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 Q1

	T-bill	S&P 500	Microsoft	Dell	Exxon	GM	IBM	Ford
Average	0.00351	0.00838	0.02632	0.03673	0.01284	0.00725	0.01069	0.00690
STD	0.00154	0.03996	0.10257	0.15161	0.04580	0.09327	0.08761	0.09430

Q2

	T-bill	S&P 500	Microsoft	Dell	Exxon	GM	IBM	Ford
T-bill	1.00000	0.06922	0.13241	0.06114	0.03865	0.00266	0.04134	0.02359
S&P 500		1.00000	0.54399	0.43517	0.45093	0.44741	0.54018	0.50752
Microsoft			1.00000	0.52712	0.13734	0.12264	0.46422	0.22796
Dell				1.00000	0.06558	0.17795	0.36041	0.26893
Exxon					1.00000	0.20574	0.25684	0.24470
GM						1.00000	0.27395	0.56059
IBM							1.00000	0.25477
Ford								1.00000

Q3

(a) T-bills are bonds issued by the US governments so they are considered as riskless. As a result, returns of T-bills are most stable and the standard deviation over time should be smaller than other assets.

(b) They are in the same industry sector—Technology. These companies are affected in a similar way by events that influence the whole Technology industry. For example, if people start to get crush in IBM, the demand for Windows operating system will also increase. Therefore, returns of these assets are likely to co-move and the correlations between them are high.

(c) Auto does not heavily rely on Technology industry. GM and Ford are in the Auto industry so they are affected in a similar way by events that influence the Auto industry. Events that influence the Auto industry do not have to affect Technology industry. So correlation coefficients between Auto and Technology assets are small.

Q4

	Microsoft	Dell	Exxon	GM	IBM	Ford
Beta	1.38720	1.64702	0.51587	1.04719	1.18401	1.20305
Std of Beta	0.14761	0.23399	0.07006	0.14294	0.12635	0.13921
	Microsoft	Dell	Exxon	GM	IBM	Ford
Alpha	0.01606	0.02521	0.00681	-0.00136	0.00141	-0.00246
Std of Alpha	0.00592	0.00938	0.00281	0.00573	0.00507	0.00558
	Microsoft	Dell	Exxon	GM	IBM	Ford
Sigma	0.08634	0.13685	0.04098	0.08360	0.07390	0.08142

CAPM

$$R_f = 0.00351 \quad E(R_m) - R_f = 0.00838 - 0.00351 = 0.00487$$

$$E(R_{\text{Micro}}) = 0.00351 + 1.3872 * 0.00487 = 0.01027$$

$$E(R_{\text{Dell}}) = 0.00351 + 1.64702 * 0.00487 = 0.01153$$

$$E(R_{\text{Exxon}}) = 0.00351 + 0.51587 * 0.00487 = 0.00602$$

$$E(R_{\text{GM}}) = 0.00351 + 1.04719 * 0.00487 = 0.00861$$

$$E(R_{\text{IBM}}) = 0.00351 + 1.18401 * 0.00487 = 0.00928$$

$$E(R_{\text{Ford}}) = 0.00351 + 1.20305 * 0.00487 = 0.00937$$

According to CAPM, Dell stock has the highest expected return while Exxon stock has the lowest.

These CAPM predictions are not supported by the actual data. This may be caused by

- CAPM needs many assumptions and these assumptions are not held at the same time in reality
- CAPM is a simple model that predicts the return of an asset. Compared to multi-factor models, CAPM is less accurate
- We cannot highly rely on historical data to predict the future return
- Life is complex, same to stocks....