

# Crypto Fund Management and Trading Strategy Report

Crypto Analyst Intern Project

Prepared by: [Kaustab saha]

Date: [27/10/24]

---

## Table of Contents

1. **Introduction**
  2. **Task 1: Crypto Fund Management**
    - Objectives
    - Data Collection and Portfolio Allocation
    - Calculations and Analysis
      - Daily Returns
      - APR and APY Calculation
      - Volatility and VaR (Value at Risk)
      - Beta Calculation
    - Portfolio Performance Metrics
    - Market Crash Scenario Analysis
    - Visualizations
  3. **Task 2: Trading Strategy Development and Backtesting**
    - Objectives
    - Strategy and Data Preparation
      - Data Collection and Indicators
      - Signal Generation
    - Backtesting
    - Performance Metrics
    - Parameter Optimization
    - Risk Management
    - Performance Visualization
  4. **Conclusion**
  5. **Appendix: Code and Output**
- 

## 1. Introduction

This report summarizes the analysis and development conducted in two main areas: managing a diversified crypto fund and developing a trading strategy for a specified crypto asset. Task 1 focuses on portfolio management using several cryptocurrencies, while Task 2 involves creating and optimizing a backtest trading strategy using a simple moving average (SMA) crossover.

---

## 2. Task 1: Crypto Fund Management

### Objectives

- To design and analyze a diversified crypto portfolio.
- Calculate various performance metrics, including APR, APY, volatility, Value at Risk (VaR), and beta.
- Simulate and assess portfolio resilience in market crash scenarios.

### Data Collection and Portfolio Allocation

Using **Yahoo Finance**, we retrieved historical price data for the selected assets in our portfolio:

- **Assets:** BTC, ETH, SOL, DOT, LINK, Stablecoin, DeFi Yield
- **Portfolio Allocation:** Defined for each asset, including stablecoins and DeFi yield-based investments, with allocations summing to 100%.

### Calculations and Analysis

1. **Daily Returns Calculation:**  
Daily returns were calculated based on percent changes, forming the foundation for further analysis.
2. **APR and APY Calculation:**
  - **APR (Annual Percentage Rate):** Calculated by annualizing mean daily returns over 252 trading days.
  - **APY (Annual Percentage Yield):** Calculated using daily compounding for a more accurate yield estimation.
3. **Volatility and VaR Calculation:**
  - **Volatility:** Calculated as the annualized standard deviation of daily returns.
  - **Value at Risk (VaR):** Estimated at the 95% confidence level, indicating the maximum expected loss under normal market conditions.
4. **Beta Calculation:**  
Beta values were calculated relative to Bitcoin to measure each asset's correlation with Bitcoin's price movements.

### Portfolio Performance Metrics

The portfolio's overall APR, APY, volatility, and VaR were calculated. The portfolio's performance was compared to individual assets, showcasing an APR of 24.43%, an APY of 27.65%, a volatility of 51.98%, and a VaR at the 95% confidence level of 0.86.

### Market Crash Scenario Analysis

A hypothetical 30% market crash was simulated by adjusting returns accordingly. Key performance metrics under these conditions:

- **APR:** 17.10%
- **Volatility:** 36.39%

- **VaR:** 0.60 at 95% confidence

## Visualizations

- **Portfolio Allocation Pie Chart:** Visual representation of portfolio allocations.
  - **Portfolio Daily Returns:** A line plot of daily returns to observe trends and volatility.
- 

## 3. Task 2: Trading Strategy Development and Backtesting

### Objectives

- Develop a Python-based trading strategy using a simple moving average (SMA) crossover.
- Implement backtesting to evaluate strategy performance.
- Optimize parameters and apply risk management for improved stability.

### Strategy and Data Preparation

1. **Data Collection and Indicators:**  
Historical Bitcoin data was retrieved, with daily returns calculated for analysis. Short (20-day) and long (50-day) SMAs were added to implement the crossover strategy.
2. **Signal Generation:**
  - **Buy Signal:** Generated when the short SMA crosses above the long SMA.
  - **Sell Signal:** Triggered when the short SMA crosses below the long SMA.

### Backtesting

The strategy was backtested, simulating a \$10,000 investment. Portfolio value was calculated based on returns generated by following the SMA crossover signals.

### Performance Metrics

- **Total Return:** Measure of portfolio appreciation from start to end.
- **Annual Return and Volatility:** Annualized return and risk exposure.
- **Sharpe Ratio:** Performance metric relative to risk taken.
- **Max Drawdown:** Maximum observed loss from a peak to a trough in portfolio value.

### Parameter Optimization

A grid search was performed over SMA window parameters to maximize the Sharpe Ratio. Optimized parameters for SMA periods were identified, improving the strategy's robustness.

### Risk Management

A simple stop-loss (5%) and take-profit (10%) system was implemented to limit losses and lock in gains. This additional risk control adjusted strategy returns when conditions were met.

## Performance Visualization

- **Portfolio Value Comparison:** Plots of strategy performance vs. buy-and-hold Bitcoin investment.
  - **Drawdown Over Time:** Shows strategy stability and risk exposure.
- 

## 4. Conclusion

The crypto fund management and trading strategy tasks demonstrated robust financial analysis capabilities and offered insights into managing crypto investments and developing algorithmic trading strategies. Task 1 presented a diversified portfolio analysis, showing substantial risk-adjusted returns, while Task 2 illustrated how parameter optimization and risk management can enhance a trading strategy's stability and profitability.

---

## 5. Appendix: Code and Output

### Task 1: Crypto Fund Management

- Code snippets and output summaries for data collection, APR/APY, volatility, VaR, and beta calculations, as well as portfolio metrics and visualizations.

### Task 2: Trading Strategy Development and Backtesting

- Code for SMA crossover implementation, parameter optimization, risk management, and visualization of portfolio performance.