Module 4: Types of MEV Strategies

Duration: 75 minutes | **Level:** Beginner | **Author:** Obelisk Core

Learning Objectives

By the end of this module, you will:
- Understand the three main types of MEV strategies in detail
- Learn technical implementation approaches for each strategy type
- Analyze real-world examples and case studies
- Explore advanced MEV techniques and emerging opportunities

MEV Strategy Classification

Primary Categories

```
MEV Strategies
├── Arbitrage MEV (60% of total MEV)
│   ├── DEX Arbitrage
│   ├── Cross-Chain Arbitrage
│   └── Triangular Arbitrage
├── Liquidation MEV (30% of total MEV)
│   ├── Protocol Liquidations
│   ├── Cross-Protocol Liquidations
│   └── Cascading Liquidations
└── Sandwich Attack MEV (10% of total MEV)
    ├── Simple Sandwich
    ├── Complex Sandwich
    └── Multi-Victim Sandwich
```

Strategy Characteristics

- **Capital Requirements:** Vary from $0 (flashloans) to 100M+
- **Risk Level:** Low to extremely high
- **Technical Complexity:** Basic to advanced
- **Competition:** Moderate to extremely competitive

Arbitrage MEV

Definition and Mechanics

Arbitrage MEV involves exploiting price differences across different venues, protocols, or assets to generate profits.

DEX Arbitrage

Core Concept

```
Price on DEX A: 100 USDC per token
Price on DEX B: 102 USDC per token
Opportunity: Buy on A, sell on B
Profit per token: 2 USDC (minus fees and gas)
```

Implementation Requirements

1. Price Monitoring
- Real-time price feeds from multiple DEXs
- Slippage calculation and estimation
- Gas cost prediction
- Liquidity depth analysis

2. Execution Infrastructure
- Low-latency transaction submission
- Optimal gas price selection
- Slippage protection mechanisms
- Failure handling and rollback

3. Capital Management
- Sufficient capital for trades
- Gas reserve for failed attempts
- Risk management for position exposure

DEX Arbitrage Example

Scenario: ETH/USDC arbitrage opportunity

```
Initial State:
- Uniswap V3: 1 ETH = 1,850 USDC
- SushiSwap: 1 ETH = 1,855 USDC
- Gas estimate: 0.08 ETH
- Trade size: 10 ETH

Calculation:
Buy on Uniswap: 10 ETH × 1,850 = 18,500 USDC
Sell on SushiSwap: 10 ETH × 1,855 = 18,550 USDC
Gross profit: 50 USDC
Gas cost: 0.08 ETH = 150 USDC (at $1,875/ETH)
Net profit: -100 USDC (not profitable)

Optimal Trade Size:
Max profitable size: 50 USDC ÷ 0.08 ETH = 625 USDC per ETH
Optimal trade: 0.27 ETH
Actual profit: 0.27 × 5 USDC - 0.08 ETH = 1.35 - 150 = -148.65 USDC
```

Result: Opportunity not profitable with $1,875 ETH price and high gas costs

Advanced DEX Arbitrage

Flashloan Arbitrage:

```
Capital Requirement: $0 (borrowed funds)
Process:
1. Flashloan 100 ETH from Aave
2. Execute arbitrage: Uniswap → SushiSwap
3. Repay flashloan + fees
4. Keep remaining profit

Requirements:
- Integration with flashloan-enabled protocols
- Atomic execution capability
- Accurate profit calculation
```

Cross-DEX Optimization:
- Route optimization across multiple DEXs
- Liquidity fragmentation exploitation
- Optimal trade size calculation
- Fee optimization strategies

Cross-Chain Arbitrage

Multi-Chain Opportunities

Ethereum → Arbitrum → Optimism arbitrage

```
ETH Price on Ethereum: $1,875
ETH Price on Arbitrum: $1,878
ETH Price on Optimism: $1,872

Opportunity Path:
1. Buy ETH on Ethereum ($1,875)
2. Bridge to Arbitrum (cost: ~$15)
3. Sell on Arbitrum ($1,878)
4. Bridge to Optimism (cost: ~$12)
5. Buy back on Optimism ($1,872)
6. Bridge back to Ethereum

Complexity Factors:
- Bridge delays and costs
- Price volatility during bridge time
- Chain-specific liquidity differences
- Gas cost optimization across chains
```

Bridge Arbitrage Strategies

- Monitor multiple bridges for price discrepancies
- Time bridge crossings with market movements
- Optimize bridge selection based on costs
- Manage cross-chain position risks

Triangular Arbitrage

Three-Asset Arbitrage

```
Path: ETH → USDC → UNI → ETH

Initial State:
- ETH/USDC: 1 ETH = 1,850 USDC
- USDC/UNI: 1 USDC = 0.75 UNI
- UNI/ETH: 1 UNI = 0.00054 ETH

Arbitrage Calculation:
Start with 1 ETH
Convert to USDC: 1 × 1,850 = 1,850 USDC
Convert to UNI: 1,850 ÷ 0.75 = 2,467 UNI
Convert back to ETH: 2,467 × 0.00054 = 1.332 ETH
Profit: 0.332 ETH (17.9% return)

After Gas Costs and Slippage:
Actual return: ~15% (still highly profitable)
```

Technical Implementation

- Real-time price feed aggregation
- Path optimization algorithms
- Slippage impact calculation
- Gas cost optimization

Liquidation MEV

Definition and Purpose

Liquidation MEV involves closing undercollateralized lending positions to capture liquidation bonuses.

How Liquidation Works

Collateralization Ratio

```
Lending Protocol Example (Aave):
- Collateral Requirement: 150%
- Liquidation Threshold: 145%
- Liquidation Bonus: 7%

Position Example:
- Borrowed: 1,000 USDC
- Collateral: 2.0 ETH @ <span class="math-inline" style="display:
inline;"><math xmlns="http://www.w3.org/1998/Math/MathML"
display="inline"><mrow><mn>1</mn><mo>&#x0002C;</mo><mn>875</
mn><mo>&#x0003D;</mo></mrow></math></span>3,750
- Ratio: 3,750 ÷ 1,000 = 375% (safe)

Price Drop Scenario:
- ETH drops to $1,000
- New value: 2.0 ETH @ <span class="math-inline" style="display:
inline;"><math xmlns="http://www.w3.org/1998/Math/MathML"
display="inline"><mrow><mn>1</mn><mo>&#x0002C;</mo><mn>000</
mn><mo>&#x0003D;</mo></mrow></math></span>2,000
- New ratio: 2,000 ÷ 1,000 = 200% (still safe)

Further Drop:
- ETH drops to $750
- New value: 2.0 ETH @ <span class="math-inline" style="display:
inline;"><math xmlns="http://www.w3.org/1998/Math/MathML"
display="inline"><mrow><mn>750</mn><mo>&#x0003D;</mo></mrow></math></
span>1,500
- New ratio: 1,500 ÷ 1,000 = 150% (liquidated)

Liquidation Trigger:
- Seizer gets: 1,000 USDC + 70 USDC (7% bonus)
- Seizer pays: 2.0 ETH (or equivalent)
- Protocol recovers: 1,070 USDC from liquidation
```

Protocol-Specific Parameters

Aave V3:
- Liquidation Threshold: 82.5%

- Liquidation Bonus: 5-10% (varies by asset)
- Gas Cost: ~0.01-0.05 ETH
- Competition: High (many liquidators)

Compound:
- Liquidation Threshold: 75%
- Liquidation Bonus: 5%
- Gas Cost: ~0.008-0.03 ETH
- Competition: Moderate

MakerDAO:
- Liquidation Threshold: 150%
- Liquidation Penalty: 13%
- Auction-based system
- Competition: Very high

Liquidation MEV Process

Step-by-Step Implementation

1. Position Monitoring

```
Real-time tracking of:
├── Collateral prices
├── Loan-to-value ratios
├── Liquidation thresholds
└── Position sizes and borrowers
```

2. Profit Calculation

```
Opportunity Analysis:
Position Value: $1,000,000
Liquidation Threshold: 150%
Current Ratio: 155% (approaching liquidation)
Bonus: 7%
Gas Estimate: 0.02 ETH ($37.50)

Profit Calculation:
Gross Bonus: <span class="math-inline" style="display: inline;"><math
xmlns="http://www.w3.org/1998/Math/MathML"
display="inline"><mrow><mn>1</mn><mo>&#x0002C;</mo><mn>000</
mn><mo>&#x0002C;</mo><mn>000</mn><mi>×</mi><mn>7</mn></mrow></math></
span>70,000
Gas Cost: $37.50
Net Profit: $69,962.50
Competition Risk: 40% chance of being frontrun
```

3. Execution Strategy
- Determine optimal gas price
- Submit liquidation transaction
- Handle competing liquidators
- Monitor transaction inclusion

Advanced Liquidation Strategies

Cascading Liquidations:

```
Single Price Drop → Multiple Liquidations

Market Event:
- ETH drops 20% in 5 minutes
- Aave positions at various ratios

Liquidation Sequence:
1. Positions at 150% ratio liquidate first
2. Price impact from liquidations
3. More positions drop below threshold
4. Chain reaction continues

MEV Opportunity:
Monitor for potential cascades
Execute early liquidations
Capture multiple liquidation bonuses
```

Cross-Protocol Liquidations:

```
Multiple Protocols = Multiple Opportunities

Portfolio Approach:
├── Monitor Aave positions
├── Track Compound loans
├── Watch MakerDAO CDPs
├── Scan specialized protocols

Benefit: Diversified opportunity source
Challenge: Multiple technical integrations
```

Liquidation MEV Economics

Profit Factors

- **Position Size:** Larger positions = higher bonuses
- **Liquidation Threshold:** Lower thresholds = more liquidations
- **Bonus Percentage:** Higher bonuses = better profits
- **Gas Competition:** Lower gas = higher net profits

Risk Assessment

- **Frontrunning Risk:** Others may execute first
- **Gas Market Risk:** Sudden gas price increases
- **Liquidity Risk:** Unable to liquidate position
- **Protocol Risk:** Smart contract vulnerabilities

Sandwich Attack MEV

Definition and Mechanics

Sandwich attacks involve placing transactions immediately before and after a victim's transaction to profit from the price impact.

Simple Sandwich Attack

Attack Pattern

```
Victim Transaction: Large DEX trade

Execution Sequence:
1. Front-Run: Detect victim's trade, buy before them
2. Victim Trade: Large trade moves price favorably
3. Back-Run: Sell acquired assets for profit

Example:
Token A price: $100
Victim buys 1,000 tokens (drives price to $110)
Sandwich attack:
- Buy 50 tokens at $100
- Victim buys, price moves to $110
- Sell 50 tokens at $110
- Profit: 50 × <span class="math-inline" style="display:
inline;"><math xmlns="http://www.w3.org/1998/Math/MathML"
display="inline"><mrow><mn>10</mn><mo>&#x0003D;</mo></mrow></math></
span>500
```

Technical Requirements

- **Mempool Monitoring:** Detect victim trades before inclusion
- **Price Impact Prediction:** Estimate slippage from large trades

- **Transaction Coordination:** Ensure bundle inclusion
- **Slippage Protection:** Minimize own trade impact

Complex Sandwich Attacks

Multi-Victim Sandwich

```
Target: Multiple victim transactions in same block

Attack Structure:
Victim 1: Large UNI buy (price impact +2%)
Victim 2: Large UNI sell (price impact -1.5%)
Victim 3: Large UNI buy (price impact +3%)

Sandwich Strategy:
1. Front-run all three victims
2. Buy before first victim (+2% gain)
3. Sell between second and third victims
4. Buy again before third victim (+3% gain)
5. Back-run final victim

Total Profit: Combined impact from all victims
```

Sandwich with Liquidation

```
Cross-Strategy Opportunity:

Victim Transaction: Large trade triggers liquidation
Attack Sequence:
1. Front-run victim trade
2. Execute victim's trade (moves price)
3. Trigger liquidation of existing position
4. Back-run victim's position
5. Capture liquidation bonus + trade profit

Benefit: Multiple profit sources in single bundle
Challenge: Complex execution coordination
```

Sandwich Protection Mechanisms

User-Implemented Protection

```
Slippage Tolerance Protection:
- Set tight slippage limits
- Use limit orders when possible
- Submit transactions privately
- Monitor for potential sandwich attacks

Example Protection:
Victim Transaction:
- Trade Size: 10,000 UNI
- Max Slippage: 0.5%
- Max Price Impact: <span class="math-inline" style="display:
inline;"><math xmlns="http://www.w3.org/1998/Math/MathML"
display="inline"><mrow><mn>102.50</mn><mo stretchy="false">&#x00028;</
mo><mi>i</mi><mi>f</mi><mi>s</mi><mi>t</mi><mi>a</mi><mi>r</mi><mi>t</
mi><mi>i</mi><mi>n</mi><mi>g</mi><mi>a</mi><mi>t</mi></mrow></math></
span>102)

Attack Analysis:
Expected slippage: 2% (victim trade)
Attack viability: High (5x above user limit)
User protection: Effective (transaction would fail)
```

Protocol-Level Protection

```
Uniswap V3 Protection:
- Concentrated liquidity reduces price impact
- Slippage protection mechanisms
- TWAP (Time-Weighted Average Price) oracles
- Private transaction support

1inch Protection:
- Advanced pathfinding algorithms
- Price impact minimization
- MEV-resistant routing
- Private transaction submission
```

Advanced MEV Techniques

Non-Standard MEV Strategies

Time-Window Arbitrage

```
Concept: Exploit predictable price movements

Example: Governance Token Voting
1. Monitor upcoming governance votes
2. Identify tokens likely to appreciate
3. Buy before vote announcement
4. Sell after price increase

Risk Factors:
- Vote outcome uncertainty
- Price moves before announcement
- Other participants with similar strategies
```

NFT MEV

```
Opportunities in NFT Markets:

Floor Sweeping:
- Detect underpriced NFT listings
- Sweep floor before others notice
- Resell at market price

Collection Launch Sniping:
- Monitor new NFT collections
- Mint at floor price
- Quick flip for profit

Rare Trait Hunting:
- Identify rare trait combinations
- Mint strategies targeting rare traits
- Premium pricing for rare items
```

Governance MEV

```
Token Vote Exploitation:

Pre-Vote Position Building:
1. Buy governance tokens before proposal
2. Vote for proposal that benefits you
3. Sell tokens after vote passes

MEV Considerations:
- Requires significant token holdings
- Long-term time horizons
- Regulatory considerations
- Community reputation impact
```

Cross-Protocol MEV

Multi-Protocol Arbitrage

```
DeFi Protocol Coordination:

Lending → DEX → Lending Arbitrage
1. Identify overpriced lending rates
2. Borrow from expensive lender
3. Lend at higher rate elsewhere
4. Pocket the spread

Requirements:
- Integration with multiple protocols
- Risk management across protocols
- Gas optimization across platforms
```

Strategy Performance Analysis

Arbitrage MEV Performance

```
Average Returns (2023-2024):
├── Simple DEX Arbitrage: 0.1-2% per opportunity
├── Flashloan Arbitrage: 0.05-1% per trade
├── Cross-Chain Arbitrage: 1-5% per opportunity
└── Triangular Arbitrage: 2-10% per cycle

Success Rates:
├── Profitable opportunities: 60-80%
├── Break-even opportunities: 15-25%
└── Losing opportunities: 5-15%

Capital Utilization:
├── Average trade size: <span class="math-inline" style="display:
inline;"><math xmlns="http://www.w3.org/1998/Math/MathML"
display="inline"><mrow><mn>50</mn><mi>K</mi><mo>&#x02212;</mo></mrow></
math></span>500K
├── Capital turnover: 10-50x per day
├── Risk-adjusted returns: 15-35% annually
```

Liquidation MEV Performance

```
Average Returns:
├── Small positions (<$10K): 5-10% bonus
├── Medium positions (<span class="math-inline" style="display:
inline;"><math xmlns="http://www.w3.org/1998/Math/MathML"
display="inline"><mrow><mn>10</mn><mi>K</mi><mo>&#x02212;</mo></mrow></
math></span>100K): 3-7% bonus
└── Large positions (>$100K): 1-3% bonus

Frequency:
├── Daily opportunities: 100-500
├── Profitable executions: 60-80%
├── Average execution time: 5-15 seconds

Capital Requirements:
├── Minimum: $50K for competitive execution
├── Optimal: $500K+ for major opportunities
└── Flashloan eligible: $0 (no capital required)
```

Sandwich Attack Performance

```
Average Returns:
├── Simple sandwich: <span class="math-inline" style="display:
inline;"><math xmlns="http://www.w3.org/1998/Math/MathML"
display="inline"><mrow><mn>100</mn><mo>&#x02212;</mo></mrow></math></
span>5,000 per attack
├── Complex sandwich: <span class="math-inline" style="display:
inline;"><math xmlns="http://www.w3.org/1998/Math/MathML"
display="inline"><mrow><mn>1</mn><mo>&#x0002C;</mo><mn>000</
mn><mo>&#x02212;</mo></mrow></math></span>50,000 per attack
└── Multi-victim: <span class="math-inline" style="display:
inline;"><math xmlns="http://www.w3.org/1998/Math/MathML"
display="inline"><mrow><mn>5</mn><mo>&#x0002C;</mo><mn>000</
mn><mo>&#x02212;</mo></mrow></math></span>500,000 per attack

Frequency:
├── Daily attacks: 50-200 (varies with market activity)
├── Success rate: 70-85%
├── Average attack duration: 10-30 seconds

Market Impact:
├── Contributes to price volatility
├── Reduces user trading efficiency
├── Drives protocol innovation for protection
```

Risk Management

Technical Risks

Execution Failures

```
Common Failure Modes:
├── Gas price competition loss
├── Transaction ordering conflicts
├── Smart contract reverts
└── Network congestion issues

Mitigation Strategies:
├── Gas price optimization
├── Multiple relay submission
├── Transaction simulation testing
└── Fallback execution paths
```

Competition Risks

```
Competitive Threats:
├── Faster detection algorithms
├── Superior infrastructure
├── Better capital allocation
└── Strategic partnerships

Countermeasures:
├── Technology investment
├── Infrastructure optimization
├── Capital scaling
└── Strategic positioning
```

Financial Risks

Capital Requirements

```
Arbitrage Capital:
├── Minimum viable: $50K
├── Competitive level: $500K
└── Institutional level: $10M+

Liquidation Capital:
├── Minimum viable: $100K
├── Competitive level: $1M+
└── Flashloan eligible: $0

Sandwich Capital:
├── Minimum viable: $200K
├── Competitive level: $2M+
└── Flashloan options: Limited
```

Risk-Adjusted Returns

```
Expected Returns by Strategy:
Arbitrage: 15-25% annually
Liquidation: 20-35% annually
Sandwich: 10-100% annually (highly volatile)

Risk Factors:
├── Market volatility
├── Competition intensity
├── Technology obsolescence
└── Regulatory changes
```

Real-World Case Studies

Case Study 1: The Terra Luna MEV Event

Context: Massive price movement creates unprecedented MEV opportunities

Timeline:
- May 9, 2022: UST depeg begins

- May 11, 2022: Luna price crashes 99%
- MEV extraction: $50M+ over 48 hours

MEV Activities:

```
Arbitrage Opportunities:
├── UST/USDC price discrepancies
├── Cross-chain arbitrage (Terra → Ethereum)
├── DEX price fragmentation
└── CEX-DEX price gaps

Liquidation Cascades:
├── Collateral value destruction
├── Automated liquidations
├── Manual liquidations
└── Cross-protocol liquidations

Technical Challenges:
├── Network congestion
├── Gas price spikes
├── API failures
└── Liquidity constraints
```

Lessons:
- Extreme market conditions create massive MEV
- Infrastructure resilience crucial during crises
- Capital requirements scale with opportunity size
- Risk management becomes critical

Case Study 2: Uniswap V3 MEV Evolution

Context: Concentrated liquidity creates new MEV landscape

Innovation:
- Concentrated liquidity pools
- Position-dependent pricing
- NFT-style LP positions
- New MEV opportunities

New Strategies:

```
Concentrated Liquidity Arbitrage:
├── Monitor price range updates
├── Arbitrage between ranges
├── Front-run range changes
└── Exploit position exits

NFT MEV:
├── LP position NFT identification
├── Rarity-based arbitrage
├── Position ownership tracking
└── Dynamic pricing models
```

Impact:
- 3x increase in arbitrage opportunities
- New sandwich attack vectors
- Enhanced liquidation strategies
- Protocol-level MEV protection needs

Case Study 3: Layer 2 MEV Landscape

Context: Arbitrum and Optimism create new MEV environments

L2 Characteristics:

```
Arbitrum:
├── Fast finality (2-3 minutes)
├── Low gas costs ($0.001-0.01)
├── Centralized sequencer
└── MEV-aware ordering

Optimism:
├── Fast finality (2-4 minutes)
├── Very low gas costs ($0.001-0.005)
├── Centralized sequencer
└── Priority fee markets
```

MEV Differences:
- Faster finality reduces opportunity window
- Centralized sequencing creates different dynamics
- Low gas costs enable new strategies
- New protocols create novel opportunities

Lessons:
- MEV adapts to new environments
- Architecture changes affect MEV types
- Low latency doesn't eliminate MEV
- New opportunities emerge in L2 ecosystems

Strategy Selection Guide

Choosing Your MEV Strategy

Factor Analysis

```
Strategy Selection Criteria:

Capital Requirements:
- Flashloan eligible: Liquidation MEV
- $50K-200K: Simple arbitrage
- $200K-1M: Complex arbitrage + liquidation
- $1M+: All strategies including sandwich

Technical Skills:
- Beginner: Liquidation MEV
- Intermediate: DEX arbitrage
- Advanced: Cross-chain + sandwich
- Expert: Multi-strategy optimization

Risk Tolerance:
- Low: Liquidations (predictable)
- Medium: Arbitrage (moderate risk)
- High: Sandwich (high risk/reward)

Market Conditions:
- Low volatility: Focus on arbitrage
- High volatility: All strategies active
- Crisis periods: Liquidation opportunities
- New protocol launches: Various strategies
```

Portfolio Approach

```
Diversified MEV Strategy:

Core Holdings (70%):
├── 50% Liquidation MEV (stable returns)
├── 30% Simple arbitrage (moderate risk)
└── 20% Capital reserves

Growth Opportunities (20%):
├── 15% Complex arbitrage
├── 5% Cross-chain opportunities

High-Risk/High-Reward (10%):
├── 7% Sandwich attacks
└── 3% Experimental strategies
```

Future of MEV Strategies

Emerging Trends

AI-Powered MEV

```
Machine Learning Applications:
├── Predictive modeling for opportunities
├── Pattern recognition in transaction flow
├── Automated strategy optimization
└── Risk assessment and management

Benefits:
├── Faster opportunity detection
├── Better prediction accuracy
├── Reduced human error
└── 24/7 automated operation
```

Cross-Chain MEV

```
Multi-Chain Opportunities:
├── Bridge arbitrage
├── Cross-chain liquidations
├── Multi-chain arbitrage
└── Governance arbitrage

Technical Requirements:
├── Multi-chain infrastructure
├── Bridge integration
├── Cross-chain security
└── Latency optimization
```

NFT and GameFi MEV

```
New Opportunity Areas:
├── NFT floor sweeping
├── Gaming asset arbitrage
├── Yield farming optimization
└── Governance token manipulation

Growth Drivers:
├── NFT market expansion
├── Play-to-earn adoption
├── DeFi-GameFi convergence
└── New economic models
```

Regulatory Evolution

Potential Impacts:
- Securities regulations for MEV firms
- Market manipulation definitions
- Tax treatment standardization
- International coordination frameworks

Technology Development

Upcoming Changes:
- Ethereum 2.0 MEV integration
- Layer 2 MEV optimization

- Privacy-preserving MEV
- Decentralized MEV protocols

Interactive Exercise

Strategy Implementation Planning

Scenario: You have $500K capital and strong technical skills

Tasks:
1. Choose optimal strategy mix
2. Calculate expected returns
3. Identify required infrastructure
4. Assess competition risks
5. Plan risk management approach

Solution Framework:

```
Strategy Allocation (based on $500K capital):

Liquidation MEV (50% - $250K):
- Expected return: 25% annually
- Risk level: Low-Medium
- Infrastructure: Price monitoring, liquidation bots
- Competition: High but manageable

Arbitrage (35% - $175K):
- DEX arbitrage: $100K
- Cross-chain arbitrage: $75K
- Expected return: 20% annually
- Risk level: Medium
- Infrastructure: Multi-DEX integration, bridge APIs

Sandwich (15% - $75K):
- Expected return: Variable (10-200%)
- Risk level: High
- Infrastructure: Mempool monitoring, sandwich bots
- Competition: Extremely high

Total Expected Return:
Conservative estimate: 22% annually ($110K)
Optimistic estimate: 35% annually ($175K)
Risk-adjusted return: 18% annually ($90K)
```

Module Summary

Strategy Types Covered

- **Arbitrage MEV:** Price differences across venues
- **Liquidation MEV:** Undercollateralized position closure
- **Sandwich Attacks:** Profiting from victim trades

Technical Implementation

- Real-time monitoring requirements
- Execution infrastructure needs
- Risk management frameworks

- Performance optimization techniques

Economic Analysis

- Capital requirements by strategy
- Expected returns and risk profiles
- Competition dynamics
- Market impact considerations

Next Steps

- **Module 5:** Understand market impact and ethics
- **Module 6:** Analyze real-world MEV transactions

Quick Check: Test Your Understanding

1. **What percentage of total MEV does arbitrage typically represent?**
   - [ ] 30-40%
   - [ ] 60-70%
   - [ ] 80-90%
2. **What is the typical liquidation bonus in major lending protocols?**
   - [ ] 1-3%
   - [ ] 5-10%
   - [ ] 15-20%
3. **Which strategy typically requires the most capital?**
   - [ ] Arbitrage MEV
   - [ ] Liquidation MEV
   - [ ] Sandwich Attack MEV
4. **What is a key limitation of flashloan-based strategies?**
   - [ ] High gas costs
   - [ ] Limited transaction size
   - [ ] Single-block execution requirement

This module is part of the MEV Fundamentals course by ObeliskCore Education. For questions or feedback, contact our support team.