API: https://finnhub.io/
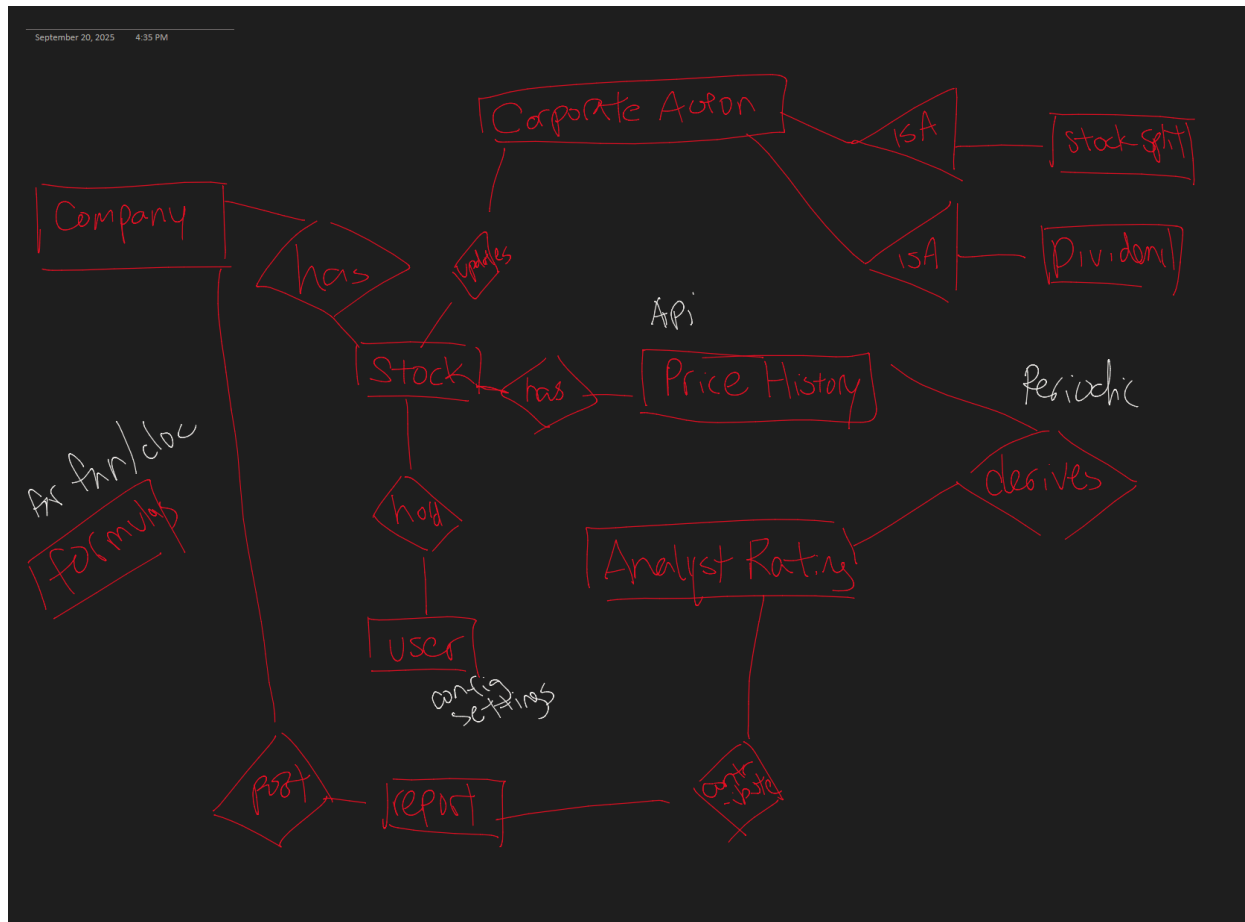

Entities:
- Company (companyID, name, country, industry)
- Company Action (ID, timestamp, ticker(know which stock))
    - Stock split(split ratio)
    - dividend(amount per share, dividend type (stock, cash))
- Stock (ticker, CompanyID, exchange, currency, market_cap)
- Price history (ID, ticker, date, open price, high price, low price, close price, volume)
- User (email, prefered country, preferred industry)
- Reports (ID, timestamp, fiscal_year, revenue, net_income, eps, total_debt, equity, debt equity ratio)
- Analyst Rating (ID, ticker, buy rate, hold rate, sell rate, target_price (prediction), timestamp)

Formulas

Fundamental Based

Price-to-Earnings Ratio	$$\text{P/E} = \frac{\text{Price per share}}{\text{Earnings per share (EPS)}}$$	Low P/E compared to peers may mean the stock is under-evaluated
Earnings Growth	$$\text{EPS Growth} = \frac{\text{EPS}_{\text{current}} - \text{EPS}_{\text{previous}}}{\text{EPS}_{\text{previous}}}$$	Compare quarterly or yearly reports. Positive growth is attractive.
Debt-to-Equity Ratio (report)	$$\text{D/E} = \frac{\text{Total Debt}}{\text{Shareholders' Equity}}$$	Lower D/E = less risky
Return on Equity (ROE) (report)	$$\text{ROE} = \frac{\text{Net Income}}{\text{Shareholders' Equity}}$$	Higher = company is efficient at generating profits

Price/Technical Based

Daily Return (price history)	$$r_t = \frac{\text{Close}_t - \text{Close}_{t-1}}{\text{Close}_{t-1}}$$	Can be aggregated over weeks/months.
Moving Averages (MA)	$$\text{SMA}_n = \frac{1}{n} \sum_{i=0}^{n-1} \text{Close}_{t-i}$$	Common: 20-day and 50-day SMA. A crossover (20-day > 50-day) is a "Buy" signal.
Momentum (12-1 Rule)	$$\text{Momentum} = \frac{\text{Price}_t - \text{Price}_{t-12\text{mo}}}{\text{Price}_{t-12\text{mo}}}$$	Skip the last month to avoid short-term reversal. Stocks with high past 12-month momentum often keep performing.

Analyst/Market Signals

Analyst Consensus	$$\text{Consensus} = \frac{\sum \text{Ratings (mapped to numeric)}}{\text{Number of Ratings}}$$	Example: Buy=1, Hold=0, Sell=-1. Positive score = bullish sentiment.
Dividend Yield (corporate action, stock)	$$\text{Dividend Yield} = \frac{\text{Annual Dividend per Share}}{\text{Price per Share}}$$	Higher yield = income potential.

Final Recommendation Ranking
- P/E < 20, EPS growth > 10%, ROE > 15%
- Momentum Screening: SMA20 > SMA50 and 12 month momentum > 0.2
- Quality and Dividend Screener: D/E <1.0 and Divident Yield > 2%

Glossary:
- Ticker: A ticker symbol or stock symbol is an abbreviation used to uniquely identify publicly traded shares of a particular stock or security on a particular stock exchange. Ticker symbols are arrangements of symbols or characters which provide a shorthand for investors to refer to, purchase, and research securities.
- Exchange: Different markets where stocks are traded (eg. NASDAQ, NYSE)
- Close price: Last trade when market close also know as price per share
- Volume: Shares traded that day

2. A brief project description answering these questions:

a) What is the domain of the application? Describe it.
The domain of an application refers to the area of knowledge your application resides in. For example, if I am making an application for a hospital, the domain would be something like healthcare/patient management/logistics (it would depend on what the application is trying to do). Ensure that all members of the team are familiar with the domain and data that will be modelled. If you do not understand the domain/data, you will have an exceptionally hard time meaningfully contributing to the project which will lead to lots of project issues down the road.

The domain of this web application is finance and stock investment. Many students have Tax-Free Savings Accounts that they use for investing. However, analyzing stock performance and reviewing company financial reports can be time consuming and overwhelming, especially for non perfessionals. Therefore, we want to create an application that simplifies and provides an starting point to the investment research process.

b) What aspects of the domain are modeled by the database? In answering this question, you will want to talk about what your project is trying to address and how it fits within the domain. It is likely that in the process of answering these questions you will bring up examples of a real-life situation that the application could be applied to.

The database models stock price, company performance, and investor decision aspects of stock investment. First, it stores historical price and volume data for each stock, pulled from an API, which can be used for trend analysis. Additionally, users can also upload quarterly / annual company financial reports, which are processed by a script to extract and store relevant financial metrics, such as revenue, net income, and equity. By combining past stock prices with company performance during a fiscal year, the system can generate recommendations such as buy or sell. This allows users to focus their time on a smaller, recommended subset of stocks, making investment research more manageable.
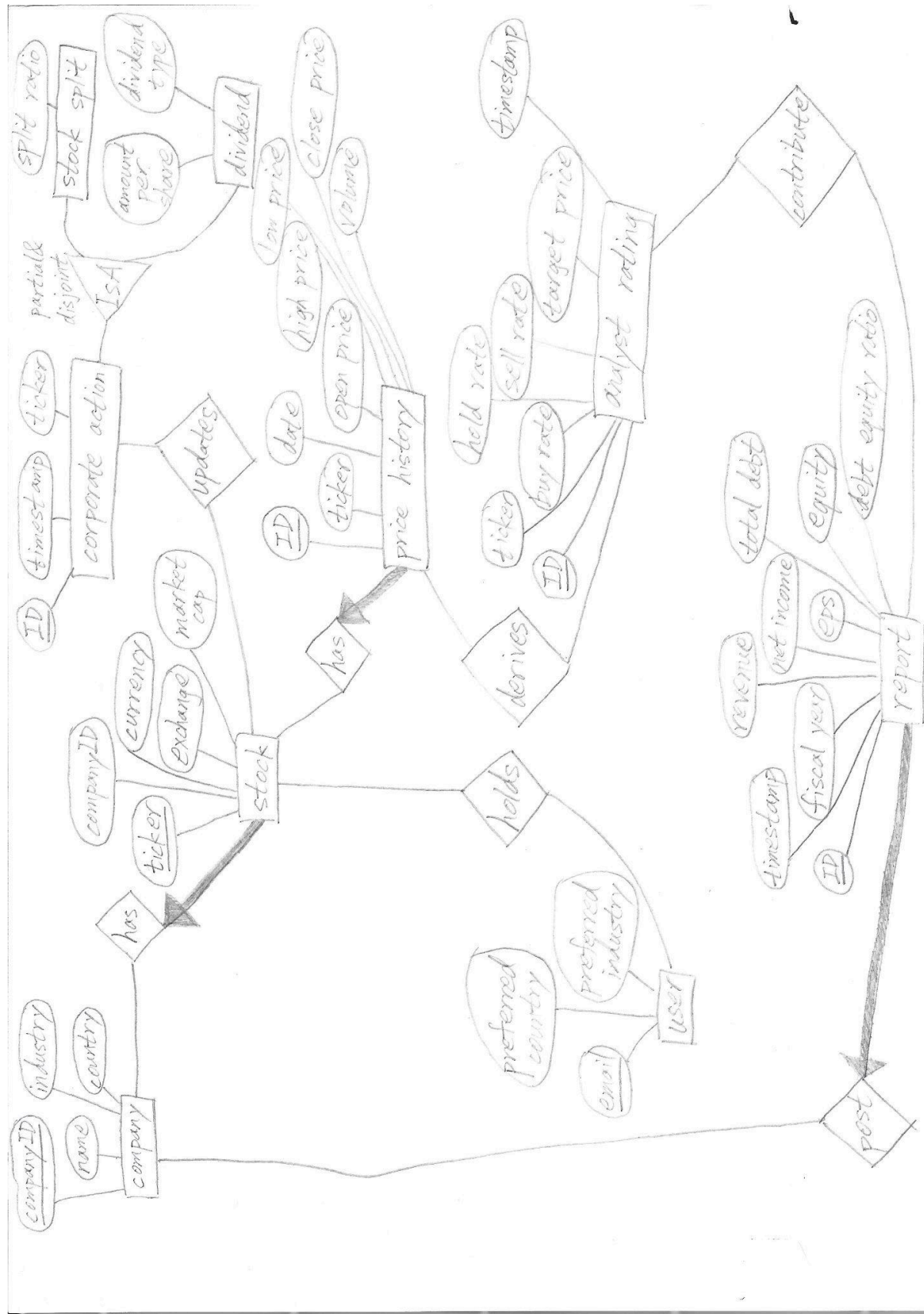
3. Database specifications: (3-5 sentences)
a) What functionality will the database provide? I.e., what kinds of things will people using the database be able to do.

The primary functionality of this database is to provide recommendations on which stocks to sell/buy. People using this application would be able to make more informed decisions when manipulating their stock market portfolio. The application will calculate rankings by utilising both live stock market data pulled from APIs, scraped quarterly financial reports, and long term trends of company and stocks.

4. An ER diagram for the database that your application will use. It is OK to hand-draw it but if it is illegible or messy or confusing, marks will be taken off. You can use software to draw your diagram (e.g., draw.io, GoogleDraw, Microsoft Visio, Powerpoint, Gliffy, etc.) The result should be a legible PDF or PNG document. Note that your ER diagram must use the conventions from the textbook and the lectures. For example, do not use crow's feet notation or notation from other textbooks).
a) Please limit your diagram to a letter size page (8.5 x 11 inches). If you require additional space, talk to your project mentor beforehand as this might mean that your project is a bit more complicated than what we expect.

Entity-Relationship Diagram (hand-drawn)

Entities and attributes:

- **company**: companyID, name, industry, country
- **stock**: ticker, companyID, currency, exchange, market cap
- **price history**: ID, ticker, date, open price, high price, low price, close price, volume
- **corporate action**: ID, timestamp, ticker
  - IsA (partially disjoint):
    - **dividend**: amount per share, dividend type
    - **stock split**: split ratio
- **analyst rating**: ID, ticker, buy rate, hold rate, sell rate, target price, timestamp
- **report**: ID, fiscal year, timestamp, revenue, net income, eps, total debt, equity, debt to equity ratio
- **user**: name, preferred country, preferred industry

Relationships:

- company — has — stock
- stock — has — price history
- price history — derives
- stock — holds — user
- analyst rating — contribute
- corporate action — Updates
- company — posts — report
- report — contribute — analyst rating

5. Your E/R diagram should adhere to the expectations listed above.

6. Other comments, as appropriate, to explain your project.

7. An explicit acknowledgment about your use of AI tools in this assignment. Specifically, we are looking for a clear yes/no about whether you have used one or more AI tools. If yes, we want to know which tool(s) you have used and we want a PDF of the full Conversation.

Yes we have used AI tools in this assignment. We used ChatGPT to mostly familiarize ourselves with finance terminology and formulas. Here is the copy of the full conversation.

https://drive.google.com/file/d/1kWSGiVNdQzQWouNBkBXffsJC0So73gmt/view?usp=sharing