# Assumptions:

**Income Statement:**

* For revenue assumptions, please refer to [**Revenue Growth Rate Calculation]** below
* Project R&D costs separately since R&D Department is likely the core driver of growth and competitive advantage for NVIDIA.
* Apply an effective tax rate instead of statutory tax rate since it will give a better projection of future earnings and reflect real cash flow impact. Future marginal tax rate is fixed at 14%

Source: [Charles Schwab](https://www.schwab.com/learn/story/schwabs-long-term-capital-market-expectations)

* The remaining items are expressed as a percentage of sales.

**Balance Sheet**

* Inventory is projected by calculating Days Inventory Held for historical data using the formula: DIH = (Inventory/COGS) \* 365. An average for the previous 5 years is implemented in projections moving forward.
* Account Payables is projected by calculating Days Payables Outstanding for historical data using the formula: DPO = (Account Payable/COGS) \* 365. An average for the previous 5 years is implemented in projections moving forward.
* Account Receivables is projected by calculating Days Sales Outstanding for historical data using the formula: DSO = (Account Receivable/Revenue) \* 365. An average for the previous 5 years is implemented in projections moving forward.
* Depreciation is projected as a percentage of CAPEX to accurately reflect the direct relationship. An annual step of 1% is implemented to reflect NVIDIA’s gradual shift towards shorter-lived assets (AI, Chips, etc. with shorter lifespan).
* Share Repurchases are projected as a percentage of Net Income since this aligns with historical practices. Moreover, Net Income represents the company’s profitability that is used to repurchase shares, and it is more stable than Free Cash Flow since it is not affected by CAPEX or Working Cap.
* The remaining items are expressed as a percentage of sales.

# Revenue Growth Rate Calculation:

NVIDIA’s growth rate is abnormal where FY2023 and FY2024 are outliers, 0.12% and 126.08%, respectively.

For this reason, I decided to use the **Weighted Average** method to deal with outliers and arrive at an unbiased growth rate:

* Calculate the mean and standard deviation of the growth rates
* Calculate the z-score for each fiscal year to know how many standard deviations they are away from the mean.
* Calculate the inverse z-score as the weight should have an inverse relation with z-score
* Inverse z-score will represent raw initial weight for each data point (not expressed in percentage).

After calculating the initial assigned weight (%), I decided to set a weight cap of 40% to prevent any overestimation of any data points, especially when those data points are historical data. Any remaining weight from the weight cap will be distributed proportionally against the inverse z-score of each fiscal year.

New weight after distribution can exceed 40% cap, thus repeating the process.

I try to avoid setting growth rate cap since they are raw data and reflect market conditions and growth relative to NVIDIA. This results in a very high weighted average growth rate, which aligns with my expectations of further immediate growth for NVIDIA. This growth rate is then tapered down by a step of 10% annually, reflecting when the exponential curve flattens over time when NVIDIA reaches maturity.

# Using Debt as a Plug

After projecting out the Balance Sheet, there was an imbalance since I simplified future debt as zero for NVIDIA for the sake of simplicity. To counter this, I decided to use debt as a plug to balance the sheet.

Reasoning:

* To account for the fact that I assume zero debt in my projections.
* NVIDIA is a strong cash generating company, issuing debt should not be a problem.
* Current Debt to Total Capitalization ratio for NVIDIA is approximately 3.02%, which can be too low, and NVIDIA might want to balance this by issuing more debt.
* To simplify DCF work and aligns with the theory that DCF should by comprehensive enough for users to realize the true value, but fast enough to not waste time and resources each time investors want to calculate the implied value of a company.

# Discounted Cash Flow

**Cost of Equity:**

I use the Capital Asset Pricing Model (CAPM) method to arrive at NVIDIA’s Cost of Equity. All data in blue (hardcoded) is derived from Yahoo Finance, accessed Nov 18, 2024. The resulting Cost of Equity aligns well with similar companies in Microchip Industry (AMD, Intel, Qualcomm, etc.)

**Cost of Debt:**

Pre-tax cost of debt is derived from [Market Watch](https://www.marketwatch.com/livecoverage/nvidia-earnings-stock-ai-expectations-results-revenue-q1/card/nvidia-s-high-quality-bonds-are-yielding-more-than-5--T4sicOovRkDWP1IohAAZ)

**Weighted Average Cost of Capital (WACC):**

I first calculated the Total Debt to Total Capitalization, which represents to weight of debt. The weight of equity is calculated by (1 – weight of debt).

WACC Formula: WACC = w(d) \* Cost of Debt + w(e) \* Cost of Equity

* W(d): weight of debt
* W(e): weight of equity

**Exit Multiple Method:**

The common exit multiple for tech companies ranges from 10x to 15x. I simply take the average of this, which gives me an exit multiple of 12.5x.

**Perpetuity Growth Method:**

Reasoning behind choosing 2.5% as the terminal growth rate:

* Historically, Global GDP Growth Rate has been around 2% to 3%. Choosing 2.5% aligns with the broader economy.
* Consistent with financial modeling standards. Experts advise using a terminal growth rate the does not exceed the long-term GDP growth rate.
* This also accounts for overestimation or underestimation for NVIDIA, which is a promising technology company, but also accounting for unforeseen challenges.