post-crisis Recovery Period	std	0.117431
DEU	Post-crisis Recovery Period	min	-0.49431
DEU	Post-crisis Recovery Period	max	-0.06365
DEU	Post-crisis Recovery Period	autocorr	0.181638
DEU	Post-crisis Recovery Period	skewness	0.351489
DEU	Post-crisis Recovery Period	excess_kurtosis	-1.18737

fic	period	level_2	vw_ret
FRA	COVID-19 Crisis Period	mean	-0.04153
FRA	COVID-19 Crisis Period	median	-0.04515
FRA	COVID-19 Crisis Period	std	0.013559
FRA	COVID-19 Crisis Period	min	-0.06044
FRA	COVID-19 Crisis Period	max	-0.0084
FRA	COVID-19 Crisis Period	autocorr	0.247014
FRA	COVID-19 Crisis Period	skewness	1.177983
FRA	COVID-19 Crisis Period	excess_kurtosis	0.623097

fic	period	level_2	vw_ret
FRA	Post-crisis Recovery Period	mean	-0.04885
FRA	Post-crisis Recovery Period	median	-0.04713
FRA	Post-crisis Recovery Period	std	0.028375
FRA	Post-crisis Recovery Period	min	-0.17327
FRA	Post-crisis Recovery Period	max	-0.00376
FRA	Post-crisis Recovery Period	autocorr	-0.09625
FRA	Post-crisis Recovery Period	skewness	-2.29511
FRA	Post-crisis Recovery Period	excess_kurtosis	8.549689

fic	period	level_2	vw_ret
GBR	COVID-19 Crisis Period	mean	-0.05634
GBR	COVID-19 Crisis Period	median	-0.06325
GBR	COVID-19 Crisis Period	std	0.028152
GBR	COVID-19 Crisis Period	min	-0.10103
GBR	COVID-19 Crisis Period	max	0.024909
GBR	COVID-19 Crisis Period	autocorr	0.11978
GBR	COVID-19 Crisis Period	skewness	1.010574
GBR	COVID-19 Crisis Period	excess_kurtosis	1.228861

fic	period	level_2	vw_ret
GBR	Post-crisis Recovery Period	mean	-0.07914
GBR	Post-crisis Recovery Period	median	-0.08034
GBR	Post-crisis Recovery Period	std	0.022625
GBR	Post-crisis Recovery Period	min	-0.11868
GBR	Post-crisis Recovery Period	max	-0.0215
GBR	Post-crisis Recovery Period	autocorr	0.320825
GBR	Post-crisis Recovery Period	skewness	0.549657
GBR	Post-crisis Recovery Period	excess_kurtosis	-0.07259

fic	period	level_2	vw_ret
IND	COVID-19 Crisis Period	mean	0.05511
IND	COVID-19 Crisis Period	median	0.063504
IND	COVID-19 Crisis Period	std	0.095721
IND	COVID-19 Crisis Period	min	-0.31928
IND	COVID-19 Crisis Period	max	0.149159
IND	COVID-19 Crisis Period	autocorr	-0.42219
IND	COVID-19 Crisis Period	skewness	-2.7707
IND	COVID-19 Crisis Period	excess_kurtosis	8.849301

fic	period	level_2	vw_ret
IND	Post-crisis Recovery Period	mean	0.031743
IND	Post-crisis Recovery Period	median	0.030292
IND	Post-crisis Recovery Period	std	0.042006
IND	Post-crisis Recovery Period	min	-0.0632
IND	Post-crisis Recovery Period	max	0.120052
IND	Post-crisis Recovery Period	autocorr	0.181172
IND	Post-crisis Recovery Period	skewness	-0.15336
IND	Post-crisis Recovery Period	excess_kurtosis	-0.64365

fic	period	level_2	vw_ret
JPN	COVID-19 Crisis Period	mean	0.016889
JPN	COVID-19 Crisis Period	median	0.016594
JPN	COVID-19 Crisis Period	std	0.04147
JPN	COVID-19 Crisis Period	min	-0.04155
JPN	COVID-19 Crisis Period	max	0.105589
JPN	COVID-19 Crisis Period	autocorr	-0.20413
JPN	COVID-19 Crisis Period	skewness	0.454565
JPN	COVID-19 Crisis Period	excess_kurtosis	-0.51494

fic	period	level_2	vw_ret
JPN	Post-crisis Recovery Period	mean	0.008543
JPN	Post-crisis Recovery Period	median	0.004646
JPN	Post-crisis Recovery Period	std	0.032264
JPN	Post-crisis Recovery Period	min	-0.05532
JPN	Post-crisis Recovery Period	max	0.076333
JPN	Post-crisis Recovery Period	autocorr	-0.0565
JPN	Post-crisis Recovery Period	skewness	0.104402
JPN	Post-crisis Recovery Period	excess_kurtosis	-0.62074

fic	period	level_2	vw_ret
TUR	COVID-19 Crisis Period	mean	-0.50366
TUR	COVID-19 Crisis Period	median	-0.81483
TUR	COVID-19 Crisis Period	std	0.458762
TUR	COVID-19 Crisis Period	min	-0.8771
TUR	COVID-19 Crisis Period	max	0.27321
TUR	COVID-19 Crisis Period	autocorr	-0.11668
TUR	COVID-19 Crisis Period	skewness	0.638721
TUR	COVID-19 Crisis Period	excess_kurtosis	-1.47435

fic	period	level_2	vw_ret
TUR	Post-crisis Recovery Period	mean	-0.55094
TUR	Post-crisis Recovery Period	median	-0.78285
TUR	Post-crisis Recovery Period	std	0.372296
TUR	Post-crisis Recovery Period	min	-0.89172
TUR	Post-crisis Recovery Period	max	0.167647
TUR	Post-crisis Recovery Period	autocorr	0.485042
TUR	Post-crisis Recovery Period	skewness	0.646714
TUR	Post-crisis Recovery Period	excess_kurtosis	-1.26536

fic	period	level_2	vw_ret
ZAF	COVID-19 Crisis Period	mean	0.023671
ZAF	COVID-19 Crisis Period	median	0.01911
ZAF	COVID-19 Crisis Period	std	0.036277
ZAF	COVID-19 Crisis Period	min	-0.03008
ZAF	COVID-19 Crisis Period	max	0.112534
ZAF	COVID-19 Crisis Period	autocorr	0.225576
ZAF	COVID-19 Crisis Period	skewness	0.806077
ZAF	COVID-19 Crisis Period	excess_kurtosis	0.146776

fic	period	level_2	vw_ret
ZAF	Post-crisis Recovery Period	mean	0.023426
ZAF	Post-crisis Recovery Period	median	0.024899
ZAF	Post-crisis Recovery Period	std	0.04192
ZAF	Post-crisis Recovery Period	min	-0.05741
ZAF	Post-crisis Recovery Period	max	0.109802
ZAF	Post-crisis Recovery Period	autocorr	0.33556
ZAF	Post-crisis Recovery Period	skewness	0.133799
ZAF	Post-crisis Recovery Period	excess_kurtosis	-0.28521

5번 문제

요구조건

- 선진국과 신흥국의 통계량 비교

풀이방향

a)

선진국과 신흥국을 각각 developed와 emerging으로 분류한 다음, ew_ret와 vw_ret 데이터셋에도 분류를 하였습니다. 이후에는 위의 4번 문제에서 선언한 calc_summary_stats 함수를 이용하여 그룹간 통계량을 구하였습니다. 이에 따른 통계량의 결과표는 밑에 첨부하였습니다.

b)

신흥국 시장과 선진국 시장을 비교해보았을 때,

변동성(std): 코로나 시기와 회복 시기 모두 신흥국의 변동성이 높습니다. (EW 수익률, VW 수익률 모두)

왜도(skewness): EW 수익률 기준 코로나 시기와 회복 시기 모두 선진국이 신흥국보다 강한 음의 왜도, VW 수익률 기준 신흥국이 코로나 시기와 회복 시기 모두 신흥국이 선진국보다 강한 음의 왜도를 보이고 있습니다.

심각한 위기 경향 (excess_kurtosis): EW 수익률 기준 코로나 시기와 회복 시기 모두 선진국이 신흥국보다 심각한 위기 경향이 있으며, VW 수익률 기준 코로나 시기와 회복 시기 모두 신흥국이 선진국보다 심각한 위기 경향이 있습니다.

c)

이외에도 여러 통계량들을 종합하여 분석해보면, 선진국은 회복 속도와 정상화 측면에서 팬데믹 충격에서 신흥국보다 더 빠르고 안정적으로 시장 분포가 회복되었습니다. 반면 신흥국은 전반적으로 회복 특성을 보이나 지연성이 뚜렷하며, 일부 극단적 위험 분포가 지속적으로 나타납니다.

<선진국과 신흥국의 기간별 EW 수익률 통계량>

group	period	level_2	ew_ret
developed	COVID-19 Crisis Period	mean	0.000974
developed	COVID-19 Crisis Period	median	-0.0008
developed	COVID-19 Crisis Period	std	0.084942
developed	COVID-19 Crisis Period	min	-0.66073
developed	COVID-19 Crisis Period	max	0.216654
developed	COVID-19 Crisis Period	autocorr	0.071995
developed	COVID-19 Crisis Period	skewness	-4.77397
developed	COVID-19 Crisis Period	excess_kurtosis	34.87848

group	period	level_2	ew_ret
developed	Post-crisis Recovery Period	mean	-0.01728
developed	Post-crisis Recovery Period	median	-0.01711
developed	Post-crisis Recovery Period	std	0.032196
developed	Post-crisis Recovery Period	min	-0.16224
developed	Post-crisis Recovery Period	max	0.121431
developed	Post-crisis Recovery Period	autocorr	0.29391
developed	Post-crisis Recovery Period	skewness	-0.0152
developed	Post-crisis Recovery Period	excess_kurtosis	3.411828

group	period	level_2	ew_ret
emerging	COVID-19 Crisis Period	mean	-0.00442
emerging	COVID-19 Crisis Period	median	0.000844
emerging	COVID-19 Crisis Period	std	0.101902
emerging	COVID-19 Crisis Period	min	-0.50457
emerging	COVID-19 Crisis Period	max	0.282849
emerging	COVID-19 Crisis Period	autocorr	-0.0221
emerging	COVID-19 Crisis Period	skewness	-1.04065
emerging	COVID-19 Crisis Period	excess_kurtosis	5.262634

group	period	level_2	ew_ret
emerging	Post-crisis Recovery Period	mean	-0.01554
emerging	Post-crisis Recovery Period	median	-0.01541
emerging	Post-crisis Recovery Period	std	0.085006
emerging	Post-crisis Recovery Period	min	-0.18993
emerging	Post-crisis Recovery Period	max	0.282757
emerging	Post-crisis Recovery Period	autocorr	-0.1167
emerging	Post-crisis Recovery Period	skewness	0.63878
emerging	Post-crisis Recovery Period	excess_kurtosis	0.980373

<선진국과 신흥국의 기간별 VW 수익률 통계량>

group	period	level_2	vw_ret
developed	COVID-19 Crisis Period	mean	-0.04755
developed	COVID-19 Crisis Period	median	-0.04066
developed	COVID-19 Crisis Period	std	0.111809
developed	COVID-19 Crisis Period	min	-0.35019
developed	COVID-19 Crisis Period	max	0.105589
developed	COVID-19 Crisis Period	autocorr	-0.00429
developed	COVID-19 Crisis Period	skewness	-1.51412
developed	COVID-19 Crisis Period	excess_kurtosis	1.913948

group	period	level_2	vw_ret
developed	Post-crisis Recovery Period	mean	-0.06769
developed	Post-crisis Recovery Period	median	-0.04653
developed	Post-crisis Recovery Period	std	0.129361
developed	Post-crisis Recovery Period	min	-0.49431
developed	Post-crisis Recovery Period	max	0.125495
developed	Post-crisis Recovery Period	autocorr	-0.10939
developed	Post-crisis Recovery Period	skewness	-1.29164
developed	Post-crisis Recovery Period	excess_kurtosis	1.176181

group	period	level_2	vw_ret
emerging	COVID-19 Crisis Period	mean	-0.07745
emerging	COVID-19 Crisis Period	median	0.019258
emerging	COVID-19 Crisis Period	std	0.299037
emerging	COVID-19 Crisis Period	min	-0.8771
emerging	COVID-19 Crisis Period	max	0.27321
emerging	COVID-19 Crisis Period	autocorr	-0.12407
emerging	COVID-19 Crisis Period	skewness	-2.03808
emerging	COVID-19 Crisis Period	excess_kurtosis	2.528827

group	period	level_2	vw_ret
emerging	Post-crisis Recovery Period	mean	-0.09573
emerging	Post-crisis Recovery Period	median	0.00737
emerging	Post-crisis Recovery Period	std	0.283841
emerging	Post-crisis Recovery Period	min	-0.89172
emerging	Post-crisis Recovery Period	max	0.167647
emerging	Post-crisis Recovery Period	autocorr	-0.12809
emerging	Post-crisis Recovery Period	skewness	-2.09991
emerging	Post-crisis Recovery Period	excess_kurtosis	2.763733

6번 문제

요구조건

- 기간별 & 국가별 수익률의 상관계수 행렬 구하기
- 선진국과 신흥국의 기간별 상관계수 수준 비교
- 코로나 기간 중 금융전염 현상에 대한 증거 논의

풀이방향

a)

<코로나 시기 국가별 EW 수익률의 상관계수 행렬>

fic	AUS	BRA	CHN	DEU	FRA	GBR	IND	JPN	TUR	ZAF
AUS	1	0.131329	0.057153	0.520906	0.420084	0.422085	0.598531	0.879128	0.792608	0.786554
BRA	0.131329	1	0.261007	0.513215	0.442048	0.515593	0.426191	0.100659	0.181072	0.127463
CHN	0.057153	0.261007	1	-0.01326	0.05049	-0.04649	0.057545	-0.05037	-0.05376	-0.02867
DEU	0.520906	0.513215	-0.01326	1	0.924685	0.883289	0.328387	0.401367	0.462421	0.41083
FRA	0.420084	0.442048	0.05049	0.924685	1	0.83791	0.268207	0.328186	0.380167	0.432293
GBR	0.422085	0.515593	-0.04649	0.883289	0.83791	1	0.221342	0.222236	0.331528	0.221595
IND	0.598531	0.426191	0.057545	0.328387	0.268207	0.221342	1	0.714555	0.50114	0.718689
JPN	0.879128	0.100659	-0.05037	0.401367	0.328186	0.222236	0.714555	1	0.716374	0.909405
TUR	0.792608	0.181072	-0.05376	0.462421	0.380167	0.331528	0.50114	0.716374	1	0.667296
ZAF	0.786554	0.127463	-0.02867	0.41083	0.432293	0.221595	0.718689	0.909405	0.667296	1

<코로나 시기 국가별 VW 수익률의 상관계수 행렬>

fic	AUS	BRA	CHN	DEU	FRA	GBR	IND	JPN	TUR	ZAF
AUS	1	0.024422	0.369647	-0.10276	-0.31464	-0.54827	0.919759	0.357749	0.183005	0.038047
BRA	0.024422	1	0.446963	0.508251	0.474509	0.319717	-0.00699	0.31468	0.04667	0.537183
CHN	0.369647	0.446963	1	0.316272	0.138327	-0.15284	0.251256	-0.04424	0.365986	0.340688
DEU	-0.10276	0.508251	0.316272	1	0.441012	0.21602	-0.10156	0.306641	-0.10023	0.586186
FRA	-0.31464	0.474509	0.138327	0.441012	1	0.596455	-0.21541	0.40385	0.302839	0.590964
GBR	-0.54827	0.319717	-0.15284	0.21602	0.596455	1	-0.48063	0.066181	0.08019	0.48854
IND	0.919759	-0.00699	0.251256	-0.10156	-0.21541	-0.48063	1	0.436247	0.189907	0.165759
JPN	0.357749	0.31468	-0.04424	0.306641	0.40385	0.066181	0.436247	1	-0.03076	0.333338
TUR	0.183005	0.04667	0.365986	-0.10023	0.302839	0.08019	0.189907	-0.03076	1	0.234881
ZAF	0.038047	0.537183	0.340688	0.586186	0.590964	0.48854	0.165759	0.333338	0.234881	1

<회복 시기 국가별 EW 수익률의 상관계수 행렬>

fic	AUS	BRA	CHN	DEU	FRA	GBR	IND	JPN	TUR	ZAF
AUS	1	0.475097	0.163464	0.646565	0.596383	0.69397	0.295249	0.218958	0.088685	0.512825
BRA	0.475097	1	-0.02902	0.303973	0.399835	0.359045	0.286502	0.314405	0.043758	0.232917
CHN	0.163464	-0.02902	1	0.335679	0.161666	0.168681	-0.51475	0.167486	-0.15938	0.056738
DEU	0.646565	0.303973	0.335679	1	0.833077	0.896142	0.05306	0.443798	0.068887	0.481747
FRA	0.596383	0.399835	0.161666	0.833077	1	0.860781	0.156797	0.337551	0.097326	0.456221
GBR	0.69397	0.359045	0.168681	0.896142	0.860781	1	0.365213	0.458551	0.098333	0.711627
IND	0.295249	0.286502	-0.51475	0.05306	0.156797	0.365213	1	-0.0359	0.302961	0.299104
JPN	0.218958	0.314405	0.167486	0.443798	0.337551	0.458551	-0.0359	1	0.305054	0.136496
TUR	0.088685	0.043758	-0.15938	0.068887	0.097326	0.098333	0.302961	0.305054	1	-0.09716
ZAF	0.512825	0.232917	0.056738	0.481747	0.456221	0.711627	0.299104	0.136496	-0.09716	1

<회복 시기 국가별 VW 수익률의 상관계수 행렬>

fic	AUS	BRA	CHN	DEU	FRA	GBR	IND	JPN	TUR	ZAF
AUS	1	0.283671	0.219205	-0.03638	0.16872	0.177731	0.512457	0.509967	-0.25244	0.442917
BRA	0.283671	1	-0.11053	0.151908	0.155986	-0.13604	0.386489	0.222354	0.074175	0.262698
CHN	0.219205	-0.11053	1	0.185426	0.061526	0.213587	-0.23828	0.117787	0.171384	-0.11661
DEU	-0.03638	0.151908	0.185426	1	-0.22823	-0.21295	0.082252	-0.08996	0.138419	-0.08836
FRA	0.16872	0.155986	0.061526	-0.22823	1	0.127805	0.174617	0.399414	-0.22453	0.491267
GBR	0.177731	-0.13604	0.213587	-0.21295	0.127805	1	0.013344	0.191704	0.005797	0.172787
IND	0.512457	0.386489	-0.23828	0.082252	0.174617	0.013344	1	0.305444	-0.05063	0.502614
JPN	0.509967	0.222354	0.117787	-0.08996	0.399414	0.191704	0.305444	1	0.031743	0.392324
TUR	-0.25244	0.074175	0.171384	0.138419	-0.22453	0.005797	-0.05063	0.031743	1	-0.35077
ZAF	0.442917	0.262698	-0.11661	-0.08836	0.491267	0.172787	0.502614	0.392324	-0.35077	1

b)

<선진국과 신흥국의 기간별 상관계수 수준 비교>

	type	group	period	mean_corr
0	ew_ret	developed	COVID-19 Crisis Period	0.583988
1	vw_ret	developed	COVID-19 Crisis Period	0.142224
2	ew_ret	developed	Post-crisis Recovery Period	0.598578
3	vw_ret	developed	Post-crisis Recovery Period	0.100782
4	ew_ret	emerging	COVID-19 Crisis Period	0.285797
5	vw_ret	emerging	COVID-19 Crisis Period	0.257230
6	ew_ret	emerging	Post-crisis Recovery Period	0.042167
7	vw_ret	emerging	Post-crisis Recovery Period	0.053054

c)

1. 코로나 시기의 국가별 EW 수익률 상관계수 행렬에서는 전체적으로 선진국, 신흥국 구분 없이 상관계수 값이 높게 분포합니다. 이는 글로벌 위기 시, 모든 국가가 동시적으로 충격, 급락을 경험했다는 것을 보여줍니다.
2. 코로나 시기의 국가별 VW 수익률 상관계수 행렬에서도 높은 상관계수가 다수 분포하고 있습니다.
3. 이 정보들을 종합하면, 코로나 시기에는 국가, 수익률과 관계없이 상관계수가 높은 값을 보입니다. 이를 통해 글로벌 시장 동조화가 일어났고, Financial Contagion이 발생한 것을 알 수 있습니다.

7번 문제

요구조건

- 국가별, 기간별, 그룹별 통계량 구하기
- 대표적인 선진국, 신흥국에 대해 수익률 히스토그램 제시
- 국가별, 기간별, 그룹별 주요 차이점을 2~3문단으로 간단히 논의

풀이방향

a-1) 국가별 요약 통계표

<국가별 EW 수익률 통계표>

fic	level_1	ew_ret
GBR	mean	-0.01008
GBR	median	-0.014
GBR	std	0.034521
GBR	min	-0.08044
GBR	max	0.106306
GBR	autocorr	0.263652
GBR	skewness	0.789838
GBR	excess_kurtosis	1.767279

fic	level_1	ew_ret
DEU	mean	-0.01862
DEU	median	-0.02158
DEU	std	0.023479
DEU	min	-0.07913
DEU	max	0.062175
DEU	autocorr	0.163645
DEU	skewness	0.67317
DEU	excess_kurtosis	1.998274

fic	level_1	ew_ret
JPN	mean	-0.0196
JPN	median	-0.00543
JPN	std	0.092828
JPN	min	-0.66073
JPN	max	0.089555
JPN	autocorr	-0.28831
JPN	skewness	-5.75574
JPN	excess_kurtosis	37.72125

fic	level_1	ew_ret
FRA	mean	-0.01004
FRA	median	-0.00977
FRA	std	0.02688
FRA	min	-0.07822
FRA	max	0.101559
FRA	autocorr	0.00493
FRA	skewness	0.803558
FRA	excess_kurtosis	4.420969

fic	level_1	ew_ret
AUS	mean	0.007918
AUS	median	0.010024
AUS	std	0.076772
AUS	min	-0.36385
AUS	max	0.216654
AUS	autocorr	-0.12844
AUS	skewness	-1.61969
AUS	excess_kurtosis	8.770675

fic	level_1	ew_ret
CHN	mean	-0.00361
CHN	median	-0.00451
CHN	std	0.037912
CHN	min	-0.11465
CHN	max	0.121738
CHN	autocorr	0.005668
CHN	skewness	-0.00112
CHN	excess_kurtosis	1.964223

fic	level_1	ew_ret
IND	mean	0.040578
IND	median	0.036764
IND	std	0.07223
IND	min	-0.25256
IND	max	0.196148
IND	autocorr	-0.1495
IND	skewness	-0.94949
IND	excess_kurtosis	3.314781

fic	level_1	ew_ret
BRA	mean	-0.01821
BRA	median	-0.02252
BRA	std	0.046606
BRA	min	-0.12099
BRA	max	0.108458
BRA	autocorr	0.280414
BRA	skewness	0.363134
BRA	excess_kurtosis	-0.20124

fic	level_1	ew_ret
ZAF	mean	-0.11925
ZAF	median	-0.11727
ZAF	std	0.059455
ZAF	min	-0.50457
ZAF	max	-0.00995
ZAF	autocorr	-0.00958
ZAF	skewness	-4.65905
ZAF	excess_kurtosis	28.83682

fic	level_1	ew_ret
TUR	mean	0.0439
TUR	median	0.030771
TUR	std	0.11194
TUR	min	-0.33328
TUR	max	0.282849
TUR	autocorr	0.110758
TUR	skewness	-0.15826
TUR	excess_kurtosis	1.350468

<국가별 VW 수익률 통계표>

fic	level_1	vw_ret	fic	level_1	vw_ret	fic	level_1	vw_ret
GBR	mean	-0.07049	DEU	mean	-0.24814	JPN	mean	0.011709
GBR	median	-0.07397	DEU	median	-0.31815	JPN	median	0.009518
GBR	std	0.027035	DEU	std	0.130126	JPN	std	0.03591
GBR	min	-0.11868	DEU	min	-0.49431	JPN	min	-0.05532
GBR	max	0.024909	DEU	max	-0.03052	JPN	max	0.105589
GBR	autocorr	0.318138	DEU	autocorr	0.48962	JPN	autocorr	-0.12626
GBR	skewness	0.862631	DEU	skewness	0.30057	JPN	skewness	0.383449
GBR	excess_kurtosis	1.246372	DEU	excess_kurtosis	-1.42391	JPN	excess_kurtosis	-0.25867

fic	level_1	vw_ret	fic	level_1	vw_ret
FRA	mean	-0.04607	AUS	mean	0.05276
FRA	median	-0.04588	AUS	median	0.066909
FRA	std	0.023978	AUS	std	0.054011
FRA	min	-0.17327	AUS	min	-0.2559
FRA	max	-0.00376	AUS	max	0.125495
FRA	autocorr	-0.03259	AUS	autocorr	-0.16718
FRA	skewness	-2.47758	AUS	skewness	-3.366
FRA	excess_kurtosis	12.13207	AUS	excess_kurtosis	16.58516

fic	level_1	vw_ret	fic	level_1	vw_ret	fic	level_1	vw_ret
CHN	mean	0.015979	IND	mean	0.040606	BRA	mean	0.00893
CHN	median	0.012434	IND	median	0.0525	BRA	median	0.014031
CHN	std	0.025012	IND	std	0.067749	BRA	std	0.053819
CHN	min	-0.03421	IND	min	-0.31928	BRA	min	-0.08235
CHN	max	0.115504	IND	max	0.149159	BRA	max	0.140475
CHN	autocorr	-0.01764	IND	autocorr	-0.09452	BRA	autocorr	0.358421
CHN	skewness	1.043239	IND	skewness	-2.47433	BRA	skewness	0.247192
CHN	excess_kurtosis	3.134003	IND	excess_kurtosis	11.90057	BRA	excess_kurtosis	-0.59704

fic	level_1	vw_ret	fic	level_1	vw_ret
ZAF	mean	0.023519	TUR	mean	-0.53301
ZAF	median	0.02269	TUR	median	-0.80902
ZAF	std	0.039547	TUR	std	0.403959
ZAF	min	-0.05741	TUR	min	-0.89172
ZAF	max	0.112534	TUR	max	0.27321
ZAF	autocorr	0.30129	TUR	autocorr	0.183751
ZAF	skewness	0.321964	TUR	skewness	0.683367
ZAF	excess_kurtosis	-0.11781	TUR	excess_kurtosis	-1.26587

a-2) 기간별 요약 통계표

<기간별 EW 수익률 통계표>

period	level_1	ew_ret		period	level_1	ew_ret
COVID-19 Crisis Period	mean	-0.00172		Post-crisis Recovery Period	mean	-0.01638
COVID-19 Crisis Period	median	-0.00023		Post-crisis Recovery Period	median	-0.01682
COVID-19 Crisis Period	std	0.093631		Post-crisis Recovery Period	std	0.064946
COVID-19 Crisis Period	min	-0.66073		Post-crisis Recovery Period	min	-0.18993
COVID-19 Crisis Period	max	0.282849		Post-crisis Recovery Period	max	0.282757
COVID-19 Crisis Period	autocorr	0.230887		Post-crisis Recovery Period	autocorr	0.007927
COVID-19 Crisis Period	skewness	-2.45179		Post-crisis Recovery Period	skewness	0.764336
COVID-19 Crisis Period	excess_kurtosis	15.33288		Post-crisis Recovery Period	excess_kurtosis	3.218231

<기간별 VW 수익률 통계표>

period	level_1	vw_ret		period	level_1	vw_ret
COVID-19 Crisis Period	mean	-0.0625		Post-crisis Recovery Period	mean	-0.08171
COVID-19 Crisis Period	median	-3.59E-05		Post-crisis Recovery Period	median	-0.01325
COVID-19 Crisis Period	std	0.22573		Post-crisis Recovery Period	std	0.220707
COVID-19 Crisis Period	min	-0.8771		Post-crisis Recovery Period	min	-0.89172
COVID-19 Crisis Period	max	0.27321		Post-crisis Recovery Period	max	0.167647
COVID-19 Crisis Period	autocorr	-0.12621		Post-crisis Recovery Period	autocorr	-0.05993
COVID-19 Crisis Period	skewness	-2.59397		Post-crisis Recovery Period	skewness	-2.47816
COVID-19 Crisis Period	excess_kurtosis	6.210036		Post-crisis Recovery Period	excess_kurtosis	5.641666

a-3) 그룹별 요약 통계표

<그룹별 EW 수익률 통계표>

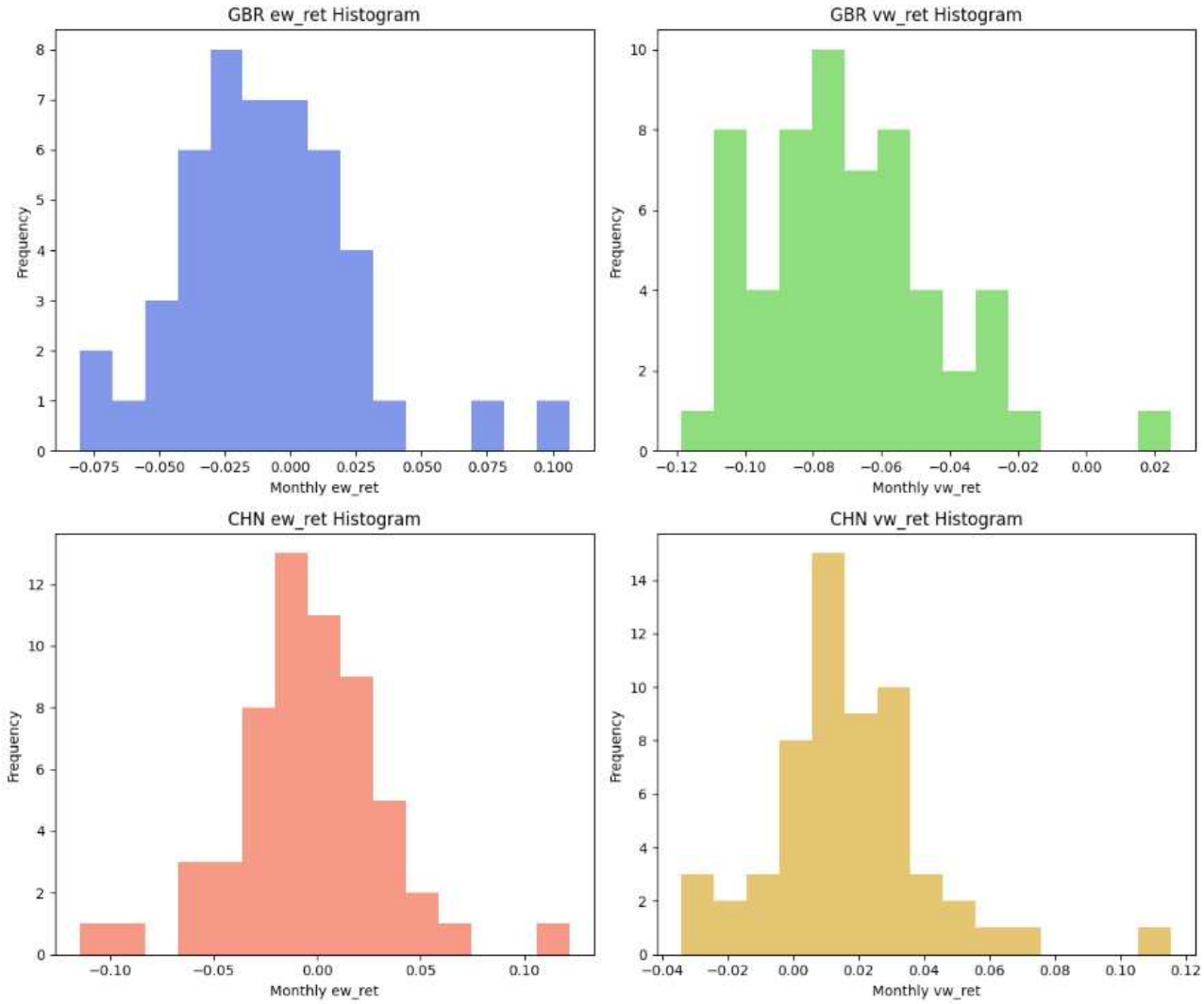
group	level_1	ew_ret		group	level_1	ew_ret
developed	mean	-0.01008		emerging	mean	-0.01132
developed	median	-0.01		emerging	median	-0.00997
developed	std	0.059458		emerging	std	0.091768
developed	min	-0.66073		emerging	min	-0.50457
developed	max	0.216654		emerging	max	0.282849
developed	autocorr	0.140516		emerging	autocorr	-0.06827
developed	skewness	-5.0596		emerging	skewness	-0.18994
developed	excess_kurtosis	54.9794		emerging	excess_kurtosis	3.325991

<그룹별 VW 수익률 통계표>

group	level_1	vw_ret		group	level_1	vw_ret
developed	mean	-0.06005		emerging	mean	-0.08879
developed	median	-0.04331		emerging	median	0.013455
developed	std	0.12319		emerging	std	0.289321
developed	min	-0.49431		emerging	min	-0.89172
developed	max	0.125495		emerging	max	0.27321
developed	autocorr	-0.06896		emerging	autocorr	-0.12485
developed	skewness	-1.38344		emerging	skewness	-2.06861
developed	excess_kurtosis	1.481096		emerging	excess_kurtosis	2.656998

b)

선진국에서는 영국(GBR), 신흥국에서는 중국(CHN)을 선정해 EW, VW 수익률의 히스토그램을 비교해보았습니다.



c)

코로나 시기와 회복기를 거친 주식시장 통계는, 각 국가별·그룹별·기간별로 뚜렷한 차이를 보여주고 있습니다. 우선 국가별 통계표를 보면 일본(JPN)과 남아프리카공화국(ZAF) 등 일부 국가는 위기기에 극단적 음의 왜도와 높은 첨도를 기록해, 하락 리스크와 극단적 변동이 두드러졌습니다. 반면 독일(DEU)과 인도(IND) 등은 이 지표들이 좀 더 완만하게 나타나 국가별 충격 흡수력과 위험 특성이 서로 다름을 보여주었습니다. 이를 통해 국가마다 다양한 지표를 보여준다는 것을 알 수 있습니다.

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