

NVDA a Trillion Dollar Company?

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Nvidia Corporation (NVDA) recently achieved a market capitalization of \$1T on May 30th 2023 when the stock price spiked above \$400. The enterprise value of NVDA crossed \$1T as well¹. As this implies a P/E ratio on the order of 200, such a valuation implies that the market has great expectations for NVDA.

How great are the expectations for company given a \$1T valuation? How can we think about them? The revenue of Apple (APPL) was about \$40B in 2009 and their operating income was about \$8B. Today, their revenue is about \$400B and their operating income is about \$110B. The total assets on their balance sheet has also grown from \$40B to \$352B during this time period and the share price has grown from about 7 to about 177.25 today. The annualized rate of return of holding this stock was approximately 25% over this period. APPL substantially exceeded the expectations of the market over the past 14 years.

I am working on a research project to understand how firms are valued in practice. In corporate finance, the value of a firm is the present discounted value of expected future cash flows discounted at a rate that accounts for the systematic risk of the exposure. The accounting that determines what is a free cash flow is often not straightforward from both a pragmatic standpoint and a philosophical one. Determining an appropriate discount rate and projecting forward growth paths is challenging as well. Consequently, the project is intellectually fascinating.

The valuation framework that I am developing has its roots in a spreadsheet created by Aswath Damodaran, a corporate finance professor at NYU Stern. I am focusing on projecting forward Free Cash Flow to the Firm and discounting these cash flows backwards using a reasonable weighted average cost of capital to determine the “Enterprise Value,” which is how much it would cost to buy the company outright free of both debt and cash. In this context, the cash flows that are being modeled are independent of the capital structure and financing of the firm.

In Damodaran’s spreadsheet, he defines Free Cash Flow to the Firm as:

$$FCFF = \text{Operating Income} - \text{Taxes} - \text{Reinvestment}$$

where Reinvestment is the change in the total assets of the company year on year. If FCFF is negative in one year the firm will need some form of financing. If FCFF is positive they could use the proceeds to pay a dividend or interest on debt.

Below is a set of projections for NVDA that produce a stream of cash flows that when discounted at 7.55% produce a valuation of \$999B. The projections go out for 14 years. Revenue growth is sustained at 23% for the first 9 years before tapering off to 2% by year 14. Operating margin starts at 31% before increasing to 50% by year 9. The 50% margin persists forever. We assume that each new \$1 of incremental investment produces \$0.62 of new sales—Asset Turnover will be 62% on new investment.

There are many projections that will yield a comparable valuation, we choose these projections as follows. The Asset Turnover assumption is consistent with NVDA historical experience and the 50% sustainable margin combined with 23% growth is consistent with Morningstar’s research. The 30% initial margin is in

¹NVDA has about \$11B in debt and about \$3B in cash on its balance sheet at the end of January 2023, which implies it has an enterprise value that is about \$8B more than its Market Cap. Since the spike, there has been a about a 6% correction—its EOD share price for May 31, 2023 was 378.34, so its Enterprise Value and Market CAP are both about \$940B as of June 1, 2023

between the margins that they achieved in fiscal years 2022 and 2023. The initial revenue of \$33B for FY 2024 is a 23% increase on their reported revenue for FY 2023 (ending on January 31, 2023). Their book assets of \$51B is \$10B more than their assets at the end of FY 2023 which reflects a reinvestment of \$10B in order to achieve an increase in sales of \$6B. The longer the period of 23% growth the greater the valuation. I chose to extend the period of growth to year 9 to achieve a valuation close to \$1T. Given the constraints of the initial conditions and a \$1T valuation, these projections are reasonable; others can be considered.

For the first five years, NVDA will require financing in the range of \$1 to \$2B a year as its FCFF is negative, and they currently pay a dividend of about \$400mm a year. This financing could be achieved with Stock Based Compensation, which is approximately \$2.7B a year; we use GAAP operating income when computing FCFF which implies that SBC is being treated as an expense.

One can think of the value of any asset as representing the probability weighted average of the value of the asset under many projections. In this context, the projections below have a value that is equal to this probability weighted average. One can think of the projections below as indicative of the center of mass of the distribution of many projections, some of which are better and some of which are worse than the projection below.

Table 1: DCF Calculation: Trillion Dollar NVDA Projections

FY	Revenue	Assets	OpInc	OpInc after Tax	ROI	Reinvest	FCFF	Discounted
2024	33.2	51.2	10.3	8.13	15.2	10	-1.88	-1.750
2025	41.3	64.3	14.1	11.2	16.7	13.2	-2	-1.730
2026	52.1	81.6	19.4	15.3	18.3	17.3	-1.97	-1.580
2027	66.1	104	26.6	21	19.7	22.7	-1.66	-1.240
2028	84.5	134	36.4	28.8	21.1	29.6	-0.842	-0.585
2029	108	172	49.4	39	22.4	38.1	0.891	0.575
2030	138	220	65.9	52.1	23.4	47.9	4.17	2.510
2031	174	278	85.7	67.7	24.2	57.7	10	5.590
2032	214	342	107	84.3	24.5	64.4	19.9	10.400
2033	254	407	127	100	24.5	65.2	35.1	16.900
2034	291	467	145	115	24.5	59.7	55.2	24.800
2035	320	513	160	126	24.5	46.4	79.9	33.300
2036	336	540	168	133	24.5	26.5	106	41.300
2037	343	551	171	135	24.5	10.8	125	45.000
2038	350	562	175	138	24.5	11.3	127	825.000
								999.000

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 (\$825B) is computed with a Gordon Growth Model that multiplies terminal cash flow by 18.02 and then discounts it by 36.1%. Equivalently, multiplies terminal cash flow by 6.504. Terminal Cash Flow is \$127B. Terminal WACC is 7.55% and terminal growth is 2%. So the terminal multiplier is the reciprocal of 5.55% (which is 18.02).

For NVDA to realize such projections would be a substantial accomplishment. In twelve years, revenue and assets would increase ten fold and operating income by even more. The accomplishment would be comparable to what Apple has accomplished over the past 13 years. Keep in mind, however, that this is what the market expects of NVDA. Investors that bought Apple in 2009 and held earned returns in the range of 25%. Investors that buy NVDA today and hold will earn returns of about 7.55% if NVDA's success over the next 15 years is comparable to that of Apple over the past 15 years. The market has *great expectations* for NVDA.

How Sensitive is this valuation to the WACC assumption?

I have been using 7.55% as an assumption for the WACC which is the current 10-year treasury rate (3.55% in early 2023) plus 4% as a liquidity/risk premium. For NVDA, I think it would be easier to defined a higher WACC as it has a lot of systematic risk. A higher WACC will lower the value of the firm and vice-versa. The figure below shows the sensitivity of the valuation to the WACC. If one used a 8.55% assumption for the WACC it would lower the valuation by about 25% so the trillion dollar valuation would become \$750B, which is more in line with Morningstar's fair value estimate of \$300 per share. As NVDA is a high beta stock, one can argue that the WACC should be as much as 500bps higher than 7.55% in which case the value would be 67% lower. To get to a \$1T valuation with a WACC of more than 12% one would need even more impressive projections.

Sensitivity of Enterprise Value to the WACC

