Stock Market Analysis Application

System Requirements Specification

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Project Description

This project aims to develop a comprehensive web application to gather, analyze, and predict stock trends for the Macedonian Stock Exchange (MSE). The application will aggregate stock data from the exchange going back 10 years, process it, and perform necessary transformations to make it suitable for analysis. It will compare previous projections to actual results and use machine learning to predict future changes in the market. The primary objectives include data collection, projection comparison, and predictive modeling.

The application will interface with the Macedonian Stock Exchange, collecting data on all publicly listed companies ignoring bonds. The gathered data will undergo formatting to ensure consistency and usability. The transformed data will be stored in a dedicated database. The application will also gather publicly available financial projections from listed companies. These projections, such as quarterly earnings estimates, revenue goals, and growth targets, will be compared against actual performance. This comparison will contribute in adding depth to the analysis. The application will employ machine learning algorithms to predict potential stock trends by leveraging historical data, actual performance metrics, and company projections. These models will produce forecasts of stock movements in the near term.

Functional Requirements

1. The application shall collect daily stock data from the Macedonian Stock Exchange for all publicly listed companies (excluding bonds).
2. The application shall determine the last date of available data and retrieve the historical data for the past 10 years.
   2.1. For each issuer, the application should check the database for existing data and identify the last recorded date.
   2.2. Based on the last recorded date, the application shall fetch any missing data for each issuer up to the present date.
3. The application shall implement a robust data transformation pipeline using the Pipe and Filter architecture.
4. The system shall allow users to search for specific issuers by name or stock symbol.
5. The application shall allow users to select a date range for viewing historical data.

6. The system shall allow users to compare the performance of multiple issuers over a selected period.
7. The application shall format and transform the acquired data for consistency and usability.
   7.1. The application shall format dates using consistent formatting (dd.mm.yyyy).
   7.2. The application shall format prices using consistent formatting (e.g. 2.000,50).
8. The application shall store the transformed data in a dedicated database.
9. The application shall gather publicly available company projections, including quarterly earnings, revenue goals, and growth targets.
10. The application shall compare company projections with actual results.
11. The application shall implement machine learning models to predict stock trends based on historical data, company projections, and actual performance.
12. The application shall provide short-term forecasts for stocks on the Macedonian Stock Exchange.
13. The application shall provide data export functionality, enabling users to download selected data in common formats

Non-functional Requirements

1. The application shall populate an empty database with all stock data of the last 10 years from MSE in less than 140 seconds 99.5% of the time.
2. The application shall retrieve the last available date for a given stock from the database in under 0.5 seconds for 99% of requests.
3. The web application user interface should load pages and respond to user actions within 3 seconds for 95% of interactions.
4. The application shall update the stock data for all issuers daily, ensuring the data in the database is never more than 24 hours old.
5. The application shall generate machine learning predictions for a given stock within 5 seconds for 95% of requests. This assumes a standard set of prediction parameters and a typical workload.
6. The application shall validate 100% of the downloaded stock data for correct formatting, including date format, price delimiters, and issuer codes, before storing it in the database.
7. The application shall handle API request timeouts and errors smoothly, with retry mechanisms in place. The average response time for successful API requests shall not exceed 2 seconds.

8. The application's database shall accommodate a 20% year-on-year increase in data volume for at least five years without requiring major architectural changes.
9. The application shall allow for easy configuration of key parameters, such as data sources, API keys, and update schedules, through a configuration file or a user-friendly interface. This facilitates easy system adaptation to different environments or changes in requirements.

User Personas & Scenarios

Persona 1: Marko – Aspiring Investor

Description:

Marko is a young professional in Macedonia with limited financial knowledge. He is interested in starting his investment journey in the Macedonian stock market and requires an easy-to-use tool that simplifies stock trend analysis, helping him make smart investment choices.

Narrative:

For a novice investor like Marko, with minimal expertise in trading, our tool could be crucial. It would allow him to leverage market data and predictive insights to make informed investment decisions without requiring extensive manual data analysis. With our application, Marko can stay updated on trends and make investment choices confidently.

Persona 2: Jovana – Business Owner with Savings

Description:

Jovana runs a local business in Macedonia and has some savings she wishes to invest. She's also interested in tracking her business sector's performance but lacks a deep financial background. She seeks a tool that will guide her in both personal investment and business decision-making.

Narrative:

For business owners like Jovana, our application would provide sector-specific data and predictions, empowering her to make more strategic decisions. By comparing companies in similar sectors, Jovana could use our tool to assess market trends and evaluate investment opportunities that align with her industry. This functionality enables business owners to make well-calculated, informed choices.

Persona 3: Macedonian Newspaper Company

Description:

A newspaper company specializing in Macedonian financial news aims to diversify its sources and stay updated on stock trends, company performance, and market forecasts.

Narrative:

For a news organization dependent on timely, reliable data, our application offers invaluable support through its comprehensive data aggregation and predictive analytics. The tool would serve as a critical resource, providing additional insights to enhance financial reporting and offering data-driven content to their readership.