Milestone Submission: Week 3–4 (Due April 27)

Github Repo: https://github.com/JOOJOONOGHLI/cs194-project-ryan

1. Formalization of Component Modules

1.1 Signal Generation

Mean Reversion Strategy:

- Inputs: Historical price series of assets (daily closes)
  - General commodities (Gold, Crude, Natural Gas, Power)
  - Other novel commodities are also a candidate, but wanted to make the dashboard as comprehensive as possible for industry use/white labeling
- Signal:
  - Calculate Z-score of asset returns or price relative to moving average.
  - Buy signal: Z-score < -threshold; Sell signal: Z-score > +threshold.
- Output: Discrete trading signals (+1 for buy, -1 for sell, 0 for hold).
- Next Step: Optimize threshold and window length parameters.

Lead-Lag Strategy:

- Inputs: Time series data of correlated asset pairs.
- Signal:
  - Identify leading asset based on Granger causality or correlation with lag.
  - Trade lagging asset when leading asset moves.
- Output: Buy/Sell triggers based on leader movement.
- Next Step: Formalize feature engineering for causal pair identification.

1.2 Lifecycle Prediction

Objective: Predict whether a component is "Active", "NRFFD", or "Discontinued."

- Inputs: Historical price, shipment volumes, supply data, technical attributes.
- Model:
  - Use a supervised classification model (Logistic Regression or Random Forest baseline).
- Output: Predicted class plus probability distribution.
- Next Step: Feature engineering from Bills of Materials (BOMs) and parametric fields.

1.3 NLP-Based Sentiment Tagging

Objective: Analyze supplier and customer commentary (emails, transcripts) for market sentiment.

- Inputs: Text data (email bodies, press releases, news articles).
- Model:
    - Use a fine-tuned transformer (DistilBERT or FinBERT) to classify sentiment (positive, neutral, negative).
- Output: Sentiment score attached to components or sectors.
- Next Step: Curate labeled dataset from historical corporate disclosures.
2. Literature Review

Can offer more color on reasoning behind each of the 3 strategies, mainly these are based on my experience from Shadowing a systematic crude oil trader.

2.1 Financial Reinforcement Learning

- Jiang et al. (2017): "Deep Reinforcement Learning for Trading" — Presents policy gradient methods (DDPG) applied to trading multiple assets.
- Moody and Saffell (2001): "Learning to Trade via Direct Reinforcement" — Early proposal of online direct reinforcement learning for trading.
- Feng et al. (2019): "Reinforcement Learning for Trading Systems and Portfolios" — Reviews actor-critic methods and reward shaping in finance.
- Key Takeaways:
    - Reward design (such as risk-adjusted returns or Sharpe ratio) is critical.
    - Importance of handling partial observability and transaction costs.

2.2 Existing Agent-Based Market Diagnostic Systems

- Lux and Marchesi (1999): "Scaling and Criticality in a Stochastic Multi-Agent Model of a Financial Market" — Early agent-based model with noise traders and fundamentalists simulating crashes.
- LeBaron (2001): "Empirical Regularities from Interacting Agents" — Agent simulations matching real-world asset return features like fat tails and volatility clustering.
- Recent Developments:
    - Multi-agent reinforcement learning (MARL) for complex market simulation.
    - Modeling supply-demand curves in alternative assets and semiconductor sectors.
- Key Takeaways:
    - Realistic market simulations require heterogeneous agent classes.
    - Calibration to empirical data is necessary for predictive validity.

Annotated Bibliography

1. World Economic Forum & Cambridge Centre for Alternative Finance (2024). "How Agentic AI will transform financial services."
URL:
https://www.weforum.org/stories/2024/12/agentic-ai-financial-services-autonomy-efficiency-and-inclusion/
This article explores how agentic AI, which enables autonomous decision-making and learning, is set to revolutionize financial services. It discusses the benefits of increased efficiency, innovation, and inclusion, while also highlighting challenges around governance, labor disruption, and privacy. The piece provides an overview of agentic AI's potential to personalize financial services and optimize workflows, emphasizing the need for robust oversight and ethical frameworks.[1]

2. Bryan Zhang et al. (2024). LinkedIn post on Agentic AI in Financial Services.
URL:
https://www.linkedin.com/posts/bryanzhengzhang_genai-agenticai-ai-activity-7269263898929725440-8Zak
This LinkedIn post by a leading researcher at the Cambridge Centre for Alternative Finance introduces a World Economic Forum article on agentic AI. It summarizes key points about agentic AI's ability to act independently, its impact on financial services, and the importance of addressing governance and equity concerns.[2]

3. Dattaraj Rao (2025). "Future of Agentic AI in Financial Services."
URL: https://www.linkedin.com/pulse/future-agentic-ai-financial-services-dattaraj-rao-gafpf
This article provides an in-depth look at agentic AI's capabilities, including autonomous learning, real-time decision-making, and applications across wealth management, institutional investment, and insurance. It details use cases such as dynamic portfolio management, adaptive financial advice, and operational efficiency improvements.[3]

4. Market.us (2025). "Agentic AI For Financial Services Market Size | CAGR of 43%."
URL: https://market.us/report/agentic-ai-for-financial-services-market/
This market report analyzes the rapid growth of agentic AI in financial services, projecting a CAGR of 43.8% through 2034. It highlights adoption trends, regional market shares, and the technology's use in automating workflows, compliance, and customer engagement.[4]

5. Moody's (2025). "Agentic AI in financial service."
URL: https://www.moodys.com/web/en/us/creditview/blog/agentic-ai-in-financial-services.html
Moody's blog discusses the evolution of AI in finance from passive assistance to agentic autonomy. It covers efficiency gains, strategic implications for investment and risk management, and the importance of explainable AI and governance for regulatory compliance.[5]

6. Silent Eight (2025). "Agentic AI in AML & Risk Management."
URL:
https://www.linkedin.com/posts/silenteight_smarter-faster-stronger-agentic-ai-in-activity-7303052113247379458-rF1T

This LinkedIn post outlines how agentic AI is transforming anti-money laundering (AML) and risk management. It explains the technology's role in contextual decision-making, continuous learning, end-to-end automation, and integrating human oversight for compliance.[6]

Dashboarding for Financial Assets

7. Kubera. "How to Build a Bulletproof Financial Dashboard."
URL: https://www.kubera.com/blog/financial-dashboard
This blog provides a step-by-step guide to building a comprehensive financial dashboard. It covers asset aggregation, layout planning, and the inclusion of traditional and alternative assets, offering practical advice for customization and real-time tracking.[7]

Each source above is directly relevant to either agentic AI in financial trading or dashboarding for financial assets, and the annotation describes its main contribution to the literature.

Some Screenshots of Some of my Dashboard:

Older Draft:
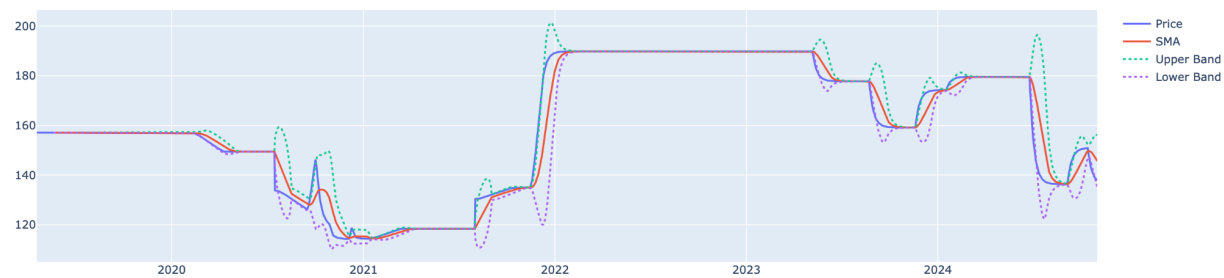
Newer Draft (UI Improvements and Search Functionality):