

Real-Time Stock Advisor Powered by AI

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Chapter 1: Introduction

1.1 What is this project about?

This project is about building a Mini Stock Analytics Assistant. The idea is to create an AI using OpenAI Assistant [Ope24] that can help users analyse stock market data, show useful charts, and give advice based on investment strategies. It's designed to be simple for users, but smart enough to understand real-time stock prices, calculate things like averages or trends, and even explain investment ideas using well-known financial principles.

1.2 Why is it important?

Many people who want to invest don't have access to expensive tools or financial advisors. Free tools like ChatGPT are helpful, but they can't access real-time stock data or do deeper analysis on their own. This assistant fills that gap. It offers a simple way to ask questions about stocks and get helpful answers using real data, smart calculations, and investment advice based on real strategies.

1.3 How is it built?

The assistant was made using the OpenAI Assistants API. It combines three key parts:

- **Function calling:** Calls the Alpha Vantage API [Van17] (a free stock API) to get real-time stock data like prices and trading volume, and also generates a CSV and a plot image with the data received from the API.
- **Code interpreter:** It uses Python to calculate indicators (like moving averages) and create charts showing how a stock is performing.
- **File Search (RAG):** It uses a set of markdown files that include advice and strategies from famous investment books and experts. These help the assistant retrieve useful knowledge and give more meaningful, informed answers.

All of this is wrapped into one assistant that can help answer questions like:

- "What is the current price of Apple stock?"
- "Should I invest in index funds or growth stocks?"
- "Can you show me a chart of Tesla's performance today?"

Chapter 2: Assistant Design: A Schematic View

The assistant is built using the OpenAI Assistants API, and the design is centered around using tools that make it more than just a basic chatbot. Here's an overview of the main parts of the system and how they connect:

- **User input:** The user asks a question or makes a request, like asking for a stock's current price or a chart.
- **Assistant logic:** The assistant receives the input and checks whether it needs to call a tool (like a function or code interpreter) or retrieve information from the uploaded strategy files.
- **Tool calls:** If needed, the assistant runs the function (fetching stock data and generating the CSV and the plot image), processes that data with Python, or looks through its RAG documents.
- **Response:** Once it has everything it needs, the assistant generates a reply that includes the result and a short explanation or recommendation.

This process allows the assistant to combine different tools and sources of information in a single response ([Figure 2.1](#)).

2.1 What parts of the API are used?

- The **Function calling** feature is used to run a custom function named `get_stock_price`, which calls Alpha Vantage, reformats the data, generates a CSV and a plot image.
- The **Code interpreter** tool is used to calculate stock indicators, generate other needed plots, generate code for meaningful measures and whatever the user needs in terms of coding with regards to the stock data.
- The **File search** tool is used to pull relevant information from the uploaded strategy files.

2.2 What parts are not used?

- Features like uploading images or using the vision tool are not used because they are not needed for this type of assistant.
- Audio input and speech tools are also skipped since the assistant is designed for typing and reading text.

This design is simple but flexible, and it gives the assistant enough power to handle real-world financial queries with smart, useful responses.



Figure 2.1: System flow of the Stock Analytics Assistant

Chapter 3: Added Value: More than Mere ChatGPT or basic LLM

This assistant was built to do more than just have a conversation. While ChatGPT is a powerful language model, it has some serious limitations when it comes to working with real-time stock data and giving personalised financial insights. This section explains what makes this assistant more useful than ChatGPT on its own.

3.1 Why ChatGPT Alone Is Not Enough

ChatGPT is great at explaining general concepts, but it has no access to up-to-date financial data. If you ask it about today's price of Apple stock or to generate a chart of Tesla's volume over the last hour, it won't be able to help. It also can't calculate real technical indicators like moving averages, RSI, or MACD on demand. And while it can explain investment strategies, it doesn't know how to apply those strategies to live data.

3.2 What This Assistant Adds

Here are the main reasons this assistant goes beyond ChatGPT:

- **Live data access:** The assistant fetches current stock information through the Alpha Vantage API. This allows it to give real-time answers that ChatGPT cannot generate.
- **Mathematical analysis:** It uses the code interpreter to do calculations and generate charts. It can process real data and show things like price trends, volatility, or trading volume, which ChatGPT can't compute.
- **Investment advice based on real strategies:** By using RAG, the assistant can pull advice from a curated library of well-known investment strategies, classified in chunks so that the assistant gets only the information needed, without having to go through unwanted strategies. ChatGPT may try to imitate this, but it won't have access to the same structured, reliable information.
- **All-in-one response:** The assistant doesn't just answer part of a question. If you ask it to check a stock and tell you whether you should buy or hold, it fetches the price, runs the analysis, looks through investment rules, and gives a well-rounded answer.

3.3 User Example

If a user asks: *"Should I hold or sell AAPL based on today's data?"*, ChatGPT might respond with: *"I can't browse current data, but I can tell you about Apple as a company"*. In contrast, this assistant fetches the live price, runs a technical indicator like RSI or MACD, checks guidance from uploaded investing files, and then says something like: *"Based on the presented intraday data and the long-term investing principles, here are my thoughts: <information> Hold <justification>"*

This shows how the assistant is designed not just to talk, but to think, calculate, and guide.

Chapter 4: Tool Usage

The assistant works by combining 3 different tools from the OpenAI Assistants API. Each tool plays a specific role and adds a unique kind of functionality. Together, they make the assistant capable of understanding questions, gathering data, running calculations, and giving useful answers based on both numbers and strategy.

4.1 Function Calling: `get_stock_price`

The assistant uses a custom function called `get_stock_price(symbol: str)`. This function connects to the Alpha Vantage API and pulls intraday stock data for a given ticker symbol. It collects the open, high, low, close prices, and trading volume, all grouped into 5-minute intervals.

Once the data is received, it's reformatted into a dictionary that's easy for the assistant to use and it's also curated so as to not use as many tokens making it a lot cheaper ($\approx -30\% \rightarrow -35\%$ tokens reduction). This information is used for generating a CSV with the formatted data and generating a plot image for better visualisation, then it is passed to other tools or directly used in the assistant's reply.

4.2 Code Interpreter: Custom Charts and Analysis

The assistant also uses the code interpreter tool, which allows it to run Python code when needed. This tool is useful for understanding and explaining data or running deeper calculations that go beyond what's built into the function.

In this specific assistant, the main technical processing, including CSV export and chart generation, happens inside the `get_stock_price` function itself, which is part of the function tool. However, the code interpreter remains available for additional tasks, such as:

- Running custom calculations on top of fetched stock data
- Running custom charts besides the ones created based on the fetched data
- Calculating indicators like RSI, MACD etc. (if needed outside the function)
- Explaining mathematical processes in detail if the user asks for them

So while most of the heavy lifting happens in the function, the code interpreter provides extra flexibility when users want to explore or understand the numbers further.

Without this tool, the assistant would not be able to handle data at this level or generate custom visualizations.

4.3 File Search: Retrieval-Augmented Gen. (RAG)

This assistant also uses the RAG feature to access uploaded markdown files that contain summaries of investing strategies. These files were created from books and resources by well-known experts like John C. Bogle [Bog17], J.L. Collins [Col16], Burton G. Malkiel [Mal73], Jeremy J. Siegel [Sie98], C.D. Ellis [Ell98], and others [Vip].

When the assistant receives a question like *“Should I invest in value stocks or index funds?”*, it doesn’t just guess. It retrieves relevant parts of these documents and uses them to give an answer that reflects real-world strategies.

This retrieval process is automatic and happens during the assistant’s response generation. It’s what makes the assistant feel knowledgeable and grounded in actual investing principles, rather than sounding vague or generic.

4.4 Summary

Each tool has a clear job:

- The function brings in curated fresh data.
- The code interpreter runs the numbers for custom code tasks.
- The file search adds expert-level advice.

Together, these tools help the assistant act more like a real financial analyst than a simple chatbot.

Chapter 5: Outside Knowledge: Curated Data Sources

To help the assistant give useful and thoughtful investment advice, the data received from the API is curated in such way in which it doesn't spend as much money (tokens) as it would, and a set of curated documents was added using the RAG feature. These documents come from well-known investment strategies and are used to improve the assistant's answers when someone asks for financial guidance or comparisons between investment approaches.

5.1 Where does the data come from?

The assistant uses a series of markdown (.md) files that were created based on popular books and trusted investing resources. These include ideas and strategies from authors and thinkers like:

- John C. Bogle (Index Investing / Bogleheads)
- Benjamin Graham (Value Investing)
- Malkiel (Random Walk Theory)
- Wealth management and risk handling principles

Each file focuses on one style or concept, such as growth investing, behavioral biases, index investing etc.

5.2 How much data is there and how is it organized?

In total, the uploaded strategy content contains around 60,000–70,000 characters spread across 8 different markdown files. Each file is focused on a single theme. For example:

- `value-investing.md` explains long-term investing based on company fundamentals
- `index-investing.md` supports passive strategies like buying ETFs and avoiding market timing
- `wealth-management.md` gives advice on asset allocation and risk handling

This helps the assistant retrieve only the most relevant sections during a conversation.

5.3 How was the content prepared?

The information was carefully curated and rewritten into markdown format. Each file includes key points, simple explanations, and practical advice. The idea was to give the assistant short, clean, and useful pieces of text to work with, rather than overwhelming it with full book chapters or messy text.

Before uploading, the content was checked for formatting and consistency. Unnecessary words or repeated concepts were removed, and the final documents were broken down into small chunks during the upload process (so that the assistant can retrieve relevant parts efficiently).

5.4 What does this knowledge add?

Without these files, the assistant would only be able to guess based on general training. With the RAG system in place, it can now give real recommendations, for example, when someone asks: *"Should I choose index investing over growth stocks?"*, the assistant can pull the actual arguments from the indexing strategy file and respond with a clear, knowledgeable answer.

5.5 Example snippet

Here's a short example from the `index-investing.md` file:

"Index investing diversifies an investor's money widely among various types of equities, hoping to mirror the same returns as the overall stock market. One of the main attractions of index investing is that many studies have shown that few strategies of picking individual stocks outperform index investing over the long term. An index investing strategy is usually followed by investing in mutual funds or exchange-traded funds that are designed to reflect the performance of a major stock index such as the S&P 500 or the FTSE 100."

This type of input gives the assistant something solid to work with and helps avoid generic or vague advice.

Chapter 6: Worked Examples: Your Assistant in Action

In this section, we'll take a look at real examples of how the assistant behaves when asked practical stock-related questions. These examples show how the assistant uses function calls, RAG, and the code interpreter to give complete, well-informed answers. Where possible, the answers are compared to what ChatGPT would say on its own, showing how much more capable this assistant is in handling real financial queries.

6.1 Example 1: RT Stock Data Fetch & Advice

User Prompt: *"What's the current stock price for Apple?"*

Assistant:

- Calls `get_stock_price("AAPL")` to fetch intraday stock data
- Returns a curated summary of open, high, low, close values and volume in that day with 5-minute windows
- Provides a CSV (`timeseries_AAPL_2025-04-24.csv`) and chart ([Figure 6.1](#)) visualizing the recent price and volume
- Gives the following answer (snippet):

```
### Investment Suggestion:  
Given the latest price action where the stock opened at $207.7500 and  
closed at $207.9100, there seems to be an upward trend for the day.  
The high of $208.1500 indicates potential strength, and if the price  
holds above $207.50, it might continue to trend upwards.  
  
**Recommendation: Buy** - If you're considering a long-term  
investment, it's a favorable time to buy, especially if it dips close  
to the $207 mark again. However, remain cautious and set a stop-loss  
just below $207 to mitigate risk, as the market can be volatile.  
Always consider your financial objectives and risk tolerance before  
making investment decisions.
```

Typical ChatGPT Response: *"I'm sorry, I don't have access to real-time data, but I can tell you about Apple as a company."*

What this shows: The assistant provides a clear advantage by returning up-to-date data and visual evidence, something ChatGPT cannot do without tool access.

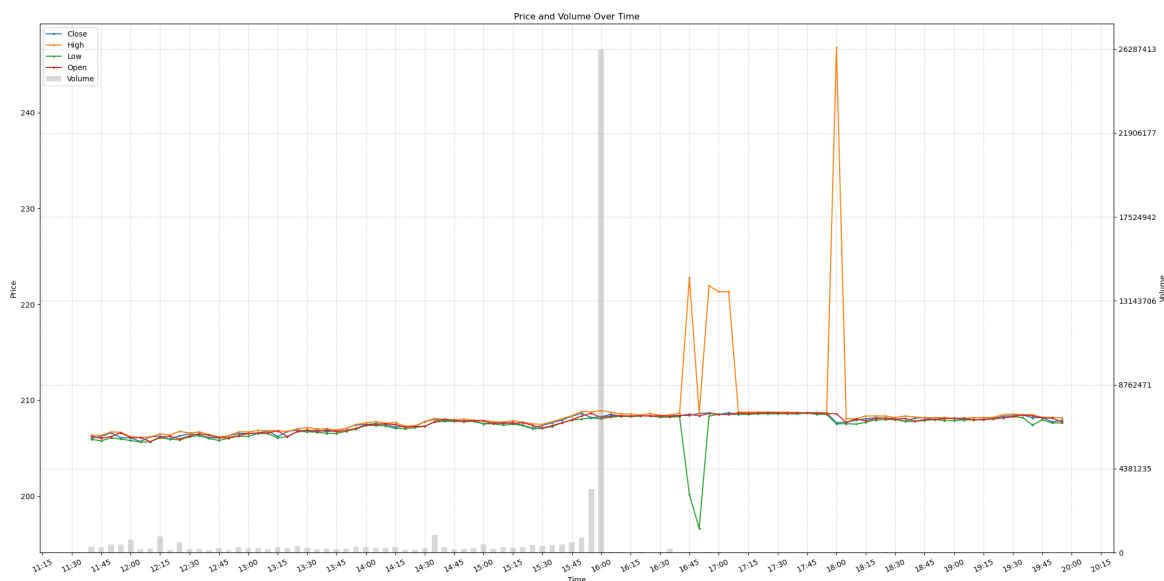


Figure 6.1: Time Series Apple (AAPL) 24/04/2025 (.png)

6.2 Example 2: Applying Investment Strategy

User Prompt: *"Should I invest in value stocks or index funds?"*

Assistant:

- Retrieves relevant content from value-investing.md and index-investing.md
- Gives a side-by-side comparison of both strategies
- Summarises which might be a better fit depending on the user's risk profile and timeline
- Gives the following answer:

Investing in value stocks and index funds serve different strategies and depend on your financial goals, risk tolerance, and investment horizon. Here are the pros and cons of each investment type to help you decide:

Value Stocks

Pros:

1. **Potential for High Returns:** Value stocks, which are often undervalued, have the potential for significant capital appreciation when the market recognizes their true value.
2. **Dividends:** Many value stocks pay dividends, providing income even when stock prices do not appreciate.
3. **Market Inefficiencies:** Knowledgeable investors can exploit market inefficiencies, especially in undervalued segments.

Cons:

1. **Higher Risk:** The market may take time to recognize the value, leading to potential periods of underperformance.
2. **Research Required:** Finding good value stocks requires analysis and research to understand the fundamentals of the business.
3. **Volatility:** Value stocks can be more volatile and might fluctuate dramatically based on market sentiment and economic conditions.

Index Funds

Pros:

1. ****Diversification:**** Index funds invest in a broad range of companies, spreading out risk and reducing the impact of poor performance by any single stock.
2. ****Lower Costs:**** They generally have lower management fees compared to actively managed funds because they are passively managed.
3. ****Consistent Tracking:**** They aim to replicate the performance of a market index (e.g., S&P 500), making them a reliable option for long-term investors.

Cons:

1. ****Limited Growth Potential:**** Index funds may not outperform the market, particularly in bull runs where individual stocks can rocket higher.
2. ****Market Risk:**** If the entire market declines, your investment will also decrease proportionally.
3. ****Less Flexibility:**** Index funds are tied to their underlying index and cannot make tactical changes in investment strategy.

Conclusion

- If you are comfortable with risk and are looking for potentially higher returns over the long term, ****investing in value stocks**** might be appropriate for you.
- If you prefer a more stable, diversified approach with consistent tracking of market performance, ****index funds**** are likely the better choice.

Considerations

- Evaluate your time horizon, investment experience, and financial goals thoroughly.
- Diversifying your portfolio with a mix of both value stocks and index funds can also be a balanced approach.

Ultimately, the right choice largely depends on your personal investment philosophy and objectives.

ChatGPT Response:

That depends on your investment goals, risk tolerance, and time horizon.

****Value investing**** involves selecting stocks that appear to be trading for less than their intrinsic value. It requires more active decision-making and analysis, and it can offer higher returns but also comes with more risk.

****Index investing****, on the other hand, is a passive strategy that involves buying a broad market index, such as the S&P 500. It generally has lower fees and is considered safer for long-term investors.

If you prefer a hands-off approach with broad diversification and lower costs, index investing might be more suitable. If you enjoy researching companies and are comfortable with higher risk, value investing could be an option.

As always, it's best to speak with a financial advisor to choose a strategy that fits your personal situation.

What this shows: With RAG support, the assistant can give well-reasoned, grounded advice, instead of vague or surface-level comparisons.

6.3 Summary of the Examples

Each example shows the assistant combining its tools to solve real questions:

- **Function call** gets fresh data
- **Code interpreter** makes custom plots/measures that are needed
- **File Search** provides expert advice based on the given certified documents

By combining these three tools, the assistant works more like a digital financial advisor than a chatbot. It doesn't just give answers — it brings data, runs analysis, and offers guidance, all in one flow.

Chapter 7: Summary and Conclusions

This project set out to build an AI assistant that could go beyond just chatting, an assistant that could actually help users make sense of live stock data, perform real calculations, and offer useful investment guidance based on proven strategies.

The result is a functional and flexible Mini Stock Analytics Assistant. It combines real-time data access, Python-based analysis, and retrieval-augmented responses to answer questions like:

- What is the current price of a stock?
- Should I hold, buy, or sell based on recent trends?
- What investment strategy fits my risk level and goals?
- Calculate technical indicators SMA, RSI, MACD, and plot relevant charts.

Thanks to the OpenAI Assistants API, the assistant handles everything behind the scenes:

- It uses function calling to fetch live data.
- It uses a code interpreter to process, visualise and generate code for technical indicators for that data.
- It uses a file search tool to bring in knowledge from real investing philosophies.

Compared to a normal chatbot like ChatGPT, this assistant feels more like a tool or co-pilot. It's not just answering questions based on general knowledge, it's giving you personalised advice. It fetches real data, runs analysis, creates charts, and explains what to do next.

7.1 Next Steps

This assistant could grow in several directions. In the future, it might:

- Track a user's portfolio over time
- Give alerts when trends change (e.g., price drops or RSI signals)
- Compare multiple stocks side by side
- Pull financial news headlines to add context
- Add more advanced indicators or custom strategies

Overall, the project shows that it's not just possible, but practical, to build a smart, real-world financial assistant using today's tools. And with continued development, it could easily become something even more powerful.

Acknowledgements

This report and the assistant described in it were created entirely by the author as part of a university project. All implementation, writing, testing, and content curation were done independently.

Some parts of the assistant's functionality were inspired by official documentation provided by OpenAI and Alpha Vantage. Technical examples, such as using function calling or the code interpreter, were adapted and restructured to fit the needs of this specific project.

All quoted or summarised financial advice was carefully rewritten from well-known sources, which are listed in the references below. Every attempt was made to avoid plagiarism and to give proper credit to original ideas.

Note: If this report includes any charts or outputs copied from the assistant's actual behaviour, they were generated during testing by the author.

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