Advanced AI Applications in Finance

SESSION 3 | AFTERNOON (13:30 – 16:30)

PORTFOLIO ANALYSIS, DUE DILIGENCE & CONTINUOUS MONITORING

Afternoon Agenda

Part A: Portfolio Analysis

Stress testing, regime identification, and AI-driven ESG integration (60 min).

Part B: Due Diligence

Processing VDRs, automating legal review, and red-teaming investment theses (60 min).

Part C: Monitoring

Fraud detection, anomaly alerts, and future agentic workflows (45 min).

Part A: Portfolio Analysis & Risk

Optimizing Allocations with the AI Trinity

Part A: Session Agenda

1. Workflow

Establishing the "AI Trinity" pipeline for data aggregation and macro context.

2. Stress Testing

Running Monte Carlo simulations and dynamic correlation matrices in Python.

3. ESG & Exercise

Automated sustainability scoring and a $5B portfolio risk scan scenario.

The "AI Trinity" Portfolio Workflow

Step 1: Aggregate

Gemini: Ingest scattered CSVs, PDFs, and emails to create a unified "Golden Source" of exposure data in Sheets.

Step 2: Contextualize

Perplexity: Identify qualitative market regimes (e.g., "Stagflation") via real-time web search.

Step 3: Simulate

ChatGPT (Python): Stress test the aggregated portfolio against the identified regimes using Monte Carlo.

Step 1: Intelligent Data Aggregation

From Chaos to Order

The biggest bottleneck in risk management is dirty data. Analysts spend 80% of their time cleaning data and only 20% analyzing it.

Problem: Custodians send data in different formats (PDF, CSV, Body of Email).

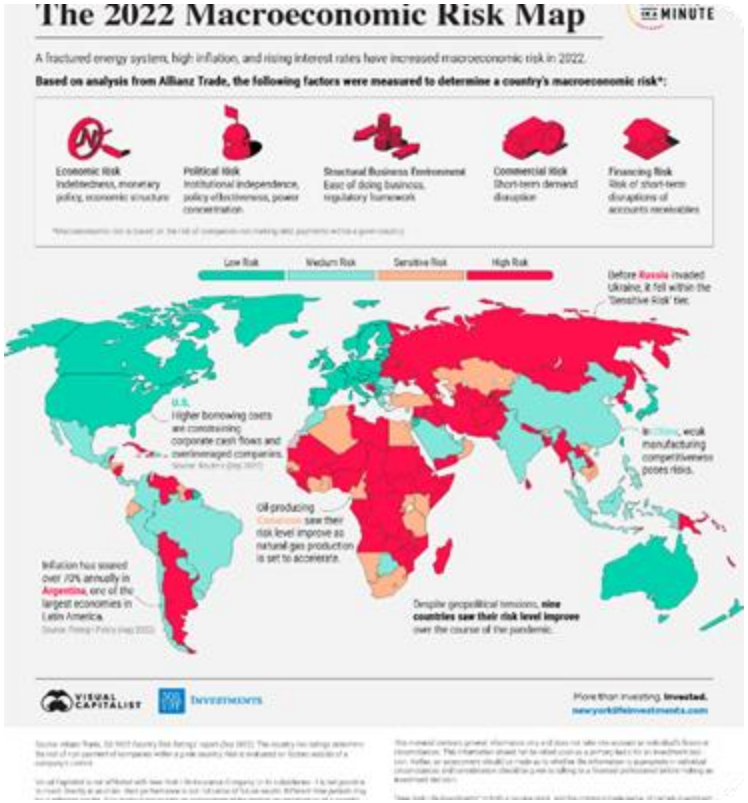
Solution: Use Multimodal AI to parse visual tables in PDFs and standardize headers into a master JSON/CSV format.

Step 2: Macro Regime Identification

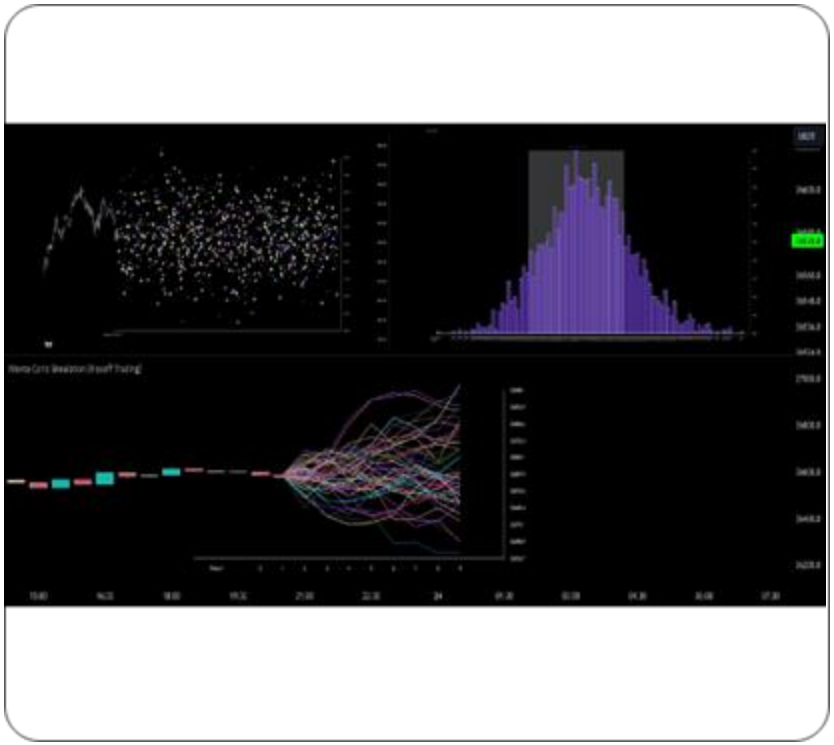
Beyond Static Data: Traditional feeds provide lagging indicators (CPI, GDP). AI Search provides leading qualitative context.

The Prompt: "Scan the last 2 weeks of IMF reports and G7 central bank minutes. Identify the consensus probability of a 'Higher for Longer' rate regime."

Output: A specific set of assumptions (e.g., "Rates > 5% for 12 months") to feed into your quantitative model.



Step 3: Monte Carlo Simulations



Simulating the Unseen

We use Python to generate thousands of potential future paths for the portfolio based on our Macro Regime assumptions.

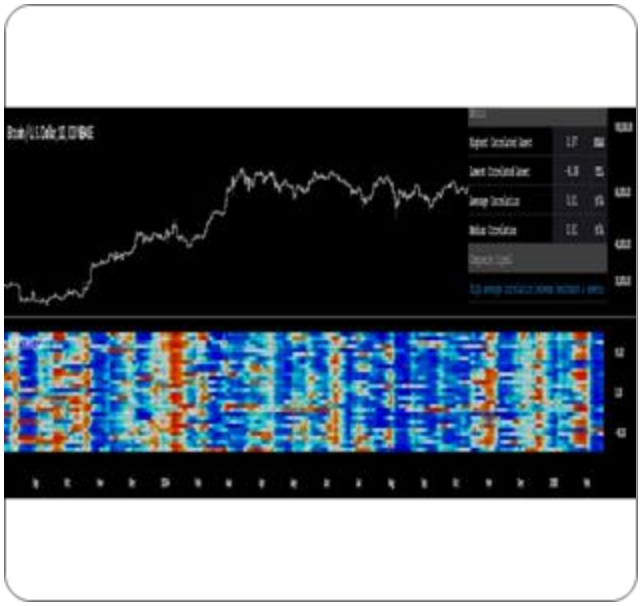
$$dS_t = \mu S_t dt + \sigma S_t dW_t$$

Code Interpreter: "Run 10,000 simulations using Geometric Brownian Motion. Calculate the 95% Value at Risk (VaR) if volatility spikes by 20%."

Dynamic Correlation Matrices

The Crisis Correlation Trap

In normal markets, equities and bonds might be negatively correlated. In a liquidity crisis, correlations often converge to 1.0.



Dynamic Modeling: Use AI to adjust the correlation matrix based on the stress regime.

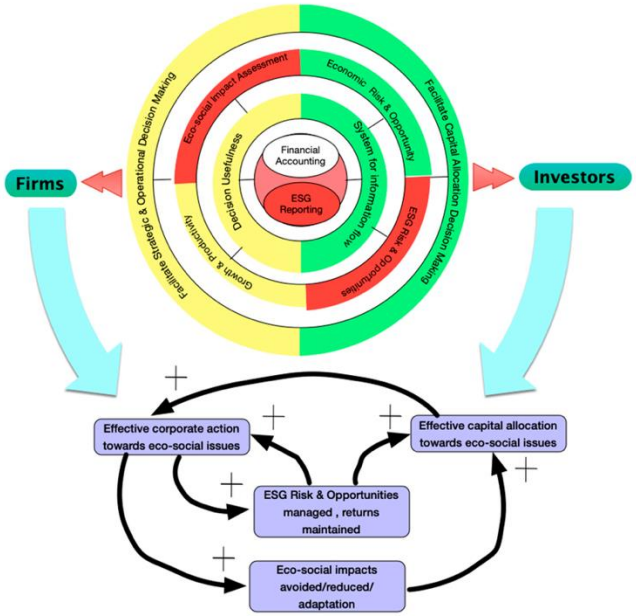
Scenario: "Re-calculate portfolio variance assuming the correlation between Tech Stocks and 10Y Treasuries shifts from -0.3 to +0.6."

ESG Integration: Unstructured Data

The Challenge: ESG data is trapped in unstructured PDF reports. Manual scoring is subjective and slow.

The Solution: Use LLMs (like Claude) with large context windows to ingest entire reports.

Extraction: "Extract the Scope 1, 2, and 3 emission tonnages for 2023 and 2024. Present in a table."



The "Greenwashing" Detector

The Vague Promise

Companies often use ambiguous language like "aspiring to" or "working towards" without concrete milestones.

The AI Audit Prompt

"Review the 'Net Zero' section. Flag any sentences that use non-binding language. Compare their carbon offset strategy against the Oxford Principles for Net Zero Aligned Carbon Offsetting."

Exercise 3: Portfolio Risk Scan

Scenario: You manage a $5B Multi-Asset Global Portfolio.

1 **Task 1:** Use Perplexity to identify 3 "Black Swan" risks in the current Asian market.

2 **Task 2:** Use ChatGPT to simulate a 15% currency devaluation in that region. How does it impact your unhedged equity positions?

Output: Draft a 1-page "Risk Alert" memo for the Investment Committee.

Part B: Session Agenda

1. The Data Room

Taming hundreds of files using 200k+ token context windows to ingest "The Whole Room."

2. Automated Memos

Turning raw research into formatted Investment Memos instantly.

3. Red Teaming

Using AI as an adversary to challenge your thesis and find valuation gaps.

The Bottleneck: VDR Overload

Drowning in Documents

Modern due diligence involves processing thousands of files in a secure Virtual Data Room (VDR). The sheer volume often leads to "sampling" rather than comprehensive review.

Risk: Missing a single critical "Change of Control" clause in a minor subsidiary contract.

Time Sink: Junior analysts spend 80% of their time indexing files, not analyzing them.

Virtual Data Room Vs. Cloud Storage

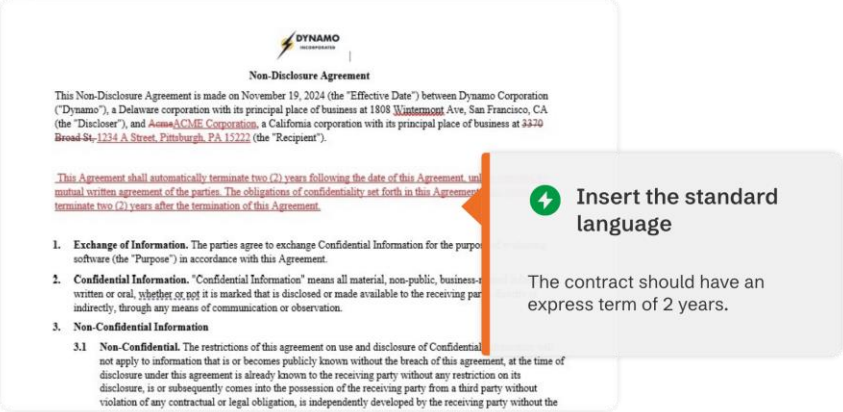
	Virtual data room	Cloud storage
Best for	Business needs	Personal use
Control		
Distribution of user roles	✓	✓
Custom access levels	✓	✗
User activity control	✓	✗
View only access	✓	✓
View time tracking	✓	✗
Security		
Basic security certifications	✓	✓
Advanced security certifications	✓	✗
Real-time data backup	✓	✗
Remote shred	✓	✗
Protection against mitm attacks	✓	✗
Custom watermarks	✓	✗
Encryption of sensitive data	✓	✗
Screenshot protection	✓	✗
Prevent download and print	✓	✓

The Solution: Infinite Context

- **200k+ Tokens:** Models like Claude and Gemini 1.5 Pro can now hold the equivalent of 500+ pages of text in their "working memory" at once.
- **Whole-Room Analysis:** Instead of uploading one file at a time, we upload the entire "Legal" folder.
- **Result:** The AI can cross-reference definitions across 50 separate agreements simultaneously.

Automating Legal Review

The Mission: Find "Poison Pills."



- **The Prompt:** "Review these 20 customer contracts. Extract any clause that allows the customer to terminate upon a 'Change of Control'. List the customer name, revenue at risk, and the exact page number."
- **The Output:** A structured risk table generated in seconds, ready for the Investment Committee.

Cross-Referencing: The "Hidden" Risks

HR vs. Legal

Does the "Key Employee" list in the Pitch Deck match the "Employment Agreements" in the VDR? AI finds the gaps.

Tech vs. IP

Does the "Proprietary Tech" claimed in marketing materials actually have filed patents in the "IP Folder"?

Litigation Check

Scanning the "General Ledger" for payments to law firms that aren't disclosed in the "Active Litigation" schedule.

From Research to Document

The Investment Memo is the culmination of diligence.

Writing it is often a formatting struggle.

Input: Raw Research Notes + Financial Model Exports + Risk Assessment.

Process: "Act as a Senior Associate. Draft a 5-page memo following this [Attached Template]. Prioritize risks identified in step 2."

Benefit: 80% draft in 5 minutes. You spend your time refining the *judgment*, not the formatting.

YOUR LOGO

Company Email Address
Company Website
Company Number
Company Social Media

Financial Investment Strategy Memo Template

To: [Recipient Name]

From: [YOUR NAME]

Date: August 5, 2050

Subject: Financial Investment Strategy

I am writing to provide you with an overview of our proposed Financial Investment Strategy. This strategic overview is designed to steer our future investments and financial holdings to maximize returns, mitigate risks, and align our inventory with our long-term business goals.

Objectives

The main objective of this memorandum is to initiate a discussion and formulate a plan for our financial investment strategy. The strategy will aim to leverage high-growth instruments, diversify our portfolio, and make data-driven investment decisions.

Suggested Plan

Given the current state of the financial market and our particular needs, I suggest taking a diversified investment approach. This would involve strategic allocation of funds into different types of assets – including stocks, bonds, mutual funds, and perhaps exploring disruptive areas, such as blockchain or AI-related investments.

Benefits

The "Red Team" Adversary

Defeating Confirmation Bias

Deal teams often fall in love with the deal. We use AI to break that bias.

The Adversarial Prompt

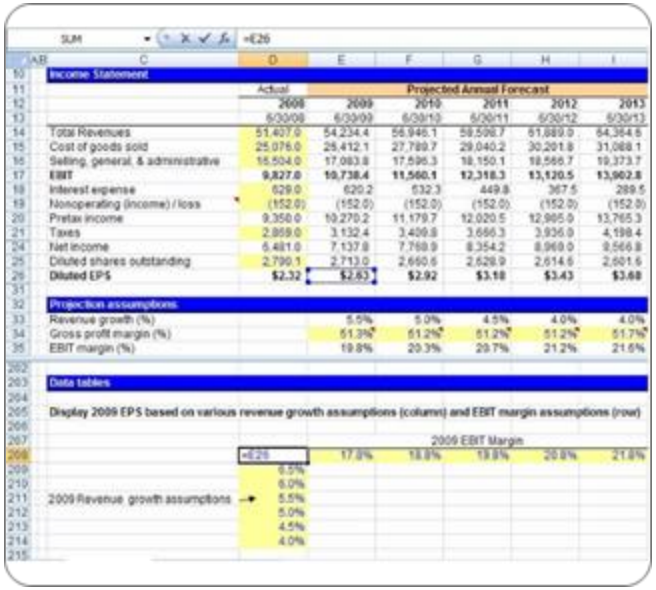
"You are a Short Seller from a rival firm. Read my Bull Case thesis below. Identify the 3 weakest assumptions and explain why this company is actually overvalued by 50%."

Valuation Reality Check

Sensitivity Analysis

We ask the AI to challenge our quantitative inputs.

- **Scenario:** "If Churn increases by just 2%, what happens to LTV/CAC and implied Terminal Value?"
- **Output:** A sensitivity table showing the "zone of failure" for the investment.



SUM =E26

	C	D	E	F	G	H	I
10	Income Statement						
11		Actual	Projected Annual Forecast				
12		2008	2009	2010	2011	2012	2013
13		6/30/08	6/30/09	6/30/10	6/30/11	6/30/12	6/30/13
14	Total Revenues	51,407.0	54,234.4	56,946.1	59,598.7	61,889.0	64,364.6
15	Cost of goods sold	25,076.0	26,412.1	27,789.7	29,040.2	30,201.8	31,088.1
16	Selling, general, & administrative	16,504.0	17,083.8	17,596.3	18,150.1	18,568.7	19,373.7
17	**EBIT**	**9,827.0**	**10,738.4**	**11,560.1**	**12,318.3**	**13,120.5**	**13,902.8**
18	Interest expense	629.0	620.2	632.3	449.8	367.5	289.5
19	Nonoperating (income) / loss	(152.0)	(152.0)	(152.0)	(152.0)	(152.0)	(152.0)
20	Pretax income	9,350.0	10,270.2	11,179.7	12,020.5	12,905.0	13,765.3
21	Taxes	2,869.0	3,132.4	3,409.8	3,666.3	3,936.0	4,198.4
24	Net income	6,481.0	7,137.8	7,769.9	8,354.2	8,969.0	9,566.8
25	Diluted shares outstanding	2,790.1	2,713.0	2,660.6	2,628.9	2,614.6	2,601.6
29	**Diluted EPS**	**$2.32**	**$2.63**	**$2.92**	**$3.18**	**$3.43**	**$3.68**
31							
32	Projection assumptions						
33	Revenue growth (%)		5.5%	5.0%	4.5%	4.0%	4.0%
34	Gross profit margin (%)		51.3%	51.2%	51.2%	51.2%	51.7%
35	EBIT margin (%)		19.8%	20.3%	20.7%	21.2%	21.6%
202							
203	Data tables						
204							
205	Display 2009 EPS based on various revenue growth assumptions (column) and EBIT margin assumptions (row)						
206							
207			2009 EBIT Margin				
208		=E26	17.8%	18.8%	19.8%	20.8%	21.8%
209		6.5%					
210		6.0%					
211	2009 Revenue growth assumptions →	5.5%					
212		5.0%					
213		4.5%					
214		4.0%					
215							

Exercise 4: The Due Diligence Sprint

- **Inputs:** 3 "Dummy" Legal Agreements (PDFs) containing hidden risks.
- **Task:** Use Claude/GPT-4 to find the "Change of Control" clause and the "Uncapped Liability" clause.
- **Deliverable:** A 1-page "Go / No-Go" recommendation email.

Part C: Session Agenda

1. Anomaly Detection

Using statistical methods (Benford's Law) and AI to flag accounting irregularities instantly.

2. Sentiment Pulse

Continuous monitoring of management tone across earnings calls and news cycles.

3. Agentic Future

Moving from "Chatbots" to autonomous "Agents" that execute complex multi-step workflows.

The "Needle in a Haystack" Problem

Manual vs. Automated

Traditional monitoring relies on random sampling.

Auditors check 50 invoices out of 50,000.

- ✗ **The Flaw:** Fraudsters know how to hide in the noise. Random sampling misses 99% of the data.

- ✓ **The AI Advantage:** AI checks 100% of the transactions, 100% of the time, looking for patterns humans can't see.

Fraud Detection: Benford's Law

The Mathematical Truth

In naturally occurring financial datasets (expenses, revenues), the leading digit **'1'** appears about 30% of the time, while **'9'** appears less than 5% of the time.

The "Human" Tell

When humans invent numbers (e.g., creating fake invoices), they try to make them look "random," often distributing digits equally (11% each). This unnatural distribution triggers the AI.

Walkthrough: Benford Analysis

- **Input:** Upload a vendor ledger (CSV) to ChatGPT Code Interpreter.
- **The Prompt:** "Analyze the 'Amount' column for adherence to Benford's Law. Plot the actual distribution vs. expected. List top 5 vendor IDs with the highest deviation."
- **Output:** A bar chart revealing Vendor X has 80% of invoices starting with '9' (likely just under an approval limit).

Continuous Monitoring: Sentiment

Detecting the "Shift"

Management often signals trouble through tone before numbers.

- **Ingest:** Feed last 4 quarters of Earnings Call transcripts into the AI.
- **Track:** "Plot the frequency of 'uncertainty' words (e.g., 'challenging', 'headwinds') over time."
- **Alert:** Trigger a review if the "Confidence Score" drops by >1 Standard Deviation.

The Evolution: Chatbots vs. Agents

Chatbots (Now)

Reactive. You prompt, it answers. You must guide it step-by-step.
"Summarize this PDF."

Agents (Next)

Proactive. You give a goal, it figures out the steps, uses tools, and loops until finished.
"Monitor my portfolio for ESG risks and email me a weekly report."

Anatomy of a Financial Agent

- **The Brain (LLM):** Breaks the goal into tasks ("Check News", "Check Stock Price", "Write Summary").
- **The Tools:** APIs it can "call" (Web Search, Calculator, Email Client, Database).
- **The Loop:** It observes the output of a tool, decides the next step, and repeats until the goal is met.

```
> Agent: Goal received "Analyze Competitor X"
> Thought: I need to find their latest earnings.
> Action: Search_Web("Competitor X Q3 Earnings")
> Observation: Found report URL...
> Action: Read_PDF(url)
> ...
```

The Future: Multi-Agent Teams

- **Specialization:** Instead of one general AI, we will have teams of specialized agents.

1. **Researcher Agent:** Scours the web for data.
2. **Analyst Agent:** crunches the numbers in Python.
3. **Critic Agent:** Reviews the work for logical fallacies ("Red Teaming").

- **Result:** Higher quality output through automated peer review.

Session 3 Wrap-Up

Part A & B: The "Now"

- **Portfolio:** Contextualize risk with Perplexity.
- **Diligence:** Tame the VDR with large context windows.

Part C: The "Next"

- **Monitoring:** 100% coverage via AI anomaly detection.
- **Agents:** Moving from asking questions to delegating jobs.

Next Steps: Pick ONE workflow (e.g., Contract Review) and build your first prompt today.