

# Ordinary Returns for Extraordinary Performance: On the Valuation of NVIDIA Corporation

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## 1. Introduction

A few months back I started a project that seeks to value each non-financial firm in the S&P 500. For each firm, I am building projections of revenue, margins, and asset turnover that yield a stream of cash flows whose discounted value is consistent with the enterprise value for the firm as of the end of the most recent quarter using a specific weighted average cost of capital. There have been more than a handful of firms for whom my projections imply great expectations – you can buy the stock at the current price and if the firm does extraordinarily well you will enjoy only ordinary returns. I had thought I must be doing something wrong because the research available to a retail investor never said the firm's fundamental value was dramatically different than the current price. There was a set of firms that I did not understand.

I looked at what Berkshire Hathaway was currently holding. It seemed that I was on to something. The names that didn't make sense to me Berkshire Hathaway was not holding with one exception. Berkshire Hathaway holds Snowflake (SNOW) even though the firm has never had positive operating income.

I was very excited when Aswath Damodaran came out with a valuation of NVIDIA Corporation (NVDA) that specified all the details as to how he did the valuation for two reasons. First, NVDA was one of the names that I was struggling to understand. Second, I used Damodaran's GINZU spreadsheet as the starting point to build my framework. Therefore, I was very curious to see how he had applied this framework to NVDA. My take on his analysis is that he valued NVDA at about 55% of its current value using a rather optimistic scenario and consequently, decided to sell half of his exposure to NVDA. In this note, I will replicate his analysis and compare it to what I did. Further, I will explain why his scenario feels rather optimistic to me.

Damodaran's valuation comes in at \$583B and I will refer to it as the Five Eighty-Three valuation. My approach is designed to match the Enterprise Value of NVDA at the close of the last day of Q2 2023 and comes in at \$1.06T and I will refer to it as the Trillion Dollar valuation. Relative to a trillion dollars, the debt and cash holdings of NVDA are small and Market Capitalization and Enterprise Value are very close, and consequently, I will treat them as if they were equivalent in this note.

### 1.1 How could an investor make ordinary returns when a firm's performance is extraordinary?

The market closed on July 7, 2023, with NVDA trading at \$428 per share for a Market Cap of \$1.05T and a P/E ratio of \$222 per share. Suppose you hold it for ten years. It is not reasonable to think a stock can sustain a P/E ratio of over 100 for 10 years. Suppose it drops to 30, which is about the P/E ratio of Apple today. For the price to stay the same, earnings have to increase more than sevenfold. Suppose you want to double your money over ten years, then earnings need to double again. Doubling your money over ten years is only about a 7% return on your money, which would be ordinary. Nevertheless, the firm would have sustained growth in earnings of 31% per year for ten years, which would be extraordinary. Of course, this simple analysis assumes there are no dividends and no changes in total shares outstanding over the next ten years, but it illustrates the point.

## 2. Replicating the Five Eighty-Three Valuation

Damodaran models NVDA as three different companies: “Auto” “AI” and “Rest of the Business” and he works out different revenue projections for each. For “Auto” and “AI” he projects the growth of the market as a whole for these segments and makes an assumption on NVDA’s market share of each. For the “Rest of the Business,” he assumes that Sales will grow at 15% for the first five years before tapering off to the terminal growth rate of 3.6%. For all three of the segments, he assumes that they are the same in terms of everything except sales (operating margin, tax rate, asset turnover, and weighted average cost of capital). Consequently, you can aggregate the sales of each of the three segments and then value them as one company with respect to the aggregate sales projection.

I have written a function DCF\_dwd (in r) that replicates the crux of the Damodaran valuation framework.<sup>1</sup> Both summing the three businesses and using aggregate sales match Damodaran’s spreadsheet value to a high level of precision . Damodaran gets \$583,004.77982912m as the value of the business as an ongoing concern.

```
#compute the DCF for the rest of the business using the list parmsRest:
DCFrest <- DCF_dwd(parmsRest,reinvestForward = TRUE)
#compute DCF for AI:
DCFai <- DCF_dwd(parmsAI,reinvestForward = TRUE)
#compute DCF for auto:
DCFauto <- DCF_dwd(parmsAuto,reinvestForward = TRUE)
#compute DCF for the agregate business:
DCFall <- DCF_dwd(parmsAll,reinvestForward = TRUE)

#Value of Discounted Cash Flow as the sum of Three Aggregate Businesses:
print(dwdForm(DCFrest$sumPV + DCFai$sumPV + DCFauto$sumPV,"mmToB",places=13))

## [1] "$583.0047798292B"

#Value of Discounted Cash Flows Computed as an Aggregate Business:
print(dwdForm(DCFall$sumPV,"mmToB",places=13))

## [1] "$583.0047798292B"
```

### 2.1 Five Eighty-Three Valuation Projections

Table 1 presents the projections that the Five Eighty-Three valuation uses for NVDA as an aggregate business. The first row is for the Fiscal Year ending January 31, 2023, and it is excluded from the DCF calculation. The projection calls for NVDA to grow its revenue in FYE 2024 by more than 50% while more than tripling its operating profit. If the investor could buy NVDA for \$583B the investor would be rewarded with an internal rate of return of approximately 9.79%, while NVDA achieves a 20-fold increase in earnings — investors are getting ordinary returns for the extraordinary performance on the part of the company. Over ten years (2023 to 2033) revenue increased by 8.9 times (267/30) and total assets only increased 5.8 times (240/7/41.2). This difference reflects an optimistic assumption that NVDA will be able to increase the sales generated per dollar investment relative to their historical experience because of the recent investments they have made in *R&D*.

### 2.2 What are the assumptions of the \$583B valuation?

Table 2 presents the assumption that the Five Eighty-Three valuation employs to get a discounted cash flow of \$583B. The operating margin is assumed to increase from 35% in 2024 to 40% in 2034. It initially expects revenue to grow by 83% in year 1 which then drops to 20% in five year and then a terminal growth rate of 3.6% by year 11. It uses a time-varying weighted average cost of capital that starts at 12.21% and declines to a more typical value of 8.8% by year 10. It assumes that the tax rate will start at 10% and then grow to 25% by 2033. For Asset Turnover, it assumes a value of 1.15 that then falls to 0.667 for purposes of doing the terminal calculation. The asset turnover of 0.667 implies a terminal ROI for NVDA of 20%, which

<sup>1</sup>For more details on the mathematics of this calculation see My Blog Post: (Dwyer 2023a).

Table 1: DCF Calculation: Five Eighty-Three Valuation

| Year | Revenue | Assets | EBIT | EBITafterTax | ROI  | Reinvest | FCFF  | Discounted |
|------|---------|--------|------|--------------|------|----------|-------|------------|
| 2023 | 30      | 41.2   | 5.6  | 4.2          |      |          |       |            |
| 2024 | 47.2    | 59.9   | 16.5 | 14.9         | 36.2 | 18.7     | -3.82 | -3.4       |
| 2025 | 68.7    | 78.7   | 25.4 | 22.9         | 38.3 | 18.9     | 4.02  | 3.19       |
| 2026 | 90.4    | 97.7   | 34.4 | 30.9         | 39.3 | 19.1     | 11.8  | 8.38       |
| 2027 | 112     | 116.7  | 43.8 | 39.4         | 40.4 | 19.4     | 20.1  | 12.7       |
| 2028 | 135     | 142.7  | 53.9 | 48.5         | 41.4 | 25.2     | 23.3  | 13.1       |
| 2029 | 164     | 166.7  | 65.4 | 56.9         | 40   | 24.2     | 32.7  | 16.5       |
| 2030 | 191     | 189.7  | 76.6 | 64.3         | 38.6 | 23.1     | 41.2  | 18.7       |
| 2031 | 218     | 211.7  | 87.2 | 70.6         | 37.3 | 21.8     | 48.8  | 20.1       |
| 2032 | 243     | 231.7  | 97.3 | 75.9         | 35.9 | 20.4     | 55.4  | 20.9       |
| 2033 | 267     | 240.7  | 107  | 80           | 34.5 | 8.35     | 71.7  | 24.8       |
| 2034 | 276     | 255.7  | 111  | 82.9         | 20   | 14.9     | 68    | 448        |
|      |         |        |      |              |      |          |       | 583        |

*Note:*

In the table above, the sum of discounted cash flows is the number in the lower right corner. It is the sum of the column above. The last number in this column is the terminal value. The Terminal Value (\$448B) is computed with a Gordon Growth Model that multiplies terminal cash flow by 19.05 and then discounts it by 34.6%. Equivalently, multiplies Terminal Cash Flow by 6.592. Terminal Cash Flow is \$68B. Terminal WACC is 8.85% and Terminal Growth is 3.6%. Therefore, the terminal multiplier is the reciprocal of 5.25% (which is 19.05).

is  $40 \times (1 - 0.25) / (0.667)$ . Rather than specifying a terminal Asset Turnover, Damodaran specifies a terminal Return on Investment (20%), which implies a terminal Asset Turnover of 0.667. I solved for an internal rate of return on the cash flows of 9.79% by using a flat WACC of 9.79% that yields the same valuation.

Table 2: The Five Eighty-Three Assumptions

| Year | Operating Margin | Growth Rate | WACC    | Asset Turnover | TaxRate |
|------|------------------|-------------|---------|----------------|---------|
| 2024 | 0.35             | 0.82520     | 0.12210 | 1.1500         | 0.10    |
| 2025 | 0.37             | 0.45520     | 0.12210 | 1.1500         | 0.10    |
| 2026 | 0.38             | 0.31570     | 0.12210 | 1.1500         | 0.10    |
| 2027 | 0.39             | 0.24270     | 0.12210 | 1.1500         | 0.10    |
| 2028 | 0.40             | 0.19810     | 0.12210 | 1.1500         | 0.10    |
| 2029 | 0.40             | 0.21510     | 0.11540 | 1.1500         | 0.13    |
| 2030 | 0.40             | 0.17030     | 0.10860 | 1.1500         | 0.16    |
| 2031 | 0.40             | 0.13880     | 0.10190 | 1.1500         | 0.19    |
| 2032 | 0.40             | 0.11520     | 0.09522 | 1.1500         | 0.22    |
| 2033 | 0.40             | 0.09667     | 0.08850 | 1.1500         | 0.25    |
| 2034 | 0.40             | 0.03600     | 0.08850 | 0.6667         | 0.25    |

## 2.3 Sensitivity Analysis of the Five Eighty-Three Valuation

I perform four sensitivity analyses with respect to the Five Eighty-Three valuation: sensitivity analyses with respect to Revenue Growth, Operating Margin, WACC and Asset Turnover. For each, one chart shows the percentage change in the Enterprise Value on the vertical axis and the “shift parameter” on the horizontal axis that is changing while holding everything else constant. When plotted, the dark blue dotted horizontal line represents the change in value required to increase the Five Eighty-Three Valuation to match the Trillion Dollar valuation (\$1.06T).

The implementation of the “shift parameter” across the analyses is somewhat different as appropriate. For the growth rate, it is the growth rate for the first five years. For WACC and Operating Margin, the shift is a simple parallel shift to the assumed paths in units of percentage points. For Asset Turnover, the shift is a parallel shift as well but only for the first ten years, the terminal value is held fixed at 66.67%. For growth, the shift is a parallel shift to the growth path for the first five and then decays linearly to zero over the next ten years.

**Sensitivity to Growth** The upper left panel of Figure 1 shows the sensitivity of the DCF Valuation of NVDA to changes in the Growth Assumption. The chart is centered at around the Five Eighty-Three Valuation, so the way the chart is read is that a 5-percentage point shift in the growth curve increases the value of the firm by about 30% while holding everything else constant. The horizontal dark blue line is at 82%, which is the amount of increase in value required to meet the Trillion Dollar valuation. In order to reach this value, the growth curve would have to shift upward by 20 percentage points for the first five years.

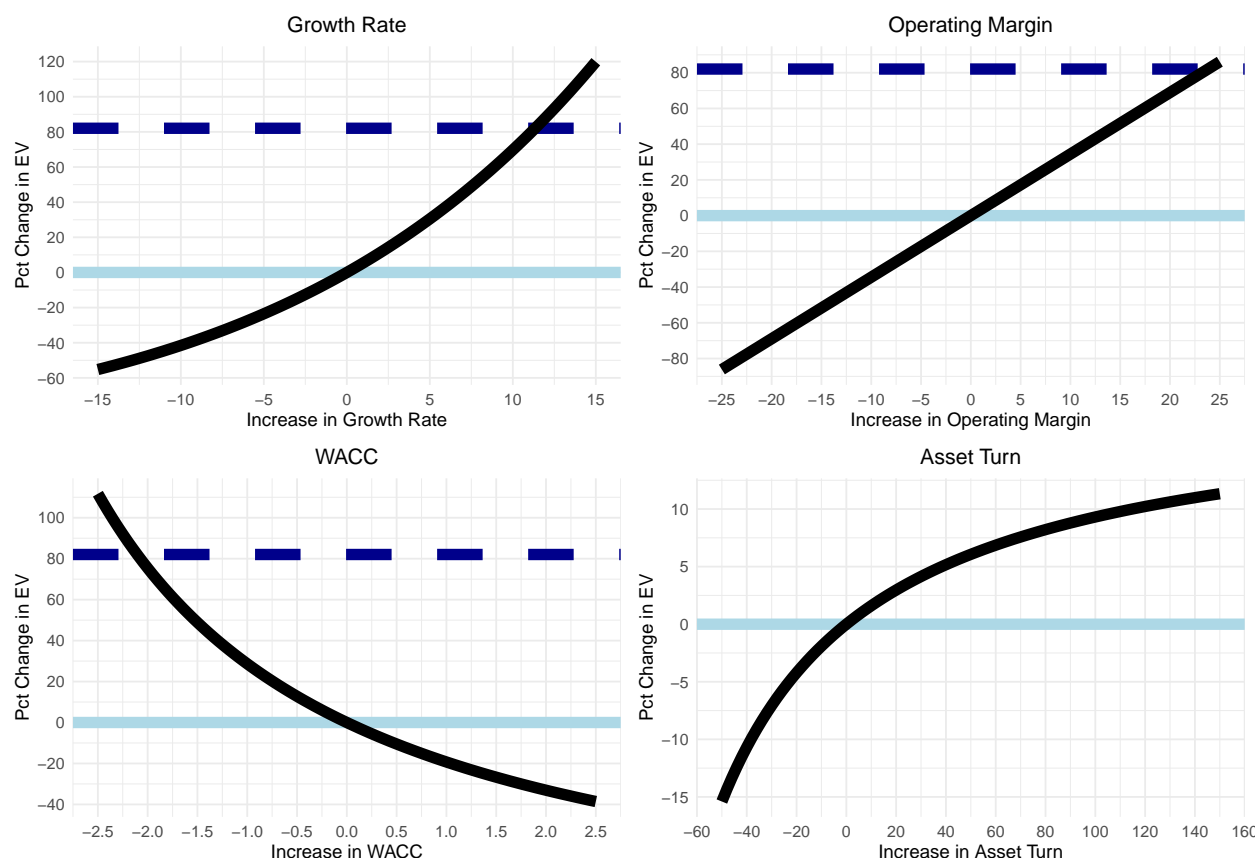


Figure 1: Sensitivity Analyses

### Sensitivity to Margin

The upper right panel of Figure 2 shows the sensitivity of the valuation to a parallel shift in operating margin, which is approximately linear. The Five Eighty-Three valuation assumes the margin will start at 35% and increase to 40% over the next ten years. If we shift this curve up by twenty-five points we would meet the Trillion Dollar valuation, but the plausibility of a 65% margin is clearly questionable. On the other hand, if we shift margins down by 15 percentage points the Enterprise Value is cut in half. This reduction would be a margin of 20% increasing to 25%. A margin of about 25% is consistent with NVDA historical experience.

### Sensitivity to WACC

The lower left panel of Figure 2 shows the sensitivity of the DCF valuation to the WACC. The Five Eighty-Three valuation uses a 12.88% initial WACC, which declines to 8.8% to reflect the anticipated reduction in systematic risk of NVDA as it matures. A two-percentage point reduction in WACC would close the gap between the *Five Eighty-Three* and *Trillion-Dollar* valuations. A three-percentage point increase would cut the value of NVDA in half. The valuation of NVDA is sensitive to the WACC assumption.

### Sensitivity to Asset Turnover

The lower right panel of Figure 2 shows the sensitivity to the Asset Turnover Assumption. Relative to other parameters the sensitivity to the Asset Turnover is smaller. In fact, one cannot eliminate the gap between \$583mm and \$1.06T using Asset Turnover. When Asset Turnover goes to infinity and reinvestment goes to zero, Free Cash Flow to the Firm becomes EBIT after Tax. Doing so only increases the value of the Five Eighty-Three Valuation by about 20%. Nevertheless, the 1.15 assumption for Asset Turnover for the next 10 years is optimistic and intended to reflect that NVDA has been investing heavily in R&D. Consequently, NVDA may not be able to realize rapid sales growth while simultaneously increasing Asset Turnover. If we reduce the 115% to the terminal assumption for Asset Turnover of 66.67%, we will reduce the \$583B valuation by about 16%.

## 3. The Trillion Dollar Valuation

This alternative approach uses the same underlying calculation as the Five Eighty-Three valuation but solves for projections that are consistent with a \$1.06T enterprise value of NVDA, which is accomplished as follows. First, the initial growth of revenue is set to the firm's average revenue growth rate over the past five years. Second, the initial operating margin is set to the median operating margin over the past five years. Third, Asset Turnover and the Tax Rate are set to constants that are the median of historical values for the firm over the past five years. Fourth, initial growth is assumed to be sustained for five years and then tapers off to 2% over the next five years. Fifth, WACC is set to a flat 7.555%. Finally, the initial margin converges to an "implied sustainable margin" over the next five years, and the "implied sustainable margin" is fixed in perpetuity.<sup>2</sup> This approach is useful in that it can be applied uniformly across many non-financial companies and facilitates comparison of valuations across a wide variety of non-financial firms including firms that have historically had negative operating margins.

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<sup>2</sup>Yield to maturity, Z-spread and Option Implied Volatility are examples of solving a valuation model for a given parameter such that the solution is equal to a current market price. Implied sustainable margin presented here can be understood by analogy to these examples. See my blog post for the elaboration of this analogy (Dwyer 2023c).

### 3.1 Trillion Dollar Projections & Assumptions

Table 3 presents the Trillion Dollar projections, and a footnote describes the terminal value calculation. Revenue is projected to grow by a factor of 4.4 while assets grow by a factor of 5 and EBIT grows by a factor of 22. The discounted terminal value is \$821mm, which implies that most of the value of the firm is in the terminal value. Table 4 presents the assumptions used in this valuation. The growth of revenue is about 24% for the first five years before converging to the 2% terminal growth assumption by year 10. The operating margin grows from 27% to an implausible 94%. Asset Turnover is assumed to be flat at 63% and the tax rate is assumed to be flat at 21%. Relative to the Five Eighty-Three valuation, the sales growth assumption is more moderate, but the margin expansion is more aggressive resulting in somewhat larger EBIT growth. Nevertheless, the key difference in the valuations is that the Trillion Dollar valuation uses a lower WACC (7.55% versus about 9.7%). The methodological advance that we introduce this quarter addresses the issue of solving for an implausibly large implied sustainable margin.(Dwyer 2023b)

Table 3: DCF Calculation: The Trillion-Dollar Valuation

| Year | Revenue | Assets | EBIT | EBITafterTax | ROI  | Reinvest | FCFF  | Discounted |
|------|---------|--------|------|--------------|------|----------|-------|------------|
| 2023 | 30      | 41.2   | 5.6  | 4.2          |      |          |       |            |
| 2024 | 32      | 54.2   | 8.66 | 6.84         | 13.5 | 13.1     | -6.21 | -5.77      |
| 2025 | 40.3    | 71.3   | 17.7 | 13.9         | 21.9 | 17.1     | -3.12 | -2.7       |
| 2026 | 51.1    | 92.6   | 30.9 | 24.4         | 30.3 | 21.3     | 3.17  | 2.54       |
| 2027 | 64.5    | 116.7  | 49.9 | 39.4         | 38.6 | 24.2     | 15.2  | 11.4       |
| 2028 | 79.8    | 141.7  | 75.2 | 59.4         | 47   | 24.7     | 34.7  | 24.1       |
| 2029 | 95.4    | 163.7  | 89.9 | 71           | 47   | 22.7     | 48.3  | 31.2       |
| 2030 | 110     | 181.7  | 103  | 81.6         | 47   | 17.7     | 64    | 38.4       |
| 2031 | 121     | 191.7  | 114  | 89.9         | 47   | 10       | 79.9  | 44.6       |
| 2032 | 127     | 195.7  | 120  | 94.7         | 47   | 4.03     | 90.6  | 47.1       |
| 2033 | 130     | 199.7  | 122  | 96.6         | 47   | 4.11     | 92.5  | 44.7       |
| 2034 | 132     | 203.7  | 125  | 98.5         | 47   | 4.19     | 94.3  | 821        |
|      |         |        |      |              |      |          |       | 1060       |

*Note:*

In the table above, the sum of discounted cash flows is the number in the lower right corner. It is the sum of the column above. The last number in this column is the terminal value.. The Terminal Value (\$821B) is computed with a Gordon Growth Model that multiplies terminal cash flow by 18.02 and then discounts it by 48.3%. Equivalently, multiplies Terminal Cash Flow by 8.702. Terminal Cash Flow is \$94.3B. Terminal WACC is 7.55% and Terminal Growth is 2%. Therefore, the terminal multiplier is the reciprocal of 5.55% (which is 18.02).

## 4. Comparative Analysis of the Two Approaches

I see the two approaches as complementary. The Five Eighty-Three valuation uses analyst expertise on both the semiconductor industry and NVDA to determine appropriate values for sales growth, margins, asset turnover, taxes and the weighted average cost of capital. The Trillion Dollar valuation takes a broad brush to these issues. It uses recent history where appropriate, and it solves for an implied sustainable margin to ensure that the discounted value of cash flows is equal to the \$1.06T enterprise of NVDA as of the end of Q2 2023.

I have applied this broad-brush approach to 436 non-financial firms. This sample includes the 361 non-financial firms in the S&P 500 as well as another 62 firms that were added to the sample because they were of interest. For example, the name commonly appears in the press. Before running the analysis, I pulled financial statement information available from the SEC as of the end of Q2 2023 as well as the corresponding stock

Table 4: DCF Calculation: The Trillion-Dollar Assumptions

| Year | Operating Margin | Growth Rate | WACC   | Asset Turnover | TaxRate |
|------|------------------|-------------|--------|----------------|---------|
| 2024 | 0.2705           | 0.23740     | 0.0755 | 0.6321         | 0.21    |
| 2025 | 0.4383           | 0.25770     | 0.0755 | 0.6321         | 0.21    |
| 2026 | 0.6061           | 0.26790     | 0.0755 | 0.6321         | 0.21    |
| 2027 | 0.7739           | 0.26350     | 0.0755 | 0.6321         | 0.21    |
| 2028 | 0.9417           | 0.23740     | 0.0755 | 0.6321         | 0.21    |
| 2029 | 0.9417           | 0.19540     | 0.0755 | 0.6321         | 0.21    |
| 2030 | 0.9417           | 0.15010     | 0.0755 | 0.6321         | 0.21    |
| 2031 | 0.9417           | 0.10170     | 0.0755 | 0.6321         | 0.21    |
| 2032 | 0.9417           | 0.05253     | 0.0755 | 0.6321         | 0.21    |
| 2033 | 0.9417           | 0.02000     | 0.0755 | 0.6321         | 0.21    |
| 2034 | 0.9417           | 0.02000     | 0.0755 | 0.6321         | 0.21    |

price information for the close of the last market day of the Q2 2023. Berkshire Hathaway held 19 of these firms in Q2 2023. This approach allows for comparison of valuation parameters across a variety of firms.

#### 4.1 Comparison with other semiconductor Companies

Table 5 shows NVDA and 15 other semiconductor companies that are in the sample of 436 firms. This list was assembled by looking at the holdings of the Fidelity Select Semiconductors Portfolio (a mutual fund). Intel was included as well as it is the largest semiconductor firm in the S&P 500 by revenue even though it is not held by the mutual fund. The table is sorted by descending revenue placing NVDA in the fifth row. NVDA's initial operating margin (OM1) and Asset Turnover (Asset Turn) are 27.5% and 63.2% both of which are in the middle of the distribution. NVDA's initial growth (G) is on the high end at 23.7% but not an outlier – AMD and ENPH have had more rapid growth. NVDA is a clear outlier in terms of Enterprise Value to EBIT (EV to EBIT), implied sustainable operating margin (OM5) and Enterprise Value itself, all of which are driven by the “great expectations” valuation of NVDA. Only AMD has an asset turnover of 115% with every other firm below 90%, which draws into question the reasonableness of the 115% asset turnover used in the Five Eighty-Three valuation.

#### 4.2 Comparisons of Projections with Recent History

The left-hand panels of Figures 3 & 4 below compare projections for Asset Turnover and Operating Margin for the two valuations with the historical experience of NVDA using a rolling four-quarters approach for Sales and Operating Margin. The Five Eighty-Three approach uses a much more aggressive assumption for Asset Turnover for the ten years of the projection before reverting to the historical experience, while Trillion Dollar valuation starts at a reasonable value for operating margin before jumping 95% to achieve the Trillion Dollar valuation.

The right-hand panels of Figures 3 & 4 compare the historical growth of revenue for NVDA to the projections using a rolling four-quarter approach and logarithmic vertical axes for sales. The Five Eighty-Three projections are aggressive relative to history whereas the Trillion Dollar projections are slow relative to the full history. The Trillion Dollar projections only consider the past five years which includes past four quarters in which sales declined.

#### 4.3 Value Attribution Analysis

Figure 4 demonstrates an attribution analysis that can be performed across a sample firms based on projections for each firm derived using a common approach. The chart below shows the impact of the Assumed Growth

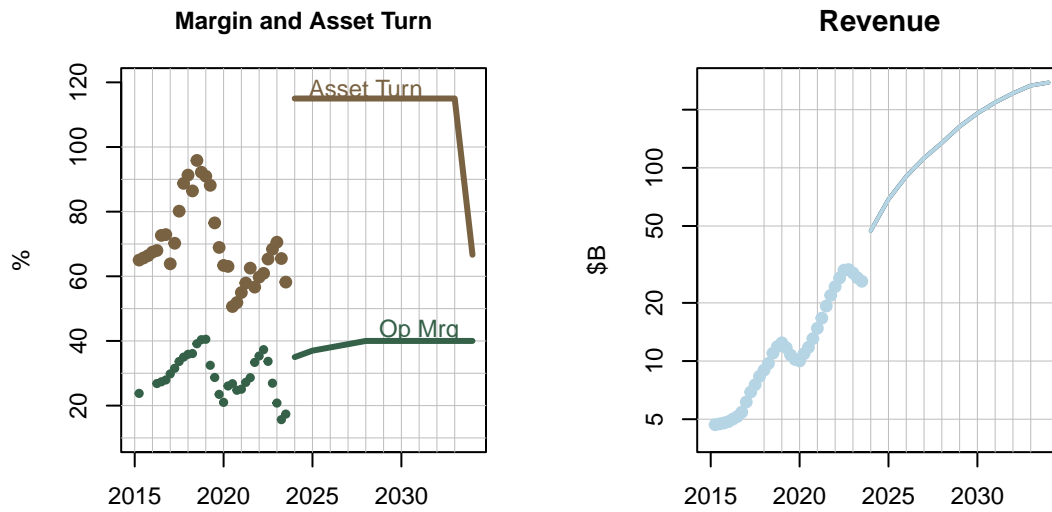


Figure 2: Actual history (Dots) beside projections (Lines) for the \$583B Valuation

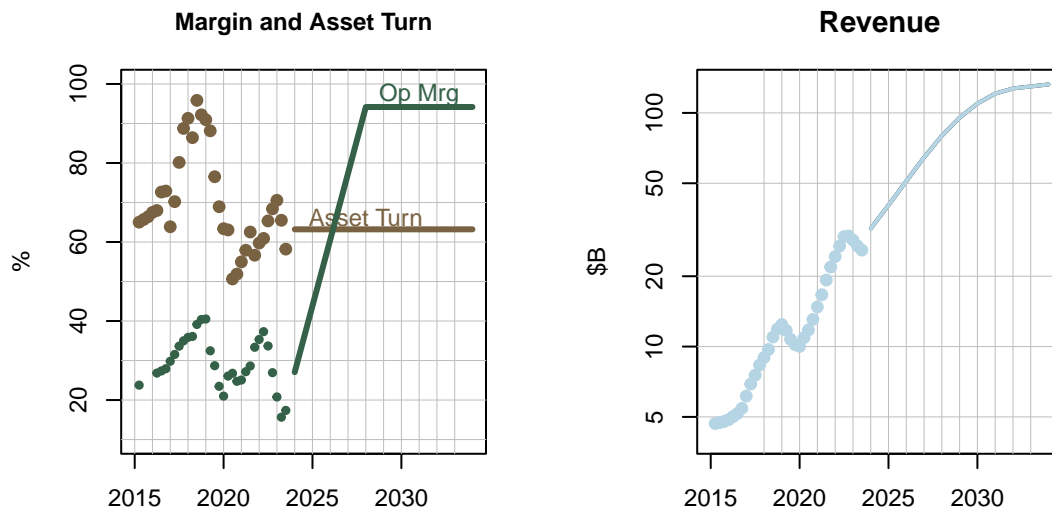


Figure 3: Actual history (Dots) beside projections (Lines) for \$1.06T Valuation



Table 5: Semiconductor Firms in the Valuation Space Sample

| ticker | EV to EBIT | OM1   | OM5   | G     | Asset Turn | EV      | REV     |
|--------|------------|-------|-------|-------|------------|---------|---------|
| INTC   | 12.1       | 28.2% | 28.6% | -1.8% | 51.1%      | \$190B  | \$56.4B |
| QCOM   | 10.1       | 30.9% | 16.1% | 15.6% | 77.5%      | \$149B  | \$41.1B |
| AVGO   | 36.1       | 25.5% | 59.5% | 11.2% | 32.8%      | \$360B  | \$35B   |
| AMAT   | 15.7       | 27.3% | 21.9% | 11.4% | 88.6%      | \$127B  | \$26.6B |
| NVDA   | 122.0      | 27.1% | 94.2% | 23.7% | 63.2%      | \$1060B | \$25.9B |
| AMD    | 54.3       | 11.2% | 16.6% | 32.9% | 115%       | \$186B  | \$23.1B |
| TXN    | 19.6       | 42.7% | 48.7% | 6.01% | 78.5%      | \$174B  | \$19.5B |
| NXPI   | 20.4       | 21.3% | 25.3% | 12.2% | 48.2%      | \$64.3B | \$13.2B |
| ADI    | 24.8       | 28.7% | 42.6% | 13.9% | 26.5%      | \$104B  | \$12.9B |
| KLAC   | 15.5       | 36.3% | 21.4% | 21.2% | 67%        | \$72.4B | \$10.6B |
| MCHP   | 38.7       | 16.1% | 45.8% | 11.8% | 32%        | \$58.7B | \$8.44B |
| ON     | 35.9       | 13.9% | 31.2% | 7.77% | 68.8%      | \$44.7B | \$8.34B |
| SWKS   | 12.4       | 28.2% | 20.4% | 9.79% | 64.8%      | \$19.6B | \$5.12B |
| TER    | 19.5       | 27%   | 25.2% | 12.7% | 86.1%      | \$17.9B | \$3.02B |
| ENPH   | 36.8       | 17.3% | 17.4% | 45.5% | 72.3%      | \$24.2B | \$2.62B |
| MPWR   | 57.1       | 19.2% | 29%   | 27.4% | 73.2%      | \$26.1B | \$1.87B |

Rate and the Implied Margin on the Revenue Multiple of all the firms in our sample. Revenue Multiple is just the ratio of Enterprise Value to Revenue.

The Margin Attribution is measured as follows. It computes what the Enterprise Value would be if everything was held constant except the margin over the next ten years was set to the initial margin (the median value of over the past five years). The new Revenue Multiple is then subtracted from the current Revenue Multiple. Therefore, if Margin Attribution is 2 it has the interpretation that the value of the firm is 2 annual revenues more than it would be if the implied sustainable margin equaled the initial margin.

The Growth Attribution is measured as follows. It computes what the Enterprise Value would be if everything was held constant except revenue growth was set to zero. The new Revenue Multiple is then subtracted from the current Revenue Multiple. Therefore, if the Growth Attribution is 2 it has the interpretation that the value of the firm is 2 annual revenues more than it would be if the estimated growth were equal to 0.

Figure 4 is a scatter plot of this attribution analysis performed on all the firms in our sample. The horizontal axis is the Margin Attribution, and the vertical axis is the Growth Attribution. This analysis allows for the categorization of firms.

- The firms that are near *Great Expectations* are firm's whose valuations are positively impacted by both the assumed growth rate and the implied margin. These are the firms that are both expected to continue to grow and simultaneously increase their margins. Both NVDA and SNOW are in this category.
- The firms near the origin are *Business as Usual* firms in the sense that their valuation is not heavily impacted by either the assumed growth rate or the implied margin.
- The firms near *Show Me the Money* are firms for which the assumed growth rate has little impact, but the implied margin has a positive impact on the Revenue Multiple. These are the firms that the market expects to improve their operating margins going forward.
- The firms near the "Rising Stars" are the firms for which the assumed growth rate has a large positive impact on the valuation, but the implied margin does not. These are firms that are expected to grow over the next five years like they have in the past five years and sustain the current levels of operating margins.

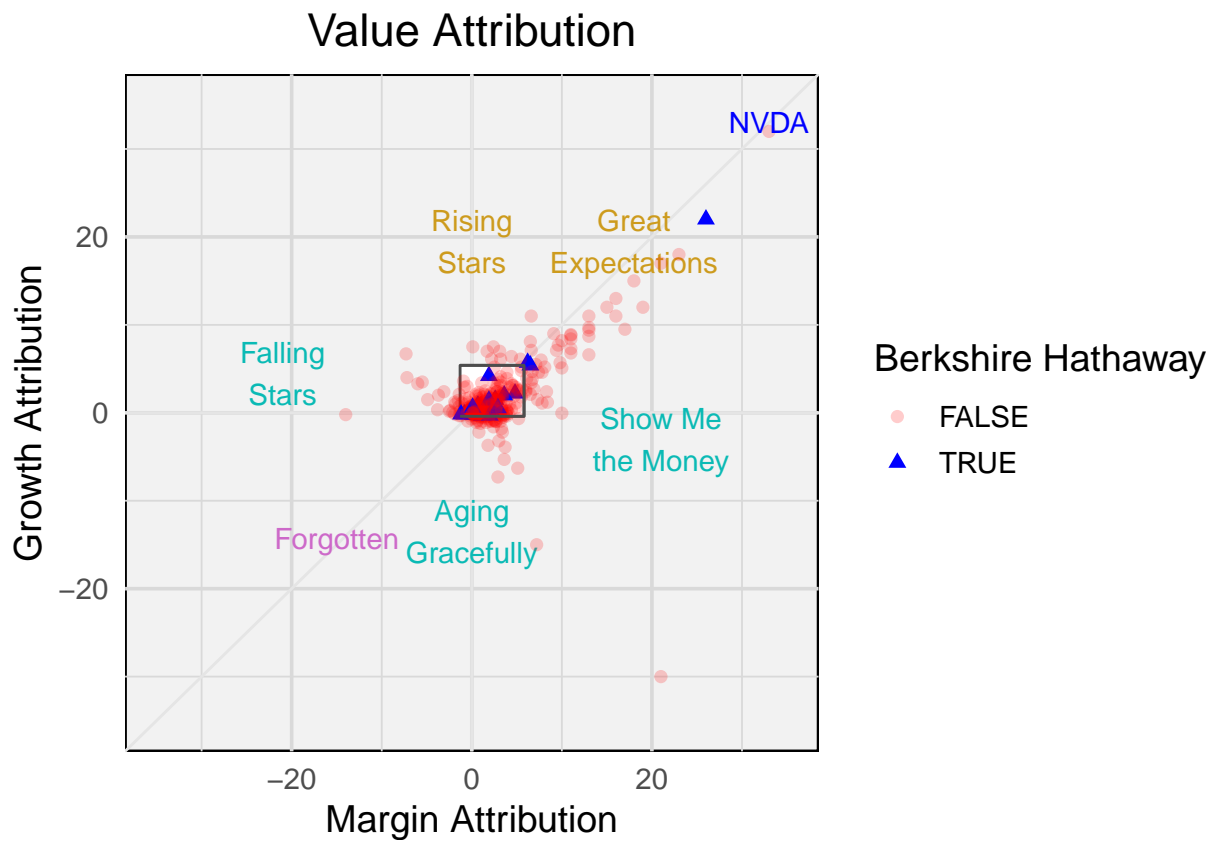


Figure 4: Value Attribution on a sample of 436 non-financial firms with 19 held by Berkshire Hathaway

Of the 436 firms in our sample, Berkshire Hathaway held 19 of them in the beginning of 2023. The investment philosophy of Berkshire Hathaway has been characterized as *Value Investing* where one only buys firms whose intrinsic value exceeds their current price. For 18 of the firms that Berkshire held, they are in the valuation zone in the sense that the impact of both Margin and Growth is not too big. For the most part, Berkshire Hathaway does not hold the names that require both growth and a substantial margin increase to justify their valuation — firms like NVDA. The exception to the rule is SNOW.

In this analysis, NVDA is a clear outlier. The growth assumption increases its valuation by 32 annual revenues and the assumption on margin expansion increases its valuation by 32 annual revenues as well. As its revenue is about \$26B this represents a \$832B reduction in value or a 78% reduction in share price.

## 5. A \$329B Valuation based on a reasonable scenario

Below are the projections that combine the revenue growth, tax rate, and WACC projections of the Five Eighty-Three Valuation with a flat Operating Margin and Asset Turnover of 27.5% and 63%, respectively. These projections yield a discounted value of \$329B. One can increase the value to \$1.06T by lowering the WACC to a flat 6.03%. This analysis demonstrates that a buy-and-hold investor that pays \$1.06T for NVDA would be making a 6% return on their investment despite extraordinary performance on the part of the firm (more than a ten-fold increase in earnings over a ten-year period).

Table 6: DCF Calculation: the Three Twenty-Nine Valuation

| Year | Revenue | Assets | EBIT | EBITafterTax | ROI  | Reinvest | FCFF  | Discounted |
|------|---------|--------|------|--------------|------|----------|-------|------------|
| 2023 | 30      | 41.2   | 5.6  | 4.2          |      |          |       |            |
| 2024 | 47.2    | 59.9   | 12.8 | 11.5         | 28   | 18.7     | -7.2  | -6.41      |
| 2025 | 68.7    | 78.7   | 18.6 | 16.7         | 28   | 18.9     | -2.13 | -1.69      |
| 2026 | 90.4    | 97.7   | 24.5 | 22           | 28   | 19.1     | 2.93  | 2.08       |
| 2027 | 112     | 116.7  | 30.4 | 27.4         | 28   | 19.4     | 8.01  | 5.05       |
| 2028 | 135     | 142.7  | 36.4 | 32.8         | 28   | 25.2     | 7.6   | 4.27       |
| 2029 | 164     | 166.7  | 44.3 | 38.5         | 27.1 | 24.2     | 14.3  | 7.2        |
| 2030 | 191     | 189.7  | 51.8 | 43.5         | 26.1 | 23.1     | 20.4  | 9.27       |
| 2031 | 218     | 211.7  | 59   | 47.8         | 25.2 | 21.8     | 25.9  | 10.7       |
| 2032 | 243     | 231.7  | 65.8 | 51.3         | 24.3 | 20.4     | 30.9  | 11.6       |
| 2033 | 267     | 240.7  | 72.1 | 54.1         | 23.3 | 8.35     | 45.8  | 15.8       |
| 2034 | 276     | 255.7  | 74.7 | 56.1         | 13.5 | 14.9     | 41.1  | 271        |
|      |         |        |      |              |      |          |       | 329        |

*Note:*

In the table above, the sum of discounted cash flows is the number in the lower right corner. It is the sum of the column above. The last number in this column is the terminal value.. The Terminal Value (\$271B) is computed with a Gordon Growth Model that multiplies terminal cash flow by 19.05 and then discounts it by 34.6%. Equivalently, multiplies Terminal Cash Flow by 6.592. Terminal Cash Flow is \$41.1B. Terminal WACC is 8.85% and Terminal Growth is 3.6%. Therefore, the terminal multiplier is the reciprocal of 5.25% (which is 19.05) .

## 6. Concluding Remarks

If I were running a business with the intent of generating long-term wealth for its stakeholders, I would want the valuation to be “about right”. If it is too low, I would have difficulty getting the appropriate financing required to grow the business. If it is too high, there would be pressure to grow the business rapidly that could lead to excessive risk-taking.

I grew up in Corning, NY which is the home of Corning Incorporated (GLW), a company whose current enterprise value is about \$37B. At the turn of the century, GLW’s stock price was extremely volatile: \$8 a share in August of 1998, \$109 by August of 2000, and then \$2 a share in the summer of 2002. Today a share of GLW will cost you about \$33 (in July of 2023), which buys you a P/E ratio of about 30.

Of course, the P/E ratio for GLW was very high in August of 2000. At the time Corning pursued a growth strategy that included acquiring a number of expensive, small companies in the fiber optics business. There were residents of Corning, NY that thought the market had gone insane. Nevertheless, there were relatively few who could specify a set of trajectories for revenue, profit, investment and cost of capital that would yield a stream of discounted cash flows (DCF) consistent with the current valuation of the company. Consequently,

few could quantify how “insane” the market had become. After the stock price crashed, Corning reversed its growth strategy and executed a painful reduction in force.

There are many firms today with very elevated P/E ratios and even negative P/E ratios. In acquiring a company, I do not think a corporation would tell its board: ‘We want to buy a firm that is going to do extraordinarily well and when it does, we will get an ordinary return on investment’. Surprisingly, buyers of some stocks seem to be making such investments.

## References

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