Actionable and Comparable Transaction Cost Analysis

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DATAROAD

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Agenda

Old Investment Paradigm

Two Dimensions of Investment
1. Return : Prediction of future realized return
2. Risk: Management of return uncertainty

Return —— Risk

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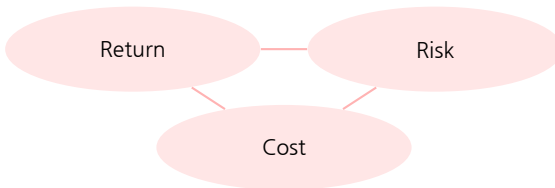INDUSTRY-DRIVEN · INDEPENDENT · NEUTRAL

New Investment Paradigm

Changing Investment Environment

- ❏ decreased market volatility, competition in fund markets, popularity of passive managed funds

Cost: New Dimension of Investment

1. Return
2. Risk
3. Transaction Cost

Return

Risk

Cost

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Transaction Cost Definition 1: Benchmark Comparison

> ### Benchmark Comparison
>
> ❏ monetary value difference between the executed portfolio and the portfolio evaluated at a benchmark price
>
> $$\text{TC\%} = \frac{P_{\text{Executed}} - P_{\text{Benchmark}}}{P_{\text{Benchmark}}} \qquad (1)$$
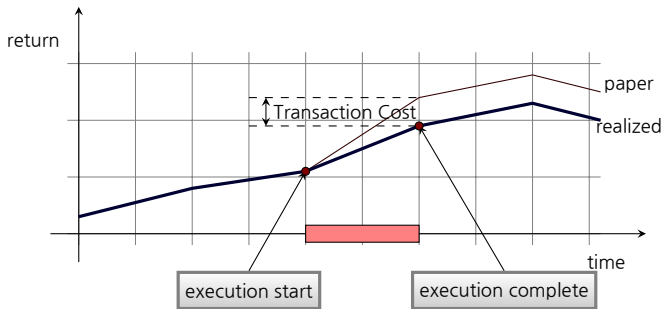
❏ Popular Benchmark
  - ▶ Market Close
    - • vulnerable to manipulation in Korea market
  - ▶ VWAP (Volume Weighted Average Price)
    - • daily VWAP, interval VWAP
  - ▶ Arrival Price

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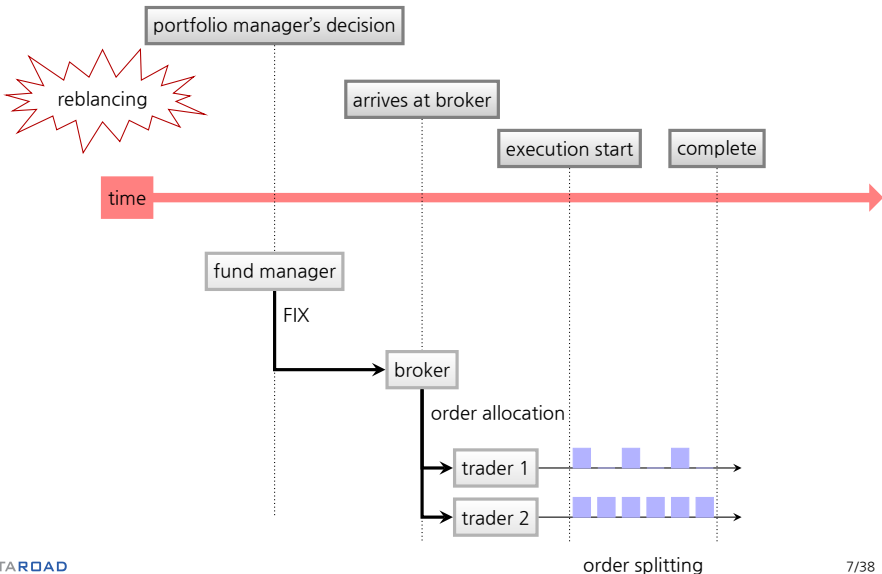# Transaction Cost Definition 2: Implementation Shortfall

Implementation Shortfall

❏ return difference between paper portfolio and realized portfolio
❏ return loss occuring in execution process

Order Execution Process

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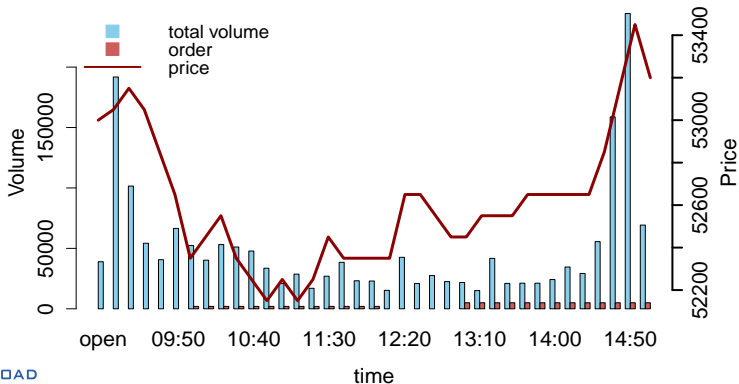# Order Execution Strategies

- ❏ TWAP (Time Weighted Average Price)
- ❏ Static VWAP (Volume Weighted Average Price)
- ❏ Dynamic VWAP (Volume Weighted Average Price)
- ❏ POV (Participation of Volume)
- ❏ Price-Inline
- ❏ IS (Implementation Shortfall)
- ❏ Iceberg
- ❏ Multi-Venue

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TWAP (Time Weighted Average Price)

TWAP (Time Weighted Average Price)

❏ simple even allocation

Static VWAP (Volume Weighted Average Price)

Static VWAP (Volume Weighted Average Price)
❑ fixed intraday volume-profile

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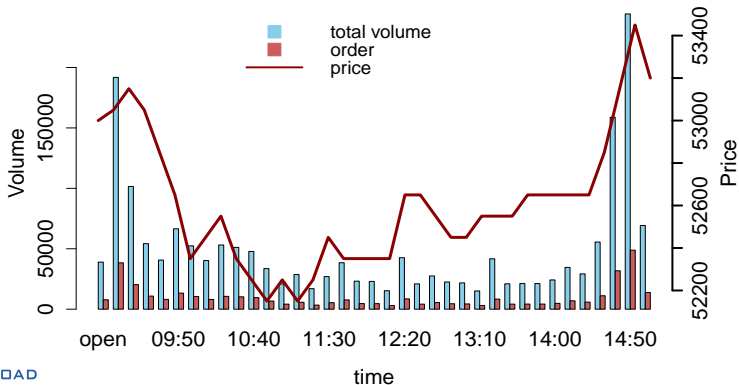INDUSTRY-DRIVEN · INDEPENDENT · NEUTRAL
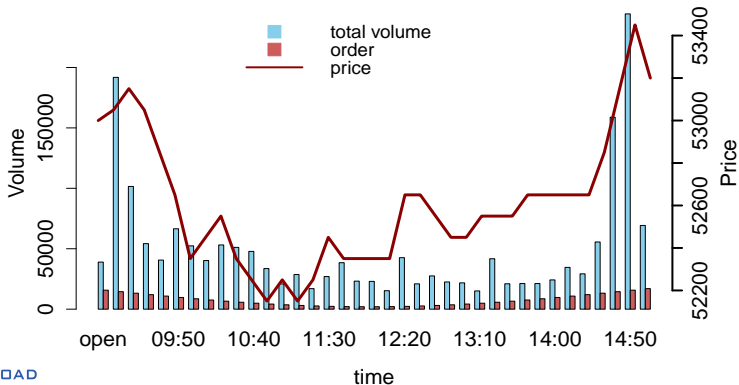
Dynamic VWAP (Volume Weighted Average Price)

Dynamic VWAP (Volume Weighted Average Price)
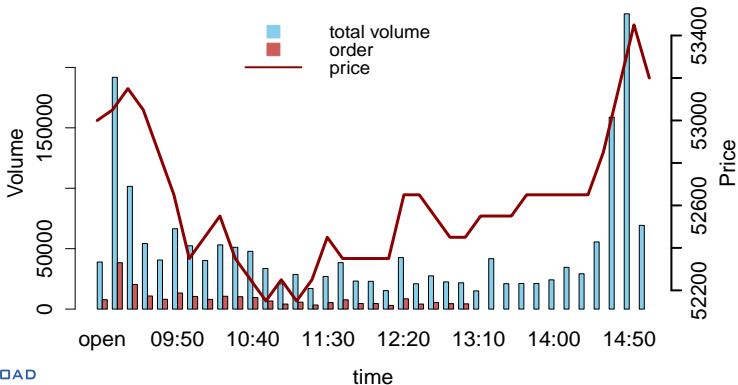
❏ tracking a real intraday volume profile

POV (Participation of Volume)

POV (Participation of Volume)

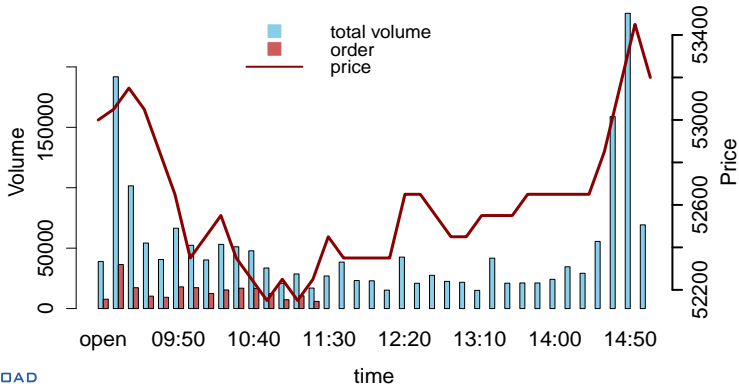❏ participate in trade volume at a user-defined rate

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Active Price-Inline

Active Price-Inline

❏ increase participation rate if market moves in favor

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Passive Price-Inline

Passive Price-Inline

❏ increase participation rate if market moves against

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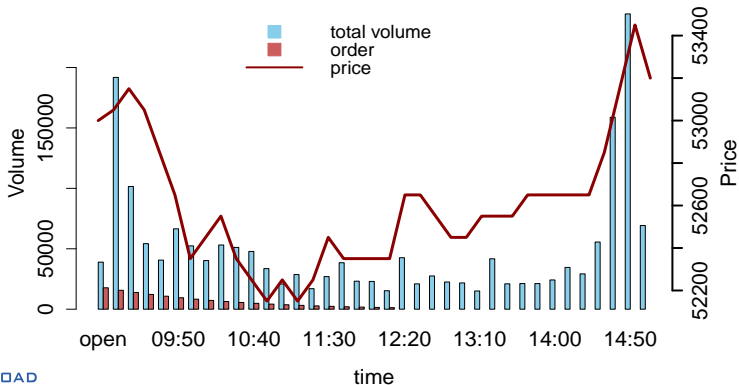INDUSTRY-DRIVEN · INDEPENDENT · NEUTRAL
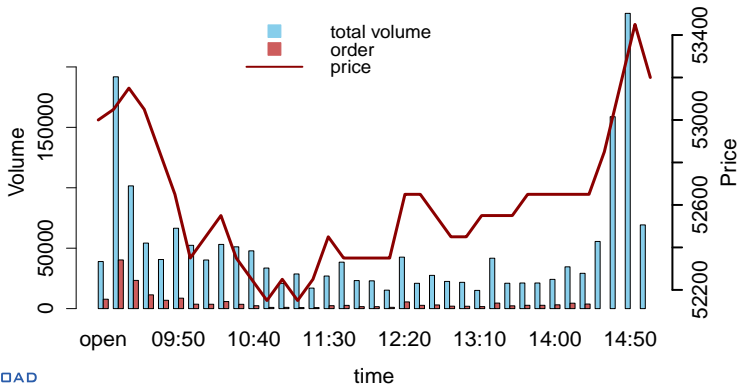
IS (Implementation Shortfall)

IS (Implementation Shortfall)

❑ user choose cost-risk trade-off

TCA: Transaction Cost Analysis

TCA

- ❏ calculate/estimate/predict/analysis of transaction costs
- ❏ in order to
  - ► evaluate the quality and performance of execution
  - ► provide information for execution strategy to traders and managers

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TCA Categories

Pre-TCA

- ❑ provide market-statistics for optimal execution planning
- ❑ predict estimated cost and risk
- ❑ for blind portfolio auctions

Realtime-TCA

- ❑ provide market-indicators for optimal execution
- ❑ monitor the performance of exeuction

Post-TCA

- ❑ report the execution quality
- ❑ comprison/peer analysis of executions
- ❑ component analysis (spread, market impact, captured alpha, etc.)

Objectives of TCA

Sell-side objectives

- ❏ Measure the execution quality and performance of traders
- ❏ Broker's best exeuction obligation

Buy-side objectives

- ❏ Evaluate brokers' execution performance
- ❏ Estimate alpha loss due to transaction cost
- ❏ Robust porftfolio optimization
- ❏ Disclosure of transaction cost for end-clients

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Regulatory Pressure

> ### United States
>
> ❏ "Disclosure of order Execution and routing Practices," SEC Final rule no. 34-43590, 27 November 2000 :
>   - ▶ "a duty to seek the most favorable execution terms reasonably available given the specific circumstances of each trade"
>
> ❏ "Best Execution and Interpositioning", FINRA Rule 5310
>   - ▶ "use reasonable diligence to ascertain the best market for the subject security and buy or sell in such market so that the resultant price to the customer is as favorable as possible under prevailing market conditions"
>   - ▶ At a minimum, a member must conduct such reviews (of the executions of its customers' orders) on a quarterly basis

Regulatory Pressure (cont.)

Europe

- ❏ MiFID "Investment Services Directive markets in Financial Instruments Directive," European Parliament and of the Council, november 2007
  - ► Level 1, article 21, 24, 25
  - ► Level 2 Directive, article 44, general provisions
  - ► "speed, likelihood of execution and settlement, the size and nature of the order, market impact and any other implicit transaction costs may be given precedence over the immediate price and cost factors"

Fund Industry

- ❏ FINAL REPORT ON ELEMENTS OF INTERNATIONAL REGULATORY STANDARDS ON FEES AND EXPENSES OF INVESTMENT FUNDS
  - ► transaction costs include "the market impact of the transaction and the opportunity costs"

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Regulatory Pressure in Korea

National Pension Fund

- ❏ From 2013, NPS' broker selection form includes an execution performance factor (VWAP benchmark)

ATS

- ❏ Introduction of Alternative Trading System (ATS)
- ❏ Best execution regulation needs to be amended

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Transaction Cost Components

Component Analysis

- ❏ Objective of Component Analysis
  - ► Indentify which component of transaction cost is responsible for the execution performance
  - ► Compute controllability of transaction cost
- ❏ Components
  - ► Explicit Transaction Cost
    - No uncertainty. can be computed before the execution
  - ► Implicit Transaction Cost
    - Random variable with fat-tail distribution
    - Possible negative costs (profits)

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Explicit Transaction Cost

Explicit Transaction Cost
❏ commissions
❏ exchange fees
❏ custodial activity charge
❏ taxes

Implicit Transaction Cost

Implicit Transaction Cost

- ❏ Components: market impact, spread, delay cost, opportunity cost
- ❏ Levels of implicit costs are about 80% of total costs [a]
- ❏ implicit costs in US stock markets: **more than 30 billion in 2003** [b]

[a] ITG-KOSCOM Seminar, 2013
[b] SECURITIES AND EXCHANGE COMMISSION 17 CFR PARTS 200, 201, 230, 240, 242, 249, and 270, Release No. 34-51808; File No. S7-10-04

Spread, Delay Cost, and Opportunity Cost

Spread

❏ Price difference between ask price and bid price

Delay Cost

❏ Price change after the manager's decision until the execution starts

Opportunity Cost

❏ Foregone profit/loss resulting from not fully executing the order within the period

Market Impact Cost

Market Impact Cost

- ❏ Price movement due to trader's buy/sell action
- ❏ Types of market impact costs
  - ▶ Temporary Market Impact Cost
  - ▶ Permanant Market Impact Cost

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Temporary and Permanant Market Impact Cost

Temporary or Realized Market Impact Cost

❏ price concession needed to attract counterparties within a specified short time interval

Permanant Market Impact Cost

❏ reflects the information transmitted to the market by the buy/sell im-balance.

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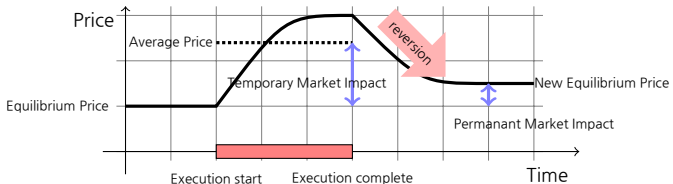
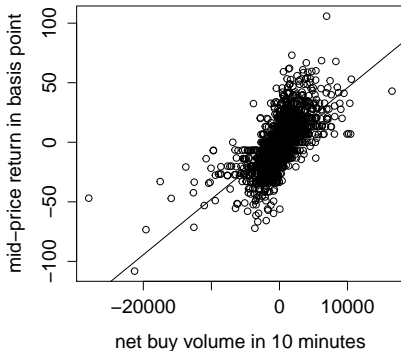# Example of Market Impact 1 : Multiple-Days

- ❏ 2013-08-28 ∼ 2013-09-04 large buy trade
- ❏ 2013-09-04 Disclosure: Change in the Number of Shares Owned by the Largest Shareholder
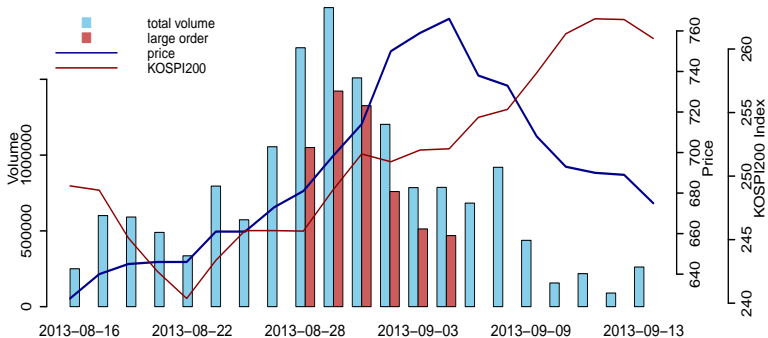
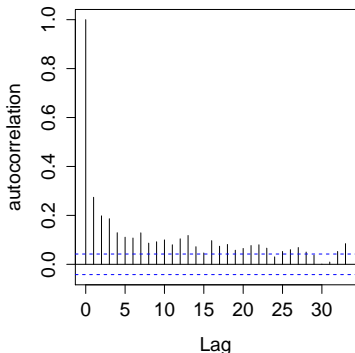## Example of Market Impact 2 : Intraday

Intraday Market Impact

- ❏ x axis : net buy volume in 10 minutes
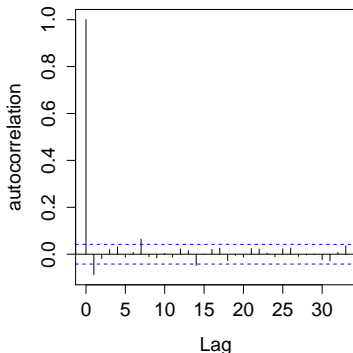- ❏ y axis : 10-minute mid-price return
- ❏ regression : 0.004676 bp/share

Example of Market Impact 3 : Order Flow Correlation

❏ Strong auto-correlations in order flows
❏ No auto-correlation in price change due to reversions after temporary market impact

order autocorrelation

return autocorrelation

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3 Facts About Transaction Cost

1. Cost is a Random Variable

❏ Exact (implicit) transaction cost cannot be predicted. To reduce the uncertainty (risk) of cost, expected cost is increased.
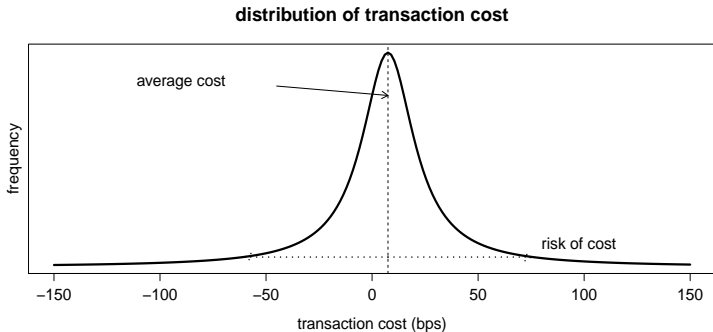
2. Cost Distribution is Known

❏ Distribution of transaction cost (expected cost and risk) can be calculated from transaction logs and market impact models

3. Fat Tail Distribution

❏ Cost distribution has very long, fat tails.

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Statistical Characteristics of Transaction Cost

distribution of transaction cost

- ❏ VWAP Strategy Performance[1]
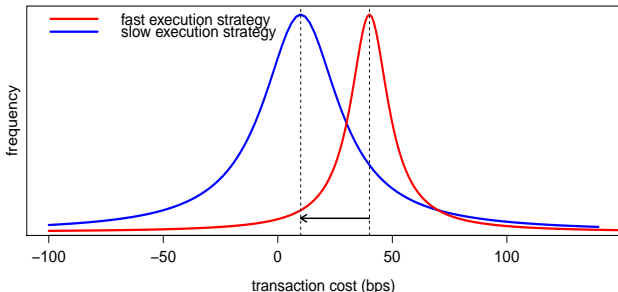 - ▶ average = 3.7 bps, std ⟩ 40 bps

Control of Transaction Cost

Control of Transaction Cost

❏ Choose best execution strategy with acceptible cost risk

❏ Trade-off between expected cost and cost risk
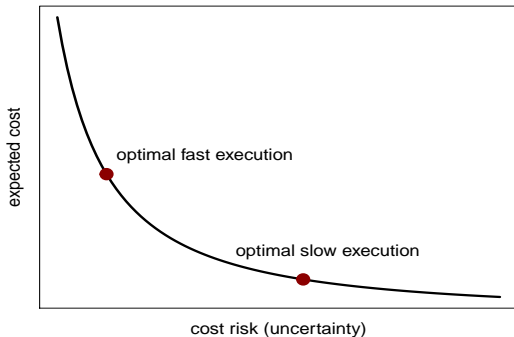

Control of transaction cost

Efficient Trading Frontier

Efficient Trading Frontier

❑ Set of all trading strategies with the lowest cost for a given quantity of risk

Efficient Trading Frontiers

expected cost

optimal fast execution

optimal slow execution

cost risk (uncertainty)

# Applications of TCA : Optimal Execution Scheduling

Needs of Pre-TCA

- ❏ For small expected alpha, prediction of transaction cost is important
- ❏ Knowledge of distribution of expected transaction cost can help set up best execution plans

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Participation Rate

❏ participation rate
  ► Typical execution parameter
  ► Proxy of execution speed
  ► Trade volume relative to ADV(Average Daily Volume) or MDV(Median Daily Volume)
  ► Fast executions increase mean cost but decrease cost risk
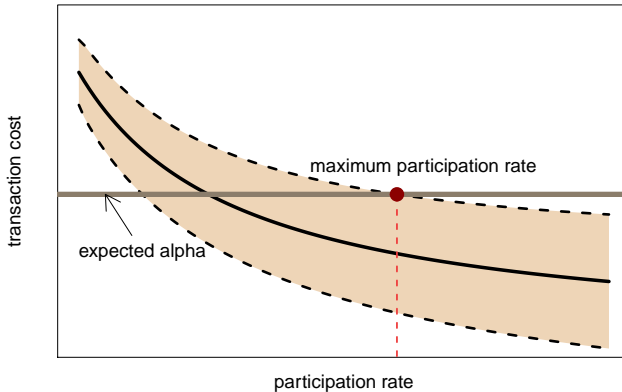
Calculation of Alpha slippage
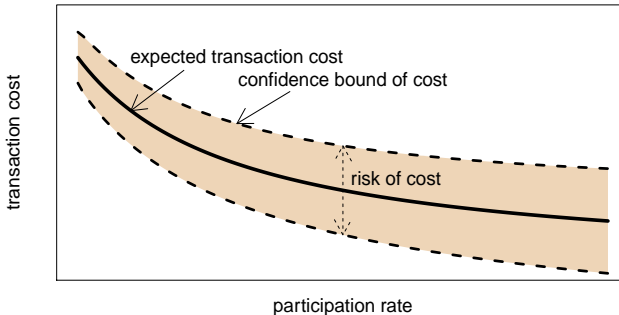
Determination of Participation Rate 1

- ❏ decide execution speed within the captured alpha bound

Optimal Participation Rate

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Determination of Participation Rate 2

❏ For rapidly decaying alphas, price appreciation loss must be considered
❏ Optimal execution speed can be determined for expected alpha loss models

Optimal Participation Rate