CRYPTO VOLATILITY AND RISK ANALYZER

(CVARA)

INFOSYS SPRINGBOARD FINAL PROJECT

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Introduction

Cryptocurrency markets are highly volatile and unpredictable. Investors and analysts require systematic tools to measure risk, analyze price behavior, and make informed decisions.

*This project presents an end-to-end crypto risk analytics system that:

- Collects live crypto data

- Computes statistical risk metrics

- Visualizes trends

- Classifies assets into risk categories

Project Overview

- The project "Crypto Volatility and Risk Analyzer" aims to analyze and visualize the volatility patterns of selected cryptocurrencies to estimate their risk levels over time.
- The system fetches real-time and historical cryptocurrency data from APIs such as CoinGecko and performs quantitative analysis to measure volatility, Sharpe ratio, and beta coefficients.
- Using data analytics and visualization libraries in Python (like Matplotlib and Plotly), this project will generate interactive visual dashboards that display risk insights.
- The tool will ultimately help traders, investors, and researchers identify high-risk and low-risk cryptocurrencies through dynamic and data-driven visual analysis.

Project Workflow

```
Home Page
    ↓
Milestone 1: Data Collection
    ↓
Milestone 2: Volatility Analysis
    ↓
Milestone 3: Risk Metrics
    ↓
Milestone 4: Risk Classification & Dashboard
```

- CVARA is a crypto risk and volatility analysis tool
- Designed with milestone-based development
- Each milestone represents a functional module
- Integrated using a centralized Home Page

Purpose

- To analyze cryptocurrency market volatility

- To calculate risk metrics such as volatility and Sharpe ratio

- To visualize price trends and risk–return behavior

- To classify cryptocurrencies into High, Medium, and Low risk categories

- To provide a decision-ready analytical dashboard

HOME PAGE

- **Home Page Overview:**
  - The Home Page serves as the central entry point of the CVARA application
  - It provides a single, unified interface to access all project functionalities
  - Designed to ensure clarity, simplicity, and ease of navigation

- **Purpose:**
  - To organize project functionalities in a structured manner.

Features:

01 • Acts as the main navigation hub for the application

02 • Provides dedicated links to all four milestones

03 • Allows users to move between modules without restarting the application

04 • Maintains a clean, minimal, and user-friendly layout

Output :-

Milestone_1

- Objective:
  - To fetch live and historical cryptocurrency price data.

- Key Activities:
  - Python environment setup

  - API integration (CoinGecko / Binance)

  - Automated data fetching

  - Missing value handling

  - Cryptocurrencies Used:

    - Bitcoin, Ethereum, Solana, Cardano, Dogecoin

How Milestone 1 Works ?

- Fetches live and historical cryptocurrency price data using APIs

- Extracts timestamp and closing price values

- Converts raw API responses into structured time-series format

- Handles missing values and duplicate records

- Supports automatic data refresh for real-time updates

Output:

✓ Clean and reliable price dataset ready for risk analysis

Benefits of Milestone 1

- Provides a strong and reliable data foundation

- Enables real-time market monitoring

- Eliminates manual data collection

- Ensures consistency across all milestones

- Scalable for adding more cryptocurrencies

Significance:

✓ Milestone 1 forms the backbone of the entire crypto risk analytics system.

Output :-

Milestone 1: Data Acquisition

Requirements

Environment Setup (Python + Libraries)

API Integration using Binance

CSV / Parquet Storage (optional)

Missing Value Handling

Outputs

Live price data for BTC, ETH, SOL, ADA, DOGE

Verified API + 7-Day consistency

7-Day Multi-Coin Price Trend Chart

Crypto Data Fetcher Live

Refresh

Crypto	Price (USD)	24h Change	Volume
BITCOIN	$87,888.04	0.477%	$4,117.675
ETHEREUM	$2,939.62	0.253%	$97,605.42
SOLANA	$124.44	1.27%	$1,274,828.631
CARDANO	$0.37	3.469%	$86,798,029.6
DOGECOIN	$0.124	0.854%	$214,354,870

Last updated: 6:27:07 PM

Milestone_2

- Objective:
  - To process raw price data and compute risk metrics.

- Key Calculations Performed

  - Logarithmic daily returns
  -
  - Volatility (risk measurement)
  -
  - Sharpe Ratio (risk-adjusted return)
  -
  - Beta (relative risk compared to benchmark)

- Input:
  Clean time-series price data from Milestone 1

Metrics Generated

- Volatility: Measures price fluctuation intensity

- Sharpe Ratio: Evaluates return per unit of risk

- Beta: Indicates sensitivity to market movements

Advantages of Milestone 2

- Converts raw data into actionable risk insights

- Enables comparison between different cryptocurrencies

- Supports informed investment decision-making

- Provides inputs for visualization and classification

Output :-

Milestone 2: Data Processing

Requirements

Daily log-return calculation

Statistical measures: volatility, Sharpe ratio, Beta

Moving average & rolling volatility

Outputs

Metrics table with risk indicators

Processed dataset for visualization & classification

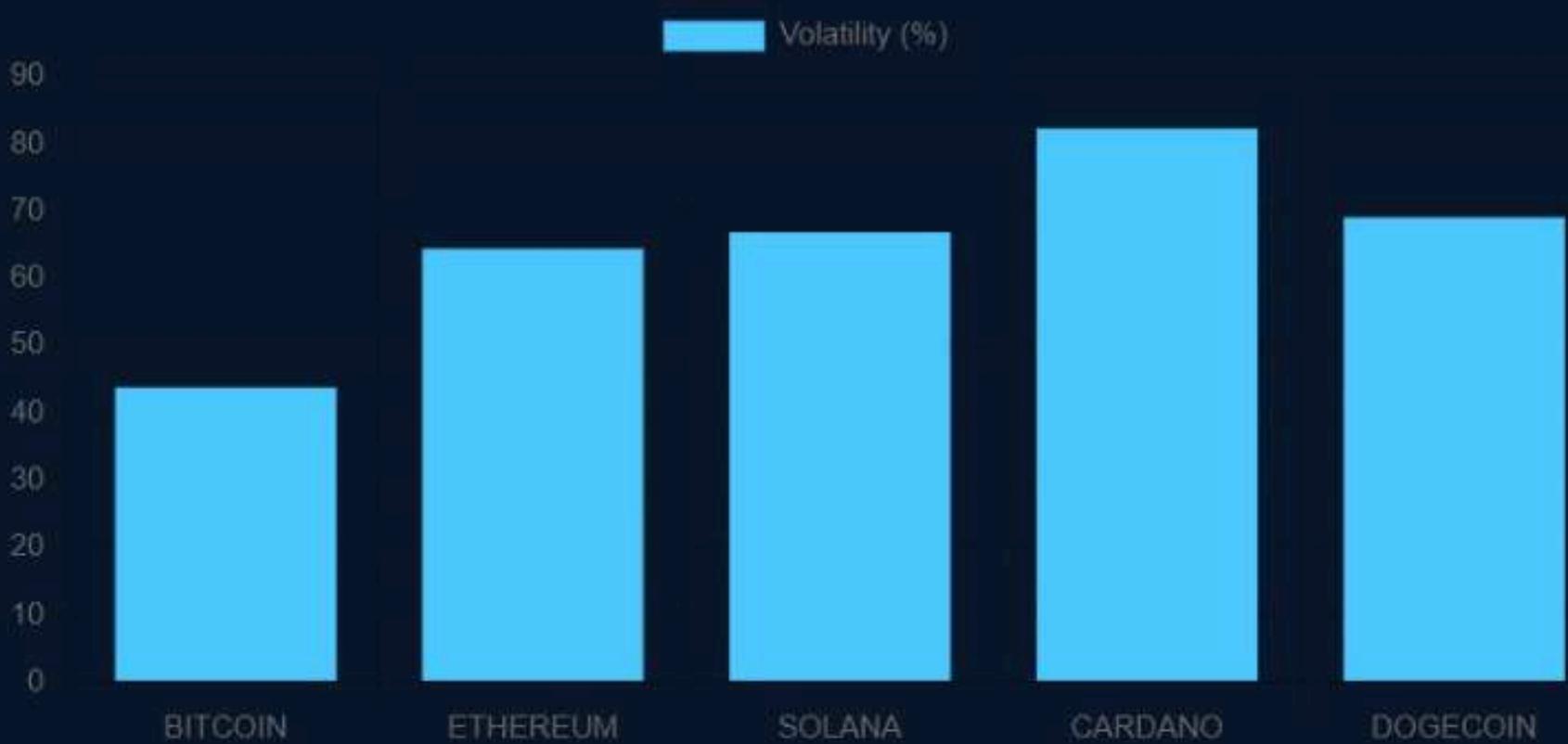**Risk Metrics Dashboard** Live Analysis   [30D] [90D] [1Y] [Refresh]

Crypto	Volatility	Sharpe	Beta	VaR
BITCOIN	43.75%	-0.1	1.04	-3.98%
ETHEREUM	64.38%	-0.02	1.34	-5.85%
SOLANA	66.83%	-0.05	1.31	-4.45%
CARDANO	82.26%	-0.17	1.68	-6.79%
DOGECOIN	69.04%	-0.16	1.34	-5.77%

Volatility (%)

Milestone_3

- Objective:
  - To visually analyze crypto price behavior and risk trends.

- Visualizations Implemented:

  - Price Trend Charts:
    - Display historical price movements to identify trends and market direction
  - Volatility Trend Charts:
    - Highlight fluctuations and instability in cryptocurrency prices over time
  - Risk–Return Scatter Plots:
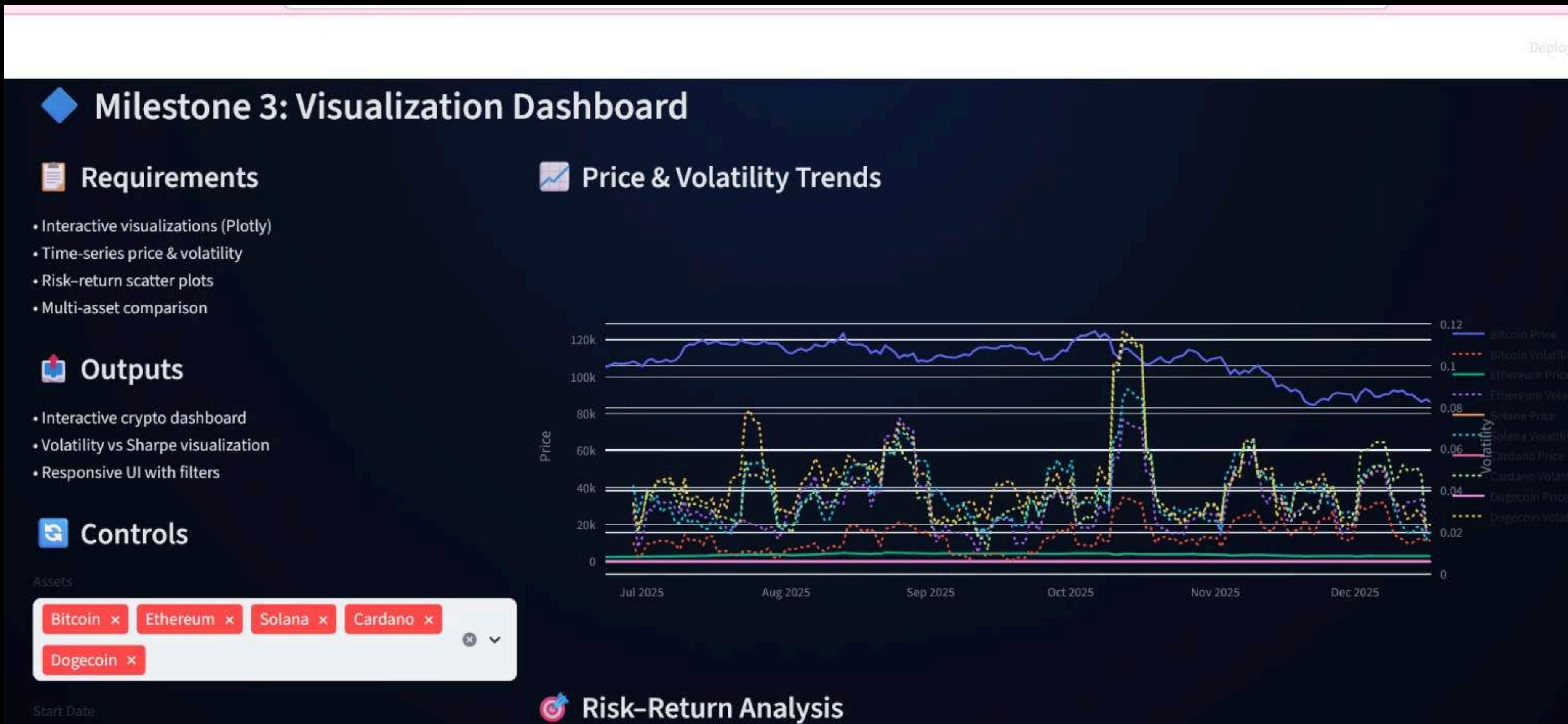   - Compare cryptocurrencies based on risk versus expected return

Key Activities

- Time-series visualization of crypto prices

- Volatility trend analysis using rolling windows

- Risk–return relationship visualization

- Multi-cryptocurrency comparison using interactive charts

Input: Processed risk metrics from Milestone 2

Advantages of Milestone 3

- Makes complex risk metrics easy to understand

- Enables quick identification of volatile assets

- Improves decision-making through visual insights

- Provides a professional, user-friendly analytical dashboard

Output :-

Controls

Assets

Bitcoin × | Ethereum × | Solana × | Cardano ×
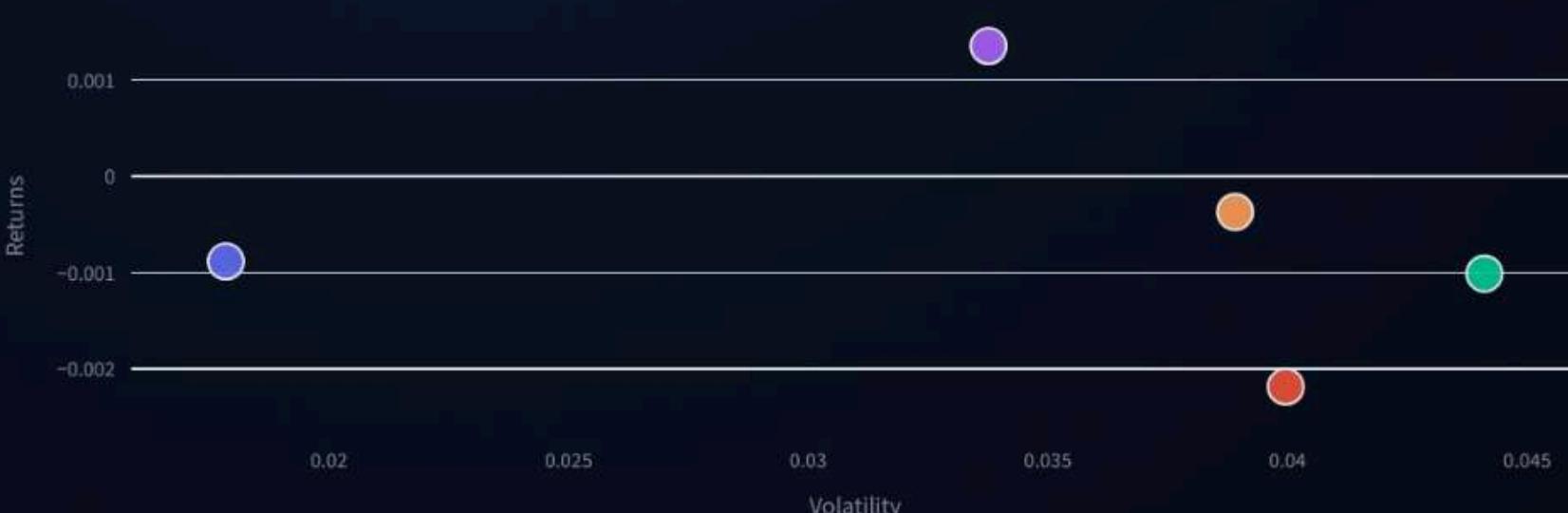
Dogecoin ×

Start Date

2025/06/23

End Date

2025/12/18

Last Updated: 2025-12-19 20:36:07.178920

🎯 Risk–Return Analysis

Returns

0.001

0

-0.001

-0.002

0.02   0.025   0.03   0.035   0.04   0.045

Volatility

Crypto
- Bitcoin
- Cardano
- Dogecoin
- Ethereum
- Solana

Start Date

2025/06/23

End Date

2025/12/18

Last Updated: 2025-12-19 20:36:07.178920

🎯 Risk–Return Analysis

Returns

0.001

0

-0.001

-0.002

0.02   0.025   0.03   0.035   0.04   0.045

Volatility

Crypto
- Bitcoin
- Cardano
- Dogecoin
- Ethereum
- Solana

3.49%	-0.01	-0.06%	Low
Volatility	Sharpe Ratio	Avg Return	Risk Level

Milestone_4

- Objective:
  - To summarize analysis results and present them in a

    clear, decision-ready format.

- Key Features:

  - Risk Distribution Summary:
    - Displays how cryptocurrencies are distributed across risk categories
  - Risk-Level Visualization:
    - Graphical representation of low, medium, and high-risk assets
  - Exportable Reports (CSV):
    - Allows users to download analytical results for further use

Input :   Processed risk metrics from Milestone 2 & visual insights from Milestone 3

Risk Classification Logic

- High Risk: Cryptos with highest volatility

- Medium Risk: Moderately volatile assets

- Low Risk: Relatively stable cryptocurrencies

(Classification based on recent volatility trends)

Advantages of Milestone 4

- Simplifies complex risk data into clear categories

- Helps investors quickly identify high-risk assets

- Supports strategic investment decisions

- Completes the end-to-end crypto risk analysis pipeline

Output :-

◆ Milestone 4: Risk Classification & Reporting

Final Analysis – Crypto Volatility and Risk Analyzer

📋 Requirements

- Risk thresholds for classification
- Visual highlighting of high-risk assets
- Summary reports (CSV, PNG, PDF)
- System validation & documentation

📤 Outputs

- Complete dashboard with risk classification
- Categorized risk report with metrics
- Documentation & deployment guide

📊 Project Completion Status

📊 Risk Classification Dashboard

🔴 **High Risk**   🟡 **Medium Risk**   🟢 **Low Risk**

Cardano 4.22%	**Solana** 3.48%	**Bitcoin** 2.29%
Dogecoin 3.68%		**Ethereum** 3.40%

📄 Risk Summary Report

Total Cryptocurrencies: 5
Average Volatility: 3.42%
Risk Distribution:
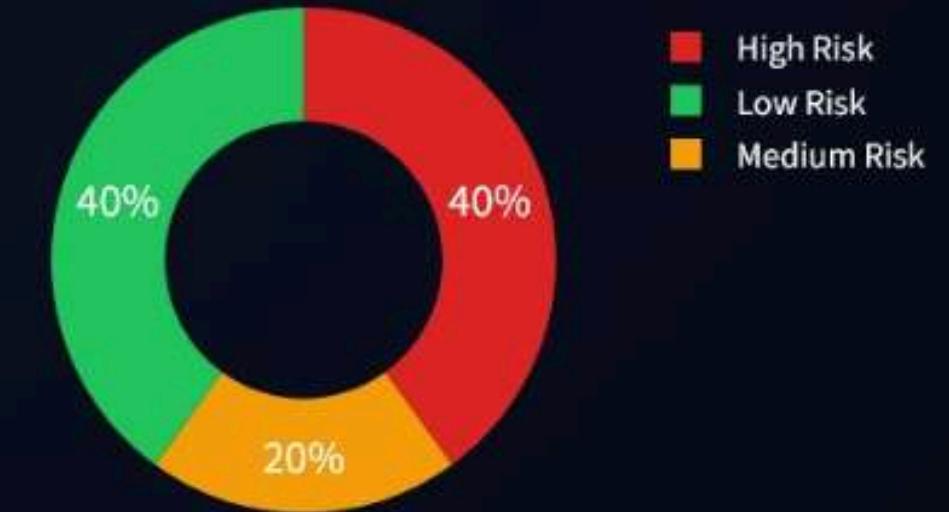2 High / 1 Medium / 2 Low

📊 Project Completion Status

Completion (%)

100

50

0

| Milestone 1 | Milestone 2 | Milestone 3 | Milestone 4 |

📑 Risk Summary Report

Total Cryptocurrencies: 5

Average Volatility: 3.42%

Risk Distribution:

2 High / 1 Medium / 2 Low

[Export CSV]

🟥 High Risk
🟩 Low Risk
🟧 Medium Risk

40%

40%

20%

Conclusion

Successfully implemented an end-to-end crypto risk analytics system

Integrated data collection, processing, visualization, and classification

Developed a professional, scalable, and interactive dashboard

Enables informed decision-making in volatile crypto markets

✓ **All project milestones successfully completed**

Future Scope of the Project

Machine Learning Integration
Incorporate ML models (LSTM, Random Forest) to predict future volatility and price trends.

Real-Time Risk Alerts
Enable live alerts when volatility crosses predefined risk thresholds.

Portfolio Risk Analysis
Extend the system to analyze multi-crypto portfolios instead of individual assets.

Sentiment Analysis
Integrate social media and news sentiment to enhance risk prediction accuracy.

Advanced Risk Metrics
Include Value at Risk (VaR), Conditional VaR, and Maximum Drawdown.

Automated Reporting
Generate downloadable PDF or Excel risk reports for investors.

Cloud Deployment
Deploy the dashboard using cloud platforms for global access and scalability.

User Personalization
Allow users to set risk preferences and customize dashboards.

THANK YOU !