## Market and Limit Orders





## Bid-Ask and Effective Spreads





## Types of Markets Structures





## Roles of Brokers

- **Limit order book** is a dealer's offering of securities.
- **Inside bid** or **market bid** is the best bid price.
- **Inside ask** or **market ask** is the best ask price.
- **Inside bid-ask spread** or **market bid-ask spread** is the difference between the inside bid and ask.
- **Midquote** is the average of the inside bid and ask.
- **Effective spread** is a measure of the round trip cost of a transaction. It reflects price improvement, trades executed at better than the bid-ask quote, and price impact, trades executed at worse than the bid-ask quote.

$$\text{effective spread for a buy} = 2 \times (\text{execution price} - \text{midquote})$$
$$\text{effective spread for a sell} = 2 \times (\text{midquote} - \text{execution price})$$

- **Market orders** execute immediately at the best possible price. May be filled by multiple trades. The advantage is the execution speed. Disadvantage is that the price isn't known ahead of time. Thus it has price uncertainty.
- **Limit orders** execute at the limit price or better. Can be set to expire after a set amount of time, but if prices don't move correctly, it may not execute. Thus it has execution uncertainty.

- **Acts as a trader's agent** which imposes a legal obligation to act in his best interest.
- **Represent the order** and advise the trader on price and volume for execution.
- **Find counterparties** via contacts, market information, or by acting as a dealer.
- **Provide secrecy** if the trader wishes to remain anonymous.
- **Provide other services** such as record keeping, safe keeping, or cash management. Not liquidity, which is the role of the dealer.
- **Support the market** indirectly by participating.

- **Quote-driven markets.** Traders interact with dealers who provide liquidity by willingness to buy or sell. Closed-book markets require a broker to interact.
- **Order-driven markets.** Traders interact with other traders. Prices are set by supply and demand. Disadvantage is that liquidity may be poor. Execution is determined by a mechanical rule. In an electronic crossing network, traders are institutions and are anonymous. In an auction market, orders compete against others. Can be periodic (batch) or continuous. Automated auctions trade continuously and execute based on a set of rules. They are like ECNs but with price discovery.
- **Brokered markets.** Brokers act as traders' agents to find counterparties for the traders.

## Components of Market Quality





## Components of Execution Costs





## Volume-Weighted Average Price





## Implementation Shortfall

- **Explicit costs** commissions, taxes, stamp duties, and fees.
- **Implicit costs** are more difficult to measure. They include
  - **Bid-ask spread**
  - **Market or price impact costs** is the effect of the order on market prices. E.g., a large sell order triggers a price decline which the order is partially filled at.
  - **Opportunity costs** occur when an order is not filled and the price moves such that a potential profit is lost.
  - **Delay** or **slippage** costs occur when an order is unfilled because of illiquidity.

- **Liquidity** is measured by small bid-ask spreads, market depth allowing larger orders, and resilience providing price accuracy. Factors needed for a liquid market are
  - Many buyers and sellers so traders can reverse positions if necessary.
  - Diverse investors with different information and opinions.
  - Convenient location or trading platform.
  - Integrity determined by participants and regulation so all traders are treated fairly.
- **Transparency** means traders can get pre- (quotes and spreads) and post- (completed trades) trade information quickly and cheaply.
- **Assurity of completion** means traders have confidence counterparties will uphold their side of the trade. Brokers and clearinghouses may provide guarantees to this end.

Implementation shortfall is the difference between actual return and a hypothetical return based on execution at the decision price, i.e., the market price at the time the decision to trade is made. Can be broken down into four components of cost.

1. **Explicit costs** are commissions, taxes, and fees.
2. **Realized profit and lost** is the difference between the execution price and the benchmark price.
3. **Delay** or **slippage cost** is the cost of not being able to execute the order during the day of initiation. If a order is not executed the first day, the delay cost is the closing price that day versus the decision price.
4. **Missed trade opportunity cost** is the difference between the cancellation price of the order and the decision price.

VWAP is a weighted average of execution prices during the day where the weight applied is the proportion of the day's trading volume. The disadvantages are

- Not useful if the trader is a significant portion of the trading volume.
- Can be used to manipulate performance by executing trades late in the day after VWAP is mostly known.
- Does not consider mixed trades.

## Advantages and Disadvantages of Volume-Weighted Average Price and Implementation Shortfall



Trading, Monitoring and Rebalancing

## Econometric Models in Pre-Trade Analysis

Study Session 16

Trading, Monitoring and Rebalancing

## Summary of Major Trader Types and Their Motivations

Study Session 16

Trading, Monitoring and Rebalancing

## Summary of Trading Tactics

Study Session 16

Econometric models can be used to forecast transaction costs. It has been shown that trading costs are nonlinearly related to

- Security liquidity, trading volume, market cap, spread, and price.
- Size of the trade relative to liquidity.
- Trading style, with more aggressive trades having higher costs.
- Momentum.
- Risk.

| *Trading Tactic* | *Strengths* | *Weaknessess* | *Usual Trade Motivation* |
|---|---|---|---|
| Liquidity-at-any-cost | Quick, certain execution | High costs and leakage of information | Information |
| Costs-are-not-important | Quick, certain execution at market price | Loss of control of trade costs | Variety of motivations |
| Need-trustworthy-agent | Broker uses skill and time to get low price | High commission and potential leak of intention | Not information |
| Advertise-to-draw-liquidity | Market-determined price | High costs and possible front running | Not information |
| Low-cost-whatever-the-liquidity | Low trading costs | Uncertain timing and possible trade into weakness | Passive and value |

- Advantages of VWAP
  - Easily understood.
  - Computationally simple.
  - Can be applied quickly to enhance trading decisions.
  - Appropriate for comparing small trades in non-trending markets.
- Disadvantages of VWAP
  - Not useful for trades that dominate volume.
  - Can be abused by traders.
  - Does not evaluate delayed or unfilled orders.
  - Does not account for market movement or trade volume.
- Advantages of implementation shortfall
  - Managers can see the costs of implementing their ideas.
  - Shows the tradeoff between quick execution and market impact.
  - Decomposes and identifies costs.
  - Can be used to minimize cost and maximize performance.
  - Not subject to gaming.
- Disadvantages of implementation shortfall
  - May be unfamiliar to traders.
  - Requires considerable data and analysis.

| *Trader Type* | *Motivation* | *Time or Price Preference* | *Preferred Order Type* |
|---|---|---|---|
| Information-motivated | Time-sensitive information | Time | Market |
| Value-motivated | Security misvaluations | Price | Limit |
| Liquidity-motivated | Reallocation and liquidity | Time | Market |
| Passive | Reallocation and liquidity | Price | Limit |

## Categories of Algorithmic Trading Strategies





## Characteristics of Best Execution





## Policies and Procedures Related to Best Execution





## Costs and Benefits of Rebalancing

- Can't be judged independently of the investment decision. High costs doesn't mean that the strategy shouldn't be pursued.
- Can't be known with certainty ex ante, as it depends on the circumstances of the trade.
- Can only be assessed ex post. Is assessed over time using the costs of many trades.
- Relationships and practices are integral. Is ongoing and requires diligence and dedication.

- **Simple logical participation strategies** trade with market flow so as not to become noticeable and minimize market impact. They include
  - VWAP strategy spreads orders over the course of the day to equal or outperform the VWAP. Trades are more common towards the end of the day.
  - Time-weighted average price strategy spreads trades evenly over the day. Often used for thinly traded, volatile stocks.
  - Percent-of-volume strategy trades at 5–20% of normal volume until the order is filled.
- **Implementation shortfall strategies** minimize implementation shortfall or total execution costs. Trades more at the beginning of the day to minimize opportunity costs. Useful when an entire portfolio must be traded.
- **Opportunistic participation** strategies trade passively but increase volume when liquidity is present.

- Benefits
  - Theoretically equal to the loss in utility avoided by rebalancing.
  - Can increase returns as overvalued assets are sold and undervalued assets are bought.
- Costs
  - Transaction costs including commissions, bid-ask spread, and market impact.
  - Tax liability for selling positions which have gained in value

- Investment management firms should periodically provide disclosure to clients regarding
  - General information on trading techniques, markets, and brokers.
  - Conflicts of interest related to trading.
- Investment management firms should maintain documentation supporting
  - Compliance with polices and procedures.
  - Disclosures made to its clients

## Calendar Versus Percentage-of-Portfolio Rebalancing





## Determining Factors for Percentage-of-Portfolio Rebalancing Corridors





## Constant Proportion Portfolio Insurance





## Performance of Rebalancing Strategies in Different Markets

- **Transaction costs.** Higher transaction costs increase the width of the corridor.
- **Risk tolerance.** Greater risk tolerance leads to wider corridors.
- **Correlation of returns with other asset classes.** Higher correlations imply wider corridors.
- **Volatility of asset class returns.** Higher volatility make deviations potentially more costly and suggest narrower corridors.
- **Volatility on returns of other portfolio assets.** Also suggests narrower corridors.

- Calendar rebalancing rebalances a portfolio on a regular set schedule, e.g., quarterly.
    - Advantage is that it gives discipline without requiring monitoring of allocations between periods.
    - Disadvantage is that there might be large deviations from optimal allocation between rebalancing dates.
- Percentage-of-portfolio rebalancing is triggered by changes in relative asset values. A corridor approach is used where allocations are allowed within a specified range.

- **Up or down trending market**
    - CPPI will outperform. As values increase or decrease, the cushion and resulting allocation increases or decreases, respectively.
    - Buy-and-hold underperforms CPPI because no purchases or sales are made to capitalize on the changing market values.
    - Constant mix strategy has the worst performance. Increases in value require selling to bring allocations back to the target. This lowers exposure to future increases in value. The opposite is true for decreases in value.
- **Nontrending, mean-reverting markets**
    - CPPI will have the worst performance. A rise in value triggers more allocation, which will then add exposure to an asset that will fall in value. The opposite is true of a fall in value.
    - Buy-and-hold will perform better than CPPI because no buys or sells are made.
    - Constant mix has the best performance because increases in value trigger sales at market highs and decreases trigger buys at market lows.

Using CPPI, target weight varies with portfolio value and a specified minimum value. The difference is called the cushion. To get target allocation use

$$\text{target investment} = M \times (\text{portfolio value} - \text{floor value} = M \times \text{cushion})$$

where $M$ is the constant proportion for an asset class. To use CPPI, $M$ must be greater than 1 and it doesn't change once selected.

# Differences Between Buy-and-Hold, Constant Mix, and CPPI Rebalancing Strategies

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- **Buy-and-hold**
  - Underperforms in trending markets
  - Produces a linear payoff curve
  - Good for investor who requires a floor value and risk tolerance that increases with wealth.
- **Constant mix**
  - Underperforms in trending markets and outperforms in mean-reverting markets.
  - Produces a concave payoff curve.
  - Risk increases proportionally with wealth, good for constant relative risk aversion.
- **CPPI**
  - Outperforms in upward and downward trending markets, and underperforms in mean-reverting markets.
  - Produces a convex payoff curve.
  - Good for investors concerned about downside risk, and risk tolerance increases more than proportionally to wealth.