

Module 3: Connecting AI to Data and Tools

MGMT 675: Generative AI for Finance

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The Connectivity Problem

AI in a Browser Is Powerful but Isolated

In Modules 1–2 we used Claude's built-in sandbox to analyze data and build models. But the sandbox has limits:

- Cannot access your local files, databases, or APIs
- Must upload data manually each session
- No internet access from the sandbox
- State is lost between conversations

To do real financial work, AI needs to connect to the outside world.

Three Ways to Extend AI's Reach

MCP Servers

- Plug-in protocol
- Connect to APIs, databases, browsers
- Works with Claude Desktop

Code Execution

- Claude Code runs on your machine
- Full file and network access
- VS Code or terminal

AI in Apps

- Excel add-in, Colab, Sheets
- AI works inside tools you already use
- Platform-specific features

This module covers all three approaches and when to use each.

MCP: The Universal Connector

What is MCP?

The **Model Context Protocol (MCP)** is an open standard that lets AI applications connect to external tools and data sources through a uniform interface.

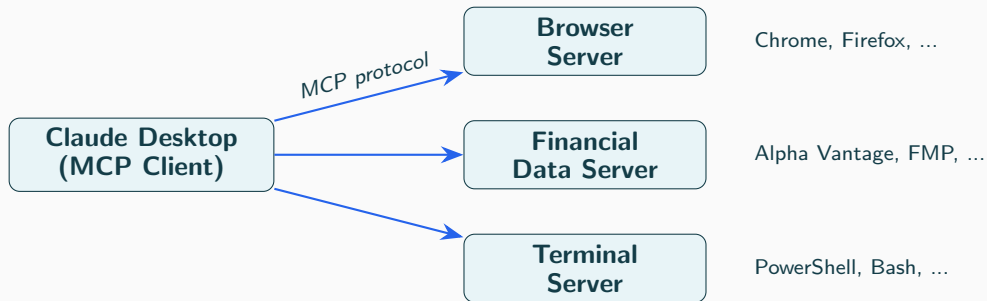
The Idea

- A standard “plug-in” protocol
- AI app connects to MCP servers
- Each server provides specific tools
- Tools appear automatically in the AI

Analogy

- USB is a standard for peripherals
- Plug in a keyboard, it just works
- MCP is a standard for AI tools
- Connect a server, tools just appear

How MCP Works



- Claude Desktop is the **client**; each external service runs as a **server**
- Servers expose **tools** (functions the AI can call) via a standard protocol
- You can connect multiple servers at once

Two Ways to Install MCP Servers

Desktop Extensions (Easy)

1. Open Claude Desktop
2. Go to **Settings** → **Extensions**
3. Click **Browse extensions**
4. Find the server you want
5. Click **Install**

One-click install. Anthropic-reviewed.

Manual Configuration

1. Install prerequisites (Node.js or uv)
2. Edit a JSON config file
3. Specify the server command
4. Restart Claude Desktop
5. Tools appear automatically

More control. Works with any server.

Prerequisites: Node.js and uv

MCP servers are distributed as Node.js or Python packages.

Node.js (for npx servers)

- Download the **LTS** installer from <https://nodejs.org>
- Run the installer (includes npm and npx)
- Verify: `node --version`

Used by: DesktopCommander, FMP

uv (for uvx servers)

- **Mac:** `brew install uv`
- **Windows:** `winget install astral-sh.uv`
- Verify: `uvx --version`

Used by: Browser-Use, Alpha Vantage

Install these before configuring any MCP server.

Connecting to Financial Data

MCP Servers for Financial Data

Alpha Vantage

- 115+ tools: stock prices, options, forex, crypto, economic indicators
- Free API key at <https://www.alphavantage.co>
- **Free tier**: 25 requests/day

Financial Modeling Prep

- 253+ tools: financial statements, fundamentals, SEC filings
- Free API key at <https://financialmodelingprep.com>
- **Free tier**: 250 requests/day

Install the server, ask Claude to pull data — **no code, no API documentation needed**.
Example: “Get Apple’s income statement for the last 5 years and compute revenue growth rates”

Installing Financial Data Servers

Alpha Vantage

```
"alphavantage": {  
  "command": "uvx",  
  "args": ["av-mcp", "YOUR_API_KEY"]  
}
```

Financial Modeling Prep

```
"financial-modeling-prep": {  
  "command": "npx",  
  "args": ["-y", "@hountini/fmp-mcp"],  
  "env": { "FMP_API_KEY": "YOUR_API_KEY" }  
}
```

Replace YOUR_API_KEY with your actual key. Then restart Claude Desktop.

Browser-Use: Web Automation via MCP

Browser-Use is an MCP server that lets Claude autonomously control a web browser. Describe a task in plain English, and it handles the navigation.

Finance Applications

- “Search for AAPL on Yahoo Finance and get the P/E ratio”
- “Download all linked CSV files from this SEC page”
- “Fill out this application form with my information”

Key Features

- Plain-language task descriptions
- Navigates pages and fills forms
- Extracts data from web pages
- **Recommended**: local (self-hosted) for full privacy

Connecting to Your Computer

Three Ways Claude Runs Code

Chat (Analysis)

- Sandboxed Python in the browser
- No local file access
- Must upload data manually
- Good for quick calculations

Cowork

- Runs in a local VM
- Can install packages
- Files synced to/from VM
- **No internet access**

Code

- Runs on **your machine**
- Full local file access
- Full internet access
- Most token-efficient

Code mode gives Claude direct access to your machine — no sandbox, no VM, no upload step.

DesktopCommander: Terminal Control via MCP

DesktopCommanderMCP gives Claude Desktop the ability to execute terminal commands, manage files, and control processes — without switching to Code mode.

What It Can Do

- Run terminal commands (pip install, git, scripts)
- Read, write, and search files
- Manage running processes

When to Use It

- You want to stay in Claude Desktop Chat
- Quick terminal tasks
- **Always review commands before approving**

Which Tool When?

Task	Chat	Artifacts	Cowork	Code
Explain WACC formula	✓			
Interactive DCF calculator		✓		
Analyze CSV, create Excel			✓	✓
Run Fama–French regressions			✓	✓
Organize 50 PDF 10-Ks			✓	
Fetch live data from APIs				✓

Rule of thumb: Start with Chat. If you need a visual, use Artifacts. If you need file I/O, use Code. Save Cowork for complex multi-file tasks.

Working in Notebooks

What is Colab?

- Free browser-based notebooks from Google
- No installation required
- Saves to Google Drive
- Gemini AI built in

How Gemini Helps

- Generate code from English descriptions
- Explain existing code and fix errors
- Suggest improvements
- Mount Google Drive for data files

Philosophy: *code environment with a chatbot* (vs. Claude: chatbot with code execution).

VS Code + Claude Code

VS Code

- Free desktop editor from Microsoft
- Works on Windows, Mac, Linux
- Supports Jupyter notebooks
- Explorer, Terminal, Extensions

Claude Code Extension

- AI sidebar inside VS Code
- Reference files with @filename
- Writes and runs code with your approval
- Same Claude Code as the terminal/desktop

When to use which: Colab for quick browser-based exploration; VS Code for serious projects with local files.

AI in Spreadsheets

Formulas vs. Hardcoded Values

Hardcoded (Bad)

```
sheet['B10'] = 1500
```

Cell shows 1500, but if inputs change, the total doesn't update.

Formula (Good)

```
sheet['B10'] = '=SUM(B2:B9)'
```

Cell contains a formula that recalculates when inputs change.

Always instruct AI to use formulas, not hardcoded values.

Claude for Excel Add-in

What It Does

- AI sidebar inside Excel
- Reads your workbook, modifies cells
- Preserves formula dependencies
- Works with local files — **no OneDrive required**

Capabilities

- Ask questions about workbook content
- Build financial models from scratch
- Trace and fix formula errors
- Create charts and pivot tables

Requires Claude Pro (\$20/mo). Install via **Insert** → **Get Add-ins** → “**Claude by Anthropic**”.

AI Spreadsheet Tools Compared

	Claude for Excel	Microsoft Copilot	Google Sheets + Gemini
Cost	Claude Pro (\$20/mo)	M365 Copilot (\$30/mo)	Google One AI Pro (\$20/mo)
Platform	Excel (Win/Mac/Web)	Excel (Win/Mac/Web)	Google Sheets (Web)
Key feature	Formula-preserving edits	Agent Mode, =COPILOT()	=AI() function
Python	Server-side sandbox	Python in Excel	Apps Script
OneDrive	Not required	Required (AutoSave on)	N/A (Google Drive)
Best for	Financial modeling	Enterprise ecosystem	Cloud collaboration

All three can produce the same kinds of financial tools — DCF calculators, amortization tables, scenario analyzers. Choose based on your ecosystem.

Combining Multiple Connections

Multi-Server MCP Configurations

You can connect multiple MCP servers at once. Claude sees all their tools and can use them together.

Example: Three Servers in One Config

```
{
  "mcpServers": {
    "browser-use": {
      "command": "uvx",
      "args": ["--from", "browser-use[cli]",
               "browser-use", "--mcp"],
      "env": {"ANTHROPIC_API_KEY": "sk-ant-..."}
    },
    "desktop-commander": {
      "command": "npx",
      "args": ["-y", "desktop-commander-mcp"]
    },
  }
}
```

Built-In Alternatives to MCP

DesktopCommander and Browser-Use add capabilities to Claude's **Chat** mode. But Code and Cowork modes have some of these built in.

	Chat	Code tab	Cowork tab
Terminal / files	MCP needed	Built in	Built in
Browser control	MCP needed	Chrome ext	Chrome ext
Internet access	No	Yes	No

MCP servers for **data sources** (Alpha Vantage, FMP, databases) remain valuable on any mode.

Exercises

Exercise 1: Financial Data via MCP

1. Get a free API key from Alpha Vantage or Financial Modeling Prep
2. Install the corresponding MCP server in Claude Desktop
3. Ask Claude to retrieve a company's financial data, analyze trends, and produce formatted Excel output

No code required — just install the server and ask questions in natural language.

Exercise 2: Browser Automation

Use Browser-Use MCP to navigate a financial website:

- Extract market cap, P/E ratio, and revenue for a company
- Compile a summary comparison of 3 companies
- Save results to a formatted document

Exercise 3: Stock Analysis in Colab

1. Open Google Colab (<https://colab.research.google.com>)
2. Ask Gemini to download daily returns for 3 stocks using `pandas-datareader` or `yfinance`
3. Ask Gemini to compute annualized mean returns, volatilities, betas, and a correlation matrix
4. Ask Gemini to create boxplots and cumulative return charts

Exercise 4: Loan Amortization in Excel

1. Open a new workbook in Excel
2. Launch the Claude add-in (Insert → Claude icon)
3. Ask Claude to build a 30-year mortgage amortization table for a \$200,000 loan at 6.5% with monthly payments
4. Ask Claude to chart principal vs. interest over time
5. Verify: **all values should use live formulas, not hardcoded numbers**

Summary

MCP

- Universal plug-in protocol
- Financial data, browser, terminal
- Works with Claude Desktop

Code Execution

- Chat, Cowork, Code modes
- Match the tool to the task
- Code for APIs and files

AI in Apps

- Excel, Colab, Sheets
- Formulas, not hardcodes
- Choose by ecosystem

AI becomes truly powerful when it can reach your data, your tools, and your files.