# **High-Performance Strategy Optimization for Dhaka Stock Exchange (DSE)**

## **Project Proposal**

### **1. Introduction (Problem Statement)**

The Dhaka Stock Exchange (DSE), Bangladesh's primary stock exchange, presents unique challenges and opportunities for investors. While the market has shown significant growth potential, it is characterized by high volatility, information asymmetry, and varying levels of market efficiency. Traditional trading approaches often struggle to capture consistent returns in this emerging market environment, highlighting the need for sophisticated, data-driven trading strategies.

The challenge lies in developing and validating trading strategies that can:

* Maintain robustness across different market conditions
* Account for the unique characteristics of the DSE market
* Handle the computational complexity of testing multiple strategy combinations
* Provide reliable, actionable trading signals for practical implementation

This project aims to address these challenges through the development of a high-performance computing (HPC) framework for strategy optimization and backtesting, leveraging 10 years of historical data across 400 DSE-listed stocks.

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### **2. Background (Project Justification)**

## **2.1 Market Context**

The DSE has evolved significantly over the past decade, with increased market capitalization, trading volume, and technological advancement. However, several factors justify the need for this project:

* **Market Inefficiency**: Research indicates that the DSE exhibits various forms of market inefficiency, creating opportunities for systematic trading strategies
* **Limited Research**: There is a scarcity of comprehensive quantitative research on DSE-specific trading strategies
* **Computational Challenges**: Traditional backtesting approaches are insufficient for handling the scale of analysis required for robust strategy validation
* **Need for Localization**: Trading strategies successful in developed markets may not translate directly to the DSE context

## **2.2 Technical Context**

Recent advances in computational capabilities and trading strategy development make this project particularly timely:

* Availability of high-performance computing resources
* Maturation of technical analysis libraries and frameworks
* Advanced statistical methods for strategy validation
* Improved data quality and availability for DSE stocks

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### **3. Objectives**

## **3.1 Primary Objective**

To develop and implement a high-performance backtesting framework that identifies robust, consistently profitable trading strategies for DSE stocks.

## **3.2 Specific Objectives**

1. **Framework Development**
   * Design and implement a scalable HPC-based backtesting infrastructure
   * Integrate multiple technical indicators and strategy generation capabilities
   * Develop comprehensive performance evaluation metrics
2. **Strategy Optimization**
   * Identify optimal combinations of technical indicators
   * Fine-tune strategy parameters for maximum effectiveness
   * Evaluate strategy performance across different market conditions
3. **Performance Analysis**
   * Assess strategy robustness through various market cycles
   * Analyze risk-adjusted returns and drawdown characteristics
   * Compare performance across different market sectors
4. **Practical Implementation**
   * Develop guidelines for practical strategy implementation
   * Create monitoring and adjustment mechanisms
   * Document best practices for strategy deployment

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### **4. Methodology**

## **4.1 Data Processing and Management**

* Collection and cleaning of 10-year historical data for 400 DSE stocks
* Implementation of adjustments for corporate actions
* Development of efficient data storage and retrieval mechanisms

## **4.2 Technical Framework**

1. **Indicator Implementation**
   * Integration of 12 technical indicators including:
     + Trend indicators (SMA, EMA, MACD)
     + Momentum indicators (RSI, Stochastic, CCI)
     + Volume indicators (OBV, MFI)
     + Volatility indicators (Bollinger Bands)
2. **Strategy Generation**
   * Systematic generation of indicator combinations
   * Parameter optimization using grid search
   * Signal generation and combination logic
3. **Performance Testing**
   * Implementation of parallel processing for strategy testing
   * Transaction cost modeling
   * Risk management rules integration

## **4.3 Analysis Framework**

1. **Performance Metrics**
   * Risk-adjusted returns (Sharpe Ratio, Sortino Ratio)
   * Maximum drawdown and recovery analysis
   * Win rate and profit factor calculation
2. **Robustness Testing**
   * Out-of-sample validation
   * Monte Carlo simulation
   * Sensitivity analysis

## **4.4 Validation and Documentation**

* Cross-validation across different time periods
* Peer review of methodology and results
* Comprehensive documentation of findings

### **5. Timeline and Deliverables**

## **5.1 Project Phases (6 Weeks)**

1. Week 1-2: Framework Development and Data Preparation
2. Week 3-4: Strategy Implementation and Testing
3. Week 4-5: Analysis and Optimization
4. Week 5-6: Documentation and Presentation

## **5.2 Key Deliverables**

1. HPC-based backtesting framework
2. Optimized strategy sets for different market conditions
3. Comprehensive performance analysis report
4. Implementation guidelines and best practices
5. Final presentation and documentation

### **6. Resource Requirements**

1. **Computing Resources**
   * High-performance computing cluster access
   * Data storage infrastructure
   * Development environment setup
2. **Data Resources**
   * Historical price data for DSE stocks
   * Market index and sector data
   * Corporate action information
3. **Software Resources**
   * Python development environment
   * Technical analysis libraries
   * Statistical analysis packages
   * Visualization tools