

MarketPulse: Daily Volatility & Returns Dashboard

1. Context & Background

MarketPulse is an automated analytics pipeline designed to provide portfolio managers, traders, and risk teams with a unified, up-to-date view of stock price behaviour. By extracting, staging and preparing one year of daily price and volume data for selected tickers, MarketPulse enables rapid answering of critical questions around returns, volatility, anomalies and short-term forecasts—without manual spreadsheet work.

2. Business Problem

- **Data Fragmentation**

Price history lives in multiple places (APIs, CSV exports, spreadsheets). Analysts spend hours gathering and cleaning raw data before any analysis can begin.

- **Manual Workflows**

The process of downloading, transforming and loading data into a database is error-prone and must be repeated for each new ticker or time period.

- **Lack of Timely Insights**

Traders and risk managers need fast answers to questions such as “When did volatility spike?” or “How did returns compare month-over-month?” Current ad-hoc analyses cannot be easily refreshed or extended.

3. Project Objective

- Automate the extraction of one year of daily OHLCV data for 3–5 stock tickers via the Yahoo Finance API.
- Stage cleaned data in a PostgreSQL schema (‘marketpulse.stg_stocks’) for reliability and performance.
- Prepare the dataset for downstream analytics, including calculation of daily returns and 14-day rolling volatility.
- Support machine-learning modules:
 - Anomaly Detection (Isolation Forest) to flag extreme return days.
 - Volatility Forecasting (Prophet or ARIMA) to project the next 14 days of volatility.
- Enable a Power BI dashboard that answers key business questions and delivers actionable insights.

4. Key Business Questions

- **Return Distributions:**
What is the distribution of each stock’s daily returns over the past year?
- **Volatility Trends:**

How does rolling volatility (14-day window, annualized) change through time?

- **Anomaly Identification:**
Which dates exhibit statistically unusual price movements?
- **Short-Term Forecasting:**
What is the projected volatility over the next 14 trading days?
- **Cross-Ticker Comparison:**
How do returns and volatility metrics compare across different stocks?
- **Actionable Signals:**
Which periods should trigger alerts for risk management or trading strategies?

5. Glossary of Terms

- **Ticker Symbol**
A short code representing a publicly traded security (e.g., AAPL, MSFT).
- **OHLCV**
Daily market snapshot: Open, High, Low, Close prices plus traded Volume.
- **Daily Return**
Percent change from the prior close: $(\text{Close}_t - \text{Close}_{t-1}) / \text{Close}_{t-1} \times 100$.
- **Rolling Volatility**
The standard deviation of daily returns over a 14-day window, annualized by $\sqrt{252}$.
- **Anomaly Detection**
Unsupervised learning (e.g., Isolation Forest) is used to flag extreme return days.
- **Time-Series Forecast**
Projection of future volatility using models such as Prophet or ARIMA.
- **Forecast Horizon**
The number of days into the future for which volatility is predicted (14 days).
- **Pipeline**
The end-to-end sequence: Extract → Load → Transform → ML → Visualize.