Financial Data Analytics
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For every topic we will study, I will publish the project requirements related to that topic.

Part A: Analyzing Valuation Multiples

1. Analyze the valuation of your two firms using three valuation multiples: P/E, P/S, and one of the following valuation multiples that you choose: Forward P/E, PEG, P/B, Price/Cash, Price/Free Cash Flow. All variables are in the database "market data December 29, 2023.csv", which is attached – use this database for your analyses. See description of the variables in the database at the end of this document.
2. For each of the three valuation multiples:
    a. Use a linear regression analysis.
    b. Use a neural network analysis.
    c. Describe all your modeling choices (in the regression and neural network analyses). For example, describe the features you chose. What hyperparameters you used (e.g. size of neural network, regularization technics, learning rate, number of training steps, etc.), and what is the process that led you to choosing these hyperparameters? Please describe in detail your modeling steps. You can also describe your failed attempts, and what you learned from them. The goal is to describe the process and not only the end models.
3. Include in your paper link to your python programs on CoLab.
4. Qualitatively analyze your results, and determine if your firms look overvalued, undervalued, or fairly-valued. If different models give you different results, decide which model to rely on for your conclusion, and explain why you think that model is better than your other models.

Variable Description
market data December 29, 2023.csv

Exchange

The stock exchange on which a company is listed. All stocks listed on: National Association of Securities Dealers Automated Quotation (NASDAQ), New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) are available.

Index

A stock's membership in a major stock exchange index such as Dow Jones Industrial or S&P 500. The stock indices track the performance various segments of the market.

Sector

Companies are divided into several groups - sectors - according to their business activities.

Industry

Companies in a common sector are further divided by products and services into smaller groups - industries.

Country

The geographic location of a company (listed on U.S. markets). This filter includes continents, countries or groups of countries such as Brazil + Russia + India + China (BRIC).

Market Cap.

The total dollar value of all of a company's outstanding shares. Market capitalization is a measure of corporate size.

Market Capital = Current Market Price * Number Of Shares Outstanding
Shares Outstanding = Total Number Of Shares - Shares Held In Treasury
Float = Shares Outstanding - Insider Shares - Above 5% Owners - Rule 144 Shares

P/E

A popular valuation ratio of a company's current share price compared to its per-share earnings (trailing twelve months). Low P/E value indicates a stock is relatively cheap compared to its earnings. For instance, a P/E value of 15 means that the current price equals the sum of 15-year earnings per share. The average level varies across the market. Therefore, P/E value should be compared per sector or industry.

P/E = Current Market Price / Earnings Per Share (EPS)
P/E = Average Common Stock Price / Net Income Per Share
EPS = (Net Income - Dividends On Preferred Stock) / Average Outstanding Shares

Forward P/E

A measure of the price-to-earnings ratio using forecasted earnings for the P/E calculation for the next fiscal year. If the earnings are expected to grow in the future, the forward P/E will be lower than the current P/E.

Forward P/E = Current Market Price / Forecasted Earnings Per Share

PEG

A ratio used to determine a stock's value while taking into account the earnings' growth. PEG is used to measure a stock's valuation (P/E) against its projected 3-5 year growth rate. It is favored by many over the price/earnings ratio because it also takes growth into account. A lower PEG ratio indicates that a stock is undervalued.

PEG = (P/E) / Annual EPS Growth

P/S

A ratio that reflects the value placed on sales by the market. It is calculated by dividing the current closing price of the stock by the dollar-sales value per share. The ratio is often used to value unprofitable companies.

P/S = Current Market Price / Total Revenues Per Share

P/B

A ratio used to compare a stock's market value to its book value. It is calculated by dividing the current closing price of the stock by the latest quarter's book value per share. A lower P/B ratio could mean that the stock is either undervalued or something is fundamentally wrong with the company.

P/B = Current Market Price / (Total Assets - Total Liabilities)
P/B = Current Market Price / (Total Common Equity / Total Common Shares Outstanding)
Book Value = (Total Assets - Total Liabilities) = Share Holder's Equity

Price/Cash

A ratio used to compare a stock's market value to its cash assets. It is calculated by dividing the current closing price of the stock by the latest quarter's cash per share.

P/C = Current Market Price / Cash per Share

Price/Free Cash Flow

A valuation metric that compares a company's market price to its level of annual free cash flow.

P/FCF = Current Market Price / Cash Flow per Share

EPS growth next year

EPS estimate for the next fiscal year.

EPS growth past 5 years

EPS annual growth over the past 5 fiscal years.

EPS growth next 5 years

EPS annual long-term estimate.

EPS growth qtr over qtr

EPS increase in the last quarter.

Sales growth qtr over qtr

Company's total revenues increase in the last quarter compared on a year-over-year basis.

Sales growth past 5 years

Anual sales increase over past 5 years.

Dividend Yield

The dividend yield equals the annual dividend per share divided by the stock's price. This measurement tells what percentage return a company pays out to shareholders in the form of dividends. Investors who require a minimum stream of cash flow from their investment portfolio can secure this cash flow by investing in stocks paying relatively high, stable dividend yields.

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Dividend Yield = Annual Dividend Per Share / Price Per Share
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Return on Assets

An indicator of how profitable a company is relative to its total assets. ROA gives an idea as to how efficient management is at using its assets to generate earnings. Calculated by dividing a company's annual earnings by its total assets, ROA is displayed as a percentage.

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ROA = Annual Earnings / Total Assets
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Return on Equity

A measure of a corporation's profitability that reveals how much profit a company generates with the money shareholders have invested. Calculated as Net Income / Shareholder's Equity.

ROE = Annual Net Income / Share Holder's Equity
ROE = Annual Net Income / Book Value
ROE = Annual Net Income / (Total Assets - Total Liabilities)

Current Ratio

A liquidity ratio that measures a company's ability to pay short-term obligations. Calculated as Current Assets / Current Liabilities.

Current Ratio = Current Assets / Current Liabilities

Quick Ratio

An indicator of a company's short-term liquidity. The quick ratio measures a company's ability to meet its short-term obligations with its most liquid assets. The higher the quick ratio, the better the position of the company. Calculated as (Current Assets - Inventories) / Current Liabilities.

Quick Ratio = (Current Assets - Inventories) / Current Liabilities

Long Term Debt/Equity

A measure of a company's financial leverage calculated by dividing its long term debt by stockholders' equity. It indicates what proportion of equity and debt the company is using to finance its assets.

LT Debt/Equity = Long Term Debt / (Share Holder's Equity)
LT Debt/Equity = Long Term Debt / (Total Assets - Total Liabilities)
LT Debt/Equity = Long Term Debt / (Book Value)

Debt/Equity

A measure of a company's financial leverage calculated by dividing its liabilities by stockholders' equity. It indicates what proportion of equity and debt the company is using to finance its assets.

Debt/Equity = Current Liabilities / (Share Holder's Equity)
Debt/Equity = Current Liabilities / (Total Assets - Total Liabilities)
Debt/Equity = Current Liabilities / (Book Value)

Gross Margin

A company's total sales revenue minus its cost of goods sold, divided by the total sales revenue, expressed as a percentage. The gross margin represents the percent of total sales revenue that the company retains after incurring the direct costs associated with producing the goods and services sold by a company. The higher the percentage, the more the company retains on each dollar of sales to service its other costs and obligations.

Gross Margin = (Total Sales - Costs) / Total Sales

Operating Margin

Operating margin is a measurement of what proportion of a company's revenue is left over after paying for variable costs of production such as wages, raw materials, etc. A healthy operating margin is required for a company to be able to pay for its fixed costs, such as interest on debt. Calculated as Operating Income / Net Sales.

Operating Margin = Operating Income / Net Sales

Net Profit Margin

A ratio of profitability calculated as net income divided by revenues, or net profits divided by sales. It measures how much out of every dollar of sales a company actually keeps in earnings.

Net Profit Margin = Net Income / Revenues
Net Profit Margin = Net Profits / Sales

Payout Ratio

The percentage of earnings paid to shareholders in dividends.

Payout Ratio = Dividends / Earnings

Insider Ownership

% of shares currently owned by company management.

Insider Transactions

A company's shares being purchased or sold by its own management. Value represents % change in total insider ownership.

Institutional Ownership

% of shares currently owned by institutional investors.

Institutional Transactions

A company's shares being purchased or sold by financial institutions. Value represents % change in total institutional ownership.

Analyst Recommendation

An outlook of a stock-market analyst on a stock.

Rating Scale: 1.0 Strong Buy, 2.0 Buy, 3.0 Hold, 4.0 Sell, 5.0 Strong Sell

Performance

% Rate of return for a stock for a given time frame.

Performance values are based on the following time periods:

Performance 1 Week = Last 5 trading days
Performance 1 Month = Last 21 trading days
Performance 3 Months = Last 63 trading days
Performance 6 Months = Last 126 trading days
Performance 1 Year = Last 252 trading days

Volatility

A statistical measure of the dispersion of returns for a given stock. Represents average daily high/low % range.

Sorting: Yes; Export: Yes; Appearance: performance, snapshot, fullview

Simple Moving Average

Simple Moving Average calculated as an average of the last N-periods (20-Day, 50-Day, 200-Day).

Beta

A measure of a stock's price volatility relative to the market. An asset with a beta of 0 means that its price is not at all correlated with the market. A positive beta means that the asset generally follows the market. A negative beta shows that the asset inversely follows the market, decreases in value if the market goes up.

Sorting: Yes; Export: Yes; Appearance: technical, fullview

Average Volume

The average number of shares traded in a security per day, during the recent 3-month period.

Shares Outstanding

The total number of common shares currently owned by the public.

Shares Outstanding = Total Number Of Shares - Shares Held In Treasury

Shares Float

The total number of common shares currently owned by the public and available to be traded.

Shares Float = Shares Outstanding - Insider Shares - Above 5% Owners - Rule 144 Shares