

What Is Modern Portfolio Theory?

Worksheet

Modern Portfolio Theory states that an investor can optimize returns by diversifying across assets—the combination matters more than individual asset performance.

$$\sigma_p = \sqrt{w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\rho_{12}\sigma_1\sigma_2}$$

σ_p = Portfolio standard deviation (risk)

w_1, w_2 = Weight of asset 1 and 2 (%)

σ_1, σ_2 = Standard deviation of each asset (%)

ρ_{12} = Correlation between assets

Questions

1. Modern Portfolio Theory was developed by...
A) Benjamin Graham
B) Harry Markowitz
C) Warren Buffett
D) Peter Lynch
2. The Efficient Frontier is...
A) Portfolios with lowest risk
B) Portfolios with highest return
C) Optimal risk-return trade-offs
D) Random collections of assets
3. Correlation = -1 means...
A) Assets move together
B) Assets move in opposite directions
C) No relationship
D) One asset leads the other
4. Which reduces non-systematic risk?
A) Buying more of one stock
B) Diversifying across different assets
C) Monitoring daily prices
D) Timing the market
5. You hold Stock A ($\sigma=15\%$, $E(R)=10\%$) and Stock B ($\sigma=25\%$, $E(R)=14\%$), correlation = 0.3. Calculate portfolio risk with 60% A and 40% B.
6. Two assets have correlation = -1 (perfect negative). Weight 50/50. $\sigma_1=10\%$, $\sigma_2=15\%$. What is portfolio risk?
7. Compare two portfolios: (A) 100% Stock, $\sigma=20\%$; (B) 70% Stock + 30% Bonds, $\sigma=12\%$. Which follows MPT better?
8. Define: Who developed Modern Portfolio Theory?
9. Define: What is the Efficient Frontier?
10. Define: Why does low correlation reduce portfolio risk?

Answer Key

1. B) Harry Markowitz — Markowitz won the Nobel Prize in Economics (1990) for this framework.
2. C) Optimal risk-return trade-offs — It shows the best return for each level of risk.
3. B) Assets move in opposite directions — Perfect negative correlation means assets offset each other — maximum diversification benefit.
4. B) Diversifying across different assets — Diversification spreads risk across unrelated assets; systematic risk remains.
5. $\sigma_p = \sqrt{[(0.6)^2(15)^2 + (0.4)^2(25)^2 + 2(0.6)(0.4)(0.3)(15)(25)]} = \sqrt{[81 + 100 + 54]} = \sqrt{235} = 15.33\%$ Notice: 15.33% is less than the weighted average of 18% — diversification benefit!
6. $\sigma_p = \sqrt{[(0.5)^2(10)^2 + (0.5)^2(15)^2 + 2(0.5)(0.5)(-1)(10)(15)]} = \sqrt{[25 + 56.25 - 75]} = \sqrt{6.25} = 2.5\%$ Perfect negative correlation nearly eliminates portfolio risk.
7. Portfolio B has lower risk (12% vs 20%). If bonds have similar or better expected return, B is on the Efficient Frontier. Portfolio A is suboptimal — same or lower return with higher risk.
8. Harry Markowitz, Nobel Prize winner in 1990.
9. The curve of portfolios with the highest expected return for each risk level.
10. When assets move independently, losses in one offset gains in another.

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