Approved Prep Provider

CFA Institute

Level III – Trading, Performance Evaluation, and Manager Selection

Trade Strategy and Execution

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Contents and Introduction

1. Introduction
2. Motivations to Trade
3. Trading Strategies and Strategy Selection
4. Trade Execution (Strategy Implementation)
5. Trade Evaluation
6. Trade Governance

2. Motivations to Trade

1. Profit Seeking
2. Risk Management/Hedging Needs
3. Cash Flow Needs
4. Corporate Actions/Index Reconstitutions/Margin Calls

2.1 Profit Seeking

- Short-term alpha-driven strategy → high trade urgency
  - Concern about alpha decay
  - Use of alternative trading systems rather than “lit” markets
- Long-term profit seeking → more patient trading strategy

2.2 Risk Management/Hedging Needs

Reasons for trading based on risk management concerns

- Keep portfolios at targeted risk levels or risk exposures
- Hedge risks that the portfolio manager does not have an investment view on
- Hedge risks that may be outside a portfolio manager’s investment objectives

Amount and nature of trading required for risk management depend on the risk profile of the portfolio and leverage

2.3 Cash Flow Needs

- Trading is generally client-driven
  - Fund inflows
  - Fund outflows
- Many funds offer daily liquidity; trades are typically based on end-of-day closing prices
- Funds with less liquid positions may allow quarterly liquidation with a notice period
- Cash flow needs may involve high or low trade urgency depending on their nature
- If there is a choice between different securities, a cost-benefit analysis should be performed

2.4 Corporate Actions/Index Reconstitutions/Margin Calls

- Corporate actions: mergers, acquisitions, spinoffs
- Dividend/coupon reinvestment
- Margin calls
- Index reconstitutions

IN-TEXT QUESTION

The trading desk of a large firm receives three orders from the senior portfolio manager. Based on his research, the portfolio manager has identified two investment opportunities: a short-term stock buy and a longer-term stock sell. The third order is to raise proceeds to accommodate an end-of-day client withdrawal from the fund.

Discuss the motivation to trade and the associated trade urgency for each order:

a Short-term buy

b Longer-term sell

c Client withdrawal

Solution:

a This is a profit-seeking trade because the portfolio manager has identified the short-term buy as an investment opportunity. Short-term profit-seeking trades typically involve higher levels of trade urgency as managers attempt to realize short-term alpha before it dissipates (decays). These managers seek to transact before the rest of the market recognizes the mispricing and as a result are less price sensitive and more aggressive (seek to transact at accelerated rates) in their trading.

b This is a profit-seeking trade because the portfolio manager has identified the longer-term sell as an investment opportunity. Managers seeking long-term profits are typically more patient in trading and willing to wait for favorable prices by spreading executions over a longer time horizon, which may be days or weeks. Managers trading for long-term profits generally have much lower trade urgency for these orders.

c This is a cash flow–driven trade arising from the need to raise proceeds for the client withdrawal. For funds that offer daily liquidity, clients can invest and redeem at the end of each trading day. In this case, managers raising proceeds for client withdrawals will generally target end-of-day closing prices to match trade prices to those used to calculate the fund's valuation and redemption proceeds to the client. Hedge funds that hold less liquid positions may allow redemptions only at quarter-end and with a relatively long notice period (e.g., one month), allowing them more time to sell illiquid positions. Client-driven redemptions usually involve much lower levels of trade urgency.

3. Trading Strategies and Strategy Selection

1. Trade Strategy Inputs
2. Reference Prices
3. Trade Strategies

3.1 Trade Strategy Inputs

Inputs affecting trade strategy are order related, security related, market related, and user based.

Order Characteristics

- Side (or trade direction)
- Size
- Percentage of average daily volume

Security Characteristics

- Security type
- Short-term (trade) alpha
- Security price volatility
- Security's liquidity profile

Market Conditions

- Market liquidity
- Traded volumes, price volatility, bid-ask spreads
- Security volatility

Market volatility and liquidity vary over time

Liquidity considerations may differ substantially during periods of crisis

User-Based Considerations: Trading Cost Risk Aversion

- High risk aversion → greater trade urgency

Market impact is the adverse price impact in a security caused from trading an order and can represent one of the largest costs in trading.

Execution risk is the adverse price impact resulting from a change in the fundamental value of the security and is often proxied by price volatility.

Trader's Dilemma

Trade-off between market impact and market risk

IN-TEXT QUESTION

Discuss how order size and security liquidity considerations affect market impact and execution risk for an order.

Solution:

Trading a large order creates greater market impact than trading a smaller order, all else being equal. To minimize market impact, large orders are often traded over longer trade time horizons, which increases the corresponding execution risk of the order. Smaller orders have less market impact and can be traded more quickly over shorter time horizons, with lower associated execution risk. The liquidity profile of a security has important implications for trading strategy. More liquid securities (higher traded volumes, tighter bid–ask spreads, etc.) have lower levels of market impact and execution risk given that they can be transacted over shorter time horizons with greater certainty of execution. Finally, higher rates of alpha decay would speed up order execution time horizons and increase market impact costs given greater trade order urgency, whereas lower rates of alpha decay would increase trade time horizons and associated execution risk.

3.2 Reference Prices

Pre-Trade Benchmarks

- Decision price
- Previous close
- Opening price
- Arrival price

Managers seeking short-term alpha will use pre-trade benchmarks, such as the arrival price, when they wish to transact close to current market prices (greater trade urgency).

Intraday Benchmarks

- Volume-weighted average price
- Time-weighted average price

Managers without views on short-term price movements who wish to participate in volumes over the execution horizon typically use an intraday benchmark, such as VWAP or TWAP.

Post-Trade Benchmarks

Price Target Benchmarks

Managers of index funds or funds whose valuation is calculated using closing prices typically select the closing price post-trade benchmark to minimize fund risk and tracking error.

3.3 Trade Strategies

The primary goal of a trading strategy is to balance the expected costs, risks, and alpha associated with trading the order in a manner consistent with the portfolio manager's trading objectives, risk aversion, and other known constraints.

- Short-term alpha trade
- Long-term alpha trade
- Risk rebalance trade
- Client redemption trade
- New mandate trade

IN-TEXT QUESTION

A portfolio manager for a global fixed-income index fund is required to trade for quarterly index changes taking place at the end of the trading day. To keep the fund in line with the anticipated index constituent changes, the portfolio manager generates a fund rebalance list consisting of buys and sells. He approaches the senior trader to discuss the best trade strategy for the list.

1 Identify the most appropriate reference price benchmark for his trade.

2 Select and justify the most appropriate trading strategy to execute his trade.

Solution:

1 A closing price is the most appropriate reference price benchmark for an index fund. The portfolio manager needs to trade to maintain the same security holdings and weights as the benchmark index. Since the index fund will be valued using official closing prices, he should select the closing price as the reference price benchmark for trading the rebalance names. By executing the buys and sells at the close, he will be minimizing the fund's potential tracking error to the benchmark index.

The previous close would not be an appropriate reference price benchmark since it would be the security's closing price on the previous trading day. A previous close benchmark is often used by quantitative portfolio managers whose models or optimizers incorporate the previous close as an input or who wish to use this price as a proxy for the decision price. The opening price benchmark would not be an appropriate benchmark because it references the security's opening price on the day and is often selected by portfolio managers and traders who wish to begin trading at the market open. The opening price may also be used as a proxy for the decision price.

2 A market-on-close (MOC) trade strategy would be the most appropriate strategy for his rebalance list. Trading the rebalance list at the market's closing prices best aligns the trade execution prices with the same closing prices used for the fund's NAV and benchmark calculation, thus minimizing tracking error of the fund to the benchmark index.

4. Trade Execution (Strategy Implementation)

1. Trade Implementation Choices
2. Algorithmic Trading
3. Comparison of Markets

4.1 Trade Implementation Choices

Quote-driven, over-the-counter, off-exchange markets

- Large blocks of securities require a high touch approach
- Principal trades or broker risk trades
- Dealer or market maker becomes the counterparty
- Request for quote is a variation of quote-driven markets

Order-driven markets

- Buyers and sellers display prices and quantities at which they are willing to transact
- Order matching systems use rules to arrange trades
- Works for liquid, standardized securities

Direct market access (DMA) gives all market participants a way to interact directly with the order book of an exchange.

4.2 Algorithmic Trading

Algorithmic trading

- Computerized execution of investment decisions based on a set of trading instructions
- Slice large orders into smaller pieces to minimize market impact
- Used for trade execution and profit seeking

Execution Algorithm Classification

- Scheduled (POV, VWAP, TWAP)
- Liquidity seeking
- Arrival price
- Dark strategies/Liquidity aggregators
- Smart order routers

IN-TEXT QUESTION

A portfolio manager has identified a stock with attractive long-term growth potential and would like to place an order of moderate size, relative to the stock's average traded volume. The stock is very liquid and has attractive short-term alpha potential. The portfolio manager expects short-term buying pressure by other market participants into the market close, ahead of the company's earnings call scheduled later in the day.

1 Explain when the following algorithms are used: (a) arrival price, (b) dark aggregator, and (c) SOR.

2 Discuss which of the three algorithms is most suited to trading this order.

Solution:

1 **a** Arrival price algorithms are used for relatively liquid securities and when the order is not expected to have a significant market impact. Arrival price algorithms are also used when portfolio managers and traders have higher levels of risk aversion and wish to trade more aggressively at an accelerated pace to reduce the execution risk associated with trading over longer time horizons.

b Dark aggregator algorithms are appropriate for trading securities that are relatively illiquid or that have relatively wide bid–ask spreads or for relatively large order sizes in which trading in the open market is expected to have a significant price impact. Additionally, they are used by portfolio managers and traders who are concerned with information leakage that may occur when posting limit orders in lit venues. Given their higher risk of unfilled executions, these algorithms are also used when the order does not need to be filled in its entirety.

c Smart order routing systems are used to electronically send small orders into the market. Based on prevailing market conditions, SORs will determine which trade destinations have the highest probability of executing for limit orders and which trading venues have the best market prices for market orders and will route orders accordingly. SORs continuously monitor market conditions in real time in both lit and dark markets.

2 An arrival price algorithm would be most appropriate for trading this order because the portfolio manager has adverse price expectations. In this case, the portfolio manager wants to trade more aggressively to capture alpha ahead of less favorable prices expected later in the day. By trading the order more quickly, the portfolio manager can execute at more favorable prices ahead of the adverse price movement and the less favorable prices expected from other participants' buying pressure into the close, in line with his trade urgency.

4.3 Comparison of Markets (1/2)

Equites

- Traded on exchanges and alternative trading systems (dark pools)
- Exchanges provide pre-trade transparency
- Dark pools provide anonymity
- Algorithmic trading is common, and most trades are electronic
- Large trades in less illiquid securities are often executed as high-touch broker risk trades

Fixed Income

- Generally traded in a bilateral, dealer-centric market structure
- Dealers make markets in the securities
- Urgent trades are generally implemented as broker risk trades (via RFQs)
- Majority of fixed-income securities are relatively illiquid
- Limited algorithmic trading except for on-the-run US Treasuries
- High-touch trading

4.3 Comparison of Markets (2/2)

Exchange-Traded Derivatives

- Most of the trading volume in exchange-traded derivatives is concentrated in futures
- Electronic trading is pervasive, and algorithmic trading is growing

Over-the-Counter Derivatives

- Trading takes place through dealers
  - Urgent trades are generally implemented as broker risk trades (via RFQs)
  - Non-urgent trades are generally implemented as agency trades
- Historically OTC markets have been opaque, with little public data about prices, trade sizes, and structure details
- Regulatory pressure on OTC markets to introduce central clearing facilities

Spot Foreign Exchange (Currency)

- No exchange or centralized clearing place for the majority of spot currency trades
- OTC market with multiple levels: interbank, small and mid-sized banks, commercial companies and retail traders
- Large, urgent trades: RFQs submitted to multiple dealers
- Large, non-urgent trades: executed using algorithms or a high-touch agency approach
- Small trades: executed using direct market access (DMA)

IN-TEXT QUESTION

A hedge fund manager has three trades that she would like to execute for her fund. The orders are for:

1. a large, non-urgent sell of OTC options,
2. a large, urgent buy of corporate bonds, and
3. a small, non-urgent buy of six liquid emerging market currencies.

Describe factors affecting trade implementation for each trade.

Solution:

1. A large, non-urgent sell of OTC options would generally involve a broker agency trade in which the broker would act on behalf of the manager to find a matching buyer for the options. Depending on the level of contract customization, however, a significant price concession may be required by the manager to complete order execution.
2. A large, urgent buy of corporate bonds would usually involve a broker risk trade via the RFQ process. Because of corporate bond illiquidity, the likelihood of finding a matching seller is low. For more immediate (urgent) order execution, a broker would be needed to act as counterparty to the trade, taking the bonds and their associated risk into his inventory.
3. Small, non-urgent trades in foreign exchange are generally executed using direct market access. DMA allows the buy-side trader to electronically route orders using the broker's technology infrastructure and market access and typically involves algorithmic trading.

5. Trade Evaluation

1. Trade Cost Measurement

2. Evaluating Trade Execution

5.1 Trade Cost Measurement

Implementation shortfall is the most important *ex post* trade cost measurement.

IS = Paper return – Actual return

$$\text{IS} = \underbrace{\sum s_j p_j - \sum s_j p_d}_{\text{Execution cost}} + \underbrace{\left(S - \sum s_j\right)\left(P_n - P_d\right)}_{\text{Opportunity cost}} + \text{Fees}$$

Execution cost is the cost due to the buying and/or selling pressure of the portfolio manager and corresponding market risk.

Opportunity cost is the cost due to not being able to execute all shares of the order because of adverse price movement or insufficient liquidity.

On Monday, the shares of Impulse Robotics close at £10.00 per share. On Tuesday, before trading begins, a portfolio manager decides to buy Impulse Robotics. An order goes to the trading desk to buy 1,000 shares of Impulse Robotics at £9.98 per share or better, good for one day. The benchmark price is Monday's close at £10.00 per share. No part of the limit order is filled on Tuesday, and the order expires. The closing price on Tuesday rises to £10.05. On Wednesday, the trading desk again tries to buy Impulse Robotics by entering a new limit order to buy 1,000 shares at £10.07 per share or better, good for one day. During the day, 700 shares are bought at £10.07 per share. Commissions and fees for this trade are £14. Shares for Impulse Robotics close at £10.08 per share on Wednesday. No further attempt to buy Impulse Robotics is made, and the remaining 300 shares are canceled.

Expanded Implementation Shortfall

$$\underbrace{\underbrace{\left(\sum s_j\right)p_0 - \left(\sum s_j\right)p_d}_{\text{Delay cost}} + \underbrace{\sum s_j p_j - \left(\sum s_j\right)p_0}_{\text{Trading cost}}}_{\text{Execution cost}} + \underbrace{\left(S - \sum s_j\right)(P_n - P_d)}_{\text{Opportunity cost}} + \text{Fees}$$

Delay cost is the cost associated with not submitting the order to the market at the time of the investment decision.

Delay cost can be minimized by having a process in place that provides the trader with broker performance metrics.

This allows the trader to quickly identify the best broker and/or algorithm.

Opportunity cost can be minimized by reducing order quantity to a size that can be absorbed into the market at the portfolio manager's target price.

IN-TEXT QUESTION (1/3)

A portfolio manager decides to buy 100,000 shares of RLK at 9:00 a.m., when the price is $30.00. He sets a limit price of $30.50 for the order. The buy-side trader does not release the order to the market for execution until 10:30 a.m., when the price is $30.10. The fund is charged a commission of $0.02/share and no other fees. At the end of the day, 80,000 shares are executed and RLK closes at $30.65. Order and execution details are summarized as follows:

Order	
Stock Ticker	RLK
Side	Buy
Shares	100,000
Limit Price	$30.50

Trades	Execution Price	Shares Executed
Trade 1	$30.20	30,000
Trade 2	$30.30	20,000
Trade 3	$30.40	20,000
Trade 4	$30.50	10,000
Total		80,000

a Calculate execution cost.
b Calculate opportunity cost.
c Calculate fixed fees.
d Calculate implementation shortfall in basis points.
e Discuss how opportunity cost could be minimized for the trade.
f Calculate delay cost.
g Calculate trading cost.
h Show expanded implementation shortfall in basis points.
i Discuss how delay cost could be minimized for the trade.

a **Execution cost** is calculated as the difference between the costs of the real portfolio and the paper portfolio. It reflects the execution price(s) paid for the amount of shares in the order that were actually filled, or executed. Execution cost can be calculated as follows:

$$\begin{aligned}\text{Execution cost} &= \sum s_j p_j - \sum s_j p_d \\ &= (30{,}000 \text{ shares} \times \$30.20 + 20{,}000 \text{ shares} \times \$30.30 + \\ &\quad 20{,}000 \text{ shares} \times \$30.40 + 10{,}000 \text{ shares} \times \$30.50) - \\ &\quad 80{,}000 \times \$30.00 \\ &= \$2{,}425{,}000 - \$2{,}400{,}000 \\ &= \$25{,}000\end{aligned}$$

b **Opportunity cost** is based on the amount of shares left unexecuted in the order and reflects the cost of not being able to execute all shares at the decision price. Opportunity cost can be calculated as follows:

$$\begin{aligned}\text{Opportunity cost} &= \left(S - \sum s_j\right)(p_n - p_d) \\ &= (100{,}000 - 80{,}000)(\$30.65 - \$30.00) \\ &= \$13{,}000\end{aligned}$$

c **Fixed fees** are equal to total explicit fees paid and can be calculated as follows:

$$\text{Fees} = 80{,}000 \times \$0.02 = \$1{,}600$$

IN-TEXT QUESTION (2/3)

A portfolio manager decides to buy 100,000 shares of RLK at 9:00 a.m., when the price is $30.00. He sets a limit price of $30.50 for the order. The buy-side trader does not release the order to the market for execution until 10:30 a.m., when the price is $30.10. The fund is charged a commission of $0.02/share and no other fees. At the end of the day, 80,000 shares are executed and RLK closes at $30.65. Order and execution details are summarized as follows:

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f Calculate delay cost.
g Calculate trading cost.
h Show expanded implementation shortfall in basis points.
i Discuss how delay cost could be minimized for the trade.

d **Implementation shortfall** can be calculated as follows:

$$\text{Implementation shortfall (\$)} = \underbrace{\$25{,}000}_{\text{Execution cost}} + \underbrace{\$13{,}000}_{\text{Opportunity cost}} + \underbrace{\$1{,}600}_{\text{Fees}}$$
$$= \$39{,}600$$

The implementation shortfall is expressed in basis points as follows:

$$\text{Implementation shortfall (bps)} = \frac{\text{Implementation shortfall (\$)}}{(\text{Total shares})(p_d)} \times 10{,}000 \text{ bps}$$
$$= \frac{\$39{,}600}{(100{,}000 \times \$30.00)} \times 10{,}000 \text{ bps}$$
$$= 132 \text{ bps}$$

e **Minimizing opportunity cost:** Based on the decomposition of IS, the portfolio manager incurred an opportunity cost of $13,000 on 20,000 shares. The opportunity cost could be lowered by reducing order quantity to a size that can be absorbed into the market at the portfolio manager's price target or better. In this example, opportunity cost represented 32.8% ($13,000/$39,600) of the total IS cost. If the portfolio manager had known this in advance, he could have reduced the size of the order to 80,000 shares and invested the extra $600,000 (20,000 shares × $30.00/share = $600,000) in his second most attractive investment opportunity.

f **Delay cost** can be calculated as follows:

$$\text{Delay cost} = \left(\sum s_j\right)p_0 - \left(\sum s_j\right)p_d$$
$$= 80{,}000 \times \$30.10 - 80{,}000 \times \$30.00 = \$8{,}000$$

IN-TEXT QUESTION (3/3)

A portfolio manager decides to buy 100,000 shares of RLK at 9:00 a.m., when the price is $30.00. He sets a limit price of $30.50 for the order. The buy-side trader does not release the order to the market for execution until 10:30 a.m., when the price is $30.10. The fund is charged a commission of $0.02/share and no other fees. At the end of the day, 80,000 shares are executed and RLK closes at $30.65. Order and execution details are summarized as follows:

Order	
Stock Ticker	RLK
Side	Buy
Shares	100,000
Limit Price	$30.50

Trades	Execution Price	Shares Executed
Trade 1	$30.20	30,000
Trade 2	$30.30	20,000
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Trade 4	$30.50	10,000
Total		80,000

a Calculate execution cost.
b Calculate opportunity cost.
c Calculate fixed fees.
d Calculate implementation shortfall in basis points.
e Discuss how opportunity cost could be minimized for the trade.
f Calculate delay cost.
g Calculate trading cost.
h Show expanded implementation shortfall in basis points.
i Discuss how delay cost could be minimized for the trade.

g **Trading cost** can be calculated as follows:

$$\begin{aligned}\text{Trading cost} &= \sum s_j p_j - \left(\sum s_j\right) p_0 \\ &= (30{,}000 \text{ shares} \times \$30.20 + 20{,}000 \text{ shares} \times \$30.30 + 20{,}000 \\ &\quad \text{shares} \times \$30.40 + 10{,}000 \text{ shares} \times \$30.50) - 80{,}000 \times \\ &\quad \$30.10 \\ &= \$2{,}425{,}000 - \$2{,}408{,}000 \\ &= \$17{,}000\end{aligned}$$

h **Expanded implementation shortfall** can be calculated as follows:

$$\text{Expanded IS} = \underbrace{\$8{,}000}_{\text{Delay cost}} + \underbrace{\$17{,}000}_{\text{Trading cost}} + \underbrace{\$13{,}000}_{\text{Opportunity cost}} + \underbrace{\$1{,}600}_{\text{Fees}} = \$39{,}600$$

The delay cost is $8,000, which accounts for 20.2% ($8,000/$39,600) of the total IS cost, whereas the opportunity cost of $13,000 accounts for 32.8% ($13,000/$39,600) of the total IS cost.

i **Minimizing delay cost:** The delay cost of $8,000 accounts for a sizable portion (20.2%) of the total IS cost and could be minimized by having a process in place that provides the buy-side trader with broker performance metrics. This would allow the trader to quickly identify the best broker and/or algorithm to execute the order given its characteristics and current market conditions, thereby minimizing the time between order receipt and market execution.

5.2 Evaluating Trade Execution (1/3)

Trade evaluation measures the execution quality of the trade and the performance of the trader, broker, and/or algorithm.

Various techniques measure trade cost execution using different benchmarks (pre-trade, intraday, and post-trade).

Trade cost analysis enables investors to better manage trading costs and understand where trading activities can be improved.

$$\text{Cost (\$)} = \text{Side} \times \left(\bar{P} - P^*\right) \times \text{Shares}$$

Cost in dollars per share ($/share):

$$\text{Cost (\$/share)} = \text{Side} \times \left(\bar{P} - P^*\right)$$

Cost in basis points (bps):

$$\text{Cost (bps)} = \text{Side} \times \frac{\left(P - P^*\right)}{P^*} \times 10{,}000 \text{ bps}$$

$$\text{Side} = \begin{cases} +1 & \text{Buy order} \\ -1 & \text{Sell order} \end{cases}$$

$\bar{P}$ = Average execution price of order

P^* = Reference price

Shares = Shares executed

Arrival Price
A portfolio manager executes a buy order at an average price of P = \$30.05. The **arrival price** at the time the order was submitted to the market was P_0 = \$30.00.

VWAP
A portfolio manager executes a buy order at an average price of P = \$30.05. The **VWAP** over the trading horizon is \$30.04.

TWAP
Exclude potential trade price outliers.

Market on Close
Used primarily by index managers and mutual funds.

5.2 Evaluating Trade Execution (1/2)

Market-adjusted cost measurement helps separate trading cost due to trading the order from the general market movement in the security price.

$$\text{Market-adjusted cost (bps)} = \text{Arrival cost (bps)} - \beta \times \text{Index cost (bps)}$$

$$\text{Index cost (bps)} = \text{Side} \times \frac{(\text{Index VWAP} - \text{Index arrival price})}{\text{Index arrival price}} \times 10^4$$

Consider a portfolio manager who executes a buy order at an average price of $30.50. The arrival price at the time the order was entered into the market was $30.00. The selected index price at the time of order entry was $500, and market index VWAP over the trade horizon was $505. The stock has a beta to the index of $\beta = 1.25$.

Step 1 Calculate arrival cost.

$$\begin{aligned}\text{Arrival cost (bps)} &= \text{Side} \times \frac{(\bar{P} - P_0)}{P_0} \times 10^4 \text{ bps} \\ &= +1 \times \frac{(\$30.50 - \$30.00)}{\$30.00} \times 10^4 \text{ bps} \\ &= 166.7 \text{ bps}\end{aligned}$$

Step 2 Calculate index cost.

$$\begin{aligned}\text{Index cost (bps)} &= \text{Side} \times \frac{(\text{Index VWAP} - \text{Index arrival price})}{\text{Index arrival price}} \times 10^4 \\ &= +1 \times \frac{\$505 - \$500}{\$500} \times 10^4 \\ &= 100 \text{ bps}\end{aligned}$$

Step 3 Calculate market-adjusted cost.

$$\begin{aligned}\text{Market-adjusted cost (bps)} &= \text{Arrival cost (bps)} - \beta \times \text{Index cost (bps)} \\ &= 166.7 \text{ bps} - 1.25 \times 100 \text{ bps} \\ &= 166.7 \text{ bps} - 125 \text{ bps} \\ &= 41.7 \text{ bps}\end{aligned}$$

IN-TEXT QUESTION

A portfolio manager executes a sell order at an average price of $29.50. The arrival price at the time the order was entered into the market was $30.00. The selected index price at the time of order entry was $500, and market index VWAP over the trade horizon was $495. The stock has a beta to the index of 1.25.

1 Calculate arrival cost.

2 Calculate index cost.

3 Calculate market-adjusted cost.

1 Calculate arrival cost.

$$\text{Arrival cost (bps)} = \text{Side} \times \frac{\left(\bar{P} - P_0\right)}{P_0} \times 10^4 \text{ bps}$$

$$= -1 \times \frac{(\$29.50 - \$30.00)}{\$30.00} \times 10^4 \text{ bps}$$

$$= 166.7 \text{ bps}$$

A positive arrival cost in this case indicates that the fund underperformed the arrival price benchmark.

2 Calculate index cost.

$$\text{Index cost (bps)} = \text{Side} \times \frac{(\text{Index VWAP} - \text{Index arrival price})}{\text{Index arrival price}} \times 10^4$$

$$= -1 \times \frac{\$495 - \$500}{\$500} \times 10^4$$

$$= 100 \text{ bps}$$

3 Calculate market-adjusted cost.

$$\text{Market-adjusted cost (bps)} = \text{Arrival cost (bps)} - \beta \times \text{Index cost (bps)}$$

$$= 166.7 \text{ bps} - 1.25 \times 100 \text{ bps}$$

$$= 166.7 \text{ bps} - 125 \text{ bps}$$

$$= 41.7 \text{ bps}$$

In this example, the arrival cost is calculated to be +166.7 bps, indicating that the order underperformed the arrival price. Although this is true, much of the adverse prices were likely due to market movement rather than inferior performance from the broker or algorithm. This sell order was executed in a falling market, which resulted in an arrival cost of 166.7 bps for the investor. However, an estimated 125 bps of this cost was due to market movement, which would have occurred even if the order had not traded in the market. Thus, the market-adjusted cost for this order is 41.7 bps.

5.2 Evaluating Trade Execution (1/3)

Added value measurement helps fund managers understand the value added by their broker and/or execution algorithms during the execution of the order.

$$\text{Added value (bps)} = \text{Arrival cost (bps)} - \text{Est. pre-trade cost (bps)}$$

A portfolio manager executes a buy order at an average price of P = \$50.35. The arrival price at the time the order was entered into the market was P_0 = \$50.00. Prior to trading, the buy-side trader performs pre-trade analysis of the order and finds that the expected cost of the trade is 60 bps, based on information available prior to trading.

$$\begin{aligned}\text{Arrival cost (bps)} &= \text{Side} \times \frac{(\bar{P} - P_0)}{P_0} \times 10^4 \text{ bps} \\ &= +1 \times \frac{(\$50.35 - \$50.00)}{\$50.00} \times 10^4 \text{ bps} \\ &= 70 \text{ bps}\end{aligned}$$

$$\text{Added value} = \text{Arrival cost} - \text{Est. pre-trade cost} = 70 \text{ bps} - 60 \text{ bps} = 10 \text{ bps}$$

6. Trade Governance

Major regulators mandate that asset managers have in place a trade policy document that clearly and comprehensively articulates a firm's trading policies and escalation procedures.

The objective of a trade policy is to ensure the asset manager's execution and order-handling procedures are in line with their fiduciary duty owed to clients for best execution.

1. Meaning of Best Order Execution within the Relevant Regulatory Framework
2. Factors Used to Determine the Optimal Order Execution Approach
3. List of Eligible Brokers and Execution Venues
4. Process Used to Monitor Execution Arrangements

6.1 Meaning of Best Order Execution within the Relevant Regulatory Framework

Best execution involves finding the appropriate trade-off between:

- Execution price
- Trading costs
- Speed of execution
- Likelihood of execution and settlement
- Order size
- Nature of the trade

6.2 Factors Used to Determine the Optimal Order Execution Approach

Factors used to determine the optimal execution approach

- Urgency of an order
- Characteristics of the securities traded
- Characteristics of the execution venues used
- Investment strategy objectives
- Rationale for a trade

Asset Class	Considerations
Equities and Exchange-Traded Options and Futures	An investment manager needs to choose the type of market or venue used for execution. In many cases, there are lit (on-exchange) markets and dark markets available for more liquid securities. Lit markets provide pre-trade and post-trade transparency, whereas dark markets provide post-trade transparency. The liquidity of a security and the percentage of average daily volume traded are critical in the choice of optimal execution algorithm. Historical transaction data—including liquidity characteristics and price volatility—are widely available and can be readily assessed.
Fixed Income	There are two main issues: market transparency and price discovery. Only some of the trading, particularly in corporate bonds, takes place on venues that provide market transparency as well as simultaneous, competitive quotes enabling price discovery, which is a necessary condition to ensure best execution. Generally, trade policy should dictate that, if at all possible, bids/offers should be requested from multiple independent third parties before a trade is executed. This process fosters competition and provides a more precise estimate of the likely market price at a particular time in an effort to achieve the best price possible. If there is no market transparency and if multiple competing quotes cannot or should not be obtained, then a trade policy should outline alternative means to achieve price discovery. These may include data sources (such as TRACE data)* for historical transaction prices or quotes for a given security or comparable securities. In the absence of any relevant transaction prices or quotes, an internal or external pricing model could be used to establish a market price estimate.
OTC Derivatives	Broker selection may depend on the exact terms of the proposed OTC derivative instruments, counterparty risk, and a broker's settlement capabilities.
Spot Currencies	Quotes should be requested from multiple independent dealers before a trade is executed. This process fosters competition in an effort to achieve the best price possible.

6.3 List of Eligible Brokers and Execution Venues

Asset managers should have a list of approved brokers and execution venues for trading

- Quality of service
- Financial stability
- Reputation
- Settlement capabilities
- Speed of execution
- Cost competitiveness
- Willingness to commit capital

Best practices approach is to create a Best Execution Monitoring Committee

6.4 Process Used to Monitor Execution Arrangements

Brokers and execution venues should be monitored

Checkpoints for trade execution monitoring

- Trade submission
- Execution quality relative to benchmark
- Balance between trading costs and opportunity costs
- Could better execution have been achieved

Trading records should be maintained

- Address client concerns
- Address regulator concerns
- Assist in improving execution quality
- Monitor the parties involved in trading/order execution

IN-TEXT QUESTIONS

ABC Asset Management (ABCAM) is one of the world's largest asset managers. ABCAM has been using AAA Brokerage (AAAB) as its exclusive broker for a number of its funds for many years. Other brokers are used only for market segments in which AAAB does not have business operations. The leadership of ABCAM explains its choice of broker by stating, "Because of its long-standing business relationship with AAAB, ABCAM has a uniquely informed insight into the operations of AAAB, which provides greater comfort and assurance that AAAB will fulfill its duties when compared with other brokers."

Solution:

ABCAM needs to show that it takes all sufficient steps to ensure best execution for its clients' trades. This includes choosing brokers that provide the best service for potential best execution. In order to justify that AAAB is the right broker to use, ABCAM must demonstrate that it has done comparisons of different brokers, that this analysis is regularly conducted with updates, and that each time AAAB is found to be the best choice for order implementation. A thorough and unbiased analysis is required for this. Stating a subjective opinion, such as the explanation provided by ABCAM leadership, is not sufficient justification.

For several decades, XYZ Capital has been running enhanced index funds. These funds have low levels of target tracking error compared with their market-weighted benchmarks. The firm's trade policy document has a focus on minimizing trading costs and defines best execution as follows:

> "The firm takes all sufficient steps to obtain the best possible result in executing orders; that is, the firm makes its best attempt to achieve the best execution price and lowest trading cost possible for every transaction. In this way, the firm achieves best execution for its client portfolios."

Discuss whether the trade policy statement is in line with regulatory requirements and client best interests.

Solution:

Achieving the best execution price at the lowest trading cost possible is only part of the best execution effort. To ensure that clients and their portfolios are served in the best manner possible, other factors require consideration. These considerations include the speed of execution, the alignment of execution approach and execution horizon with the investment process, the likelihood of execution to be optimal, and so on. An exclusive focus on best execution price and lowest trading cost is too narrow a definition to achieve best client execution. For example, doing so could leave many trades unexecuted, which would result in increased opportunity costs from lost opportunities that could not be implemented.

Summary

- Motivations to trade
- Trade strategy inputs
- Benchmarks for trade execution
- Selecting a trading strategy
- Algorithmic trading
- Comparison of markets
- Trade cost measurement
- Evaluating trade execution
- Trade governance