

# **MEASURING PORTFOLIO RISK**

## **WHAT WILL YOU LEARN?**

- How do you measure portfolio risk?

## REVIEW: MEASURING RISK

- ▶ We use the dispersion as measured by the standard deviation of a distribution to measure risk.
- ▶ The variance is the probability weighted average of the squared deviations from the mean.

## RISK: VARIANCE AND STANDARD DEVIATION

State of the economy	Prob.	Toyota	Walmart	Pfizer
Expansion	0.10	6.0%	4.5%	2.5%
Normal	0.40	7.5	5.5	-0.5
Recession	0.30	2.0	4.0	1.0
Depression	0.20	-3.0	-1.0	13.0
<b>Expected return E(R)</b>		<b>3.60%</b>	<b>3.65%</b>	<b>2.95%</b>
<b>Standard deviation <math>\sigma</math></b>				

## RISK: VARIANCE AND STANDARD DEVIATION

State of the economy	Prob.	Toyota	Walmart	Pfizer
Expansion	0.10	6.0%	4.5%	2.5%
Normal	0.40	7.5	5.5	-0.5
Recession	0.30	2.0	4.0	1.0
Depression	0.20	-3.0	-1.0	13.0
<b>Expected return E(R)</b>		<b>3.60%</b>	<b>3.65%</b>	<b>2.95%</b>
<b>Standard deviation <math>\sigma</math></b>		<b>4.02%</b>		

## RISK: VARIANCE AND STANDARD DEVIATION

State of the economy	Prob.	Toyota	Walmart	Pfizer
Expansion	0.10	6.0%	4.5%	2.5%
Normal	0.40	7.5	5.5	-0.5
Recession	0.30	2.0	4.0	1.0
Depression	0.20	-3.0	-1.0	13.0
<b>Expected return E(R)</b>		<b>3.60%</b>	<b>3.65%</b>	<b>2.95%</b>
<b>Standard deviation <math>\sigma</math></b>		<b>4.02%</b>	<b>2.41%</b>	<b>5.11%</b>

## MEASURING PORTFOLIO RISK

## PORTFOLIO RISK

- Find the volatility of a portfolio that consists of 50% Toyota and 50% Pfizer.

### PORTFOLIO RISK: 1/2 TOYOTA + 1/2 PFIZER

State of the economy	Prob.	Toyota	Pfizer	1/2 Toyota + 1/2 Pfizer
Expansion	0.10	6.0%	2.5%	4.25%
Normal	0.40	7.5	-0.5	3.5
Recession	0.30	2.0	1.0	1.5
Depression	0.20	-3.0	13.0	5.0
<b>Expected return E(R)</b>		<b>3.60%</b>	<b>2.95%</b>	<b>3.275%</b>
<b>Standard deviation <math>\sigma</math></b>		<b>4.02%</b>	<b>5.11%</b>	

## PORTFOLIO RISK: 1/2 TOYOTA + 1/2 PFIZER

State of the economy	Prob.	Toyota	Pfizer	1/2 Toyota + 1/2 Pfizer
Expansion	0.10	6.0%	2.5%	4.25%
Normal	0.40	7.5	-0.5	3.5
Recession	0.30	2.0	1.0	1.5
Depression	0.20	-3.0	13.0	5.0
<b>Expected return E(R)</b>		<b>3.60%</b>	<b>2.95%</b>	<b>3.275%</b>
<b>Standard deviation <math>\sigma</math></b>		<b>4.02%</b>	<b>5.11%</b>	<b>1.29%</b>

## **PORTFOLIO RISK**

- ▶ The variance of a portfolio is not a weighted average of the individual variances.
- ▶ The same is true for the standard deviation.

## **MEASURING PORTFOLIO RISK**

## PORTFOLIO RISK

- Let's now find the volatility of another portfolio that consists of 50% Toyota and 50% Walmart.

### PORTFOLIO RISK: 1/2 TOYOTA + 1/2 WALMART

State of the economy	Prob.	Toyota	Walmart	1/2 Toyota + 1/2 Walmart
Expansion	0.10	6.0%	4.5%	5.25%
Normal	0.40	7.5	5.5	6.5
Recession	0.30	2.0	4.0	3.0
Depression	0.20	-3.0	-1.0	-2.0
<b>Expected return E(R)</b>		<b>3.60%</b>	<b>3.65%</b>	<b>3.625%</b>
<b>Standard deviation <math>\sigma</math></b>		<b>4.02%</b>	<b>2.41%</b>	



## PORTFOLIO RISK: 1/2 TOYOTA + 1/2 WALMART

State of the economy	Prob.	Toyota	Walmart	1/2 Toyota + 1/2 Walmart
Expansion	0.10	6.0%	4.5%	5.25%
Normal	0.40	7.5	5.5	6.5
Recession	0.30	2.0	4.0	3.0
Depression	0.20	-3.0	-1.0	-2.0
<b>Expected return E(R)</b>		<b>3.60%</b>	<b>3.65%</b>	<b>3.625%</b>
<b>Standard deviation <math>\sigma</math></b>		<b>4.02%</b>	<b>2.41%</b>	<b>3.16%</b>