

Data Analysis

Data Analysis

Table 1: Summary Statistics—Full Sample (1870–2015)

Variable	Mean	Std. Dev.	P10	Median	P90	N
<i>Panel A: Nominal Total Returns</i>						
Equities	0.110	0.227	−0.129	0.086	0.357	2183
Housing	0.108	0.099	−0.001	0.101	0.223	1829
Govt. Bonds	0.060	0.082	−0.023	0.050	0.161	2215
Bills	0.045	0.030	0.016	0.040	0.084	2272
Total Wealth	0.100	0.084	0.009	0.092	0.197	1763
Risky (Eq+Hous)	0.112	0.103	0.000	0.104	0.227	1786
Safe (Bonds+Bills)	0.053	0.047	0.008	0.044	0.115	2168
<i>Panel B: Equity Return Components</i>						
Capital gain	0.067	0.221	−0.167	0.041	0.312	2090
Dividend return	0.043	0.017	0.020	0.043	0.064	2083
Dividend yield	0.041	0.017	0.019	0.041	0.062	2089
<i>Panel C: Housing Return Components</i>						
Capital gain	0.058	0.114	−0.050	0.046	0.179	1965
Rental return	0.055	0.020	0.033	0.052	0.084	1829
Rental yield	0.053	0.020	0.031	0.049	0.082	1841
<i>Panel D: Macroeconomic Variables</i>						
Inflation	0.039	0.085	−0.029	0.023	0.118	2312
Real GDP growth	0.020	0.043	−0.026	0.021	0.065	2320

Notes: This table reports summary statistics for the main variables. All returns are nominal and expressed as decimal fractions. P10, Median, and P90 are the 10th, 50th and 90th percentiles. All continuous variables are winsorized at the 0.5th and 99.5th percentiles. The sample covers 16 advanced economies, 1870–2015.

Table 11: Mean Nominal Equity Returns by Country and Era

Country	−1913	1914–45	1946–71	1972–	All
Australia	0.102	0.103	0.112	0.136	0.114
Belgium	0.055	0.133	0.065	0.135	0.098
Denmark	0.064	0.085	0.082	0.175	0.106
Finland	0.037	0.187	0.139	0.184	0.153
France	0.053	0.085	0.061	0.121	0.082
Germany	0.073	0.211	0.210	0.113	0.140
Italy	0.068	0.168	0.137	0.128	0.120
Japan	0.161	0.100	0.256	0.085	0.138
Netherlands	0.063	0.068	0.111	0.134	0.102
Norway	0.049	0.069	0.056	0.154	0.090
Portugal	0.068	0.124	0.064	0.130	0.099
Spain	0.036	0.093	0.141	0.143	0.116
Sweden	0.081	0.047	0.114	0.180	0.110
Switzerland	0.060	0.058	0.114	0.101	0.087
UK	0.064	0.070	0.131	0.139	0.100
USA	0.074	0.110	0.125	0.118	0.105
<i>All Countries</i>	<i>0.071</i>	<i>0.107</i>	<i>0.119</i>	<i>0.136</i>	<i>0.110</i>

Notes: Cell entries are mean nominal equity total returns by country and monetary regime. Empty cells indicate no data for that country-era. Columns: Classical Gold Standard, War and Interwar, Bretton Woods, and Modern Float.

Data Analysis

Table 21: Predictability of Equity Returns: Dividend-Yield Regressions

	(1)	(2)	(3)	(4)	(5)
	Baseline	+Inflation	+Controls	+Country FE	Real, 2-way FE
Dividend yield _{<i>t</i>-1}	1.119** (0.528)	1.244** (0.491)	1.796*** (0.515)	1.945*** (0.571)	2.142*** (0.408)
Inflation _{<i>t</i>-1}	—	0.253** (0.099)	0.265*** (0.099)	0.246** (0.106)	-0.212* (0.126)
Log real GDP p.c.	—	—	0.028*** (0.006)	0.035*** (0.007)	-0.014 (0.020)
Constant	0.064*** (0.024)	0.047** (0.021)	-0.218*** (0.063)	-0.300*** (0.083)	0.134 (0.164)
Country FE	No	No	No	Yes	Yes
Year FE	No	No	No	No	Yes
<i>R</i> ²	0.007	0.016	0.027	0.035	0.436
Observations	2072	2060	2060	2060	2055
Countries (clusters)	16	16	16	16	16

Notes: The dependent variable is the nominal equity total return in columns (1)–(4) and the real equity return in column (5). The key regressor is the lagged dividend yield. A positive coefficient is consistent with dividend-yield return predictability. Clustered standard errors (by country) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 28: Fama–MacBeth Cross-Sectional Regressions of Equity Returns

	(1)	(2)	(3)	(4)	(5)
	(div yld)	(+lag ret)	(+size)	(full)	Pooled, Year FE
Dividend yield _{<i>t</i>-1}	1.601*** (0.421)	1.751*** (0.398)	1.866*** (0.392)	1.842*** (0.409)	2.186*** (0.420)
Return _{<i>t</i>-1}	—	0.118*** (0.041)	0.105** (0.041)	0.087** (0.041)	0.107*** (0.025)
Log real GDP p.c.	—	—	-0.039* (0.022)	-0.029 (0.022)	-0.017** (0.008)
Inflation _{<i>t</i>-1}	—	—	—	-0.053 (0.178)	0.291* (0.153)
Constant	0.045** (0.022)	0.010 (0.021)	0.357* (0.213)	0.259 (0.208)	0.147* (0.077)
Time periods (<i>T</i>)	145	145	145	144	—
Avg. cross-section	14	14	14	14	2056

Notes: Fama–MacBeth estimates: equity returns are regressed on predictors cross-sectionally each year, and the time-series mean of the coefficients is reported with Fama–MacBeth standard errors (time-series standard error of the annual estimates). Years with fewer than three valid cross-sectional units are skipped. Columns marked † fall back to pooled OLS with year fixed effects where too few periods are available; column (5) is the pooled benchmark. Clustered standard errors (by country) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

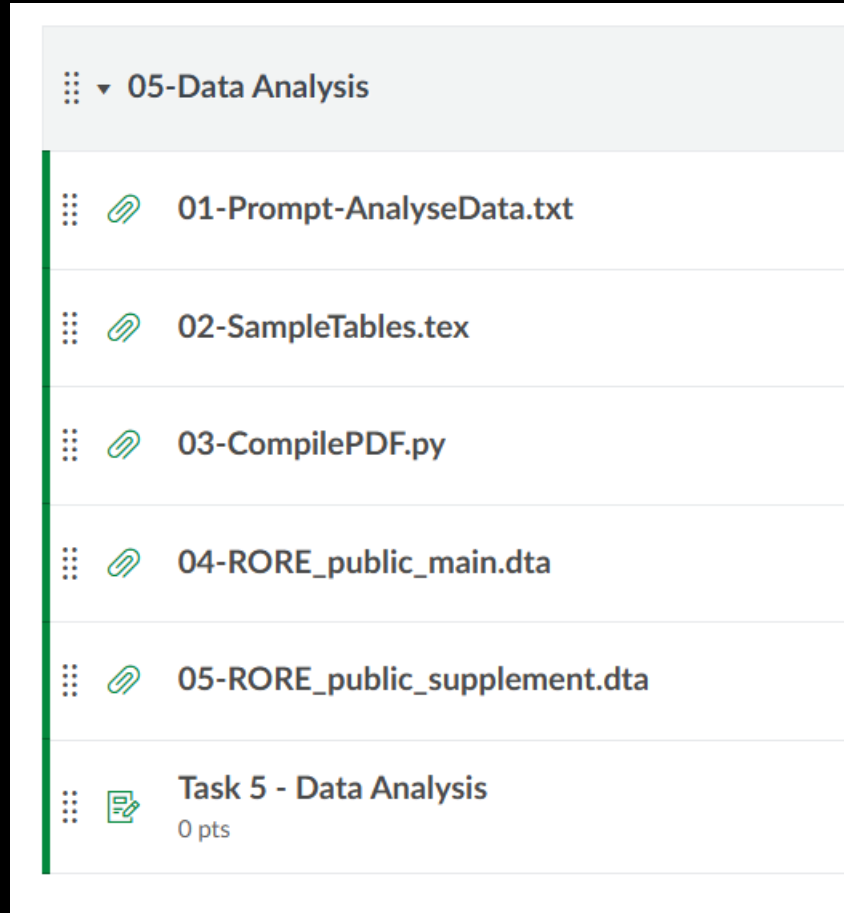
VS Code and Claude Code

- Ensure that you have installed VS Code, and added the Claude Code extension
- Follow the instructions from previous slides to ensure you have access

Python

- For this task you also need to have Python installed on your PC
- Download from <https://www.python.org>

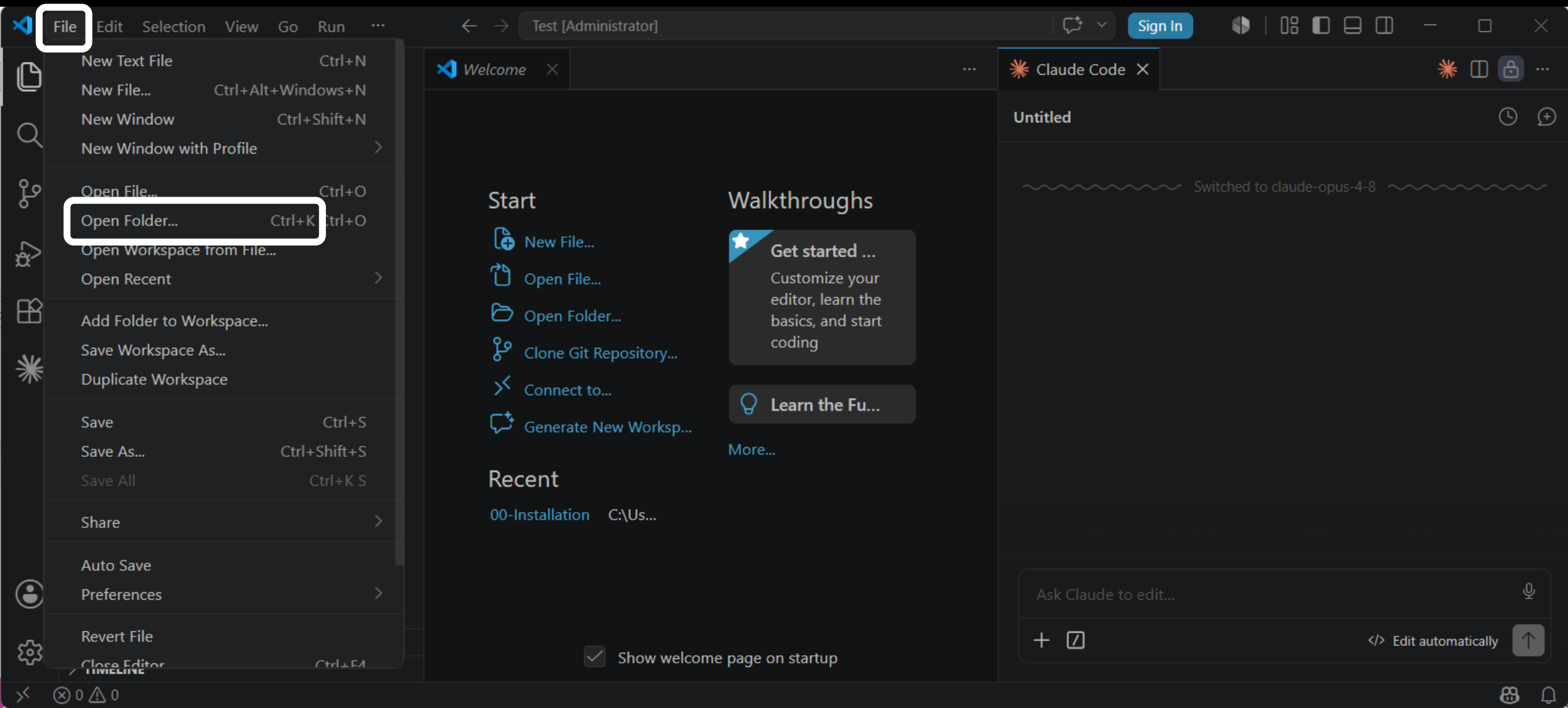
Download the files from the 05-Data Analysis section on Canvas



Save the files to a folder on your PC

-  01-Prompt-AnalyseData.txt
-  02-SampleTables.tex
-  03-CompilePDF.py
-  04-RORE_public_main.dta
-  05-RORE_public_supplement.dta

In VS Code, click File -> Open Folder Select the folder containing those files



Click on 01-Prompt-AnalyseData.txt

The screenshot shows a code editor interface with a dark theme. The top bar includes a menu (File, Edit, Selection, View, Go, Run), a search bar, and a "Sign In" button. The left sidebar contains an "EXPLORER" panel with a file tree. The main editor area displays the content of "01-Prompt-AnalyseData.txt". The right sidebar features a "CHAT" panel with a "Build with Agent" section.

EXPLORER

- 05-DATA ANALYSIS
 - 01-Prompt-AnalyseData.txt
 - 02-SampleTables.tex
 - 03-CompilePDF.py
 - 04-RORE_public_main.dta
 - 05-RORE_public_supplement.dta

01-Prompt-AnalyseData.txt

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1 =====
2 REQUIREMENTS - Please ensure before running:
3 =====
4 PYTHON: Install Python 3.x from https://www.python.org/downloads/
5     - Check "Add Python to PATH" during installation
6     - Required packages: pandas, numpy, statsmodels, linearmodels,
7       scipy, matplotlib, rdrobust (install via pip)
8     - pip install pandas numpy statsmodels linearmodels scipy
9       matplotlib rdrobust
10 =====
11 ## OBJECTIVES
12
13 Develop a publication-quality empirical finance article suitable
14 for the Journal of Finance with:
15
16 - **Topic**: Analyse the returns on equities, bonds, and housing,
17   over the long-run
18 - **Statistical Rigor**: Use appropriate statistical techniques
19   to explore the data comprehensively
20 - **Professional Formatting**: Journal of Finance standards per
21   02-SampleTables.tex
22
23 ---
24
25 ## DATA
```

CHAT

Build with Agent

AI responses may be inaccurate

[Generate Agent Instructions](#) to onboard AI onto your codebase.

+ 01-Prompt-AnalyseData.txt

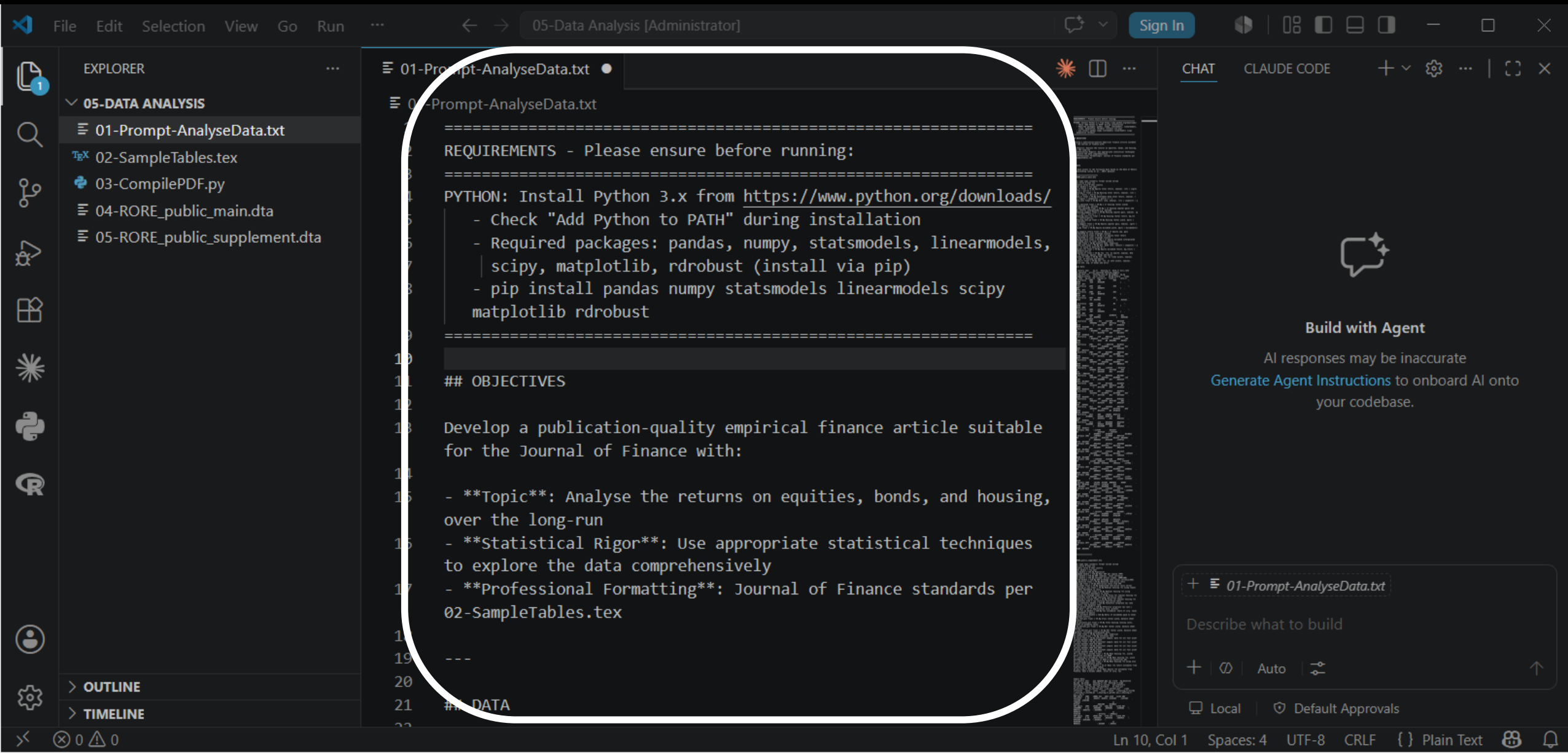
Describe what to build

+ | 🔍 | Auto | ⚙️

Local | Default Approvals

Ln 10, Col 1 Spaces: 4 UTF-8 CRLF {} Plain Text

Read through the prompt



05-Data Analysis [Administrator] Sign In

EXPLORER

- 05-DATA ANALYSIS
 - 01-Prompt-AnalyseData.txt
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```
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=====

## OBJECTIVES

Develop a publication-quality empirical finance article suitable
for the Journal of Finance with:

- **Topic**: Analyse the returns on equities, bonds, and housing,
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  02-SampleTables.tex

---

## DATA
```

CHAT CLAUDE CODE + ⚙️ ... | 🗂️ ✕

Build with Agent

AI responses may be inaccurate

Generate Agent Instructions to onboard AI onto your codebase.

+ 01-Prompt-AnalyseData.txt

Describe what to build

+ 🔍 Auto ⚙️ ↑

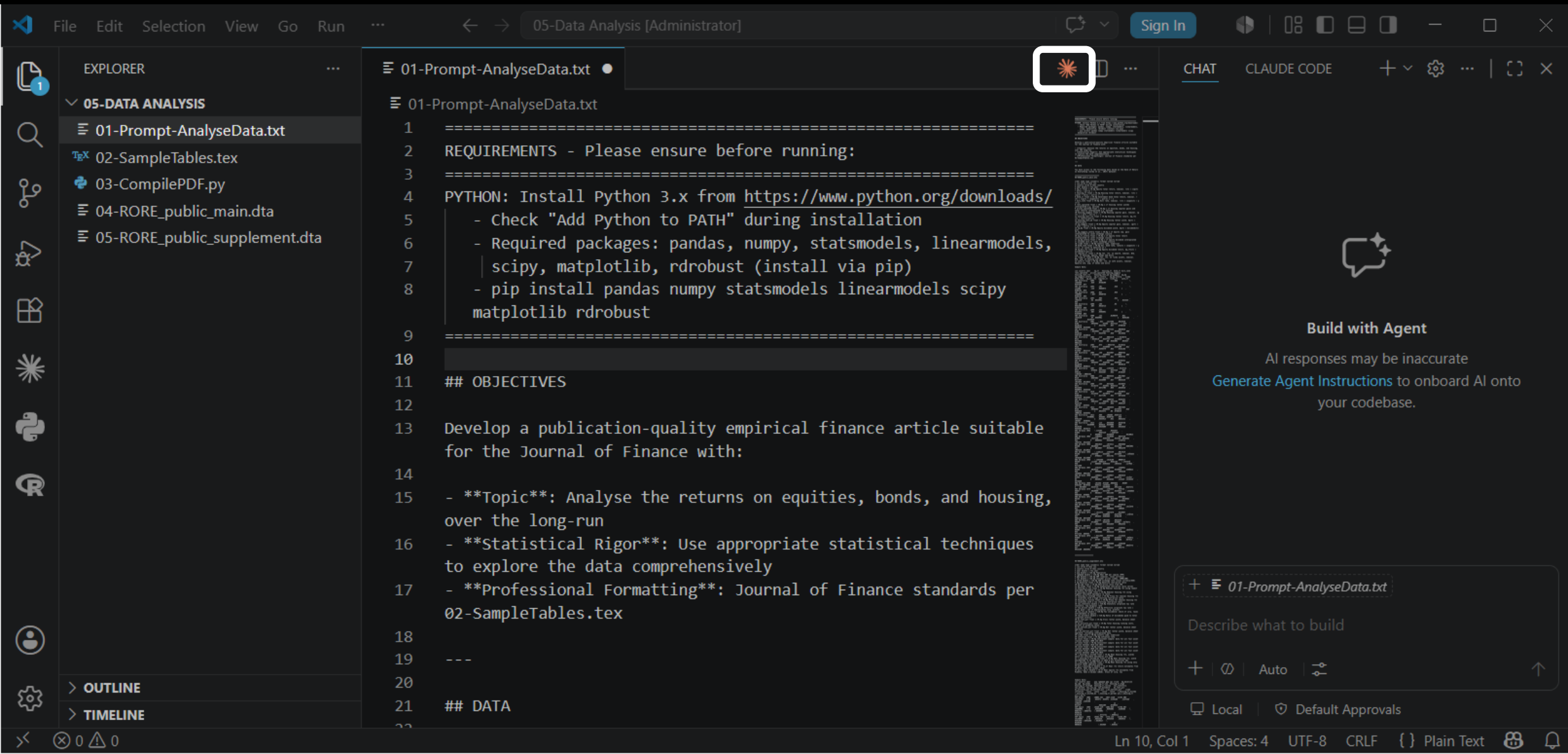
Local | Default Approvals

Ln 10, Col 1 Spaces: 4 UTF-8 CRLF {} Plain Text

Explanation of prompt

- Begins with a summary of installation requirements
- Asks Claude to perform rigorous data analysis
- Provides detailed information about the variables available
- Requests descriptive statistics, cross-tabulations, and regressions
- Compiles the results to a PDF

Click orange icon to open Claude Code



Close the other chat window

The screenshot shows the Visual Studio Code (VS Code) interface with the Claude Code extension. The interface is divided into several panels:

- EXPLORER:** Shows a file tree for a project named "05-DATA ANALYSIS". The files listed are:
 - 01-Prompt-AnalyseData.txt
 - 02-SampleTables.tex
 - 03-CompilePDF.py
 - 04-RORE_public_main.dta
 - 05-RORE_public_supplement.dta
- 01-Prompt-AnalyseData.txt:** The active file in the editor. It contains the following text:

```
1 =====  
2 =====  
3 =====  
4 =====  
5 PYTHON: Install Python 3.x  
6 from https://www.python.  
7 org/downloads/  
8 - Check "Add Python to  
9 PATH" during  
10 installation  
11 - Required packages:  
12 pandas, numpy,  
13 statsmodels,  
14 linearmodels,  
15 scipy, matplotlib,  
16 rdrobust (install via  
17 pip)  
18 - pip install pandas  
19 numpy statsmodels  
20 linearmodels scipy  
21 matplotlib rdrobust  
22 =====
```
- Claude Code:** A panel on the right side of the editor. It shows the Claude Code logo and a message: "Press **Shift** **Tab** to automatically approve code edits". Below this, there is a section titled "Meet Fable 5" with a close button (X). The text in this section reads: "Our newest model for complex, long-running work. Switch anytime with /model. Included in your plan limits until Jun 22, then switch to usage credits to continue." Below this, there is a section titled "Prefer the Terminal experience? Switch back in Settings." with a close button (X). At the bottom of the Claude Code panel, there is a search bar with the text "ctrl esc to focus or unfocus Claude" and a microphone icon. Below the search bar, there is a row of buttons: a plus sign (+), a square icon, a file icon labeled "01-Prompt-Ana...", a double arrow icon labeled "Aut...", and an up arrow icon.
- CHAT:** A panel on the right side of the editor. It shows the "Build with Agent" section with the text: "AI responses may be inaccurate. Generate Agent Instructions to onboard AI onto your codebase." Below this, there is a section titled "01-Prompt-AnalyseData.txt" with the text "Describe what to build". At the bottom of the chat panel, there is a row of buttons: a plus sign (+), a file icon, the text "Auto", and a double arrow icon.

Ensure Settings use Model=Opus, Effort=High, and Auto Mode

The image shows a side-by-side comparison of the Visual Studio Code (VS Code) editor and the Claude Code interface. The VS Code window on the left is titled '05-Data Analysis [Administrator]' and shows a file explorer on the left with a folder named '05-DATA ANALYSIS' containing several files. The main editor area displays a file named '01-Prompt-AnalyseData.txt' with the following content:

```
1 =====  
2 =====  
3 REQUIREMENTS - Please ensure before running:  
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5 =====  
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23 techniques to explore the data comprehensively  
24 - **Professional Formatting**: Journal of Finance
```

The Claude Code window on the right is titled 'Untitled' and shows the Claude Code logo and a message: 'Type /model to pick the right tool for the job.' Below this is a notification for 'Meet Fable 5' and a prompt to 'Prefer the Terminal experience? Switch back in Settings.' At the bottom of the Claude Code window, there is a search bar with the text 'ctrl esc to focus or unfocus Claude' and a button labeled 'Auto mode' which is highlighted with a white box.

Ask Claude Code: implement 01-Prompt-AnalyseData.txt

The screenshot displays the Claude Code application interface. On the left is a sidebar with an 'EXPLORER' view showing a project structure under '05-DATA ANALYSIS'. The main area is a code editor for '01-Prompt-AnalyseData.txt'. The code contains requirements and objectives for an empirical finance article. On the right, the 'Claude Code' chat window is open, showing a prompt to implement the file and a confirmation button.

EXPLORER

- 05-DATA ANALYSIS
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01-Prompt-AnalyseData.txt

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It will produce a PDF with 30 tables of analysis

The image shows a VS Code editor window titled "05-Data Analysis [Administrator]". The Explorer sidebar on the left lists files under "05-DATA ANALYSIS", including "01-Prompt-AnalyseData.txt" which is currently selected. The main editor area displays the content of "01-Prompt-AnalyseData.txt", which contains instructions for setting up a Python environment and a list of requirements (pandas, numpy, statsmodels, linearmodels, scipy, matplotlib, rdrobust). The chat window on the right, titled "Implement prompt analyze data script", shows a successful completion message for "01-Prompt-AnalyseData.txt" and a summary of the analysis pipeline. A white rounded rectangle highlights the "Done" message and the summary text. The status bar at the bottom indicates "Ln 478, Col 41", "Spaces: 4", "UTF-8", "CRLF", and "Plain Text".

File Edit Selection View Go Run ... 05-Data Analysis [Administrator] Sign In

EXPLORER

- 05-DATA ANALYSIS
 - __pycache__
 - 01-Prompt-AnalyseData.txt
 - 02-SampleTables.tex
 - 03-CompilePDF.py
 - 04-RORE_public_main.dta
 - 05-RORE_public_supplement.dta
 - 101_setup.log
 - 101_setup.py
 - 102_descriptive.log
 - 102_descriptive.py
 - 103_crosstabs.log
 - 103_crosstabs.py
 - 104_regressions.log
 - 104_regressions.py
 - analysis_panel.pkl
 - results_errors.log
 - results.aux
 - results.log
 - results.out
 - results.pdf
- OUTLINE
- TIMELINE

01-Prompt-AnalyseData.txt results.pdf

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01-Prompt-AnalyseData.txt
1 =====
2 REQUIREMENTS - Please ensure before running:
3 =====
4 PYTHON: Install Python 3.x from https://www.python.org/downloads/
5 - Check "Add Python to PATH" during installation
6 - Required packages: pandas, numpy, statsmodels, linearmodels,
7   | scipy, matplotlib, rdrobust (install via pip)
8 - pip install pandas numpy statsmodels linearmodels
9   | scipy matplotlib rdrobust
10 =====
11 ## OBJECTIVES
12
13 Develop a publication-quality empirical finance
14 article suitable for the Journal of Finance with:
15 - **Topic**: Analyse the returns on equities, bonds,
16   and housing, over the long-run
17 - **Statistical Rigor**: Use appropriate statistical
18   techniques to explore the data comprehensively
19 - **Professional Formatting**: Journal of Finance
```

Implement prompt analyze data script

</> c:\Users\3044512\My Drive (...)

implement 01-Prompt-AnalyseData.txt

- All stages complete. Here's the summary.

Done — 01-Prompt-AnalyseData.txt implemented

I built the full empirical-finance pipeline on the Jordà et al. *Rate of Return on Everything* data (16 countries, 1870–2015) and delivered a **23-page, 30-table PDF** (results.pdf) built from the **full dataset**.

Files created

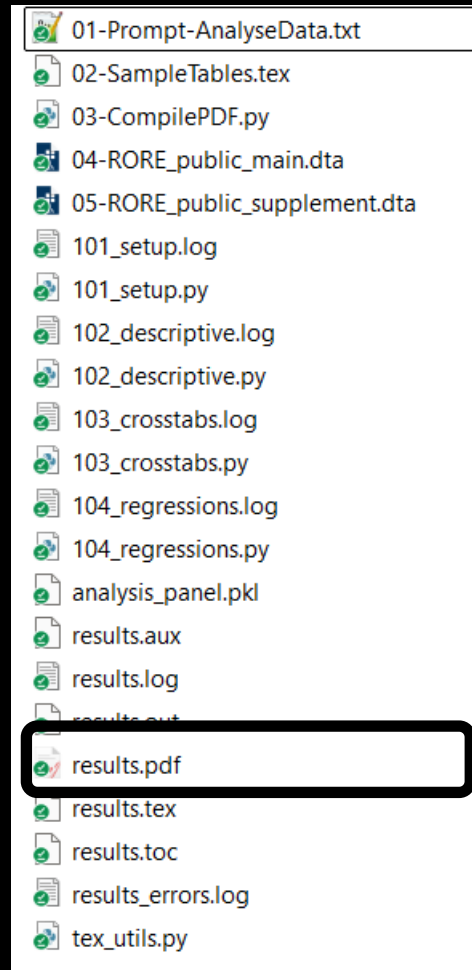
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ctrl + ... to focus or unfocus Claude

+ 01-Prompt-AnalyseData.txt Auto mode

Ln 478, Col 41 Spaces: 4 UTF-8 CRLF {} Plain Text

In Windows File Explorer (not VS Code) double-click results.pdf



Data Analysis

Table 1: Summary Statistics—Full Sample (1870–2015)

Variable	Mean	Std. Dev.	P10	Median	P90	N
<i>Panel A: Nominal Total Returns</i>						
Equities	0.110	0.227	−0.129	0.086	0.357	2183
Housing	0.108	0.099	−0.001	0.101	0.223	1829
Govt. Bonds	0.060	0.082	−0.023	0.050	0.161	2215
Bills	0.045	0.030	0.016	0.040	0.084	2272
Total Wealth	0.100	0.084	0.009	0.092	0.197	1763
Risky (Eq+Hous)	0.112	0.103	0.000	0.104	0.227	1786
Safe (Bonds+Bills)	0.053	0.047	0.008	0.044	0.115	2168
<i>Panel B: Equity Return Components</i>						
Capital gain	0.067	0.221	−0.167	0.041	0.312	2090
Dividend return	0.043	0.017	0.020	0.043	0.064	2083
Dividend yield	0.041	0.017	0.019	0.041	0.062	2089
<i>Panel C: Housing Return Components</i>						
Capital gain	0.058	0.114	−0.050	0.046	0.179	1965
Rental return	0.055	0.020	0.033	0.052	0.084	1829
Rental yield	0.053	0.020	0.031	0.049	0.082	1841
<i>Panel D: Macroeconomic Variables</i>						
Inflation	0.039	0.085	−0.029	0.023	0.118	2312
Real GDP growth	0.020	0.043	−0.026	0.021	0.065	2320

Notes: This table reports summary statistics for the main variables. All returns are nominal and expressed as decimal fractions. P10, Median, and P90 are the 10th, 50th and 90th percentiles. All continuous variables are winsorized at the 0.5th and 99.5th percentiles. The sample covers 16 advanced economies, 1870–2015.

Table 11: Mean Nominal Equity Returns by Country and Era

Country	−1913	1914–45	1946–71	1972–	All
Australia	0.102	0.103	0.112	0.136	0.114
Belgium	0.055	0.133	0.065	0.135	0.098
Denmark	0.064	0.085	0.082	0.175	0.106
Finland	0.037	0.187	0.139	0.184	0.153
France	0.053	0.085	0.061	0.121	0.082
Germany	0.073	0.211	0.210	0.113	0.140
Italy	0.068	0.168	0.137	0.128	0.120
Japan	0.161	0.100	0.256	0.085	0.138
Netherlands	0.063	0.068	0.111	0.134	0.102
Norway	0.049	0.069	0.056	0.154	0.090
Portugal	0.068	0.124	0.064	0.130	0.099
Spain	0.036	0.093	0.141	0.143	0.116
Sweden	0.081	0.047	0.114	0.180	0.110
Switzerland	0.060	0.058	0.114	0.101	0.087
UK	0.064	0.070	0.131	0.139	0.100
USA	0.074	0.110	0.125	0.118	0.105
<i>All Countries</i>	<i>0.071</i>	<i>0.107</i>	<i>0.119</i>	<i>0.136</i>	<i>0.110</i>

Notes: Cell entries are mean nominal equity total returns by country and monetary regime. Empty cells indicate no data for that country-era. Columns: Classical Gold Standard, War and Interwar, Bretton Woods, and Modern Float.

Data Analysis

Table 21: Predictability of Equity Returns: Dividend-Yield Regressions

	(1)	(2)	(3)	(4)	(5)
	Baseline	+Inflation	+Controls	+Country FE	Real, 2-way FE
Dividend yield _{t-1}	1.119** (0.528)	1.244** (0.491)	1.796*** (0.515)	1.945*** (0.571)	2.142*** (0.408)
Inflation _{t-1}	—	0.253** (0.099)	0.265*** (0.099)	0.246** (0.106)	-0.212* (0.126)
Log real GDP p.c.	—	—	0.028*** (0.006)	0.035*** (0.007)	-0.014 (0.020)
Constant	0.064*** (0.024)	0.047** (0.021)	-0.218*** (0.063)	-0.300*** (0.083)	0.134 (0.164)
Country FE	No	No	No	Yes	Yes
Year FE	No	No	No	No	Yes
R ²	0.007	0.016	0.027	0.035	0.436
Observations	2072	2060	2060	2060	2055
Countries (clusters)	16	16	16	16	16

Notes: The dependent variable is the nominal equity total return in columns (1)–(4) and the real equity return in column (5). The key regressor is the lagged dividend yield. A positive coefficient is consistent with dividend-yield return predictability. Clustered standard errors (by country) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 28: Fama–MacBeth Cross-Sectional Regressions of Equity Returns

	(1)	(2)	(3)	(4)	(5)
	(div yld)	(+lag ret)	(+size)	(full)	Pooled, Year FE
Dividend yield _{t-1}	1.601*** (0.421)	1.751*** (0.398)	1.866*** (0.392)	1.842*** (0.409)	2.186*** (0.420)
Return _{t-1}	—	0.118*** (0.041)	0.105** (0.041)	0.087** (0.041)	0.107*** (0.025)
Log real GDP p.c.	—	—	-0.039* (0.022)	-0.029 (0.022)	-0.017** (0.008)
Inflation _{t-1}	—	—	—	-0.053 (0.178)	0.291* (0.153)
Constant	0.045** (0.022)	0.010 (0.021)	0.357* (0.213)	0.259 (0.208)	0.147* (0.077)
Time periods (T)	145	145	145	144	—
Avg. cross-section	14	14	14	14	2056

Notes: Fama–MacBeth estimates: equity returns are regressed on predictors cross-sectionally each year, and the time-series mean of the coefficients is reported with Fama–MacBeth standard errors (time-series standard error of the annual estimates). Years with fewer than three valid cross-sectional units are skipped. Columns marked † fall back to pooled OLS with year fixed effects where too few periods are available; column (5) is the pooled benchmark. Clustered standard errors (by country) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Challenge

- Ask the AI to create several charts to visualise key trends and results
- Upload to Canvas for the assignment