

Week – 7

1. What are the key assumptions of the CAPM model?

Answer:

- No transaction costs
 - Securities are infinitely divisible
 - Prices are given (no trader can influence prices)
 - Investors are rational and process all available information
 - Unlimited short sales and unlimited borrowing/lending
 - Uniform expectations among investors
 - All assets are marketable
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2. What is the Capital Market Line (CML) and what does it represent?

Answer: The **Capital Market Line (CML)** represents the risk-return trade-off of efficient portfolios composed of the market portfolio and the risk-free asset.

It is given by the equation:

$$\bar{R}_e = R_F + \left(\frac{\bar{R}_M - R_F}{\sigma_M} \right) \sigma_e$$

Where:

- \bar{R}_e is the expected return of the efficient portfolio
 - R_F is the risk-free rate
 - \bar{R}_M is the expected return of the market portfolio
 - σ_M, σ_e are the standard deviations of the market and the efficient portfolio respectively
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3. What is the Security Market Line (SML)?

Answer: The **Security Market Line (SML)** shows the relationship between expected return and beta (systematic risk) for all securities.

It is given by the equation:

$$\bar{R}_i = R_F + \beta_i(\bar{R}_M - R_F)$$

Where:

- \bar{R}_i is the expected return of asset i
- β_i is the asset's beta
- The line passes through the risk-free asset (beta = 0) and the market portfolio (beta = 1)

4. What kind of risk is relevant in the CAPM framework for well-diversified portfolios?

Answer: Only **systematic risk** (market risk measured by beta) is relevant in the CAPM framework.

Non-systematic risk tends to zero in well-diversified portfolios and is thus not rewarded.

5. What is an arbitrage opportunity in the context of the SML?

Answer: An **arbitrage opportunity** exists when a portfolio lies off the SML:

- If a portfolio has a **higher expected return** than predicted by its beta → it is **underpriced**
- If it has a **lower expected return** → it is **overpriced**

Examples from the notes:

- Selling overpriced asset E and buying underpriced D generates risk-free arbitrage profits.
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6. What are the criticisms or limitations of the CAPM?

Answer:

- **Assumptions are unrealistic**, e.g., no transaction costs, perfect divisibility, and uniform expectations
- **Individual investors do not hold market portfolios**
- **Unlimited borrowing/lending and short selling** are not always feasible
- Despite these, CAPM is useful at the aggregate level and alternative models can be derived by relaxing assumptions

Week – 8

1. What is the key difference between passive and active portfolio management strategies?

Answer:

Passive portfolio management aims to replicate a benchmark index with minimal trading and management fees. It focuses on long-term returns and tracking error.

Active management seeks to outperform the market by actively selecting investments and timing trades, aiming to generate Alpha (excess return), but involves higher management costs.

2. What is 'tracking error' and how is it calculated?

Answer:

Tracking error is the deviation of a portfolio's returns from its benchmark. It measures the consistency of portfolio performance with the index.

It is calculated as the standard deviation of the return differences over time:

$$\sigma_{\Delta} = \sqrt{\frac{1}{T-1} \sum_{t=1}^T (\Delta_t - \bar{\Delta})^2}$$

Annualized TE = $\sigma_{\Delta} \times \sqrt{t}$, where t is the number of periods in a year.

3. What are the three techniques used in passive portfolio construction?

Answer:

1. **Full Replication:** Buying all index securities in exact proportions—high tracking efficiency but costly.
 2. **Sampling:** Buying a representative sample of stocks—lower cost but higher tracking error.
 3. **Quadratic Programming:** Uses past return data to minimize deviation from the index—data-intensive and may underperform if market conditions change.
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4. What is Alpha in active portfolio management?

Answer:

Alpha represents the excess return generated by the active manager over the expected return

(based on market or benchmark). It shows the value added (or lost) through active investment decisions.

5. What are the trade-offs between active and passive strategies?

Answer:

- **Passive strategies** are low-cost with predictable returns but may slightly underperform due to minimal rebalancing.
 - **Active strategies** aim for higher returns but involve greater costs and risks. High fees can reduce net returns, especially if market efficiency prevents outperforming benchmarks.
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6. What are the different active equity management approaches?

Answer:

Active equity strategies include:

- **Fundamental strategies** (Top-down or Bottom-up analysis)
- **Technical strategies** (based on price and volume data)
- **Exploiting market anomalies** (e.g., momentum, seasonal effects) and **security attributes** (e.g., value vs. growth stocks).

Week - 9

1. What is the efficient frontier in the Mean-Variance framework?

Answer:

The efficient frontier represents the set of portfolios that offer the **highest return for a given level of risk** or the **lowest risk for a given level of return**. It's derived from the convex combinations of portfolios and helps investors choose optimal portfolios based on their risk tolerance.

2. How does the availability of a risk-free rate affect portfolio selection?

Answer:

With a risk-free lending/borrowing rate, the efficient frontier changes. **Only two portfolios need to be identified**: one is the risk-free asset, and the other is the tangency portfolio. This leads to a straight line (capital market line) that becomes the new efficient frontier.

3. What is Value-at-Risk (VaR) and how is it interpreted?

Answer:

VaR answers the question: “*What is the worst expected loss at a given confidence level over a specific time period?*”

For example, a 5% daily VaR of USD 10 million means there is a **5% chance of losing more than USD 10 million in a day**. It depends on the time period, confidence level, and estimated loss.

4. Why is Conditional Value-at-Risk (CVaR) considered an improvement over VaR?

Answer:

CVaR (or Expected Shortfall) measures the **average loss given that the loss exceeds the VaR threshold**. While VaR only tells the minimum loss in the worst-case scenario, CVaR **captures the magnitude of extreme losses**, providing a more comprehensive risk measure.

5. What kind of data is used for portfolio construction in the document, and from where is it sourced?

Answer:

The data includes **daily adjusted prices** for seven securities like Nifty50, S&P500, DAX, CAC, FTSE100, Euro-Stoxx, and Russell-2000, and it is **downloaded from Yahoo Finance** using their respective ticker symbols.

6. What are the key components of a portfolio object in portfolio optimization?

Answer:

A portfolio object consists of:

- **Model list:** type of portfolio, risk measure used, and estimator name
- **Portfolio list:** weights, target return, target risk, risk-free rate, and frontier points
- **Optimization list:** the solver used for optimization

Week – 10

1. What is the Dow Theory and who proposed it?

Answer:

The **Dow Theory** was proposed by **Charles H. Dow**. It suggests that stock market trends have three movements:

- **Primary trend** (major trend): Bull or bear markets lasting years
 - **Secondary reaction** (intermediate): Counter movements to the primary trend
 - **Minor movements**: Short-term fluctuations of lesser importance
- Dow also emphasized that **market averages** discount everything, and **price action determines the trend**.
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2. What are the characteristics of a trend in the market cycle?

Answer:

A trend is defined as a **persistent movement in price**, though not necessarily in a straight line. Trends reflect the **imbalance of supply and demand** in the market. They can be **upward (bullish)**, **downward (bearish)**, or **sideways (consolidation)**.

3. What signals a trend reversal according to Dow Theory?

Answer:

A trend reversal may be identified when:

- There's a **substantial increase in volume** on an intermediate price movement **opposite** to the primary trend
 - The retracement is **more than 60%** of the previous move
 - A **series of rising/falling peaks or troughs is broken**
 - Volume doesn't increase along with the trend, or it increases in the opposite direction
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4. What is the significance of support and resistance zones?

Answer:

- **Support zone**: A price level where **buying** interest is strong enough to prevent further decline
 - **Resistance zone**: A price level where **selling** interest is strong enough to prevent further rise
- These zones are critical for identifying **entry and exit points** in trading.
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5. How are trend lines used in technical analysis?

Answer:

A **trend line** connects either:

- **Ascending bottoms** in an uptrend
- **Descending tops** in a downtrend

A **break** in the trend line, especially with **high volume**, may indicate a **trend reversal**. The more times a trend line is tested without breaking, the **stronger** it becomes.

6. What is the role of volume in confirming price trends?

Answer:

Volume is crucial as it:

- Measures **enthusiasm** of buyers/sellers
- **Confirms price trends** when volume and price move in the same direction
- Signals a **possible reversal** when price and volume diverge (e.g., rising prices with falling volume is a warning)

Week – 11

1. What is the difference between regression, causation, and correlation?

Answer:

- **Regression** shows the statistical dependence of one variable on another but does **not** imply causation.
 - **Causation** requires theoretical backing; it's not established by regression alone.
 - **Correlation** measures the **linear relationship** between two variables and treats both variables as random.
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2. What are the types of data used in econometrics and modeling?

Answer:

- **Cross-sectional data:** Observations on multiple individuals at a single time.
- **Time-series data:** Observations on a single individual over multiple time periods.

- **Panel/Longitudinal data:** Observations on multiple individuals over multiple time periods.
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3. What is a simple linear regression model and its components?

Answer: A simple linear regression is expressed as:

$$Y = \beta_0 + \beta_1 X + u$$

- **Y:** Dependent variable
 - **X:** Independent variable
 - **β_0 :** Intercept
 - **β_1 :** Slope
 - **u:** Error term (random component)
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4. What is the expectations operator (E) in regression?

Answer: The expectations operator **E(Y)** denotes the **mean value** of a random variable Y. If probabilities are equal:

- **E(Y)** becomes the **simple average** of all possible values of Y.
 - With known probabilities:
$$E(y) = p_1 y_1 + p_2 y_2 + \dots + p_n y_n$$
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5. What is the role of conditional and unconditional expectations in regression?

Answer:

- **Conditional Expectation (E(Y|X)):** The mean of Y given a specific value of X; gives more accurate predictions.
 - **Unconditional Expectation (E(Y)):** Overall mean of Y without considering X; less precise.
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6. What is the practical use of regression illustrated with the income-consumption example?

Answer: In the example, given income levels (X), the mean consumption (Y) can be predicted. For instance:

- If **X = 140**, then **E(Y|X=140) = 101**

- This illustrates how knowing **X improves prediction** of Y, which is the core idea behind regression.

Week – 12

1. What is a Limited Dependent Variable and why is it important?

Answer:

Limited dependent variables, also known as qualitative response variables, are categorical in nature (e.g., 0/1, Yes/No) and are not suitable for modeling using linear regression models like OLS. They are crucial in understanding decision-based outcomes, such as defaulting on a loan or paying dividends.

2. What is a Linear Probability Model (LPM)?

Answer:

An LPM is a simple linear regression model used when the dependent variable is binary (0 or 1). It estimates the probability of an event occurring as a linear function of explanatory variables, but suffers from several limitations, including predictions outside the [0,1] range.

3. What are the key issues with Linear Probability Models?

Answer:

LPMs face:

- **Non-normality and heteroscedasticity** of error terms.
 - Predictions **outside the [0,1]** interval.
 - **Poor fit** as measured by R^2 due to binary nature of data.
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4. Why are logit and probit models preferred over LPMs?

Answer:

Logit and probit models transform the linear function into an S-shaped curve using cumulative distribution functions, which **bound predicted probabilities between 0 and 1**, addressing LPM's major limitations.

5. What is the logistic function used in Logit models?

Answer:

The logistic function is given by:

$$F(z_i) = \frac{e^{z_i}}{1 + e^{z_i}} = \frac{1}{1 + e^{-z_i}}$$

where z_i is a linear combination of predictors. This function ensures output lies between 0 and 1.

6. What is the interpretation of parameters in a Logit model?

Answer:

Each coefficient β_j represents the change in the **log-odds** of the dependent event occurring (e.g., default, dividend payment) with a one-unit change in the corresponding predictor x_j , holding other variables constant.