

Case Study Series

**Evaluating a Growth Company’s Valuation Using Discounted Cash Flow Analysis**

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**Abstract**

After releasing its 2016 annual results, Amazon.com, Inc. (AMZN) stock was hitting new all-time highs, closing at \$842.70 on February 15, 2017, the date that the action of this case takes place on. The case provides students with a review of the widely used Free Cash Flow to the Firm version of the Discounted Cash Flow model, and then challenges them to use the model to evaluate Amazon’s valuation as of the case date. Students gain insights into the factors that drive value in the Discounted Cash Flow model by considering several different scenarios. Amazon’s financial statements and a variety of additional financial and market data are provided.

**Keywords:** valuation, free cash flow to the firm, discounted cash flow, Amazon

“It’s a privilege to be here with such a fine group of young junior associates,” said Bronx Asset Management managing director Russ Leffingwell. “I’ve asked the four of you to meet with me today so that I can brief you on an important assignment. While some of you have worked primarily on the private equity side of the firm so far, as you know Bronx also manages a large portfolio of public equities. You probably also know that our largest public position is in Amazon. Raj Kapoor first bought it at \$76.13 back in December of 1999 for our New Era Growth Fund, which has since been rechristened the Falconer Opportunity Fund. We were down over 90% on the name at one point after the dot-com crash, but are now up eleven-fold on our original basis and our compounded annual return on the name is over 15%. Currently the stock is hitting new all-time highs and sports a triple-digit P/E, and I for one am concerned that we might be getting into bubble territory again. Raj on the other hand is as big a bull as ever on the name. We have a meeting of the investment committee on Thursday morning at 10 a.m., and our Amazon position is at the top of the agenda. I would like for this group to make a presentation for the committee. I don’t want you to make an argument to buy, sell, or hold. What I do want you to do is to explain to the committee how well Amazon’s business will have to perform going forward to justify its current valuation. I don’t want a handout with dozens of scenarios. I want a simple argument based on the key value drivers. If your results turn out like I think they will then the other esteemed members of the committee might have to become more open-minded about trimming the position. Any questions?”

“No questions Russ, I’d just like to say that I am really honored that you are giving us such an important assignment, and I know that this group is up to the challenge,” said Richard “Rich” Whitney IV, a recent graduate with a degree in government from a prestigious eastern university. “Just what I wanted to hear Rich, said Russ. Unfortunately, I won’t be around for you to call on because I’m on my way out the door to catch a limo up the coast. I have a full day of interviews for new junior associates tomorrow...just in case the current crop doesn’t work out so well. But if you do need support, my assistant Jane will be on call as always.”

“Well, I hope no one had any plans for Valentine’s day” said Rich. It was just after 4 p.m. on Tuesday, February 14, 2017 as the four young associates sat in the spacious conference room and sized each other up. In addition to Rich, the team included Marisol Pinochet, a former

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management consultant already taking MBA courses in the evening, Lu Li, a chemical engineering major and avid stock market investor, and Lou Melfi, a geography major who had recently served in the Peace Corps. “As far as I’m concerned, there’s nothing more romantic than spending Valentine’s Day here with my fellow associates,” said Lou. So how should we get started? Does anyone here know anything about financial modeling?”

“Since we are short on time, allow me to volunteer to help to get everyone up to speed, said Marisol. I just took a course in valuation from Professor Aswath Damodaran at NYU last Fall, and I am concentrating in finance in the M.B.A. program. Let’s take a 10-minute break, and then when we come back I’ll give all of you a little refresher course. Once everyone understands the framework, we can decide how to divide up the work.”

An edited version of the tutorial provided by Marisol appears below.

### I. DCF Framework

The value of any company can be estimated by discounting its expected future cash flows back to their present value and adding them up. One advantage of a discounted cash flow (DCF) approach is that one can isolate and focus on the particular drivers of expected future cash flows. A DCF approach is particularly appropriate for this assignment because the team is not being asked to estimate a value, but to estimate the values of the important value drivers that are necessary to justify Amazon’s current stock price. We will work with a two-stage Free Cash Flow to the Firm (FCFF) model that explicitly estimates unlevered free cash flows over a finite forecast period, and then allows for a “steady state” beginning in the year after the end of the forecast period in which FCFF grows at a constant rate. The FCFF is discounted back to its present value using the firm’s weighted average cost of capital (WACC) to obtain the value of the firm’s operations. The model can be written as follows, where  $V_0$  is the value of operations and  $N$  is the number of years in the forecast period:

$$(1) V_0 = \frac{FCFF_1}{(1+WACC)^1} + \frac{FCFF_2}{(1+WACC)^2} + \dots + \frac{FCFF_N}{(1+WACC)^N} + \frac{FCFF^{N+1}}{(WACC - \text{Terminal Growth Rate}) * 1 / (1+WACC)^N}$$

To get from the value of operations to the intrinsic value per common share, we can use the following equation:

$$(2) \text{Intrinsic Per Common Share} = \frac{(\text{Value of the firm's operations} + \text{Excess cash and securities} - \text{Financial debt} - \text{Preferred stock} - \text{Pension Deficit and other contractual liabilities} + \text{Value of non-consolidated holdings in other firms} - \text{Value of employee options, warrants, etc.} - \text{Value of non-controlling interest in the firm held by outside investors})}{\text{Common Shares Outstanding}}$$

There are many different types of discounted cash flow (DCF) models, but we will use the two-stage FCFF model because it is appropriate for our task and it is one of the most widely used valuation models. For instance, the model is the standard model used in U.S. courts for establishing fairness opinions in mergers and acquisitions. We will retain the model’s standard five-year forecast period, but longer or shorter forecast periods may also be used when appropriate.

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Next, I will describe one convenient way to break the model down to highlight the key value drivers. The subscript t indicates the year or time period.

$$(3) \text{FCFF}_t = \text{NOPAT}_t - \text{Investment for Growth}_t$$

$$(4) \text{NOPAT}_t = \text{Operating Income}_t * (1 - \text{Tax Rate}_t)$$

Note that interest expense is not subtracted from operating income, and the benefit from the interest tax shield is not recognized. In brief, the present value of future interest payments is accounted for by subtracting debt from the value of operations, and the interest tax shield is accounted for in the cost of debt calculation in the WACC.

$$(5) \text{Operating Income}_t = \text{Sales}_t * \text{Operating Profit Margin}_t$$

$$(6) \text{Investment for Growth}_t = \text{Invested Capital}_t - \text{Invested Capital}_{t-1}$$

$$(7) \text{Invested Capital}_t = (\text{Short-term Debt}_t + \text{Long-Term Debt}_t + \text{Shareholder's Equity}_t - \text{Excess Cash and Securities}_t)$$

Note that Invested capital does not include spontaneous sources of financing such as accounts payable.

$$(8) \text{Invested Capital}_t = \text{Sales}_{t+1} * (1 / \text{Capital Turnover}_t)$$

$$(9) \text{Capital Turnover}_t = \text{Sales}_{t+1} / \text{Invested Capital}_t$$

$$(10) \text{Sales}_{t+1} = \text{Sales}_t * (1 + \text{Sales Growth Rate}_{t+1})$$

$$(11) \text{Invested Capital}_t = \text{Sales}_t * (1 + \text{Sales Growth Rate}_{t+1}) * (1 / \text{Capital Turnover}_t)$$

$$(12) \text{FCFF}_t = \text{Sales}_{t-1} * (1 + \text{Sales Growth Rate}_t) * (\text{Operating Profit Margin}_t * (1 - \text{Tax Rate}_t) - [\text{Sales}_{t-1} * (1 + \text{Sales Growth Rate}_t) * (1 + \text{Sales Growth Rate}_{t+1}) * (1 / \text{Capital Turnover}_t) - \text{Invested Capital}_{t-1}])$$

One advantage of breaking down FCFF in this manner is that in each time period t, there are only four drivers of FCFF: the sales growth rate, the operating profit margin, the tax rate, and the capital turnover ratio. If we multiply the operating profit margin by one minus the tax rate to get the NOPAT margin, then we could reduce this to three value drivers, two of which make up the firm's return on invested capital (ROIC), and are similar to the variables that determine the return on assets (ROA) identity in a DuPont analysis:

$$(13) \text{NOPAT Margin}_t = \text{NOPAT}_t / \text{Sales}_t$$

$$(14) \text{Capital Turnover}_t = \text{Sales}_t / \text{Invested Capital}_{t-1}$$

$$(15) \text{ROIC}_t = \text{NOPAT Margin}_t * \text{Capital Turnover}_t = \text{NOPAT}_t / \text{Invested Capital}_{t-1}$$

During the forecast period, the analyst may choose any value for the sales growth rate, the operating profit margin, the tax rate, and the capital turnover ratio. The values could change every year in the forecast period. However, in the terminal phase, the firm is assumed to be in a “steady state,” so these value drivers should not change. This will result in the growth rates of sales, operating profit, NOPAT, Invested Capital, and FCFF being constant and equal to each other in the terminal phase, which is often also called the “constant growth period.” That said, the value drivers can and often should change from the last year of the forecast period to the first year of the terminal phase. For example, the growth rate in the terminal phase can’t exceed the estimated growth rate of the overall economy, or the analyst will end up with a valuation that predicts that the firm will eventually “take over the world.” The growth rate in terminal phase should equal the “sustainable growth rate,” calculated as follows:

(16) Sustainable Growth Rate =  $ROIC_t \times \text{Reinvestment Rate}_t$ , where:

(17)  $\text{Reinvestment Rate}_t = \text{Investment for Growth}_t / \text{NOPAT}_t$ , implying that:

(18)  $\text{Sustainable Growth Rate}_t = \text{Investment for Growth}_t / \text{Invested Capital}_{t-1}$

which is the growth rate of invested capital. Incidentally, if you elect to use average capital or year t capital in your capital turnover calculation, you will not quite get the clean results presented above for your sustainable growth rate, but as long as you keep the value drivers constant in the terminal phrase your valuation will still make sense.

Another common practice to avoid in estimating the terminal value is to simply multiply the FCFF in the last year of the forecast period by one plus the terminal growth rate to get FCFF in the first year of the terminal phrase. If you do this you will underestimate FCFF in the terminal phrase by “locking in” the rate of investment needed to sustain the higher growth of the forecast period, thereby undervaluing the firm’s operations.

## II. The Plan

“Wow, thanks Marisol, I feel like I just earned my Pinochet MBA” said Rich.

“I’m glad that you found that helpful, said Marisol. Now let’s talk about how we can move forward. To sum up, there are six variables in our model that affect the value of Amazon’s operations: the sales growth rate, the operating profit margin, the tax rate, the capital turnover ratio, the number of years in the forecast period, and the weighted average cost of capital. In addition, we need estimates of the other variables that take us from the value of operations to the per-share value of the stock. Does anyone have any suggestion on where to begin?”

“I think that the most important thing is the profitability, said Lu. The basic bull and bear arguments about Amazon are well known. The bulls say that Amazon could have high profit margins if it wanted to, but it is focused on growth. High profitability will follow from more scale and market dominance. The bears say that Amazon faces great competition and that they will never be able to achieve the profits needed to justify the current stock price.”

It's all about the growth," said Rich.

"True, the bulls focus on growth because they need growth for their story of margin expansion from scale and market dominance to come true, but in the long-run, only cash-flows matter" said Lu.

"That is correct, said Marisol. Growth only adds value if the company's ROIC is above its WACC. And we know that the ROIC is composed of the NOPAT margin and capital turnover. I agree with Lu that coming up with scenarios for profitability that justify the current stock price will be a major focus of our presentation, if not the major focus."

"I am relieved that you agree Marisol," said Lu. I know that we are short on time, but I think that we also need to delve a little more into Amazon's different lines of business. In addition to e-commerce, they have a fast-growing cloud computing business called Amazon Web Services, or AWS. I will do a little research on Amazon's markets and business lines and try to come up with some preliminary thoughts on the company's potential future growth and profitability."

That sounds terrific Lu. If the rest of you agree, I suggest that we adjourn for the evening to collect some data and make some preliminary estimates. I will pull the financials and calculate the values of Amazon's key value driver's for the past five years. I'll also set up a FCF model on Excel that we can use to conduct our analysis. Lu has volunteered to take a closer look at Amazon's prospects for growth and profitability by business segment. Lou, if you like, you can look through the most recent 10K to obtain any information that we may need on pension deficits, employee options, the share count, and the other data that we need to get from the value of operations to intrinsic value per common share. And Rich, we could use your help in estimating Amazon's WACC. We'll meet back here at 8:00 a.m. tomorrow to put it all together and we'll be ready to present to the committee on Thursday morning. Is that okay with everyone?"

"I'm all in," said Rich.

"Sounds good to me, said Lou. There will be no time for romance tonight."

### **III. Summary of the Team's Findings**

After a spirited discussion on Wednesday morning, the team agreed that they would focus on sales growth and operating margins in the company's three reportable segments – North America, International, and Amazon Web Services (AWS) – while holding the other variables in the analysis constant. They agreed that they would try to forecast the overall operating margin that Amazon could achieve by the end of the five-year forecast period, and assume that the company could maintain that margin in the terminal phase. One of the more difficult tradeoffs the team made in the interest of simplifying the analysis was to make the assumption that Amazon's capital turnover (measured as current year sales divided by prior year invested capital) would remain constant at the level achieved in 2016. Table I below presents the segment data collected by Lu from Amazon's 2016 10-K, while Table II presents additional critical data

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collected by the team. Table III presents Amazon's income statements and balance sheets from 2011 through 2016.

**Refer Table I**  
**Refer Table II**

Amazon did not have a material number of employee stock options outstanding, but they did have 19.8 million shares of restricted stock outstanding. The team took a conservative approach and added all of these units to the share count.

Following the recommendation of Damodaran (2012), the team decided to add all cash and marketable securities to the value of operations.

The team counted capital leases as debt and included them in their calculation of invested capital. They also assumed that the book values of debt and capital leases approximated the market values.

The tax rate of 25% estimated for the forecast period was the approximate average effective tax rate for U.S. companies in the prior year, and the 35% rate used in the terminal phase was the U.S. statutory rate at the time of the analysis.

The terminal sales growth rate estimate of 5% was the team's forecast of long-run U.S. nominal GDP growth.

Rich bungled the cost of capital estimate, but fortunately, Marisol recalled a recent blog post by Damodaran (2016) in which he proposed some useful rules of thumb for estimating cost of capital. Judging Amazon to be a mature firm despite its growth opportunities, the team assigned Amazon a cost of capital of 8% based on professor Damodaran's post.

The team was also conservative in assigning no value to Amazon's equity method investments. The team was unable to locate a figure for the book value of these investments in Amazon's latest 10-K and the investments have not been profitable in recent years.

The team did not identify any pension liabilities for Amazon or any outside holdings in the firm. Amazon's cloud market share in 2015 and 2016 was from Synergy Research: <https://www.channele2e.com/2017/02/09/cloud-market-share-2017-amazon-microsoft-ibm-google/>

The estimated annualized growth rate in Amazon cloud sales through 2020 was from UBS: <http://www.barrons.com/articles/amazon-could-be-largest-u-s-company-by-2020-1464866783>

U.S. retail e-commerce sales for 2016 and forecasted sales for 2020 were from Statistica.com: <https://www.statista.com/topics/2443/us-ecommerce/>

Amazon's share of the U.S. e-commerce market in 2016, its estimated share in 2018, e-commerce as a percentage of U.S. retail ex gas, food, and cars in 2016, and the estimated

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percentage for 2018 were from JP Morgan: <http://www.barrons.com/articles/amazon-could-be-largest-u-s-company-by-2020-1464866783>

**Refer Table III**

**IV. Case Questions**

1. Use the Amazon financial statements presented in Table III to calculate the following metrics for 2012-2016: the sales growth rate, the operating profit margin, the effective tax rate, the capital turnover ratio, and the return on invested capital.
2. Calculate the five-year compounded annualized growth rate in Amazon's sales and operating margin from the end of 2011 through the end of 2016.
3. If Amazon's overall firm sales growth rate and its operating margins remain fixed at 2016 levels throughout the five-year forecast period, does the resulting valuation support the bull case or the bear case for Amazon's stock?
4. If Amazon's individual segment sales growth rates and operating margins remain fixed at 2016 levels throughout the five-year forecast period, does the resulting valuation support the bull case or the bear case for Amazon's stock? Why does the overall firm sales growth rate accelerate and the overall firm operating margin expand during the forecast period despite the fact that segment margins and growth rates are not improving?
5. Propose at least one scenario for Amazon's segment sales growth rates and operating margins in the forecast period that roughly justify the stock price. The estimated intrinsic values per share resulting from the scenarios do not have to exactly equal the stock price, but they should be between \$800 and \$900 per share. Use at least one piece of outside market data (either data provided in Table II or data that you find yourself) in your analysis. Explain to the members of the investment committee why this is a plausible scenario.
6. While Russ did not ask the team to provide their own opinion of Amazon's valuation, the team members suspect that other members of the investment committee are likely to ask for it. Prepare your own valuation of Amazon and explain your key assumptions.

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**Table I: Amazon Sales and Operating Income by Segment**  
**(USD in millions- Data from Amazon 2016 10K)**

	<b>2014</b>	<b>2015</b>	<b>2016</b>
North America Net Sales	\$50,834	\$63,708	\$79,785
North America Operating Income	\$360	\$1,425	\$2,361
International Net Sales	\$33,510	\$35,418	\$43,983
International Operating Income	-\$640	-\$699	-\$1,283
AWS Net Sales	\$4,644	\$7,880	\$12,219
AWS Operating Income	\$458	\$1,507	\$3,108
Total Firm Net Sales	\$88,988	\$107,006	\$135,987
Total Firm Operating Income	\$178	\$2,233	\$4,186

**Table II: Additional Data for Valuation Analysis**

(all data as of February 15th, 2017)

Ticker Symbol	AMZN
Fiscal Year End	December
Stock Price	\$842.70
Common Shares Outstanding, in Millions	477.171
Restricted Stock Units Outstanding, in Millions	19.8
Diluted Common Shares Outstanding, in Millions	496.971
Market Capitalization in Millions of USD	\$418,797
Price-to-Earnings (P/E) Ratio	169.6
Cash and Securities, Millions of USD	\$25,981
Debt and Capital Leases, in Millions of USD	\$15,213
Tax Rate in Forecast Period	25.00%
Tax Rate in Terminal Stage	35.00%
Terminal Sales Growth Rate	5.00%
Weighted Average Cost of Capital (WACC)	8.00%
Wal-Mart Trailing Twelve Month (TTM) Operating Margin	4.78%
Amazon Share of Cloud Market 2016	40.00%
Amazon Share of Cloud Market 2015	40.00%
Estimated Annualized Growth in Amazon Cloud Sales 2016-2020	30.00%
US Retail E-commerce Sales 2016, Millions of USD	\$396,700
Forecast US Retail E-commerce Sales 2020, in Millions of USD	\$684,000
Amazon's Estimated Share of U.S. E-commerce Market 2016	37.50%
Amazon's Estimated Share of U.S. E-commerce Market 2018	50.00%
E-commerce as % of U.S. Retail ex Gas, Food, and Cars, 2016	12.00%
Est. E-commerce as % of U.S. Retail ex Gas, Food, and Cars, 2018	14.00%

**Table III: Amazon Income Statements and Balance Sheets**

(Data from Amazon 10Ks, Morningstar, and author's calculations)

**Income Statements**

(USD in millions)

	2011	2012	2013	2014	2015	2016
Revenue	\$48,077	\$61,093	\$74,452	\$88,988	\$107,006	\$135,987
Cost of revenue	\$37,288	\$45,971	\$54,181	\$62,752	\$71,651	\$88,265
Gross profit	\$10,789	\$15,122	\$20,271	\$26,236	\$35,355	\$47,722
Fulfillment	\$4,576	\$6,419	\$8,585	\$10,766	\$13,410	\$17,619
Marketing	\$1,630	\$2,408	\$3,133	\$4,332	\$5,254	\$7,233
Technology and content	\$2,909	\$4,564	\$6,565	\$9,275	\$12,540	\$16,085
General and administrative	\$658	\$896	\$1,129	\$1,552	\$1,747	\$2,432
Other operating expense, net	\$154	\$159	\$114	\$133	\$171	\$167
Total Operating Expenses	\$47,215	\$60,417	\$73,707	\$88,810	\$104,773	\$131,801
Operating income	\$862	\$676	\$745	\$178	\$2,233	\$4,186
Interest Expense	\$65	\$92	\$141	\$210	\$459	\$484
Interest and other income, net	\$137	-\$40	-\$98	-\$79	-\$206	\$190
Income before income taxes	\$934	\$544	\$506	-\$111	\$1,568	\$3,892
Provision for income taxes	\$291	\$428	\$161	\$167	\$950	\$1,425
Equity Method Income	-\$12	-\$155	-\$71	\$37	-\$22	-\$96
Net income	\$631	-\$39	\$274	-\$241	\$596	\$2,371

**Balance Sheets**

(USD in millions)

	2011	2012	2013	2014	2015	2016
Cash and marketable securities	\$9,576	\$11,448	\$12,447	\$17,416	\$19,808	\$25,981
Accounts receivable	\$2,922	\$3,817	\$4,767	\$5,612	\$5,654	\$8,339
Inventories	\$4,992	\$6,031	\$7,411	\$8,299	\$10,243	\$11,461
Total current assets	\$17,490	\$21,296	\$24,625	\$31,327	\$35,705	\$45,781
Property, plant and equipment, net	\$4,417	\$7,060	\$10,949	\$16,967	\$21,838	\$29,114
Goodwill and other long-term assets	\$3,371	\$4,199	\$4,585	\$6,211	\$7,204	\$8,507
Total assets	\$25,278	\$32,555	\$40,159	\$54,505	\$64,747	\$83,402
Accounts payable	\$11,145	\$13,318	\$15,133	\$16,459	\$20,397	\$25,309
Accrued liabilities	\$3,751	\$5,684	\$6,688	\$9,807	\$10,372	\$13,739
Unearned revenue	\$0	\$0	\$1,159	\$1,823	\$3,118	\$4,768
Total current liabilities	\$14,896	\$19,002	\$22,980	\$28,089	\$33,887	\$43,816
Long-term debt	\$255	\$3,084	\$3,191	\$8,265	\$8,227	\$7,694
Capital and financial lease obligations	\$1,160	\$746	\$1,990	\$4,224	\$5,948	\$7,519
Deferred taxes and other non-current liabilities	\$1,210	\$1,531	\$2,252	\$3,186	\$3,301	\$5,088
Total liabilities	\$17,521	\$24,363	\$30,413	\$43,764	\$51,363	\$64,117
Total stockholders' equity	\$7,757	\$8,192	\$9,746	\$10,741	\$13,384	\$19,285
Total liabilities and stockholders' equity	\$25,278	\$32,555	\$40,159	\$54,505	\$64,747	\$83,402