

Research Report: High-Frequency Cryptocurrency Trading for Small Capital Accounts

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Report Objective: To provide a comprehensive analysis of high-frequency cryptocurrency trading strategies suitable for a £500 capital base with a 2% risk tolerance, covering technical indicators, risk management, exchange API capabilities, automated pair selection, HFT frameworks, and performance optimization for beginner traders developing autonomous trading bots.

Executive Summary

High-frequency trading (HFT) in the cryptocurrency markets presents a domain of immense opportunity, characterized by rapid price fluctuations and continuous operational hours. However, for the nascent algorithmic trader, particularly one operating with limited capital, this environment is fraught with significant risk. This report provides a foundational blueprint for developing and deploying an autonomous cryptocurrency trading bot, specifically tailored for a small capital account of £500 and a stringent 2% risk-per-trade tolerance. It deconstructs the essential components required for such an endeavor, beginning with the adaptation of traditional technical indicators for high-velocity market conditions. The analysis extends to the non-negotiable principles of risk management and precise position sizing, which form the bedrock of capital preservation. Furthermore, the report examines the technological infrastructure necessary for execution, including a detailed review of the OKX Application Programming Interface (API), methodologies for automated trading pair selection, and the architectural frameworks that translate classic technical analysis into viable HFT strategies. Finally, it addresses the critical aspects of performance optimization, from the development environment to 24/7 hosting solutions, ensuring the operational integrity and efficiency of the trading system. This document serves as an authoritative guide for beginner traders aiming to navigate the complexities of HFT with a disciplined, systematic, and technologically sound approach.

Section 1: Foundational Trading and Risk Protocols

The successful deployment of a high-frequency trading bot, especially with constrained capital, is contingent upon two core pillars: a robust signaling strategy derived from finely-tuned technical indicators and an uncompromising risk management framework. Without a clear methodology for identifying ephemeral trading opportunities and a rigid structure for preserving capital, a small account is highly susceptible to rapid depletion due to market volatility and the statistical certainty of losing streaks. This section delineates the optimal configuration of popular technical indicators for the micro-timeframes inherent to HFT and establishes a precise, mathematically grounded approach to position sizing and risk control tailored to a £500 account.

Optimizing Technical Indicators for High-Frequency Signals

Standard technical indicators, while effective for traditional swing or day trading, are often too slow to react to the sub-minute price movements that HFT strategies aim to capture. Their default parameters, typically calculated over 14, 20, or 26 periods, produce lagging signals in a high-frequency context. The key to their utility in HFT is a significant reduction in their look-back periods and a tightening

of their trigger thresholds. This recalibration increases their sensitivity, enabling the detection of micro-trends and fleeting momentum shifts that last only seconds or minutes. This subsection explores the specific optimizations for the Relative Strength Index (RSI), Moving Average Convergence Divergence (MACD), and Bollinger Bands, and details a workflow for their combined application.

The **Relative Strength Index (RSI)** is primarily used to identify overbought and oversold conditions. For HFT, its standard 14-period look-back is inadequate. By shortening the period to a range of 5 to 7, the indicator becomes far more responsive to the rapid price oscillations found on 1-minute or tick charts. This heightened sensitivity allows the bot to detect short-term exhaustion points more effectively. Concurrently, the standard overbought and oversold thresholds of 70 and 30 are too permissive for volatile crypto markets, often leading to premature or false signals. Tightening these thresholds to 80 for overbought and 20 for oversold helps filter out market noise and ensures that signals are generated only under more extreme, and therefore more reliable, conditions. A crucial HFT application of the RSI is the detection of micro-divergences, where, for instance, the price makes a new low on a 1-minute chart, but the 5-period RSI forms a higher low. This divergence can be a powerful, albeit brief, signal of an impending price reversal, providing a high-probability entry point for a quick scalp.

The **Moving Average Convergence Divergence (MACD)** is a momentum-following indicator that captures shifts in trend direction through the relationship between two Exponential Moving Averages (EMAs). To adapt it for HFT, the standard 12- and 26-period EMAs must be replaced with much faster ones, such as a 6-period and a 13-period EMA. This adjustment makes the MACD line itself more reactive to immediate price action. Furthermore, the signal line, which is typically a 9-period EMA of the MACD line, should be shortened to a 5-period EMA. This modification ensures that crossovers between the MACD line and the signal line occur earlier, providing a timelier entry signal. For HFT bots, the MACD histogram, which represents the difference between the MACD and signal lines, is of particular importance. Monitoring the histogram on a 1-minute timeframe for a rapid flip from negative (red) to positive (green), or vice versa, can often precede the development of a micro-trend by several bars, offering a critical edge in execution speed.

Bollinger Bands are designed to measure volatility and identify price extremes relative to a central moving average. In their classic configuration (a 20-period Simple Moving Average with bands set at 2 standard deviations), they adapt too slowly to the sudden volatility spikes common in cryptocurrency markets. For HFT, the SMA period should be reduced to between 12 and 15, allowing the bands to track price more closely. More importantly, the standard deviation multiplier should be tightened from 2.0 to 1.5. This makes the bands narrower and more sensitive, amplifying the signals generated by a “squeeze.” A Bollinger Band squeeze, where the bands constrict tightly, indicates a period of low volatility that often precedes a significant price breakout. An HFT strategy can be programmed to identify these squeezes on sub-5-minute charts and use a candle closing outside the tightened 1.5-deviation bands as a high-probability entry trigger for a breakout trade.

A truly effective HFT strategy emerges from the confluence of these optimized indicators. A robust workflow might begin by using the Bollinger Bands as a **volatility filter**. The bot would continuously scan for a tight squeeze on a 1-minute chart, placing it in a state of anticipation for a breakout. Once a candle closes outside the bands, signaling the start of a move, the strategy requires **momentum confirmation**. This is provided by the fast-period MACD (e.g., 6, 13, 5), where the histogram must flip in the direction of the breakout within one or two bars of the signal. Finally, an **overbought/oversold check** using the short-period RSI (e.g., 5-period) is employed to prevent entering a trade that is already exhausted. For example, a long entry would be invalidated if the RSI is already above 80, suggesting the upward move has little room to run. To further enhance signal quality, traders can overlay the **Volume Weighted Average Price (VWAP)**, entering long only if the price is above the VWAP, and the **On-Balance Volume (OBV)**, ensuring that rising volume confirms the price breakout.

Rigorous Risk Management and Position Sizing

For a trader operating with a £500 account, disciplined risk management is not merely a best practice; it is the sole determinant of survival. The high-velocity, high-leverage nature of cryptocurrency markets can obliterate a small account in a matter of minutes without a stringent, non-negotiable risk protocol. The cornerstone of this protocol is the **2% rule**, which dictates that no single trade should risk more than 2% of the total account equity. For a £500 account, this establishes a maximum permissible loss of £10 per trade. This fixed risk budget acts as a critical circuit breaker, ensuring that a string of consecutive losses—an inevitable reality in any trading system—does not result in a catastrophic drawdown from which recovery is mathematically improbable. Adhering to this rule preserves capital, the trader's most essential tool, allowing them to remain in the market long enough for their strategy's statistical edge to manifest.

With the risk budget defined at £10, the next step is to translate this abstract limit into a concrete position size for each trade. This is achieved through a simple but powerful formula that links the risk budget to the specific parameters of the trade itself: the entry price and the stop-loss price. The stop-loss is a pre-determined price at which the position will be automatically closed to prevent further losses. The distance between the entry price (E) and the stop-loss price (S) represents the risk per unit of the traded asset. The position size is then calculated as:

$\text{Position Size (in units)} = \text{Risk Budget} / |\text{Entry Price} - \text{Stop-Loss Price}|$. This formula ensures that regardless of the asset's price or the trade's volatility (as reflected in the stop-loss distance), the total amount at risk remains fixed at £10.

To illustrate this with a practical example, consider a scenario where the trading bot identifies a long entry signal for Bitcoin (BTC) at a price of £30,000. Based on technical analysis, such as placing the stop just below a recent support level or outside a volatility band, the stop-loss is set at £28,500. The risk per unit (per BTC) is therefore $£30,000 - £28,500 = £1,500$. Applying the position sizing formula, the correct size for this trade would be $£10 / £1,500$, which equals approximately 0.0067 BTC. If this position is opened and the price subsequently falls to the stop-loss level, the resulting loss will be $0.0067 \text{ BTC} * £1,500$, which is approximately £10, precisely adhering to the 2% rule. The same logic applies universally across any asset. If the bot were to trade a lower-priced altcoin with an entry at £2.00 and a stop-loss at £1.90, the risk per token would be £0.10. The position size would be $£10 / £0.10 = 100$ tokens.

The discipline to mechanically apply this formula to every single trade is paramount. It removes emotion and guesswork from the decision-making process, forcing the trader to quantify risk before entering a position. It is crucial to never deviate from the 2% rule, especially during a losing streak, when the temptation to "make it back" with a larger position is strongest. Such behavior, known as revenge trading, is the fastest path to account failure. By consistently defining the stop-loss based on sound technical reasoning and sizing the position to fit the £10 risk budget, the beginner trader builds a sustainable foundation that can withstand the inherent uncertainties of the market.

Section 2: Technological Framework for an Autonomous Trading Bot

The transition from a manual trading strategy to an autonomous, high-frequency bot requires a robust technological framework. This framework encompasses both the interface with the exchange for trade execution and the internal logic for market analysis and decision-making. A beginner trader must become proficient in utilizing an exchange's API to programmatically manage orders and account data. Simultaneously, the bot must be endowed with an intelligent mechanism for selecting which cryptocurrency pairs to trade, focusing its limited capital and computational resources on the most promising

opportunities. This section provides a detailed examination of the capabilities offered by the OKX API, a popular choice for algorithmic traders, and explores various algorithms for automated pair selection.

Leveraging the OKX API for Automated Trading

The OKX Application Programming Interface (API), particularly its v5 iteration, provides a powerful and comprehensive toolkit for building sophisticated automated trading systems. Its design philosophy centers on unification and accessibility, making it a suitable choice for developers building their first trading bot. A key feature is its **unified data model and endpoints** across a wide array of products, including Spot, Margin, Futures, Perpetual Swaps, and Options. This means a developer can use a consistent set of commands and data structures to interact with different market segments, significantly reducing the complexity of building a multi-asset strategy. The API offers both REST (Representational State Transfer) and WebSocket protocols. REST is used for request-response actions like placing an order or querying an account balance, while WebSocket provides a persistent, real-time stream of data, which is essential for HFT.

The core trading capabilities are extensive. Through both REST and WebSocket, a bot can perform all essential **order operations**: placing new orders (market, limit, etc.), amending existing orders, canceling single or multiple orders in batches, and programmatically closing entire positions. This granular control is vital for HFT strategies that require millisecond-level adjustments. The API also supports OKX's **Unified Account** system, allowing a bot to manage a single pool of capital that is shared across different trading products, simplifying profit and loss calculations and margin requirements. For more advanced users, the API exposes controls for sub-account management, enabling the creation and administration of multiple trading accounts under a single master account, which can be useful for isolating different strategies or managing API rate limits.

Beyond basic order management, the OKX API provides endpoints for its suite of pre-built automated trading tools, often referred to as "Trading-bot Mode." This allows a custom bot to programmatically configure and manage strategies like **Spot Grid** and **Futures Grid** bots, which automatically place buy and sell orders within a defined price range. It also supports the creation of **Recurring Buy (DCA)** schedules and **Smart Portfolio** bots that can auto-rebalance a basket of assets. For more sophisticated execution, the API offers access to Arbitrage, Iceberg, and Time-Weighted Average Price (TWAP) algorithms. This functionality allows a beginner to either leverage OKX's battle-tested execution logic or build a custom strategy that interacts with these pre-existing tools. The API also includes a crucial **demo-trading environment**, which allows developers to test their bot with live market data but without risking real capital.

Effective use of the API necessitates a clear understanding of its **rate limits**. To maintain platform stability, OKX imposes throttles on the number of requests an API key can make within a given time-frame. For non-VIP users, public REST endpoints (e.g., for market data) are typically limited to 20 requests per 2 seconds, while private REST endpoints (e.g., for placing orders or checking balances) are limited to 60 requests per 2 seconds for order placement and 10 requests per 2 seconds for account info. Exceeding these limits will result in an HTTP 429 error, temporarily blocking further requests. To manage this, best practices include using **WebSocket streams** for market data instead of repeatedly polling REST endpoints, **batching orders** (placing or canceling multiple orders in a single API call) where possible, and implementing an **exponential back-off** mechanism in the bot's code, which intelligently waits for increasing periods of time after receiving a rate-limit error before retrying.

Implementing Automatic Cryptocurrency Pair Selection

An autonomous trading bot operating in the vast cryptocurrency market, which contains thousands of trading pairs, cannot effectively monitor all of them simultaneously. A critical component of an intelligent bot is an automated pair selection module that dynamically identifies and focuses on the pairs

exhibiting the most favorable characteristics for the deployed strategy. This filtering process is essential for maximizing the bot's efficiency and capitalizing on the best opportunities as they arise. The algorithms for pair selection range from simple statistical screens to complex machine learning models.

For a beginner, the most accessible and effective methods are based on **statistical properties and momentum screening**. A common approach is **volatility ranking**. The bot can be programmed to calculate the historical volatility (e.g., the standard deviation of logarithmic returns) for a list of potential pairs over a recent look-back window, such as the last 24 hours or 14 days. For a scalping or grid trading strategy that thrives on price movement, the bot would then prioritize pairs with volatility above a certain threshold, ignoring stagnant or illiquid markets. Conversely, a mean-reversion strategy might seek out pairs with lower volatility. Another powerful technique is **momentum scoring**. The bot can compute a momentum indicator, like the Rate of Change (ROC) or a moving average crossover signal, for each asset against its quote currency (e.g., USDT). It would then rank the pairs based on the strength of their momentum, selecting the top N pairs that show the strongest upward or downward trend to apply a trend-following strategy.

More advanced statistical methods include **correlation filtering** and **cointegration tests**, which are foundational to statistical arbitrage or pairs trading strategies. Correlation filtering involves calculating the rolling correlation coefficient between the price returns of two different cryptocurrencies. A strategy might look for pairs that are highly correlated (e.g., a coefficient between 0.8 and 0.95) and trade on temporary divergences from this relationship. Cointegration is a more rigorous statistical property where two or more non-stationary time series (like crypto prices) have a linear combination that is stationary. The Engle-Granger or Johansen tests can be used to identify such pairs. A bot could then trade the spread or ratio between the prices of a cointegrated pair, buying the underperforming asset and selling the outperforming one, betting that their price ratio will revert to its historical mean.

While potentially beyond the scope of a first-time project, it is useful to be aware of machine learning-based approaches. **Unsupervised clustering** algorithms like k-means can group cryptocurrencies based on a variety of features (returns, volatility, liquidity, order book depth). This allows a bot to identify clusters of similarly behaving assets, enabling it to trade within a cluster (e.g., for mean-reversion) or across clusters (e.g., for momentum). **Feature ranking models**, such as Random Forests or XGBoost, can be trained on historical data to predict short-term returns or the probability of a profitable signal. The bot could then use the model's output to rank all available pairs and select only those with the highest predicted profitability for the next trading interval. Regardless of the method chosen, it is absolutely critical that any pair selection algorithm is rigorously **backtested** across diverse market conditions (bull, bear, and sideways markets) to ensure its robustness and prevent the bot from trading on spurious patterns.

Section 3: Advanced Strategy and Performance Considerations

Once the foundational elements of signaling and risk management are in place, the focus shifts to refining the trading strategy for the unique demands of the high-frequency environment and ensuring the underlying technology can perform reliably 24/7. This involves a deeper understanding of how classic technical analysis patterns are reinterpreted on micro-timeframes and an appreciation for the various HFT strategy archetypes they enable. Equally important is the operational aspect: creating a high-performance, resilient infrastructure for hosting and running the bot. This section delves into the adaptation of traditional TA for HFT and provides a detailed guide to optimizing the development and deployment environment for maximum performance and uptime.

Adapting Traditional Technical Analysis for High-Frequency Trading

Traditional technical analysis (TA), developed for daily and weekly charts, provides a rich set of frameworks and patterns for understanding market psychology and predicting price movements. In the world of HFT, these same principles remain relevant but must be radically adapted to function on tick-by-tick data and sub-minute timeframes. The core idea is not to discard classic TA, but to accelerate it, automating the recognition of patterns that form and resolve in a matter of seconds. This adaptation requires low-latency data feeds, rapid computational power, and direct market access for near-instantaneous order execution.

One of the most common adaptations is **trend-following with rapid signal confirmation**. A classic “golden cross,” where a 50-period moving average crosses above a 200-period one, might signal a bull market over weeks or months. The HFT equivalent monitors for crossovers of ultra-short EMAs, such as a 1-minute EMA crossing a 5-minute EMA on a tick chart. An algorithm can subscribe to an exchange’s raw tick feed and, upon detecting such a micro-crossover, immediately submit an Immediate-Or-Cancel (IOC) order to capture the nascent momentum. Similarly, Bollinger Band breakouts, traditionally sought on daily charts, are monitored on a sub-second basis. The bot triggers an entry the moment a tick prints outside the bands, aiming to profit from the initial burst of volatility.

Another powerful framework is **volume-weighted momentum scalping**. Indicators like the Volume-Weighted Average Price (VWAP) and On-Balance Volume (OBV) are paramount in HFT because they incorporate volume, a proxy for conviction and institutional flow. HFT bots calculate VWAP not on a daily basis, but on a rolling, sub-second basis over micro-bars (e.g., buckets of the last 100 trades). When the price deviates significantly from this real-time VWAP—for instance, by more than one standard deviation—and the move is confirmed by a corresponding spike in OBV, the bot executes a tiny scalp trade. The goal is not to ride a trend but to repeatedly capture the bid-ask spread or a few ticks of profit as the price momentarily reverts to its volume-weighted mean.

Classic chart patterns and candlestick signals are also miniaturized for HFT. A head-and-shoulders or double-top pattern, which might take weeks to form on a daily chart, can appear and resolve within a few minutes on a 1-second chart. HFT algorithms are programmed to recognize these **micro-patterns** in real-time. Likewise, powerful candlestick signals like pin bars or engulfing patterns on a 1-minute chart can serve as high-probability triggers, especially when confirmed by an immediate, corresponding imbalance in the order book. An HFT bot might detect a bullish engulfing candle and simultaneously check the order book data feed to see if buy-side liquidity is increasing, confirming the signal before placing an order. This combination of price action and order book depth analysis is a hallmark of sophisticated HFT. These accelerated TA signals form the building blocks for several HFT strategy archetypes, including market making (placing bids and asks around a short-term moving average to capture the spread), statistical arbitrage (exploiting temporary price discrepancies of the same asset on different exchanges), and momentum ignition (triggering a small flurry of orders to attract other algorithms and then reversing the position to sell into the manufactured demand).

Performance Optimization and 24/7 Operational Integrity

An autonomous trading bot is only as effective as the infrastructure it runs on. For a bot intended to operate 24/7, relying on a personal computer is untenable due to potential interruptions from power outages, internet disconnections, or system updates. The professional standard involves a carefully selected hosting solution and an optimized software stack designed for reliability and low latency. The development process itself benefits from modern tools like the Windows Subsystem for Linux (WSL2), which provides a convenient and powerful Linux environment on a Windows machine for coding and initial testing. However, for live deployment, a dedicated **Virtual Private Server (VPS)** running a

native Linux distribution is essential. A VPS provides guaranteed uptime, isolated resources, and the root access necessary for fine-tuning the operating system for performance.

The selection of a VPS provider and plan is a critical decision. The primary consideration is **uptime and reliability**, and a trader should look for providers offering a Service Level Agreement (SLA) of at least 99.9%. The physical **location of the VPS data center** is also paramount for HFT. To minimize network latency—the time it takes for an order to travel from the bot to the exchange’s servers—the VPS should be co-located in the same city or geographic region as the exchange’s matching engine. For trading on OKX, this might mean choosing a VPS in Singapore, Frankfurt, or London, depending on which exchange servers are being targeted. This can shave critical milliseconds off execution time, providing a significant competitive edge.

The **hardware specifications** of the VPS must match the demands of the trading strategy. While a simple DCA bot might run on a minimal configuration (1-2 vCPUs, 2-4 GB RAM), a more complex HFT strategy that processes large volumes of market data and performs constant calculations will require more power (e.g., 4+ vCPUs, 8+ GB RAM). For storage, an **NVMe SSD** is strongly recommended over standard SSDs or hard drives. NVMe drives offer superior input/output operations per second (IOPS), which is crucial for tasks like writing logs, reading historical data for calculations, and handling database operations without creating performance bottlenecks.

The software environment on the VPS should be lean and optimized. A minimal installation of a stable Linux distribution like **Ubuntu LTS** or CentOS is preferable to minimize background processes and reduce the attack surface. The system clock must be kept perfectly synchronized with a reliable time source using the Network Time Protocol (NTP), as exchanges will reject API requests with significant timestamp discrepancies. For deployment, **containerizing the bot using Docker** is a best practice. Docker encapsulates the bot and all its dependencies into a consistent, portable image, which eliminates “it works on my machine” problems and simplifies updates and rollbacks. Within the bot’s code itself, performance can be further optimized by batching API requests, using efficient data structures, and ensuring that only necessary market data is processed to reduce CPU load. Finally, robust **monitoring and alerting** are non-negotiable. Tools like Prometheus and Grafana can be set up to track key performance metrics in real-time, such as CPU usage, memory consumption, network latency, and trade execution success rates. Automated alerts should be configured to notify the trader immediately of any critical failures, allowing for swift intervention.

Conclusion

The pursuit of high-frequency cryptocurrency trading with a small capital base of £500 is an ambitious yet achievable objective for the disciplined and technologically adept beginner. This report has systematically deconstructed the multifaceted requirements for such an undertaking, emphasizing that success is not born from a single secret strategy, but from the synergistic integration of optimized technical analysis, unwavering risk control, and a high-performance technological framework.

The journey begins with the intelligent adaptation of familiar indicators like RSI, MACD, and Bollinger Bands, recalibrating them for the high-velocity data streams of sub-minute charts to generate timely and relevant trading signals. However, these signals are rendered meaningless without the foundational bedrock of rigorous risk management. The steadfast application of the 2% rule, translating to a maximum risk of £10 per trade, and the methodical calculation of position size are the primary mechanisms that ensure capital preservation and longevity in a volatile market.

Technologically, the OKX API provides a powerful and versatile gateway for the execution of an autonomous strategy, while algorithms for dynamic pair selection enable the bot to focus its resources on the most fertile ground. By understanding and respecting API rate limits and building logic for auto-

mated market screening, a trader can create a bot that operates both efficiently and intelligently. Furthermore, the adaptation of classic technical analysis frameworks to micro-timeframes, combined with a deep understanding of HFT strategy archetypes, elevates the bot's potential from simple automation to sophisticated market participation.

Finally, the entire system must be supported by a resilient and optimized infrastructure. The use of a co-located Linux VPS with appropriate hardware, a lean software stack, and robust monitoring ensures the 24/7 operational integrity required for HFT. By meticulously addressing each of these domains—strategy, risk, and technology—the aspiring algorithmic trader can construct a comprehensive system that navigates the challenges of the cryptocurrency markets with a professional and systematic approach, transforming a modest capital investment into a potent learning tool and a viable trading enterprise.

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