Pythonic Finance: Analyze Company Fundamentals with SEC EDGAR APIs

Hello!

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- StackOverflow: **Nicholas**

Introduction

- Originally from Indonesia, been in Japan for around 3 years!
- Working on cloud security software in HENNGE, not financial analysis.
- My professional interests are mainly in the tech world (web development) and in the finance world (financial markets).
  - I’ve been burned by the financial market in high school.
  - I realized that many people often find the finance world intimidating.
- I speak English, Bahasa Indonesia, and Japanese (日本語能力試験 N4).
- Today, we're going to bridge the gap between Python and financial analysis!

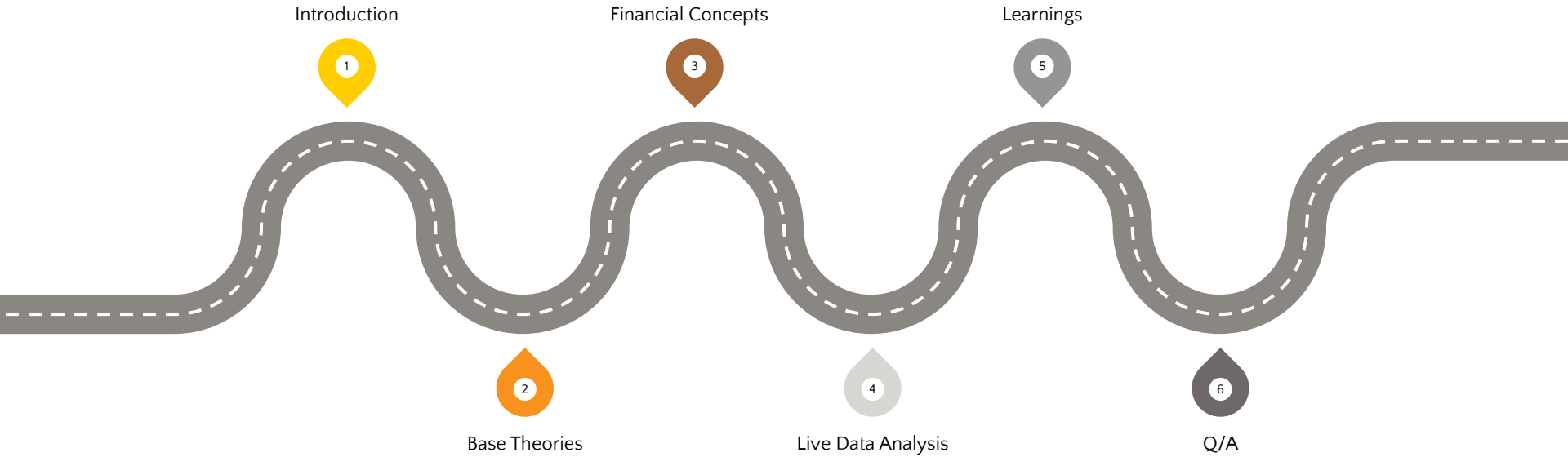
Disclaimer

I am NOT a financial advisor.

This talk is for educational purposes only and does not constitute financial advice. Please do your own research before making any investment decisions.

To maintain clarity and avoid providing investment recommendations, this discussion will not delve into company valuation theories, such as price-to-book value, price-to-sales and any other similar metrics, as that topic often involves stock prices and borders into trading.

Content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Q/A

The most important investment you can make is in yourself.

1

Background

Let's start with the first set of slides!

Why?

- ⚙️ Automation
  - Move beyond manual data entry and messy spreadsheets.
- 📈 Scalability
  - Analyze hundreds of companies programmatically.
- 🔧 Customization
  - Build the exact tools and models you need.
- 🔄 Reproducibility
  - Create analyses that can be easily replicated and shared.
- 🔗 Combinations
  - Get to combine two awesome fields: programming and finance.

2

Base Theories

Let's discuss about US Market Reporting Systems, XBRL, and more!

Securities and Exchange Commission

Abbreviated as SEC.

- The primary federal regulator of the securities industry in the United States. Its mission is to protect investors, maintain fair, orderly, and efficient markets, and facilitate capital formation.

Electronic Data Gathering, Analysis, and Retrieval

Abbreviated as EDGAR.

- Securities and Exchange Commission's online database that provides free public access to corporate information. Companies are required to file certain documents with the SEC through EDGAR.

Key Report Filings

- 10-K (Annual Report)
  - Comprehensive annual report required by the SEC that gives a summary of a company's financial performance. Includes detailed financial statements (income statement, balance sheet, cash flow statement), risk factors, business details, and more.
- 20-F (Annual Report for Foreign Private Issuers)
  - Annual report filed by non-U.S. companies that have securities registered with the SEC, similar to a 10-K but accommodating different accounting standards (e.g., IFRS).
- Other reports exist, such as 10-Q (quarterly report) and 8-K (current report, to announce major events).

eXtensible Business Reporting Language

Abbreviated as XBRL.

- XBRL is a standardized language for digital business reporting.
- It tags financial data, making it machine-readable, allowing easier data extraction and analysis.
- The SEC uses XBRL for company filings like 10-K, 20-F, 10-Q, etc.
- XBRL example from publicly available inline viewer can be seen by clicking here.

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-Q

(Mark One)

☒ **QUARTERLY REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
For the quarterly period ended December 30, 2023
or
☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
For the transition period from _____ to _____.
Commission File Number: 001-36743

Apple Inc.

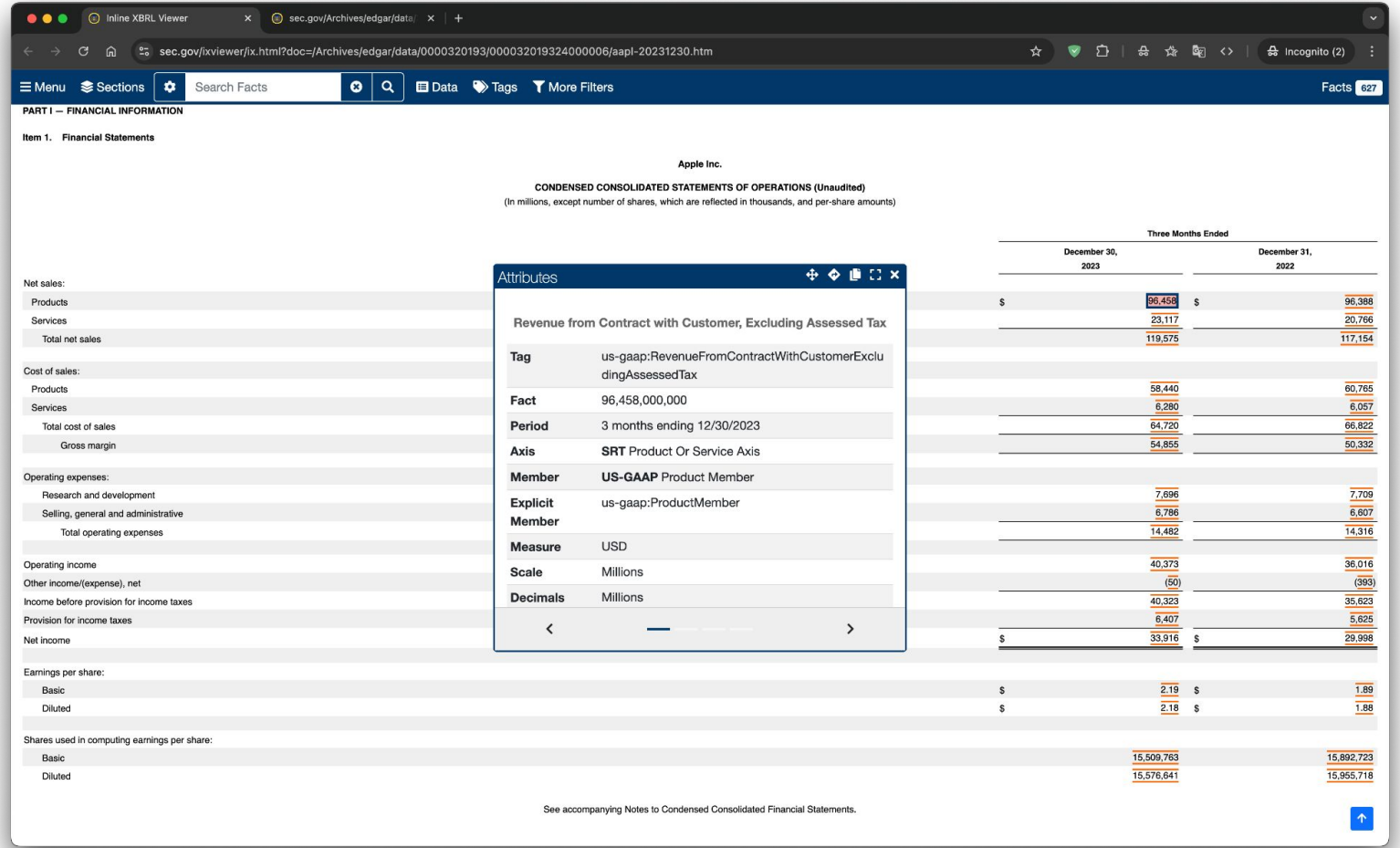
(Exact name of Registrant as specified in its charter)

California		94-2404110
(State or other jurisdiction of incorporation or organization)		(I.R.S. Employer Identification No.)
One Apple Park Way Cupertino, California		95014
(Address of principal executive offices)		(Zip Code)

(408) 996-1010
(Registrant's telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading symbol(s)	Name of each exchange on which registered
Common Stock, $0.00001 par value per share	AAPL	The Nasdaq Stock Market LLC
0.000% Notes due 2025	–	The Nasdaq Stock Market LLC
0.875% Notes due 2025	–	The Nasdaq Stock Market LLC
1.625% Notes due 2026	–	The Nasdaq Stock Market LLC
2.000% Notes due 2027	–	The Nasdaq Stock Market LLC
1.375% Notes due 2029	–	The Nasdaq Stock Market LLC



PART I — FINANCIAL INFORMATION

Item 1. Financial Statements

Apple Inc.

CONDENSED CONSOLIDATED STATEMENTS OF OPERATIONS (Unaudited)

(In millions, except number of shares, which are reflected in thousands, and per-share amounts)

	Three Months Ended	
	December 30, 2023	December 31, 2022
Net sales:		
Products	$ 96,458	$ 96,388
Services	23,117	20,766
Total net sales	119,575	117,154
Cost of sales:		
Products	58,440	60,765
Services	6,280	6,057
Total cost of sales	64,720	66,822
Gross margin	54,855	50,332
Operating expenses:		
Research and development	7,696	7,709
Selling, general and administrative	6,786	6,607
Total operating expenses	14,482	14,316
Operating income	40,373	36,016
Other income/(expense), net	(50)	(393)
Income before provision for income taxes	40,323	35,623
Provision for income taxes	6,407	5,625
Net income	$ 33,916	$ 29,998
Earnings per share:		
Basic	$ 2.19	$ 1.89
Diluted	$ 2.18	$ 1.88
Shares used in computing earnings per share:		
Basic	15,509,763	15,892,723
Diluted	15,576,641	15,955,718

See accompanying Notes to Condensed Consolidated Financial Statements.

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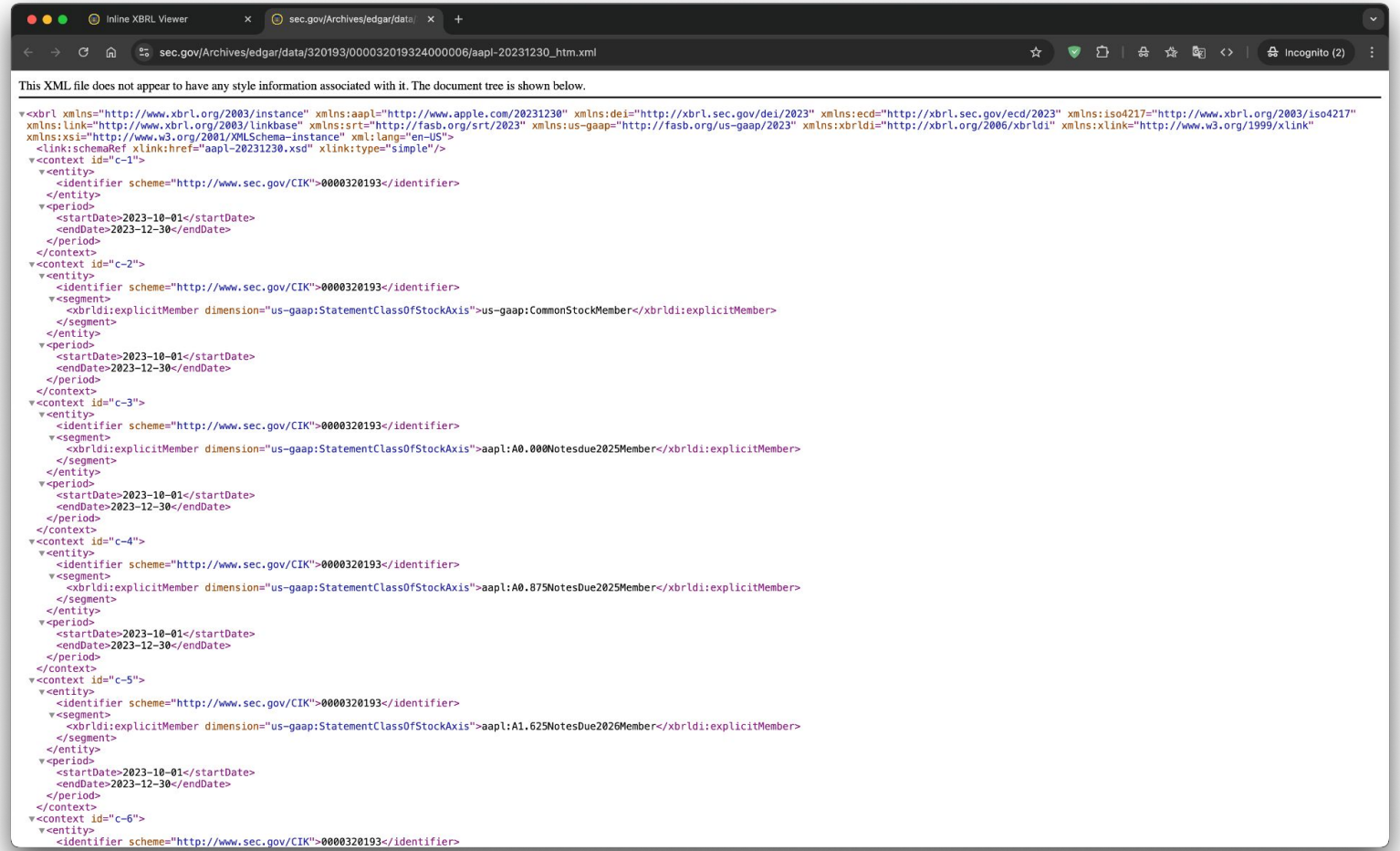
Decimals	Millions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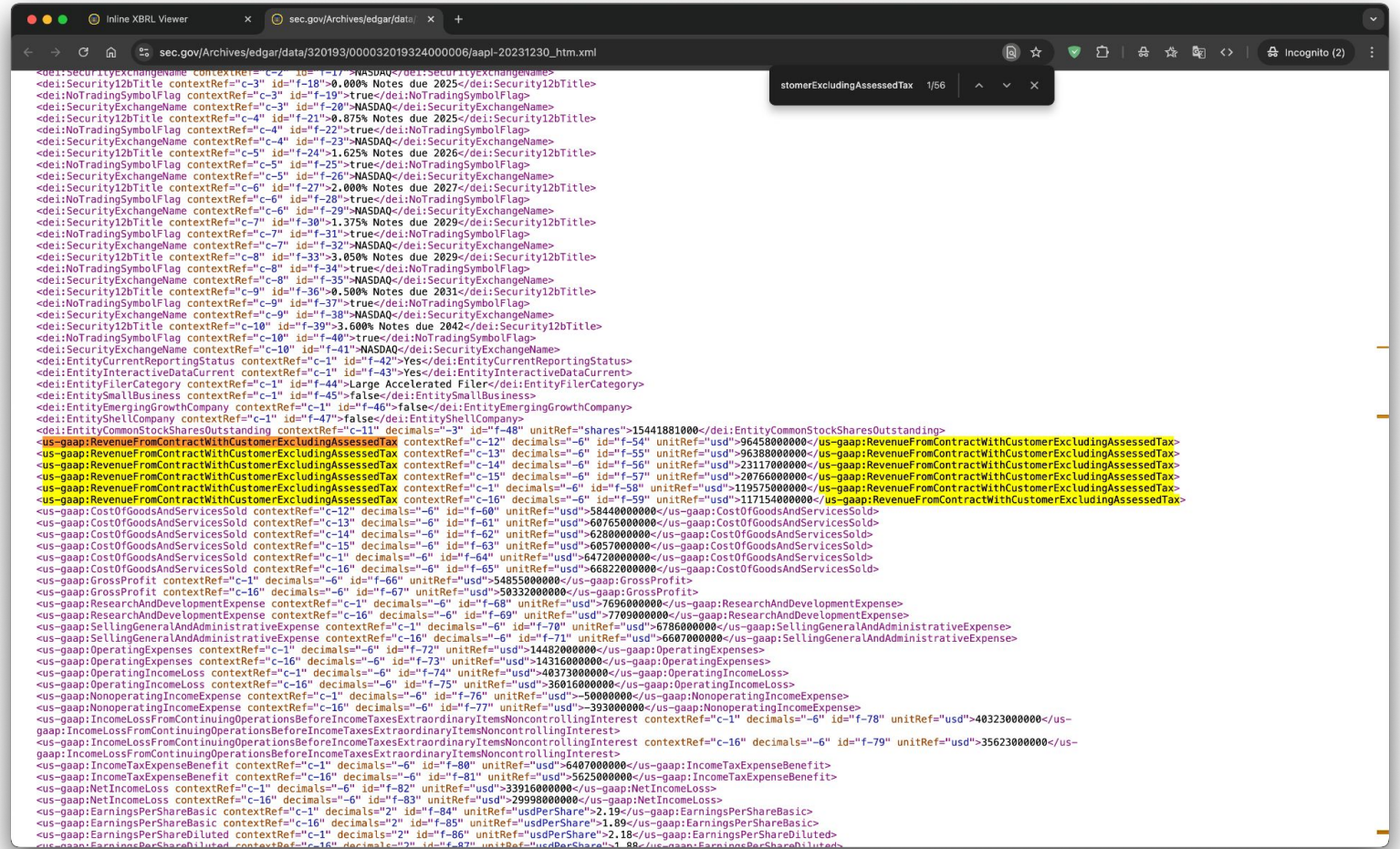
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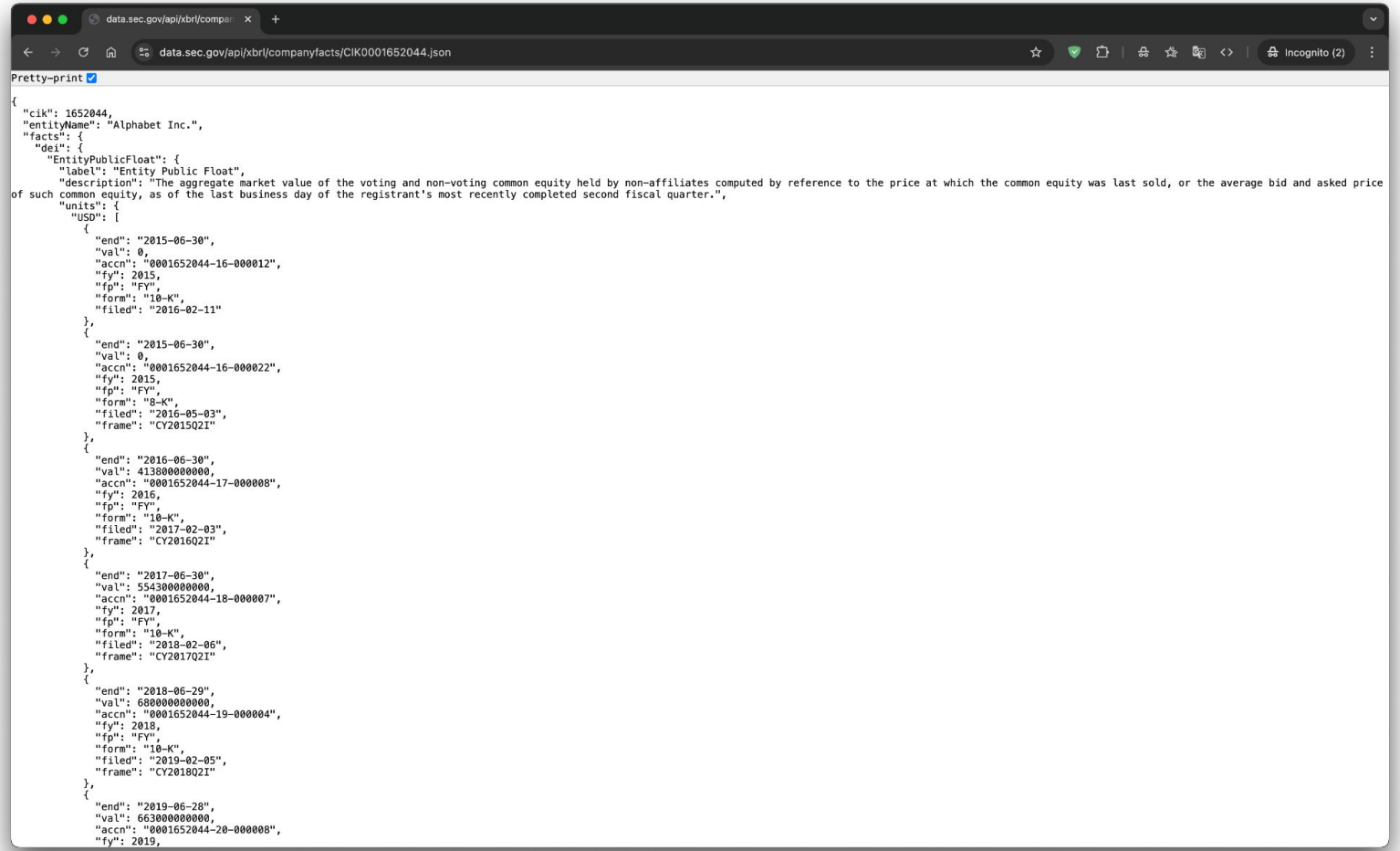
SEC's JSON Web API

We call this the Company Facts API.

- As we have seen in the previous slides, XBRL raw data is difficult to parse due to the complex XML structure and schema variations!
- To address this, SEC provides a JSON API that allows direct, programmatic access to XBRL-tagged financial data.
- API delivers financial data in a structured JSON format, making it easy to parse and integrate into your scripts and tools.

SEC's Web API: Useful Endpoints

- Tickers and Central Index Key (CIK)
  - GET https://www.sec.gov/files/company_tickers.json
  - Mapping of tickers and company IDs, useful to search for companies.
- Company Facts
  - GET https://data.sec.gov/api/xbrl/companyfacts/{cik}.json
  - Where the CIK must be filled with the company ID, add leading zeros if it's less than 10 characters.

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3

Financial Concepts

Let's discuss about core financial concepts, starting from revenue up until the more advanced ratios!

Core Concepts

Why?

The following concepts must be understood before we dive deeper into the fundamental analysis.

Revenue

Total amount of income generated by the sale of goods or services related to the company's primary operations.

Net Income

Remaining amount of revenue after deducting all costs, expenses, interest, and taxes. Different than **EBITDA or FCF!**

Assets

Resources owned or controlled by a company as a result of past events and from which future economic benefits are expected to flow to the entity.

Liabilities

Obligations of the company arising from past events, the settlement of which is expected to result in an outflow.

Equity

The value that would be returned to the stakeholders if all assets were liquidated and all debts were to be paid off (residual interest in assets).

Financial Ratio

Net Profit Margin

Measures how much net income is generated as a percentage of revenue.

Formula: (Net Income / Revenue) * 100

High ratio means that the company is more efficient at converting revenue into an actual profit.

Debt-to-Equity

How much debt a company has compared to the value of its ownership stake. Measures how much net income is generated as a percentage of revenue.

Formula: (Liabilities / Equity) * 100

High ratio indicates a reliance on leverage which can amplify return and risks.

Other Financial Ratios

Do other metrics exist? Yes.

- Return on Equity, return on assets, ...
- Debt to assets, debt to equity, ...
- Asset turnover ratio
- etc...

By knowing and understanding these ratios, we can know the capital structure, financial leverage impact, operational efficiency VS financial strategy, and more!

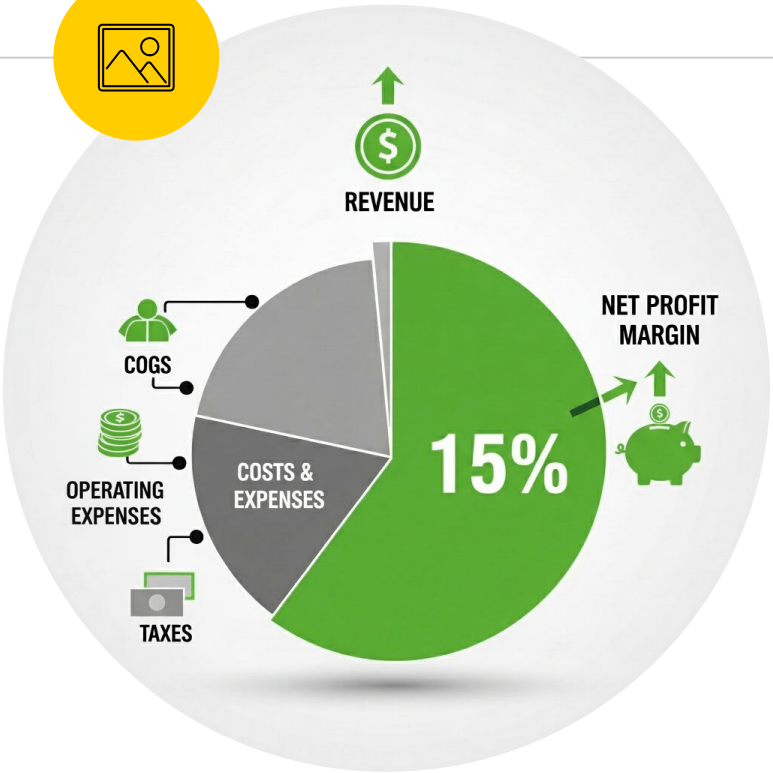


Illustration of Net Profit Margin

A 20% Net Profit Margin means that for every dollar of revenue, the company earns 20 cents in profit after all expenses, interest, and taxes are paid.

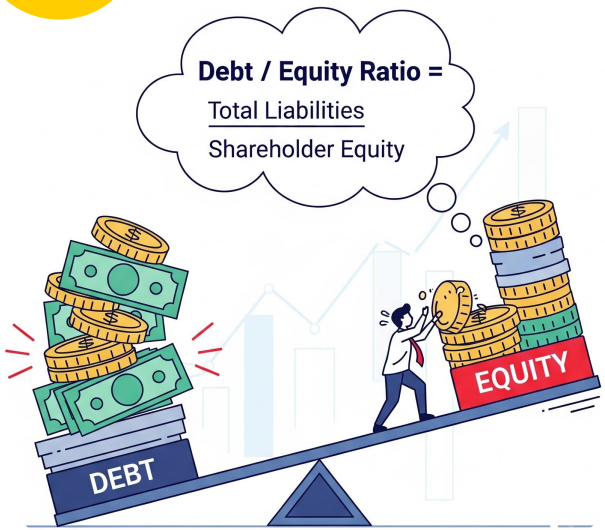


Illustration of Debt-to-Equity

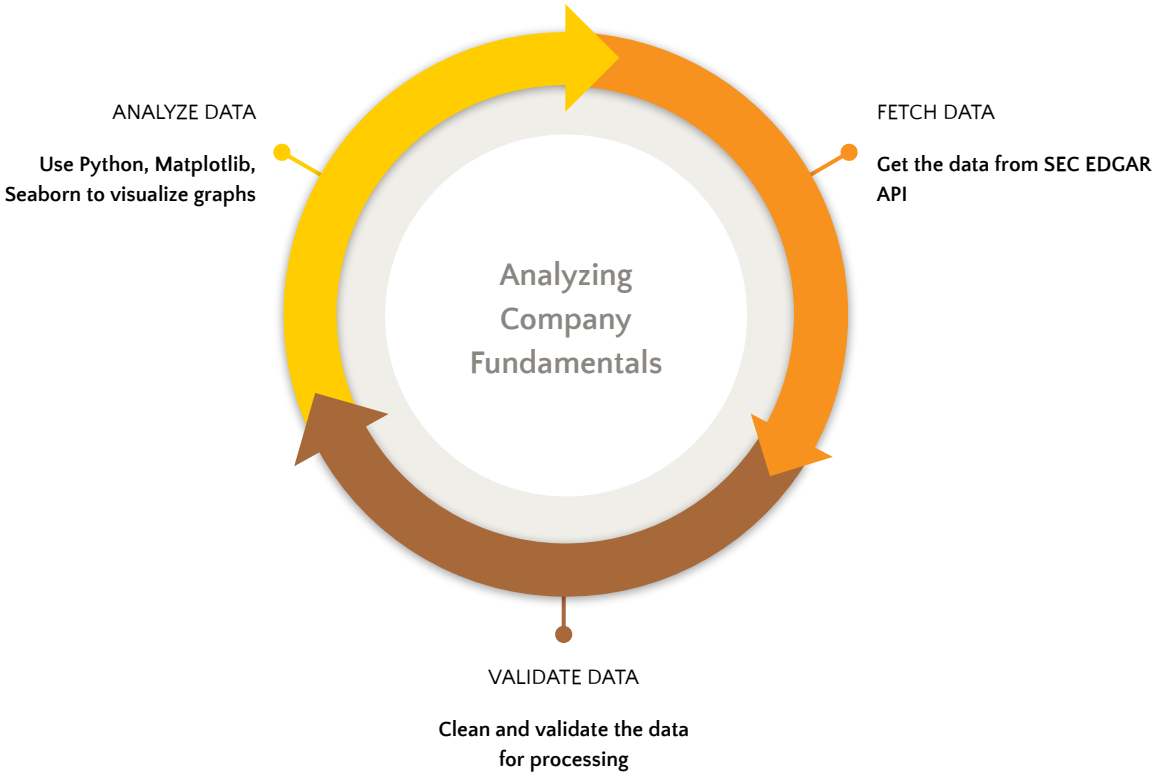
A ratio of 0.5 means the company uses 50 cents of debt for every dollar of shareholder equity.

4

Live Data Analysis

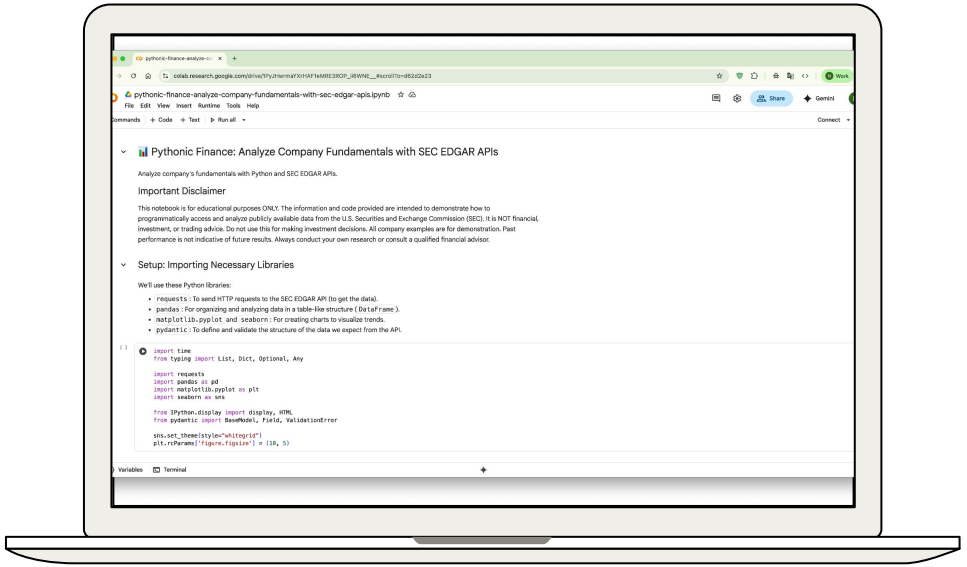
Let's do an actual practical explanation live with Google Colaboratory!

Data Analysis Process



Jupyter Notebook

Let's do the data analysis together!



5 Learnings

After the data analysis, let's see the data nuances and similar systems in other countries, other than the USA.

Data Nuances

Company Facts itself can have multiple potential issues with our data analysis procedures:

- There are multiple ways of representing a single metric.
- Depending on the reporting form that's used (10-K or 20-F), they can have different XBRL (and in extension, JSON) properties.
- Two tools are helpful to ensure our data is in the right format:
  - Data validation library: Pydantic
  - The helpful XBRL mapper to get the actual financial metric
- Knowledge of accounting and finance are required to understand what metrics to get.

International Systems

- Japan has its own EDINET systems to find the XBRL data of public companies, but the JSON API is not provided.
  - https://www.fsa.go.jp/search/20130917.html
  - https://disclosure2.edinet-fsa.go.jp/WEEK0010.aspx
- Indonesia also started to support XBRL format for financial data reporting for public companies, but they haven't publicized it. There's also no JSON API for now.
- As a conclusion, while other countries also support XBRL format, there are some caveats: data may be in different formats (looking at different forms) and there may not be JSON API yet.

6 Conclusion

Key takeaways.

Summary

- It is generally possible to automate financial analysis with Python, as far as US Market goes, since they have a well-developed financial market with supporting systems (reporting standards and JSON API).
- Data validation and knowing what metrics to use is important. Core financial concepts are important to be understood.
- Other countries may have different reporting systems, but most of them started to use XBRL as the data format. It could be possible to automate everything with the assumption that you know how they report their major financial metrics.

Future Exploration

- Analyze more metrics (e.g., Gross Profit, Operating Income, Cash Flow from Operations).
- Calculate other financial ratios (e.g., Current Ratio, Return on Equity).
- Compare metrics directly across multiple companies by collecting data frames and then merging/plotting them together.
- Investigate why data might be missing or different for certain companies (20-F reported companies).

Supplementary Materials

Will be uploaded in Pretalx, and available in:

https://github.com/lauslim12/analyze-company-fundamentals-with-sec-edgar-api

Thanks!

Any questions ?

You can find me at:

- GitHub: **@lauslim12**
- StackOverflow: **Nicholas**

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Company

A publicly traded (上場企業) cloud security B2B company in Tokyo, Japan that has been in business since 1996.

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