PRINCIPALS OF FINANCIAL MODELLING

Sławomir JANISZEWSKI

Faculty of Management
Warsaw University of Technology, Warsaw, Poland
email: slawomir.janiszewski@pl.pwc.com

Abstract: The financial statements submitted by each company annually reflect their financial performance in the past but are also utilized to forecast the future results in quantitative and realistic frames. The aim of the following elaboration is to thoroughly research all the issues related to financial modelling. The author step by step introduces the reader with theoretical and practical assumptions related to forecasting of respectively, the profit & loss account, balance sheet account and cash flow statement. All of the issues are illustrated with excel spreadsheets that were prepared exclusively for this article purposes.

Key words: financial model, input module, output module, calculation module, profit & loss account, balance sheet, cash flow statement.

1   Introduction

The main objective of preparing a financial model is to reflect the forecasted financial performance of the company. The main areas of utilisation the financial model are as follows:

- compilation of financial projections for the company being valued using Discounted Cash Flow (DCF) approach,
- compilation of financial projections for the company (no valuation involved).

The above mentioned are just the two general (indirect) areas of model utilisation. The direct objectives might vary depending on the company needs and might include e.g. profitability analysis, cost analysis, sensitivity analysis and impairment tests [13].

It is however important to analyse the objective of preparing the financial model before the analytical work begins. The financial model of a company prepared for valuation purposes shall differ from the one prepared for cost analysis purposes as an example.

The types of the financial models might be split with respect to two main criteria: consolidated/standalone basis or valuation approach being used (see Table 1).

Other approaches include primarily usage of the financial models for e.g. leverage buy-out analysis, synergy effect analysis and other specific analysis.

Before the assumptions concerning key inputs are plugged into the financial model the thorough analysis and reconciliation of historical performance of the valued entity must be performed. The history reconciliation is performed for both balance sheet and profit and loss account, but excluding cash – flow statement.

Table 1. Possible applications of different types of valuation models based on types of financial statements
(source: self study)

	Free Cash Flow to Equity	Free Cash Flow to Firm	Dividend Discount Valuation	Other approaches
Standalone basis	√	√	√	√
Consolidated basis	√	√	√	√

llustrative Valuation of ABC Company as of 31 December 2003
Macroeconomic assumptions

	Unit	2003	2004	2005	2006	2007	2008	2009
Poland								
Inflation rate (December to December)	[%]	1.10%	2.00%	2.00%	19.00%	19.00%	19.00%	19.00%
Average inflation	[%]	2.30%	1.55%	2.00%	10.50%	19.00%	19.00%	19.00%
Nominal corporate income tax rate	[%]	27.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%
F/X								
F/X rate PLN/EUR at the end of the period	PLN/EUR	4.00	4.00	4.01	4.69	5.49	6.43	7.52
Average F/X rate PLN/EUR in the period	PLN/EUR	4.00	4.00	4.01	4.35	5.09	5.96	6.97
Interest rate								
3 month WIBOR	[%]	9.1%	6.3%	5.7%	4.7%	4.6%	4.6%	4.6%
Bank rate for deposits	[%]	6.9%	4.8%	4.2%	3.2%	3.1%	3.1%	3.5%
52-week Treasury Bills	[%]	8.4%	5.9%	5.2%	4.3%	4.1%	4.1%	4.1%

Figure 1. Macroeconomic assumptions
(source: self study)

It is crucial that the breakdown of all profit and loss (revenues, costs) and balance sheet captions for the historical period is identical to the one of forecasted period. Therefore before the history reconciliation is performed the general structure of the financial model, the key-drivers and information-flow shall be identified. Items that affect the company's performance and which may be the subject of sensitivity analysis should be broken out, while other items might be presented on aggregated basis [6, 3].

While performing the historical data reconciliation it is always recommended to compare the company's past performance with forecasted by the management future results of the company. Generally past performance can be a good indicator of future performance. Therefore, any significant changes in financial performance (e. g, EBIT margins increases, sales volume or price increases) shall be verified on case-by-case basis. This is often called the 'hockey stick' effect, and can undermine the credibility of the projections [8]. A very effective means of checking the model can be to study the year-to-year performance of the company and look for dramatic or unexplained shifts in performance

The general principles how to structure financial model are presented below:

- the financial model should have a modular structure and should be consist of thee main modules:
  - input module,
  - calculation module,
  - output module,

- the financial model should be flexible, permitting to extend financial projections period; Moreover financial model should be structured to allow testing of a variety of assumptions,

- the model should adhere as rigorously as possible to accounting fundamentals; on the other hand some reclassifications and aggregative approaches that do not have material impact on the valuation results are possible e.g. division of fixed assets into 4 main categories and estimating average depreciation rate for each of the category,

- the financial model should not be more complex than the requirements of the analytical problem it is designed for.

2   Input module

Input module consists usually of three different spreadsheets:

- Macroeconomic assumptions

The data plugged on this spreadsheet include all the factors that refer to the forecasted performance of the economy that might affect either the performance of the valued company or the valuation specific parameters e.g. discount rates. Therefore macroeconomic assumptions might be usually split into three categories: market specific factors (market growth, saturation); GDP and inflation; Interest rates (T-Bills, WIBOR, LIBOR, deposit rates).

llustrative Valuation of ABC Company as of December 31 2003
Operating assumptions

	Unit	2004	2005	2006	2007	2008	2009
Increase of total number of cards embossed							
Company	[%]	1.0%	2.0%	2.0%	2.0%	0.0%	0.0%
Bank A	[%]	1.0%	2.0%	1.0%	1.0%	0.0%	0.0%
Bank B	[%]	1.0%	2.0%	1.0%	1.0%	0.0%	0.0%
Structure of the cards embossed							
Debit cards	[%]	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Credit cards	[%]	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
Total transactions per card							
Company	[number]	100	100	100	100	100	100
Bank A	[number]	110	110	110	110	110	110
Bank B	[number]	120	120	120	120	120	120
MARK-UP ASSUMPTIONS							
Cardholder management							
Bank A debit cards	[%]	20%	20%	20%	20%	20%	20%
Bank B debit cards	[%]	20%	20%	20%	20%	20%	20%
Bank A credit cards	[%]	20%	20%	20%	20%	20%	20%
Bank B credit cards	[%]	20%	20%	20%	20%	20%	20%
Cards transactions							
Bank A catrd transations	[%]	20%	20%	20%	20%	20%	20%
Bank B catrd transations	[%]	20%	20%	20%	20%	20%	20%
CAPITAL EXPENDITURES	['000 PLN]	810	1210	1210	1210	1210	1210
Intangibles	['000 PLN]	400	600	600	600	600	600
Land	['000 PLN]	200	200	200	200	200	200
Buildings and constructions	['000 PLN]	200	400	400	400	400	400
Other fixed assets	['000 PLN]	10	10	10	10	10	10
WORKING CAPITAL TURNOVER							
Trade receivables - dometic	['000 PLN]	30	30	30	30	30	30
Trade receivables - export	['000 PLN]	45	45	45	45	45	45
Trade payables - domestic	['000 PLN]	30	30	30	30	30	30
Trade payables - export	['000 PLN]	45	45	45	45	45	45
Inventory	['000 PLN]	10	10	10	10	10	10

Figure 2. Operating assumptions
(source: self study)

In case of the financial projections in current prices, all the profit and loss captions shall be adjusted for the year-average inflation and balance sheet captions shall be adjusted for December – December inflation, it is recommended to presented the both inflation ratio on the spreadsheet with macroeconomic assumptions [1].

The exemplary screenshot of spreadsheet with macroeconomic assumptions is presented in Fig. 1.

• Operating assumptions

The data plugged on this spreadsheet include all the factors that refer to the forecasted performance of the company. The structure and complexity of the operating assumptions shall be considered on case-by-case and might vary significantly with respect to different projects. In general operating assumptions might be split into five vogue categories: sales as-

sumptions (volume increases, real price increases); operating costs assumptions (margins, unit costs of materials); capital expenditures, working capital (turnover of receivables, payables, inventory and operating cash); other assumptions (dividend payout ratio, provision for receivables) [11].

The exemplary screenshot of spreadsheet with operating assumptions is presented in Fig. 2.
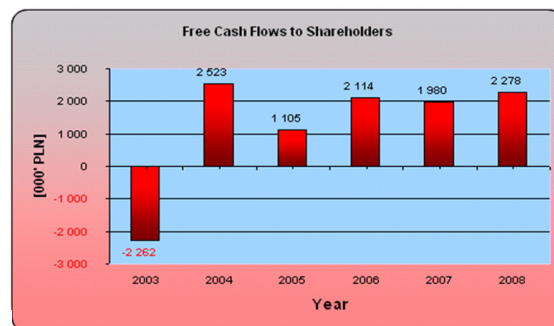
• KVD spreadsheet

The data presented on this spreadsheet include primarily the results and the key drivers of the sensitivity analysis. The structure and complexity of KVD shall be considered on case-by-case and might vary significantly with respect to different projects.

The exemplary screenshot of KVD spreadsheet is presented in Fig. 3.

llustrative Valuation of ABC Company as of 31 December 2002
KVD - Sensitivity Analysis

		2004	2005	2006	2007	2008
Change in contract revenues	[%]	0.0%	0.0%	0.0%	0.0%	0.0%
Change in non-contract revenues	[%]	0.0%	0.0%	0.0%	0.0%	0.0%
Change in costs of external services	[%]	0.0%	0.0%	0.0%	0.0%	0.0%
Change in Other costs - other	[%]	0.0%	0.0%	0.0%	0.0%	0.0%
Change in cost of equity	0.0%					

		2003	2004	2005	2006	2007	2008
Sales revenues	['000 PLN}	68 260	64 625	56 536	53 619	56 212	58 956
EBIT	['000 PLN}	-1 491	3 518	5 276	3 616	3 978	4 299
Net profit (loss)	['000 PLN}	-1 438	3 317	4 246	2 606	2 870	3 105
Average emplyment	[osoby]	696	560	490	465	465	465
Average working capital	['000 PLN}	5 240	5 222	4 486	4 025	3 985	4 178
Average excess cash	['000 PLN}	3 077	3 208	5 022	6 631	8 678	10 807
Average equity	['000 PLN}	-1 628	-895	2 707	6 133	8 871	11 858
Average overdraft	['000 PLN}	0	0	0	0	0	0
Free cas flow to equityholders	['000 PLN}	-2 262	2 523	1 105	2 114	1 980	2 278
Payroll and related charges	['000 PLN}	51 786	41 962	30 557	29 337	29 938	30 540
Increase of payments per employee (real terms)	[%]		6.0%	2.3%	1.7%	0.5%	0.5%

Valuation as of 31 December 2003		Implied multiples - residual value	
Value 2003-2008	5 100	P/S	0.47
Residual Value	16 359	P/EBITDA	5.35
TOTAL	21 459	P/EBITDA	6.40
Excess cash	4 208	P/E	8.86
EQUITY VALUE	28 667		

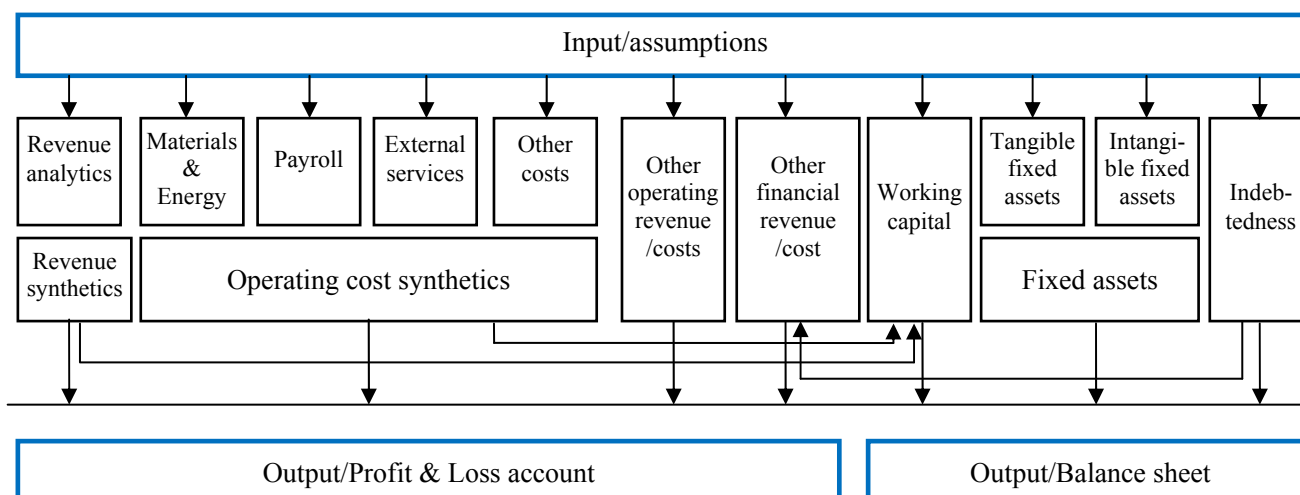Figure 3. Exemplary screenshot of KVD
(source: self study)

Figure 4. The exemplary structure of the calculation module included in the financial model
(source: self study)

3   Calculation module

The number of the spreadsheets in the calculation module depends on the business specific factors and shall be considered on project-by-projects basis. The exemplary structure of the calculation module included in the financial model of a commercial company is presented in Fig. 4.

In case particular areas are subject to simplified approach these might be calculated on one spreadsheet e.g. fixed assets. On the other hand, if particular areas

require thorough analysis, these might be modelled using several spreadsheets e.g. cost of materials and energy or production process flow. The general rule governing all financial models shall be the hierarchical data flow: input – calculation – output.

- Analytics vs. synthetics

The most common approach is to present the aggregated data on the top of the spreadsheet (see Fig. 5) if only possible. The detailed calculation presented in the bottom of the spreadsheet shall be followed by the aggregated data.

llustrative Valuation of ABC Company as of 31 December 2003
Sales of products and services

	Unit	2003	2004	2005	2006	2007	2008
Sales revenue	**'000 PLN]**	**40 914**	**44 062**	**47 474**	**51 101**	**54 819**	**56 381**
Product 1	['000 PLN]	19 258	20 740	22 346	24 053	25 803	26 539
Product 2	['000 PLN]	12 582	13 549	14 599	15 714	16 857	17 338
Product 3	['000 PLN]	9 074	9 772	10 529	11 334	12 158	12 505
Product 1	**'000 PLN]**	**19 258**	**20 740**	**22 346**	**24 053**	**25 803**	**26 539**
Retail	['000 PLN]	4 622	4 355	4 469	4 570	5 419	5 573
Wholesale	['000 PLN]	11 555	12 444	12 961	13 229	13 160	13 004
Distribution network	['000 PLN]	1 926	2 489	3 128	4 089	4 903	5 308
B2B	['000 PLN]	1 156	1 452	1 788	2 165	2 322	2 654
Product 2	**'000 PLN]**	**12 582**	**13 549**	**14 599**	**15 714**	**16 857**	**17 338**
Retail	['000 PLN]	2 642	2 710	2 920	3 143	3 709	3 814
Wholesale	['000 PLN]	6 920	7 452	7 883	8 328	8 429	8 669
Distribution network	['000 PLN]	629	813	1 022	1 257	1 686	1 907
B2B	['000 PLN]	2 391	2 574	2 774	2 986	3 034	2 947
Product 3	**'000 PLN]**	**9 074**	**9 772**	**10 529**	**11 334**	**12 158**	**12 505**
Retail	['000 PLN]	1 815	2 052	1 369	1 700	1 945	2 001
Wholesale	['000 PLN]	4 537	5 766	7 370	7 027	6 809	6 502
Distribution network	['000 PLN]	635	1 759	1 579	2 380	3 161	3 751
B2B	['000 PLN]	2 087	195	211	227	243	250

Figure 5. Aggregated data
(source: self study)

- Sales revenue

Sales revenue shall be categorized in order to distinguish between the groups of products/services with different profitability. Profitability is usually determined as contribution, margin or mark-up realised on the product/service group. While working over the analytics of the sales revenue the two objectives shall be followed:

- the number of different groups of products/services shall be minimised,
- the total sum of the variances of groups of products/services shall be minimised [10].

The criteria used in revenue categorisation shall be assessed on project-by-project basis. In valuation practise the two dimensions of revenue seem to be very useful:

- product/service group,
- distribution channel.

- Depreciation and amortisation

Depreciation and amortization shall be calculated on pre-formatted Microsoft Excel spreadsheet with respect to different groups of fixed assets. Valuation practice proves that fixed assets are usually split into four groups: intangibles; building and construction; machinery and equipment and other fixed assets (all remaining tangible fixed assets) [3].

For the purposes of compilation of financial projections the weight average economic depreciation rates estimated for different groups of assets shall always be applied. The estimate of depreciation rate might be performed based on historical financial statements (unless there is no evidence that accounting depreciation rates differ significantly from economic depreciation rates) or using the management assumption concerning the asset utilisation [12, 4].

In case there is a significant difference between the accounting and economic depreciation rates the adjustment to the historical depreciation rate is necessary.

4   Output module

The output module consists usually of several spreadsheets that present the data on the aggregated level. These are the spreadsheets that include the results and the summary of the analyses performed in the financial model.

Table 2. The basic drivers to profit & loss captions
(source: self study)

	Driver I	Driver I derivatives	Driver II	Driver II derivatives
Sales revenue	growth	inflation / real growth	sales revenue	calculated
	volume output	output growth / market share	price of product/ services	inflation / real growth
Materials & Energy	assumed %		sales revenue	calculated
	unit material/ energy usage	constant (history)	unit price of material/ energy	inflation / real growth
External services	assumed %		sales revenue	calculated
	assumed %		operating costs	calculated
	assumed %		production output/ material volume e.g. transport	calculated
	assumed %		other parameters e.g. employment e.g. subcontractors	calculated
Payroll	assumed %		sales revenue	calculated
	number of employees	increases/decreases / constant	average salary	inflation / real growth
Depreciation	depreciation rate - %	constant	gross fixed tangible assets	calculated
Amortisation	amortisation rate - %	constant	gross fixed intangible assets	calculated
Other operating revenue	constant	nil / constant		
Other operating cost	constant	nil / constant		
	assumed %	provision for receivables	sales revenue	calculated
Financial revenue	interest rates on deposits		average operating cash (valuation)	calculated
Financial expense	interest rates on loans		average indebted-ness	calculated

llustrative Valuation of ABC Company as of 31 December 2003
Profit and loss accounts

	Unit	2003	2004	2005	2006	2007	2008	2009
Sales	['000 PLN]	**43 568**	**47 532**	**51 207**	**55 213**	**59 217**	**60 901**	**62 118**
Sales of goods bought for resale	['000 PLN]	40 914	44 062	47 474	51 101	54 819	56 381	57 508
Sales of services	['000 PLN]	2 654	3 470	3 733	4 113	4 398	4 520	4 610
Operating expenses	**['000 PLN]**	**39 409**	**44 003**	**47 875**	**51 981**	**55 089**	**56 542**	**57 673**
Cost of goods and materials sold	['000 PLN]	26 795	29 821	32 528	35 796	38 249	39 148	39 931
Energy and other materials	['000 PLN]	659	682	707	731	754	776	791
External services	['000 PLN]	4 042	5 647	6 012	6 496	6 884	7 077	7 218
Payroll and related charges	['000 PLN]	5 251	5 336	5 478	5 630	6 163	6 484	6 613
Depreciation & amortisation	['000 PLN]	1 145	981	845	853	431	409	417
Other costs	['000 PLN]	1 518	1 537	2 305	2 475	2 608	2 649	2 702
Gross profit / (loss) on sales	**['000 PLN]**	**4 159**	**3 529**	**3 332**	**3 232**	**4 127**	**4 359**	**4 446**
as percentage of sales	*[%]*	*9.5%*	*7.4%*	*6.5%*	*5.9%*	*7.0%*	*7.2%*	*7.2%*
Other operating revenues	['000 PLN]	1 033	829	2 744	606	606	606	619
Other operating expenses	['000 PLN]	973	799	816	835	853	861	878
EBIT	**['000 PLN]**	**4 220**	**3 558**	**5 260**	**3 004**	**3 881**	**4 104**	**4 186**
as percentage of sales	*[%]*	*9.7%*	*7.5%*	*10.3%*	*5.4%*	*6.6%*	*6.7%*	*6.7%*
Financial revenues	['000 PLN]	787	63	60	58	53	48	49
Financial expenses	['000 PLN]	1 412	2 081	647	567	348	226	231
Profit / (loss) on ordinary activities	**['000 PLN]**	**3 595**	**1 540**	**4 673**	**2 495**	**3 586**	**3 926**	**4 005**
as percentage of sales	*[%]*	*8.3%*	*3.2%*	*9.1%*	*4.5%*	*6.1%*	*6.4%*	*6.4%*
Extraordinary gains	['000 PLN]	98	0	0	0	0	0	0
Extraordinary losses	['000 PLN]	94	0	0	0	0	0	0
Profit / (loss) before taxation	**['000 PLN]**	**3 598**	**1 540**	**4 673**	**2 495**	**3 586**	**3 926**	**4 005**
as percentage of sales	*[%]*	*8.3%*	*3.2%*	*9.1%*	*4.5%*	*6.1%*	*6.4%*	*6.4%*
Taxes	**['000 PLN]**	**1 713**	**886**	**1 427**	**856**	**1 116**	**1 194**	**1 218**
Corporate income tax	['000 PLN]	1 713	886	1 427	856	1 116	1 194	1 218
Profit / (loss) after taxation	**['000 PLN]**	**1 885**	**654**	**3 246**	**1 639**	**2 470**	**2 732**	**2 786**
as percentage of sales	*[%]*	*4.3%*	*1.4%*	*6.3%*	*3.0%*	*4.2%*	*4.5%*	*4.5%*

Figure 6. The exemplary screenshot of spreadsheet presenting profit & loss accounts
(source: self study)

The two main groups of spreadsheets categorised upon its objective might be distinguished for the concern of this document:

• Spreadsheets that present the final results on the aggregated level in the form of financial statements.

These comprise of the spreadsheets such as profit and loss account, balance sheet and cash flow statement.

• Spreadsheets that present the additional measures of financial performance.

These comprise of all the spreadsheets that present the additional results of the analysis performed by the financial model e.g. sales and operating costs analysis or ratio analysis.

Profit and loss account is the financial statements that shall be established at the beginning of the process to construct financial model (the exception to this rule refer to the models of financial institutions e.g. banks, insurance companies).

Profit and loss account seems to be a backbone of the financial model as it determines the company future profitability. The forecasted results of the company performance presented in profit and loss statements (EBIT, EBITDA, net profit) derive the value of the company in greatest part. Many of the balance sheet and cash flow items vary as a function of income statement items such as revenue or costs. The basic drivers to profit & loss captions are presented in Table 2.

It is important to remember that all the profit and loss captions shall be calculated based on year-average balances e.g. operating cash balance or indebtedness balance and year-average inflation rates [13].

In the majority of financial models, it is the cost drivers' identification that seems to be the most challenging task. The first step in analysing costs shall be categorising them into: fixed costs, semi-variable and variable costs. The further steps shall usually be considered on case-by-case basis.

It is worth noticing that relating all the costs to revenue captions is oversimplification that often causes a significant bias on the valuation results.

llustrative Valuation of ABC Company as of 31 December 2003
Balance sheets

	Unit	2003	2004	2005	2006	2007	2008	2009
Fixed assets	['000 PLN]	6 291	5 762	5 633	5 080	4 979	4 910	4 959
Intangibles	['000 PLN]	256	240	411	317	214	166	168
Tangible assets	['000 PLN]	6 035	5 521	5 222	4 764	4 765	4 744	4 791
Current assets	['000 PLN]	17 248	13 773	14 909	16 182	17 332	17 799	17 977
Inventory	['000 PLN]	5 957	4 902	5 347	5 884	6 288	6 435	6 500
Trade receivables	['000 PLN]	10 362	7 992	8 629	9 312	10 017	10 320	10 423
Other receivables	['000 PLN]	441	363	363	363	363	363	367
Operating cash	['000 PLN]	488	516	569	623	664	680	687
Excess cash	['000 PLN]	0	0	0	0	139	2 704	0
Total Assets	['000 PLN]	23 538	19 535	20 542	21 263	22 450	25 413	22 936
Equity	['000 PLN]	3 826	4 480	7 725	9 365	11 834	14 566	17 352
Subscribed share capital	['000 PLN]	3 098	3 098	3 098	3 098	3 098	3 098	3 098
Capital reserve	['000 PLN]	2 237	2 237	2 237	2 237	2 237	2 237	2 237
Accumulated profit / (loss) form previous year	['000 PLN]	-1 803	-1 509	-855	2 390	4 030	6 499	9 231
Profit / (loss) after taxation for the current financial year	['000 PLN]	294	654	3 246	1 639	2 470	2 732	2 786
Indebtedness	['000 PLN]	4 475	2 642	3 639	1 906	0	0	0
Overdraft	['000 PLN]	2 960	2 242	3 639	1 906	0	0	0
Other debt	['000 PLN]	1 515	400	0	0	0	0	0
Short term liabilities	['000 PLN]	10 626	8 151	8 811	9 625	10 248	10 479	5 126
Trande accounts payable	['000 PLN]	9 422	7 353	8 021	8 826	9 431	9 653	5 126
Other short0term liabilities	['000 PLN]	1 204	798	790	799	817	826	0
ZFRON	['000 PLN]	4 611	4 262	368	368	368	368	368
Total liabilities	['000 PLN]	23 538	19 535	20 542	21 263	22 450	25 413	22 936

Figure 7. The exemplary screenshot of spreadsheet presenting balance sheet
(source: self study)

Cost accounting is a complex discipline on its own, and in most cases it is unrealistic to expect to model all costs (and their relationship to inventory). It is important to understand the cost structure of the business and make sure that it is appropriately reflected in the base model and in all alternative scenarios.

The exemplary screenshot of spreadsheet presenting profit and loss accounts is presented in Fig. 6.

Balance sheet account is the financial statements that shall be established mainly based on information derived from profit and loss accounts (the exception refers to the models of financial institutions e.g. banks, insurance companies where the balance sheet shall be constructed as the first financial statement).

The basic drivers to the balance sheet captions are presented in the Table 3.

The exemplary screenshot of spreadsheet presenting balance sheets is presented in Fig. 7.

Every year of the financial projections' period implemented in the financial models period must satisfy the general accounting condition that total assets equal total liability. In other words the balance sheet must always balance.

From financial modelling perspective balancing the balance sheet requires implementing a circular into the financial model. The explanation of this issue is presented in Fig. 8.

The overdraft and excess cash balances with the inflow and outflow of cash during each year of the financial projections period making the balance sheet balance. Changes in overdraft and excess cash make the net interest to fluctuate as the interest expense and interest revenues are affected by the changes of overdraft and excess cash, respectively. The fluctuations in net interest affect the company's net income on annual basis. Net income of the year, stripped of dividends is recorded as retain earnings on the liability side of the balance sheet. Change on the liability side of the balance sheet requires rebalancing the balance sheet again using overdraft and excess cash balances. As profit and loss and balance sheet captions are each other logically dependent the circular links are necessary.

Table 3. The basic drivers to the balance sheet captions
(source: self study)

|	Driver I	Driver I derivatives	Driver II	Driver II derivatives
Intangible fixed assets	capital expenditures	assumptions	amortisation	assumptions/ constant
Tangible fixed assets	capital expenditures	assumptions	depreciation	assumptions/ constant
Inventory	inventory turnover ratio	assumptions	selected operating costs	calculated
Trade receivables	receivables turnover ratio	assumptions	sales revenue	calculated
Trade payables	payables turnover ratio	assumptions	selected operating costs	calculated
Operating cash	operating cash turnover ratio	assumptions	sales revenue	calculated
Excess cash	balancing figure			
Overdraft	balancing figure			
Debt	repayments	assumptions	issuing	assumptions
Issued capital	issues	assumptions	buy-backs	assumptions
Retained earnings	dividend payout ratio	assumptions	net profit	calculated
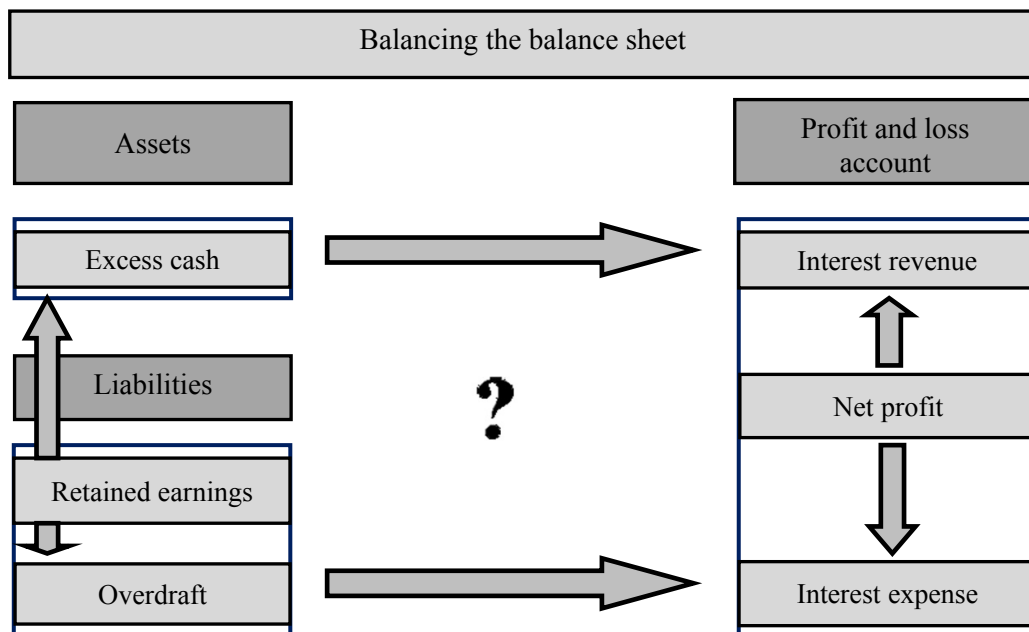
Figure 8. Balancing the balance sheet
(source: self study)

Table 4. The basic drivers to cash flow captions
(source: self study)

	Status	Source/spreadsheet	Impact on cash-flow*
Cash from operating activities			
Adjusted EBIT	calculated	profit & loss	positive
Corporate Income Tax paid	calculated	profit & loss/balance sheet	negative
Depreciation & amortisation	calculated	profit & loss or fixed assets (separate)	positive
Working capital changes	calculated	balance sheet	negative
Changes in other assets	calculated	balance sheet	negative
Changes in other liabilities	calculated	balance sheet	positive
Cash from investing activities			
Capital expenditures	assumption	input or fixed assets (separate)	negative
Proceeds from sale of fixed assets	assumption	input or fixed assets (separate)	positive
Cash from financing activities			
Change in indebtedness	calculated	balance sheet or indebtedness	positive
Net interest	calculated	profit & loss	negative
Issued capital	calculated	balance sheet	positive

* direct impact of the increase of the item on cash-flow statement

The supporting assumptions used while balancing the balance sheet are as follows:

- in case company needs more cash as of the balancing date, it is incurring overdraft – additional short term financing., the company repays as soon as excess cash appears on its balance sheet,
- in case company has excess cash of the balancing date it retains it in the balance sheet (retained earnings); for the valuation purposes the changes in excess cash, adjusted for increases in shareholders capital and dividend payouts are treated as free cash flow to equity/firm.

It is assumed that balancing procedure is recorded in visual basis language using goal seek function implemented. These are implemented for each of the years of the financial projections period [7, 14].

In extraordinary circumstances, when implementing circular links in the financial model seem inappropriate, there is a possibility to balance the balance sheet on one of the following simplified assumption:

- no interest rate expense/revenue are calculated based on overdraft and excess cash,
- the interest rate expense/revenue are calculated based on the prior year's balances.

In both of these cases circular links are avoided. However, removing circular links increases the risks of calculating inaccurate interest expense/revenue figures if there are wide fluctuations in debt and cash balances.

The more sophisticated approach to balance the balance sheet is applicable while preparing the financial model of a bank.

llustrative Valuation of ABC Company as of 31 December 2003
Cash flow statements

	Unit	2004	2005	2006	2007	2008	2009
EBIT	['000 PLN]	0	10 689	28 006	33 510	36 009	35 824
Corporate income tax	['000 PLN]	0	-2 893	-7 569	-9 056	-9 732	-9 684
Depreciation & amortisation	['000 PLN]	8 405	6 479	6 479	4 319	0	0
Gross cash flow	['000 PLN]	8 405	14 274	26 916	28 773	26 277	26 140
Change in working capital	['000 PLN]	-4 634	1 897	-1 703	-430	88	6
Operating cash	['000 PLN]	-593	-88	-279	-155	-62	-10
Trade receivables	['000 PLN]	-5 926	-884	-2 794	-1 550	-620	-95
Other receivables	['000 PLN]	0	0	0	0	0	0
Other receivables	['000 PLN]	1 884	2 869	1 371	1 275	770	111
Change in other assets and liabilities	['000 PLN]	332	127	317	61	-33	-3
Operating cash flow	['000 PLN]	4 102	16 298	25 531	28 404	26 331	26 143
Capital expenditures	['000 PLN]	0	0	0	0	0	0
Cash flow bwfore financing	['000 PLN]	4 102	16 298	25 531	28 404	26 331	26 143
Financing	['000 PLN]	0	27	26	32	36	41
Change in indebtedness	['000 PLN]	0	0	0	0	0	0
Net interest	['000 PLN]	0	27	26	32	36	41
Free cash flow to equityholders	['000 PLN]	4 102	16 325	25 557	28 436	26 367	26 184
Changes in subscribed share capital	['000 PLN]	0	0	0	0	0	0
Changes in excess cash	['000 PLN]	4 102	16 325	25 557	28 436	26 367	26 184

Figure 9. The exemplary screenshot of spreadsheet presenting cash flow statements
(source: self study)

Because the dividend discount model is recommended for bank valuation purposes both capital adequacy ratios and the dividend payout shall be additionally considered in balancing procedure.

Cash flow statement is critical for making each of the financial models. The cash flow statement records all cash inflows and outflows affecting balance sheet accounts, and determines the company's year-end cash and debt balances. Each line item on the cash flow statement should correspond to a year-to-year change in a line item on the balance sheet. The fact that every account which changes on the balance sheet is reflected on the cash flow statement is the necessary condition of the logical correctness of the financial model. Meeting this condition allows the balance sheet to balance.

The basis cash flow statement implemented in the financial model shall include three sections:

• Cash from operating activities

This is the fundamental cash flow of the business, derived from its net income corrected for non-cash income or expense items and for changes in working capital. It defines the cash available to make necessary investments and to satisfy the interest and dividend obligations of the business.

• Cash from investing activities

This reflects all of the capitalised investments of the business, in fixed assets or in intangibles. It also includes the proceeds from any sale of assets.

• Cash from financing activities

This reflects the business's decisions concerning external financing: repayment/issuing of debt. It also includes the effect of the financial revenues and financial expenses paid. The distinction and level of complexity of each of the sections shall be considered on project-by-project basis e.g. if the objective of the financial model is to assess the optimal future investment schedule than investing and financing sections of cash flow statements shall be cover in details.

The basic drivers to cash flow captions are presented in Table 4.

As presented above the majority of the cash flow captions shall derive direct from balance sheet captions. In modelling practise it is recommended to link cash flow captions direct to the balance sheet captions e.g. change in indebtedness shall be linked to changes in debt on 'Balance Sheet' spreadsheet, rather that on changes in debt balances calculated on 'Indebtedness' spreadsheet.

llustrative Valuation of ABC Company as of 31 March 2003 / Discounted Cash Flow Approach - Free Cash Flow to Equity

	Unit	2004	2005	2006	2007	2008	2009	2010	2011	2012
Estimation of Beta for rhe equity of the company										
Tax rate	[%]	8.7%	7.6%	7.6%	7.6%	7.6%	7.6%	7.6%	15.2%	15.2%
Unlevered beta	[number]	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
D/E ratio for the Company	[%]	159.0%	180.2%	171.9%	135.4%	97.3%	61.9%	30.8%	8.1%	0.0%
Beta levered		2.82	3.07	2.98	2.59	2.18	1.81	1.48	1.23	1.15
[Beta levered = Unlevered Beta x (1 + (1 - T) x (D/E))]										
Estimation of cost of equity for the Company										
Average risk free rate [Rf]	[%]	5.9%	6.1%	5.1%	4.7%	4.6%	4.6%	4.6%	4.6%	4.6%
Beta (levered)		2.82	3.07	2.98	2.59	2.18	1.81	1.48	1.23	1.15
Long-term risk premium [Rp]	[%]	5.90%	5.90%	5.90%	5.90%	5.90%	5.90%	5.90%	5.90%	5.90%
Cost of equity [Ce]	[%]	22.5%	24.2%	22.6%	20.0%	17.4%	15.2%	13.3%	11.8%	11.3%
[Ce = Rf + Beta x Rp +Sp]										
Free cash flow to equity valuation										
Change in excess cash	['000 PLN]	134	210	340	560	780	840	1 023	1 109	1 340
Shange in subscribed share capital	['000 PLN]	-47	0	0	0	0	0	0	0	0
Dividends	['000 PLN]	0	0	0	0	0	0	0	0	0
Free cash flow to equityholders [FCFtE]	['000 PLN]	87	210	340	560	780	840	1023	1109	1340
Cost of equity [Ce]	[%]	22.5%	24.2%	22.6%	20.0%	17.4%	15.2%	13.3%	11.8%	11.3%
Nominal semi-year rate of return	[%]	10.7%	11.4%	10.7%	9.5%	8.4%	7.3%	6.4%	5.7%	5.5%
Discount rate	[%]	10.7%	23.4%	23.4%	21.3%	18.7%	16.3%	14.2%	12.5%	11.6%
Discount factor	[number]	0.903	0.811	0.810	0.824	0.842	0.860	0.875	0.889	0.896
Cumulative discount factor	[number]	0.903	0.732	0.593	0.489	0.412	0.354	0.310	0.276	0.247
Present value of FCFtE in period 2004 - 2012 as of 31.12.2003	['000 PLN]	79	154	202	274	321	298	317	306	331
Assumed long-term growth rate after projeciton period	[%]									0.0%
Resudual value as of 31 December 2012	['000 PLN]									12 228
Cumulative discount rate for residual rate	['000 PLN]									0.247
Net present value of FCFtE in period 2004 - 2012 as of 31.12.2003	['000 PLN]	2 281								
Discounted residual rate	['000 PLN]	3 020								
Excess assets (cash) as of 31 December 2003	['000 PLN]									
Value of equity as of 31 December 2003	['000 PLN]	5 302								

Figure 10. The exemplary screenshot of spreadsheet presenting valuation results performed using FCFE approach
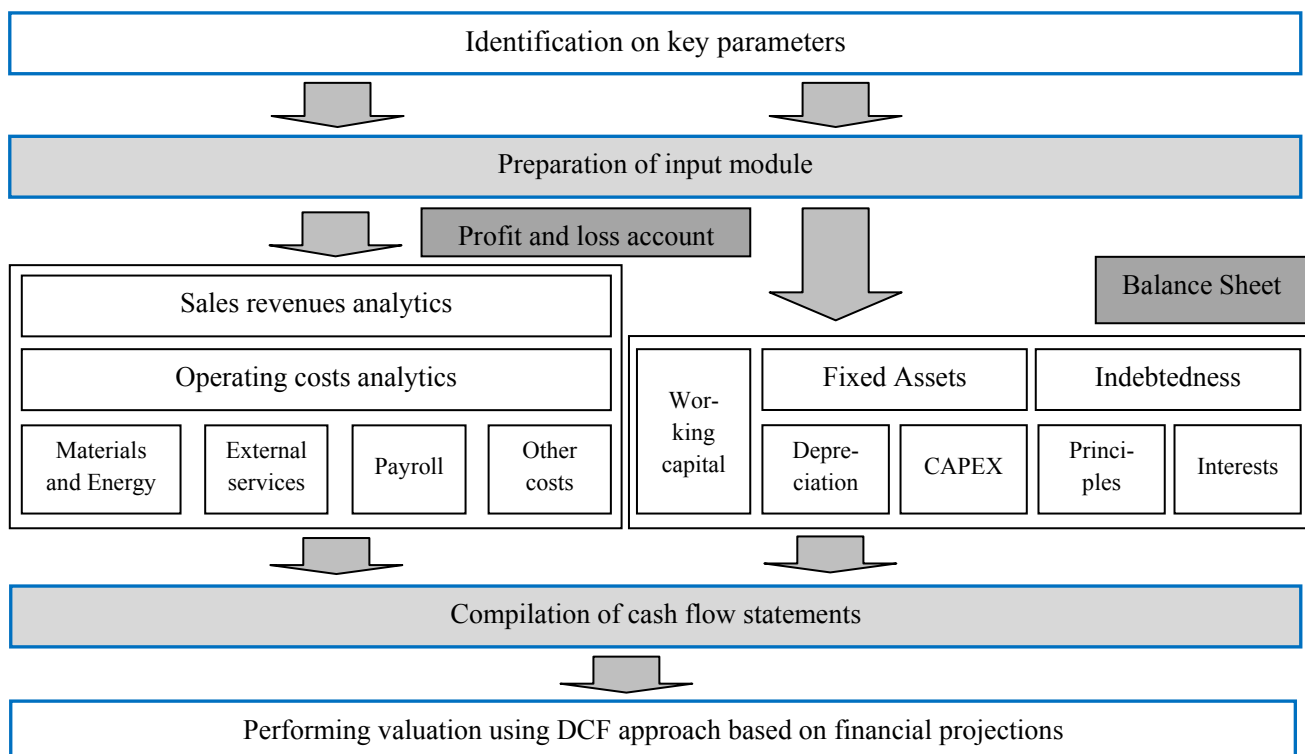*(source: self study)*

Figure 11. The major steps in building a financial model for the purpose of valuing the company
(source: self study)

This approach simplifies the control procedure, increases the transparency of the financial model and reduces the possibility of committing an error [8].

The only problem that might arise while preparing cash-flow statement is the appropriate sign of the differences between the closing and opening balances of particular assets and liabilities.

The general rules must always be applied:

- Increase in asset balances reflects cash outflow

The increase in asset balances might be perceived as a use of cash e.g. purchasing new inventory (increase in inventory balances) or allowing the clients to extend the payment period (increase in trade receivables balances). On the contrary decrease in asset balances is recorded as a source of cash e.g. selling the inventory for cash (decrease in inventory balances).

- Increase in liability balances reflects cash inflow

The increase in liability balances might be perceived as a source of cash e.g. extending the payment periods to suppliers (increase in trade payables balances). On the contrary decrease in liability balances is recorded as a use of cash e.g. repayment of debt (decrease in debt balances).The exemplary screenshot of spreadsheet presenting cash-flow statements is presented in Fig. 9.

5   Valuation spreadsheet

The valuation spreadsheet shall be prepared at the final stage of preparing the financial model. The major issues connected with valuation spreadsheet are presented below:

- estimation of the cost of equity/capital for the company,
- calculation of free cash flows to equity holders/firm,
- calculating the present value of free cash flow to equity holders/firm within the financial projections period and present value of residual value,
- addition and presentation of summary results [4, 2].

In practise, spreadsheets presenting valuation results are enclosed to the financial model at the final stage, depending on the valuation approach being used. Therefore it is possible that all three valuation results (FCFF, FCFE, DDM) are included in one financial model.

The exemplary screenshot of spreadsheet presenting valuation results performed using FCFE approach is presented in Fig. 10.

Important considerations that might be useful while preparing valuation result's spreadsheet is listed below:

- the effective tax rates and debt/equity ratios calculated on annual basis shall be applied while relevering betas,
- free cash to flow to equity shall always be adjusted for the dividends paid and increases in subscribed shareholders capital,
- the discount rate shall always be calculated on semi-annual basis. Moreover, the discount factor within the first interval of financial projections shall always be calculated assuming that the cash flow occur in the middle of the interval [11, 7, 5, 10 and 9].

6   Summary

The major steps that shall be taken while building a financial model for the purposes of valuing the company using discounted cash flows approach are presented in Fig. 11.

The Fig. 11 presented steps are just an exemplary approach. The sequence of the steps in preparing a financial model depends in greatest part on the project specific issues and availability of input data.

Generally constructing down to the operating income line is usually the first and most important step in the construction of the model.

Most of the items in the cash flow and balance sheet are derived from the income statement. The main exceptions are depreciation, an element of cost and cash flow that is generally calculated separately on a fixed asset schedule, and net interest, derived from balance sheet information.

In summary the process of constructing financial models is long and requires to respect procedures that helps to build it in the most efficient and reliable way.

Additionally the purpose of the financial projections clearly indicates the way how the model should be constructed.

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