Dio: HODL the Grid

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Abstract

Dio is a high-performance automated trading engine developed by Diophant Solutions. It is designed to systematically profit from market volatility using grid-based and market-making strategies, without requiring directional price predictions. The engine is asset-agnostic: it applies the same core methodology to any liquid instrument, including equities, ETFs, bonds, FX, and digital assets, across supported venues, with a focus on direct asset ownership rather than synthetic or leveraged exposure.

Unlike traditional trading methods that rely on trend prediction (Murphy, 1999), Dio places buy and sell orders within dynamically calibrated price intervals. This allows it to capitalize on short-term price oscillations without requiring market forecasting, thereby eliminating emotional decision-making, a common pitfall for retail traders (Kahneman & Tversky, 1979). Grid trading differentiates itself from other algorithmic strategies such as trend-following (Carver, 2019), momentum trading (Jegadeesh & Titman, 1993), and arbitrage strategies (Gatev et al., 2006) by maintaining continuous liquidity provision and profiting from mean-reverting price action.

Dio deploys two core strategies, Grid and Adaptive Market Maker (MM), each purpose-built for different market conditions and asset profiles. A sentiment-driven adaptation layer, powered by normalized market sentiment indices, dynamically adjusts grid spacing and accumulation thresholds in real time. The system is built on OCaml 5.2 with domain-based parallelism, enabling each trading asset to run in its own isolated domain with lock-free communication and microsecond-precision latency profiling.

Venue access is provided through modular adapters. Current production adapters include Interactive Brokers TWS API for traditional markets and Kraken and Hyperliquid for digital assets. While some venues support derivatives products, Dio’s strategy design avoids reliance on leverage or margin, instead operating on fully-backed positions to eliminate liquidation risk and reduce systemic exposure. This paper explores the theoretical underpinnings, deployed methodology, architectural design, and risk considerations of Dio's approach, with implementation notes specific to each adapter where venue mechanics differ.

1. Introduction

Volatile markets, across equities, fixed income, commodities, derivatives, and digital assets, are characterized by persistent price fluctuations that render traditional trading strategies ineffective for the average participant. Market movements are difficult to predict, and many traders struggle to maintain profitability amidst unpredictable price swings. Conventional trading approaches frequently rely on directional forecasting, requiring continuous market analysis and precise execution to capitalize on price movements. Such methods introduce significant cognitive and emotional burdens, making them impractical for individuals lacking extensive financial expertise.

Dio offers an alternative by implementing a suite of automated strategies that systematically execute orders within configurable price intervals. This structured, rule based mechanism eliminates the need for subjective market predictions, allowing participants to benefit from both upward and downward price movements without attempting to time the market. Unlike many algorithmic trading systems that incorporate stop-loss mechanisms to mitigate downside risk, Dio embraces volatility as an asset accumulation opportunity, aligning with a modernized, passive approach to wealth generation.

Beyond active trading, Dio supports compounding returns through discretionary reinvestment of accumulated profits. When the underlying asset supports yield generation, whether through dividends, coupons, staking, or lending, accumulated positions can continue generating passive income. This dual-layered approach enhances capital efficiency, creating a structured pathway for generating stable, passive income over time.

2. Literature Review

2.1 Grid Trading and Market Volatility

Grid trading is a well-established strategy in algorithmic trading, particularly in forex and high-volatility markets. The core principle is that markets experience continuous price fluctuations, allowing traders to systematically place buy and sell orders at predefined intervals without requiring price direction predictions (Pardo, 2008).

Studies have explored the viability of grid trading in volatile asset markets. Jia (2023) demonstrated through backtesting on Bitcoin and Ethereum that optimized grid trading parameters, such as adaptive grid spacing and capital allocation, outperformed trend-following strategies in 65% of market conditions. The study reported a Sharpe ratio of 1.45 for a volatility-adjusted grid model, compared to 0.97 for a simple moving average crossover strategy, alongside a maximum drawdown reduction of 28%. These findings suggest that grid trading thrives in environments with volatility clustering, a phenomenon where high volatility leads to further price swings, increasing trading frequency and profit capture (Cont, 2001).

By eliminating emotional bias and market timing pitfalls, grid trading aligns with behavioral finance principles that advocate for systematic decision-making over discretionary trading (Kahneman & Tversky, 1979). Dio builds upon this foundation by integrating sentiment-driven parameter adaptation, ensuring that capital not actively deployed in trades continues to compound through spread profits and optional passive yield generation.

2.2 Mean Reversion in Financial Markets

The mean reversion principle states that asset prices tend to revert to their historical average after extreme movements, a pattern widely observed across equity, commodity, and volatile asset markets (Poterba & Summers, 1988). Research indicates that many markets exhibit cyclical trends, where speculative booms and corrections reinforce the viability of mean reversion trading strategies (Urquhart, 2016).

A study by Baur, Hong, and Lee (2018) analyzed Bitcoin's historical price behavior and found that while short-term price movements exhibit high volatility, long-term trends tend to revert to fair value due to liquidity cycles and macroeconomic factors. The study further quantified Bitcoin's mean reversion behavior, reporting that daily returns exhibited a negative autocorrelation coefficient of -0.12, reinforcing the existence of reversal tendencies. The same negative autocorrelation at short horizons appears in liquid large-cap equities and highly traded ETFs, making them suitable grid candidates.

This aligns with Dio's approach, where price oscillations, rather than long-term trend continuation, are treated as the primary driver of returns. By leveraging patient accumulation and systematic execution, Dio's grid-based strategy turns volatility into an advantage rather than a risk, profiting from inevitable market corrections to generate long-term, compounding returns. The approach is not specific to any asset class. Any instrument displaying mean-reverting micro-structure at the grid's operating timescale is a viable candidate.

2.3 Long-Term Asset Retention and Compounding

The strategy of long-term asset retention despite market volatility has been extensively analyzed across financial markets. Historical data indicates that quality assets with strong fundamentals have consistently appreciated in value over extended periods, despite enduring significant drawdowns during bear markets (Bianchi, 2020; Bogle, 1999).

Research by Fidelity Digital Assets (2023) found that institutional investors are increasingly adopting long-term holding strategies, with 76% of surveyed institutional investors viewing digital assets as a viable long-term store of value, and 60% planning to increase their allocations over the next five years. Similarly, Chainalysis (2023) research suggests that wallets with long holding periods (>2 years) exhibit an average realized return 2.3x higher than short-term speculative traders who attempt to time the market. This behavior is not unique to digital assets. Bogle (1999) documents the same holding-period premium in broad equity indices, where patient accumulation outperforms timing attempts.

In line with this philosophy, Dio is designed to systematically reinvest a portion of each trade's profit into the traded asset through its accumulation mechanisms. By continually compounding these reinvested holdings, Dio captures incremental gains that accumulate over time. When the underlying assets support yield mechanisms, these accumulated positions can generate additional passive returns, further reinforcing the long-term compounding effect.

2.4 Yield Generation Across Asset Classes

Yield generation has emerged as a key component of portfolio management across asset classes, offering investors passive income while maintaining core positions. In digital assets, staking provides predictable rewards while supporting network security in Proof-of-Stake systems (Buterin, 2020). In traditional markets, dividends, bond coupons, and securities lending serve analogous functions. Research by Gupta et al. (2024) highlights that while staking rewards vary across networks, they provide a predictable yield that can offset market drawdowns and contribute to compound growth over time.

Dio does not directly execute yield transactions. It is an asset-agnostic trading engine. However, its accumulation mechanisms are designed to grow the operator's base asset holdings over time. For assets that support yield, these accumulated holdings can be deployed at the operator's discretion, creating a complementary income layer. This separation of concerns keeps the engine focused on its core competency, systematic trading, while allowing operators to capture additional passive income through external staking, lending, dividend reinvestment, or coupon accrual as appropriate for their portfolio and venue.

3. Deployed Strategies and Methodology

Dio deploys two distinct strategies, each operating independently within its own isolated execution domain. Both strategies are fully automated, event-driven, and asset-agnostic.

3.1 The Grid Strategy

The Grid strategy is Dio's primary execution mode. It maintains a single buy order and one or more sell orders around the current market price, spaced at a configurable percentage interval. The strategy operates as a suicide grid: a grid variant that knowingly removes traditional risk controls (stop-losses, reactive hedging, position exits) and replaces them with capital survivability constraints: position sizing discipline, profit-gated accumulation, and sentiment-adaptive spacing. It buys relentlessly on every dip (accumulating through resets) and sells on reversals (using layered sells for profit capture).

Core Mechanism

1. Buy Placement: Exactly one buy order is maintained at current_price × (1 - grid_interval), where grid_interval is a percentage of the current price.
2. Sell Placement: On each buy fill or reset, a new sell order is placed at current_price × (1 + grid_interval), with quantity equal to qty × sell_mult.
3. Grid Lock: The engine enforces a maximum distance of 2× grid_interval between the buy and the closest sell above it. This ensures the grid remains tight and responsive to price movements.
4. Trailing: On rising prices, the buy is trailed upward to close the gap to existing sells, but only when the proposed position can anchor to a sell within the 2× span and current price sits within that range (post-only safety).
5. All orders are post-only limit, GTC. They are rejected if they would cross the book, preventing accidental market orders.

Why 'Suicide Grid'? The name is not hyperbole. It is a precise description of the strategy's risk posture. A conventional grid hedges drawdowns through stop-losses, trailing exits, or dynamic de-risking. This grid does none of that. It deliberately exposes itself to the full amplitude of every downtrend, buying at every new low through continuous fill-and-reset cycles. What makes it survivable is not the absence of risk controls, but their replacement: capital is sized so the grid cannot exhaust before a statistically expected reversion; accumulation is gated behind realized profit thresholds so each skim is funded by spread profits, while drawdowns trigger more aggressive accumulation to maximize the DCA effect at lower prices; and sentiment-adaptive spacing widens the grid automatically in euphoric conditions where mean-reversion assumptions weaken. The strategy trails up resiliently on reversals, using existing sells as anchors to lock in profits without chasing. The result is a grid that accepts unrestricted downside exposure at the order level, while constraining aggregate risk through structural survivability guarantees at the portfolio level.

Accumulation Through sell_mult

When sell_mult is set below 1.0 (e.g., 0.999), the sell quantity is slightly less than the buy quantity. The difference (e.g., 0.1% of each round-trip) is retained as accumulated base asset. Over thousands of cycles, this creates a growing position in the traded asset, effectively a DCA (Dollar Cost Averaging) mechanism that is funded entirely by trading profits.

Profit-Gated Accumulation (Venue-Specific Adaptation)

Some venues enforce discrete order sizing through lot increments (e.g., Hyperliquid uses szDecimals where HYPE requires 2 decimal places, making the lot increment 0.01; IBKR equities have $0.01 price increments and 1-share lots; US Treasuries trade in $1,000 par increments). When sell_mult < 1.0, the desired sell quantity often falls between valid lot boundaries and must be floored, creating rounding loss that far exceeds the intended skim.

For example, with qty = 0.35 and sell_mult = 0.999: the desired sell is 0.35 × 0.999 = 0.34965, which floors to 0.34, losing 0.01 per cycle (~2.86%) instead of the intended ~0.1%.

To handle this, the Grid strategy uses profit-gated accumulation. Most cycles sell the full quantity (1:1), growing quote balance through grid spread profits. Once realized net profit (accounting for quantity and maker fees on both legs) exceeds the rounding cost plus an accumulation_buffer, a single sell_mult sell is triggered to accumulate base asset. The effective threshold is:

threshold = rounding_cost + accumulation_buffer

where rounding_cost = rounding_diff × sell_price (the quote value of the base being accumulated).

This mechanism ensures accumulation only occurs when it is clearly profitable, preventing the rounding problem from eroding returns.

State Persistence

The Grid strategy persists its accumulation state to disk (as JSON) so that reserved_base, accumulated_profit, and last_fill_oid survive engine restarts. State is written atomically (temp file + rename) with a mutex for multi-domain safety.

3.2 Fear & Greed Adaptive Parameter Tuning

Both grid_interval and accumulation_buffer are configured as [min, max] ranges and resolved dynamically using linear interpolation against a sentiment index (for example, the CoinMarketCap Crypto Fear & Greed index for digital assets, or the CNN Fear & Greed index for US equities when trading via IBKR), scaled 0 to 100:

resolved_value = min + (index / 100) × (max - min)

Low sentiment (fear): The resolved value trends toward the min bound. For grid_interval, this means tighter spacing (more frequent trading). For accumulation_buffer, this means a lower threshold (accumulate more aggressively in fearful markets, i.e. buy fear).

High sentiment (greed): The resolved value trends toward the max bound. Wider grid spacing (fewer, larger trades). Higher accumulation threshold (more conservative, avoiding over-accumulation in euphoric markets).

Runtime Re-Evaluation: The index is initially fetched at domain startup and cached atomically. It is dynamically re-evaluated whenever the underlying asset price moves by a significant threshold (e.g., ±3.5%) from the baseline at time of last evaluation.

Example: With qty=0.35, sell_mult=0.999, accumulation_buffer=[0.5, 5.0], and the asset at $39.55:

- Rounding cost = 0.01 × $39.55 = $0.40
- At F&G=25 (fear): resolved buffer ≈ $1.63, threshold ≈ $2.03, so accumulation triggers sooner
- At F&G=75 (greed): resolved buffer ≈ $3.88, threshold ≈ $4.28, so accumulation triggers later

This produces a trading system that is automatically more aggressive in fearful markets and more conservative in euphoric ones, all without any manual intervention.

3.3 Adaptive Market Maker (MM)

The MM strategy is designed for assets with stable or pegged pricing. It dynamically adapts its quoting style based on market fee structure:

6. Order Placement: Maintains exactly one buy order per asset. Sell orders are placed for all held asset balance when exposure thresholds are met. Each order is sized to respect venue lot constraints.
7. Fee-Aware Pricing: The strategy dynamically calculates the minimum profitable spread based on the configured maker_fee. It then compares this to the realized spread to ensure profitability.
8. Post-Only Enforcement: All orders are GTC post-only limit orders. This guarantees the engine only ever acts as a maker and never crosses the book as a taker.
9. Exposure Limits: The strategy checks max_exposure (maximum asset balance) and min_usd_balance before placing buy orders. When either threshold is breached, quoting pauses.
10. Profitability Guard: The strategy never places or amends an order if the calculated spread is less than 2 × maker_fee + 0.01%. Combined with post-only enforcement, this ensures every fill is profitable.

The MM strategy is particularly effective for pegged assets and stable-value pairs, where the bid-ask spread provides consistent, low-risk profits without directional exposure.

4. Supported Venues and Asset Coverage

Dio separates strategy logic from market access. Strategies operate on an abstract order book interface. Venue adapters translate that interface into native API calls, handle lot sizing, fees, and settlement rules, and normalize market data back to the engine.

4.1 Interactive Brokers (TWS API)

Provides access to stocks, ETFs, bonds, options, futures, FX, mutual funds, and warrants across 150+ market centers. The adapter manages fractional share handling where supported, bond lot conventions, and equity corporate actions. Typical use in Dio: equity and ETF grids for mean-reverting large caps, treasury ETF accumulation, and options underlyings for delta-neutral grid overlays.

4.2 Kraken

Provides spot digital assets with deep USD and EUR pairs, plus margin where enabled. The adapter enforces Kraken's minimum order sizes and fee tiers. Typical use: BTC, ETH, and stablecoin grids where 24/7 trading maximizes cycle count.

4.3 Hyperliquid

Provides high-performance spot and derivatives infrastructure for digital assets. Within Dio, Hyperliquid is treated as an additional execution venue rather than a strategy driver.

While the platform supports perpetual futures, Dio does not rely on leverage, margin, or collateralized positions. Instead, it operates using fully-backed spot-style execution wherever possible, prioritizing direct asset ownership over synthetic exposure.

This design choice reflects a core principle of Dio: achieving competitive or superior returns through systematic volatility capture and accumulation, without introducing the liquidation risk, funding costs, or counterparty complexity inherent in leveraged derivatives products.

Typical use: extending grid and market-making strategies across additional liquidity venues while maintaining a strictly non-leveraged, asset-backed approach.

5. Architecture

Dio is built on OCaml 5.2 with true parallelism via domains. Each trading asset runs in its own isolated domain with lock-free communication, enabling microsecond-precision execution across multiple concurrent strategies.

5.1 Key Design Principles

- Domain-Per-Asset Isolation: Each trading pair runs in its own OCaml 5 domain. Strategies, order executors, and exchange feeds are fully isolated with lock-free messaging.
- Event-Driven Execution: All strategy logic is triggered by events: price ticks, order fills, cancellations, balance updates, and periodic scans. There is no polling loop.
- Lock-Free Communication: The tick bus and event registry use atomic compare-and-set operations for zero-contention reads. Writers perform CAS loops on shared state.
- Ring Buffer Order Queuing: Strategy orders are queued through fixed-capacity ring buffers with per-strategy mutexes, ensuring bounded memory usage and deterministic latency.
- In-Flight Deduplication: Both order placements and amendments are deduplicated via composite keys (symbol + side + quantity + price), preventing duplicate submissions.
- Microsecond Latency Profiling: The engine records per-domain percentile latencies (p50, p90, p99, p999) in microseconds, providing real-time visibility into performance.
- Graceful Shutdown: The engine handles SIGINT/SIGTERM for orderly shutdown, tearing down feeds and cleaning up sockets with a 3-second forced-exit timeout.

5.2 Exchange Integration

Dio currently supports three venues through a common exchange interface:

- Interactive Brokers: TWS API for orders, market data, and account information. Handles equities, options, futures, bonds, and FX with unified symbology.
- Kraken: WebSocket-based feeds for ticker, orderbook, balance, and execution data. Authenticated REST/WS for order management.
- Hyperliquid: WebSocket feeds for mid-prices, L2 orderbook, and spot state. REST-based order management with L1 signature generation and retry/backoff logic.

The exchange integration layer is designed to be extensible. New exchange backends can be added by implementing the common exchange interface module.

5.3 Dashboard

A standalone TUI dashboard binary connects to the running engine over a Unix domain socket and displays:

- Uptime, sentiment index, per-venue connectivity status
- Heap size, GC statistics, memory fragmentation
- Per-strategy holdings, mid-price, accumulated positions, pending distances, unrealized value

- Per-domain latency percentiles (p50, p90, p99, p999) in microseconds
- Domain running/stopped status, restart count, and last restart age

The dashboard operates out-of-process for crash isolation and auto-reconnects when the engine restarts.

6. Asset Selection and Portfolio Composition

6.1 Asset Agnosticism

Dio's strategies are designed to be asset-agnostic. The grid trading methodology, market making approach, and accumulation mechanisms work identically across all supported asset classes, from large-cap equities to digital assets.

- Sufficient liquidity: The asset must have enough orderbook depth to fill orders at the configured quantities without excessive slippage.
- Sufficient volatility: The asset must exhibit price oscillations at the grid's operating timescale to generate trading opportunities.
- Venue support: The asset must be tradeable on a supported venue (Interactive Brokers, Kraken, or Hyperliquid).

The engine treats each trading pair as a fully independent instance. Different assets can run different strategies (Grid vs. MM), different accumulation parameters, and different sentiment configurations simultaneously.

6.2 Selection Criteria

While Dio is asset-agnostic at the engine level, the selection of specific assets to trade is a portfolio construction decision made by the operator.

- Well-Established Market Presence: Assets with multiple years of historical data are preferred, as their volatility characteristics and mean-reversion properties are better understood.
- Liquidity and Market Depth: Higher liquidity assets ensure efficient order execution with minimal slippage, which is critical for strategies that depend on tight spreads.
- Market Capitalization-Based Stability: Higher market cap assets are prioritized for stability, as they tend to exhibit more reliable mean-reversion and lower tail risk.
- Fundamental Quality: Assets should have genuine utility, strong fundamentals, and sustainable ecosystems. Purely speculative instruments increase the risk of permanent impairment.
- Yield-Bearing Assets (Optional): For operators who wish to compound returns through yield, preference is given to assets that support dividends, coupons, staking, or lending.

6.3 Operational Considerations

The engine performs best under specific technical conditions. Operators should consider the following when selecting assets and configuring parameters:

- Liquidity depth: Assets with deeper orderbooks allow the engine to fill orders consistently without excessive slippage, which is critical for tight grids.
- Volatility profile: The grid strategy requires price oscillation at the configured interval's timescale to generate trade cycles. Assets that trend in one direction for extended periods will accumulate without realizing profits.

- Order sizing relative to market depth: The configured qty should be small relative to the orderbook depth at the target grid levels to avoid moving the market.
- Fee structure awareness: The MM strategy dynamically calculates its spread from maker fees, uses GTC post-only limit orders to prevent taker execution, and respects venue-specific minimums.

The system supports running any number of concurrent trading pairs, limited only by API rate limits and available capital. The operator configures each pair independently.

7. Risk Considerations

Dio's grid-based strategy is designed to embrace market volatility while ensuring continuous liquidity across all price levels. Unlike traditional trading approaches that rely on stop losses or reactive hedging mechanisms, this strategy systematically captures trading profits to offset unrealized drawdowns. The fundamental premise is that, over time, market fluctuations generate sufficient trading gains to absorb temporary losses from prolonged drawdowns.

7.1 Inherent Strategy Risks

- Extended Drawdowns: In sustained unidirectional moves (crashes without meaningful retracements), the grid continuously accumulates at ever-lower prices. While this creates a favorable cost basis for eventual recovery, it requires sufficient capital to sustain the grid through the drawdown. The grid does not employ stop-loss mechanisms by design, instead trusting mean reversion over the full cycle.
- Grid Exhaustion: If price moves beyond the practical capital limits of the grid, the strategy cannot place further orders. Capital management and conservative position sizing are essential to prevent grid exhaustion during extreme moves.
- Opportunity Cost: Capital deployed in grid trading is committed to the grid's price range. Extended sideways action in a narrow range below the grid's effective spread may generate insufficient returns relative to alternative strategies.

7.2 External Risks

- Exchange Risk: Exchange insolvencies, downtime, or API changes could impact order execution. Diversifying across exchanges (Kraken and Hyperliquid) and monitoring exchange health are recommended mitigations.
- Regulatory Risk: Evolving regulation around automated trading, taxation of high-frequency trades, or restrictions on specific asset classes could affect operations.
- Market Structure Risk: Sudden liquidity collapses, circuit breakers, or coordinated market manipulation events may cause fills at unexpected prices. Post-only order constraints mitigate some of this risk, but cannot prevent all adverse outcomes.
- Smart Contract / Protocol Risk: For assets that support staking, slashing risks, smart contract vulnerabilities, and network-level issues may affect staked positions. This risk is external to Dio itself but relevant to the operator's overall portfolio.

7.3 Mitigations

- Fear & Greed Adaptation: Dynamic parameter adjustment reduces over-accumulation risk in euphoric markets and maximizes opportunity in fearful markets.
- Post-Only Order Constraints: All strategy orders are post-only, preventing accidental market orders and ensuring the engine always acts as a maker.
- In-Flight Deduplication: Prevents duplicate orders from reaching the exchange during transient conditions.
- Multi-Exchange Distribution: Running across multiple exchanges reduces single-point-of-failure risk.

- State Persistence: Accumulation state survives restarts, preventing loss of tracking data during deployments or failures.

8. Conclusion

Dio represents a disciplined intersection of algorithmic trading, market adaptability, and systematic asset accumulation. By deploying two complementary strategies (Grid and Adaptive Market Maker), the system transforms market volatility from a perceived risk into a structured opportunity for profit capture and long-term asset growth.

The engine's architecture reflects this philosophy: OCaml 5.2 domain-based parallelism provides true isolation between trading assets, lock-free communication ensures low-latency execution, and event-driven design eliminates unnecessary computation. The Fear & Greed sentiment adaptation layer adds a layer of market awareness that adjusts parameters automatically, producing a system that is more aggressive in fearful markets and more conservative in euphoric ones.

Critically, Dio is asset-agnostic. The strategies, accumulation mechanisms, and risk controls apply equally to any liquid, volatile tradeable instrument. This makes the framework extensible to new exchanges, new asset classes, and new market conditions without fundamental redesign.

Looking ahead, the framework can be expanded through additional exchange integrations, cross-asset correlation analysis for portfolio-level risk management, and refined sentiment-driven parameter models. As volatile markets continue to evolve and institutional adoption accelerates, systematic approaches like Dio that emphasize discipline, adaptive execution, and long-term accumulation are positioned to play an increasingly important role in the trading landscape.

While Dio presents a structured, systematic approach to trading, participants must remain aware of external risks including exchange insolvencies, regulatory changes, and extreme market events. No trading system eliminates risk entirely. Investors should regularly assess platform risk, market conditions, and their own capital constraints when employing grid-based strategies.

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Glossary

Accumulation Buffer: A configurable profit threshold that must be exceeded before a sell_mult-based accumulation trade is executed. Prevents rounding-induced losses on exchanges with discrete lot sizing. Scales dynamically with the Fear & Greed index.

Alpha: The excess return generated by an investment relative to a benchmark index. In Dio, alpha refers to the profit earned from capturing market volatility beyond passive holding returns.

Asset Agnostic: A design principle indicating that the strategy operates identically regardless of the underlying traded asset. Dio's strategies are applied uniformly to equities, bonds, ETFs, options, futures, FX, and digital assets.

Domain (OCaml 5): An isolated parallel execution unit in OCaml 5. Each trading asset in Dio runs in its own domain, providing true parallelism without shared mutable state.

Fear & Greed Index: A market sentiment indicator (0-100) used to dynamically adjust grid spacing and accumulation thresholds. For digital assets, Dio uses the CoinMarketCap index; for equities via IBKR, the CNN index. Low values indicate fear, high values indicate greed.

Grid Interval: The percentage distance from the current price at which buy and sell orders are placed. Configured as a [min, max] range and resolved via linear interpolation against the Fear & Greed index.

Grid Trading: A trading strategy that places buy and sell orders at predetermined price intervals, allowing for profit capture from incremental price movements without directional prediction.

HODL: A long-term investment strategy where assets are retained despite short-term market volatility. Dio's accumulation mechanisms embody the HODL philosophy by systematically growing base asset positions through trading profits.

Lock-Free Communication: A concurrency pattern using atomic compare-and-set operations instead of mutexes, enabling zero-contention reads across OCaml 5 domains.

Market Maker (MM): A strategy that provides two-sided liquidity (buy and sell) at profitable spread levels, dynamically adapting pricing based on exchange fee structure.

Mean Reversion: A financial principle stating that asset prices tend to return to their historical average after extreme movements. Grid trading leverages mean reversion to capture volatility-driven gains.

Post-Only Order: A limit order that is rejected if it would immediately execute against the opposing book. All Dio strategy orders are post-only, ensuring the engine always acts as a market maker, not a taker.

Profit-Gated Accumulation: A mechanism specific to the Grid strategy on venues with discrete lot sizing. Accumulation trades are only executed when realized profit exceeds rounding costs plus buffer.

sell_mult: A multiplier applied to the sell quantity relative to the buy quantity. When sell_mult < 1.0, a small fraction of each round-trip's base asset is retained, creating a systematic accumulation effect.

Sharpe Ratio: A measure of risk-adjusted return that evaluates investment performance relative to its volatility. Grid trading backtests report Sharpe ratios of ~1.45, compared to ~0.97 for trend-following strategies.

Suicide Grid: A grid variant that deliberately removes traditional risk controls (stop-losses, hedging, position exits) and replaces them with capital survivability constraints: position sizing that prevents grid exhaustion before expected mean reversion, profit-gated accumulation that ensures each skim is funded by realized spread profits while accumulating more aggressively during drawdowns to maximize the DCA effect at lower prices, and sentiment-adaptive spacing that widens automatically when mean-reversion assumptions weaken. The grid accepts unrestricted downside exposure at the order level while constraining aggregate risk structurally at the portfolio level. It buys relentlessly on every downtrend and trails upward resiliently on reversals, using existing sells as profit anchors.

Volatility: The extent of an asset's price fluctuations over time. Dio treats volatility as a source of systematic returns rather than a risk to be avoided.