

while the equation is correct, the value obtained in H20 is not yet the correct one, because cells H21 (+ I_0^l) and H22 (- I_0^d) have not yet been occupied by formulas; however, they will be filled with the amounts of interest income and expenses in the next step, and the value taken on by cell H20 will be automatically updated (see Figure 16).

INTEREST INCOME. The amounts of interest expenses (I_t^l) are not known, but the assumptions provide sufficient information for calculating it by applying the interest rate to the beginning-of-period balance of liquid assets:

$$I_t^l = C_{t-1}^l \cdot i^l$$

where i^l is the interest rate on liquid assets, equal to 3.80% (by assumption 21).

CODE INSTRUCTIONS: INTEREST INCOME

The interest rate i^l is recorded in the “Assumption” sheet. The analyst can show it in a cell above the Matrix in the “SplitScreenStrip” sheet (e.g., in cell D4) and then use it in the formulas (see Figure 15). Cell D4 is linked to the cell that contains the value of interest rate i^l with the formula

$$D4 = \text{Assumptions!}\$F\$25$$

The interest income I_t^l is calculated in cell H22:

$$\underbrace{H21}_{+I_1^l} = \underbrace{G21}_{+C_0^l} * \underbrace{\$D\$4}_{i^l}$$

(see Figure 17).

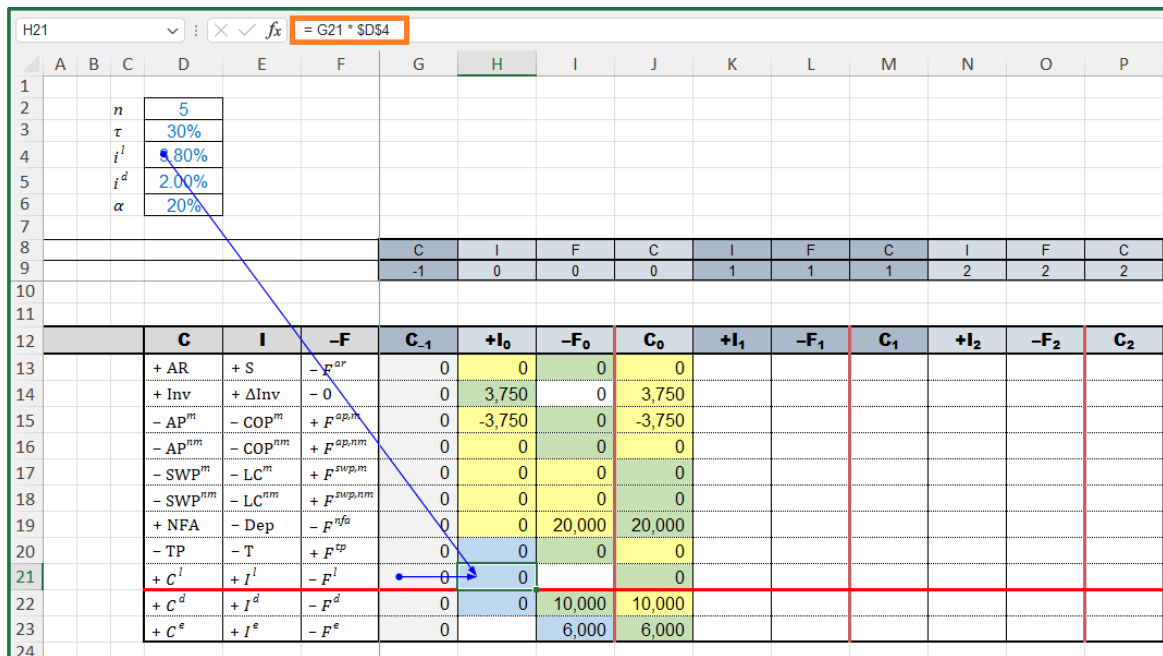


Figure 17. Cell H21 contains the specific formula for calculating the interest income (“SplitScreenStrip” sheet). (The cells whose values are provided in “PreCalc” are in yellow, the cells whose values are calculated with the law of motion are in green and the cells whose values are calculated via suitable formulas are in blue).

INTEREST EXPENSES. The amounts of interest expenses (I_t^d) are not known, but the assumptions provide sufficient information for calculating it by applying the interest rate to the beginning-of-period principal outstanding:

$$I_t^d = C_{t-1}^d \cdot i^d$$

where i^d is the interest rate of the loan, equal to 2% (by assumption 19).

CODE INSTRUCTIONS: INTEREST EXPENSES

The interest rate i^d is recorded in the “Assumption” sheet: the analyst can show it in a cell above the Matrix in the “SplitScreenStrip” sheet (e.g., in cell D5) and then use it in the formulas (see Figure 18). Cell D5 is linked to the cell that contains the value of interest rate i^d with the formula

$$D5 = \text{Assumptions!}\$F\$23.$$

The interest expenses I_t^d is calculated in cell H22:

$$H22 = G22 * \$D\$5$$

$\underbrace{+I_1^d}_{H22} = \underbrace{+C_0^d}_{G22} * \underbrace{i^d}_{\$D\$5}$

(see Figure 18).

Figure 18. Cell H22 contains the interest expenses (“SplitScreenStrip” sheet). (The cells whose values are provided in “PreCalc” are in yellow, the cells whose values are calculated with the law of motion are in green and the cells whose values are calculated via suitable formulas are in blue).

CASH FLOW TO EQUITY. For simplifying the spreadsheet calculation for the CFE (F_t^e), it is convenient to break down the CFE into three categories (equity financing, interim payout, and liquidation dividend) and, hence, build the stream of cash flows for each such category. Equity financing is equal to USD 6,000 for $t = 0$ (i.e., the cash flow initially contributed by shareholders is $F_0^e = -6,000$) and equal to 0 for $t > 0$ (the firm’s shareholders will not be required to make any other contribution) (assumption 17). The interim payout distributions are equal to $\alpha = 20\%$ of the project’s net income for $1 < t < 5$ (assumption 22). As shown in Part I, the liquidation dividend, F_5^e , may be obtained as the sum of the equity at time $t = 4$ and the net income at time $t = 5$ (Part I, Equation (62)), as displayed in Table 7.

Alternatively, one can calculate it as the sum of FCFE and the last non-operating cash flow (see Part I, Equation (61) and Section 4.1 below).

It is worth noting here that the interim payout is a decision variable which affects the project’s value and, as such, the project’s economic profitability. Such a variable is often neglected in traditional financial modeling, where the project’s value is not calculated by discounting the actual project CFEs but calculated by discounting the project FCFEs. However, this boils down to assuming that the payout ratio is 100% and that such a ratio is applied to FCFE. In real life, the payout ratio may be different (even 0%) and may be applied, commonly, to the net income, the FCFE, or other bases (see the Appendix A; see also Part I, Section 9).

Table 7. Breakdown of CFE (payout ratio = 20% of net income).

TIME		0	1	2	3	4	5
CASH FLOW TO EQUITY (F_t^c)	Shareholders’ investment	-6,000	0	0	0	0	0
	Interim payout (20% of net income)	0	$0.2 \cdot I_1^c$	$0.2 \cdot I_2^c$	$0.2 \cdot I_3^c$	$0.2 \cdot I_4^c$	0
	Liquidation dividend	0	0	0	0	0	$C_4^c + I_5^c$

CODE INSTRUCTIONS: CASH FLOW TO EQUITY

The analyst must fill cell I23 with a single formula that should consider that, depending on time t , either of the three categories of CFE applies. The project length and the payout ratio are recorded in the “Assumption” sheet: the analyst can show it in a cell above the Matrix in the “SplitScreenStrip” sheet (e.g., cell D2 and cell D6) and then use it in the formulas (see Figure 19). Cells D2 and D6 are linked to the cells that contain the values of project length and payout ratio with the respective formulas = Assumptions!\$F\$5 and = Assumptions!\$F\$26.

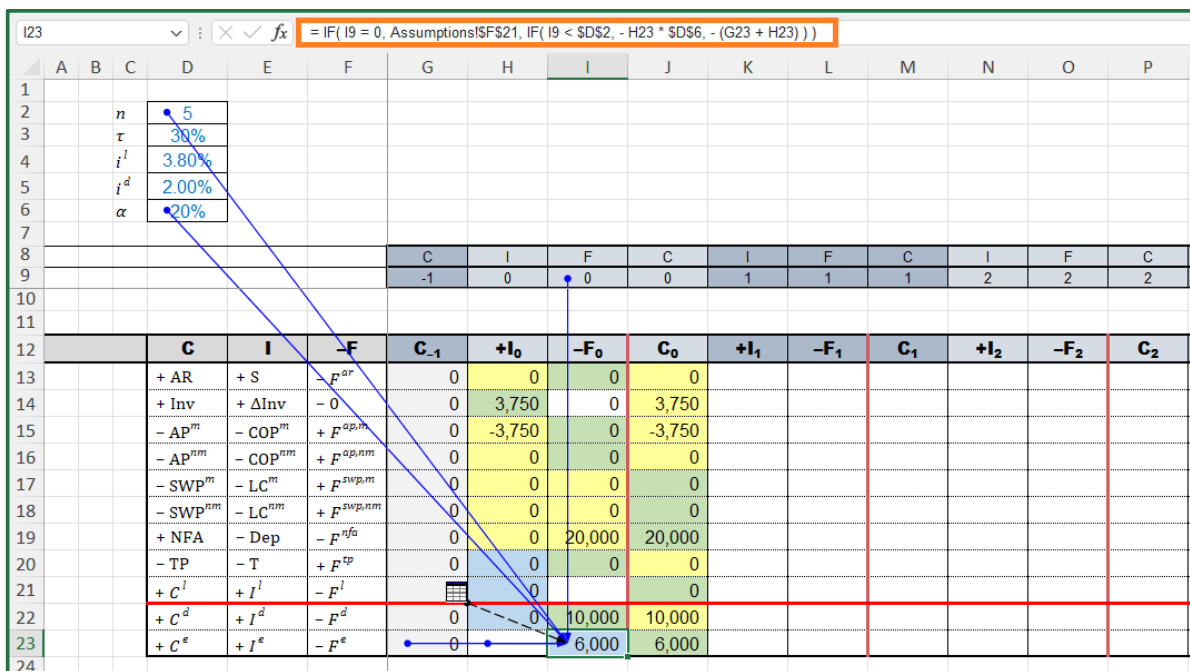


Figure 19. Cell I23 reports the cash flow to equity (“SplitScreenStrip” sheet). (The cells whose values are provided in “PreCalc” are in yellow, the cells whose values are calculated with the law of motion are in green, and the cells whose values are calculated via suitable formulas are in blue).

The spreadsheet code for I23 is:

$$\overbrace{I_{23}^{-F_0^e}} = \text{IF}(\overbrace{I_9}^{\text{period}} = 0, \underbrace{\text{Assumptions!H\$21}}_{\text{equity financing case } t=0}, \text{IF}(\overbrace{I_9}^{\text{period}} < \underbrace{\$D\$2}_{n}, \underbrace{-H23 * \$D\$6}_{\text{interim payout case } 0 < t < n}, \underbrace{-(G23 + H23)}_{\text{liquidation dividend case } t=n}))$$

The payout is calculated as a function of the net income. However, as shown in Part I, other schemes are possible. For example, the payout may be a fraction of the FCFE or a fraction of the minimum between net income and FCFE. In Appendix A of this paper, we show how to cope with these alternative schemes.

2.2.4. Cells Whose Values Are Calculated with the Law of Conservation (Step 1d)

The fourth class of cells in array H13:J23 consists of those cells which can be calculated by means of the law of conservation. These are the net income and the cash flow from non-operating (liquid) assets (see Table 8).

Table 8. Cells whose values are calculated with the law of conservation (pink orange cells).

Cell	Symbol	Magnitude	Law of Conservation	Type
H20	I_t^e	Net Income	$I_t^e = I_t^o + I_t^l - I_t^d$	Income
H21	$-F_t^l$	– Cash flow from liquid assets	$-F_t^l = F_t^o - F_t^d - F_t^e$	Cash flow

NET INCOME

Owing to the law of conservation, $I_t^o + I_t^l = I_t^d + I_t^e$ (see Part I, Equation (10)) or, breaking down the after-tax operating profit,

$$\overbrace{S_t + \Delta \text{Inv}_t - \text{COP}_t^m - \text{COP}_t^{nm} - \text{LC}_t^m - \text{LC}_t^{nm} - \text{Dep}_t - T_t}^{I_t^o} + I_t^l = +I_t^d + I_t^e$$

(see also Part I, Equation (15)), whence

$$I_t^e = +S_t + \Delta \text{Inv}_t - \text{COP}_t^m - \text{COP}_t^{nm} - \text{LC}_t^m - \text{LC}_t^{nm} - \text{Dep}_t - T_t + I_t^l - I_t^d$$

CODE INSTRUCTIONS: NET INCOME

Net Income I_t^e is calculated in cell H23:

$$\underbrace{H23}_{I_0^e} = \text{SUM}(\underbrace{H13 : H21}_{+S_0 + \Delta \text{Inv}_0 - \text{COP}_0^m - \text{COP}_0^{nm} - \text{LC}_0^m - \text{LC}_0^{nm} - \text{Dep}_0 - T_0 + I_0^l}, \underbrace{-H22}_{I_0^d})$$

(see Figure 20).

CASH FLOW FROM LIQUID ASSETS. Owing to the law of conservation (see Part I, Equation (11)), $F_t^o + F_t^l = F_t^d + F_t^e$ or, breaking down the operating cash flow,

$$\overbrace{-F_t^{ar} - 0 + F_t^{ap,m} + F_t^{ap,nm} + F_t^{swp,m} + F_t^{swp,nm} - F_t^{nfa} + F_t^{tp}}^{-F_t^o} - F_t^l = -F_t^d - F_t^e$$

(see also Part I, Equation (16)), whence

$$-F_t^l = (F_t^{ar} - F_t^{ap,m} - F_t^{ap,nm} - F_t^{swp,m} - F_t^{swp,nm} + F_t^{nfa} - F_t^{tp}) - F_t^d - F_t^e.$$

CODE INSTRUCTIONS: CASH FLOW FROM LIQUID ASSETS

Here is an example of how to calculate the cash flow from/to liquid assets F_t^l in cell I21:

$$I21 = -SUM(I13 : I20) + I22 + I23$$

$$-F_0^l = -F_0^{ar} + F_0^{ap,m} - F_0^{ap,nm} + F_0^{swp,m} + F_0^{swp,nm} - F_0^{nfa} + F_0^{tp}$$

(see Figure 21).

	C	I	F	C	I	F	C	I	F	C			
	-1	0	0	0	1	1	1	2	2	2			
	C	I	-F	C ₋₁	+I ₀	-F ₀	C ₀	+I ₁	-F ₁	C ₁	+I ₂	-F ₂	C ₂
+ AR	+ S	- F ^{ar}	0	0	0	0	0						
+ Inv	+ ΔInv	- 0	0	3,750	0	3,750							
- AP ^m	- COP ^m	+ F ^{ap,m}	0	-3,750	0	-3,750							
- AP ^{nm}	- COP ^{nm}	+ F ^{ap,nm}	0	0	0	0							
- SWP ^m	- LC ^m	+ F ^{swp,m}	0	0	0	0							
- SWP ^{nm}	- LC ^{nm}	+ F ^{swp,nm}	0	0	0	0							
+ NFA	- Dep	- F ^{nfa}	0	0	20,000	20,000							
- TP	- T	+ F ^{tp}	0	0	0	0							
+ C ⁱ	+ I ⁱ	- F ⁱ	0	0	-4,000	-4,000							
+ C ^d	+ I ^d	- F ^d	0	0	10,000	10,000							
+ C ^e	+ I ^e	- F ^e	0	0	6,000	6,000							

Figure 20. The cells whose values are calculated with the law of conservation are shown in pink orange. Cell H23 reports the net income (“SplitScreenStrip” sheet). (The cells whose values are provided in “PreCalc” are in yellow, the cells whose values are calculated with the law of motion are in green, the cells whose values are calculated via suitable formulas are in blue, and the cells whose values are calculated with the law of conservation are in pink orange).

	C	I	F	C	I	F	C	I	F	C			
	-1	0	0	0	1	1	1	2	2	2			
	C	I	-F	C ₋₁	+I ₀	-F ₀	C ₀	+I ₁	-F ₁	C ₁	+I ₂	-F ₂	C ₂
+ AR	+ S	- F ^{ar}	0	0	0	0	0						
+ Inv	+ ΔInv	- 0	0	3,750	0	3,750							
- AP ^m	- COP ^m	+ F ^{ap,m}	0	-3,750	0	-3,750							
- AP ^{nm}	- COP ^{nm}	+ F ^{ap,nm}	0	0	0	0							
- SWP ^m	- LC ^m	+ F ^{swp,m}	0	0	0	0							
- SWP ^{nm}	- LC ^{nm}	+ F ^{swp,nm}	0	0	0	0							
+ NFA	- Dep	- F ^{nfa}	0	0	20,000	20,000							
- TP	- T	+ F ^{tp}	0	0	0	0							
+ C ⁱ	+ I ⁱ	- F ⁱ	0	0	-4,000	-4,000							
+ C ^d	+ I ^d	- F ^d	0	0	10,000	10,000							
+ C ^e	+ I ^e	- F ^e	0	0	6,000	6,000							

Figure 21. Cell I21 contains the cash flow from/to liquid assets (“SplitScreenStrip” sheet). (The cells whose values are provided in “PreCalc” are in yellow, the cells whose values are calculated with the law of motion are in green, the cells whose values are calculated via suitable formulas are in blue, and the cells whose values are calculated with the law of conservation are in pink orange).

2.3. Filling the Cells for Periods 1 through n (Step 2)

The law of motion and the law of conservation hold for all $t = 0, 1, \dots, n$: the structure of all the SSMs is the same. Hence, once the cells for period 0 have been filled, it suffices to extend the same formulas for periods 1 through n to complete the project split-screen film.

CODE INSTRUCTIONS: FROM THE MATRIX TO THE STRIP

The analyst can copy the range H13:J23 and paste it in the ranges K13:Y23. Alternatively, one can copy the formulas into adjacent cells by using the fill handle. This technique works properly because the formulas do not contain embedded data or constants (the formulas must contain the links to the cells in the "Assumptions" or in "PreCalc" sheet, and they must be parameterized using the labels of row and of column). Operationally, the analyst can proceed as follows:

1. Select the range of cells H13:J23
2. Hover your cursor over the lower-right corner so that it turns into a plus sign (+) (the "fill handle")
3. Drag the fill handle right to cover all the cells up to column Y
4. Let it go and the formulas are automatically filled in the other columns of the split-screen strip

(see Figure 22).

Figure 22. Drag the fill handle to fill the strip ("SplitScreenStrip" sheet).

The result of this step is the whole strip of the project, populated with the correct figures (Figure 23).

Figure 23. Full-scale project strip with all the figures ("SplitScreenStrip" sheet).

3. Module 3: Building the Strips of Other Matrix Representations

Once constructed the full-scale strip, more compact representations of the strip can be drawn from it to act as summarized statements highlighting specific accounting and/or financial magnitudes that may be of interest to the analyst. It suffices to use the split-screen technique described in Part I, Section 4. Among the many framings that the SSM can take, we only focus on the SSM with costs classified by nature, SSM with costs classified by function, SSM showing the net operating liabilities, and SSM showing the net operating working capital (see also Part I for a detailed description). These framings are easily obtained via consolidation of rows (Rule 5 of the split-screen technique).

3.1. Expanded Matrices

If the analyst wants to build an expanded matrix and the related strip, it suffices to consolidate the relevant items of the full-scale matrix and related strip. Alternatively, the analyst may start from some other (higher-scale) matrix representation to obtain the same result.

THE EXPANDED MATRIX BY NATURE. Suppose the analyst wants to build the expanded matrix by nature and the associated strip (see Part I, Equation (33)). To do so, it suffices to consolidate, respectively, the rows pertaining to the firm’s suppliers and the rows pertaining to the firm’s employees (see Figure 24).

CODE INSTRUCTIONS: FROM FULL-SCALE MATRIX TO EXPANDED MATRIX (BY NATURE)

The analyst lays out a range of cells in the “SplitScreenStrip” sheet (rows 25:35) with the structure of the full-scale matrix (rows 11:23), but with fewer rows. More precisely, on one hand, the analyst merges the rows pertaining to the suppliers (rows 15:16) into one row (row 29); on the other hand, the analyst merges the rows pertaining to the employees (rows 17:18) into one row (row 30) by means of a simple sum of the relevant items.

Operationally, one first fills column G (cells G27:G35). To do so, one consolidates the manufacturing and nonmanufacturing AP:

$$\underbrace{G29}_{-AP_{-1}} = \underbrace{G15}_{-AP_{-1}^m} + \underbrace{G16}_{-AP_{-1}^{nm}}$$

and the manufacturing and nonmanufacturing SWP:

$$\underbrace{G30}_{-SWP_{-1}} = \underbrace{G17}_{-SWP_{-1}^m} + \underbrace{G18}_{-SWP_{-1}^{nm}}$$

The remaining cells of column G remain unvaried, so one just need to add the proper link. For example, as regards the AR,

$$\underbrace{G27}_{AR_{-1}} = \underbrace{G13}_{AR_{-1}}$$

Once column G has been filled, the analyst needs only copy and paste (or drag the fill handle) to fill the cells of all periods (see Figure 25).

THE EXPANDED MATRIX BY FUNCTION. Suppose the analyst wants to build the expanded matrix and the associated strip by function (see Part I, Equation (36)). To do so, it suffices to consolidate the rows pertaining to the manufacturing items and the rows pertaining to the nonmanufacturing items (see Figure 26).

Full-Scale Matrix				Expanded Matrix (by Nature)			
C_t	C_{t-1}	$+I_t$	$-F_t$	C_t	C_{t-1}	$+I_t$	$-F_t$
$+AR_t$	$+AR_{t-1}$	$+S_t$	$-F_t^{ar}$	$+AR_t$	$+AR_{t-1}$	$+S_t$	$-F_t^{ar}$
$+Inv_t$	$+Inv_{t-1}$	$+\Delta Inv_t$	-0	$+Inv_t$	$+Inv_{t-1}$	$+\Delta Inv_t$	-0
$-AP_t^m$	$-AP_{t-1}^m$	$-COP_t^m$	$+F_t^{ap,m}$	$-AP_t$	$-AP_{t-1}$	$-COP_t$	$+F_t^{ap}$
$-AP_t^{nm}$	$-AP_{t-1}^{nm}$	$-COP_t^{nm}$	$+F_t^{ap,nm}$	$-SWP_t$	$-SWP_{t-1}$	$-LC_t$	$+F_t^{swp}$
$-SWP_t^m$	$-SWP_{t-1}^m$	$-LC_t^m$	$+F_t^{swp,m}$	$+NFA_t$	$+NFA_{t-1}$	$-Dep_t$	$-F_t^{nfa}$
$-SWP_t^{nm}$	$-SWP_{t-1}^{nm}$	$-LC_t^{nm}$	$+F_t^{swp,nm}$	$-TP_t$	$-TP_{t-1}$	$-T_t$	$+F_t^{tp}$
$+NFA_t$	$+NFA_{t-1}$	$-Dep_t$	$-F_t^{nfa}$	$+C_t^l$	$+C_{t-1}^l$	$+I_t^l$	$-F_t^l$
$-TP_t$	$-TP_{t-1}$	$-T_t$	$+F_t^{tp}$	$+C_t^d$	$+C_{t-1}^d$	$+I_t^d$	$-F_t^d$
$+C_t^l$	$+C_{t-1}^l$	$+I_t^l$	$-F_t^l$	$+C_t^e$	$+C_{t-1}^e$	$+I_t^e$	$-F_t^e$
$+C_t^d$	$+C_{t-1}^d$	$+I_t^d$	$-F_t^d$				
$+C_t^e$	$+C_{t-1}^e$	$+I_t^e$	$-F_t^e$				

Figure 24. From full-scale matrix to expanded matrix by nature (see Part I, Equation (33)). The rows with the same color in the Full-Scale Matrix are consolidated into one row of the same color in the Expanded Matrix.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P			
1																		
2		n	5															
3		τ	30%															
4		i^l	3.80%															
5		i^d	2.00%															
6		α	20%															
7																		
8																		
9						C	I	F	C	I	F	C	I	F	C			
10						-1	0	0	0	1	1	1	2	2	2			
11																		
12						Project: Full-scale Matrix												
13						C	I	-F	C₋₁	+I₀	-F₀	C₀	+I₁	-F₁	C₁	+I₂	-F₂	C₂
14						+AR	+S	-F ^{ar}	0	0	0	0	60,000	-45,205	14,795	66,000	-64,521	16,274
15						+Inv	+ΔInv	-0	0	3,750	0	3,750	375	0	4,125	413	0	4,538
16						-AP ^m	-COP ^m	+F ^{ap,m}	0	-3,750	0	-3,750	-15,375	3,750	-15,375	-16,913	15,375	-16,913
17						-AP ^{nm}	-COP ^{nm}	+F ^{ap,nm}	0	0	0	0	-9,000	0	-9,000	-9,900	9,000	-9,900
18						-SWP ^m	-LC ^m	+F ^{swp,m}	0	0	0	0	-24,000	24,000	0	-26,400	26,400	0
19						-SWP ^{nm}	-LC ^{nm}	+F ^{swp,nm}	0	0	0	0	-6,000	6,000	0	-6,000	6,000	0
20						+NFA	-Dep	-F ^{nfa}	0	0	20,000	20,000	-4,000	0	16,000	-4,000	0	12,000
21						-TP	-T	+F ^{tp}	0	0	0	0	-494	494	0	-959	959	0
22						+C ^l	+I ^l	-F ^l	0	0	-4,000	-4,000	-152	8,030	3,878	147	3,689	7,714
23						+C ^d	+I ^d	-F ^d	0	0	10,000	10,000	200	-2,700	7,500	150	-2,650	5,000
24						+C ^e	+I ^e	-F ^e	0	0	6,000	6,000	1,154	-231	6,923	2,238	-448	8,713
25						Expanded Matrix (by nature)												
26						C	I	-F	C₋₁	+I₀	-F₀	C₀	+I₁	-F₁	C₁	+I₂	-F₂	C₂
27						+AR	+S	-F ^{ar}	0	0	0	0	60,000	-45,205	14,795	66,000	-64,521	16,274
28						+Inv	+ΔInv	-0	0	3,750	0	3,750	375	0	4,125	413	0	4,538
29						-AP	-COP	+F ^{ap}	0	-3,750	0	-3,750	-24,375	3,750	-24,375	-26,813	24,375	-26,813
30						-SWP	-LC	+F ^{swp}	0	0	0	0	-30,000	30,000	0	-32,400	32,400	0
31						+NFA	-Dep	-F ^{nfa}	0	0	20,000	20,000	-4,000	0	16,000	-4,000	0	12,000
32						-TP	-T	+F ^{tp}	0	0	0	0	-494	494	0	-959	959	0
33						+C ^l	+I ^l	-F ^l	0	0	-4,000	-4,000	-152	8,030	3,878	147	3,689	7,714
34						+C ^d	+I ^d	-F ^d	0	0	10,000	10,000	200	-2,700	7,500	150	-2,650	5,000
35						+C ^e	+I ^e	-F ^e	0	0	6,000	6,000	1,154	-231	6,923	2,238	-448	8,713
36																		

Figure 25. The strip of expanded matrices (by nature) (“SplitScreenStrip” sheet). The rows with the same color in the Full-scale Matrix are consolidated into one row of the same color in the Expanded Matrix.

Full-Scale Matrix				Expanded Matrix (by Function)			
C_t	C_{t-1}	$+I_t$	$-F_t$	C_t	C_{t-1}	$+I_t$	$-F_t$
$+AR_t$	$+AR_{t-1}$	$+S_t$	$-F_t^{ar}$	$+AR_t$	$+AR_{t-1}$	$+S_t$	$-F_t^{ar}$
$+Inv_t$	$+Inv_{t-1}$	$+\Delta Inv_t$	-0	$-NOL_t^m$	$-NOL_{t-1}^m$	$-COGS_t$	$+F_t^{cogs}$
$-AP_t^m$	$-AP_{t-1}^m$	$-COP_t^m$	$+F_t^{ap,m}$	$-NOL_t^{nm}$	$-NOL_{t-1}^{nm}$	$-SGA_t$	$+F_t^{swp}$
$-AP_t^{nm}$	$-AP_{t-1}^{nm}$	$-COP_t^{nm}$	$+F_t^{ap,nm}$	$+NFA_t$	$+NFA_{t-1}$	$-Dep_t$	$-F_t^{nfa}$
$-SWP_t^m$	$-SWP_{t-1}^m$	$-LC_t^m$	$+F_t^{swp,m}$	$-TP_t$	$-TP_{t-1}$	$-T_t$	$+F_t^{tp}$
$-SWP_t^{nm}$	$-SWP_{t-1}^{nm}$	$-LC_t^{nm}$	$+F_t^{swp,nm}$	$+C_t^l$	$+C_{t-1}^l$	$+I_t^l$	$-F_t^l$
$+NFA_t$	$+NFA_{t-1}$	$-Dep_t$	$-F_t^{nfa}$	$+C_t^d$	$+C_{t-1}^d$	$+I_t^d$	$-F_t^d$
$-TP_t$	$-TP_{t-1}$	$-T_t$	$+F_t^{tp}$	$+C_t^e$	$+C_{t-1}^e$	$+I_t^e$	$-F_t^e$
$+C_t^l$	$+C_{t-1}^l$	$+I_t^l$	$-F_t^l$				
$+C_t^d$	$+C_{t-1}^d$	$+I_t^d$	$-F_t^d$				
$+C_t^e$	$+C_{t-1}^e$	$+I_t^e$	$-F_t^e$				

Figure 26. From full-scale Matrix to expanded Matrix by function (see Part I, Equation (36)). The rows with the same color in the Full-scale Matrix are consolidated into one row of the same color in the Expanded Matrix.

CODE INSTRUCTIONS: FROM FULL-SCALE MATRIX TO EXPANDED MATRIX (BY FUNCTION)

The analyst prepares a range of cells in the “SplitScreenStrip” sheet (rows 37:46) with the structure of the full-scale Matrix (rows 11:23), but with fewer rows. More precisely, on one hand, the analyst merges the inventory and the manufacturing costs (rows 14, 15, and 17) into one row (row 40); on the other hand, the analyst merges the nonmanufacturing costs (rows 16 and 18) into one row (row 41). Consolidation is obtained by means of a simple sum of the relevant items. Operationally, one first fills column G (cells G39:G46). To do so, one consolidates the manufacturing book values,

$$\underbrace{G40}_{-NOL_{-1}^m} = \underbrace{G14}_{Inv_{-1}} + \underbrace{G15}_{-AP_{-1}^m} + \underbrace{G17}_{-SWP_{-1}^m}$$

and the nonmanufacturing book values,

$$\underbrace{G41}_{-NOL_{-1}^{nm}} = \underbrace{G16}_{-AP_{-1}^{nm}} + \underbrace{G18}_{-SWP_{-1}^{nm}}$$

The remaining cells of column G remain unvaried, so one just needs to add the proper link. For example, as regards the AR,

$$\underbrace{G39}_{AR_{-1}} = \underbrace{G13}_{AR_{-1}}$$

Once column G is filled, the analyst needs only copy and paste (or drag the fill handle) to fill the cells of all periods (see Figure 27).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1																
2		n	5													
3		τ	30%													
4		i ^l	3.80%													
5		i ^d	2.00%													
6		α	20%													
7																
8							C	I	F	C	I	F	C	I	F	C
9							-1	0	0	0	1	1	1	2	2	2
10																
11	Project: Full-scale Matrix															
12			C	I	-F	C ₋₁	+I ₀	-F ₀	C ₀	+I ₁	-F ₁	C ₁	+I ₂	-F ₂	C ₂	
13			+ AR	+ S	- F ^{ar}	0	0	0	0	60,000	-45,205	14,795	66,000	-64,521	16,274	
14			+ Inv	+ ΔInv	- 0	0	3,750	0	3,750	375	0	4,125	413	0	4,538	
15			- AP ^m	- COP ^m	+ F ^{ap,m}	0	-3,750	0	-3,750	-15,375	3,750	-15,375	-16,913	15,375	-16,913	
16			- AP ^{nm}	- COP ^{nm}	+ F ^{ap, nm}	0	0	0	0	-9,000	0	-9,000	-9,900	9,000	-9,900	
17			- SWP ^m	- LC ^m	+ F ^{swp,m}	0	0	0	0	-24,000	24,000	0	-26,400	26,400	0	
18			- SWP ^{nm}	- LC ^{nm}	+ F ^{swp, nm}	0	0	0	0	-6,000	6,000	0	-6,000	6,000	0	
19			+ NFA	- Dep	- F ^{nfa}	0	0	20,000	20,000	-4,000	0	16,000	-4,000	0	12,000	
20			- TP	- T	+ F ^{tp}	0	0	0	0	-494	494	0	-959	959	0	
21			+ C ^l	+ I ^l	- F ^l	0	0	-4,000	-4,000	-152	8,030	3,878	147	3,689	7,714	
22			+ C ^d	+ I ^d	- F ^d	0	0	10,000	10,000	200	-2,700	7,500	150	-2,650	5,000	
23			+ C ^e	+ I ^e	- F ^e	0	0	6,000	6,000	1,154	-231	6,923	2,238	-448	8,713	
24																
37	Expanded Matrix (by function)															
38			C	I	-F	C ₋₁	+I ₀	-F ₀	C ₀	+I ₁	-F ₁	C ₁	+I ₂	-F ₂	C ₂	
39			+ AR	+ S	- F ^{ar}	0	0	0	0	60,000	-45,205	14,795	66,000	-64,521	16,274	
40			- NOL ^m	- COGS	+ F ^{cogs}	0	0	0	0	-39,000	27,750	-11,250	-42,900	41,775	-12,375	
41			- NOL ^{nm}	- SGA	+ F ^{sga}	0	0	0	0	-15,000	6,000	-9,000	-15,900	15,000	-9,900	
42			+ NFA	- Dep	- F ^{nfa}	0	0	20,000	20,000	-4,000	0	16,000	-4,000	0	12,000	
43			- TP	- T	+ F ^{tp}	0	0	0	0	-494	494	0	-959	959	0	
44			+ C ^l	+ I ^l	- F ^l	0	0	-4,000	-4,000	-152	8,030	3,878	147	3,689	7,714	
45			+ C ^d	+ I ^d	- F ^d	0	0	10,000	10,000	200	-2,700	7,500	150	-2,650	5,000	
46			+ C ^e	+ I ^e	- F ^e	0	0	6,000	6,000	1,154	-231	6,923	2,238	-448	8,713	
47																

Figure 27. The strip of expanded matrices (by function) (“SplitScreenStrip” sheet). The rows with the same color in the Full-scale Matrix are consolidated into one row of the same color in the Expanded Matrix.

3.2. NOL-Framed and NOWC-Framed Matrices

THE NOL-FRAMED MATRIX. If one wants to build a NOL-framed matrix and associated strip, one may simply aggregate the items of the manufacturing and nonmanufacturing NOL obtained in the expanded matrix (Figure 27, rows 40 and 41; also see Part I, Equation (39)). Alternatively, starting from the full-scale matrix, one consolidates the rows pertaining to the net operating liabilities.

CODE INSTRUCTIONS: FROM EXPANDED MATRIX (BY FUNCTION) TO NOL-FRAMED MATRIX

The analyst lays out a range of cells in the “SplitScreenStrip” sheet (rows 48:56) with the structure of the expanded matrix (by function) (rows 37:46), but with fewer rows. Specifically, the analyst merges the rows pertaining to the net operating liabilities (rows 40:41) into one single row (row 51). Consolidation is obtained by means of a simple sum of the relevant items. Operationally, one proceeds as made for the previous matrix representations by first filling column G (cells G50:G56). To do so, one consolidates the rows of the expanded matrix (by function) that form the group of net operating liabilities:

$$\underbrace{G51}_{-NOL_{-1}} = \text{SUM}(\underbrace{G41 : G42}_{-NOL_{-1}^m - NOL_{-1}^{nm}})$$

The remaining cells of column G remain unvaried, so one just needs to add the proper links. For example, as regards the AR,

$$\underbrace{G50}_{AR_{-1}} = \underbrace{G39}_{AR_{-1}}$$

Once column G has been filled, the analyst needs only copy and paste (or drag the fill handle) to fill the cells of all periods (see Figure 28).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1																
2			n	5												
3			τ	30%												
4			i ^l	3.80%												
5			i ^d	2.00%												
6			α	20%												
7																
8																
9							C	I	F	C	I	F	C	I	F	C
37							-1	0	0	0	1	1	1	2	2	2
38																
39																
40																
41																
42																
43																
44																
45																
46																
47																
48																
49																
50																
51																
52																
53																
54																
55																
56																
57																

Figure 28. The strip of NOL-framed matrices (“SplitScreenStrip” sheet). The rows with the same color in the Expanded Matrix are consolidated into one row of the same color in the NOL-framed Matrix.

THE NOWC-FRAMED MATRIX. If one wants to build a NOWC-framed matrix and the corresponding strip, one may simply aggregate the relevant rows starting from the NOL-framed matrix. This result in a five-area matrix (see Part I, Equation (50)).

CODE INSTRUCTIONS: FROM NOL-FRAMED MATRIX TO NOWC-FRAMED MATRIX

The analyst lays out a range of cells structure of the NOL-framed matrix (rows 48:56), but with fewer rows. Specifically, the analyst merges the rows pertaining to net operating working capital (rows 50:51 and 53) into one single row (row 60). Consolidation is obtained by means of a simple sum of the relevant items. Operationally, one proceeds as made for the previous matrix representations by first filling column G (cells G60:G64). To do so, one consolidates the rows in the full-scale matrix which form the group net operating working capital:

$$\underbrace{G60}_{+NOWC_{-1}} = \text{SUM}(\underbrace{G50 : G51, G53}_{AR_{-1}-NOL_{-1}-TP_{-1}})$$

The remaining cells of column G remain unvaried, so one just needs to add the proper links. For example, as regards NFA,

$$\underbrace{G61}_{NFA_{-1}} = \underbrace{G52}_{NFA_{-1}}$$

Once column G is filled, the analyst needs only copy and paste (or drag the fill handle) to fill the cells of all periods (see Figure 29).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1															
2			n	5											
3			τ	30%											
4			i ^l	3.80%											
5			i ^d	2.00%											
6			α	20%											
7															
8							C	I	F	C	I	F	C	I	F
9							-1	0	0	0	1	1	1	2	2
48	NOL-framed Matrix														
49			C	I	-F	C₋₁	+I₀	-F₀	C₀	+I₁	-F₁	C₁	+I₂	-F₂	
50			+ AR	+ S	- F ^{ar}	0	0	0	0	60,000	-45,205	14,795	66,000	-64,521	
51			- NOL	+ OpC	+ F ^{nol}	0	0	0	0	-54,000	33,750	-20,250	-58,800	56,775	
52			+ NFA	- Dep	- F ^{nfa}	0	0	20,000	20,000	-4,000	0	16,000	-4,000	0	
53			- TP	- T	+ F ^{tp}	0	0	0	0	-494	494	0	-959	959	
54			+ C ^l	+ I ^l	- F ^l	0	0	4,000	-4,000	-152	8,030	3,878	147	3,689	
55			+ C ^d	+ I ^d	- F ^d	0	0	10,000	10,000	200	-2,700	7,500	150	-2,650	
56			+ C ^e	+ I ^e	- F ^e	0	0	6,000	6,000	1,154	-231	6,923	2,238	-448	
57															
58	NOWC-framed Matrix														
59			C	I	-F	C₋₁	+I₀	-F₀	C₀	+I₁	-F₁	C₁	+I₂	-F₂	
60			+ NOWC	+ EBITDA-T	- F ^{nowc}	0	0	0	0	5,506	-10,961	-5,455	6,241	-6,786	
61			+ NFA	- Dep	- F ^{nfa}	0	0	20,000	20,000	-4,000	0	16,000	-4,000	0	
62			+ C ^l	+ I ^l	- F ^l	0	0	4,000	-4,000	-152	8,030	3,878	147	3,689	
63			+ C ^d	+ I ^d	- F ^d	0	0	10,000	10,000	200	-2,700	7,500	150	-2,650	
64			+ C ^e	+ I ^e	- F ^e	0	0	6,000	6,000	1,154	-231	6,923	2,238	-448	
65															

Figure 29. The strip of NOWC-framed matrices (“SplitScreenStrip” sheet). The rows with the same color in the NOL-framed Matrix are consolidated into one row of the same color in the NOWC-framed Matrix.

3.3. Four-Area and Germ Matrices

It is possible to further shrink the strip and have more compact forms. For example, to favor a synthetic analysis of the project, the analyst may be willing to build a four-area matrix and corresponding strip, where one only the elements related to operating assets, non-operating assets, debt, and equity are reported (Part I, right matrix in Equation (12)). Furthermore, merging the two classes of assets and the two classes of financings, one may even build the germ strip, where all the accounting and financial items of the project are aggregated (Part I, right matrix in Equation (8)).

THE FOUR-AREA MATRIX. To build the four-area matrix and corresponding strip, it suffices to sum the relevant items from some higher-scale matrix (NOWC-framed strip, NOL-framed matrix, expanded matrix, full-scale matrix).

CODE INSTRUCTIONS: FROM NOWC-FRAMED MATRIX TO FOUR-AREA MATRIX
 The analyst lays out in the “SplitScreenStrip” sheet a range of cells (rows 66:71) with the structure of the NOWC-framed matrix (rows 58:64), but with only four rows, one for each area: operations, liquidity, debt, and equity. The analyst proceeds as in the previous matrices by filling the cells of column G and then copy and paste for the whole strip. The operating capital is obtained as

$$G68 = \text{SUM}(\underbrace{G60 : G61}_{\text{NOWC}_{-1} + \text{NFA}_{-1}})$$

For the three remaining cells of column G, it suffices to provide the proper links (see Figure 30).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1																
2																
3			n	5												
4			τ	30%												
5			i ^l	3.80%												
6			i ^d	2.00%												
7			α	20%												
8																
9							C	I	F	C	I	F	C	I	F	
10							-1	0	0	0	1	1	1	2	2	
58	NOWC-framed Matrix															
59			C	I	-F		C₋₁	+I₀	-F₀	C₀	+I₁	-F₁	C₁	+I₂	-F₂	
60			+ NOWC	+ EBITDA-T	- F ^{nowc}		0	0	0	0	5,506	-10,961	-5,455	6,241	-6,786	
61			+ NFA	- Dep	- F ^{nfa}		0	0	20,000	20,000	-4,000	0	16,000	-4,000	0	
62			+ C ⁱ	+ I ⁱ	- F ⁱ		0	0	-4,000	-4,000	-152	8,030	3,878	147	3,689	
63			+ C ^d	+ I ^d	- F ^d		0	0	10,000	10,000	200	-2,700	7,500	150	-2,650	
64			+ C ^e	+ I ^e	- F ^e		0	0	6,000	6,000	1,154	-231	6,923	2,238	-448	
65																
66	Four-area Matrix															
67			C	I	-F		C₋₁	+I₀	-F₀	C₀	+I₁	-F₁	C₁	+I₂	-F₂	
68			+ C ^o	+ I ^o	- F ^o		0	0	20,000	20,000	1,506	-10,961	10,545	2,241	-6,786	
69			+ C ⁱ	+ I ⁱ	- F ⁱ		0	0	-4,000	-4,000	-152	8,030	3,878	147	3,689	
70			+ C ^d	+ I ^d	- F ^d		0	0	10,000	10,000	200	-2,700	7,500	150	-2,650	
71			+ C ^e	+ I ^e	- F ^e		0	0	6,000	6,000	1,154	-231	6,923	2,238	-448	
72																

Figure 30. Four-area matrix (“SplitScreenStrip” sheet). The rows with the same color in the NOWC-framed Matrix are consolidated into one row of the same color in the Four-area Matrix.

THE GERM MATRIX. The germ matrix is easily built, as usual, by consolidating the rows from some higher-scale matrix.

CODE INSTRUCTIONS: FROM FOUR-AREA MATRIX TO GERM MATRIX

The analyst sets up a range of cells (rows 73:76) in the “SplitScreenStrip” sheet with the same structure of the four-area matrix (rows 66:71), but with only two rows, one for each area: investment and financing. The analyst proceeds as in the previous matrices and fill the cells of column G by aggregation. Specifically, the two cells of column G of the germ matrix are calculated as follows:

$$G75 = \text{SUM}(\underbrace{G68 : G69}_{C_{-1}^{inv}}) \quad G76 = \text{SUM}(\underbrace{G70 : G71}_{C_{-1}^{fin}})$$

Then, one copies and paste to fill the whole strip (see Figure 31).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1																
2			n	5												
3			τ	30%												
4			i ^l	3.80%												
5			i ^d	2.00%												
6			α	20%												
7																
8							C	I	F	C	I	F	C	I	F	C
9							-1	0	0	0	1	1	1	2	2	2
65																
66			Four-area Matrix													
67			C	I	-F	C₋₁	+I₀	-F₀	C₀	+I₁	-F₁	C₁	+I₂	-F₂	C₂	
68			+C ^o	+I ^o	-F ^o	0	0	20,000	20,000	1,506	-10,961	10,545	2,241	-6,786	5,999	
69			+C ^l	+I ^l	-F ^l	0	0	-4,000	-4,000	-152	8,030	3,878	147	3,689	7,714	
70			+C ^d	+I ^d	-F ^d	0	0	10,000	10,000	200	-2,700	7,500	150	-2,650	5,000	
71			+C ^e	+I ^e	-F ^e	0	0	6,000	6,000	1,154	-231	6,923	2,238	-448	8,713	
72																
73			Germ Matrix													
74			C	I	-F	C₋₁	+I₀	-F₀	C₀	+I₁	-F₁	C₁	+I₂	-F₂	C₂	
75			+C ^{inv}	+I ^{inv}	-F ^{inv}	0	0	16,000	16,000	1,354	-2,931	14,423	2,388	-3,098	13,713	
76			+C ^{fin}	+I ^{fin}	-F ^{fin}	0	0	16,000	16,000	1,354	-2,931	14,423	2,388	-3,098	13,713	
77																

Figure 31. Germ matrix (“SplitScreenStrip” sheet). The rows with the same color in the Four-area Matrix are consolidated into one row of the same color in the Germ Matrix.

4. Module 4: Building the Benchmark Split-Screen Strip

Project appraisal requires the comparison of the project with a benchmark which collects the values, the profits, and the cash flows of the benchmark portfolio. This module is precisely devoted to building the benchmark film (or strip) from the market input data (see Part I, Equation (88)). The mathematical relations are equivalent to the ones used for the project four-area matrix and strip, but, in this case, we need to flesh out the benchmark values from the prospective cash flows (which are just equal to the project’s cash flows), so we use backward induction (see Part I).

4.1. Benchmark Four-Area Matrix

To design the benchmark Matrix, the analyst requires the MARRs as well as the cash flows. Specifically, the economic value of each area may be calculated with the backward formula

$$V_{t-1}^j = \frac{V_t^j + F_t^{Vj}}{1 + r_t^j}, \quad j = o, l, d, \quad t = 1, \dots, n$$

with $V_n^o = V_n^l = V_n^d = 0$ and where $F_0^{Vj} = -V_0^j$ and $F_t^{Vj} = F_t^j$ for $t \geq 1$ (see Part I, Equation (77)). The economic value of the equity can be calculated via the law of conservation: $V_t^e = V_t^o + V_t^l - V_t^d$. The cash flows in the benchmark Matrix are the same as in the project matrix, except for period 0. The column of benchmark profits is calculated as

$$I_t^{Vj} = r_t^j \cdot V_{t-1}^j, \quad j = o, l, d$$

for the of operating assets, the non-operating assets, and the debt (see Part I, Equation (80)). The benchmark profit for the equity can be calculated with the law of conservation as a residual amount: $I_t^{Ve} = I_t^{Vo} + I_t^{Vl} - I_t^{Vd}$. The operating cash flows can be obtained as sum of the cash-flow components of the operating area in some higher-scale matrix and the other cash flows are merely linked from some other higher-scale matrix.

CODE INSTRUCTIONS: BENCHMARK MATRIX SCHEME

The analyst prepares a table in a range of cells (rows 81:86) in the “SplitScreenStrip” sheet having the structure of the project four-area matrix (rows 66:71). The rates r^o , r^l , and r^d are

recorded in the “Assumption” sheet. The analyst can position them in a space above the full-scale matrix (cells F3:F5) in the “SplitScreenStrip” sheet and use them in the relevant formulas. Cells F3:F5 are linked to the cells that contain the value of r^o , r^l , and r^d with the formulas = Assumptions!\$F\$27, = Assumptions!\$F\$28, and = Assumptions!\$F\$29.

CODE INSTRUCTIONS: ECONOMIC VALUES IN THE BENCHMARK MATRIX

For the operating class, the analyst starts by inserting the value 0 for V_5^o , V_5^l , V_5^d , and V_5^e ; then, the analyst calculates the economic value of AR as of period $t = n - 1 = 4$ with the backward formula:

$$V_4^o = (Y_{83} - X_{83} - F_5^{V_o}) / (1 + r^o)$$

(see Figure 32). For the liquid assets and the debt, the analogous backward formula applies:

$$V_4^l = (Y_{84} - X_{84} - F_5^{V_l}) / (1 + r^l)$$

$$V_4^d = (Y_{85} - X_{85} - F_5^{V_d}) / (1 + r^d)$$

The equity value is calculated with the law of conservation:

$$V_4^e = V_4^o + V_4^l - V_4^d$$

while the equations are correct, the values obtained in the cell range V83:V86 are not yet the correct ones, because cells X83:X86 have not yet been occupied by formulas; however, they will be filled with the amounts of cash flows in the next steps, and the values taken on by cells V83:V86 will be automatically updated.

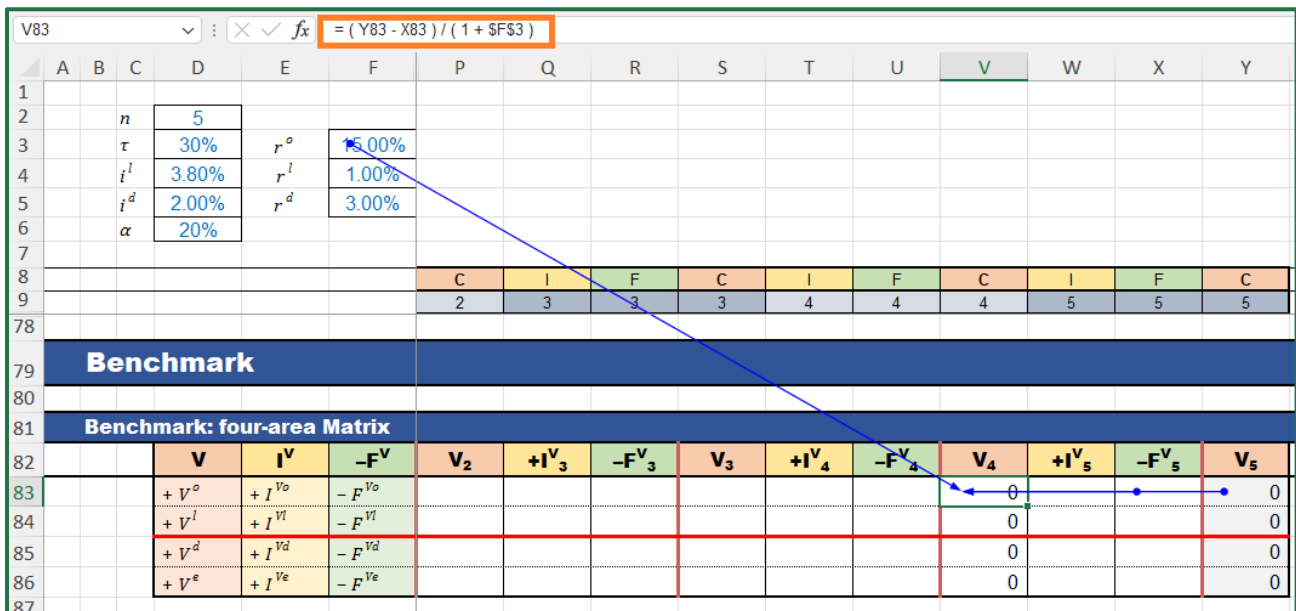


Figure 32. Cell V83 contains the formula for calculating the economic value V_4^o as a function of next-period value V_5^o and cash flow F_5^o (“SplitScreenStrip” sheet).

CODE INSTRUCTIONS: INCOMES IN THE BENCHMARK MATRIX.

The analyst may start from the operating area and, in particular, from cell W83:

$$\underbrace{W83}_{I_4^{Vo}} = \underbrace{V83}_{V_4^o} * \underbrace{\$F\$3}_{r^o}$$

(see Figure 33).

W83	= V83 * \$F\$3																		
A	B	C	D	E	F	P	Q	R	S	T	U	V	W	X	Y				
1																			
2		n	5																
3		τ	30%	r ^o	5.00%														
4		i ⁱ	3.80%	r ⁱ	1.00%														
5		i ^d	2.00%	r ^d	3.00%														
6		α	20%																
7																			
8																			
9							C	I	F	C	I	F	C	I	F	C			
							2	3	3	3	4	4	4	5	5	5			
78																			
79							Benchmark												
80																			
81							Benchmark: four-area Matrix												
82							V	IV	-FV	V ₂	+IV ₃	-FV ₃	V ₃	+IV ₄	-FV ₄	V ₄	+IV ₅	-FV ₅	V ₅
83							+V ^o	+I ^{Vo}	-F ^{Vo}							0	0		0
84							+V ⁱ	+I ^{Vl}	-F ^{Vl}							0	0		0
85							+V ^d	+I ^{Vd}	-F ^{Vd}							0	0		0
86							+V ^e	+I ^{Ve}	-F ^{Ve}							0	0		0
87																			

Figure 33. Cell W83 contains the formula for calculating the benchmark profit (“SplitScreenStrip” sheet).

For the non-operating area and the debt area, respectively, one uses

$$\underbrace{W84}_{I_4^{Vl}} = \underbrace{V84}_{V_4^l} * \underbrace{\$F\$4}_{r^l} \text{ and } \underbrace{W85}_{I_4^{Vd}} = \underbrace{V85}_{V_4^d} * \underbrace{\$F\$5}_{r^d}$$

The cash flow of the equity area can be calculated via the law of conservation:

$$\underbrace{W86}_{I_4^{Ve}} = \underbrace{W83}_{I_4^{Vo}} + \underbrace{W84}_{I_4^{Vl}} - \underbrace{W85}_{I_4^{Vd}}$$

while the equations are correct, the values obtained in the cell range W84:W86 are not yet the correct ones, because cells X83:X86 have not yet been occupied by formulas; however, they will be filled with the amounts of cash flows in the next steps, and the values taken on by cells W84:W86 will be automatically updated.

CODE INSTRUCTIONS: CASH FLOWS IN THE BENCHMARK MATRIX

The (changed-in-sign) cash flow may be grabbed by the split-screen strip for t > 0, whereas it is equal to the economic value for t = 0. Therefore, the analyst may use the following formula for cell X83:

$$\underbrace{X83}_{-F_4^{Vo}} = \text{IF}(\underbrace{X\$9}_{\text{period}} = 0, \underbrace{Y83}_{V_5^o}, \underbrace{X68}_{-F_4^o})$$

(in such a way, the analyst may later copy and paste the formula to complete the whole strip).

The analyst then copies the formula in X83 and paste it in cell X84 (the non-operating area) and in cell X85 (the debt area):

$$\underbrace{X84}_{-F_4^{VI}} = \text{IF}(\underbrace{X\$9}_{\text{period}} = 0, \underbrace{Y84}_{V_5^I}; \underbrace{X69}_{-F_4^I}) \text{ and } \underbrace{X85}_{-F_4^{Vd}} = \text{IF}(\underbrace{X\$9}_{\text{period}} = 0, \underbrace{Y85}_{V_5^d}; \underbrace{X70}_{-F_4^d})$$

The (changed-in-sign) CFE can be calculated with the same formula or via the law of conservation:

$$\underbrace{X86}_{-F_4^{Ve}} = \underbrace{X83}_{-F_4^{Vo}} + \underbrace{X84}_{-F_4^{VI}} - \underbrace{X85}_{-F_4^{Vd}}$$

(see Figure 34).

Figure 34. Cell X83 contains the formula for calculating the CFO (“SplitScreenStrip” sheet).

The analyst can now copy the cell range V83 : X86 and paste it in the cell range G83 : U86 (or, more simply, use the fill handle backwards).

4.2. Benchmark Germ Matrix

Just as with the project matrix, it is possible to construct the benchmark germ matrix.

CODE INSTRUCTIONS: FROM BENCHMARK FOUR-AREA MATRIX TO BENCHMARK GERM MATRIX

The analyst lays out a range of cells (rows 88:91) in the “SplitScreenStrip” sheet with the structure of the project germ matrix (rows 73:76). The formulas for producing the benchmark germ matrix are trivial:

$$\underbrace{G90}_{V_{-1}^{inv}} = \text{SUM}(\underbrace{G83 : G84}_{V_{-1}^o + V_{-1}^I}) \quad \underbrace{G91}_{V_{-1}^{fin}} = \text{SUM}(\underbrace{G85 : G86}_{V_{-1}^d + V_{-1}^e})$$

whence the whole strip is obtained by copying and pasting (or, more simply, use the fill handle).

4.3. Market Value Added Matrix

The analyst can build the Market Value Added (MVA) matrix and the related strip by computing the differences between the profits of the project and the benchmark profits (see Part I, Equations (91) and (92)).

CODE INSTRUCTIONS: MVA FOUR-AREA MATRIX

The analyst prepares a cell range (rows 96:101) in the “SplitScreenStrip” sheet with the structure of the four-area matrices and fills each cell of it with the differences between the corresponding cells of the benchmark four-area matrix (rows 83:86) and the project four-area matrix (rows 68:71). For example, starting from the first cell of the table,

$$G98 = \underbrace{G83}_{V_{-1}^o} - \underbrace{G68}_{C_{-1}^o} \quad G99 = \underbrace{G84}_{V_{-1}^l} - \underbrace{G69}_{C_{-1}^l}$$

$$G100 = \underbrace{G85}_{V_{-1}^d} - \underbrace{G70}_{C_{-1}^d} \quad G101 = \underbrace{G86}_{V_{-1}^e} - \underbrace{G71}_{C_{-1}^e}$$

Then, it suffices to copy G98:G101 and paste for the whole strip H98:Y101 (or, more simply, use the fill handle).

As the reader can see, the range I98:I101 shows the NPV for the various areas: $NPV^o = \text{USD}5,622$, $NPV^l = \text{USD}1,025$, $NPV^d = -\text{USD}236$, and $NPV^e = \text{USD}6,882$.

All the cells reporting the difference $I_t^{Vj} - I_t^j$ (H98:H101, K98:K101, N98:N101, Q98:Q101, T98:T101, W98:W101) give voice to the economic residual income (ERI) changed in sign (see next section for details).

CODE INSTRUCTIONS: MVA GERM MATRIX

The analyst prepares a range of cells (rows 103:106) in the “SplitScreenStrip” sheet with the structure of the germ matrices. To obtain the two values, one merely turns to the MVA four-area matrix and sums:

$$G105 = \text{SUM}(\underbrace{G98 : G99})$$

$$MVA_{-1}^{inv} = MVA_{-1}^o + MVA_{-1}^l$$

$$G106 = \text{SUM}(\underbrace{G100 : G101})$$

$$MVA_{-1}^{fin} = MVA_{-1}^d + MVA_{-1}^e$$

Then, it suffices to copy G105:G106 and paste for the whole strip H105:Y106 (or, more simply, use the fill handle) (see Figure 35).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y				
1																													
2	n		5																										
3	r		30%		r ^o	15.00%																							
4	r ^l		3.80%		r ^l	1.00%																							
5	r ^d		2.00%		r ^d	3.00%																							
6	α		20%																										
7																													
8							C	I	F	C	I	F	C	I	F	C	I	F	C	I	F	C	I	F	C				
9							-1	0	0	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5				
93	Market Value Added																												
94	Market Value Added: Four-area Matrix																												
95							V₋₁-C₋₁	+I₋₁^o-I₋₁^o	-(F₋₁^o-F₋₁^o)	V₋₁-C₋₁	+I₋₁^l-I₋₁^l	-(F₋₁^l-F₋₁^l)	V₋₁-C₋₁	+I₋₁^d-I₋₁^d	-(F₋₁^d-F₋₁^d)	V₋₁-C₋₁	+I₋₁^e-I₋₁^e	-(F₋₁^e-F₋₁^e)	V₋₁-C₋₁	+I₋₁^o-I₋₁^l	-(F₋₁^o-F₋₁^l)	V₋₁-C₋₁	+I₋₁^o-I₋₁^d	-(F₋₁^o-F₋₁^d)	V₋₁-C₋₁	+I₋₁^o-I₋₁^e	-(F₋₁^o-F₋₁^e)	V₋₁-C₋₁	
98		MVA ^o	ERI ^o	$-(F_{-1}^{inv}-F_{-1}^{inv})$	0	0	5,622	5,622	2,338	0	7,959	535	0	8,494	-932	0	7,562	-2,709	0	4,853	-4,853	0	0	0	0	0	0	0	0
99		MVA ^l	ERI ^l	$-(F_{-1}^{inv}-F_{-1}^{inv})$	0	0	1,025	1,025	122	0	1,147	-97	0	1,050	-206	0	845	-340	0	504	-504	0	0	0	0	0	0	0	0
100		MVA ^d	ERI ^d	$-(F_{-1}^{inv}-F_{-1}^{inv})$	0	0	-236	-236	93	0	-143	71	0	-72	48	0	-24	24	0	0	0	0	0	0	0	0	0	0	0
101		MVA ^e	ERI ^e	$-(F_{-1}^{inv}-F_{-1}^{inv})$	0	0	6,882	6,882	2,367	-0	9,249	367	0	9,616	-1,185	0	8,431	-3,074	0	5,357	-5,357	0	0	0	0	0	0	0	0
102																													
103	Market Value Added: Germ Matrix																												
104							V₋₁-C₋₁	+I₋₁^o-I₋₁^o	-(F₋₁^o-F₋₁^o)	V₋₁-C₋₁	+I₋₁^l-I₋₁^l	-(F₋₁^l-F₋₁^l)	V₋₁-C₋₁	+I₋₁^d-I₋₁^d	-(F₋₁^d-F₋₁^d)	V₋₁-C₋₁	+I₋₁^e-I₋₁^e	-(F₋₁^e-F₋₁^e)	V₋₁-C₋₁	+I₋₁^o-I₋₁^l	-(F₋₁^o-F₋₁^l)	V₋₁-C₋₁	+I₋₁^o-I₋₁^d	-(F₋₁^o-F₋₁^d)	V₋₁-C₋₁	+I₋₁^o-I₋₁^e	-(F₋₁^o-F₋₁^e)	V₋₁-C₋₁	
105		MVA ^{inv}	ERI ^{inv}	$-(F_{-1}^{inv}-F_{-1}^{inv})$	0	0	6,647	6,647	2,460	0	9,107	438	0	9,544	-1,138	0	8,407	-3,050	0	5,357	-5,357	0	0	0	0	0	0	0	0
106		MVA ^{fin}	ERI ^{fin}	$-(F_{-1}^{inv}-F_{-1}^{inv})$	0	0	6,647	6,647	2,460	-0	9,107	438	0	9,544	-1,138	0	8,407	-3,050	0	5,357	-5,357	0	0	0	0	0	0	0	0
107																													

Figure 35. Market value added: four-area matrix and germ matrix (“SplitScreenStrip” sheet).

5. Module 5: Performing the Single-Period Analysis

The whole project is described in detail in the split-screen film. However, a convenient representation of it is possible which favors the detailed analysis of a single period. One creates a worksheet named "SinglePeriod" where the matrix will be located. In it, one can use the preferred framing of the SSM. For example, we propose a framing where the BS at a given date is illustrated and one where the CFS is illustrated. The former facilitates the comprehension of how the project's book value is apportioned across the various areas (customers, suppliers, employees, etc.) and how it is affected diachronically by the income components and the cash-flow components; the latter facilitates the comprehension of how the project's cash flow is apportioned across the various areas and how it is diachronically determined by income and change of book values. These configurations turn the project's split-screen strip into a sequence of snapshots describing the accounting and financial magnitudes and their relationships for one period.

CODE INSTRUCTIONS: BUILDING THE SET OF MATRICES FOR SINGLE-PERIOD ANALYSIS

The analyst builds the structure of two split-screen matrices, in the configuration of full-scale matrix and in the form of BS and CFS (see Figure 36). Cell E2 indicates the period. The analyst can apply the Data Validation to restrict the values to the periods of the project, allowing only the values that are in the list "0, 1, 2, 3, 4, 5" or creating a drop-down list with these values. Some spreadsheets software allow to use a range as source list, even if it is in another worksheet: in this case, it is possible to use the range "=PreCalc!\$K\$2:\$P\$2". Three columns on the left (columns D, E, and F, same as in the sheets "PreCalc" and "SplitScreenStrip") contain the labels of the rows (" +AR", "+Inv", etc.). Below the structure of the matrix, a row (row 4) contains the descriptor of the column content. This content is C for Capital, I for Income, and F for Cash Flow. It is variable and depends on the value of cell E2: "C-1", "+I0", "-F0", and "C0" if number 0 is selected for cell E2; "C0", "+I1", "-F1", and "C1" if number 1 is selected for cell E2, and so on.

$$I4 = "C"&(\$E\$2 - 1)$$

$$J4 = "+" & "I" & \$E\$2$$

$$K4 = "-" & "F" & \$E\$2$$

$$L4 = "C" & \$E\$2$$

(see Figure 36).

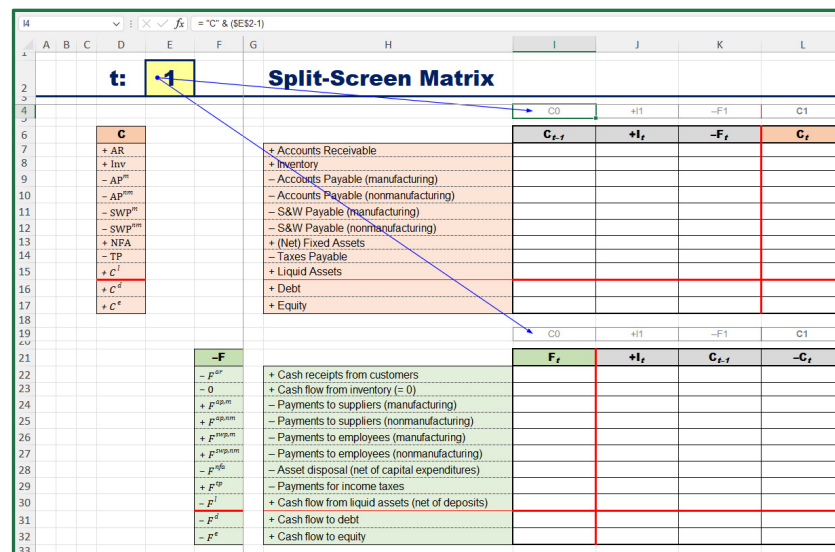


Figure 36. Cell I4 depends on cell E2: if E2 value is t, then I4 value is Ct-1 (e.g., if E2 = 1, then I4 is "C0"). Analogous code for row 19 ("SinglePeriod" sheet).

To fill the cells of the matrix, we again employ the INDEX and MATCH combination. The technique is like the one described in Section 2.2, used in the split-screen strip for picking the amounts from the “PreCalc” worksheet.

The more external formula is:

$$\text{INDEX}(\text{FullScaleStrip}, \text{row_num}, \text{column_num})$$

where

“FullScaleStrip” is the range of cells where the full-scale strip is located (i.e. the range SplitScreenStrip!\$13:\$23);

“row_num” is the row-number of the range “FullScaleStrip” where the item that contains the sought value is located: it can be selected by matching the label of the row in the Matrix and the label in the split-screen strip, using the function MATCH;

“column_num” is the column-number of the range “FullScaleStrip” where the category (capital, income, or cash flow) and the period that contains the sought value are indicated: it can be selected by matching the label of the column in the matrix and the labels in the split-screen strip, using the function MATCH.

One starts from cell I7:

$$I7 = \text{INDEX}(\text{SplitScreenStrip!}\$13 : \$23, \underbrace{\text{MATCH}(\$D7, \text{SplitScreenStrip!}\$D\$13 : \$D\$23, 0)}_{\text{the result of this formula is the number of the row in the four-area strip that has the same label as cell } \$D7 \text{ (“+AR”)}} , \underbrace{\text{MATCH}(I\$4, \text{SplitScreenStrip!}\$12 : \$12, 0)}_{\text{the result of this formula is the number of the column in the four-area strip that has the same label as cell } I\$4 \text{ (“C0”)}})$$

(see Figures 37 and 38).

	C		C _{t-1}	+I _t	-F _t	C _t
7	+AR	+ Accounts Receivable	0	60,000	-45,205	14,795
8	+ Inv	+ Inventory	3,750	375	0	4,125
9	- AP ^m	- Accounts Payable (manufacturing)	-3,750	-15,375	3,750	-15,375
10	- AP ^{nm}	- Accounts Payable (nonmanufacturing)	0	-9,000	0	-9,000
11	- SWP ^m	- S&W Payable (manufacturing)	0	-24,000	24,000	0
12	- SWP ^{nm}	- S&W Payable (nonmanufacturing)	0	-6,000	6,000	0
13	+ NFA	+ (Net) Fixed Assets	20,000	-4,000	0	16,000
14	- TP	- Taxes Payable	0	-494	494	0
15	+ C ⁱ	+ Liquid Assets	-4,000	-152	8,030	3,878
16	+ C ^d	+ Debt	10,000	200	-2,700	7,500
17	+ C ^e	+ Equity	6,000	1,154	-231	6,923

Figure 37. Cell I7 contains the formula for picking up the Account Receivable AR as of period $t = 0$ (“SinglePeriod” sheet).