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Pro-forma modelling for ESG integration in valuation

13.1 Introduction

Expected or future cash flows are one of the basic pillars of firm valuation. Yet how are these expectations formed?

Typically, a forecast is made five years into the future and after that forecast a terminal value is used. These forecasts form the basis for every discounted cash flow valuation model. Yet a typical finance text-book does not allocate a lot of space to this issue but rather assumes that students are already familiar with the topic.

In the last decade two additional factors have complicated things: technological change and ESG[17] which includes climate change. This guide will attempt to address both, but with a focus on the latter problem: how can firms incorporate uncertainty about ESG and climate change in their forecasts?

One main message of this guide is that "this time is NOT different". The tools developed to deal with uncertainty will allow the incorporation of these new factors as well. Hence this guide will mostly focus on the standard forecasting machinery while pointing out how to address some of the new challenges, like climate change.

There are different ways of forecasting, with the main difference being the number of financial statements that are being forecast and the level of consistency required. A simple strategy is to just forecast the income statement and to assume that the firm's cash flow will be sufficient to finance

[17] The acronym ESG means "Environment, Social and Governance". Technically it includes climate change in its definition.

planned investment activities and that it allows for enough slack to accommodate increases in net working capital.

A more sophisticated strategy will add other aspects of interest: one example focuses on the firm's cash balance and another one focuses on the firm's debt coverage ratio. The first approach will recognise the need to issue more capital once the cash balance turns negative. The second approach is similar but focuses on the firm's ability to service its financial obligations and its ability to not breach its covenants. An even more thorough strategy will model all three financial statements (the income statement, balance sheet and statement of cash flows) at the same time. This approach helps to ensure that any forecasts are fully internally consistent.

Other modelling choices are also of first order importance, a primary choice being the choice of the firm's growth rate will also be addressed in this guide.

13.2 The simple approach

The simplest approach forecasts the firm's profit and loss (often simply called the P&L) statement and several other variables needed in order to compute the firm's free cash flow. In its basic form free cash flow (FCF) is:

$FCF = (1 - t) \cdot EBIT + Dep - Capex - \Delta\ NWC.$

Hence the modeler needs to have a forecast of the firm's EBIT, depreciation, capital expenditures and changes in net-working cash flow. Typically, most relationships are expressed as a fraction of the firm's sales. Table 13.1 and 13.2 provide an example of such a simple set-up.

Table 13.1 Simple Modelling Assumptions

Assumptions	
Investment	100m, t = 0, straight depreciation
Duration	5 years
Discount Rate	10%
Sales/Revenues	45m, starting @ t = 1, growing at inflation rate
Growth Rate	3%

Assumptions	
Operating Costs /Expenses	40% of sales
Taxes (t)	25%
Net Working Capital (NWC)	10m initially, then 40% of sales

Table 13.2 Simple Pro Forma Example

FCF	0	1	2	3	4	5
Investment	–100	0.0	0.0	0.0	0.0	0.0
Revenues		45.0	46.4	47.7	49.2	50.6
Expenses		18.0	18.5	19.1	19.7	20.3
Depreciation		20.0	20.0	20.0	20.0	20.0
EBIT		7.0	7.8	8.6	9.5	10.4
Tax @25%		1.8	2.0	2.2	2.4	2.6
(1 - t) EBIT		5.3	5.9	6.5	7.1	7.8
NWC	1.5	18.0	18.5	19.1	19.7	0.0
Δ NWC		–16.5	–0.5	–0.6	–0.6	19.7
FCF	–101.5	8.8	25.3	25.9	26.6	47.5

In Table 13.2, revenues are modelled growing at the inflation rate, which are assumed to be three percent. Operating costs are modelled as a percentage of sales. EBIT is then simply the revenue minus expenses and deprecation. Taxes are calculated and (1 - t) EBIT is computed. This is often called NOPLAT (Net operating profit less adjusted taxes). After (1 - t) EBIT has been determined there is a need to model net-working capital and the firm's capital expenditures – what is typically used is *Δ NWC = Current Assets - Current Liabilities.*

But what is working capital (WC) really? It is catch-all for cash expenses that the firm is required to make but that are not covered by investments or cost of goods sold (COGS). Holding more inventory requires more capital as does an increase in accounts receivable if buyers are granted better payment terms. The flipside is an increase in accounts payable or a decrease in inventories. Hence, we can compute WC as: $WC = Inventories + Accounts$

Payable - Accounts receivable. Cash should be typically excluded except the share assumed necessary in the running of the firm.

On the other hand, the model above presents a question: where does the increase in NWC really come from?

Note that the typical model will not bother modelling the firm's financing choices or net income as the standard DCF approach values the whole firm and not just its equity portion. The reason for this choice is driven by the idea that the principal interest is in seeing whether the firm has a positive value or not. Under this approach an implicit assumption is that financing choices do not matter or can be reversed at very little cost. Other approaches exist of course but are typically more complicated as they require the modelling of the firm's finance structure as well. They are appropriate for firms with high levels of leverage or firms in financial distress.

How can environmental concerns be included in such a model? As a practical example, imagine that the firm starts to invest in a greener technology. This technology also has higher costs but allows the firm to grow somewhat faster. How would that change the firm's FCF?

The answer is straight-forward: adjust the relevant items to reflect the higher costs. Table 13.3 and 13.4 give an example of such an adjustment. Let's look at the effect of investments in a more environmentally friendly technology that leads to higher upfront costs and increased operating costs. On the other hand, this investment allows the firm to add 0.25% growth over the next five years.

Table 13.3 Adjusted assumptions

Assumptions	
Investment	110m, t = 0, straight depreciation
Growth Rate	3.25%
Operating Costs /Expenses	50% of sales

Table 13.4 ESG Adjusted Table

	0	1	2	3	4	5
Investment	–110	0.0	0.0	0.0	0.0	0.0
Revenues		45.0	46.5	48.0	49.5	51.1
Expenses		22.5	23.2	24.0	24.8	25.6
Depreciation		22.0	22.0	22.0	22.0	22.0
EBIT		0.5	1.2	2.0	2.8	3.6
Tax @25%		0.1	0.3	0.5	0.7	0.9
(1 - t) EBIT		0.4	0.9	1.5	2.1	2.7
NWC	1.5	18.0	18.6	19.2	19.8	0.0
Δ NWC		–16.5	–0.6	–0.6	–0.6	19.8
FCF	–111.5	5.9	22.3	22.9	23.5	44.5

As can be seen, there are significant changes, but these changes can easily be modelled within the existing framework. The only difference is maybe having to keep track of several scenarios that allow modelling the impact of such choices.

Firms with high leverage situations are often concerned about avoiding default or a breach of covenants. A somewhat more sophisticated approach recognises this and includes a simple way of dealing with these requirements. Arzac (2007) provides a good example, with two changes to the previous approach. The model itself does not try to come up with *free cash flow to the firm* but rather with *free cash flow to equity*. Hence the model attempts to ensure that the firm is able to avoid default on its interest rate payments. To do so, it explicitly keeps track of debt levels and interest rate expenses (and income). Free cash to Equity ("Available for Debt Retirement") is then used to affect the debt balance. A negative amount here would indicate a shortfall and would necessitate an idea about how this shortfall could be met, i.e., in the form of a line of credit. Tables 13.5 and 13.6 provide an example of such an approach.

Such an example can also be used to model situations where firms are worried about their ability to raise external financing (say, caused by exposure to "brown industries").

Table 13.5 Assumptions Leveraged Buyout (LBO) retirement

Variable	**Ratio**
Growth of Sales	5%
EBITDA margin of sales	10%
Depreciation/Sales	1.50%
Other non-cash items/Sales	0.20%
Capital expenditures (CAPEX) + Δ NWC	2%
Cash balance/Sales	0.20%
Interest on Cash Balance	4.50%
Tax Rate	40%
Debt Financing	
f = 35 senior debt at	8.50%
(1 – f) = 65% subordinated debt at	10%
Amortisation of Senior Debt	5
Net Cast to senor amortisation (Cash Sweep)	100%
f = 35 senior debt at	35%

Table 13.6 LBO Debt retirement example

Year	0	1	2	3	4	5
Sales		1000	1050	1102.5	1157.6	1215.5
EBITDA		100	105	110.3	115.8	121.6
Depreciation		15	15.8	16.5	17.4	18.2
Interest Income		0.1	0.1	0.1	0.1	0.1
Senior Interest Expense		13.1	11.1	8.8	6.3	3.3
Subordinated Interest Expense		28.6	28.6	28.6	28.6	28.6
Income before Tax		43.4	49.7	56.4	63.7	71.6
Provision for tax		17.4	19.9	22.6	25.5	28.6
Net Income after tax		26.1	29.8	33.8	38.2	42.9
Dep and other non-cash items		17	17.9	18.7	19.7	20.7
CAPEX + Δ NWC		20	21	22.1	23.2	24.3
Available for Debt Retirement		23.1	26.6	30.5	34.7	39.3
Senior Debt	153.8	130.8	104.1	73.6	38.8	–0.4
Junior Debt	285.7	285.7	285.7	285.7	285.7	285.7
Total Debt	439.5	416.4	389.8	359.3	324.5	285.2
Interest Coverage		2.4	2.6	2.9	3.3	3.8

13.3 The intermediate approach

In a more sophisticated model, both the firm's P&L and the balance sheet will be forecasted. This approach requires a somewhat more nuanced approach as it involves moving away from a vector of attack that defines almost all variables as a fraction of sales. In modelling the balance sheet, there is a need to model the firm's financing decisions to some extent as well. The upshot is that this approach will allow the modelling of the firm's cash level and ensures a certain amount of internal consistency.

Benninga (2014) illustrates this approach. Here cash is used as the “plug” or the variable that ensures that everything is consistent. Any increase in FCF increases shareholder’s equity and depreciation changes the amount of fixed assets in the balance sheet. The changes in shareholder’s equity and current assets determine changes in total liabilities. Finally, a requirement is that total assets equal total liabilities or: $TA = TL$. Fixed assets and current liabilities are predetermined so the only free variable in this model is cash. Note how cash increases by $4.3m in this model. Cash should have increased a lot more but as NWC is increasing, this increase needs to be financed.

A negative cash balance in such a case does not mean that the firm is going bankrupt but rather indicates that the firm has the need for external financing given its current investment programme.

Other plugs are possible (such as debt or equity). The only requirement here is that the approach is internally consistent. Benninga (2014) provides an excellent treatment of this approach.

Tables 13.7 and 13.8 show an example of this approach. As can be seen from the table changes in FCF are reflected by changes in the firm’s equity and changes to current assets and liabilities lead to changes in Net Working Capital. These links illustrate the mutual dependency of the P&L and Balance sheets.

One shortcoming of this approach is the fact that if there is a shortfall in the model, the model does not try to analyse the source of financing that will be used to cover the shortfall. In such a case, the cash flow statement would also need to be modelled separately. This approach is referred to as the “full modelling case”.

13.4 Full modelling

The modeller may forecast all three of the firm’s financial statements simultaneously. This is the most laborious approach but avoids most of the pitfalls in modelling.

The benefit of a full modelling approach is to avoid inconstancies across the different accounting statements. As said before it also forces the acknowledgement of potential cash shortfalls and makes the reliance of outside sources of financing for the firm explicit.

Table 13.7 Assumptions Full modelling case.

Investment	35m, t = 0, straight depreciation
Duration	5 years
Discount Rate	10%
Sales/Revenues	20m, starting @ t = 1, growing at inflation rate
Inflation	3%
Operating Costs/ Expenses	40% of sales
Taxes	0.35
NWC	1.5m initially, then 40% of sales
CA	60% of sales
CL	20% of sales

Cash	1.5
Current Assets	3
Fixed Assets	35
Total Assets	39.5
Current Liabilities	1.5
Debt	0
Equity	38
Total Liabilities	39.5

Table 13.8 Full modelling case – debt as a “plug”.

Year	0	1	2	3	4	5
Revenues		20	20.6	21.2	21.9	22.5
Expenses		8	8.2	8.5	8.7	9.0
Depreciation		7	7	7	7	7
EBIT		5	5.4	5.7	6.1	6.5
Tax @ 35%		1.8	1.9	2.0	2.1	2.3
(1 – t) EBIT		3.3	3.5	3.7	4.0	4.2
Investment	–35	0	0	0	0	0
(1 –t) EBIT	0	3.3	3.5	3.7	4.0	4.2
NWC	1.5	8	8.2	8.5	8.7	0
Δ NWC	1.5	6.5	0.2	0.2	0.3	–8.7
Depreciation	0	7	7	7z	7	7
FCF	–36.5	3.8	10.2	10.5	10.7	20.0
Balance Sheet						
Cash	1.5	5.8	22.8	40.0	57.4	84.2
Current Assets	3	12	12.4	12.7	13.1	13.5
Fixed Assets	35	28	21	14	7	0
Total Assets	39.5	45.8	56.1	66.7	77.6	97.7
Current Liabilities	1.5	4	4.1	4.2	4.4	4.5
Debt	0	0	0	0	0	0
Equity	38	41.8	52.0	62.5	73.2	93.2
Total Liabilities	39.5	45.8	56.1	66.7	77.6	97.7

13.5 Internal model consistency

So far, most of the concern has been with the internal consistency of the pro-forma models created. These are not the only aspects in a model that require attention.

13.5.1 Growth rates

A concern of similar importance is to get the modelling of the firm's future *growth rate* right. Typically, at least eighty percent of the firm's value is in the firm's terminal value. Since the Gordon growth formula is often used for the firm's terminal value, even small changes in the firm's growth rate can lead to massive changes in the firm's value. A simple way to avoid this issue would be a multiple approach based on the final forecast period's cash flow.

Inexperienced modellers in particular can get carried away with too high growth rates. For example, *few firms will be able to grow faster than the industry average in the long-term*. Doing so would mean that firms are consistently able to have a competitive advantage over their peers, something that is very hard to achieve.

In particular climate change can pose a new challenge: negative growth rates. For example, as demand for oil will fall considerably in the long-term, oil firms cannot expect to be able to generate future growth with their current business model, even if a short-term forecast suggests constant demand for oil.

Once negative growth is modelled, awareness of the firm's ability to be dissolved is needed.[18] As soon as the firm's profits turn negative the firm will not continue and will be liquidated. Unless this fact is modelled explicitly the terminal value will likely be misleading.

Another example is obsolete technology, for example mainframe computers. While the technology is being replaced by cloud-computing, the demand for this technology is fading relatively slowly and a modeller should carefully think about the growth (or decline) of the business.

[18] Note that simply using a negative growth rate in a Dividend Discount Model will not work. Negative growth needs to be modelled explicitly, i.e. through an extended annualised forecast model.

Table 13.9 Discount Rate vs Growth Rate

Sensitivity Analysis		**Discount Rate**				
		2.50%	3.54%	4.00%	5.00%	7.00%
Growth Rate	0.50%		220			
	1.00%	283	267	260	246	222
	1.50%		337			
	2.00%		453			
	2.50%		680			

Similarly, pro-forma statements of start-ups often assume that the firm will be able to grow for a long time, yet current technology will be outdated soon enough. In such a case the modeller needs to ask the question if the firm's R&D expenditures are large enough to justify the expected growth rate.

Start-ups in particular can achieve very high short-term growth rates but few of them will be able to maintain their growth rates for long periods of time. A simple reality check here is that few start-ups will be able to garner initial valuations above €10m–€20m. Yet it is easy to produce much higher valuations, mostly due to high assumptions about growth.

13.5.2 Growth rates and discount rates

Getting the discount rate is also important but typically less so than the growth rate. The example in Table 13.9 shows the impact of changes on a firm's valuation. It is not difficult to see that the same absolute change to the growth rate has a much higher impact on the firm's value than a same change to the firm's discount rate.

One other issue that has started to creep up is the fact that interest rates are low, leading to low estimates of discount rates. How to deal with such an issue in the long-run is not clear. This issue is under active discussion, since on the one hand interest rates tend to be mean reverting, but on the other hand have fallen from their highs in the 1980s to their current lows. There is currently no clear solution to this issue.

Damadoran's view on this issue however provides a good starting point. Interest rates reflect scarcity of capital and hence proxy the investment opportunity set. Low interest rates point out few investment opportunities and hence at low future growth rates:

> In reality, the risk-free rate is part of a macroeconomic ecosystem that is interconnected. As the risk-free rate has dropped, it is reflecting lower economic growth and inflation (which should be showing up as lower growth rates in your cash flows) and higher risk premiums (the same factors driving down risk free rates are increasing risk worries). The net effect is what drives value.[19]

Rose et al. (2013) show how a firm's M&A policy can also lead to concerns about cash flows and the consistency of the firm's accounts. ISS, a cleaning firm, has consistently used M&A to ensure an annual sales growth of ten percent. Organic sales growth has been slightly negative actually. A naïve approach to modelling ignores the fact that the acquisition strategy leads to high capex outlays. Hence low capex and high sales growth lead to massive increases in FCF and are not a viable strategy for the firm.

13.5.3 Net working capital

Modelling of the firm's working capital can also lead to several pitfalls. First, some firms can use NWC as a source of funding. Dell is probably the most famous example of this approach. Instead of building machines and using brick-and-mortar stores to sell them, Dell waits for customer orders before any machine is built. Customers then must pay for the machine first and indirectly finance the firm. Apple has an intermediate strategy since it requires pre-orders for more unusual configurations. This can lead to a sign-change in the value of net-working capital.

A second issue is the fact that in projects with a limited time horizon, working capital is typically freed up at the end of the project and hence should have a positive impact on the firm's cash flow.

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[19] See Damadoran, https://aswathdamodaran.blogspot.no/2015/04/dealing-with-low-interest-rates.html and https://ftalphaville.ft.com/2016/10/14/2177257/aswath-damodaran-doesnt-quite-agree-with-bernsteins-bashing-of-dcf-models-under-zero-rates/

13.5.4 Balance sheet effects

Balance sheet effects are often also ignored in modelling. This can be a mistake, as the following example may illustrate: both climate change and technological change (or both combined) can lead to stranded assets on the balance sheet. These stranded assets can have a profound impact if they lead to asset write downs on the balance sheet. Any write down will have to be covered by an impact on the firm's equity, leaving the firm exposed to changes in the debt-to-equity ratio. Predicting the exact impact is difficult since two effects will happen. First, if the amount of equity falls and debt costs stay constant, the firm's WACC falls. This is probably counter-intuitive because there would be an expectation to see that the financing costs rise. This rise in financing cost may however be instantaneous or delayed, depending upon the firm's debt terms. In extreme cases, such write-downs may also cause a borrowing firm to violate its debt covenants.

A second effect are the provisions the firm has on its balance sheet, like for dismantling power-plants. These provisions are effectively debt the firm has taken on and this needs to be subtracted from firm value. Underfunded pension plans fall in the same category.

13.5.5 Goodwill & Acquisitions

In particular firms that have been active acquirers can have accumulated a substantial amount of goodwill (the difference between the price paid for an asset and the book value of the asset). Goodwill can be amortised in certain accounting regimes while others do not allow for it. Some regimes allow for impairments of goodwill but do not allow for amortisation. Amortisation of goodwill can have an attractive allure for students but needs an explicit justification, otherwise it will lead to inflated cash flows.

Koller, Goedhart, & Wessels, (2020) advised against explicitly modelling acquisitions (and goodwill) as they argue that an acquisition is a zero NPV investment and hence should not affect firm value. That is a simplifying assumption. There are several reasons for modelling acquisitions, some conventional while others are not.

Let's start with the insight that any investment should be a zero NPV deal. The idea here is that sellers will demand any improvement in firm performance from the buyers in the form of an increase in the transaction price. Some of these improvements are easy to predict, such as increases in gearing and the tax shield that accompany these increases. Others are more difficult to predict such as potential synergies or more diversified revenue streams. These could be scale economies or could come from vertical integration and are more diffuse in their nature.

If acquirers are certain that they have identified sources of value that are not reflected in the purchase price, then it makes sense to include acquisitions in the forecasts.

13.5.6 Implicit assumptions

One issue that is usually not explicitly discussed is that the modeller assumes no underfunded pension plan or other large hidden expenditures. These are items that will often only surface during intensive due diligence.

13.5.7 Modelling time period

In the introduction it was stated that it is typical to model five years explicitly – that is obviously a rule of thumb that should be critically evaluated by the modeller. Five years can be short or long – think about a tech startup. How will the competitive landscape look after five years? Can five years be modelled without getting pointless forecasts? In a similar vein, longer horizons might be modelled – imagine a project with largely fixed revenues, say a powerplant. In such a case, a longer modelling horizon might be useful. To sum up this discussion, the length of forecast period should reflect the modeler's belief about their ability to forecast the future with some degree of reliability.

13.6 Summary

This guide aims to provide a concise and practical overview over some of the issues that arise during "pro-forma modelling". Pro-forma modelling is the idea that a firm's balance sheet and income statement need to be forecasted into the future to determine its value.

13.7 Related websites

Damadoran, https://aswathdamodaran.blogspot.no/2015/04/dealing-with-low-interest-rates.html, accessed, 17.2.2017

FT, https://ftalphaville.ft.com/2016/10/14/2177257/aswath-damodaran-doesnt-quite-agree-with-bernsteins-bashing-of-dcf-models-under-zero-rates/, accessed, 17.2.2017