**How do firms value assets?**

**Mikkel Klingenberg Wahl**

In the book Value: The Four Cornerstones of Corporate Finance. The authors argue that valuation can be separated into four corner stones of equal importance. These are:

* **The Core of Value:** a business's value is driven by its growth and return on capital, and resulting cash flows
* **The Conservation of Value:** value is created when companies generate higher cash flows, not by simply rearranging investors' claims on cash flows
* **The Expectations Treadmill:** movements in company share prices reflect changes in the stock market's expectations, not just underlying performance
* **The Best Owner:** the value of a business is not an absolute but, rather, depends on who is managing it and the strategy pursued

This essay will discuss the core of value and the conservation of value in detail.

There are multiple ways of calculating and justifying a firm’s value. The three most prevalent methods today are: asset valuation, valuation using a multiple, and valuation using a discounted cashflow models. I will focus on the intricacies of the discounted cashflow model, its components and the different types of model’s valuators use. Specifically, I will look at the Forward Market Multiple model (FMM), the Key Value Driver model (KVD), the Free Cashflow model (FCF) and the Adjusted present value model (APV).

# In order to understand the details and outcomes of the models mentioned above, it is important that we first understand the inputs that are prevalent across these equations. There are eight important pieces to the models that are worth discussing at depth. These are:

# Growth rate (g)

# NOPLAT

# Invested Capital (IC)

# Return on invested capital (ROIC)

# Weighted average cost of capital (Wacc)

# Free Cashflow (FCF)

# Multiple

# Tax shield

**Growth rate (g):**

The growth rate (g) is one of the most important aspects of the models I will present later. The variable is a representation of what is believed to be the future long-term growth of the company. When we calculate the value of a company there is an explicit and a continuation period. The explicit period is where we accurately forecast future sales, investments and expense growth. This period usually ranges from 1-5 years depending on how accurate we can forecast the growth. Algebraically, the explicit period is expressed as such:

In this period, the growth rate is not strictly expressed as a variable in the equation. However, it is implicitly expressed in both the wacc and FCF as the continued growth of the market influences our expected growth of revenue and cost of capital.

In the continuation term however, we can see explicit representation of g. Although g still has the same impact on the other variables in the equation, it is also expressed as a variable in the equation like so:

Providing an accurate g seems to be one of the hardest aspects of valuation as the representation of g tells us what our cashflow growth is in perpetuity (forever). It is difficult to set an accurate number on exactly how much a company will grow forever. This is objectively the reason why a small change in the long-term g can have a large effect on the total valuation of the firm. Later I will demonstrate the algebraic reason why such a change has a that effect.

**NOPLAT:**

Net Operating Profit Less Adjusted Taxes (NOPLAT) is a cashflow variable favored by many valuation consultants. It is a measure of operating proficiency and gives us an accurate picture of how the company is performing despite taxation and interest expenses. It is calculated by finding the companies EBIT and multiplying it by 1-tax rate. NOPLAT is one of the variables used to calculate our free cashflow and is therefore expressed in all our models. It is also used to calculate the value of our continuation term in the KVD model, which I will talk about later. The NOPLAT variable is calculated as such:

**Invested capital:**

Invested capital (IC) is a measure of the business investments that has been done to the company. For example, if you were to start a restaurant, the money you put in as an owner to get it to start operating would count as invested capital. Invested Capital can be observed in two different ways, the operating approach and finance approach. The operations approach is most useful for us as we can see how the capital is used in the firm’s core business operations.

Invested capital is calculated by adding the total debt and capital lease obligations to the amount of equity issued to investors (Financing approach) or adding fixed assets to net working capital. Invested capital is not a line item in company's financial statement because debt, capital leases and stockholder’s equity are each listed separately on the balance sheet.

**ROIC:**

Return on invested capital is a measure of the return an investor sees on his capital utilization in the firm. It is to see whether the addition of capital (invested capital) leads to increased return or not. A high ROIC for a company is good for investors. It is calculated by dividing NOPLAT by invested capital.

ROIC plays a key role in the KVD model as it is one of the variables used to express the continuation value of the model.

**Wacc:**

Weighted average cost of capital/discount rate is a measure of the cost of capital the firm endures from continued operations. The main components of its capital structure are represented in the formula; the value of common(E), the value of preferred(p) and the value of debt(D). These are weighted against the total (v) and multiplied by the cost of that specific capital section. This is calculated as such: (Where V is the total on E, P and D).

Some look at wacc as the opportunity cost of the capital investment. This variable can also be substituted for investors required return when evaluating a company for investment.

A relationship that is worth mentioning in this section is the values of ROIC, wacc and g. For a company to increase its worth in perpetuity the company must have a relationship as follows: ROIC > WACC > g. If this condition is not met, the company will have a negative value. Although the algebraic relationship is such, it is worth discussing the practical impact of this relationship.

If g is greater than your wacc, the market is growing faster than what your company is capable of. At this point, there is no reason to invest in the company, because the market is outperforming the asset (in perpetuity). This means that the investor would lose money on investing in the company and therefore, the company will have a negative value.

Similarly, if ROIC is less than wacc, it tells us that we cannot keep growing at this rate without constant influx of new capital. This then gives us a negative valuation because the investor cannot put money into the company for ever. In other words, if ROIC < wacc, the growth is not sustainable.

**Free cashflow:**

Free cashflow is measure of the cash that can be reinvested or distributed to the shareholders of a company. The importance of free cashflow comes from its usage in the explicit period calculation of valuation models (+ continuation period in FCF model). Free cashflow is calculated as such:

There is one more possible way to calculate free cashflow using g and ROIC. This construction is used in the KVD model to calculate the continuation term of the asset. The equation in the KVD model will equal the FCF models free cashflow given that the g observed in the calculated free cashflow is equal to the g used in the calculation of the continuation term in the KVD model. The continuation term is calculated as such:

**Multiples:**

Using multiples to calculate the value of a company is the quickest and easiest way to calculate the value of any given company. A multiple is an expression of what a company is selling for as a multiple of another variable on the balance sheet. For example, we could say that a company is trading at 7x sales. This means that the multiple is 7, and that if you do sales\*7 you will get what the company is currently selling for.

The forward market multiple model uses an exit multiple as an expression of the continuing value discounted to today.

**Tax shield:**

In the APV model, a tax shield is added to the FCF model. The reason this tax shield is applied is to reflect the benefit a firm obtains by paying interest and reducing their taxable income. This is added in the form of an additional cashflow that represents the tax shield the firm obtains. This will be explained further in the APV section.

**Three value types**

**Market value:**

The market value of a company represents how the market would value an asset. This is based on previous transactions. Since a lot of privately held companies do not experience consistent transactions, it is likely that the market value approach differs from what you would expect as a company can experience growth/contraction without seeing it reflected in the market cap of equity. It will also differ from the book value of the asset, as there are other parameters controlling the pricing of the asset. The market value (Enterprise value) of an asset is calculated as such:

**Book value:**

The book value of a company is calculated similarly to the market value. However, they differ in how the specific number for the variables are calculated. In book value, we use the values found on the balance sheet. We can expect the value to differ quite drastically from the market value as these numbers are not changed on the same basis as the market value approach. For example, the long-term debt would not change as the market yield changes. This is calculated as such:

**Production value:**

The production value of an asset is a way to asses what future cashflow the asset will provide and value it accordingly. There are two ways of calculating the production value that yields the same number. These are the equations:

**Models**

In this section I will discuss the valuation models mentioned above.

**Free cashflow model:**

When we are calculating the value of a company, the goal is to valuate the future cashflows the company can provide an investor. The question we would generally ask is how much is the right to these future cashflows worth today and what is the risk premium on these cashflows?

This is calculated by forecasting an explicit period where we carefully consider the growth of revenue and expenses in that period. This value is added to the value of a continuation term, which is simply the growth a company has from now until infinity. Algebraically this is how it is expressed:

The values for these two variables represent the explicit and the continuation term of the valuation. Expanding it to show the variables discuss, we get the two equations mentioned earlier which looks like this:

The wacc is used as a discount factor. The cashflows are discounted to assess what they would be worth today, considering the opportunity cost of that capital. This must also be done for the continuation period. This means that the first part of the equation (explicit) is simply the cashflows of that period added together, discounted back to present value. This is then added to the value of **,** which represents the value of the cashflow in perpetuity after the explicit period has ended. In this equation we factor in the growth rate the company will have. As mentioned earlier, there is a critical relationship between WACC and g in this instance. If g is to exceed wacc, the cost of owning the company would be greater than the growth rate of the market, which would give us a negative valuation. To visualize this concept, let me provide you with an example.

|  |  |  |
| --- | --- | --- |
| **FCF** | | |
| **FCF** | **PVDCF(FCF)** | **Total PVDCF(FCF)** |
| 10.187 |  |  |
| -0.120 | -0.108 | -0.108 |
| -3.449 | -2.794 | -2.902 |
| -0.840 | -0.612 | -3.514 |
| -5.263 | -3.454 | -6.969 |
| -7.491 | -4.426 | -11.394 |
| 10.654 |  |  |
|  |  |  |
|  |  |  |
|  | **PVDCF** | -11.394 |
|  | **CVFCF** | 131.558 |
|  | **PVCV** | 77.728 |
|  | **VALUEFCF** | 66.333 |

Here you can see a series of cashflows and a value calculation using the method stated above. In this example, the long run g is at 3% and the wacc at 11.1%. Looking at this, one would expect that the value would increase if the growth rate increases which is exactly what it will do.

|  |  |  |
| --- | --- | --- |
| **FCF** | | |
| **FCF** | **PVDCF(FCF)** | **Total PVDCF(FCF)** |
| 10.187 |  |  |
| -0.120 | -0.108 | -0.108 |
| -1.793 | -1.453 | -1.560 |
| 1.246 | 0.909 | -0.652 |
| -3.114 | -2.044 | -2.696 |
| -5.104 | -3.016 | -5.711 |
| 10.654 |  |  |
|  |  |  |
|  |  |  |
|  | **PVDCF** | -5.711 |
|  | **CVFCF** | 507.696 |
|  | **PVCV** | 299.959 |
|  | **VALUEFCF** | 294.247 |

In this example, the growth rate is increased from 3% to 9%. As we can see, the value has increased quite substantially compared to the first example. Now see what happens as soon as the g > wacc.

|  |  |  |
| --- | --- | --- |
| **FCF** | | |
| **FCF** | **PVDCF(FCF)** | **Total PVDCF(FCF)** |
| 10.187 |  |  |
| -0.120 | -0.108 | -0.108 |
| -0.965 | -0.782 | -0.890 |
| 2.289 | 1.669 | 0.780 |
| -2.040 | -1.339 | -0.559 |
| -3.911 | -2.311 | -2.870 |
| 10.654 |  |  |
|  |  |  |
|  |  |  |
|  | **PVDCF** | -2.870 |
|  | **CVFCF** | -1181.921 |
|  | **PVCV** | -698.307 |
|  | **VALUEFCF** | -701.176 |
|  |  |  |

As we can see the value is negative because we can expect to gain more from the market than the company makes. Hence, we are losing money compared to the market.

The benefit of using this model is that the numerator used in the continuation period represents the cashflow shareholders can expect to have “working for them”.

**Key Value Driver:**

The KVD model uses the same principle as the FCF model. The difference is the numerator is used in the continuation period. The numerator is expressed as an FCF function. As we recall from earlier, this equals FCF. However, the g stated in our calculation must be the same as the one observed in the normal FCF calculation. Usually, this is not the case. Therefore, we have a different valuation for the KVD model. The equation is expressed like this:

The strength of this model form is that we have more control over the applied g for the numerator in the continuation period. This lets us be more aggressive or conservative when evaluating the asset. This also gives us a complimentary valuation when trying to assess the actual value of the company.

Given the construction of the KVD model, we can visualize the impact g > roic would have on the result.

|  |  |  |
| --- | --- | --- |
| **KVD (FCF)** | | |
| **FCF** | **PVDCF(FCF)** | **Total PVDCF(FCF)** |
| 10.187 |  |  |
| -0.120 | -0.108 | -0.108 |
| -3.449 | -2.794 | -2.902 |
| -0.840 | -0.612 | -3.514 |
| -5.263 | -3.454 | -6.969 |
| -7.491 | -4.426 | -11.394 |
| 10.654 |  |  |
|  |  |  |
|  |  |  |
|  | **PVDCF** | -11.394 |
|  | **CVKVD** | 400.768 |
|  | **PVCV** | 236.783 |
|  | **VALUEKVD** | 225.389 |

Here we can see a valuation of the same cashflows as above using a long-run g of 3%, a wacc of 11.1 and a ROIC of 12.99%. When we decrease the ROIC to 2% (lower than g).

|  |  |  |
| --- | --- | --- |
| **KVD (FCF)** | | |
| **FCF** | **PVDCF(FCF)** | **Total PVDCF(FCF)** |
| 10.187 |  |  |
| -0.120 | -0.108 | -0.108 |
| -3.449 | -2.794 | -2.902 |
| -0.840 | -0.612 | -3.514 |
| -5.263 | -3.454 | -6.969 |
| -7.491 | -4.426 | -11.394 |
| 10.654 |  |  |
|  |  |  |
|  |  |  |
|  | **PVDCF** | -11.394 |
|  | **CVKVD** | -260.577 |
|  | **PVCV** | -153.955 |
|  | **VALUEKVD** | -165.349 |

As we can see the new value is a negative. As mentioned earlier, this hints at the growth being unsustainable for the company.

**Forward market multiple:**

As mentioned earlier, the forward market multiple uses an exit multiple as the continuation term. This multiple is either calculated based on previous market information on the company or based on general market information (similar companies). Multiples are used on many different variables. In the example below, it is used on EBIT.

The advantage of this model is that the numerator provided in the continuation period is very reflective of the market. However, this method tends to overstate the value of the companies compared to the KVD and FCF model. This is due to the g observed in the multiple is higher than what is expected in other models.

**Adjusted present value model:**

As mentioned earlier, the APV is similar to the FCF model with an additional cashflow which represents the reduction in taxes a firm might benefit from given interest expense. Because this is an additional cashflow to the already existing FCF model, the APV value is usually higher than he FCF value. This is the construct of the APV model:

The purpose of such a model is to reflect how the capital structure of a firm might affect their value. To simplify our equation, we assume that ku = kd = ktax =WACC. This is because capturing the overall benefit of taxation as a percentage of a cashflow is nearly an impossible task. This DCF construct is less common compared to the others. However, can be a good addition to any valuation argument to account for capital structures that might be reflected as a benefit to the firm.

**Conclusion**

Firms value assets by calculating their current value based on their impact on growth for the company. As we have seen, valuators can easily influence the valuation of a company by changing core variables such as the capital structure, wacc and long-term g. However, generic growth or acquisition with the condition that ROIC>WACC>G is the best way to obtain long-term growth. Should this condition not be met as we model our projected cashflows, the result would be additional growth destroying value. It is also worth noting that a high g, if the core condition is met, will increase value for the company.

When looking at the different models explained in this paper. We can see that they will provide different values for the same company. It is therefore important to remember that there is no right or wrong answer when valuating a company. Since some of our variables used when calculating is based off assumptions of the future, it is hard to get a 100% accurate valuation. However, when you are building a case for whether you should sell, buy or hold a company it is a guiding principle for the end decision. Different type of investors might have different opinions on what is reasonable to expect from the future. Some might have an aggressive stance on future growth, let’s say 5%. While others might have a more conservative outlook on the same company, say 2%. The change in these variables alone will lead to a dramatically different valuation. Though both investors are from their perspective correct in the valuation. It is often said that valuation is more than just number crunching. It is more an “art”. This is because there is no simple solution to the value of a company.

When considering all these factors, I would recommend using a mixture of these valuation models to arrive at an approximate value. Some models might be better suited than others to specific situation. However, I would use the ones that are most applicable to the current situation. After all, these models are built to back up an argument for why a company is worth (or not worth) a certain amount.