AI with Code Execution

MGMT 675: Generative AI for Finance

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Why Code Execution Matters

- LLMs can write code, but writing is not the same as running
- Code execution enables:
    - Data analysis with real calculations
    - Visualizations and charts
    - File processing (Excel, CSV, PDF)
    - Iterative debugging—run, fix, repeat
- Transforms chatbots into computational tools

Code Execution Approaches

Chat-Based

- ChatGPT, Claude, Gemini
- Upload files, ask questions
- Server-side sandbox
- No internet access

Local Agents

- Cursor, VS Code, Claude Code
- AI runs code on your machine
- Full environment access
- Internet, databases, APIs

Cloud Agents

- Jules, GitHub Copilot agent
- Work on GitHub repos
- Cloud sandbox execution
- Async—runs in background

What is it?

- A Python environment that runs inside ChatGPT
- ChatGPT writes code, executes it, and returns results
- If code fails, it reads error messages and fixes them
- Sandboxed environment: secure but limited

Accessing Code Interpreter

- Available on free tier (limited to twice per day)
- ChatGPT Plus ($20/month) provides more usage
- GPT-5 is now the default model (GPT-4o still available)
- Code Interpreter is enabled automatically
- Upload files directly to the conversation

ChatGPT: What You Can Do

- Upload CSV, Excel files
- Statistical analysis
- Financial analysis
- Create visualizations
- Download results

ChatGPT: Limitations

- **No internet access**—cannot fetch live data
- Maximum file upload: 512 MB
- Runtime limit: 120 seconds per execution
- Session state clears when environment resets
- Pre-installed packages only

ChatGPT Exercise

"I'm uploading an Excel file with monthly returns for WMT, the excess market return (MKT-RF) and the risk-free rate (RF). Calculate excess returns for WMT and regress on MKT-RF to estimate the beta of WMT. Plot the data and the regression line."

ChatGPT will write Python code, run it, show results, and let you download the chart.

Download Data for Beta Exercise

What Do We Need to Check?

- Mostly, that it used the correct left-hand side and right-hand variables. Miscommunication could possibly cause an error.
- AI knows how to run regressions with Python, so that is not an issue.
- Can ask to see the code. Python is mostly readable. If something is unclear, ask ChatGPT about it.
- Can check against calculation by other method, but then no need to use AI, unless we are taking a step towards building an app.

Claude: Two Code Execution Features

Artifacts

- JavaScript in your browser
- Fast, lightweight
- Can save and publish artifacts

Python Execution

- Python/Bash on server
- Full linux environment
- **Can install packages (pip)**
- No internet access

Claude Exercise

"I'm uploading an Excel file with monthly returns for WMT, the excess market return (MKT-RF) and the risk-free rate (RF). Calculate excess returns for WMT and regress on MKT-RF to estimate the beta of WMT. Plot the data and the regression line."

Claude will write Python code, run it, show results, and let you download the chart.

Use same betas.xlsx file.

Claude Artifacts

- Interactive content in a panel next to the chat
- Codes in React/JavaScript—runs in your browser
- View, edit, and iterate in real-time
- **Save** artifacts to your account for later use
- **Publish** to create a public URL others can use (with charges to **their account, not yours**.)
- Create and check once. Use forever!

Claude Artifact Exercise

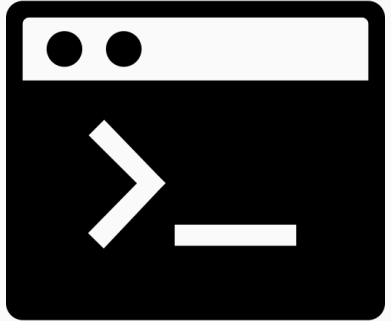*"Create an artifact that allows me to upload a csv file containing the return of a stock, the market excess return, and the risk-free rate over a given time period. Compute excess returns of the stock and regress them on the market excess return. Display the beta of the stock and a plot of the data with the regression line."*

Claude creates an interactive artifact with file upload, regression calculations, and a chart—all running in your browser.

Claude Artifact Limitations

- Artifacts use JavaScript only (not Python)
- Limited libraries
- No direct file system access
- Uploaded files consume context window

Local Execu- tion

Local Execution: Advantages

- **No sandboxing**—access databases, APIs, local files
- **Install anything**—pip install, npm, system packages
- **Large datasets**—no upload limits
- **Persistent state**—pick up where you left off
- **Version control**—code saved in your repo
- **Production path**—code is ready to deploy

Leading Local Execution Tools

- **Claude Code**—terminal agent
- **VS Code + Claude/Copilot**
- **Cursor**—AI-native IDE
- **Google AntiGravity**
- AI writes and runs code in your environment