Week 5 assignment

Problem 1

I create a Library for risk management, which contains missing_data.py, EWMA.py, nearpsd_higham.py, chol.py, simulation.py, returns_fit_var_es.py.

In compare_results.py, I test the functionality of these methods by using compare_results function, showing that my output was close to the expected outcome to a few decimal places.

Test1-8:

```
(base) ada@AdadeAir Project % python3 compare_results.py
1.1: The results are identical.
1.2: The results are identical.
1.3: The results are identical.
1.4: The results are identical.
2.1: The results are identical.
2.2: The results are identical.
2.3: The results are identical.
3.1: The results are identical.
3.2: The results are identical.
3.3: The results are identical.
3.4: The results are identical.
4.1: The results are identical.
5.1: The results are identical.
5.2: The results are identical.
5.3: The results are identical.
5.4: The results are identical.
5.5: The results are identical.
6.1: The results are identical.
6.2: The results are identical.
7.1: The results are identical.
7.2: The results are identical.
7.3: The results are identical.
8.1: The results are identical.
8.2: The results are identical.
8.3: The results are identical.
8.4: The results are identical.
8.5: The results are identical.
8.6: The results are identical.
```

Test 9:

My outcome is similar to the expected outcome

My outcome:

Stock	VaR95	ES95	VaR95_Pct	ES95_Pct
A	93.13115393	115.7573155	0.046565577	0.057878657
B	108.6059319	153.9765949	0.036201977	0.051325531
Total	152.2533105	202.8261729	0.030450662	0.040565234

Expected outcome:

Stock	VaR95	ES95	VaR95_Pct	ES95_Pct
A	94.46037635	118.2893708	0.047230188	0.059144685
B	107.8804274	151.2181736	0.035960142	0.050406058
Total	152.5656843	199.7045322	0.030513137	0.039940906

Problem 2

By applying the library, answers are as followed.

	VaR	ES
Using a normal distribution with an exponentially weighted variance	0.09110379	0.11512766
Using a MLE fitted T distribution	0.07647603	0.11677670
Using a Historic Simulation	0.07598069	0.11677670

Problem 3

To compare the results from this week and from week4, I use Portfolio.csv and DailyPrices.csv from week4, the result are as follows:

Myoutput_risk_A

Stock	VaR95	ES95	VaR95_Pct	ES95_Pct
AAPL	773.6886144	1156.780216	0.028015124	0.041886802
MSFT	1783.573657	2527.495676	0.031608077	0.044791689
AMZN	566.4872049	810.8464343	0.039884479	0.057088999
NVDA	1100.422569	1657.890276	0.048974274	0.073784358
GOOGL	296.7981605	436.6996682	0.033024358	0.048591023
TSLA	915.3863939	1248.869698	0.062301697	0.084998753
GOOG	729.3062984	1066.520478	0.03327317	0.048657906
BRK-B	1172.255828	1727.078669	0.017593619	0.025920592
META	1076.926614	1786.920827	0.042866643	0.071127685
UNH	668.549999	1034.385152	0.021655475	0.0335055
XOM	212.6158624	280.4194394	0.027202922	0.035877982
LLY	2543.023951	4125.043266	0.023211784	0.037651872
JPM	519.6411572	806.229224	0.023305754	0.036159145
JNJ	204.1157325	308.0101315	0.016304476	0.024603413
V	270.1425387	394.973218	0.020520563	0.030002948
PG	178.2606116	249.4548444	0.016109818	0.022543803
MA	1433.427216	2070.692983	0.021598721	0.031200971
AVGO	3830.572291	5504.707175	0.032767862	0.047088913
HD	1315.79434	1856.263258	0.02502197	0.035299865
CVX	575.7014887	825.4799141	0.024908211	0.035715086
MRK	120.9915427	169.2805922	0.0196169	0.02744622
ABBV	207.9120187	304.5067372	0.020017871	0.029318058
COST	2178.864267	3404.615814	0.021315028	0.033306105
PEP	497.8601393	701.9959786	0.016709015	0.023560153

ADBE	2859.119721	4194.361129	0.036197527	0.053102184
WMT	199.1479285	285.210529	0.015527316	0.02223751
KO	70.16872029	98.33460253	0.015420342	0.021610102
CSCO	188.7515794	272.9666247	0.02060501	0.029798321
CRM	891.3294875	1275.810148	0.033998656	0.048664194
MCD	269.5634555	386.3310815	0.015718114	0.022526777
ACN	475.9898195	671.8990157	0.025963242	0.036649264
BAC	56.00349098	79.75069073	0.028945365	0.041219089
TMO	1212.050579	1664.598328	0.025645209	0.035220455
Total	20176.49854	27729.97235	0.018522169	0.025456312

Myoutput_risk_B

Stock	VaR95	ES95	VaR95_Pct	ES95_Pct
CMCSA	59.8772829	90.53210049	0.025419122	0.038432715
PFE	69.70299309	96.9320745	0.023691579	0.032946561
LIN	761.1521524	1184.431846	0.021483115	0.033429959
ORCL	310.0619677	476.979587	0.025166571	0.03871465
ABT	247.3774838	345.4714091	0.023122956	0.032292027
NFLX	1080.512569	1719.3515	0.044451197	0.070732385
DHR	488.6349187	709.6890216	0.027324541	0.039685921
AMD	376.5882373	545.1823775	0.050187676	0.072656111
WFC	196.9212303	279.6917797	0.029665613	0.042134757
DIS	469.5257121	686.6334668	0.032833966	0.048016326
PM	171.2326683	239.9548795	0.018219982	0.025532357
TXN	823.5196268	1088.933266	0.028539137	0.037737068
INTC	114.7578849	154.968925	0.040944599	0.055291543
AMGN	371.6411969	589.0324035	0.023137914	0.036672418
COP	453.9430437	655.4615882	0.034013618	0.049113255
INTU	1287.706198	1807.905647	0.037235495	0.052277656
VZ	147.4182083	215.7281074	0.022148169	0.032411075
CAT	1001.272725	1450.374294	0.02842527	0.041174876
NEE	119.0889537	172.3820059	0.025493751	0.036902364
IBM	183.3315931	267.5430979	0.018351731	0.026781412
UNP	284.280858	426.3425278	0.025634628	0.038444841
HON	658.6942231	927.8181749	0.021163601	0.029810454
BMY	189.040113	258.0061066	0.019690242	0.026873676
LOW	910.2402539	1342.781774	0.027899271	0.041156863
GE	187.0014042	266.9504567	0.025468356	0.036356889
SPGI	1112.488754	1576.966493	0.025364876	0.035955024
QCOM	807.6778531	1115.368647	0.038663521	0.053392672
AMAT	289.4504985	398.2930077	0.03936399	0.054166091

BA	1046.373251	1675.750685	0.03131636	0.050152669
UPS	759.7961164	1090.712109	0.026141795	0.0375274
NKE	406.778585	612.137751	0.031755141	0.04778649
NOW	1417.097953	2048.607738	0.037610631	0.054371281
T	44.20504473	68.5636838	0.025645737	0.039777502
Total	11806.45626	16053.88274	0.020549321	0.027942033

Myoutput_risk_C

Stock	VaR95	ES95	VaR95_Pct	ES95_Pct
GS	430.2117005	549.6142246	0.025231942	0.032234908
BKNG	11751.48632	14930.05945	0.029291373	0.037214181
MS	308.1119252	386.1228349	0.027606468	0.034596154
MDT	209.0173046	261.1632914	0.025280856	0.031587966
SBUX	437.8559381	535.1125251	0.02733306	0.033404281
ELV	1506.78935	1876.80049	0.026747138	0.033315235
PLD	532.5471811	657.4284386	0.029736305	0.036709409
RTX	350.4084844	435.9103718	0.025364459	0.031553547
DE	627.9875312	797.7834278	0.027946167	0.035502279
TJX	292.0507637	372.8031959	0.019382133	0.024741319
ISRG	650.1038657	826.8906172	0.033172625	0.042193462
ADP	859.0792471	1068.363143	0.023156242	0.028797432
MMC	323.3468731	407.1282251	0.019688853	0.024790367
MDLZ	164.4931241	207.2716089	0.017828663	0.022465228
SYK	1381.473106	1738.836964	0.02562178	0.032249704
BLK	1641.040547	2070.994002	0.029952391	0.037799933
GILD	320.3360873	401.7681524	0.024403305	0.030606825
LMT	690.1129767	881.8400435	0.020854375	0.026648134
CVS	219.605408	277.4547279	0.027314275	0.034509508
VRTX	1587.166449	1998.979191	0.025654571	0.032311011
AXP	512.6919481	637.9921703	0.030172761	0.037546885
REGN	4498.565511	5720.720084	0.031525227	0.04008989
CB	893.8601481	1129.631201	0.022078689	0.027902325
ADI	742.1841484	930.3643679	0.0306482	0.038419027
CI	1151.479387	1453.286162	0.02502076	0.031578788
ETN	518.5921927	665.5946025	0.025402059	0.032602638
SLB	392.3835294	500.2726088	0.038416546	0.048979491
PGR	750.5584503	949.8394157	0.030109971	0.038104477
SCHW	364.5697508	459.3057715	0.041838684	0.052710761
LRCX	5246.772139	6759.066797	0.043684027	0.05627522
ZTS	646.9831827	804.8916819	0.030263576	0.037649975
C	95.56012474	122.8930945	0.028136043	0.036183767

BSX	197.006294	253.4872917	0.019550482	0.025155536
AMT	351.551982	441.0493898	0.031104518	0.039023044
Total	26260.82776	33711.83506	0.018927957	0.024298403

		Total		
Stock	VaR95	ES95	VaR95_Pct	ES95_Pct
A	20176.49854	27729.97235	0.018522169	0.025456312
B	11806.45626	16053.88274	0.020549321	0.027942033
C	26260.82776	33711.83506	0.018927957	0.024298403
Toal	58243.78256	77495.69015	0.057999447	0.077696748

VaR from weel4:

Portfolio A VaR: $15253.97
Portfolio B VaR: $7765.47
Portfolio C VaR: $17933.67
Total VaR: $38091.10
The result is larger.

If I use the dataset this week, the results are as follows:

		Total		
Stock	VaR95	ES95	VaR95_Pct	ES95_Pct
A	8010.421658	10565.423037	0.026706	0.035224
B	6892.734897	9167.522369	0.023414	0.027942033
C	5934.79124	7504.778036	0.021977	0.027791
Toal	20837.947795	27237.723442	0.072097	0.090957033

The dataset is different, so we cannot campare.