

WEB MASTER 3

Théorie Financière

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Contexte

Vous démarrez un stage au sein d'une société de conseil en placements financiers et on vous charge d'**analyser les profils de risque et de rentabilité de plusieurs actions composant le portefeuille d'un client**. Plus précisément, il vous est demandé de déterminer les rentabilités mensuelles moyennes et les écart-types de 12 actions sur les cinq dernières années.

Les actions (symboles entre parenthèses) sont :

Axa (CS.PA),
BNP Paribas (BNP.PA),
Bouygues (EN.PA),
Carrefour (CA.PA),

Danone(BN.PA),
Engie (ENGI.PA),
Kering (KER.PA),
Total (TTE.PA),

L'Oréal (OR.PA),
Michelin (ML.PA),
Saint-Gobain (SGO.PA)
et Vinci(DG.PA).

Pour ce projet, nous avons également envoyé un fichier Excel avec un code couleur par question identiques à celles des diapositives afin de faciliter la lecture des résultats par rapport aux captures d'écran présentes dans la présentation.

Question 1

QUESTION 1

Trouvez les **prix de chaque action au cours des cinq dernières années** sur Yahoo!Finance. Assurez-vous de bien sélectionner des données mensuelles. Cliquez d'abord sur Rechercher, puis sur Télécharger au format tableur. Quelques manipulations de données sont nécessaires pour que votre tableur lise correctement ces dernières : convertir les données, remplacer les points(.) par des virgules (,). Ne conservez que les colonnes Adj. Close (cours de clôture ajusté) et Date.

Premièrement, nous avons rédigé un **script** afin de télécharger les cours de clôture ajustés de nos 12 actions (une par feuille du fichier) sur les 5 dernières années afin de les enregistrer dans un **fichier CSV compatible avec Excel**.

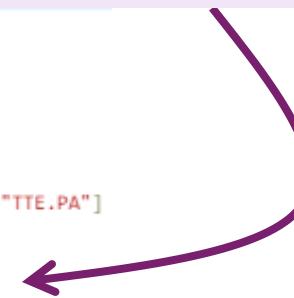
```
! pip install xlsxwriter

import yfinance as yf
import pandas as pd

# Liste des symboles boursiers pour Yahoo Finance
tickers = ["CS.PA", "BNP.PA", "EN.PA", "CA.PA", "BN.PA", "ENGI.PA", "KER.PA", "OR.PA", "ML.PA", "SGO.PA", "DG.PA", "TTE.PA"]

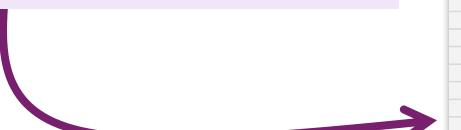
# Télécharger Les données historiques (données des 5 dernières années)
data = yf.download(tickers, period="5y", interval="1mo", auto_adjust=True)

# Créer un fichier Excel avec plusieurs feuilles
titre_fichier = "Portfolio_AdjClose.xlsx"
with pd.ExcelWriter(titre_fichier, engine="xlsxwriter") as writer:
    for ticker in tickers:
        df = data["Close"][ticker].reset_index() # Extraire Les prix de clôture
        df['Date'] = df['Date'].dt.date # Enlever L'heure de La colonne Date
        df = df.rename(columns={'Close': 'Adj Close'}) # Renommer La colonne
        df.to_excel(writer, sheet_name=ticker, index=False) # Sauvegarde dans une feuille distincte
```



QUESTION 1

Voici le résultat obtenu : chaque photo représente les données sur 5 ans de ces 12 actions différentes , chacune étant issue d'une feuille distincte du fichier Excel. Chaque feuille contient les dates en première colonne et les cours de clôture ajustés en deuxième colonne pour une action spécifique.



	A	B
	Date	CS.PA
1	2020-03-01	11,87824631
2	2020-04-01	12,18520832
3	2020-05-01	12,32364273
4	2020-06-01	14,00290968
5	2020-07-01	12,68778515
6	2020-08-01	13,35445118
7	2020-09-01	12,33777332
8	2020-10-01	10,7924242
9	2020-11-01	15,41595936
10	2020-12-01	15,25954723
11	2021-01-01	14,3116924
12	2021-02-01	16,26684189
13	2021-03-01	17,89743614
14	2021-04-01	18,39795494
15	2021-05-01	17,65890884
16	2021-06-01	17,77651596
17	2021-07-01	18,18798828
18	2021-08-01	19,76738548
19	2021-09-01	20,0209198
20	2021-10-01	20,91452408
21	2021-11-01	20,24120522
22	2021-12-01	21,76656723
23	2022-01-01	23,23790169
24	2022-02-01	20,17885971
25	2022-03-01	22,08244705
26	2022-04-01	21,16390228
27	2022-05-01	19,54294586
28	2022-06-01	19,20363617
29	2022-07-01	19,90404892
30	2022-08-01	20,85713577
31	2022-09-01	19,92621231
32	2022-10-01	22,16486359
33	2022-11-01	23,95578384
34	2022-12-01	23,1002163
35	2023-01-01	25,36990356
36	2023-02-01	26,46484756
37	2023-03-01	24,97093582
38	2023-04-01	26,21660042
39	2023-05-01	23,41939545
40	2023-06-01	25,45993614
41	2023-07-01	26,35021019
42	2023-08-01	26,166502
43	2023-09-01	26,54804802
44	2023-10-01	26,33607864
45	2023-11-01	26,93901443
46	2023-12-01	27,7821846
47	2024-01-01	29,35547066
48	2024-02-01	30,97586441
49	2024-03-01	32,79880142
50	2024-04-01	30,56134415
51	2024-05-01	33,04999924
52	2024-06-01	30,56999969
53	2024-07-01	32,49000168
54	2024-08-01	34,40000153
55	2024-09-01	34,52999878
56	2024-10-01	34,52000046
57	2024-11-01	32,97999954
58	2024-12-01	34,31999969
59	2025-01-01	36,65000153
60	2025-02-01	36,09000015

	A	B
	Date	BNP.PA
1	2020-03-01	19,06334305
2	2020-04-01	19,87064362
3	2020-05-01	22,35144043
4	2020-06-01	27,51618767
5	2020-07-01	26,53985786
6	2020-08-01	28,44583893
7	2020-09-01	24,09708405
8	2020-10-01	23,22577667
9	2020-11-01	33,42473602
10	2020-12-01	33,53364563
11	2021-01-01	30,94695663
12	2021-02-01	38,33318116
13	2021-03-01	40,36018753
14	2021-04-01	41,53489304
15	2021-05-01	43,44865417
16	2021-06-01	41,95848465
17	2021-07-01	40,8315506
18	2021-08-01	42,64099884
19	2021-09-01	43,99807735
20	2021-10-01	47,246521
21	2021-11-01	44,94539642
22	2021-12-01	49,58844757
23	2022-01-01	51,40812683
24	2022-02-01	42,8482666
25	2022-03-01	42,37498856
26	2022-04-01	40,55938339
27	2022-05-01	43,33787155
28	2022-06-01	39,73287964
29	2022-07-01	40,28904343
30	2022-08-01	40,71382904
31	2022-09-01	38,19138336
32	2022-10-01	41,59843445
33	2022-11-01	46,79660034
34	2022-12-01	46,63894272
35	2023-01-01	55,09088516
36	2023-02-01	57,93739319
37	2023-03-01	48,35560608
38	2023-04-01	51,315973
39	2023-05-01	47,30458832
40	2023-06-01	54,07786179
41	2023-07-01	56,23272705
42	2023-08-01	55,94228745
43	2023-09-01	56,61685944
44	2023-10-01	50,86429214
45	2023-11-01	54,12470245
46	2023-12-01	58,64056015
47	2024-01-01	58,60308456
48	2024-02-01	51,88551331
49	2024-03-01	61,70422363
50	2024-04-01	63,34379959
51	2024-05-01	63,42811584
52	2024-06-01	59,52999878
53	2024-07-01	63,45999908
54	2024-08-01	62,58000183
55	2024-09-01	61,54999924
56	2024-10-01	62,75
57	2024-11-01	56,63999935
58	2024-12-01	59,22000122
59	2025-01-01	65,72000122
60	2025-02-01	63,90999985

	A	B
	Date	EN.PA
1	2020-03-01	20,44649506
2	2020-04-01	21,51014328
3	2020-05-01	21,07397079
4	2020-06-01	23,27013397
5	2020-07-01	22,95639992
6	2020-08-01	25,4433403
7	2020-09-01	22,6656189
8	2020-10-01	22,68510437
9	2020-11-01	26,89978027
10	2020-12-01	27,11736488
11	2021-01-01	26,12614822
12	2021-02-01	27,04483604
13	2021-03-01	27,5528383
14	2021-04-01	28,721035
15	2021-05-01	26,89978027
16	2021-06-01	26,38141632
17	2021-07-01	27,48099709
18	2021-08-01	29,96773338
19	2021-09-01	30,36527443
20	2021-10-01	29,60402679
21	2021-11-01	25,3325901
22	2021-12-01	26,63516617
23	2022-01-01	26,38141632
24	2022-02-01	27,08345604
25	2022-03-01	26,753582
26	2022-04-01	27,78549194
27	2022-05-01	27,17649841
28	2022-06-01	26,30202484
29	2022-07-01	26,42744255
30	2022-08-01	26,24827385
31	2022-09-01	24,05345345
32	2022-10-01	25,87201691
33	2022-11-01	26,48119164
34	2022-12-01	25,11950874
35	2023-01-01	27,09036827
36	2023-02-01	28,7028904
37	2023-03-01	27,85138716
38	2023-04-01	29,74207115
39	2023-05-01	26,83953094
40	2023-06-01	29,16142273
41	2023-07-01	30,87735748
42	2023-08-01	30,24217976
43	2023-09-01	31,417137605
44	2023-10-01	31,48409653
45	2023-11-01	33,05974849
46	2023-12-01	32,34680557
47	2024-01-01	32,21408081
48	2024-02-01	34,66947937
49	2024-03-01	35,86400223
50	2024-04-01	32,81134033
51	2024-05-01	36
52	2024-06-01	29,96999931
53	2024-07-01	31,94000053
54	2024-08-01	32,40999985
55	2024-09-01	30,05999947
56	2024-10-01	29,43000031
57	2024-11-01	28,15999985
58	2024-12-01	28,54000092
59	2025-01-01	30,62999916
60	2025-02-01	30,47999954

	A	B
	Date	CA.PA
1	2020-03-01	12,30040264
2	2020-04-01	11,51536083
3	2020-05-01	11,6518898
4	2020-06-01	11,73722076
5	2020-07-01	11,70066738
6	2020-08-01	11,66599846
7	2020-09-01	11,84367466
8	2020-10-01	11,57932663
9	2020-11-01	11,90001106
10	2020-12-01	12,1600256
11	2021-01-01	12,12535856
12	2021-02-01	12,5197134
13	2021-03-01	13,38642979
14	2021-04-01	13,95846176
15	2021-05-01	14,49149132
16	2021-06-01	14,79151535
17	2021-07-01	13,96654415
18	2021-08-01	15,02798573
19	2021-09-01	13,86398029
20	2021-10-01	13,96208477
21	2021-11-01	13,03900814
22	2021-12-01	14,36342239
23	2022-01-01	15,09029007
24	2022-02-01	15,96431255
25	2022-03-01	17,52061081
26	2022-04-01	17,7991943
27	2022-05-01	16,97211647
28	2022-06-01	15,0590744
29	2022-07-01	16,24460411
30	2022-08-01	15,24460411
31	2022-09-01	13,02295971
32	2022-10-01	14,91937447
33	2022-11-01	15,04763317
34	2022-12-01	14,32846353
35	2023-01-01	16,00500298
36	2023-02-01	17,14017197
37	2023-03-01	17,6772614
38	2023-04-01	17,27844048
39	2023-05-01	15,74390221
40	2023-06-01	15,62011719
41	2023-07-01	15,09964581
42	2023-08-01	17,2206966
43	2023-09-01	15,41713142
44	2023-10-01	15,66941045
45	2023-11-01	16,46797752
46	2023-12-01	15,68220997
47	2024-01-01	14,9761295
48	2024-02-01	15,02408125
49	2024-03-01	15,02898121
50	2024-04-01	14,94851112
51	2024-05-01	14,19114494
52	2024-06-01	13,99999931
53	2024-07-0	

QUESTION 1

	A	B		A	B		A	B		A	B		A	B		A	B		A	B		A	B
1	Date	ENGI.PA	1	Date	KER.PA	1	Date	OR.PA	1	Date	MLPA	1	Date	SGO.PA	1	Date	DG.PA	1	Date	TTE.PA	2	Date	
2	2020-03-01	6,962,909,698	2	2020-03-01	415,254,0894	2	2020-03-01	219,991,1652	2	2020-03-01	17,275,417,33	2	2020-03-01	19,749,000,59	2	2020-03-01	63,399,604,8	2	2020-03-01	25,654,386,52	3	2020-04-01	
3	2020-04-01	7,326,886,654	3	2020-04-01	401,554,096	3	2020-04-01	244,301,6357	3	2020-04-01	18,988,893,51	3	2020-04-01	21,571,094,51	3	2020-04-01	62,811,008,45	3	2020-04-01	24,326,044,08	4	2020-05-01	
4	2020-05-01	7,867,673,397	4	2020-05-01	409,756,958	4	2020-05-01	241,170,7306	4	2020-05-01	19,363,983,15	4	2020-05-01	25,901,351,93	4	2020-05-01	70,799,439,24	4	2020-05-01	24,899,951,93	5	2020-06-01	
5	2020-06-01	8,137,697,22	5	2020-06-01	430,171,3562	5	2020-06-01	263,087,0361	5	2020-06-01	19,679,395,68	5	2020-06-01	28,556,53	5	2020-06-01	70,102,539,87	5	2020-06-01	25,159,130,1	6	2020-07-01	
6	2020-07-01	8,352,235,794	6	2020-07-01	431,805,9387	6	2020-07-01	260,600,708	6	2020-07-01	18,826,921,46	6	2020-07-01	27,772,449,49	6	2020-07-01	63,163,894,65	6	2020-07-01	23,635,551,45	7	2020-08-01	
7	2020-08-01	8,622,260,094	7	2020-08-01	461,250,3357	7	2020-08-01	258,335,6628	7	2020-08-01	20,611,742,02	7	2020-08-01	30,276,159,29	7	2020-08-01	68,178,817,75	7	2020-08-01	24,994,783,4	8	2020-09-01	
8	2020-09-01	8,448,410,034	8	2020-09-01	508,755,6763	8	2020-09-01	258,988,7695	8	2020-09-01	19,980,0148	8	2020-09-01	32,084,888,46	8	2020-09-01	62,053,114,21	8	2020-09-01	22,049,783,71	9	2020-10-01	
9	2020-10-01	7,682,725,906	9	2020-10-01	464,746,0022	9	2020-10-01	259,082,0618	9	2020-10-01	20,180,042,83	9	2020-10-01	29,848,478,32	9	2020-10-01	58,843,040,81	9	2020-10-01	19,951,110,84	10	2020-11-01	
10	2020-11-01	9,151,209,831	10	2020-11-01	542,278,3203	10	2020-11-01	286,231,0486	10	2020-11-01	22,753,07846	10	2020-11-01	35,479,551,8	10	2020-11-01	74,182,861,33	10	2020-11-01	27,681,978,23	11	2020-12-01	
11	2020-12-01	9,262,179,375	11	2020-12-01	532,777,3438	11	2020-12-01	289,962,8906	11	2020-12-01	22,861,9976	11	2020-12-01	33,412,471,77	11	2020-12-01	70,590,843,2	11	2020-12-01	27,276,304,24	12	2021-01-01	
12	2021-01-01	9,484,116,554	12	2021-01-01	485,451,2024	12	2021-01-01	270,650,6653	12	2021-01-01	24,811,639,79	12	2021-01-01	36,602,256,77	12	2021-01-01	66,443,542,48	12	2021-01-01	26,963,316,74	13	2021-02-01	
13	2021-02-01	8,940,369,606	13	2021-02-01	472,571,7468	13	2021-02-01	282,499,6276	13	2021-02-01	26,085,98709	13	2021-02-01	39,578,193,66	13	2021-02-01	74,651,374,82	13	2021-02-01	30,217,334,75	14	2021-03-01	
14	2021-03-01	8,955,158,63	14	2021-03-01	529,912,3257	14	2021-03-01	304,890,1672	14	2021-03-01	27,806,90002	14	2021-03-01	44,835,086,82	14	2021-03-01	75,796,615,38	14	2021-03-01	31,319,723,13	15	2021-04-01	
15	2021-04-01	9,151,209,831	15	2021-04-01	600,052,979	15	2021-04-01	318,744,6289	15	2021-04-01	26,216,686,25	15	2021-04-01	46,777,469,64	15	2021-04-01	79,301,910,4	15	2021-04-01	29,482,501,98	16	2021-05-01	
16	2021-05-01	8,988,455,772	16	2021-05-01	673,700,5005	16	2021-05-01	347,665,2527	16	2021-05-01	27,403,901,25	16	2021-05-01	48,844,585,42	16	2021-05-01	82,447,303,77	16	2021-05-01	30,347,156,52	17	2021-06-01	
17	2021-06-01	8,906,681,061	17	2021-06-01	668,975,2459	17	2021-06-01	354,745,0256	17	2021-06-01	29,849,412,92	17	2021-06-01	49,486,106,87	17	2021-06-01	79,847,526,55	17	2021-06-01	30,547,307,97	18	2021-07-01	
18	2021-07-01	8,673,877,7716	18	2021-07-01	686,403,4242	18	2021-07-01	364,279,1748	18	2021-07-01	30,559,581,76	18	2021-07-01	54,936,847,69	18	2021-07-01	29,874,862,67	18	2021-07-01	30,211,015,71	19	2021-08-01	
19	2021-08-01	9,352,247,238	19	2021-08-01	611,790,4663	19	2021-08-01	374,096,4966	19	2021-08-01	30,415,330,89	19	2021-08-01	55,976,314,54	19	2021-08-01	80,646,959,28	19	2021-08-01	30,399,111,88	20	2021-09-01	
20	2021-09-01	8,743,255,6569	20	2021-09-01	559,143,7378	20	2021-09-01	336,856,781	20	2021-09-01	29,472,133,64	20	2021-09-01	53,104,103,09	20	2021-09-01	33,647,848,43	20	2021-09-01	29,749,203,36	21	2021-10-01	
21	2021-10-01	9,478,670,712	21	2021-10-01	588,371,7041	21	2021-10-01	372,822,1436	21	2021-10-01	30,115,724,56	21	2021-10-01	54,307,697,93	21	2021-10-01	81,959,297,18	21	2021-10-01	35,931,056,98	22	2021-11-01	
22	2021-11-01	9,874,898,964	22	2021-11-01	618,507,8353	22	2021-11-01	375,292,2948	22	2021-11-01	28,961,694,72	22	2021-11-01	51,225,761,41	22	2021-11-01	74,230,972,29	22	2021-11-01	33,644,625,49	23	2021-12-01	
23	2021-12-01	10,032,157,9	23	2021-12-01	641,653,8086	23	2021-12-01	393,585,9691	23	2021-12-01	31,991,0202	23	2021-12-01	56,413,986,21	23	2021-12-01	83,008,613,59	23	2021-12-01	36,797,437,44	24	2022-01-01	
24	2022-01-01	10,448,430,006	24	2022-01-01	595,724,0601	24	2022-01-01	355,736,2061	24	2022-01-01	32,778,869,63	24	2022-01-01	54,389,762,88	24	2022-01-01	86,358,970,64	24	2022-01-01	41,606,124,88	25	2022-02-01	
25	2022-02-01	10,998,834,61	25	2022-02-01	581,140,625	25	2022-02-01	335,110,4431	25	2022-02-01	27,519,159,32	25	2022-02-01	51,016,044,62	25	2022-02-01	84,447,021,48	25	2022-02-01	38,337,219,24	26	2022-03-01	
26	2022-03-01	9,199,613,571	26	2022-03-01	525,133,606	26	2022-03-01	343,464,5996	26	2022-03-01	27,286,134,72	26	2022-03-01	49,484,195,71	26	2022-03-01	83,008,071,83	26	2022-03-01	38,707,221,98	27	2022-04-01	
27	2022-04-01	8,727,839,47	27	2022-04-01	468,032,0435	27	2022-04-01	329,352,2304	27	2022-04-01	26,420,614,24	27	2022-04-01	51,362,533,357	27	2022-04-01	82,946,060,18	27	2022-04-01	40,293,067,93	28	2022-05-01	
28	2022-05-01	10,362,082,725	28	2022-05-01	464,930,7251	28	2022-05-01	314,607,4524	28	2022-05-01	26,908,857,53	28	2022-05-01	50,241,001,13	28	2022-05-01	82,085,556,03	28	2022-05-01	47,430,201,10	29	2022-06-01	
29	2022-06-01	9,093,360,0901	29	2022-06-01	454,718,1091	29	2022-06-01	315,325,6531	29	2022-06-01	23,950,975,42	29	2022-06-01	37,334,259,03	29	2022-06-01	77,765,258,79	29	2022-06-01	30,547,201,89	30	2022-07-01	
30	2022-07-01	10,005,041,69	30	2022-07-01	516,695,6175	30	2022-07-01	352,479,126	30	2022-07-01	30,027,482,489	30	2022-07-01	42,549,270,63	30	2022-07-01	85,472,221,37	30	2022-07-01	43,021,018,98	31	2022-08-01	
31	2022-08-01	9,841,326,821	31	2022-08-01	666,686,7981	31	2022-08-01	328,683,6548	31	2022-08-01	28,411,106,11	31	2022-08-01	37,878,940,58	31	2022-08-01	84,437,911,99	31	2022-08-01	32,852,065,61	32	2022-09-01	
32	2022-09-01	9,819,768,906	32	2022-09-01	425,457,703	32	2022-09-01	316,235,5316	32	2022-09-01	22,097,017,54	32	2022-09-01	34,791,071,54	32	2022-09-01	76,126,846,31	32	2022-09-01	41,737,213,03	33	2022-10-01	
33	2022-10-01	10,907,721,252	33	2022-10-01	430,233,999	33	2022-10-01	304,600,9126	33	2022-10-01	23,798,838,58	33	2022-10-01	38,864,644,31	33	2022-10-01	85,289,168,16	33	2022-10-01	42,320,067,03	34	2022-11-01	
34	2022-11-01	12,040,424,5296	34	2022-11-01	526,437,5	34	2022-11-01	339,743,5303	34	2022-11-01	24,642,523,42	34	2022-11-01	41,061,062,859	34	2022-11-01	88,437,843,42	34	2022-11-01	52,889,848,648	35	2022-12-01	
35	2022-12-01	11,101,761,82	35	2022-12-01	441,172,0886	35	2022-12-01	319,443,1763	35	2022-12-01	23,960,197,45	35	2022-12-01	42,854,371,02	35	2022-12-01	86,296,						

Question 2

QUESTION 2

Convertissez ces prix en **rentabilités mensuelles**.

Pour convertir ces prix en rentabilités mensuelles, nous utilisons la formule suivante :

$$R_m = \frac{Prix_m - Prix_{m-1}}{Prix_{m-1}} + \frac{Div_m}{Prix_{m-1}}$$

Cependant, étant donné que nous dispensons des cours de clôture ajustés, les dividendes sont déjà pris en compte. La formule se simplifie donc à :

$$R_m = \frac{Prix_m^{Adj} - Prix_{m-1}^{Adj}}{Prix_{m-1}^{Adj}}$$



The table contains three columns: Date, A (Price), and C (Monthly return percentage). It lists data for three companies: CS.PA, BNP.PA, and EN.PA, spanning from March 2020 to February 2025.

	A	B	C
1	Date	CS.PA	Taux de rendement mensuel (en %)
2	2020-03-01	11,87824631	-
3	2020-04-01	12,18520832	2,58%
4	2020-05-01	12,32364273	1,14%
5	2020-06-01	14,0029068	13,63%
6	2020-07-01	12,68778515	-9,39%
7	2020-08-01	13,35445118	5,25%
8	2020-09-01	12,33777332	-7,61%
9	2020-10-01	10,7924242	-12,53%
10	2020-11-01	15,41595936	42,84%
11	2020-12-01	15,25954723	-1,01%
12	2021-01-01	14,31169224	-6,21%
13	2021-02-01	16,26684189	13,66%
14	2021-03-01	17,89743614	10,02%
15	2021-04-01	18,39795494	2,80%
16	2021-05-01	17,65890884	-4,02%
17	2021-06-01	17,77651596	0,67%
18	2021-07-01	18,18798828	2,31%
19	2021-08-01	19,76738548	8,68%
20	2021-09-01	20,0209198	1,28%
21	2021-10-01	20,91452408	4,46%
22	2021-11-01	20,24120522	-3,22%
23	2021-12-01	21,76656723	7,54%
24	2022-01-01	23,23790169	6,76%
25	2022-02-01	20,17885971	-13,16%
26	2022-03-01	22,08244705	9,43%
27	2022-04-01	21,16390228	-4,16%
28	2022-05-01	19,54294586	-7,66%
29	2022-06-01	19,20363617	-1,74%
30	2022-07-01	19,90404892	3,65%
31	2022-08-01	20,85713577	4,79%
32	2022-09-01	19,92621231	-4,46%
33	2022-10-01	22,16486359	11,23%
34	2022-11-01	23,95578384	8,08%
35	2022-12-01	23,10022163	-3,57%
36	2023-01-01	25,36990356	9,83%
37	2023-02-01	26,46484756	4,32%
38	2023-03-01	24,97093582	-5,64%
39	2023-04-01	26,21660042	4,99%
40	2023-05-01	23,41939545	-10,67%
41	2023-06-01	25,45993614	8,71%
42	2023-07-01	26,35021019	3,50%
43	2023-08-01	26,166502	-0,70%
44	2023-09-01	26,54804802	1,46%
45	2023-10-01	26,33607864	-0,80%
46	2023-11-01	26,93901443	2,29%
47	2023-12-01	27,7821846	3,13%
48	2024-01-01	29,35547	5,66%
49	2024-02-01	30,981694	5,52%
50	2024-03-01	32,79880142	5,89%
51	2024-04-01	30,56134415	-6,82%
52	2024-05-01	33,04999924	8,14%
53	2024-06-01	30,56999969	-7,50%
54	2024-07-01	32,49000168	6,28%
55	2024-08-01	34,40000153	5,88%
56	2024-09-01	34,52999878	0,38%
57	2024-10-01	34,52000046	-0,03%
58	2024-11-01	32,97999954	-4,46%
59	2024-12-01	34,31999969	4,06%
60	2025-01-01	36,65000153	6,79%
61	2025-02-01	36,09000015	-1,53%

	A	B	C
1	Date	BNP.PA	Taux de rendement mensuel (en %)
2	2020-03-01	19,06334035	-
3	2020-04-01	19,87064362	4,23%
4	2020-05-01	22,35144043	12,48%
5	2020-06-01	27,51618767	23,11%
6	2020-07-01	26,53985786	-3,55%
7	2020-08-01	28,44583893	7,18%
8	2020-09-01	24,09708405	-15,29%
9	2020-10-01	23,22577667	-3,62%
10	2020-11-01	33,42473602	43,91%
11	2020-12-01	33,53364563	0,33%
12	2021-01-01	30,94695663	-7,71%
13	2021-02-01	38,33361816	23,87%
14	2021-03-01	40,36018753	5,29%
15	2021-04-01	41,53489304	2,91%
16	2021-05-01	43,44865417	4,61%
17	2021-06-01	41,95848465	-3,43%
18	2021-07-01	40,83150506	-2,69%
19	2021-08-01	42,64099884	4,43%
20	2021-09-01	43,99807739	3,18%
21	2021-10-01	47,246521	7,38%
22	2021-11-01	44,94539642	-4,87%
23	2021-12-01	49,58844757	10,33%
24	2022-01-01	51,40812683	3,67%
25	2022-02-01	42,8482666	-16,65%
26	2022-03-01	42,37498856	-1,10%
27	2022-04-01	40,55938339	-4,28%
28	2022-05-01	43,33787155	6,85%
29	2022-06-01	39,73287964	-8,32%
30	2022-07-01	40,28904343	1,40%
31	2022-08-01	40,71382904	1,05%
32	2022-09-01	38,19138336	-6,20%
33	2022-10-01	41,59843445	8,92%
34	2022-11-01	46,79660034	12,50%
35	2022-12-01	46,63894272	-0,34%
36	2023-01-01	55,09088516	18,12%
37	2023-02-01	57,93739319	5,17%
38	2023-03-01	48,35560608	-16,54%
39	2023-04-01	51,315979	6,12%
40	2023-05-01	47,30458832	-7,82%
41	2023-06-01	54,07786179	14,32%
42	2023-07-01	56,23272705	3,98%
43	2023-08-01	55,94228745	-0,52%
44	2023-09-01	56,61685944	1,21%
45	2023-10-01	50,86429214	-10,16%
46	2023-11-01	54,12470245	6,41%
47	2023-12-01	58,64056015	8,34%
48	2024-01-01	58,60308456	-0,06%
49	2024-02-01	51,88551331	-11,46%
50	2024-03-01	61,70422363	18,92%
51	2024-04-01	63,34379959	2,66%
52	2024-05-01	63,42811584	0,13%
53	2024-06-01	59,52999878	-6,15%
54	2024-07-01	63,45999908	6,60%
55	2024-08-01	62,58000183	-1,39%
56	2024-09-01	61,54999924	-1,65%
57	2024-10-01	62,75	1,95%
58	2024-11-01	56,63999939	-9,74%
59	2024-12-01	59,22000122	4,56%
60	2025-01-01	65,72000122	10,98%
61	2025-02-01	63,9099985	-2,75%

	A	B	C
1	Date	EN.PA	Taux de rendement mensuel (en %)
2	2020-03-01	20,44649506	-
3	2020-04-01	21,51014328	5,20%
4	2020-05-01	21,07397079	-2,03%
5	2020-06-01	23,27013397	10,42%
6	2020-07-01	22,95639992	-1,35%
7	2020-08-01	25,4433403	10,83%
8	2020-09-01	22,66556189	-10,92%
9	2020-10-01	22,68510437	0,09%
10	2020-11-01	26,89978027	18,58%
11	2020-12-01	27,11736488	0,81%
12	2021-01-01	26,12614822	-3,66%
13	2021-02-01	27,04483604	3,52%
14	2021-03-01	27,55252838	1,88%
15	2021-04-01	28,721035	4,24%
16	2021-05-01	26,89978027	-6,34%
17	2021-06-01	26,38141632	-1,93%
18	2021-07-01	27,48099709	4,17%
19	2021-08-01	29,66773338	9,05%
20	2021-09-01	30,36527443	1,33%
21	2021-10-01	29,60402679	-2,51%
22	2021-11-01	25,3325901	-14,43%
23	2021-12-01	26,63516617	5,14%
24	2022-01-01	26,38141632	-0,95%
25	2022-02-01	27,08345604	2,66%
26	2022-03-01	26,753582	-1,22%
27	2022-04-01	27,78549194	3,86%
28	2022-05-01	27,17649841	-2,19%
29	2022-06-01	26,3020484	-3,22%
30	2022-07-01	26,42744255	0,48%
31	2022-08-01	26,24827385	-0,68%
32	2022-09-01	24,05345345	-8,36%
33	2022-10-01	25,87201691	7,56%
34	2022-11-01	26,48119164	2,35%
35	2022-12-01	25,11950874	-5,14%
36	2023-01-01	27,09036827	7,85%
37	2023-02-01	28,7028904	5,95%
38	2023-03-01	27,85183716	-2,97%
39	2023-04-01	29,74207115	6,79%
40	2023-05-01	26,83953094	-9,76%
41	2023-06-01	29,16142273	8,65%
42	2023-07-01	30,87735748	5,88%
43	2023-08-01	30,24217796	-2,06%
44	2023-09-01	31,41773605	3,89%
45	2023-10-01	31,48409653	0,21%
46	2023-11-01	33,0957489	5,12%
47	2023-12-01	32,34680557	-2,26%
48	2024-01-01	32,21408081	-0,41%
49	2024-02-01	34,66947937	7,62%
50	2024-03-01	35,86400223	3,45%
51	2024-04-01	32,81134033	-8,51%
52	2024-05-01	36	9,72%
53	2024-06-01	29,96999931	-16,75%
54	2024-07-01	31,94000053	6,57%
55	2024-08-01	32,40999985	1,47%
56	2024-09-01	30,05999947	-7,25%
57	2024-10-01	29,43000031	-2,10%
58	2024-11-01	28,15999985	-4,32%
59	2024-12-01	28,54000092	1,35%
60	2025-01-01	30,62999916	7,32%
61	2025-02-01	30,47999954	-0,49%

QUESTION 2

	A	B	C
1	Date	CA.PA	Taux de rendement mensuel (en %)
2	2020-03-01	12,30040264	-
3	2020-04-01	11,51536083	-6,38%
4	2020-05-01	11,6518898	1,19%
5	2020-06-01	11,7372076	0,73%
6	2020-07-01	11,7006738	-0,31%
7	2020-08-01	11,66599846	-0,30%
8	2020-09-01	11,84367466	1,52%
9	2020-10-01	11,57932663	-2,23%
10	2020-11-01	11,90001106	2,77%
11	2020-12-01	12,1600256	2,18%
12	2021-01-01	12,12535858	-0,29%
13	2021-02-01	12,5197134	3,25%
14	2021-03-01	13,38642979	6,92%
15	2021-04-01	13,95846176	4,27%
16	2021-05-01	14,49149132	3,82%
17	2021-06-01	14,79151535	2,07%
18	2021-07-01	13,96654415	-5,58%
19	2021-08-01	15,02785873	7,60%
20	2021-09-01	13,86398029	-7,74%
21	2021-10-01	13,96208477	0,71%
22	2021-11-01	13,03900814	-6,61%
23	2021-12-01	14,36342239	10,16%
24	2022-01-01	15,09029007	5,06%
25	2022-02-01	15,96431255	5,79%
26	2022-03-01	17,52061081	9,75%
27	2022-04-01	17,97991943	2,62%
28	2022-05-01	16,97211647	-5,61%
29	2022-06-01	15,0590744	-11,27%
30	2022-07-01	15,24460411	1,23%
31	2022-08-01	15,24460411	0,00%
32	2022-09-01	13,02295971	-14,57%
33	2022-10-01	14,91937447	14,56%
34	2022-11-01	15,04763317	0,86%
35	2022-12-01	14,32846355	-4,78%
36	2023-01-01	16,00500298	11,70%
37	2023-02-01	17,14101791	7,10%
38	2023-03-01	17,06772614	-0,43%
39	2023-04-01	17,27840408	1,23%
40	2023-05-01	15,74390221	-8,88%
41	2023-06-01	15,89964581	0,99%
42	2023-07-01	17,22060966	8,31%
43	2023-08-01	16,72832108	-2,86%
44	2023-09-01	15,41713142	-7,84%
45	2023-10-01	15,69641018	1,81%
46	2023-11-01	16,46797752	4,92%
47	2023-12-01	15,68220997	-4,77%
48	2024-01-01	14,9769125	-4,50%
49	2024-02-01	14,70236683	-1,83%
50	2024-03-01	15,02898121	2,22%
51	2024-04-01	14,94851112	-0,54%
52	2024-05-01	14,19114494	-5,07%
53	2024-06-01	13,19999981	-6,98%
54	2024-07-01	13,80000019	4,55%
55	2024-08-01	14,57999992	5,65%
56	2024-09-01	15,31000042	5,01%
57	2024-10-01	14,53499985	-5,06%
58	2024-11-01	14,39999962	-0,93%
59	2024-12-01	13,72999954	-4,65%
60	2025-01-01	13,68999958	-0,29%
61	2025-02-01	13,72500038	0,26%

	A	B	C
1	Date	BN.PA	Taux de rendement mensuel (en %)
2	2020-03-01	49,32273102	-
3	2020-04-01	53,20866013	7,88%
4	2020-05-01	51,77877808	-2,69%
5	2020-06-01	51,77877808	0,00%
6	2020-07-01	47,55640411	-8,15%
7	2020-08-01	47,98532486	0,90%
8	2020-09-01	48,09893231	0,22%
9	2020-10-01	41,27957153	-14,16%
10	2020-11-01	46,90543747	13,63%
11	2020-12-01	46,81835175	-0,19%
12	2021-01-01	47,86340332	2,23%
13	2021-02-01	49,16971588	2,73%
14	2021-03-01	50,94630814	3,61%
15	2021-04-01	51,05952454	0,22%
16	2021-05-01	50,77212906	-0,56%
17	2021-06-01	53,45695496	5,29%
18	2021-07-01	55,87903976	4,53%
19	2021-08-01	55,70796204	-0,31%
20	2021-09-01	53,16882706	-4,56%
21	2021-10-01	50,73773575	-4,57%
22	2021-11-01	46,8119812	-7,74%
23	2021-12-01	49,1502658	5,00%
24	2022-01-01	49,74729156	1,21%
25	2022-02-01	48,90091324	-1,70%
26	2022-03-01	45,04718399	-7,88%
27	2022-04-01	51,89925766	15,21%
28	2022-05-01	49,27907944	-5,05%
29	2022-06-01	49,67993164	0,81%
30	2022-07-01	50,19296265	1,03%
31	2022-08-01	48,98034668	-2,42%
32	2022-09-01	45,30518723	-7,50%
33	2022-10-01	46,95621109	3,64%
34	2022-11-01	46,7136879	-0,52%
35	2022-12-01	45,92082214	-1,70%
36	2023-01-01	46,92820329	2,19%
37	2023-02-01	49,66127777	5,82%
38	2023-03-01	53,45769501	7,64%
39	2023-04-01	55,95755005	4,68%
40	2023-05-01	51,62011719	-7,75%
41	2023-06-01	54,15725708	4,92%
42	2023-07-01	53,56879807	-1,09%
43	2023-08-01	51,92884064	-3,06%
44	2023-09-01	50,41428757	-2,92%
45	2023-10-01	54,16690445	7,44%
46	2023-11-01	56,88731003	5,02%
47	2023-12-01	56,60754776	-0,49%
48	2024-01-01	59,55947876	5,21%
49	2024-02-01	56,93554306	-4,41%
50	2024-03-01	57,77481461	1,47%
51	2024-04-01	56,58825684	-2,05%
52	2024-05-01	57,03200912	0,78%
53	2024-06-01	57,08000183	0,08%
54	2024-07-01	60,15999985	5,40%
55	2024-08-01	62,79999924	4,39%
56	2024-09-01	65,33999634	4,04%
57	2024-10-01	65,69999695	0,55%
58	2024-11-01	64,66000366	-1,58%
59	2024-12-01	65,12000275	0,71%
60	2025-01-01	67,48000336	3,62%
61	2025-02-01	66,58000183	-1,33%

	A	B	C
1	Date	ENGI.PA	Taux de rendement mensuel (en %)
2	2020-03-01	6,962909698	-
3	2020-04-01	7,326886654	5,23%
4	2020-05-01	7,867673397	7,38%
5	2020-06-01	8,13769722	3,43%
6	2020-07-01	8,352235794	2,64%
7	2020-08-01	8,622260094	3,23%
8	2020-09-01	8,448410034	-2,02%
9	2020-10-01	7,682725906	-9,06%
10	2020-11-01	9,151209831	19,11%
11	2020-12-01	9,262179375	1,21%
12	2021-01-01	9,484116554	2,40%
13	2021-02-01	8,940369606	-5,73%
14	2021-03-01	8,955165863	0,17%
15	2021-04-01	9,151209831	2,19%
16	2021-05-01	8,988455772	-1,78%
17	2021-06-01	8,906681061	-0,91%
18	2021-07-01	8,673877716	-2,61%
19	2021-08-01	9,352247238	7,82%
20	2021-09-01	8,743256569	-6,51%
21	2021-10-01	9,47867012	8,41%
22	2021-11-01	9,874899864	4,18%
23	2021-12-01	10,0321579	1,59%
24	2022-01-01	10,44843006	4,15%
25	2022-02-01	10,99883461	5,27%
26	2022-03-01	9,199613571	-16,36%
27	2022-04-01	8,72783947	-5,13%
28	2022-05-01	10,36208725	18,72%
29	2022-06-01	9,093360901	-12,24%
30	2022-07-01	10,00504169	9,98%
31	2022-08-01	9,841326821	-1,59%
32	2022-09-01	9,819768906	-0,22%
33	2022-10-01	10,90772152	11,08%
34	2022-11-01	12,04045296	10,38%
35	2022-12-01	11,10176182	-7,80%
36	2023-01-01	10,79660416	-2,75%
37	2023-02-01	11,47325802	6,27%
38	2023-03-01	12,08523178	5,33%
39	2023-04-01	12,03713608	-0,40%
40	2023-05-01	12,80782318	6,40%
41	2023-06-01	13,88958359	8,45%
42	2023-07-01	13,60135651	-2,08%
43	2023-08-01	13,5812912	-0,15%
44	2023-09-01	13,25293159	-2,42%
45	2023-10-01	13,68527126	3,26%
46	2023-11-01	14,51893806	6,09%
47	2023-12-01	14,51893806	0,00%
48	2024-01-01	13,50832272	-6,96%
49	2024-02-01	13,53203773	0,18%
50	2024-03-01	14,14679813	4,54%
51	2024-04-01	14,84000015	4,90%
52	2024-05-01	14,16960049	-4,52%
53	2024-06-01	13,33500004	-5,89%
54	2024-07-01	14,53999996	9,04%
55	2024-08-01	15,93000031	9,56%
56	2024-09-01	15,51500034	-2,61%
57	2024-10-01	15,41499996	-0,64%
58	2024-11-01	15,08500004	-2,14%
59	2024-12-01	15,31000042	1,49%
60	2025-01-01	15,91499996	3,95%
61	2025-02-01	15,90499973	-0,06%

	A	B	C
1	Date	KER.PA	Taux de rendement mensuel (en %)
2	2020-03-01	415,2540894	-
3	2020-04-01	401,5548096	-3,30%
4	2020-05-01	409,756958	2,04%
5	2020-06-01	430,1713562	4,98%
6	2020-07-01	431,0853937	0,38%
7	2020-08-01	461,2503357	6,82%
8	2020-09-01	508,7556763	10,30%
9	2020-10-01	464,7460022	-8,65%
10	2020-11-01	542,2783203	16,68%
11	2020-12-01	532,7773438	-1,75%
12	2021-01-01	48	

QUESTION 2

	A	B	C		A	B	C		A	B	C		A	B	C
1	Date	MLPA	Taux de rendement mensuel (en %)	2	Date	SGO.PA	Taux de rendement mensuel (en %)	3	Date	DG.PA	Taux de rendement mensuel (en %)	4	Date	TTE.PA	Taux de rendement mensuel (en %)
2	2020-03-01	17,7541733	-	2	2020-03-01	19,74900055	-	2	2020-03-01	63,3996048	-	2	2020-03-01	25,65438652	-
3	2020-04-01	18,9889351	9,92%	3	2020-04-01	21,57109451	9,23%	3	2020-04-01	62,81100845	-0,93%	3	2020-04-01	24,32604408	-5,18%
4	2020-05-01	19,36398315	1,98%	4	2020-05-01	25,90135193	20,07%	4	2020-05-01	70,9943924	13,03%	4	2020-05-01	24,89995193	2,36%
5	2020-06-01	19,67939568	1,63%	5	2020-06-01	28,55653	10,25%	5	2020-06-01	70,10523987	-1,25%	5	2020-06-01	25,1591301	1,04%
6	2020-07-01	18,82692146	-4,33%	6	2020-07-01	27,77244949	-2,75%	6	2020-07-01	63,16389465	-9,90%	6	2020-07-01	23,63555145	-6,06%
7	2020-08-01	20,61174202	9,48%	7	2020-08-01	30,27615929	9,02%	7	2020-08-01	68,17881775	7,94%	7	2020-08-01	24,9947834	5,75%
8	2020-09-01	19,9800148	-3,06%	8	2020-09-01	32,08488846	5,97%	8	2020-09-01	62,05331421	-8,98%	8	2020-09-01	22,04978371	-11,78%
9	2020-10-01	20,18042183	1,00%	9	2020-10-01	29,84847832	-6,97%	9	2020-10-01	58,84304081	-5,17%	9	2020-10-01	19,95111084	-9,52%
10	2020-11-01	22,75307846	12,75%	10	2020-11-01	35,47959518	18,87%	10	2020-11-01	74,18286133	26,07%	10	2020-11-01	27,68197823	38,75%
11	2020-12-01	22,8619976	0,48%	11	2020-12-01	33,41247177	-5,83%	11	2020-12-01	70,5908432	-4,84%	11	2020-12-01	27,27630424	-1,47%
12	2021-01-01	24,81163979	8,53%	12	2021-01-01	36,60225677	9,55%	12	2021-01-01	66,44354248	-5,88%	12	2021-01-01	26,96336174	-1,15%
13	2021-02-01	26,08598709	5,14%	13	2021-02-01	39,57819366	8,13%	13	2021-02-01	74,65137482	12,35%	13	2021-02-01	30,21733475	12,07%
14	2021-03-01	27,80690002	6,60%	14	2021-03-01	44,83508682	13,28%	14	2021-03-01	75,79666138	1,53%	14	2021-03-01	31,31972313	3,65%
15	2021-04-01	26,21668625	-5,72%	15	2021-04-01	46,77746964	4,33%	15	2021-04-01	79,3019104	4,62%	15	2021-04-01	29,48250198	-5,87%
16	2021-05-01	27,40390015	4,53%	16	2021-05-01	48,84458542	4,42%	16	2021-05-01	82,44730377	3,97%	16	2021-05-01	30,34715652	2,93%
17	2021-06-01	29,84941292	8,92%	17	2021-06-01	49,48610687	1,31%	17	2021-06-01	79,84752655	-3,15%	17	2021-06-01	30,54730797	0,66%
18	2021-07-01	30,55958176	2,38%	18	2021-07-01	54,93684769	11,01%	18	2021-07-01	79,15544128	-0,87%	18	2021-07-01	29,87486267	-2,20%
19	2021-08-01	30,41533089	-0,47%	19	2021-08-01	55,97631454	1,89%	19	2021-08-01	80,64609528	1,88%	19	2021-08-01	30,39991188	1,76%
20	2021-09-01	29,47213364	-3,10%	20	2021-09-01	53,10410309	-5,13%	20	2021-09-01	79,98949432	-0,81%	20	2021-09-01	33,64788437	10,68%
21	2021-10-01	30,11572456	2,18%	21	2021-10-01	54,3076973	2,27%	21	2021-10-01	81,95929718	2,46%	21	2021-10-01	35,93105698	6,79%
22	2021-11-01	28,96169472	-3,83%	22	2021-11-01	51,22576141	-5,67%	22	2021-11-01	74,23097229	-9,43%	22	2021-11-01	33,64462559	-6,36%
23	2021-12-01	31,9910202	10,46%	23	2021-12-01	56,41398621	10,13%	23	2021-12-01	83,00861359	11,82%	23	2021-12-01	36,97493744	9,90%
24	2022-01-01	32,77886963	2,46%	24	2022-01-01	54,38976288	-3,59%	24	2022-01-01	86,35897064	4,04%	24	2022-01-01	41,60612488	12,53%
25	2022-02-01	27,51915932	-16,05%	25	2022-02-01	51,01604462	-6,20%	25	2022-02-01	84,44702148	-2,21%	25	2022-02-01	38,33721924	-7,86%
26	2022-03-01	27,88613472	-0,85%	26	2022-03-01	49,84195173	-3,00%	26	2022-03-01	83,08007813	-1,62%	26	2022-03-01	38,70722198	0,97%
27	2022-04-01	26,42061424	-3,17%	27	2022-04-01	51,36253357	3,80%	27	2022-04-01	82,94606018	-0,16%	27	2022-04-01	40,29306793	4,10%
28	2022-05-01	26,90885735	1,85%	28	2022-05-01	50,24100113	-2,18%	28	2022-05-01	82,08555603	-1,04%	28	2022-05-01	47,43021011	17,71%
29	2022-06-01	23,95097542	-10,99%	29	2022-06-01	37,33425903	-25,69%	29	2022-06-01	77,76525879	-5,26%	29	2022-06-01	42,97642899	-9,39%
30	2022-07-01	25,04824829	4,58%	30	2022-07-01	42,54927063	13,97%	30	2022-07-01	85,47222137	9,91%	30	2022-07-01	43,02101898	0,10%
31	2022-08-01	22,41110611	-10,53%	31	2022-08-01	37,87894058	-10,98%	31	2022-08-01	84,43791199	-1,21%	31	2022-08-01	43,82506561	1,87%
32	2022-09-01	21,35071754	-4,73%	32	2022-09-01	34,78103638	-8,18%	32	2022-09-01	76,12684631	-9,84%	32	2022-09-01	41,73713303	-4,76%
33	2022-10-01	23,79883385	11,47%	33	2022-10-01	38,8646431	11,74%	33	2022-10-01	85,28916168	12,04%	33	2022-10-01	48,32006073	15,77%
34	2022-11-01	24,64253426	3,55%	34	2022-11-01	41,06602859	5,66%	34	2022-11-01	88,43784332	3,69%	34	2022-11-01	52,88898468	9,46%
35	2022-12-01	23,96019745	-2,77%	35	2022-12-01	42,85437012	4,35%	35	2022-12-01	86,29689026	-2,42%	35	2022-12-01	51,4332428	-2,75%
36	2023-01-01	26,69876862	11,43%	36	2023-01-01	49,33180618	15,11%	36	2023-01-01	95,87104034	11,09%	36	2023-01-01	50,83834705	-1,17%
37	2023-02-01	27,41789873	2,69%	37	2023-02-01	52,88031769	7,19%	37	2023-02-01	99,75621033	4,05%	37	2023-02-01	52,87439346	4,01%
38	2023-03-01	25,95188552	-5,35%	38	2023-03-01	49,1158905	-7,12%	38	2023-03-01	97,79512787	-1,97%	38	2023-03-01	49,07378769	-7,19%
39	2023-04-01	26,58350754	2,43%	39	2023-04-01	49,20976639	0,19%	39	2023-04-01	103,7893829	6,13%	39	2023-04-01	52,96762466	7,93%
40	2023-05-01	24,449039078	-7,87%	40	2023-05-01	48,62773895	-1,18%	40	2023-05-01	101,0800781	-2,61%	40	2023-05-01	48,52471161	-8,39%
41	2023-06-01	26,09305763	6,54%	41	2023-06-01	52,31706238	7,59%	41	2023-06-01	101,1371155	0,06%	41	2023-06-01	48,04019165	-1,00%
42	2023-07-01	28,70622253	10,01%	42	2023-07-01	59,85966492	14,42%	42	2023-07-01	101,5174026	0,38%	42	2023-07-01	51,23076248	6,64%
43	2023-08-01	27,87695313	-2,89%	43	2023-08-01	58,57445526	-2,15%	43	2023-08-01	97,88568115	-3,58%	43	2023-08-01	53,83588028	5,09%
44	2023-09-01	28,03123474	0,55%	44	2023-09-01	55,38095015	-5,45%	44	2023-09-01	99,84414673	2,00%	44	2023-09-01	57,76672363	7,30%
45	2023-10-01	27,01875496	-3,61%	45	2023-10-01	50,04533005	-9,63%	45	2023-10-01	99,33076477	-0,51%	45	2023-10-01	59,28778076	2,63%
46	2023-11-01	29,70905876	9,96%	46	2023-11-01	58,23368073	16,36%	46	2023-11-01	106,765358	7,48%	46	2023-11-01	58,40597534	-1,49%
47	2023-12-01	31,30009842	5,36%	47	2023-12-01	64,90315247	11,45%	47	2023-12-01	109,1666107	2,25%	47	2023-12-01	57,7868309	-1,06%
48	2024-01-01	29,71870232	-5,05%	48	2024-01-01	64,10475159	-1,23%	48	2024-01-01	112,4118576	2,97%	48	2024-01-01	56,37968063	-2,44%
49	2024-02-01	32,96828079	10,93%	49	2024-02-01	69,32348633	8,14%	49	2024-02-01	113,6792221	1,13%	49	2024-02-01	56,01126099	-0,65%
50	2024-03-01	34,25075531	3,89%	50	2024-03-01	70,03425598	1,03%	50	2024-03-01	114,0248718	0,30%	50	2024-03-01	60,26503372	7,59%
51	2024-04-01	34,8871727	1,86%	51	2024-04-01	72,69230652	3,80%	51	2024-04-01	105,8541718	-7,17%	51	2024-04-01	65,88473511	9,32%
52	2024-05-01	35,82251358	2,68%	52	2024-05-01	78,45628357	7,93%	52	2024-05-01	113,3300323	7,06%	52	2024-05-01	64,3670578	-2,30%
53	2024-06-01	36,11000061	0,80%	53	2024-06-01	70,70606995	-9,88%	53	2024-06-01	97,4172821	-14,04%	53	2024-06-01	59,87163544	-6,98%
54	2024-07-01	36,5999847	1,36%	54	2024-07-01	79,44000244	12,35%	54	2024-07-01	104,5666351	7,34%	54	2024-07-01	60,77957153	1,52%
55	2024-08-01	35,50999832	-2,98%	55	2024-08-01	79,08000183	-0,45%	55	2024-08-01	107,0916824	2,41%	55	2024-08-01	60,49746323	-0,46%
56	2024-09-01	36,45999908	2,68%	56	2024-0										

Question 3

QUESTION 3

Calculez la rentabilité **mensuelle moyenne** et l'**écart-type des rentabilités mensuelles** de chaque titre.
Annualisez ces chiffres (multipliez la moyenne mensuelle par 12 et l'écart-type mensuel par 12).

Pour calculer la **rentabilité mensuelle moyenne** et l'**écart-type des rentabilités mensuelles** pour chaque titre nous avons utilisés les formules suivantes :

$$\bar{R} = \frac{1}{M} \sum_{m=1}^M R_m = \frac{1}{M} (R_1 + \dots + R_M)$$

$$\sigma = \sqrt{Var[M]} = \sqrt{\frac{1}{M-1} \sum_{m=1}^M (R_m - \bar{R})^2}$$

où R_m : rentabilité effective d'un titre au mois m

Ensuite, ces valeurs ont été **annualisées** en multipliant la rentabilité mensuelle moyenne par 12 et l'écart-type mensuel par racine de 12



	A	B	C		A	B	C		A	B	C
	Date	CS.PA	Taux de rendement mensuel (en %)		Date	BNP.PA	Taux de rendement mensuel (en %)		Date	EN.PA	Taux de rendement mensuel (en %)
1				1				1			
2	2020-03-01	11,87824631	-	2	2020-03-01	19,06334305	-	2	2020-03-01	20,44649506	-
3	2020-04-01	12,18520832	2,58%	3	2020-04-01	19,87064362	4,23%	3	2020-04-01	21,51014328	5,20%
4	2020-05-01	12,32364273	1,14%	4	2020-05-01	22,35144049	12,48%	4	2020-05-01	21,07397079	-2,03%
5	2020-06-01	14,0029068	13,63%	5	2020-06-01	27,51618767	23,11%	5	2020-06-01	23,7013397	10,42%
6	2020-07-01	12,68778515	-9,39%	6	2020-07-01	26,53985786	-3,55%	6	2020-07-01	22,95639992	-1,35%
7	2020-08-01	13,35485118	5,25%	7	2020-08-01	28,44588389	7,18%	7	2020-08-01	25,4433403	10,83%
8	2020-09-01	12,33777332	-7,61%	8	2020-09-01	24,09708405	-15,29%	8	2020-09-01	22,6656189	-10,92%
9	2020-10-01	10,7924242	-12,53%	9	2020-10-01	23,22577667	-3,62%	9	2020-10-01	22,68510437	0,09%
10	2020-11-01	15,41595936	42,84%	10	2020-11-01	33,4247360	43,91%	10	2020-11-01	26,88978027	18,58%
11	2020-12-01	15,25954723	-1,01%	11	2020-12-01	33,53364569	0,33%	11	2020-12-01	27,11736488	0,81%
12	2021-01-01	14,31169224	-6,21%	12	2021-01-01	30,94695663	-7,71%	12	2021-01-01	26,12614822	-3,66%
13	2021-02-01	16,26684189	13,66%	13	2021-02-01	38,33361816	23,87%	13	2021-02-01	27,04483604	3,52%
14	2021-03-01	17,89743614	10,02%	14	2021-03-01	40,3601875	5,29%	14	2021-03-01	27,55252838	1,88%
15	2021-04-01	18,39795494	2,80%	15	2021-04-01	41,53489304	2,91%	15	2021-04-01	28,721035	4,24%
16	2021-05-01	17,65890884	-4,02%	16	2021-05-01	43,44865417	4,61%	16	2021-05-01	26,88978027	-6,34%
17	2021-06-01	17,77651596	0,67%	17	2021-06-01	41,95848465	-3,43%	17	2021-06-01	26,38141632	-1,93%
18	2021-07-01	18,18798828	2,31%	18	2021-07-01	40,8315500	-2,69%	18	2021-07-01	27,48099709	4,17%
19	2021-08-01	19,76738548	8,68%	19	2021-08-01	42,64099884	4,43%	19	2021-08-01	29,96773338	9,05%
20	2021-09-01	20,0209198	1,28%	20	2021-09-01	43,98907739	3,18%	20	2021-09-01	30,36527443	1,33%
21	2021-10-01	20,91452408	4,46%	21	2021-10-01	47,246521	7,38%	21	2021-10-01	29,60402679	-2,51%
22	2021-11-01	20,24120522	-3,22%	22	2021-11-01	44,953964	-4,87%	22	2021-11-01	25,3325901	-14,43%
23	2021-12-01	21,76656723	7,54%	23	2021-12-01	49,5884757	10,33%	23	2021-12-01	26,63516617	5,14%
24	2022-01-01	23,23790169	6,76%	24	2022-01-01	51,40812683	3,67%	24	2022-01-01	26,38141632	-0,95%
25	2022-02-01	20,17885971	-13,16%	25	2022-02-01	42,9482666	-16,65%	25	2022-02-01	27,08345604	2,66%
26	2022-03-01	22,08244705	9,43%	26	2022-03-01	42,37499856	-1,10%	26	2022-03-01	26,753582	-1,22%
27	2022-04-01	21,16390228	-4,16%	27	2022-04-01	40,55938339	-4,28%	27	2022-04-01	27,78549194	3,86%
28	2022-05-01	19,54294586	-7,66%	28	2022-05-01	43,33787155	6,85%	28	2022-05-01	27,17649841	-2,19%
29	2022-06-01	19,20363617	-1,74%	29	2022-06-01	39,73287964	-8,32%	29	2022-06-01	26,30202484	-3,22%
30	2022-07-01	19,9040892	3,65%	30	2022-07-01	40,28904343	1,40%	30	2022-07-01	26,42744255	0,48%
31	2022-08-01	20,85713577	4,79%	31	2022-08-01	40,71382904	1,05%	31	2022-08-01	26,24827385	-0,68%
32	2022-09-01	19,92621231	-4,46%	32	2022-09-01	38,19138336	-6,20%	32	2022-09-01	24,05345454	-8,36%
33	2022-10-01	22,16486359	11,23%	33	2022-10-01	41,59843445	8,92%	33	2022-10-01	25,87201691	7,56%
34	2022-11-01	23,95578384	8,08%	34	2022-11-01	46,79660034	12,50%	34	2022-11-01	26,48191164	2,35%
35	2022-12-01	23,10022163	-3,57%	35	2022-12-01	46,63894277	-0,34%	35	2022-12-01	25,1950874	-5,14%
36	2023-01-01	25,36990356	9,83%	36	2023-01-01	55,09088516	18,12%	36	2023-01-01	27,09036827	7,85%
37	2023-02-01	26,46484756	4,32%	37	2023-02-01	57,93739319	5,17%	37	2023-02-01	28,7028904	5,95%
38	2023-03-01	24,97093582	-5,64%	38	2023-03-01	48,35560609	-16,54%	38	2023-03-01	27,58133716	-2,97%
39	2023-04-01	26,21660042	4,99%	39	2023-04-01	51,3159797	6,12%	39	2023-04-01	29,74207115	6,79%
40	2023-05-01	23,41939545	-10,67%	40	2023-05-01	47,30458833	-7,82%	40	2023-05-01	26,38953094	-9,76%
41	2023-06-01	25,45993614	8,71%	41	2023-06-01	54,0778617	14,32%	41	2023-06-01	26,16142273	8,65%
42	2023-07-01	26,35022109	3,50%	42	2023-07-01	56,23277205	3,98%	42	2023-07-01	30,87735748	5,88%
43	2023-08-01	26,166502	-0,70%	43	2023-08-01	55,94228745	-0,52%	43	2023-08-01	27,04217796	-2,06%
44	2023-09-01	26,54804802	1,46%	44	2023-09-01	56,61685944	1,21%	44	2023-09-01	31,41773605	3,89%
45	2023-10-01	26,33607864	-0,80%	45	2023-10-01	50,86429214	-10,16%	45	2023-10-01	31,48409653	0,21%
46	2023-11-01	26,93901443	2,29%	46	2023-11-01	54,12470245	6,41%	46	2023-11-01	33,09574899	5,12%
47	2023-12-01	27,7821846	3,13%	47	2023-12-01	58,64056015	8,34%	47	2023-12-01	32,34680557	-2,26%
48	2024-01-01	29,35547066	5,66%	48	2024-01-01	58,60308456	-0,06%	48	2024-01-01	32,21408081	-0,41%
49	2024-02-01	30,97586441	5,52%	49	2024-02-01	51,88551331	-11,46%	49	2024-02-01	34,66947937	7,62%
50	2024-03-01	32,79880142	5,89%	50	2024-03-01	61,7042263	18,92%	50	2024-03-01	35,86400223	3,45%
51	2024-04-01	30,56134415	-6,82%	51	2024-04-01	63,34379959	2,66%	51	2024-04-01	32,81134033	-8,51%
52	2024-05-01	33,04499924	8,14%	52	2024-05-01	63,42811584	0,13%	52	2024-05-01	36	9,72%
53	2024-06-01	30,56399969	-7,50%	53	2024-06-01	59,52999878	-6,15%	53	2024-06-01	29,96999931	-16,75%
54	2024-07-01	32,49000168	6,28%	54	2024-07-01	63,45999909	6,60%	54	2024-07-01	31,09400053	6,57%
55	2024-08-01	34,40000153	5,88%	55	2024-08-01	62,5800181	-1,39%	55	2024-08-01	32,40999985	1,47%
56	2024-09-01	34,52999878	0,38%	56	2024-09-01	61,54999924	-1,65%	56	2024-09-01	30,05999947	-7,25%
57	2024-10-01	34,52000046	-0,03%	57	2024-10-01	62,75	1,95%	57	2024-10-01	29,03000031	-2,10%
58	2024-11-01	32,97999954	-4,46%	58	2024-11-01	56,63999939	-9,74%	58	2024-11-01	28,54000095	-4,32%
59	2024-12-01	34,31999969	4,06%	59	2024-12-01	59,2200012	4,56%	59	2024-12-01	28,54000092	1,35%
60	2025-01-01	36,65000153	6,79%	60	2025-01-01	65,7200012	10,98%	60	2025-01-01	30,62999916	7,32%
61	2025-02-01	36,09000015	-1,53%	61	2025-02-01	63,90999985	-2,75%	61	2025-02-01	29,79999954	-0,49%
62	Rentabilité moyenne Mensuelle (en %)		2,22%	62	Rentabilité moyenne Mensuelle (en %)		2,56%	62	Rentabilité moyenne Mensuelle (en %)		0,89%
63	Annuelle		26,59%	63	Annuelle		30,68%	63	Annuelle		10,62%
64	Ecart-type des rentabilités Mensuelle (en %)		8,36%	64	Ecart-type des rentabilités Mensuelle (en %)		10,32%	64	Ecart-type des rentabilités Mensuelle (en %)		6,45%
65	Annuelle		28,97%	65	Annuelle		35,76%	65	Annuelle		22,34%

QUESTION 3

	A	B	C		A	B	C		A	B	C		A	B	C		A	B	C	
1	Date	CA.PA	Taux de rendement mensuel (en %)	1	Date	BN.PA	Taux de rendement mensuel (en %)	1	Date	ENGI.PA	Taux de rendement mensuel (en %)	1	Date	KER.PA	Taux de rendement mensuel (en %)	1	Date	OR.PA	Taux de rendement mensuel (en %)	
2	2020-03-01	12,30040264	-	2	2020-03-01	49,32273102	-	2	2020-03-01	6,962909698	-	2	2020-03-01	415,2540894	-	2	2020-03-01	219,9911652	-	
3	2020-04-01	11,51536083	-6,38%	3	2020-04-01	53,20866013	7,88%	3	2020-04-01	7,326886654	5,23%	3	2020-04-01	401,5548096	-3,30%	3	2020-04-01	244,3016357	11,05%	
4	2020-05-01	11,6518898	1,19%	4	2020-05-01	51,77877808	-2,69%	4	2020-05-01	7,867673397	7,38%	4	2020-05-01	409,756958	2,04%	4	2020-05-01	241,1707306	-1,28%	
5	2020-06-01	11,73722076	0,73%	5	2020-06-01	51,77877808	0,00%	5	2020-06-01	8,13769722	3,43%	5	2020-06-01	430,1713562	4,98%	5	2020-06-01	263,0870361	9,09%	
6	2020-07-01	11,70066738	-0,31%	6	2020-07-01	47,55640411	-8,15%	6	2020-07-01	8,352235794	2,64%	6	2020-07-01	431,8059387	0,38%	6	2020-07-01	260,600708	-0,95%	
7	2020-08-01	11,66599846	-0,30%	7	2020-08-01	47,98532486	0,90%	7	2020-08-01	8,622260094	3,23%	7	2020-08-01	461,2503357	6,82%	7	2020-08-01	258,3356628	-0,87%	
8	2020-09-01	11,84367466	1,52%	8	2020-09-01	48,08983231	0,22%	8	2020-09-01	8,484810034	-2,02%	8	2020-09-01	508,7556763	10,30%	8	2020-09-01	258,9887695	0,25%	
9	2020-10-01	11,57932663	-2,23%	9	2020-10-01	41,27957153	-14,16%	9	2020-10-01	7,682725906	-9,06%	9	2020-10-01	464,7460022	-8,65%	9	2020-10-01	259,0820618	0,04%	
10	2020-11-01	11,90001106	2,77%	10	2020-11-01	46,90543747	13,63%	10	2020-11-01	9,151209831	19,11%	10	2020-11-01	542,2783203	16,68%	10	2020-11-01	286,2310486	10,48%	
11	2020-12-01	12,1600256	2,18%	11	2020-12-01	46,81835175	-0,19%	11	2020-12-01	9,262179375	1,21%	11	2020-12-01	532,7773438	-1,75%	11	2020-12-01	289,9628906	1,30%	
12	2021-01-01	12,12535858	-0,29%	12	2021-01-01	47,86340332	2,23%	12	2021-01-01	9,484116554	2,40%	12	2021-01-01	485,4512024	-8,88%	12	2021-01-01	270,6506653	-6,66%	
13	2021-02-01	12,5197134	3,25%	13	2021-02-01	49,16971588	2,73%	13	2021-02-01	8,940369606	-5,73%	13	2021-02-01	472,5717468	-2,65%	13	2021-02-01	289,4992676	4,38%	
14	2021-03-01	13,38642979	6,92%	14	2021-03-01	50,94630814	3,61%	14	2021-03-01	8,955165863	0,17%	14	2021-03-01	529,9213257	12,14%	14	2021-03-01	304,8901672	7,93%	
15	2021-04-01	13,95846176	4,27%	15	2021-04-01	51,05952454	0,22%	15	2021-04-01	9,151209831	2,19%	15	2021-04-01	600,0552979	13,23%	15	2021-04-01	318,7446289	4,54%	
16	2021-05-01	14,49149132	3,82%	16	2021-05-01	50,77212906	-0,56%	16	2021-05-01	9,898455772	-1,78%	16	2021-05-01	673,7005005	12,27%	16	2021-05-01	347,6652527	9,07%	
17	2021-06-01	14,79151535	2,07%	17	2021-06-01	53,45695496	5,29%	17	2021-06-01	8,906681061	-0,91%	17	2021-06-01	668,9755249	-0,70%	17	2021-06-01	354,7450256	2,04%	
18	2021-07-01	13,96654415	-5,58%	18	2021-07-01	55,87903976	4,53%	18	2021-07-01	8,673877716	-2,61%	18	2021-07-01	686,4034242	2,61%	18	2021-07-01	364,2791748	2,69%	
19	2021-08-01	15,02785873	7,60%	19	2021-08-01	55,70796204	-0,31%	19	2021-08-01	9,352247238	7,82%	19	2021-08-01	611,7904663	-10,87%	19	2021-08-01	374,0946946	2,69%	
20	2021-09-01	13,86398029	-7,74%	20	2021-09-01	53,16882706	-4,56%	20	2021-09-01	8,743256569	-6,51%	20	2021-09-01	559,1437378	-8,61%	20	2021-09-01	336,856781	-9,95%	
21	2021-10-01	13,96208477	0,71%	21	2021-10-01	50,73773575	-4,57%	21	2021-10-01	9,47867012	8,41%	21	2021-10-01	588,3717041	5,23%	21	2021-10-01	372,8221436	10,68%	
22	2021-11-01	13,03900814	-6,61%	22	2021-11-01	46,8119812	-7,74%	22	2021-11-01	9,874899864	4,18%	22	2021-11-01	618,5073853	5,12%	22	2021-11-01	375,229248	0,65%	
23	2021-12-01	14,36342329	10,16%	23	2021-12-01	49,15302658	5,00%	23	2021-12-01	10,0321579	1,59%	23	2021-12-01	641,6538086	3,74%	23	2021-12-01	393,5856961	4,89%	
24	2022-01-01	15,09029007	5,06%	24	2022-01-01	47,94729156	1,21%	24	2022-01-01	10,44843006	4,15%	24	2022-01-01	595,7240601	-7,16%	24	2022-01-01	355,7362061	-9,62%	
25	2022-02-01	15,96431255	5,79%	25	2022-02-01	48,90091324	-1,70%	25	2022-02-01	10,99883461	5,27%	25	2022-02-01	581,140625	-2,45%	25	2022-02-01	335,1104431	-5,80%	
26	2022-03-01	17,52061081	9,75%	26	2022-03-01	45,04718399	-7,88%	26	2022-03-01	9,99613571	-16,36%	26	2022-03-01	525,133606	-9,64%	26	2022-03-01	343,4645996	2,49%	
27	2022-04-01	17,97991943	2,62%	27	2022-04-01	51,89925766	15,21%	27	2022-04-01	8,72783947	-5,13%	27	2022-04-01	468,0320435	-10,87%	27	2022-04-01	329,3522034	-4,11%	
28	2022-05-01	16,97211647	5,61%	28	2022-05-01	49,27907944	-5,05%	28	2022-05-01	10,36208725	18,72%	28	2022-05-01	646,9307251	-0,66%	28	2022-05-01	314,6074524	-4,48%	
29	2022-06-01	15,0590744	-11,27%	29	2022-06-01	49,67993164	0,81%	29	2022-06-01	9,093360901	-12,24%	29	2022-06-01	454,7181091	-2,20%	29	2022-06-01	315,3256531	0,23%	
30	2022-07-01	14,24460411	1,23%	30	2022-07-01	50,19296265	1,03%	30	2022-07-01	10,00054169	9,98%	30	2022-07-01	516,6956177	13,63%	30	2022-07-01	352,4791216	11,78%	
31	2022-08-01	15,24460411	0,00%	31	2022-08-01	48,98034668	-2,42%	31	2022-08-01	9,841328621	-1,59%	31	2022-08-01	466,6867981	-9,68%	31	2022-08-01	328,6836548	-6,75%	
32	2022-09-01	13,02295971	-14,57%	32	2022-09-01	45,30518723	-7,50%	32	2022-09-01	9,819768906	-0,22%	32	2022-09-01	425,4457703	-8,84%	32	2022-09-01	316,2353516	-3,79%	
33	2022-10-01	14,91937447	14,56%	33	2022-10-01	46,956221109	3,64%	33	2022-10-01	10,90772152	11,08%	33	2022-10-01	430,233999	1,12%	33	2022-10-01	304,6009216	-3,68%	
34	2022-11-01	15,04763317	0,86%	34	2022-11-01	46,7136879	-0,52%	34	2022-11-01	12,04045296	10,38%	34	2022-11-01	526,43753	22,36%	34	2022-11-01	339,7435303	11,54%	
35	2022-12-01	14,2846355	-4,78%	35	2022-12-01	45,92082214	-1,70%	35	2022-12-01	11,10176182	-7,80%	35	2022-12-01	441,1720886	-16,20%	35	2022-12-01	319,4431763	5,98%	
36	2023-01-01	16,00500298	11,70%	36	2023-01-01	46,9823029	2,19%	36	2023-01-01	10,79660416	-2,75%	36	2023-01-01	529,3137207	19,98%	36	2023-01-01	362,0068539	13,32%	
37	2023-02-01	17,14101791	7,10%	37	2023-02-01	49,66127777	5,82%	37	2023-02-01	11,47325802	6,27%	37	2023-02-01	519,0772705	-1,93%	37	2023-02-01	359,2026797	-0,78%	
38	2023-03-01	17,06772614	-0,43%	38	2023-03-01	53,45769503	7,64%	38	2023-03-01	12,08523178	5,33%	38	2023-03-01	561,1646729	8,11%	38	2023-03-01	393,7980042	9,64%	
39	2023-04-01	17,27844048	1,23%	39	2023-04-01	55,95755005	4,68%	39	2023-04-01	12,03713608	-0,40%	39	2023-04-01	542,1785278	-3,38%	39	2023-04-01	414,3855896	5,23%	
40	2023-05-01	15,74390221	-8,88%	40	2023-05-01	51,62011719	-7,75%	40	2023-05-01	12,80782318	6,40%	40	2023-05-01	466,0939941	-14,03%	40	2023-05-01	392,9566345	-5,17%	
41	2023-06-01	15,89964581	0,99%	41	2023-06-01	54,15725708	4,92%	41	2023-06-01	13,88959855	8,45%	41	2023-06-01	480,7517331	3,15%	41	2023-06-01	420,6310212	7,04%	
42	2023-07-01	17,22060966	8,31%	42	2023-07-01	53,56897807	-1,09%	42	2023-07-01	13,60135651	-2,08%	42	2023-07-01	497,865913	3,56%	42	2023-07-01	416,7901001	-0,91%	
43	2023-08-01	16,72831028	-2,86%	43	2023-08-01	51,92884064	-3,06%	43	2023-08-01	13,5812912	-0,15%	43	2023-08-01	469,9134216	-5,61%	43	2023-08-01	399,6536255	-4,11%	
44	2023-09-01	15,41713112	-7,84%	44	2023-09-01	50,14128757	-2,92%	44	2023-09-01	13,25291359	-2,42%	44	2023-09-01	410,6750488	-12,61%	44	2023-09-01	387,4447673	-3,10%	
45	2023-10-01	15,69641018	1,81%	45																

QUESTION 3

	A	B	C
1	Date	MLPA	Taux de rendement mensuel (en %)
2	2020-03-01	17,7541733	-
3	2020-04-01	18,98889351	9,92%
4	2020-05-01	19,36598319	1,98%
5	2020-06-01	19,67939568	1,63%
6	2020-07-01	18,82692146	-4,33%
7	2020-08-01	20,61174202	9,48%
8	2020-09-01	19,9800148	-3,06%
9	2020-10-01	20,18042183	1,00%
10	2020-11-01	22,75307846	12,75%
11	2020-12-01	22,8619976	0,48%
12	2021-01-01	24,81163979	8,53%
13	2021-02-01	26,08598709	5,14%
14	2021-03-01	27,80690002	6,60%
15	2021-04-01	26,21668625	-5,72%
16	2021-05-01	27,40390019	4,53%
17	2021-06-01	29,84941292	8,92%
18	2021-07-01	30,55985176	2,38%
19	2021-08-01	30,41533089	-0,47%
20	2021-09-01	29,47213364	-3,10%
21	2021-10-01	30,11572456	2,18%
22	2021-11-01	28,96169472	-3,83%
23	2021-12-01	31,9910202	10,46%
24	2022-01-01	32,77886963	2,46%
25	2022-02-01	27,51915932	-16,05%
26	2022-03-01	27,28613472	-0,85%
27	2022-04-01	26,42061424	-3,17%
28	2022-05-01	26,90885739	1,85%
29	2022-06-01	23,95097542	-10,99%
30	2022-07-01	25,04824829	4,58%
31	2022-08-01	22,41110611	-10,53%
32	2022-09-01	21,35017154	-4,73%
33	2022-10-01	23,79883385	11,47%
34	2022-11-01	24,64253426	3,55%
35	2022-12-01	23,96019745	-2,77%
36	2023-01-01	26,69876862	11,43%
37	2023-02-01	27,41798973	2,69%
38	2023-03-01	25,9518852	-5,35%
39	2023-04-01	26,58350754	2,43%
40	2023-05-01	24,49039078	-7,87%
41	2023-06-01	26,09305763	6,54%
42	2023-07-01	28,70622253	10,01%
43	2023-08-01	27,87695313	-2,89%
44	2023-09-01	28,03123474	0,55%
45	2023-10-01	27,01875496	-3,61%
46	2023-11-01	29,70905876	9,96%
47	2023-12-01	31,30009842	5,36%
48	2024-01-01	29,71870232	-5,05%
49	2024-02-01	32,96828079	10,93%
50	2024-03-01	34,25075531	3,89%
51	2024-04-01	34,88717272	1,86%
52	2024-05-01	35,82251358	2,68%
53	2024-06-01	36,11000061	0,80%
54	2024-07-01	36,59999847	1,36%
55	2024-08-01	35,50999832	-2,98%
56	2024-09-01	36,45999908	2,68%
57	2024-10-01	31,04999924	-14,84%
58	2024-11-01	30,75	-0,97%
59	2024-12-01	31,79999924	3,41%
60	2025-01-01	33,59999847	5,66%
61	2025-02-01	33,11000061	-1,46%
62	Rentabilité moyenne (en %)	Mensuelle	1,31%
63	Ecart-type des rentabilités (en %)	Mensuelle	15,75%
64	Ecart-type des rentabilités (en %)	Annuelle	22,25%

	A	B	C
1	Date	SGO.PA	Taux de rendement mensuel (en %)
2	2020-03-01	19,74900055	-
3	2020-04-01	21,57109451	9,23%
4	2020-05-01	25,90135193	20,07%
5	2020-06-01	28,55653	10,25%
6	2020-07-01	27,77244949	-2,75%
7	2020-08-01	30,27615929	9,02%
8	2020-09-01	32,08488846	5,97%
9	2020-10-01	29,84847832	-6,97%
10	2020-11-01	35,47959518	18,87%
11	2020-12-01	33,41247177	-5,83%
12	2021-01-01	36,60225677	9,55%
13	2021-02-01	39,57819366	8,13%
14	2021-03-01	44,83050682	13,28%
15	2021-04-01	46,77476464	4,33%
16	2021-05-01	48,84458542	4,42%
17	2021-06-01	49,48610687	1,31%
18	2021-07-01	54,93684769	11,01%
19	2021-08-01	55,97631454	1,89%
20	2021-09-01	53,10410309	-5,13%
21	2021-10-01	54,3076975	2,27%
22	2021-11-01	51,22576141	-5,67%
23	2021-12-01	56,41398621	10,13%
24	2022-01-01	54,38976288	-3,59%
25	2022-02-01	51,01604642	-6,20%
26	2022-03-01	49,48419571	-3,00%
27	2022-04-01	51,36253357	3,80%
28	2022-05-01	50,24100115	-2,18%
29	2022-06-01	37,33425903	-25,69%
30	2022-07-01	42,54927063	13,97%
31	2022-08-01	37,8794058	-10,98%
32	2022-09-01	34,78103638	-8,18%
33	2022-10-01	38,8646431	11,74%
34	2022-11-01	41,06602859	5,66%
35	2022-12-01	42,85437012	4,35%
36	2023-01-01	49,33180618	15,11%
37	2023-02-01	52,88031769	7,19%
38	2023-03-01	49,1158905	-7,12%
39	2023-04-01	49,20976639	0,19%
40	2023-05-01	48,62773895	-1,18%
41	2023-06-01	52,31706238	7,59%
42	2023-07-01	59,85966492	14,42%
43	2023-08-01	58,57445526	-2,15%
44	2023-09-01	55,38090515	-5,45%
45	2023-10-01	50,04533005	-9,63%
46	2023-11-01	52,3368073	16,36%
47	2023-12-01	64,90315247	11,45%
48	2024-01-01	64,10475159	-1,23%
49	2024-02-01	69,32348633	8,14%
50	2024-03-01	70,03425598	1,03%
51	2024-04-01	72,69230652	3,80%
52	2024-05-01	78,45628357	7,93%
53	2024-06-01	70,70606995	-9,88%
54	2024-07-01	79,44000244	12,35%
55	2024-08-01	79,08000183	-0,45%
56	2024-09-01	81,72000122	3,34%
57	2024-10-01	82,98000336	1,54%
58	2024-11-01	86,33999634	4,05%
59	2024-12-01	85,69999695	-0,74%
60	2025-01-01	90,58000183	5,69%
61	2025-02-01	86,69999695	-4,28%
62	Rentabilité moyenne (en %)	Mensuelle	2,90%
63	Ecart-type des rentabilités (en %)	Mensuelle	34,81%
64	Ecart-type des rentabilités (en %)	Annuelle	8,55%
65	Ecart-type des rentabilités (en %)	Annuelle	29,61%

	A	B	C
1	Date	DG.PA	Taux de rendement mensuel (en %)
2	2020-03-01	63,3996046	-
3	2020-04-01	62,81100845	-0,93%
4	2020-05-01	70,9943924	13,03%
5	2020-06-01	70,10523987	-1,25%
6	2020-07-01	63,16389465	-9,90%
7	2020-08-01	68,17881775	7,94%
8	2020-09-01	62,05531421	-8,89%
9	2020-10-01	58,8430481	-5,17%
10	2020-11-01	74,18286139	26,07%
11	2020-12-01	70,5908432	-4,84%
12	2021-01-01	66,44354248	-5,88%
13	2021-02-01	74,65137482	12,35%
14	2021-03-01	75,79661338	1,53%
15	2021-04-01	79,3019104	4,62%
16	2021-05-01	82,44730377	3,97%
17	2021-06-01	79,8475655	-3,15%
18	2021-07-01	79,15544128	-0,87%
19	2021-08-01	80,64609528	1,88%
20	2021-09-01	79,98949432	-0,81%
21	2021-10-01	81,95929718	2,46%
22	2021-11-01	74,23972299	-9,43%
23	2021-12-01	83,00861359	11,82%
24	2022-01-01	86,35897064	4,04%
25	2022-02-01	84,44702148	-2,21%
26	2022-03-01	83,08007813	-1,62%
27	2022-04-01	82,94606018	-0,16%
28	2022-05-01	82,08556503	-1,04%
29	2022-06-01	77,76525879	-5,26%
30	2022-07-01	85,47221337	9,91%
31	2022-08-01	84,43791199	-1,21%
32	2022-09-01	76,12684631	-9,84%
33	2022-10-01	85,28916168	12,04%
34	2022-11-01	88,4378433	3,69%
35	2022-12-01	86,29698026	-2,42%
36	2023-01-01	95,87104034	11,09%
37	2023-02-01	99,75621033	4,05%
38	2023-03-01	97,79512787	-1,97%
39	2023-04-01	103,78938243	6,13%
40	2023-05-01	101,0800781	-2,61%
41	2023-06-01	101,1371155	0,06%
42	2023-07-01	101,5174206	0,38%
43	2023-08-01	97,88568115	-3,58%
44	2023-09-01	99,84414673	2,00%
45	2023-10-01	99,33076477	-0,51%
46	2023-11-01	106,76035856	7,48%
47	2023-12-01	109,1666107	2,25%
48	2024-01-01	112,41784576	2,97%
49	2024-02-01	113,6792213	1,13%
50	2024-03-01	114,0248718	0,30%
51	2024-04-01	107,8541718	-7,37%
52	2024-05-01	113,3300323	7,06%
53	2024-06-01	97,4172821	-14,04%
54	2024-07-01	104,5666353	7,34%
55	2024-08-01	107,0916824	2,41%
56	2024-09-01	103,929965	-2,96%
57	2024-10-01	101,6950073	-2,14%
58	2024-11-01	99,8600061	-1,80%
59	2024-12-01	99,73999786	-0,12%
60	2025-01-01	104,5	4,77%
61	2025-02-01	103,1500015	-1,29%
62	Rentabilité moyenne (en %)	Mensuelle	1,04%
63	Ecart-type des rentabilités (en %)	Mensuelle	12,53%
64	Ecart-type des rentabilités (en %)	Annuelle	29,61%

	A	B	C
1	Date	TTE.PA	Taux de rendement mensuel (en %)
2	2020-03-01	25,65438652	-
3	2020-04-01	24,32604406	-5,18%
4	2020-05-01</td		

Question 4

QUESTION 4

Calculez la **rentabilité moyenne de l'ensemble des titres mois par mois**. Cette rentabilité est celle d'un portefeuille équipondéré composé de ces 12 titres.

Calculez la moyenne et l'écart-type des rentabilités mensuelles de ce portefeuille. Vérifiez que la rentabilité moyenne de ce portefeuille est égale à la moyenne des rentabilités moyennes de tous les titres. Annualisez ces chiffres.

La rentabilité mensuelle du portefeuille équipondéré a été obtenue en **prenant la moyenne des rentabilités mensuelles des 12 actions**. Cela a été fait en additionnant les rentabilités de chaque action **pondérées à parts égales (1/12)**.

$$R_p = \sum_i x_i R_i \text{ avec } x_i = \frac{1}{12} \quad \forall i$$

R_i : rentabilité du titre i

x_i : le poids du titre i

En Excel, pour la cellule B3 (et ainsi de suite jusqu'à B61), la formule est :

=1/12*'Q1-2-3 - TTE.PA'!C3 + 1/12*'Q1-2-3 - DG.PA'!C3 + 1/12*'Q1-2-3 - SGO.PA'!C3 + 1/12*'Q1-2-3 - ML.PA'!C3 +
 1/12*'Q1-2-3 - OR.PA'!C3 + 1/12*'Q1-2-3 - KER.PA'!C3 + 1/12*'Q1-2-3 - ENGI.PA'!C3 + 1/12*'Q1-2-3 - BN.PA'!C3 +
 1/12*'Q1-2-3 - CA.PA'!C3 + 1/12*'Q1-2-3 - EN.PA'!C3 + 1/12*'Q1-2-3 - BNP.PA'!C3 + 1/12*'Q1-2-3 - CS.PA'!C3

	A	B
	Date	Rentabilité moyenne du portefeuille (en %)
1		-
2	2020-03-01	-
3	2020-04-01	0,032945943
4	2020-05-01	0,046392279
5	2020-06-01	0,064214122
6	2020-07-01	-0,036431343
7	2020-08-01	0,054369313
8	2020-09-01	-0,034499393
9	2020-10-01	-0,058987285
10	2020-11-01	0,220364823
11	2020-12-01	-0,007309448
12	2021-01-01	-0,014773628
13	2021-02-01	0,067255985
14	2021-03-01	0,06084401
15	2021-04-01	0,026486408
16	2021-05-01	0,0274433103
17	2021-06-01	0,009030394
18	2021-07-01	0,013129334
19	2021-08-01	0,028469547
20	2021-09-01	-0,024954049
21	2021-10-01	0,036240216
22	2021-11-01	-0,043516304
23	2021-12-01	0,075588455
24	2022-01-01	0,015463204
25	2022-02-01	-0,048634156
26	2022-03-01	-0,015856939
27	2022-04-01	-0,001921618
28	2022-05-01	0,013559095
29	2022-06-01	0,059784484
30	2022-07-01	-0,074398353
31	2022-08-01	-0,030098603
32	2022-09-01	-0,067881418
33	2022-10-01	0,087884037
34	2022-11-01	0,074930021
35	2022-12-01	-0,04090204
36	2023-01-01	0,097263503
37	2023-02-01	0,041553076
38	2023-03-01	-0,013726223
39	2023-04-01	0,034953204
40	2023-05-01	-0,064779039
41	2023-06-01	0,057841167
42	2023-07-01	0,043840465
43	2023-08-01	-0,018827629
44	2023-09-01	-0,014940777
45	2023-10-01	-0,016569459
46	2023-11-01	0,061428463
47	2023-12-01	0,023198107
48	2024-01-01	-0,010055991
49	2024-02-01	0,022312882
50	2024-03-01	0,029005069
51	2024-04-01	-0,010205855
52	2024-05-01	0,020915233
53	2024-06-01	-0,060594613
54	2024-07-01	0,03562753
55	2024-08-01	0,011757674
56	2024-09-01	-0,03672563
57	2024-10-01	-0,038897395
58	2024-11-01	-0,02849333
59	2024-12-01	0,015920214
60	2025-01-01	0,054507183
61	2025-02-01	0,015511049

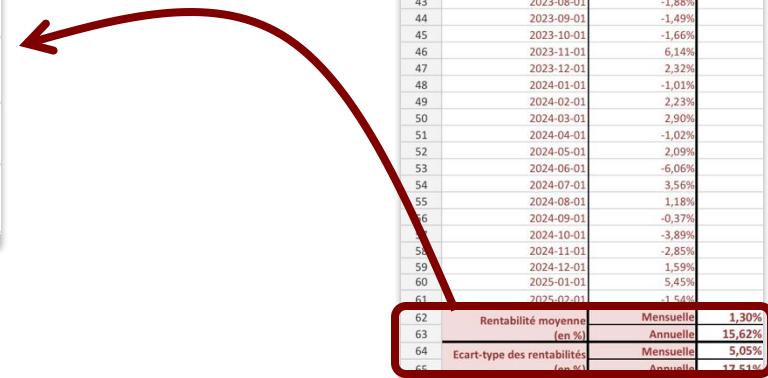
QUESTION 4

Calculez la rentabilité moyenne de l'ensemble des titres mois par mois. Cette rentabilité est celle d'un portefeuille équitablement composé de ces 12 titres.

Calculez la **moyenne et l'écart-type des rentabilités mensuelles de ce portefeuille**. Vérifiez que la rentabilité moyenne de ce portefeuille est égale à la moyenne des rentabilités moyennes de tous les titres. **Annualisez ces chiffres**.

Les statistiques du portefeuille ont été calculées en appliquant les mêmes méthodes que pour les titres individuels dans la question 3

A	B	C
62 Rentabilité moyenne (en %)	Mensuelle	1,30%
63	Annuelle	15,62%
64 Ecart-type des rentabilités (en %)	Mensuelle	5,05%
65	Annuelle	17,51%



A	B	C
1	Date	Rentabilité moyenne du portefeuille (en %)
2	2020-03-01	-
3	2020-04-01	3,29%
4	2020-05-01	4,64%
5	2020-06-01	6,42%
6	2020-07-01	-3,64%
7	2020-08-01	5,44%
8	2020-09-01	-3,45%
9	2020-10-01	-5,90%
10	2020-11-01	22,04%
11	2020-12-01	-0,73%
12	2021-01-01	-1,48%
13	2021-02-01	6,73%
14	2021-03-01	6,08%
15	2021-04-01	2,65%
16	2021-05-01	2,74%
17	2021-06-01	0,90%
18	2021-07-01	1,31%
19	2021-08-01	2,85%
20	2021-09-01	-2,50%
21	2021-10-01	3,62%
22	2021-11-01	-4,35%
23	2021-12-01	7,56%
24	2022-01-01	1,55%
25	2022-02-01	-4,86%
26	2022-03-01	-1,59%
27	2022-04-01	-0,19%
28	2022-05-01	1,36%
29	2022-06-01	-7,44%
30	2022-07-01	5,98%
31	2022-08-01	-3,01%
32	2022-09-01	-6,79%
33	2022-10-01	8,79%
34	2022-11-01	7,49%
35	2022-12-01	-4,09%
36	2023-01-01	9,73%
37	2023-02-01	4,16%
38	2023-03-01	-1,37%
39	2023-04-01	3,50%
40	2023-05-01	-6,48%
41	2023-06-01	5,78%
42	2023-07-01	4,38%
43	2023-08-01	-1,88%
44	2023-09-01	-1,49%
45	2023-10-01	-1,66%
46	2023-11-01	6,14%
47	2023-12-01	2,32%
48	2024-01-01	-1,03%
49	2024-02-01	2,23%
50	2024-03-01	2,90%
51	2024-04-01	-1,02%
52	2024-05-01	2,09%
53	2024-06-01	-6,06%
54	2024-07-01	3,56%
55	2024-08-01	1,18%
56	2024-09-01	-0,37%
57	2024-10-01	-3,89%
58	2024-11-01	-2,85%
59	2024-12-01	1,59%
60	2025-01-01	5,45%
61	2025-02-01	-1,54%
62	Rentabilité moyenne (en %)	Mensuelle 1,30%
63		Annuelle 15,62%
64	Ecart-type des rentabilités (en %)	Mensuelle 5,05%
65		Annuelle 17,51%

QUESTION 4

Calculez la rentabilité moyenne de l'ensemble des titres mois par mois. Cette rentabilité est celle d'un portefeuille équipondéré composé de ces 12 titres.

Calculez la moyenne et l'écart-type des rentabilités mensuelles de ce portefeuille. **Vérifiez que la rentabilité moyenne de ce portefeuille est égale à la moyenne des rentabilités moyennes de tous les titres. Annualisez ces chiffres.**

Cette vérification a été effectuée en calculant la moyenne des valeurs de C62 des différentes actions et en la comparant à C62 du portefeuille.

	E	F	G
61			
62	Vérification que la rentabilité moyenne du portefeuille est égale à la moyenne des rentabilités moyennes de tous les titres qui le composent		
63			
64			
65	Rentabilité moyenne (en %)	Mensuelle	1,30%
66		Annuelle	15,62%

En Excel, cette comparaison a été réalisée avec la formule suivante pour la rentabilité moyenne mensuelle de l'ensemble des titres mois par mois :
 $=1/12*'Q1-2-3 - TTE.PA'!C62 + 1/12*'Q1-2-3 - DG.PA'!C62 + 1/12*'Q1-2-3 - SGO.PA'!C62 + 1/12*'Q1-2-3 - ML.PA'!C62 + 1/12*'Q1-2-3 - OR.PA'!C62 + 1/12*'Q1-2-3 - KER.PA'!C62 + 1/12*'Q1-2-3 - ENGI.PA'!C62 + 1/12*'Q1-2-3 - BN.PA'!C62 + 1/12*'Q1-2-3 - CA.PA'!C62 + 1/12*'Q1-2-3 - EN.PA'!C62 + 1/12*'Q1-2-3 - BNP.PA'!C62 + 1/12*'Q1-2-3 - CS.PA'!C62$
*L'annualisation de cette vérification a été réalisée avec : =G65*12*

Question 5

QUESTION 5

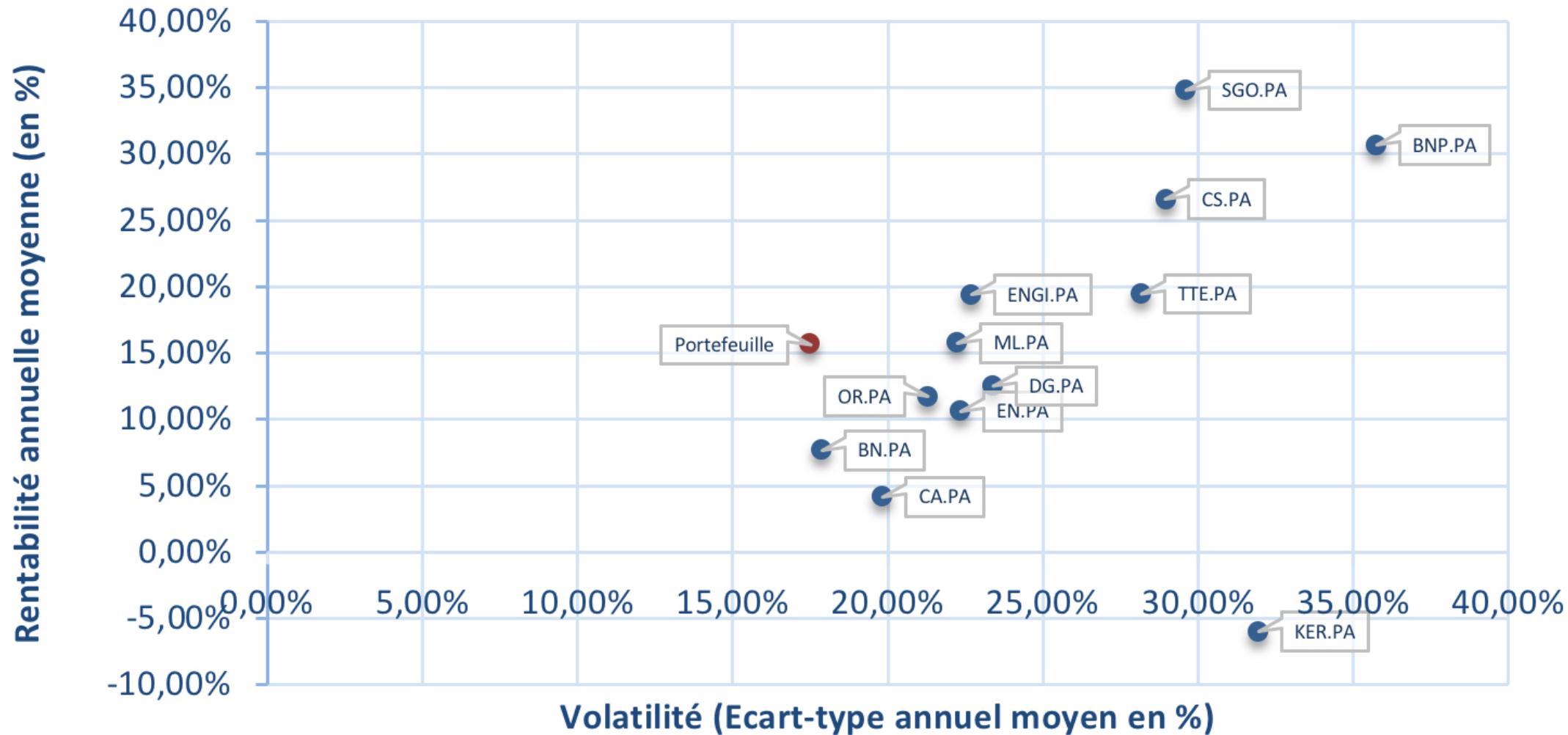
En utilisant les chiffres annuels, créez un graphique avec l'écart-type (volatilité) en abscisse et la rentabilité moyenne en ordonnée. A cet effet, créez trois colonnes sur votre feuille de calcul contenant les statistiques calculées aux questions 3 et 4 pour chaque titre et le portefeuille équipondéré. La **première colonne contiendra le code de la valeur, la deuxième son écart type annuel et la dernière sa rentabilité annuelle moyenne**. Créez ensuite un graphique « nuage de points » à l'aide des données des deux dernières colonnes (écart-type et moyenne).

	A	B	C
1	code de la valeur	Ecart-type annuel moyen	Rentabilité annuelle moyenne
2	CS.PA	28,97%	26,59%
3	BNP.PA	35,76%	30,68%
4	EN.PA	22,34%	10,62%
5	CA.PA	19,84%	4,17%
6	BN.PA	17,87%	7,68%
7	ENGI.PA	22,69%	19,42%
8	KER.PA	31,95%	-5,97%
9	OR.PA	21,28%	11,73%
10	ML.PA	22,25%	15,76%
11	SGO.PA	29,61%	34,81%
12	DG.PA	23,39%	12,53%
13	TTE.PA	28,19%	19,45%
14	Portefeuille	17,51%	15,62%

Le tableau récapitulatif comprend trois colonnes : le code de chaque valeur, son écart-type annuel récupéré depuis C65 de chaque feuille correspondante, et sa rentabilité annuelle moyenne issue de C63. En Excel, les formules utilisées pour la première action en B2 et C2 sont respectivement : ='Q1-2-3 - CS.PA'!C65 pour l'écart-type annuel (B2) et ='Q1-2-3 - CS.PA'!C63 pour la rentabilité annuelle moyenne (C2). Ces formules ont été étendues aux autres actions et au portefeuille.

QUESTION 5

Rendement-Risque



Question 6

QUESTION 6

Que remarquez-vous à propos des volatilités des titres individuels par rapport à la volatilité du portefeuille équiconcordé ?

En comparant la volatilité du portefeuille équiconcordé à celles des titres individuels, on observe qu'elle est systématiquement plus faible, illustrant ainsi l'effet de diversification. Ce phénomène repose sur le principe selon lequel la combinaison d'actifs présentant des corrélations imparfaites permet d'atténuer les variations spécifiques à chaque titre, réduisant ainsi la volatilité globale du portefeuille.

D'un point de vue théorique, cette diversification diminue le risque spécifique lié aux événements propres à chaque entreprise (résultats financiers, gestion, scandales, etc.), tout en conservant une exposition au risque systémique inhérent aux mouvements globaux du marché.

L'effet portefeuille constitue ainsi un levier essentiel en gestion d'actifs, permettant d'optimiser le couple rendement-risque et de minimiser l'impact des fluctuations individuelles sans compromettre le rendement attendu, renforçant ainsi l'efficience de l'investissement.