9.4 Risk and return

Name: _____ Class: _____ Date: _____ **Total: 13 marks**

KEY WORDS expected return • volatility

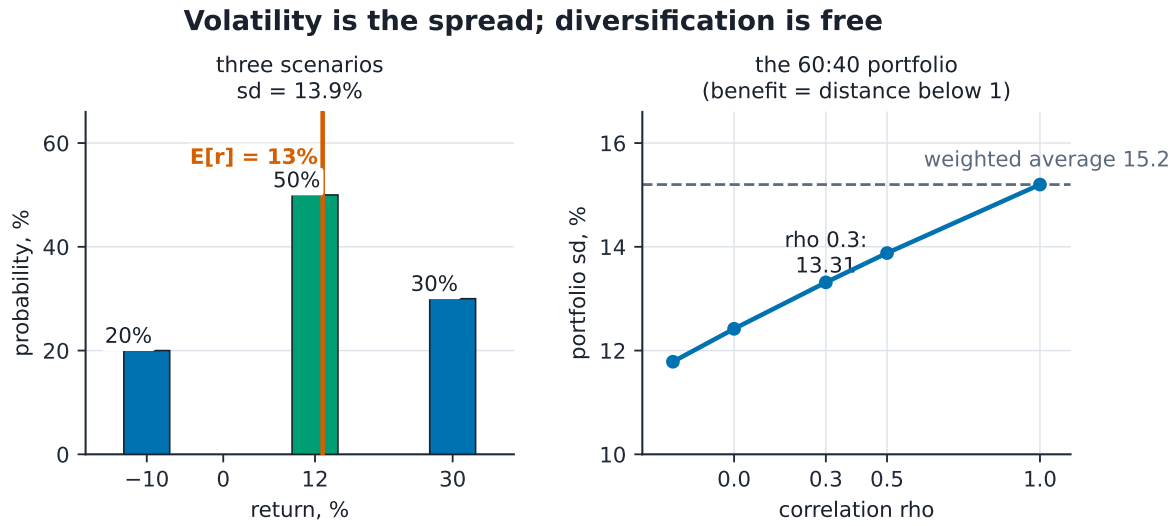
Objective

Compute expected return and volatility from a distribution; price portfolios with the covariance term; separate systematic from specific risk.

1 Key knowledge and worked examples

■ The two numbers and the free lunch

E[r] = Σp · r; σ = the spread. Portfolio σ falls with the covariance term; only systematic risk is priced.



Diversification is free - exactly as far as rho sits below 1

■ Worked example. The site

Boom 30 (p .3), base 12 (p .5), bust −10 (p .2): E[r] 13.0, σ 13.9. The 60:40 portfolio: σ 13.31 at ρ 0.3, 12.4 at ρ 0, 11.8 at ρ −0.2 ✓.

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2 Practice

A food-truck expansion: strong 24% (p 0.25), steady 10% (p 0.55), weak −8% (p 0.20).

2.1 Compute E[r] and σ (one decimal). [4]

2.2 The risk-free rate is 3.5%. The risk premium? And why does the market not pay a premium for the truck breaking down? [3]

2.3 A fund holds the truck venture (σ 10.7%) and a bond sleeve (σ 6%) at 50:50, $\rho = 0.25$. Compute σ_p (one decimal) and the weighted average it beats. [4]

2.4 In one line: why does adding a second food truck ($\rho \approx 0.9$) barely help the portfolio? [2]

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Solutions

2.1

- $E[r] = 0.25(24) + 0.55(10) + 0.20(-8) = 9.7\%$.
- Variance $= 0.25(14.1)^2 + 0.55(0.1)^2 + 0.20(-17.9)^2 = 113.8 \rightarrow \sigma = 10.7\%$.

2.2

- Premium $= 9.9 - 3.5 = 6.4$ points.
- The breakdown is specific risk – a diversified holder sheds it for free, so it earns no premium.

2.3

- $\sigma_p^2 = 0.25(0.107)^2 + 0.25(0.06)^2 + 2(0.5)(0.5)(0.25)(0.107)(0.06)$
- $= 0.00286 + 0.0009 + 0.0008 = 0.00456 \rightarrow \sigma_p = 6.8\%$.
- Weighted average: $0.5(10.7) + 0.5(6) = 8.35\%$ – beaten by 1.6 points.

2.4

- Its risk is nearly the same bet again ($\rho \approx 0.9$): the covariance term barely shrinks, so the sd barely falls.

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