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Everything Is a DCF Model

A Mantra for Valuing Cash-Generating Assets

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Introduction

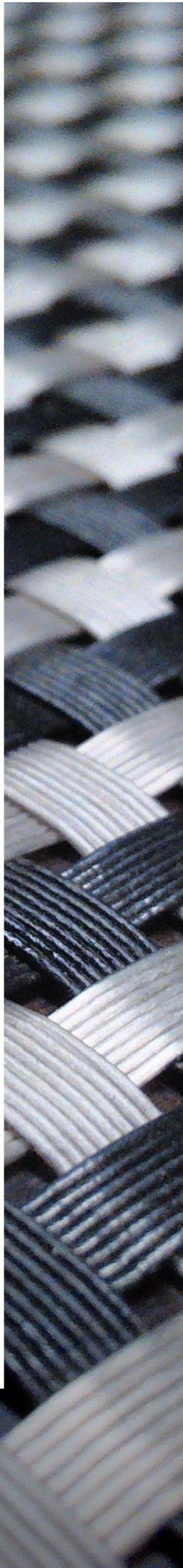
Matt Levine is a very talented journalist who writes the *Money Stuff* opinion column for Bloomberg. A trained lawyer and former banker, Levine is smart, entertaining, and informative.[1] He also likes to use a handful of themes to create context for his observations about business, law, and the markets.

One of his favorites is "everything is securities fraud."[2] The basic idea is that whenever something bad happens to a company causing its stock to decline, someone will accuse the management of acting nefariously. In the same vein, we want to suggest the mantra "everything is a DCF model." The point is that whenever investors value a stake in a cash-generating asset, they should recognize that they are using a discounted cash flow (DCF) model.

This is important because an investor, from a venture capitalist to a manager with a portfolio of large-capitalization stocks, owns partial stakes in businesses. The value of those businesses is the present value of the cash they can distribute to their owners.

This suggests a mindset that is very different from that of a speculator, who buys a stock in anticipation that it will go up without reference to its value. Investors and speculators have always coexisted in markets, and the behavior of many market participants is a blend of the two. But it is useful to keep in mind that these are separate activities.

Note, too, that "everything is a DCF model" does not apply to assets that do not generate cash flows, including cryptocurrencies, art, wine, and gold.[3] All of these assets may be of value and many of them have appreciated over time, but they are not subject to what John Burr Williams, an economist and author of the 1938 classic book *The Theory of Investment Value*, called "evaluation by the rule of present worth."[4]



The topic deserves attention because many market participants now, as in the past, don't think that DCF models are relevant.[5] High valuations for many startups and companies with negative earnings, as well as the existence of "meme stocks," where gains and losses are determined more by online forums than fundamentals, make thinking about cash flows appear quaint. Further, many practitioners use heuristics for value without recognizing the purpose and limitations of the shorthands.

At the end of the day, the intrinsic value, determined by the present value of future cash flows, attracts the price like a magnetic force. This means that investors always have to keep in mind the value drivers of a discounted cash flow model. It is easy to forget but useful to remember.

The Wonder of Markets

Public stock exchanges are wondrous. When you buy a stock, you trade cash for a portion of the future cash flows of a business. When you sell a stock, you trade the cash flows for cash. It's a form of time travel: if you buy a stock at a price less than its perceived value, you are essentially traveling into the future and judging that today's expectations for future cash flows are too low. Selling stock that is perceived to be overvalued is a symmetrical move.

The founder, buyer, or holder of a business anticipates satisfactory returns based on the company's distributable cash flows over time. Cash flows are defined as the difference between profits after taxes and the investments required to sustain or grow the business. This is as relevant for a small business in the local community as it is for a company in the S&P 500. When an owner sells a business, the rights to the cash flow and the associated risk and reward are transferred to the new holder.

Private markets are in some ways different than public markets, but the driver of value is the same. Private markets generally have less liquidity, a measure of how cheap and easy it is to buy and sell stakes in companies, than do public markets. As a result, investors in private markets expect an illiquidity premium, a little extra return to pay them for the inability to transact cheaply.[6] That premium is compensation for the friction of buying and selling. But future cash flows still determine the value of the underlying assets.

Investors in private markets generally have more control over businesses than do investors in public markets. For example, most venture capitalists work closely with the entrepreneurs in whom they invest, sitting on their boards and making key introductions. Buyout firms also have tight control over their portfolio companies, allowing the buyout firms to put in place strong governance practices, including an ability to make changes swiftly and decisively. Control allows private equity investors to be proactive about placing a firm on a path to generating strong long-term cash flows.

Another distinguishing feature of private markets is limited price discovery, a fancy way of saying that prices are not set by a market with lots of willing buyers and sellers. For example, in venture capital the price of a new round of financing is often set by the buyer who is willing to pay most for the stake, and those who think the price is too high have no ready way to sell.

Something similar is true for buyouts. If a buyout firm seeks to acquire a public company, it may have to contend with competing bids from other buyout funds or strategic buyers. But in most cases, the highest bidder wins the auction. As with venture capital, there are lots of potential buyers but only one seller. Price discovery is weak in private markets because the optimists can buy but the pessimists can't sell.

The decision to be private or public boils down to the tradeoff between better governance for companies held by private equity firms and a lower cost of capital for public companies in a portfolio.[7]

Private equity investments are generally riskier than those in public markets. Risk for venture capital firms comes from investing in new or young businesses that have yet to demonstrate their long-term viability. Risk for buyout firms is the result of financial leverage.

These observations are borne out in the distribution of returns for individual investments across the asset classes. From the mid-1990s to 2018, about 60 percent of venture capital investments lost money, but the handful that did exceedingly well allowed the overall asset class to generate competitive returns. Roughly 27 percent of buyout deals lost money, the median investment approximately doubled, and some did very well (though not as well as venture deals). From 1985 to 2019, nearly 25 percent of public market investments lost money over 5 years, and the losses were on average less severe than those in private equity.[8] But the lower risk meant lower returns, with the upside outliers contributing less to returns than in private equity.

Private equity funds have to sell their investments eventually to realize returns for their fundholders. And when they sell, they essentially transfer the problem of assessing future cash flows to the new buyers, whether a company, another fund, or an active portfolio manager. Everything is a DCF model.

Why Doesn't Everyone Believe?

The time value of money, the idea that money today is worth more than an identical amount of money in the future, is one of the first concepts taught in a finance class. As a discounted cash flow model formalizes this concept, it stands to reason that it should be the primary method for investors to value financial assets, including stocks, and for corporate managers to allocate capital.[9]

However, a recent survey of professional equity analysts found that "market multiples" were "[b]y far the most popular approach to valuation" among nearly 2,000 respondents.[10] Specifically, these analysts said that when valuing companies they used price-earnings multiples 88 percent of the time and enterprise value-to-earnings before interest, taxes, depreciation, and amortization (EBITDA) multiples 77 percent of the time.

The discounted cash flow model was the second most popular approach to valuation, albeit more popular in regions outside the Americas. While this sounds encouraging, there are two substantial caveats.

The first is that analysts commonly use an enterprise value-to-EBITDA multiple to estimate the continuing value, also known as the terminal or residual value, in a DCF model.[11] The continuing value often represents 70 to 80 percent of corporate value.[12] That means that what drives the DCF model is for the most part a dressed up multiple.

The second concern is that many DCF models are done poorly, having errors related to theory and dubious economic judgments.[13] Errors include the use of a faulty risk-free rate and assuming unrealistic growth rates in the calculation of continuing value. An example of a poor judgment is an explicit forecast period that is too short. These shortcomings speak poorly not about the approach but rather to how it is applied.

We think there are a number of reasons a DCF model is not used more consistently and properly, in private and public markets:

- **The public markets are pretty good at valuation.** Markets are not completely efficient, of course, but by and large markets are reasonably effective at reflecting known information in prices. While price and value can and do diverge, the wisdom of crowds reminds us that the collective opinion of the market is generally a better judge of price than a single person's estimation.[14]

  Charley Ellis, founder of Greenwich Associates and a luminary in the investment industry for more than a half century, writes playfully, "If you could have anyone—and everyone—you ever wanted as colleague-investors working with you all day, every day, which great investors would you include on your investor's dream team?" He goes on, ". . . today's professional-dominated stock market reflects the accumulated expertise of all those diligent experts making their best judgments on pricing all the time."[15]

  Because the market is likely to be better at valuation than they are, most investors can defer to its ability to reflect what's out there. They can then turn their attention to whether a company's fundamental results will be better or worse than the market's expectations. The problem is that without a clear understanding of what is priced in, there is no easy way to know how changes in the consensus will affect the stock price.

- **Small changes in assumptions for a DCF model can lead to large changes in value.** As a result, many investors are more comfortable using multiples of earnings or cash flow as proxies for valuation. Multiples are a shorthand for the valuation process that have the benefit of saving the user time at the cost of buried assumptions.

  John Burr Williams anticipated concerns about the inputs into a discounted cash flow model. In chapter 15 of his book, called "A Chapter for Skeptics," he wrote, ". . . the old-fashioned methods of appraisal in reality took cognizance of all the factors which give such intricacy to the new formulas, but the old methods did so implicitly, whereas the new methods do so explicitly."[16]

  In other words, valuation using multiples does not avoid the drivers of long-term cash flows but rather obscures them. Williams argues that it is better to make your assumptions explicit and debate them than to make them implicit and ignore them.

- **Lots of valuation is done by comparing.** There are two ways to come up with a value for a financial asset. The first is to calculate an intrinsic value by discounting future cash flows. If the stock market is efficient, price and value will be the same. The second is to compare investments that are similar and buy the relatively undervalued one and sell the overvalued one. If a sufficient number of investors are doing this, few will outperform the market. The first approach assumes that prices are right while the second posits only that it is hard to beat the market.[17]

  Both of these approaches have deep roots in finance. Models based on general equilibrium determine intrinsic value. Other models, including options pricing models, derive value from an underlying asset without concern for whether it is priced correctly.

  Arbitrage in its purest form involves comparing prices of the same asset, say on separate exchanges, and simultaneously buying at the low price and selling at the high price to lock in a riskless profit. Such opportunities are extremely rare. Often there are costs to implementing arbitrage that offset the gains. Arbitrage activities today generally include buying and selling assets that are similar rather than identical, which introduces more risk.[18]

  Relying solely on comparison presents a pair of challenges. One is that investors often select comparable assets to support the case they are making.[19] For example, if an analyst wants to recommend that the

investment firm buy a stock, he or she will select the stocks of comparable companies that have high valuations, making the focal stock look relatively inexpensive.

The more basic issue is that comparative analysis says nothing about intrinsic value. Something may look relatively attractive but still may be absolutely overvalued. An investor can isolate a mispricing by going long one asset and short another, removing exposure to absolute valuation. But this activity introduces new challenges, including identifying stocks that are close substitutes and the mechanics and costs of shorting.

- **Valuation is tricky early in a company's life cycle.** Start-ups are difficult to value using a discounted cash flow model because the range of potential outcomes is so great. The dispersion of growth rates in sales and profits narrows as companies get bigger, which makes the task easier as companies grow and mature. But Aswath Damodaran, a professor of finance and expert in valuation, argues that a DCF model can be used for start-ups and he provides a multi-step process to do so.[20]

  Damodaran's steps boil down to forecasting revenues, estimating profitability, assessing risk, and considering base rates.

  Forecasting a range of potential revenues benefits from a thoughtful assessment of total addressable market (TAM). We believe that TAM can be estimated by a bottom up calculation of the market size, application of a diffusion model, and reference to past results of similar businesses.[21]

  The basic unit of analysis provides insight into how a company makes money. For example, the basic unit of analysis in a subscription business is customer lifetime value, which estimates the cash flow a customer will generate while active and subtracts the cost of acquiring the customer.[22] This step can take into consideration potential benefits from operating leverage and economies of scale.

  Risk includes an estimation of the opportunity cost of capital and how it changes over time. The risk and expected return of a company's stock tend to decline as the company moves through its life cycle.

  Base rates, the results of an appropriate reference class of companies, are useful for assessing survival and growth. This is a powerful and underutilized tool for forecasting.

- **It is hard to value companies that have negative net income.** Nearly 40 percent of public companies in the United States had negative net income in 2020. Companies can lose money for two reasons. The first is that costs exceed revenues and the company is fundamentally unprofitable. The second is the company expenses investments today that are expected to generate attractive cash flows in the future.

  The latter occurs as a quirk of accounting. Tangible investments, such as capital expenditures, are recorded on the balance sheet and only the depreciation of the assets shows up on the income statement. Intangible investments, such as marketing spending, are reflected in full on the income statement. This accounting treatment of intangible assets overstates expenses and understates investment and therefore obscures the economic picture.

  Because investments precede sales and earnings, a profitable company reliant on intangible assets that is growing rapidly will report negative net income even as its business is thriving. Indeed, companies should invest more than they earn if the return on investment is attractive and they have access to capital. Successful companies reliant on tangible assets such as Walmart and Home Depot had years of negative free cash flow in their growth stages even as they were creating substantial shareholder value.

> The answer to this challenge is not to fall back on heuristics, such as multiples of price to sales, but to adjust the financial statements to make them more accurate. This requires shifting intangible investments from the income statement to the balance sheet, leaving only an amortization expense on the income statement. The net result is higher earnings, a bigger balance sheet, and a better sense of the magnitude of investment and return on capital.[23]

Each of these reasons helps explain why DCF models are not used more widely, but none of them stand up to scrutiny. Even if you choose not to build a DCF model for every investment you make, it is useful to keep in mind the factors that drive value. These include growth from investments that earn in excess of the cost of capital, the competitive advantage or uniqueness of a business that keeps competitors at bay, and the opportunity cost of capital. You have to earn the right to use a multiple, which happens when you can demonstrate the link between value and the multiple.[24]

Another effective way to use the model is to ask what you have to believe about the value drivers to justify today's price. This approach singlehandedly addresses all of the common concerns about a DCF model. Instead of an investor determining value, he or she needs only to assess whether the expectations embedded in the shares are likely to be met.[25]

How DCF Models Apply More Broadly

The application of a DCF model in valuation is more prevalent in some assets than others. Corporate bonds are an example where investors commonly use DCF models. A company that issues a bond makes a legal commitment to make timely interest payments on the principal and to return the principal at maturity. The key elements of a DCF model are the magnitude, timing, and riskiness of cash flows. Bonds specify by contract the magnitude and timing of cash flows, leaving the risk that the company will not be able to meet its obligations as the main source of judgment.

Bonds are different than stocks in that with a bond the company will meet all its commitments if everything goes right. There is no upside, only downside if the company defaults. Bondholders get paid before stockholders, which means that bonds generally have less risk than stocks.

A stock is a residual claim on cash flows, which means there is upside if the results are better than expected. Bonds are more about not being wrong and stocks are more about being right. Benjamin Graham and David Dodd, authors of the book *Security Analysis* that formalized the process of investing, said it this way: ". . . bond selection is primarily a negative art. It is a process of exclusion and rejection, rather than of search and acceptance. In this respect the contrast with common-stock selection is fundamental in character."[26]

The discounted cash flow model also works for real estate.[27] Owners of commercial real estate commonly seek to buy a building based on its potential net operating income (NOI), a measure of cash flow calculated as rental or lease income minus operating expenses. These cash flows are discounted at a capitalization rate, or cap rate, which is the investor's required rate of return. For example, if a building has NOI of $50,000 and a market value of $1 million, the cap rate is 5 percent. Cap rates capture the risk associated with a building's cash flows.

We generally don't think about valuing our homes using a DCF model, but in fact it applies to residential real estate as well. Economists define cash flows as the rent the house would generate minus the expenses associated with owning a home, including property taxes, insurance, and upkeep. They then estimate the rate of return by combining these interim cash flows with lumpy cash flows, the entry and exit price.[28] This approach

has tracked home price indices more closely than the estimates made by the economists at the Bureau of Economic Analysis.[29]

Public equities have been the primary focus of our discussion, so there's not much to add. But the topic of asset value deserves a brief comment. One of the criticisms of a DCF model is its sensitivity to inputs, where small changes in assumptions can lead to large changes in output. An alternate approach builds on layers of value, including asset value, earnings power, and franchise value. The bedrock is asset value, deemed to be tangible and reliable, which appears to sidestep the problem of garbage in, garbage out.[30]

The calculation of asset value requires going through the balance sheet line by line and adjusting the figures recorded by the accountants to reflect market or reproduction values. For example, if a company carries a machine on its books at $100 that is worth $150, the company's book value would increase by $50, all else being equal.

The important insight is that asset values themselves are based on the present value of cash flows. Considering what an asset might fetch in the market or what it might cost to build it anew goes right back to the problem of forecasting and discounting cash flows. That this skirts the issue is an illusion.

The purchaser of a company in a leveraged buyout seeks a business with predictable cash flows and uses a relatively large amount of debt to finance the deal. Buyout firms focus intently on improving cash flows during the time they own a business, a median of five years, and often dedicate those cash flows to reducing debt. The total return from the deal requires consideration of the entry price, the interim cash flows, and the exit price. Exit multiples in recent decades have been on average higher than entry multiples, leading to satisfactory returns for buyout funds.

Venture capital is the other large part of private equity. We have already discussed the process to value a start-up. But another important feature of venture funding is that it tends to go in stages. Each successive round of funding, denoted as Series A, Series B, etc., tends to be contingent on a company meeting certain performance metrics. This can be modeled as a series of real options.[31] An option is a right but not an obligation to do something. Real options derive their value from real investments as opposed to financial investments such as stocks.

Option pricing models create a portfolio that is a mix of the underlying asset and the risk-free rate to replicate the cash flows of the option.[32] The models then rely on arbitrage as the value of the option and the value of the replicating portfolio should be the same. Options derive their value from another asset, but their value is still pegged to expected cash flows.

Conclusion

The value of an asset that produces cash is the present value of the cash flows it generates over its life. Few investors explicitly use a DCF model all the time, but it is useful to keep the drivers of the model in mind constantly.

The ideas behind a DCF model have been around for a very long time. Warren Buffett, chairman and chief executive officer of Berkshire Hathaway, suggests they were introduced more than 2,500 years ago:[33]

> " . . . the formula for valuing all assets that are purchased for financial gain has been unchanged since it was first laid out by a very smart man in about 600 B.C. (though he wasn't smart enough to know it was 600 B.C.).
>
> The oracle was Aesop and his enduring, though somewhat incomplete, investment insight was 'a bird in the hand is worth two in the bush.' To flesh out this principle, you must answer only three questions. How certain are you that there are indeed birds in the bush? When will they emerge and how many will there be? What is the risk-free interest rate (which we consider to be the yield on long-term U.S. bonds)? If you can answer these three questions, you will know the maximum value of the bush— and the maximum number of the birds you now possess that should be offered for it. And, of course, don't literally think birds. Think dollars."

Aesop knew that everything is a DCF model.

Please see Important Disclosures on pages 11-13

Endnotes

[1] Emily Flitter, "A Columnist Makes Sense of Wall Street Like None Other (See Footnote)," *New York Times*, October 8, 2020.
[2] For example, Matt Levine, "Everything Still Might Be Securities Fraud," *Bloomberg Opinion: Money Stuff*, June 22, 2021. See www.bloomberg.com/opinion/articles/2021-06-22/everything-still-might-be-securities-fraud.
[3] Benjamin J. Burton and Joyce P. Jacobsen, "Measuring Returns on Investments in Collectibles," *Journal of Economic Perspectives*, Vol. 13, No. 4, Fall 1999, 193-212.
[4] John Burr Williams, *The Theory of Investment Value* (Cambridge, MA: Harvard University Press, 1938), 55.
[5] Here's an example of a confused statement: "Those guys are morons," says Palihapitiya of many value investors. The historic way of determining value by looking at balance sheets and discounted cash flow no longer works, he asserts.
"Today, when money has no value, because we've essentially printed all the money in the world and we'll continue to print it over and over, you have to find value in other parts of the balance sheet, so you have to go to things like brand or intangibles," he says. "And this is where their mathematical models break, and then their brains explode." See Michelle Celarier, "The Unusual Ambitions of Chamath Palihapitiya," *Institutional Investor*, May 31, 2020.
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[15] Charles D. Ellis, *Winning the Loser's Game: Timeless Strategies for Successful Investing, Eighth Edition* (New York: McGraw Hill, 2021), 43-44.
[16] Williams, *Theory of Investment Value*, 186.
[17] Nicholas Barberis and Richard H. Thaler, "A Survey of Behavioral Finance" in George Constantinides, Milton Harris, and Rene M. Stulz, eds., *Handbook of the Economics of Finance* (Amsterdam: Elsevier, 2003), 1053-1128.
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[20] Aswath Damodaran, *Investment Valuation: Tools and Techniques for Determining the Value of* Any *Asset, 3rd Edition* (Hoboken, NJ: John Wiley & Sons, 2012), 643-665.
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[23] Michael J. Mauboussin and Dan Callahan, "One Job: Expectations and the Role of Intangible Investments," *Consilient Observer: Counterpoint Global Insights*, September 15, 2020.
[24] We take the concept of "earning the right to use a multiple" from Dave Zorub, founder of Parsifal Capital.
[25] John Burr Williams also got to this early. He wrote (*Theory of Investment Value*, 188): "Those who feel it unsound to use long-range forecasts under any circumstances may still use the new formulas another way, a way that was almost impossible with the old methods. They may transpose the new formulas and use the actual market price as a datum, instead of seeking the theoretical investment value as an answer. Then with the transposed formulas they may deduce the particular rate of growth, the particular duration of growth, or the like, that is implied by the actual market price, and see in this way whether the prevailing price is reasonable or not." For a contemporary discussion of this approach, see Michael J. Mauboussin and Alfred Rappaport, *Expectations Investing: Reading Stock Prices for Better Returns–Revised and Updated* (New York: Columbia Business School Publishing, 2021).
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