Constructing Consistent Financial Planning Models for Valuation

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ABSTRACT

In this work we show a simplified financial planning model. In reality, financial planning models are huge and cumbersome. This is a very simplified model compared with what is found in practice.

We present some basic principles for constructing the financial statements needed for valuation. We show in detail all the items of the financial model and show the formulas to be used for constructing the financial planning model. The relevant financial statements are: the Balance Sheet (BS), the Income statement (IS) and the Cash Budget (CB). The construction of the financial statements starts from input data and policies and/or targets (i.e. accounts receivable policy or target). With these targets or policies we can construct the financial statements.

The contribution of this work is double: one is to show that we can construct financial statements without the use of plugs and circularity and the second is that we can use a very simple approach to construct cash flows and to value them. Keeping track of value creation is a major duty of management and this can be done with the proposed model.

The model shown has two parts. One is the proper financial statements forecast. The second one is a simple cash flow calculation and valuation exercise using the Capital Cash Flow and assuming the risk of the tax savings equal to Ku, the cost of unlevered equity.

KEY WORDS.

Accounting, Forecasting Financial Statements, Decision Making, plugs, Planning and control, double entry principle, unbalancing problem, cash flows, firm valuation, cost of unlevered equity.

JEL CLASSIFICATION

D6, E47, G31,H43

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Introduction

In reality, financial planning models are huge and cumbersome. What we present is very simplified model in comparison to what is found in practice. We start the model constructing intermediate tables. The first table to be constructed is the table of parameters. This table organizes all of the relevant information. The subsequent tables are linked to the table of parameters via formulas. We construct other supplementary tables that will be used in the construction of the main financial statements.

We indicate the formulas that have to be utilized in the construction of the financial planning model. We have constructed the formulas in such a way that they can be used to construct part of or the complete model. In the first line and in the first column the reader finds the letters and numbers corresponding to a spreadsheet in order to make it easier the localization and the construction of the different formulas. In the last two columns we have written those formulas. Usually the formulas correspond to the year 0 and/or year 1. When necessary, we show the formulas for other years and we indicate it. Shaded cells are for the input data. All input data are numbers hence the model is parameterized, this is, expressed in terms of some selected parameters. The convenience of this approach is to allow for sensitivity analysis or even, Monte Carlo Simulation, MCS. This model also has the virtue that complexities can be handled building a linear programming model for finding the best strategy for the maximization of shareholders value. If the reader wishes to construct the model exactly as we did, she will be able to do that step by step.

The contribution of this work is double: one is to show that we can construct financial statements without the use of plugs and circularity and the second is that we can use a very simple approach to construct cash flows and to value them. The financial statements we construct are: Cash Budget, CB (similar to Cash flow Statements but more detailed and prospective), the Income Statement, IS and the Balance Sheet, BS.

Discussing on the “pitfalls in model design”, Brealey and Myers, 2003, p. 854, say that the analyst “might want to distinguish between short-term lending and borrowing opportunities, now buried in working capital”. This is one of the features of our model: it

distinguishes between “short-term lending and borrowing opportunities” and long-term borrowing. They also point out the flaws of a model “known as a *percentage of sales model*” because “in reality many variables will *not* be proportional forecasted level of sales”. The model we propose takes into account that and only forecast some variables as a *percentage of sales model* such as sales commissions, advertising expenses, level of cash on hand and policies such as AR and inventory level. In any case these inputs can be modified according to the needs of the analyst or firm.

B&M, p. 855-856, complains that there is no finance in financial planning models. Our model allows the analyst to keep track of any financial ratio or cash flow. Moreover, the complete and integral model as is presented here, allows management to keep track of what is most important for financial analysis: value creation.

In value creation many variables intervene and in the model we propose and we can keep them in sight using different approaches to sensitivity analysis as mentioned above. In proposing this model we keep in mind what B&M, p. 856 say: “Shareholders want to be richer; not to have the satisfaction of a [*given*] percent of profit margin”. Our model is designed to keep control of value creation.

The model shown has two parts. One is the proper financial statements forecast. The second one is a simple cash flow calculation and valuation exercise using the Capital Cash Flow and assuming the risk of the tax savings equal to Ku, the cost of unlevered equity. We propose a way to construct the CCF from the CB because it is closer to the idea of cash flows. In fact, the CB lists all the cash transactions of a firm. We prefer this approach because we can "see" the items that are considered as part of the CCF. With this approach the probability of mistakes in the construction of the CCF is reduced. We expect the reader will find this approach more intuitive and easy to follow than the traditional.

Vélez-Pareja and Tham 2009, show how to proceed from historical financial statements to derive some input data for forecasting financial statements. Vélez-Pareja, 2007, shows the inconveniences of using plugs and a procedure to avoid that malpractice. In both works the idea is that plugs are avoided if we recognize that the critical items in the financial statements are the calculation of debt and/or cash excess invested in market securities. Once we calculate the debt or investment in market securities for each year, interest earned and/or paid is based on the previous period balance of debt and/or market

securities. That has been the rule we follow in constructing the forecasted financial statements.

Critical issues in forecasting (and shown in the model) are three:

1. Calculation of short-term deficit to define short-term debt to cover operational deficits.
2. Calculation of long-term deficit to define the long-term debt and/or equity to cover capital investment deficits.
3. Calculation of excess cash to be invested in market securities.

In the model we assume a given percent of long-term deficit to be covered by debt and the remainder to be covered by equity.

On the other hand, one of the reasons to introduce circularity is that usually analysts work in terms of years. When this is done, we recognize that practitioners wish to reflect what happens within the year in terms of debt payment and short-term, ST investment. Hence, to recognize this, what is usually done is to consider debt and/or short-term investment as an average of beginning and ending balance and from it they calculate the interest. With the power of current spreadsheets we could even work for daily periods is we wish.[1]

The approach includes the construction of intermediate tables. The interesting thing is that once we have the intermediate tables the IS and the BS are derived just linking the values from them.

The model makes extensively use if the Fisher equation. This is a tool for calculating nominal rates (interest and price increases).

Section Two

An Example for Projecting Financial Statement with no Plugs and no Circularity

We have mentioned the idea of plugs in several places, but we have not defined them. Typical textbooks on corporate finance and forecasting and budgeting recommend "closing" and matching the financial statements using this idea. We can cite just one of the

[1] Excel® 2007 has more than 16,000 columns that would allow for more than 44 years in a daily period basis and more than 1,000,000 rows. We think that this is good enough to consider the need of introducing circularity in a financial planning model like the one we show here.

many recognized authors that use that concept. Benninga (2006) defines "the "plug" [as] the balance sheet item that guarantees the equality of the future projected total assets and the future total liabilities and equity. Every financial planning model has a plug, and the plug is almost always either cash […] or debt or stock." (p. 274). A plug is a formula to match the Balance Sheet using differences in some items listed in it in such a way that the accounting equation holds. In other words, "a plug is an item which guarantees that Assets = [Total] Liabilities + Equity. Plug is usually a financing item such as Cash, Debt or Common stock. […] The Plug is not a number. It is an equation, for instance,

1. *Cash = Total liabilities [+Equity] – [Non Cash] Current Assets – Net Fixed Assets*
2. *Debt = Total assets – Current liabilities – Equity*
3. *Equity = Total assets – Current liabilities – Debt"* (Benninga, 2007)

When using plugs there is no external protocol to check if we have made or not a mistake while constructing the model. Any mistake will be concealed by the use of the plug. For a more detailed discussion on this see Vélez-Pareja (2007).

The key issue regarding plugs and circularity is that the analyst can avoid them using a simple approach:

1. Design each cell as the result of transactions according to the accounting, logical and arithmetical operation.
2. Use the end of period convention for loans inflows and payments.
3. On the first occasion that the model mismatches when something new has been introduced, immediately look for recovering the matching of the model. Do not accumulate mismatching errors because the solution of those problems will become more difficult.
4. When you do this correctly, no circularity and no plugs are needed.

Assumptions for the Financial Planning Model

Some features and assumptions of the model are:

1. No plugs.
2. No circularity.
3. A new firm (starting from zero).

4. A simple firm with only one product. A commercial firm that purchases a product to be sold at a higher price
5. Taxes are paid the same year as accrued
6. All the expenses are paid on a cash basis. The only credit is from the supplier of product and has to be paid the following year and an advance payment prior to the purchase. Part of the purchase is paid the same year when the purchase is done.
7. Customers have to pay some portion of the sales in advance. They pay a percent (Accounts Receivable) of the amount sold in the next period. The remaining amount has to be paid the current year either as an advance payment or a payment done the same year.
8. Dividends are not greater than the Net Income of previous year. The payout ratio is a percent of previous year Net Income.
9. Dividends are paid the next year after the Net Income is generated.
10. The firm can repurchase equity and the amount is defined as a percentage of the depreciation charge. (Depreciation retains cash in the firm that can be distributed).
11. In the model the limit of the repurchase of equity is the amount of depreciation charge.
12. Input prices are fixed and do not depend on volume purchased.
13. It is expected to invest in new assets (Capital expenditures, Capex) every year. There are two lines for investing in fixed assets: one is the investment of the amount of depreciation charge. The second is a fraction of previous year net fixed assets equal to the real growth expected for the next year.
14. Any deficit is covered by new debt and new equity investment. In the example, a percent of deficit is covered by long-term debt, the rest by equity. Deficit in the after investment in fixed assets module (Module 2) should be covered with long-term loans, and not with short-term loans.
15. Deficit in the operating module (Module 1) should be covered with short-term loans.
16. Short-term loans will be repaid the following year.
17. Long-term loans are repaid in 10 years.
18. Any cash excess is invested in short-term securities.

19. Inventory valuation is done under the First in, First Out (FIFO) policy.
20. A deficit can arise in any year when a dynamic approach is used (input data can be changed and the results reflect that change).
21. Short-term portion of long-term debt is not considered in the current liabilities.

A detailed description of the financial planning model follows.

Input Data for the Model

This model has been constructed using an area for the input data. The input data is well disaggregated with the purpose of doing sensitivity analysis on any future decision. This analysis might be done using the tools found in any spreadsheet.

The first table consists of the endogenous and exogenous variables such as initial investment in assets, inflation rates, real increase in price, real interest rate and risk premia.

Table 1a. Exogenous and Endogenous Input Data

	B	C	D	E	F	G	H
3	Year		0	1	2	3	4
4	Check the balancing of the BS		0.0	0.0	0.0	0.0	0.0
5							
6	Fixed assets		45.0				
7	Lineal Depreciation (4 years)		4.0				
8							
9	Corporate tax rate.		35.0%				
10	Initial inventory (units)		4.0				
11	Initial purchase price.		5.0				
12	Estimated Overhead expenses.		22.0				
13	Administrative and Sales payroll.		24.0				
14							
15	Long-term (LT) years Loan 3 (M years).		10				
16	Short-term loan 2 (1 year).		1				
17							
18	Inflation rate.		6.0%	6.0%	5.5%	5.5%	5.0%
19	Real increase in selling price.			1.0%	1.0%	1.0%	1.0%
20	Real increase in purchase price.			0.5%	0.5%	0.5%	1.0%
21	Real increase in overhead expenses.			0.5%	0.5%	0.5%	0.5%
22	Real increase in payroll expenses.			1.5%	1.5%	1.5%	1.5%
23	Increase in sales volume (units).			0.0%	1.0%	2.0%	2.0%
24	Real interest rate.			2.0%			
25	Risk premium for cost of debt.			5.00%			
26	Risk premium for return on ST investment			-2.00%			

Some of the input variables are not collected as external (or internal) data. They might be goals set by the management or even could be assessed looking at historical data. Examples of these input data are inventory, accounts receivable, accounts payable or payout policies.

Table 1b. Policy and Goal Formulation

	B	C	D	E	F	G	H
27	Year		0	1	2	3	4
28	Promotion and advertising as a fraction of sales			3.0%			
29	Inventory as % of volume in units sold			1/12	1/12	1/12	1/12
30	Accounts receivable as % of sales			5.0%			
31	Advance payments from customers as % of next year sales.			10.0%			
32	Accounts payable as % of purchases.			10.0%			
33	Advance payments to suppliers as a % of next year purchases			10.0%			
34	Payout ratio			70.0%			
35	% of sales as Cash			4.00%			
36	% of financing with debt, the rest is financed by equity			70.00%			
37	Minimum cash required for initial year (based on expenses)		13.0				
38	Selling commissions			4.00%			
39	Stock Repurchase as a % of depreciation			0%	0%	0%	0%

On the other hand, some information has to be collected through market surveys, especially when we are planning a new venture. A good market study should include a sensitivity table where we could find quantity and price. This might give an idea on how is the price-demand relation of our product/service. With that information we could estimate the quantity to be sold given a price level.

Table 1c. Market research data

	B	C	D
40	Selling price.		7.0
41	Elasticity b		-0.350
42	Elasticity coefficient (b_0)		100.00

Constructing Intermediate Tables

Based on the previous information we can construct some intermediate tables. In fact, the financial statements are practically constructed here in these tables. We will see that the Income Statement and the Balance Sheet and most lines of the Cash Budget come from these tables.

This model relies on the well known Fisher relation that says

Nominal rate = (1 + real rate)(1 + inflation rate) – 1 = Real rate + Inflation rate + Real rate × Inflation rate (1)

We use this relation for "constructing" nominal interest rates and price increases.

Nominal Increases in Price and Volume

The first Table contains the calculation of nominal increases in prices and an increase factor for volume. As can be seen, all the data required are in the input tables 1a.

Table 2. Nominal increase in prices and expenses, minimum cash and increase in volume (units)

	B	C	D	E	F	G	H		
45	Year		0	1	2	3	4		
46	Selling		0.0%	7.1%	6.6%	6.6%	6.1%	=(1+D$18)*(1+D19)-1	
47	Purchasing		0.0%	6.5%	6.0%	6.0%	6.1%	=(1+D$18)*(1+D20)-1	
48	Overhead expenses		0.0%	6.5%	6.0%	6.0%	5.5%	=(1+D$18)*(1+D21)-1	
49	Payroll expenses		0.0%	7.6%	7.1%	7.1%	6.6%	=(1+D$18)*(1+D22)-1	
50	Minimum cash required		13.0	15.17	16.33	17.74	19.19	=D37	=$E$35*E103

Volume, Price and Sales Revenues

In the next table we calculate the initial volume to be sold according to the market research from table 1c. The initial potential quantity to be sold in year t=0 is calculated as

$$Q=b_0 Price^b \quad (2)$$

From year 1 and on the increase factor in volume from Table 3 is applied. Based on the initial selling price we can forecast the prices for the coming years. With these two forecasted values we can estimate the forecasted sales revenues. We forecast quantities and sales up to year 6 because we have considered payments in advance received from customers and paid to suppliers.

Table 3. Forecasting volume, prices and sales revenues

	B	C	D	E	F	G	H		
51	Year		0	1	2	3	4		
52	Increase factor in volume			1.000	1.010	1.020	1.020		=(1+E23)
53									
54									
55	Sales in units.		50.6	50.6	51.1	52.1	53.2	=D42*D40^D41	=D55*E52
56	Selling price.		7.0	7.5	8.0	8.5	9.0	=D40	=D56*(1+E46)
57	Total sales.			379.3	408.2	443.6	479.9		=E56*E55

Risk Free Rate and Cost of Debt

In the same fashion, using Fisher relation, we estimate the risk free rate Rf, for the coming years. With Rf and using the basic idea of the Capital Asset Pricing Model we estimate the forecasted cost of debt, Kd and the return on investment for any cash excess resulting in the forecasting period. We add the respective risk premium to the Rf and find Kd and short-term return.

Table 4. Forecasting Risk free rate and cost of debt and investment return

	B	C	D	E	F	G	H	
59	Year		0	1	2	3	4	
60	Risk free rate, Rf.			8.12%	7.61%	7.61%	7.10%	=((1+E18)*(1+$E$24)-1)
61	Return on ST investment			6.12%	5.61%	5.61%	5.10%	=E60+$E$26
62	Cost of debt, Kd			13.12%	12.61%	12.61%	12.10%	=E60+$E$25

Return on ST investment = Rf + risk premium of ST return, Kd = Rf + risk premium in cost of debt.

Capital Expenditures and Depreciation Schedule

Given an assumed depreciation life we calculate the depreciation of the initial capital expenditure in fixed assets and of any other investment in subsequent years. In the assumptions above, we stipulate that the firm invest every year what has been depreciated and with this it keeps the physical assets level constant. On the other hand we assume that the firm grows every year a given percent rate. In order to grow we consider an additional investment in assets equal to the real growth rate for next year multiplied by the net fixed assets level for the previous year. Each year investment has a depreciation schedule that initiates the following year. We are assuming a fictitious depreciation life of 4 years just for illustration.

As can be observed in table 5, we do not invest in year 4 for a growth in year 5. The reason is that, as will be explained below when the valuation process will be presented, we assume zero growth from year 5 up to infinity.

We can consider that the BS measures the level of some reservoirs or tanks. One of those tanks is the Net Fixed Assets, NFA. The level of the tank increases with the investment in fixed assets and decreases with depreciation charges.

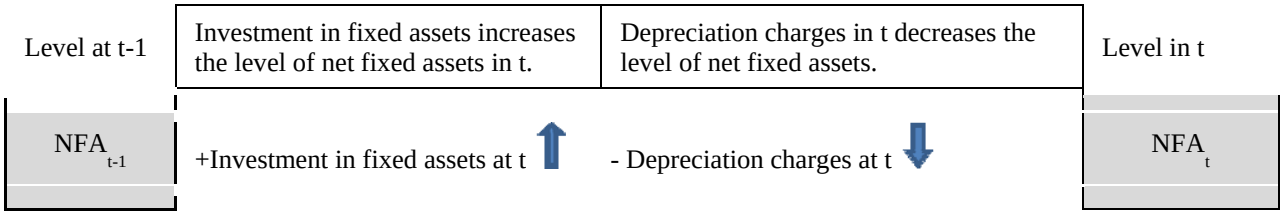

Exhibit 1. Net Fixed Assets Account

According to the previous exhibit we have

$$NFA_t = NFA_{t-1} + \text{Investment in } FA_t - \text{Depreciation}_t \quad (3a)$$

It is interesting to note that we can derive from (3a) the investment of Fixed Assets as follows

$$\text{Investment in } FA_t = NFA_t + \text{Depreciation}_t - NFA_{t-1} \quad (3b)$$

This is shown in the next table. Observe that the calculation in line 77 is exactly equation (3b).

Table 5. Depreciation schedule and investment in fixed assets

	B	C	D	E	F	G	H		
65	Year		0	1	2	3	4		
66	Beginning Net fixed assets		0.0	45.0	45.5	46.4	47.3	=C77	=D77
67	Annual depreciation for investment in year 0	From year 1		11.3	11.3	11.3	11.3	=D76/D7	=E67
68	Annual depreciation for investment in year 1	From year 2			2.9	2.9	2.9	=E76/D7	=F68
69	Annual depreciation for investment in year 2	From year 3				3.8	3.8	=F76/D7	=G69
70	Annual depreciation for investment in year 3	From year 4					4.7	=G76/D7	=H70
71									
72	Annual depreciation		0.0	11.3	14.2	17.9	22.7	=SUM(D67:D71)	
73	Cumulated depreciation		0.0	11.3	25.4	43.4	66.0	=D72+C73	
74	Investment to keep fixed assets constant		45.0	11.3	14.2	17.9	22.7	=D6	=E72
75	Investment in fixed assets for growth		0.0	0.5	0.9	0.9	0.0	=C77*E23	
76	New fixed assets		45.0	11.7	15.1	18.9	22.7	=D75+D74	
77	Net fixed assets		45.0	45.5	46.4	47.3	47.3	=D66+D76-D72	

Inventories, Purchases and Goods Sold

Based upon the final inventory policy and having the quantity expected to sell we can construct the table for defining inventories, cost of sales and purchases in units. Observe that purchases are calculated using a simple equation.

We can deduce the purchases using the idea that the accounts in the BS are reservoirs or tanks and that the BS measures the level of them after some transactions occur. The level of the tanks increases or decreases when some decisions are made in the firm, this is, when the firm purchases and sells product.

We use the item inventories as tanks that increase when the firm purchases goods and decreases when the firm sells those goods.

In this case we have, in units

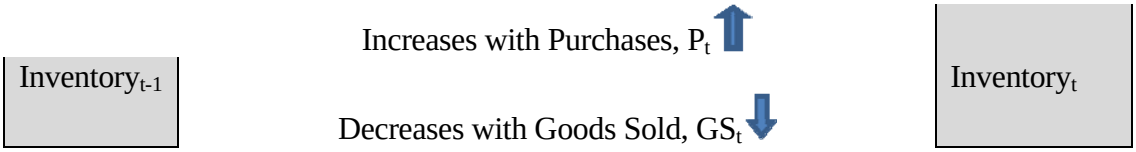

Exhibit 2. Inventories, Purchases and Goods Sold

From the previous exhibit we can establish the following relation:

$$Inventory_t = Inventory_{t-1} + P_t - GS_t \quad (4a)$$

Hence P_t will be

$$P_t = Inventory_t - Inventory_{t-1} + GS_t \quad (4b)$$

Table 6a. Inventory and purchases in units

	B	C	D	E	F	G	H		
80	Year		0	1	2	3	4		
81	Units sold			50.6	51.1	52.1	53.2		=E55
82	Final inv.		4.0	4.2	4.3	4.3	4.4	=D10	=E81*E29
83	In. inv.		0.0	4.0	4.2	4.3	4.3	=C82	
84	Purchases		4.0	50.8	51.2	52.2	53.3	=D81+D82-D83	

In. Inv. = Initial inventory, Final inv. = Final inventory

Row 84 above is derived using (3b)

Once we have inventories, goods sold and purchases in units, we can value them with their respective prices. In this case we use (4a) in dollars as follows:

$$\$Inventory_t = \$Inventory_{t-1} + \$P_t - COGS_t \quad (4c)$$

$$COGS_t = \$Inventory_{t-1} - \$Inventory_t + \$P_t \quad (4d)$$

Where COGS is cost of goods sold.

Table 6b. Inventory valuation using FIFO and Cost of goods sold (COGS) in dollars

	B	C	D	E	F	G	H		
89	Year		0	1	2	3	4		
90	Unit cost		5.00	5.33	5.65	5.99	6.35	=D11	=D90*(1+E47)
91	In. inv.		0.0	20.0	22.5	24.1	26.0	=C93	
92	Purchases		20.0	270.7	288.9	312.7	338.2	=D84*D90	
93	Final inv.		20.0	22.5	24.1	26.0	28.1	=D90*D82	
94	COGS		0.0	268.3	287.3	310.7	336.1	=D91+D92-D93	

In. Inv. = Initial inventory, Final inv. = Final inventory, COGS = Cost of goods sold

Row 94, COGS uses equation (4d).

Overhead and Administrative & Sales Expenses

Now we can estimate the forecasted expenses according to the initial expenses and the nominal increases calculated above, in Table 2. We simply apply the nominal increases to the previous value for each expense (except those expenses estimated as a percent of sales, such as sales commissions or advertising expenses).

Table 7. Administrative and Selling A&S expenses.

	B	C	D	E	F	G	H		
95	Year		0	1	2	3	4		
96	Sales commissions		0.0	15.2	16.3	17.7	19.2	=D57*$E$38	
97	Overhead expenses		22.0	23.4	24.8	26.3	27.8	=D12	=D97*(1+E48)
98	Payroll expenses		24.0	25.8	27.7	29.6	31.6	=D13	=D98*(1+E49)
99	Advertising expenses		0.0	11.4	12.2	13.3	14.4	=D57*$E$28	
100	A&S expenses			75.8	81.1	87.0	92.9		=SUM(E96:E99)

As said above, rows 96 and 99 are estimated as a percent of sales revenues.

Sales Inflows and Purchases Outflows

Above we have calculated sales and purchases. Now we can apply the associated policies for Accounts Receivable and Payable and advance payments. This means that we identify, for example, how much of sales revenues are received as advance payment (one year before), as accounts receivable (one year later) and finally how much is received the same year when the goods sold are invoiced.

Table 8a. Sales and Purchases Disaggregated According to the Timing of Flows

	B	C	D	E	F	G	H		
102	Year		0	1	2	3	4		
103	Total sales revenues		0.0	379.3	408.2	443.6	479.9	=D57	
104	Inflow from current year		0.0	322.4	346.9	377.1	407.9	=D57*(1-$E$30-$E$31)	
105	Credit sales		0.0	19.0	20.4	22.2	24.0	=D103*$E$30	
106	Payment in advance		0.0	37.9	40.8	44.4	48.0	=D103*$E$31	
107	Total purchases		20.0	270.7	288.9	312.7	338.2	=D92	
108	Purchases paid the same year		20.0	216.6	231.1	250.2	270.6	=D92	=E92*(1-$E$32-$E$33)
109	Purchases on credit		0.0	27.1	28.9	31.3	33.8	=D92-D108	=E107*$E$32
110	Payment in advance			27.1	28.9	31.3	33.8		=E107*$E$33

Observe that we can check that total sales for a give year should equal the advance payment in previous year, inflow received the current year and inflow for next year. For instance, for year 4 we have 479.9 = 407.9 + 24.0 + 48.0 (allow for rounding in other cases). The same check can be applied to purchases.

Once we know the amounts for each category (AR, advance payments and payments during the year) we can put those items in the respective periods when cash flows occur. This is shown in the next table. In this way we will calculate the inflows from sales and the outflows from purchases.

Table 8b. Flows from sales and purchases

	B	C	D	E	F	G	H	
112	Year		0	1	2	3	4	
113	Sales revenues from current year		0	322.4	346.9	377.1	407.9	=D104
114	Accounts Receivable		0	0.0	19.0	20.4	22.2	=C105
115	Advance payments		37.9	40.8	44.4	48.0	0.0	=E106
116	Total inflows		37.9	363.2	410.3	445.5	430.1	=D114+D113+D115
117	Purchases paid the current year		20.0	216.6	231.1	250.2	270.6	=D108
118	Payment of Accounts Payable		0.0	0.0	27.1	28.9	31.3	=C109
119	Advance payment to suppliers		27.1	28.9	31.3	33.8	0.0	=E110
120	Total outflows		47.1	245.5	289.5	312.9	301.9	=D118+D117+D119

The Cash Budget

Now we are prepared to start constructing our forecasted financial statements. We begin with the Cash Budget, CB.

As we said above, most of lines in the CB come from the intermediate tables. We split the CB into five modules. The Operating Module is the first module. This first module is shown in the next table. All the lines, except Income taxes (line 130) are taken from intermediate tables above. Income taxes are defined below in the Income Statement.

Module 1: Operating Activities

In this module we list all the inflows and outflows related to the operating activity and income taxes.

Table 9a. Cash Budget: Module 1: Operating activities.

	B	C	D	E	F	G	H	
123	Year		0	1	2	3	4	
124	Cash inflows							
125	Inflows from sales		37.9	363.2	410.3	445.5	430.1	=D116
126	Total inflows		37.9	363.2	410.3	445.5	430.1	=SUM(D125:D125)
127	Cash outflows							
128	Payments for purchases		47.1	245.5	289.5	312.9	301.9	=D120
129	Administrative and selling expenses		0.0	75.8	81.1	87.0	92.9	=D100
130	Income Taxes		0.0	5.9	7.4	8.4	8.7	=D205
131	Total cash outflows		47.1	327.2	377.9	408.3	403.5	=SUM(D128:D130)
132	Operating NCB		-9.1	36.0	32.3	37.2	26.6	=D126-D131

NCB = Net Cash Balance

Module 2: Capital Investing Activities

In module 2 we include the amounts invested in fixed assets from Table 5. This module might have a line for inflow coming from the sale of assets. This is not shown in the model, but can be easily included.

Table 9b. Cash Budget: Module 2: Investing activities.

	B	C	D	E	F	G	H	
133	Year		0	1	2	3	4	
134	Investment in fixed assets		45.0	11.7	15.1	18.9	22.7	=D76
135	NCB of investment in assets		-45.0	-11.7	-15.1	-18.9	-22.7	=-D134
136	NCB after Capex		-54.1	24.3	17.2	18.3	3.9	=D135+D132

Capex = Capital Expenditures

Module 3: Financing Activities: External Financing

In Module 3 we define if the firm has short-term and long-term deficit and define the amounts to be borrowed. We 'match maturities' as Brealey and Myers, 2003, p. 855, mention that "most financial managers attempt to 'match maturities' of assets and liabilities. That is, they finance long-lived assets […] with long-term borrowing and equity". This means that short-term or operational deficit should be financed by short-term debt and long-term deficit derived from long-term investments (i.e. fixed assets) should be financed using long-term debt and /or equity. This is very important because we are designing the 'matching maturities' for the firm, instead of looking backwards and see how the firm was financed. This is a managerial decision and should not be considered as an act of God[2]. When a financial analyst looks backwards to see what happened with the matching of maturities it is as if that were not a decision of management, but an act of God.

Table 9c. Cash Budget: Module 3: External financing.

	B	C	D	E	F	G	H	
137	Year		0	1	2	3	4	
138	Inflow of loans							
139	ST Loan		22.15	0.00	0.00	0.00	0.00	=IF((C163+D132-D144-D50)>0,0,-(C163+D132-D144-D50))
140	LT loan		31.50	7.14	0.00	0.34	11.00	=IF((C163+D136+D139-D147-D153+D159-D50)>0,0,-(C163+D136+D139-D147-D153+D159-D50))*$E$36
141	Payment of loans							
142	Principal ST loan		0.0	22.1	0.0	0.0	0.0	=C139
143	Interest ST loan		0.0	2.9	0.0	0.0	0.0	=D169
144	Total ST loan payment		0.0	25.1	0.0	0.0	0.0	=D143+D142
145	Principal LT loan		0.0	3.2	3.9	3.9	3.9	=D191
146	Interest LT loan		0.0	4.1	4.5	4.0	3.4	=D189
147	Total loan payment		0.0	32.3	8.3	7.9	7.3	=+D144+D145+D146
148	NCB of financing activities		53.6	-25.2	-8.3	-7.5	3.7	=D139+D140-D147

ST = Short-term, LT = long-term

[2] An act of God is an event outside of human control.

Observe that the determination of the required debt seems too complex and with too many cells, but it is not. In the case of short-term debt we only deal with four cells (they are repeated in the right side of the logical function). Similarly, formula for defining long-term debt has seven cells in the logical function and an extra cell for defining the proportion of the deficit to be financed by debt.

Now we examine the Short-term loan in cell D139

=IF((C163+D132-D144-D50)>0,0,-(C163+D132-D144-D50)) (5a)

The relevant formulation for analysis in words is (when there exists a deficit)

-(C163+D132-D144-D50) (5b)

$ST\ loan_t = -(Cumulated\ Net\ Cash\ Balance_{t-1} + Operating\ Net\ Cash\ Balance\ NCB_t - Total\ ST\ loan\ payment_t - Target\ minimum\ cash_t)$ (6)

The short-term deficit is $Cumulated\ Net\ Cash\ Balance_{t-1}$ + Operating Net Cash Balance NCB_t - Total ST loan $payment_t$ but as we have a target minimum cash we have to increase that deficit in order to have the minimum cash left as planned.

In the same fashion, we do for the long-term loan. We examine the long-term loan in D140:

=IF((C163+D136+D139-D147-D153+D159-D50)>0,0,-(C163+D136+D139-D147-D153+D159-D50))*$E$36 (7a)

The relevant formulation for analysis in words is (when there exists a deficit) is for year 0 (cell D140)

,-(C163+D136+D139-D147-D153+D159-D50) (7b)

$LT\ Loan_t = -\ Deficit_t \times$ Fraction to be financed by debt

$= -(Cumulated\ Net\ Cash\ Balance_{t-1} + Net\ Cash\ Balance\ NCB_t$ after Capex - Total payments for $loans_t$ – Total payments to $owners_t$ + Total inflow from ST $investment_t$ –Target minimum $cash_t) \times$ Fraction to be financed by debt (8)

These are crucial formulas. They allow differentiating between long and short-term deficits and debt. Observe that debt is not a plug as recommended by many authors.

Brealey and Myers, 2003, B&M, p. 852 define the External Capital requirement as

"External capital required = Operating cash flow – investment in net working capital – investment in fixed assets – dividends"

The first two terms at the right are exactly our Operating NCB (Module 1); Investment in fixed assets is exactly our NCB after Capex; and dividends correspond to our total payments to owners. However, it has to be said, B&M include in the investment in net working capital the short-term loans that we include as total payments for loans in equations (7a) to (8). In addition we include in this last item any payment for previous loans.

Module 4: Financing Activities: Transactions with Owners

In this module we list all transactions with equity holders. It includes equity investment, dividends payment and repurchase of stock.

Table 9d. Module 4: Transactions with owners.

	B	C	D	E	F	G	H	
149	Year		0	1	2	3	4	
150	IE		13.5	3.1	0.0	0.1	4.7	=(D140/$E$36)*(1-$E$36)
151	Div		0.0	0.0	7.7	9.6	10.9	=C207
152	RS		0.0	0.0	0.0	0.0	0.0	=D72*D39
153	Payments to owners		0.0	0.0	7.7	9.6	10.9	=D151+D152
154	NCB with owners.		13.5	3.1	-7.7	-9.5	-6.2	=D150-D153
155	NCB of previous modules		13.0	2.2	1.2	1.4	1.4	=D154+D148+D136

IE = Invested Equity, Div = Dividends payment, RS = Repurchase of stock

Formula in cell D150 seems strange. However, this is simply that if we know the LT debt in cell D140 and we know that debt is a fraction of deficit, the deficit will be Debt/fraction. The terms in parenthesis in cell D150 are the fraction to be financed by equity[3].

In line 155 we add all the previous NCB. This will make some other formulas clearer.

Module 5: Financing Activities: Measuring Excess Cash for Investment

Finally, we present Module 5. In this module we define any excess cash and in such a case we invest it in market securities.

[3] The calculation of the equity investment done as proposed in this case has the problem of division by zero when investment in assets is financed only by equity. This drawback can be easily solved using the long form presented in row 140 to define the deficit and replace D140/$E$36 for the long formula. We do not include it here in order to make the text clearer.

Table 9e. Module 5: Discretionary transactions

	B	C	D	E	F	G	H	
156	Year		0	1	2	3	4	
157	Redemption of ST investment.		0.00	0.00	0.00	0.06	0.00	=C160
158	Return from ST investments.		0.00	0.00	0.00	0.00[4]	0.00	=D61*D157
159	Total inflow from ST investment		0.00	0.00	0.00	0.06	0.00	=D158+D157
160	ST investments.		0.00	0.00	0.06	0.00	0.00	=IF(D139+D140>0,0,C163+D155+D159-D50)
161	NCB of discretionary transactions		0.0	0.0	-0.1	0.1	0.0	=D159-D160
162	Year NCB		13.0	2.2	1.2	1.4	1.4	=D155+D161
163	Cumulated NCB		13.0	15.2	16.3	17.7	19.2	=D50

In this module we have another critical cell: Short-term Investments. This measures all the available excess cash minus the target minimum cash. Management should not invest in short-term investment if the firm has deficits. It makes no sense to borrow money at a cost higher than the return to invest it at a return lower than the cost of money. That is the reason why we force the model not to invest if there is some kind of debt in the period. That is the reason for the logical statement at the beginning of cell D160.

=IF(D139+D140>0,0,C163+D155+D159-D50) (9)

In words we have for the relevant part of the formula (when there is a cash excess)

Cash excess$_t$ = Cumulated Net Cash Balance$_{t-1}$ + NCB for the year after previous transactions$_t$ + Total inflow from ST investment$_t$ - Target minimum cash$_t$ (10)

Finally in the last row we force Cumulated NCB to be the same target for the minimum cash. This is done to prevent that cash becomes a plug. If instead we calculate the Cumulated NCB and we make a mistake, that row would depart from the target, would balance the BS and we would not identify the existence of that mistake (although that could be checked with the cumulated cash and the target cash). The model will warn the analyst when such an error occurs showing the mismatching. At the same time, we can check the

[4] The exact value is 0.0032. With the rounding to two decimals it is seen as zero.

mismatching between the calculated cumulated NCB and the target minimum cash as is shown in the next table.

Cumulated NCB versus Minimum Cash Target, MCT

In this table we compare for checking purposes, the calculated Cumulated NCB with the Minimum Cash Target. They should match. If they do not, the model would warn the user that there is a balancing problem. Also, if there is a balancing problem, rows 164 and 165 below will not match.

Table 10. Checking the Cumulated NCB and the Minimum Cash Target

	B	C	D	E	F	G	H		
164	Year		0	1	2	3	4		
165	Calculated Cumulated NCB		13.0	15.2	16.3	17.7	19.2	=D162	=D165+E162
166	Check with MCT		0.0	0.0	0.0	0.0	0.0	=D165-D50	

Short and Long-term Debt Schedules

In the following tables we construct the debt schedule for each short-term loan defined in the CB in Module 3, table 9c.

Table 11a. Short-term Loan schedules

	B	C	D	E	F	G	H		
167	Year		0	1	2	3	4		
168	BB		0.0	22.1	0.0	0.0	0.0	=C171	
169	IP		0.0	2.9	0.0	0.0	0.0	=C171*D172	
170	PP		0.0	22.1	0.0	0.0	0.0	=C171/$D$16	
171	EB		22.1	0.0	0.0	0.0	0.0	=D139	=D171-E170+E139
172	Kd		0.0%	13.1%	12.6%	12.6%	12.1%	=D62	

BB = Beginning balance IP = Interest payment PP = Principal payments, EB = Ending balance, Kd = cost of debt

In table 11b we show the debt schedules for any possible long-term loan the firm eventually will need to contract in the next years, including initial loans at the start. We should observe that the loan is contracted in year t and we assume that the firm starts repaying it in year t+1. This is simply the end of year convention. In practice, it might be necessary to design monthly or quarterly debt schedules and add the transactions within the year to obtain a yearly figure or use the shorter and proper period length (month, quarter,

and etcetera). The Excel formulas in the table refer to the year the loan is contracted and the year the firm starts repaying it.

Table 11b. Long-term Loan schedules

	B	C	D	E	F	G	H		
175	Year		0	1	2	3	4		
176	BB LT debt		0.0	31.50	35.49	31.63	28.11	=C192	
177	LT loan yr 0		31.50					=D140	
178	PP loan yr 0			3.15	3.15	3.15	3.15	=D177/D15	=E178
179	New loan yr 1			7.14				=E140	
180	PP loan yr 1				0.71	0.71	0.71	=E179/D15	=F180
181	New loan yr 2				0.00			=F140	
182	PP loan yr 2					0.00	0.00	=F181/D15	=G182
183	New loan yr 3					0.34		=G140	
184	PP loan yr 3						0.03	=G183/D15	
185	New loan yr 4						11.0	=H140	
186									
187									
188									
189	Total Interest			4.13	4.48	3.99	3.40	=C192*D172	
190	New debt LT		31.5	7.1	0.0	0.3	11.0	=D177+D179+D181 +D183+D185	
191	Total PP LT		0.0	3.2	3.9	3.9	3.9	=D178+D180+D182 +D184+D186	
192	EB LT debt		31.5	35.5	31.6	28.1	35.2	=D176+D190-D191	

BB = Beginning Balance, LT = long-term, PP = Principal payment, EB = Ending balance

The Income Statement

With the intermediate tables and the Cash Budget we can easily construct the Income Statement.

Table 12. Income Statement

	B	C	D	E	F	G	H	
195	Year		0	1	2	3	4	
196	Sales revenues			379.3	408.2	443.6	479.9	=D57
197	COGS			268.3	287.3	310.7	336.1	=D94
198	Gross Income			111.0	120.9	132.9	143.7	=D196-D197
199	A&S expenses			75.8	81.1	87.0	92.9	=D100
200	Depreciation			11.3	14.2	17.9	22.7	=D72
201	EBIT			24.0	25.6	27.9	28.1	=D198-D199-D200
202	Interest payments			7.0	4.5	4.0	3.4	=D189+D169
203	Return from ST investment			0.0	0.0	0.0[5]	0.0	=D158
204	EBT			16.9	21.1	23.9	24.7	=D201+D203-D202
205	Income Taxes			5.9	7.4	8.4	8.7	=IF(D204<=0,0,D204*$D$9)
206	Net Income		0.0	11.0	13.7	15.6	16.1	=D204-D205
207	Next year Dividends		0.0	7.7	9.6	10.9	11.3	=D206*$E$34
208	CRE		0.0	0.0	3.3	7.4	12.1	=C208+C206-C207

A&S = Administrative and Sales; EBIT = Earnings Before Interest and Taxes; EBT = Earnings Before Taxes, CRE=Cumulated retained earnings

Observe that Income Statement is constructed linking cells from previous intermediate tables and/or the Cash Budget. In table 12 there is a critical cell: the calculation of income tax. If we do not use the logical statement and we have a negative EBT, Net Income (losses) would be over stated (less negative).

Next to the Income Statement (last two rows) we have estimated the dividends to be paid in the following period and based on the payout policy and the cumulated retained earnings. Combining dividends, current year net income and cumulated retained earnings from previous year, gives the cumulated retained earnings. This can be shown using the same metaphor of the Balance Sheet as a collection of tanks.

[5] The exact value is 0.0032. With the rounding to two decimals it is seen as zero.

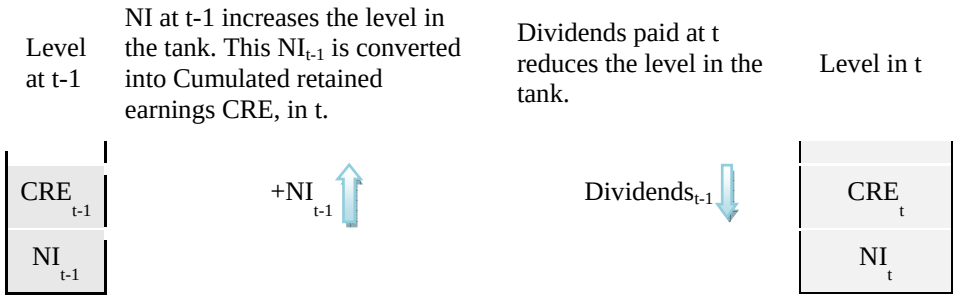

Exhibit 3. Cumulated Retained Earnings, Dividends and Net Income

From Exhibit 3 we can derive this relationship:

$$CRE_t = CRE_{t-1} + NI_{t-1} - Dividends_t \quad (11)$$

This is known as a Clean Surplus Relation and is a basic tenet of Finance and Accounting.

The Balance Sheet

At this point, constructing the Balance Sheet is straightforward. We simply link cells from the Cash Budget, the Intermediate Tables and the Income Statement.

Table 13. The Balance Sheet

	B	C	D	E	F	G	H	
211	Year		0	1	2	3	4	
212	Assets							
213	Cash CB		13.0	15.2	16.3	17.7	19.2	=D163
214	AR IT		0.0	19.0	20.4	22.2	24.0	=D105
215	Inventory IT		20.0	22.5	24.1	26.0	28.1	=D93
216	APP		27.1	28.9	31.3	33.8	0.0	=D119
217	ST investments CB		0.0	0.0	0.1	0.0	0.0	=D160
218	Current assets		60.1	85.5	92.1	99.8	71.3	=SUM(D213:D217)
219	Net fixed assets IT		45.0	45.5	46.4	47.3	47.3	=D77
220	Total		105.07	130.94	138.48	147.05	118.62	=D219+D218
221	Liabilities and equity							
222	AP IT		0.0	27.1	28.9	31.3	33.8	=D109
223	APR		37.9	40.8	44.4	48.0	0.0	=D115
224	Short-term debt CB		22.1	0.0	0.0	0.0	0.0	=D171
225	Current liabilities		60.1	67.9	73.3	79.3	33.8	=SUM(D222:D224)
226	Long-term debt CB		31.5	35.5	31.6	28.1	35.2	=D192
227	Total Liabilities		91.6	103.4	104.9	107.4	69.0	=D226+D225
228	Equity investment CB		13.5	16.6	16.6	16.7	21.4	=C228+D150
229	Retained earnings IS		0.0	0.0	3.3	7.4	12.1	=D208
230	Current year NI		0.0	11.0	13.7	15.6	16.1	=D206
231	Repurchase of equity		0.0	0.0	0.0	0.0	0.0	=C231 –D152
232	Liabilities and equity		105.07	130.94	138.48	147.05	118.62	=SUM(D228:D231)+D227
233	Check		0.0	0.0	0.0	0.0	0.0	=D232-D220

AR = Accounts Receivable, APP = Advance payments paid, AP = Accounts Payable, APR = Advance payments received, NI = Net Income, CB = Cash Budget, IS = Income Statement, IT = Intermediate tables.

Observe that equity investment in years 1 and 2 because there is not long-term deficit and hence no new debt nor new equity investment. As can be seen it is not necessary to use plugs in order to solve the balancing problem.

Cash Flows and Valuation

Cash flows can be derived using a direct or an indirect method. We prefer the former. We will derive the following cash flows: cash flow to debt, CFD, cash flow to equity, CFE, capital cash flow, CCF (the sum of the first two cash flows). In addition we define the free cash flow, FCF and the tax savings (or tax shield), TS. Later we show that when properly done, both approaches give identical results, as it should be.

Defining Cash Flows

Simple definitions of previous cash flows follow. They are defined from the standpoint of the owners of the cash flows.

Cash flow to debt, CFD, is all outflows from debt holders plus any payment (principal and interest charges) to them. Cash flow to equity, CFE, is all outflows from equity holders (equity investment) plus any payment (dividends and stock repurchase) to them. Tax shields or tax savings, TS, is the subsidy the government pays to the firm for interest expenses. Free cash flow, FCF, is the cash flow available to debt and equity holders adjusted by tax savings.

In a seminal paper Modigliani and Miller (1958) established a relationship among cash flows as follows:

$$FCF + TS = CFD + CFE \qquad (12a)$$

Equation (12a) is known as Capital Cash Flow, CCF, and this cash flow can be used to calculate the value of a firm.

In a similar way Modigliani and Miller (1958) defined the relationship among values as follows:

$$V^L = V^{Un} + V^{TS} = V^D + V^E \qquad (12b)$$

Where V^L is the firm levered value, V^{Un} is the unlevered firm value, V^{TS} is the TS value discounted at a proper discount rate, V^D is the market value of debt and V^E is the levered equity value.

From the Cash Budget we can directly derive the CFD and the CFE.

Table 14a. Deriving the Cash Flows: CFD

	B	C	D	E	F	G	H	
239	Year		0	1	2	3	4	
240	Loan inflows		-53.6	-7.1	0.0	-0.3	-11.0	=-SUM(D139:D140)
241	PP		0.0	25.3	3.9	3.9	3.9	=D142+D145
242	IP		0.0	7.0	4.5	4.0	3.4	=D143+D146
243	CFD		-53.6	25.2	8.3	7.5	-3.7	=SUM(D240:D242)
244	NCB of Module 3.		53.6	-25.2	-8.3	-7.5	3.7	=D148

CFD = Cash Flow to Debt, PP = Principal payments, IP = Interest payments

Observe CFD is the negative of NCB of financing activities (row 147, Table 9c).

Table 14b. Deriving the Cash Flows: CFE

	B	C	D	E	F	G	H	
246	Year		0	1	2	3	4	
247	CFE							
248	EI		-13.5	-3.1	0.0	-0.1	-4.7	=-D150
249	Div		0.0	0.0	7.7	9.6	10.9	=D151
250	SR		0.0	0.0	0.0	0.0	0.0	=D152
251	CFE		-13.5	-3.1	7.7	9.5	6.2	=SUM(D248:D250)
252	NCB of Module 4	0	13.5	3.1	-7.7	-9.5	-6.2	=D154

CFE = Cash flow to equity, EI = Equity investment, Div = Dividends, SR = Stock repurchases

Observe CFE is the negative of NCB of module 4 (row 153, Table 9d).

Table 14c. Deriving CCF and FCF

	B	C	D	E	F	G	H	
254	Year		0	1	2	3	4	
255	CCF		-67.1	22.1	16.0	17.0	2.5	=D251+D243
256	TS		0.0	2.5	1.6	1.4	1.2	=C9*(MAX(MIN(D201+D203,D202),0))
257	FCF		-67.1	19.7	14.5	15.6	1.3	=D255-D256

CCF = Capital Cash Flow = CFD + CFE, TS = Tax shields, FCF = Free Cash Flow.

The CCF is the sum of CFD and CFE. According to equation (12a), FCF is

$$FCF = CCF - TS = CFD + CFE - TS \quad (12c)$$

An explanation of formula in row 256, the calculation of TS, follows:

=C9*(MAX(MIN(D201+D203,D202),0)) (13a)

In words

=Tax rate*(MAX(MIN(EBIT + Other income,Interest charges),0)) (13b)

Usually we say that tax savings is Tax rate times Interest charges, however, this is true only when we have enough EBIT (plus Other income, OI) to offset the Financial Expenses, FE, (interest charges), this is EBIT + OI > FE. In case EBIT + OI≤ FE we

calculate TS as as Tax rate times (EBIT + OI) or 0. This is what formula in row 256 does. This means if EBIT + OI > FE, TS is calculated with FE, Tax rate times FE; if EBIT + OI < FE, but non negative, TS is calculated with EBIT + OI, Tax rate times (EBIT + OI); and finally if EBIT + OI < 0, then TS = 0. (See Vélez Pareja, 2008).

A word has to be said regarding the calculation of TS. The right to earn the tax shield arises when the interest expense is listed in the IS and not when interest is paid. In fact the TS is actually earned when taxes are paid, but the right to earn it appears when taxes are accrued.

Estimating Cost of Capital and Value

Value is the present value of future cash flows at a proper discount rate. Following this definition, value at the end of the forecasting horizon is the present value of all cash flows from N+1 up to infinity. This is known as Terminal Value TV or Continuing Value, CV. This means that V, the firm value today is composed of two parts: the present value of the forecasted cash flows from 1 to N, the forecasting horizon and the present value of TV. We calculate the former with the CCF and Ku as discount rate and the second part (TV) as a non growing perpetuity. In both cases we assume that the discount rate for the tax savings is Ku, the cost of unlevered equity. See Taggart 1989 and Tham and Vélez-Pareja, 2004.

Table 15. Input data for Valuation purposes

	B	C	D
273	Year		0
274	Observed Nominal Ku, cost of unlevered equity		15.00%
275			
276	Perpetual leverage, D%		30%
277	Expected inflation rate for perpetuity		0%
278	Real growth rate		0%

We deflate observed Ku at year 0 using Fisher relation and assume that real Ku, ku, is constant over the time. This means that it is affected only by inflation.

Table 16. Estimating Forecasted Ku for the Planning Horizon

	B	C	D	E	F	G	H		
	Year		0	1	2	3	4		
283	Real Ku, ku		8.49%	8.49%	8.49%	8.49%	8.49%	=(1+D274)/(1+D18)-1	=D283
284	Inflation rate.		6.0%	6.0%	5.5%	5.5%	5.0%	=D18	
285	Nominal Ku.		15.00%	15.00%	14.46%	14.46%	13.92%	=(1+D283)*(1+D284)-1	

For calculating TV we need to make some strong assumptions regarding some variables that will define the TV.

Table 17. Input Data for perpetuity

	B	C	D	E	F	G	H	I	
287									
288	Year		0	1	2	3	4	5	
289	Tax rate, T							35.00%	=D9
290	Real Growth, g							0.00%	=D278
291	Real interest rate							2.00%	=E24
292	Risk premium for debt							5.00%	=E25
293									
294	Kd, real cost of debt							7.00%	=I292+I291
295	ku for perpetuity							8.49%	=D283
296	wacc = ku - kd×T×D%*							7.76%	=I295-I289*D276*I294

*(For the expression of wacc see Taggart, 1989 and Tham and Vélez-Pareja 2004)

Table 18. Calculating TV and liquidating current Assets

	B	C	D	E	F	G	H	
298	Year		0	1	2	3	4	
299	NOPLAT = EBITx(1-T)						18.3	=H201*(1-D9)
300	TV = NOPLAT/wacc						235.8	=H299/I296
301								
302	Cash						19.2	=H213
303	AR. (discounted at wacc)						22.3	=H214/(1+I296)
304	Market securities						0.0	=H217
305	AP (discounted at wacc)						-31.4	=-H222/(1+I296)
306	Liquidation of Current assets						10.1	=SUM(H302:H305)
307	Adjusted TV						245.8	=H306+H300

We are assuming a non growing perpetuity. The expression for TV as a non growing perpetuity is

$$TV=\frac{NOPLAT}{wacc} \quad (14)$$

Where NOPLAT is Net Operating Profit Less Adjusted Taxes and wacc is real wacc.

Table 19 Calculating Value

	B	C	D	E	F	G	H	
309		Year	0	1	2	3	4	
310	CCF		-67.1	22.1	16.0	17.0	2.5	=D255
311	V		187.4	193.4	205.3	218.0	245.8*	=(E310+E311)/(1+E285)
312	Debt		53.6	35.5	31.6	28.1	35.2	=D224+D226
313	E. = V - D		133.7	157.9	173.7	189.9	210.6	=D311-D312
314	IC		67.1	63.0	65.2	67.8	84.8	=D220-D225+D224
315	NPV firm.		120.2					=D311-D314
316	NPV equity.		120.2					=D313-D228

TV = Terminal Value, E = Equity IC = Invested capital = Total assets -Current liabilities + ST debt.
* From H307, above.

In previous table we include TV at year 4 because that is the value for the firm at that time. It is the present value of cash flows from N+1 up to infinity.

The formula for calculating the value from t=1 to t=4, is a basic tenet in Finance:

$$PV_t=\frac{PV_{t+1}+CF_{t+1}}{1+DR_{t+1}} \quad (15)$$

Where PV is present value, CF is Cash Flow and DR is discount rate.

In table 19 we use equation (12) to calculate the equity value. We can observe that NPV for the firm (or project) is identical to the NPV for the investor (the equity holder) as expected and according to the same definition of NPV. This is valid only if market value of debt is identical to book value of debt.

Calculating Cash Flow with the Indirect Method

In the next four tables we show that when properly done, the indirect method and the direct method for constructing the cash flows give identical results. The first table shows the calculation of the Working Capital and its change.

Table 20. Calculating Working Capital, WC

	B	C	D	E	F	G	H	
333	Year		0	1	2	3	4	
334	Current Assets		60.1	85.5	92.1	99.8	107.9	=D218
335	Current liabilities minus financial debt		37.9	67.9	73.3	79.3	85.7	=D225-D224
336	WC		22.1	17.6	18.9	20.5	22.2	=D334-D335
337	Change in WC		22.1	-4.5	1.3	1.6	1.7	=D336-C336

In table 21 we calculate the investment in capital assets (Capex). This is not an item we find in the financial statements but has to be derived from them. In row 341 below, we use equation (3b)

$$\text{Investment in } FA_t = NFA_t + \text{Depreciation}_t - NFA_{t-1} \qquad (3b)$$

Table 21 Calculation of Investment in Assets

	B	C	D	E	F	G	H	
338	Year		0	1	2	3	4	
339	Net Fixed Assets		45.0	45.5	46.4	47.3	48.5	=D219
340	Depreciation		0.0	11.3	14.2	17.9	22.7	=D200
341	Investment in assets		45.0	11.7	15.1	18.9	23.8	=D339+D340-C339

We have to keep in mind that the usual approaches when calculating cash flows with the indirect method, users only construct the Income Statement and the Balance Sheet and from them they derive the cash flow. This is what we do with equation (3b).

Next we show the calculation of FCF

Table 22. Calculating FCF with the Indirect Method

	B	C	D	E	F	G	H	
342	Year		0	1	2	3	4	
343	FCF Indirect method							
344	EBIT		0.0	24.0	25.6	27.9	28.1	=D201
345	Minus tax on EBIT		0.0	-8.4	-9.0	-9.8	-9.8	=-D344*D9
346	NOPLAT		0.0	15.6	16.6	18.2	18.3	=D345+D344
347	plus depreciation		0.0	11.3	14.2	17.9	22.7	=D200
348	Minus change in WC		-22.1	4.5	-1.3	-1.6	-1.7	=-D337
349	Minus investment in assets		-45.0	-11.7	-15.1	-18.9	-23.8	=-D341
350	Interest charges		0.0	0.0	0.0	0.0	0.0	=D203
351	Minus tax on interest charges (tax savings)		0.0	0.0	0.0	0.0	0.0	=-D350*D9
352	FCF		-67.1	19.7	14.5	15.6	15.4	=SUM(D344:D351)
353	Check with direct method (D257)			0.0	0.0	0.0	0.0	=D352-D257

Finally, next table shows the calculation of CFE with the indirect method

Table 23. Calculating CFE with the Indirect Method

	B	C	D	E	F	G	H	
354	Year		0	1	2	3	4	
355	CFE indirect method							
356	Net Income		0.0	11.0	13.7	15.6	16.1	=D206
357	plus depreciation		0.0	11.3	14.2	17.9	22.7	=D200
358	Minus change in WC		-22.1	4.5	-1.3	-1.6	-1.7	=-D337
359	Minus payment (inflow) of debt (principal)		53.6	-18.2	-3.9	-3.5	-2.8	=-D241-D240
360	Minus investment in assets		-45.0	-11.7	-15.1	-18.9	-23.8	=-D341
361								
362	CFE indirect method		-13.5	-3.1	7.7	9.5	10.4	=SUM(D356:D361)
363	Check with direct method (D251)		0.0	0.0	0.0	0.0	0.0	=D362-D251

As can be seen, both approaches give the same results.

Section Three

Concluding Remarks

This exercise has shown how to construct consistent financial statement without plugs and circularity. We also have shown that constructing the cash flows with the direct method from a financial planning model is the easiest way to do it. We show both methods: the direct and the indirect. We ask the reader to make a decision between which is the simplest way to do it.

This model has the virtue of keeping track of financial ratios, policies and what is more relevant, value for the shareholder.

We also have shown that when properly done, the NPV for the firm (or project) has to be identical to the NPV for the equity investment as by definition should be.

We expect to convince practitioners, teachers and authors about the inconvenience of using plugs, a malpractice that might conceal many errors and mistakes. This practice should be abolished from our Accounting and Finance courses. We invite the reader to practice with this model and profit from the approach to construct consistent financial statements and cash flows for valuation.

Bibliographic References

Benninga, Simon, 2007. Conference: Teaching of Finance with Excel, Guest Speaker in *4th National and 1st International Symposium for the Teaching in Finance*, Cartagena, June 20. ISSN 1900-3218.

Benninga, Simon, 2006. *Principles of Finance with Excel*, Oxford, London.

Brealey, Richard and Stewart C. Myers, 2003, *Principles of Corporate Finance*, 7th edition, McGraw Hill-Irwin, New York.

Modigliani, F.; Miller, M. 1958. "The Cost of Capital, Corporation Finance and the Theory of Investment". *American Economic Review*, 48 (3): 261–297. http://www.jstor.org/stable/1809766.

Taggart, Jr, R. A. 1989. Consistent Valuation and Cost of Capital Expressions with Corporate and Personal Taxes, National Bureau of Economic Research, August. Also as Consistent Valuation and Cost of Capital Expressions with Corporate and. Personal Taxes. *Financial Management*, Autumn, pp. 8-20

Tham, J., and Vélez–Pareja I. 2004. *Principles of Cash Flow Valuation,* Academic Press.

Vélez-Pareja, Ignacio and Tham, Joseph, 2009. "Prospective Analysis: Guidelines for Forecasting Financial Statements" in S.R. Vishwanath, C. Krishnamurti (eds.). Investment Management: A Modern Guide to Security Analysis and Stock Selection, DOI: 10.1007/978-3-540-88802-4 2. Springer-Verlag Berlin Heidelberg. Available at SSRN: http://ssrn.com/abstract=1026210

Vélez-Pareja, Ignacio, 2008. Return to Basics: Are You Properly Calculating Tax Shields? (Updated July 15, 2009). Available at *SSRN*: http://ssrn.com/abstract=1306043

Vélez-Pareja, Ignacio, 2007. "Forecasting Financial Statements with No Plugs and No Circularity". Available at *SSRN*: http://ssrn.com/abstract=1031735.