

Agentic AI Financial Analyst: A Multi-Page Web Application for Stock Screening, Portfolio Optimization, and Weekly ML S&P 500 Predictions

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Live Application

<https://huggingface.co/spaces/andrewnap211/agentic-ai-financial-analyst>

YouTube Demo

<https://www.youtube.com/watch?v=yeWEjTBer5Y>

Abstract

Equity analysts face information overload: thousands of stocks, noisy fundamentals, technical signals, and dense earnings call transcripts. Most tools stop at screening or charting and do not connect data pipelines, machine learning, portfolio optimization, and large language models (LLMs) into a single workflow. This project builds an Agentic AI Financial Analyst: a multi-page Streamlit app that combines (1) fundamental and technical screening, (2) peer metrics and performance dashboards, (3) portfolio optimization with crisis-aware risk roles, and (4) a weekly S&P 500 machine-learning prediction engine. GPT-based components summarize company descriptions and earnings calls, generate sentiment, answer peer-comparison questions, and explain model-driven recommendations. The platform demonstrates how agentic AI can augment quantitative equity research by making signals and model behavior more transparent, rather than acting as an opaque black box.

Research Question

Can we design an end-to-end, agentic AI platform that: Screens and ranks stocks in a transparent way, Constructs risk-aware portfolios that compare favorably to benchmarks, and Provides explainable narratives around earnings and model-based recommendations?

System Overview—Agentic AI Financial Analyst App

The platform is implemented as a multi-page Streamlit application:

- Page 1 – Screener & Earnings:

 - Sector + market cap + liquidity filters using the FMP Screener.
 - Advanced multi-factor metrics filters (valuation, quality, momentum, risk).
 - Company profiles and **GPT summaries** of what each business does.
 - Earnings call summarization and **sentiment scoring** (bullish / neutral / bearish) with QoQ fundamentals injected into the prompt.
- Page 2 – Metrics & Performance:

 - Peer comparison table of fundamentals, technicals, and recent performance.
 - Exportable DataFrame and an **Agentic Q&A panel** that answers questions using the full metrics table as context.
- Page 3 – Portfolio Optimizer & Back tests:

 - Efficient frontier of random long-only portfolios built from selected tickers.
 - Risk/return stats, Sharpe ratios, and crisis behavior for each asset.
 - K-means **risk buckets** and **crisis roles** (defensive, core, growth, speculative).
- Page 4 – Weekly S&P 500 Predictions:

 - Logistic Regression model on weekly technical features predicting next-week outperformance.
 - Ranked list of S&P 500 tickers with predicted probabilities, sectors, and a research disclaimer.

Data Integration

- Financial Modeling Prep (FMP) API – Core Data Source**
- Equity universe & metadata:** U.S. listed equities with symbols, company names, sectors, and industries.
- Fundamental data:** Company profiles, income statement and cash flow snapshots, and **TTM ratio endpoints** (P/E, P/S, P/B, EV/Sales, PEG).
- Quality & risk metrics:** Profitability (ROE, ROA, margins), leverage and liquidity (Debt/Equity, Current Ratio, Debt/Assets), and key metrics used in multi-factor screening.
- Technical indicators:** FMP technical endpoints for RSI, moving-average distances, 52-week high/low proximity, and price performance horizons (1M / 3M / 6M / 1Y).
- Earnings call transcripts:** Text of quarterly earnings calls used for GPT-based summarization and sentiment scoring.
- Market Prices (Yahoo Finance)**
- Daily OHLCV for S&P 500 constituents and user-selected tickers.
- Resampled to **weekly bars** for the prediction model and used at daily frequency for risk/return stats and efficient frontier simulation.
- Index Membership (Wikipedia)**
- Current **S&P 500 constituents** scraped from Wikipedia to define the weekly prediction universe.

LLM-based agents transform earnings transcripts and fundamentals into automated peer comparisons and decision-ready equity research.

Earnings Transcript (agentic)

☒ Include earnings call summary / sentiment

Transcript mode

☒ Latest

☐ Specific (year/quarter)

Year (if specific)

2024

-

+

Quarter (if specific)

2

▼

Tell the analyst what you want

Summarize in 5–7 bullets: Results, Guidance, Demand, Margins/Costs, Capital returns, Risks.

Step 1 — Run screener + metrics

Fig. 1. Earnings Transcript GPT Prompt

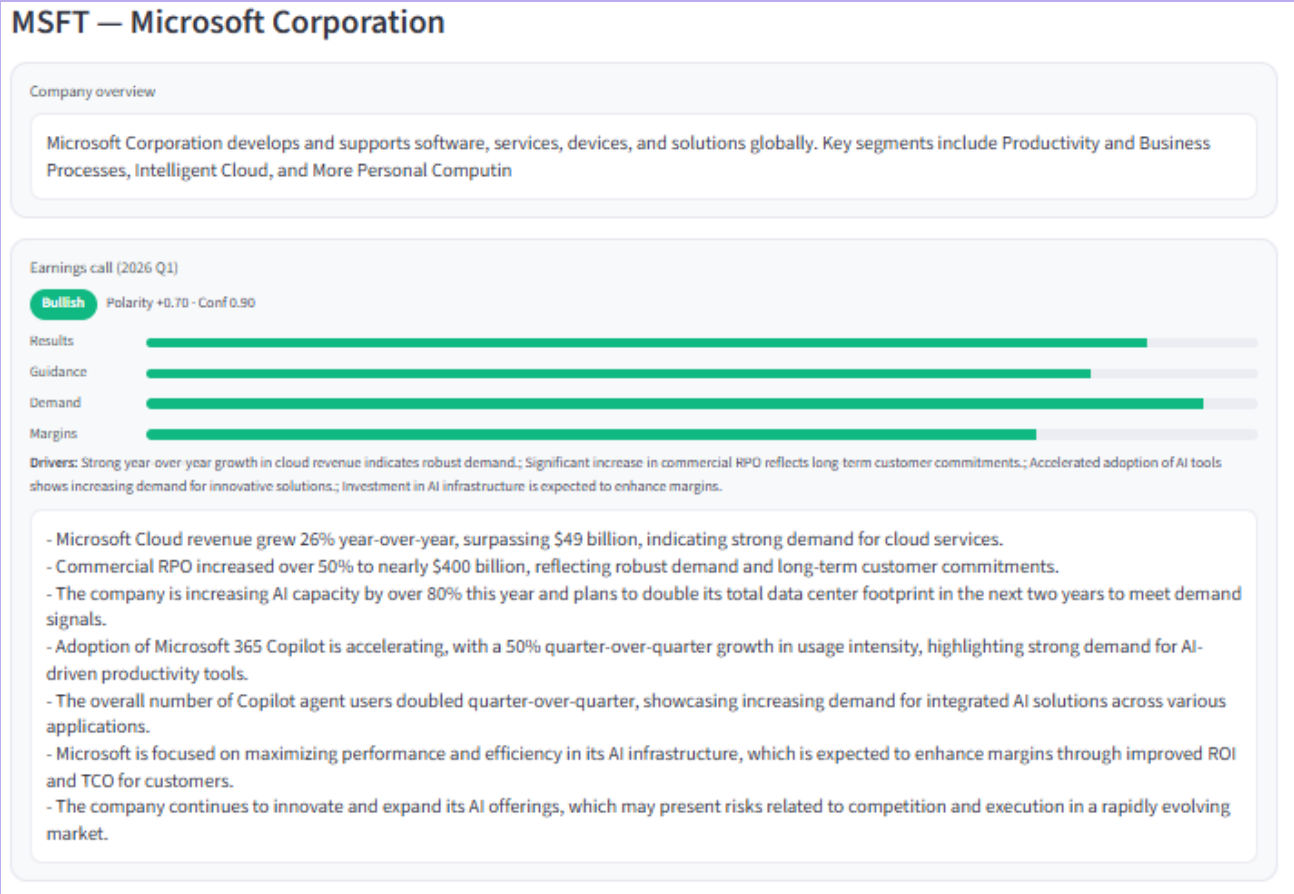


Fig. 2. LLM GPT results for earnings transcript summary

☹️ Agentic Competitive Analysis

Ask anything in natural language. The analyst will use the tables above and other cached tabs (if available).

Companies to analyze

AAPL

×

MSFT

×

Max companies to send to the analyst

2

Ask your financial analyst

Can you compare these companies in terms of valuation, growth rates, and core profitability?

Fig. 3. Competitive Analysis GPT Prompt

Metric	AAPL	MSFT
Price	\$278.36	\$492.01
P/E (TTM)	37.15	34.86
PEG (TTM)	2.79	11.65
Price to Sales (TTM)	9.88	12.45
Price to FCF (TTM)	41.64	46.88
Price to Book (TTM)	56.43	10.07
Operating Margin (%)	31.97	46.27
Net Margin (%)	26.92	35.71
ROE (%)	164.05	31.53
3Y Revenue CAGR	1.81%	12.42%
Revenue Growth This Year	8.20%	15.86%
Revenue Growth Next Year	6.78%	15.05%

Fig. 4. GPT Results for Peer Comparisons

Insights:

- Valuation:** AAPL has a lower P/E and PEG ratio compared to MSFT, indicating it may be relatively undervalued based on earnings growth expectations.
- Profitability:** MSFT shows superior operating and net margins, suggesting it is more efficient in converting revenue into profit.
- Growth Rates:** MSFT significantly outpaces AAPL in revenue growth rates and 3-year revenue CAGR, indicating stronger growth momentum.

Fig. 5. GPT Results for Peer Comparisons with customized insights

App Functionality

Earnings Analyzer: Uses FMP screener and earnings call transcripts to filter stocks by fundamentals/technicals, then calls an agentic GPT module to summarize business descriptions, generate focused earnings-call bullet points, and assign structured sentiment scores with QoQ fundamentals injected to ground the analysis

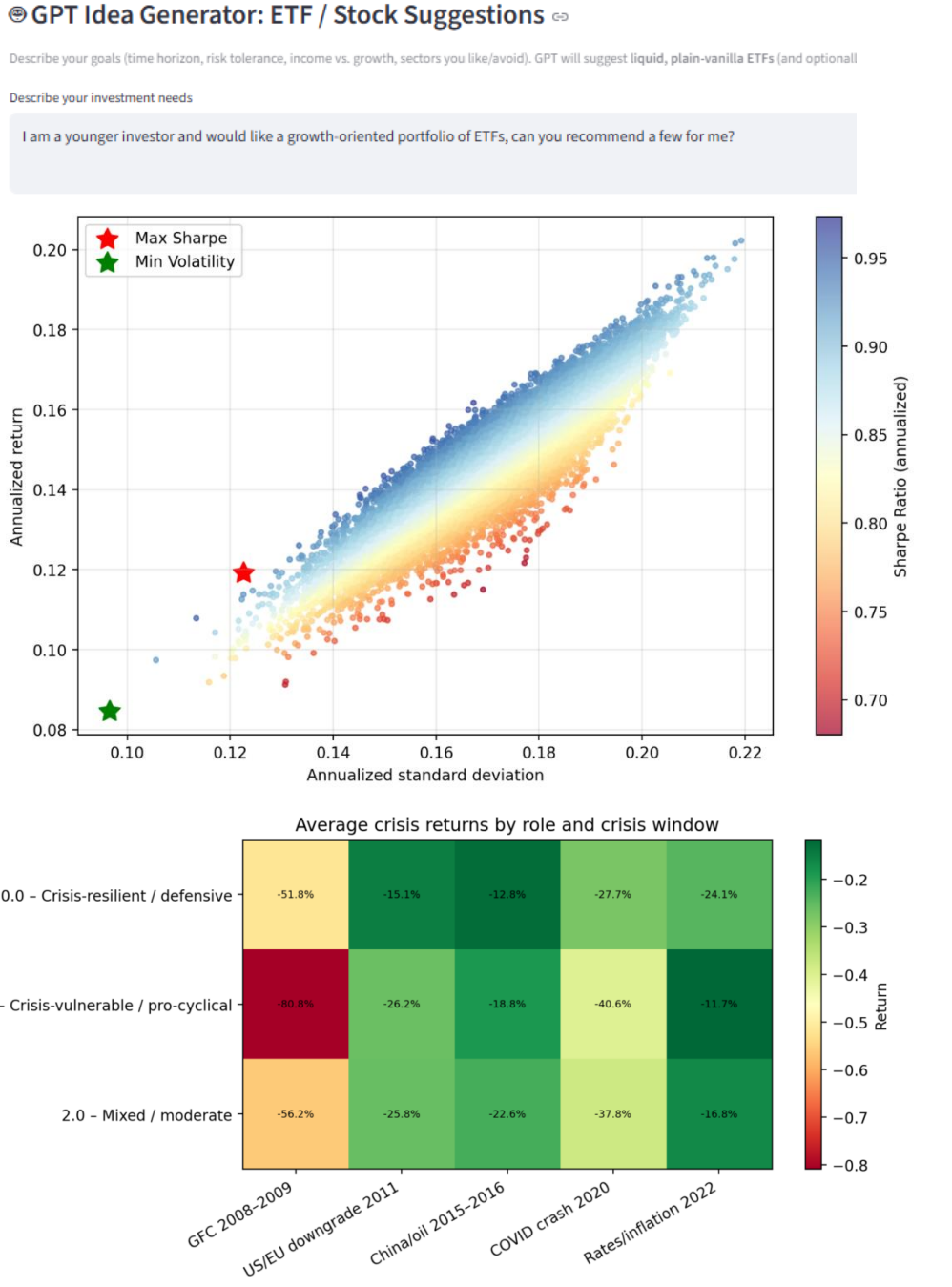
Peer Performance Dashboard: Aggregates valuation, quality, momentum, and risk metrics into a single peer table and exposes it to an agentic Q&A panel, allowing GPT to answer natural-language questions like “Which names look like quality at a reasonable price?” using the live DataFrame as context.

Portfolio Optimizer: Pulls multi-year price history to compute risk/return statistics, simulate thousands of long-only portfolios, trace the efficient frontier, and apply K-means clustering so GPT can explain each ticker’s risk bucket and “crisis role” in plain English.

Weekly Prediction Page: Engineers weekly technical features for S&P 500 constituents, applies a Logistic Regression pipeline to rank expected next-week outperformers, and leverages GPT to explain model-driven picks and highlight how recommended stocks compare to alternatives in the universe.

Custom Risk Assessment/Portfolio Optimizer

This page lets users build and compare portfolios from any set of tickers (including GPT-suggested ETFs or stocks). The app pulls daily prices from Yahoo Finance over user-selected windows or crisis regimes (e.g., 2008–2009, 2020), computes daily returns, and simulates thousands of random long-only portfolios. These are converted to annualized return, volatility, Sharpe ratio, and max drawdown and plotted as an efficient frontier with max-Sharpe and minimum-volatility portfolios highlighted. In parallel, K-means clustering creates intuitive risk buckets and crisis roles for each asset, which an LLM then explains in plain language, so users understand how each holding behaves in normal vs. stress periods.



Conclusion & Future Work

We built a multi-page Agentic AI Financial Analyst platform that unifies FMP fundamentals, technical indicators, Yahoo Finance price history, and GPT into a single equity research workflow. The app screens U.S. stocks, compares peers on valuation and quality, optimizes portfolios along an efficient frontier, and deploys a weekly Logistic Regression model to rank S&P 500 names on expected outperformance. Large language models summarize earnings calls, score sentiment, and generate automated peer and portfolio commentary, showing how LLMs can augment traditional quant tools rather than replace them. Future work includes adding fundamental factors to the weekly model, expanding the model zoo with time-series cross-validation, integrating full transaction-cost-aware backtests directly into the app, and hardening the system with scheduled ETL and a production database for continuous updates..