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Assignment - 2

Variation

Q1

x:	11	0	36	21	31	23	24	-11	-11	-21
y:	10	-2	29	14	22	18	14	-2	-3	10

(a) compute Σx, Σx^2, Σy and Σy^2

→

x	y	x^2	y^2
11	10	121	100
0	-2	0	4
36	29	1296	841
21	14	441	196
31	22	961	484
23	18	529	324
24	14	576	196
-11	-2	121	4
-11	-3	121	9
-21	10	441	100
103	90	4607	2258

So, $\Sigma x = 103$ $\quad \Sigma x^2 = 4607$

$\Sigma y = 90$ $\quad \Sigma y^2 = 2258$

(b) Use the results of part (a) to compute the sample mean, variance and standard deviation for x and for y.

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→ Mean, Variance and standard for x :

x	$\bar{x}$	$(x_i - \bar{x})$	$(x_i - \bar{x})^2$
11	10.3	0.7	0.49
0	10.3	-10.3	106.09
36	10.3	25.7	660.49
21	10.3	10.7	114.49
31	10.3	20.7	428.49
23	10.3	12.7	161.29
24	10.3	13.7	187.69
-11	10.3	-21.3	453.69
-11	10.3	-21.3	453.69
-21	10.3	-31.3	979.69
103		0	3546.10

Mean : $\bar{x} = \frac{103}{10} = 10.3$

Variance : $s^2 = \frac{3546.10}{9} = 394.01$

Standard deviation : $s = \sqrt{394.01}$

$= 19.85$ //

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Mean, variance and standard deviation for y

y	$\bar{x}$	$(x_i - \bar{x})$	$(x_i - \bar{x})^2$
10	9	1	1
-2	9	-11	121
29	9	20	400
14	9	5	25
22	9	13	169
18	9	9	81
14	9	5	85
-2	9	-11	121
-3	9	-12	144
-10	9	-19	361
90		0	1448

$$\text{Mean} = \bar{x} = \frac{90}{10} = 9$$

$$\text{Variance} = s^2 = \frac{1448}{9} = 160.89$$

$$\text{standard deviation} = \sqrt{160.89}$$

$$= 12.68$$

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(c) Compute a 75% Chebyshev interval around the mean for x values and also for y values. Use the intervals to compare the two ~~finds~~ funds.

→ We know that 75% of the observation here values within two standard deviations of the mean.

So, $\bar{x} \pm 2s = 10.3 - 2(19.85)$
$= -29.4$
and $10.3 + 2(19.85)$
$= 50$

so, for x it is -29.4 to 50

for y $\bar{x} \pm 2s = 9 - 2(12.68)$
$= -16.36$
and $9 + 2(12.68)$
$= 34.36$

So, for y it is -16.36 to 34.36

Vanguard Balanced index (y) has a smaller spread than Vanguard total stock index (x)

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(d) Compute the coefficient of variation for each funds. Use the coefficient of variation to compare the two funds. If S represents risks and $\bar{x}$ represents expected return, then $s/\bar{x}$ can be thought of as a measure of risk per unit of expected return. In this case, why is smaller CV better? Explain

→ Co-efficient of variation

$$= \frac{SD}{\bar{X}} \times 100\%$$

For x : $$CV = \frac{19.85}{10.3} \times 100\%$$

$$= 192.7\%$$

For y = $$CV = \frac{12.68}{9} \times 100\%$$

$$= 140.9\%$$

If S represents risks and $\bar{x}$ represents expected return, then as the $s/\bar{x}$ is lesser, lower is the risk
so, a smaller CV is better because it means a lower risk

Q2 Let X be a random variable representing time to failure (in hours) at 90% breaking strength.

0.54	1.80	1.52	2.05	1.03	1.18	0.80	1.33	1.29
1.11	3.34	1.54	0.08	0.12	0.60	0.72	0.92	1.05
1.43	3.03	1.81	2.17	0.63	0.56	0.03	0.09	0.18
0.34	1.57	1.45	1.52	0.19	1.55	0.02	0.07	0.65
0.40	0.24	1.57	1.45	1.60	1.80	4.69	0.08	7.89
1.58	1.64	0.03	0.23	0.72				

(a) Find the range

→ Range = Maximum Value − Min Value

$= 7.89 - 0.02$

$= 7.87$

(b) Compute Mean, Variance and SD

→ Mean: $\bar{x} = \frac{\Sigma x}{n} = \frac{62.11}{50} = 1.24$

→ Variance: $s^2 = \frac{89}{50} = 1.78$

→ SD: $s = \sqrt{1.78} = 1.33$

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(d) Compute the coefficient of variation. What does this number say about time to failure? Why does a small CV indicate more consistent data, whereas a larger CV indicate less consistent data? Explain.

→ Coefficient of variation

$$= \frac{SD}{Mean} \times 100\%$$

$$= \frac{1.33}{1.24} \times 100\% = 107\%$$

$CV = 107\%$

The SD of the time to failure is just slightly larger than the average time.

A smaller CV indicates more consistent data because the vale of s in the numerator is smaller

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Q3 Given :-

pax world Balanced:

Mean = 9.58%

SD (s) = 14.05%

Vanguard Balanced Index:

Mean = 9.02 %

SD (s) = 12.50%

(a) Compute the coefficient of variation for each fund.

→ for pax world Balanced:

$$\text{Coefficient of variation (CV)} = \frac{SD}{\bar{x}} \times 100\%$$

$$CV = \frac{14.05}{9.58} \times 100\%$$

$$= 146.7\%$$

→ For Vanguard Balanced Index:

$$CV = \frac{12.50}{9.02} \times 100\%$$

$$CV = 138.6\%$$

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here we are using the coefficient of variation to represent risk per unit of return because coefficient of variation indicates how large is the SD relative to the mean.

From this point of view, the risk per unit of return of Vanguard Balanced Index ~~ax~~ is slightly lesser than that of Pax World Balanced.

So, the fund of Vanguard Balanced Index appears to be better.

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Qn Given average number of physician visits by males per year.

Mean = 2.2
Coefficient of variation = 1.5%
Determine standard of Deviation

$\rightarrow CV = \frac{s}{\bar{x}} \times 10\%$

So, $s = 0.015 \times 2.2 = 0.033$

So, the standard deviation of the annual number of visits to physicians made by males is 0.033

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