

Lesson 41: Market Microstructure

Mini-Lecture Version (30 min)

Digital Finance

Learning Objectives: Understand market microstructure theory and empirical regularities — Analyze bid-ask spreads and their components — Examine market maker economics and inventory management — Evaluate high-frequency trading strategies and market impact

Core Questions:

- How are prices formed in continuous trading?
- What determines bid-ask spreads?
- How does information get incorporated into prices?
- What is the role of market makers and liquidity providers?
- (See full lecture for details)

Key Concepts:

- **Price Discovery:** Aggregating dispersed information
- **Liquidity:** Ability to trade without price impact
- **Market Depth:** Volume available at various prices
- **Resilience:** Speed of price recovery after shocks

Trading Costs Framework:

- **Explicit Costs:** Commissions, fees, taxes
- **Implicit Costs:** Spread, impact, opportunity
- **Total Cost:** $TC = \text{Spread} + \text{Impact} + \text{Delay}$

Market Quality Metrics:

- **Efficiency:** Prices reflect available information
- **Liquidity:** Low cost, high volume capacity
- **Transparency:** Order flow and trade visibility
- **Stability:** Resistance to manipulation and crashes
- **Fairness:** Equal access and opportunity

This concept is fundamental to understanding Market Microstructure.

Spread Definitions:

- **Quoted Spread:** $S_Q = P_{ask} - P_{bid}$
- **Percent Spread:** $S_{\%} = \frac{P_{ask} - P_{bid}}{P_{mid}} \times 100$
- **Effective Spread:** $S_E = 2|P_{trade} - P_{mid}|$
- **Realized Spread:** $S_R = 2(P_{trade} - P_{mid+5min}) \times D$

where $D = +1$ for buyer-initiated, -1 for seller-initiated

Example:

- Bid:
- Quoted spread:
- Percent spread: 0.04
- Trade at
- (See full lecture for details)

Spread Components (Stoll 1989):

- **Order Processing:** Fixed costs (40-50%)
- **Inventory Holding:** Risk aversion costs (10-20%)
- **Adverse Selection:** Informed trading (30-50%)

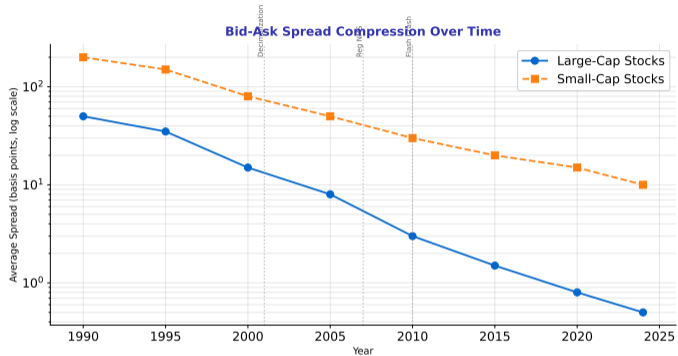
Determinants of Spreads:

- **Volume:** Higher volume \rightarrow tighter spreads
- **Volatility:** Higher volatility \rightarrow wider spreads
- **Competition:** More market makers \rightarrow tighter
- **Tick Size:** Minimum increment constraint
- **Information Asymmetry:** More informed trading \rightarrow wider

US large-cap spreads: 1-3 bps; small-cap: 10-50 bps (2024)

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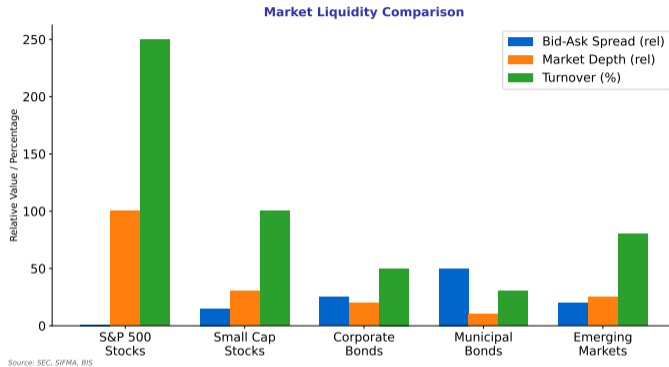
Bid-Ask Spread Analysis



Source: SEC, FIMRA, Academic Research

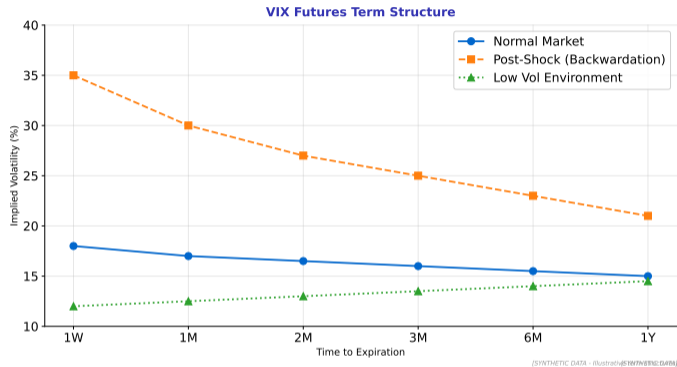
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Liquidity Metrics Across Markets



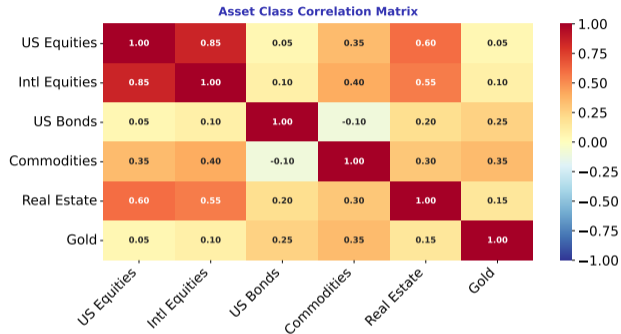
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Volatility Term Structure



This concept is fundamental to understanding Market Microstructure.

Asset Correlation Matrix



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Glosten-Milgrom Model (1985):

- Sequential trade model with information asymmetry
- Informed traders know true value V
- Uninformed traders are noise/liquidity traders
- Market maker sets bid-ask to break even
- (See full lecture for details)

Key Implications:

- Spread widens with more informed trading
- Price update after each trade (Bayesian learning)
- Bid-ask bounce causes negative autocorrelation
- Larger trades signal more information

Kyle Model (1985):

- Batch auction with strategic informed trader
- Informed trader optimizes profit vs price impact
- Market depth (lambda): $\lambda = \frac{dP}{dQ}$
- Price impact linear in order flow

Kyle's Lambda:

$$\lambda = \frac{\sigma_v}{2\sigma_u}$$

where σ_v = value volatility, σ_u = noise trading volatility

Empirical Evidence:

- Larger trades move prices more (concave impact)
- Block trades have 5-10x impact vs VWAP execution
- Price impact persists 30-60 minutes post-trade

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Market Maker Functions:

- Continuous two-sided quotes (bid and ask)
- Absorb temporary order imbalances
- Facilitate price discovery
- Reduce search costs for traders
- (See full lecture for details)

Designated Market Makers (DMM):

- **NYSE:** DMM obligations for assigned stocks
- **Nasdaq:** Competitive market makers (no exclusivity)
- **Obligations:** Maintain fair and orderly markets
- **Benefits:** Informational advantages, rebates

Profitability Sources:

- **Spread Capture:** Buy bid, sell ask
- **Maker Rebates:** 0.15-0.30 cents/share (US equities)
- **Order Flow Internalization:** Payment for order flow (PFOF)
- **Statistical Arbitrage:** Short-term mean reversion

Risks:

- **Inventory Risk:** Directional exposure
- **Adverse Selection:** Losing to informed traders
- **Volatility Spikes:** Widening spreads, reduced depth
- **Technology Failures:** Latency, connectivity issues

Top HFT market makers: Citadel Securities, Virtu, Jane Street, Jump Trading

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Key Takeaways

- 1 Understand market microstructure theory and empirical regularities
- 2 Analyze bid-ask spreads and their components
- 3 Examine market maker economics and inventory management
- 4 Evaluate high-frequency trading strategies and market impact

Bottom Line: Market Microstructure is transforming how financial services operate and compete.

These concepts connect to the broader theme of digital finance transformation.

Market Microstructure in Visual Perspective



Technology view



Application view



Future view

Visual representations help reinforce key concepts of market microstructure.

Concrete Examples: Making It Real

Technical Examples

- Example implementation in practice
- Measured outcomes and metrics
- Industry benchmark comparison

Case Study

- Real-world deployment scenario
- Quantifiable results achieved

Industry Leaders

- Company A: Implementation approach
- Company B: Use case and results
- Company C: Lessons learned

Market Data

- Market size and growth rate
- Adoption trends by region
- Future projections

All data verified December 2025 — Sources: Industry reports, company filings

Quiz Questions (1–5)

Q1. What is the primary purpose of market microstructure?

- A) Increase efficiency B) Reduce costs C) Improve access D) All of the above

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Answer: D – All these factors contribute to the value proposition.

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A) APIs B) Blockchain C) Machine Learning D) Cloud Computing

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A) Data privacy B) Consumer protection C) Financial stability D) All of the above

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Q10. What is a key takeaway about market microstructure?

- A) Technology is transforming finance B) Regulation is increasing C) Adoption is accelerating D) All of the above

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- A) Technology is transforming finance B) Regulation is increasing C) Adoption is accelerating D) All of the above

Answer: D – All these trends are interconnected.