

Table 2-5 continued

Legend:

Analysis of the Investment in Operating Net Working Capital

Operating net working capital (ONWC)

Change (increase or decrease) in operating net working capital $ONWC(t-1) - ONWC(t)$

Analysis of Property, Plant and Equipment Needs

Sales

Capex (purchases plus sales of fixed assets)

Net Property, Plant, and Equipment (Beginning Balance)

less: Depreciation Expense (Depr)

plus: Capital Expenditures (Capex)

Net Property Plant and Equipment (Ending Balance)

Formulas

$$[\text{Sales}(t+1) - \text{Sales}(t)] \times [\text{Net PP\&E}(t) / \text{Sales}(t+1)]$$
Ending PP&E $(t-1)$

See Income Statement

See above

$$\text{Beginning Net PP\&E}(t) - \text{Depr}(t) + \text{Capex}(t)$$

	2015	2016	2017	2018	2019	2020
Operating net working capital (ONWC)	\$ 50,000	\$ 55,000	\$ 60,500	\$ 66,550	\$ 73,205	\$ 80,526
Change (increase or decrease) in operating net working capital	\$ (50,000)	\$ (5,000)	\$ (5,500)	\$ (6,050)	\$ (18,205)	\$ (7,321)

	2015	2016	2017	2018	2019	2020
Sales	\$1,000,000	\$1,100,000	\$1,210,000	\$1,331,000	\$1,464,100	\$1,610,000
Capex (purchases plus sales of fixed assets)	\$ (400,000)	\$ (80,000)	\$ (92,000)	\$ (105,600)	\$ (121,000)	\$ (138,424)

	2015	2016	2017	2018	2019	2020
Net Property, Plant, and Equipment (Beginning Balance)	—	\$ 400,000	\$ 440,000	\$ 484,000	\$ 532,400	\$ 585,640
less: Depreciation Expense (Depr)	—	(40,000)	(48,000)	(57,200)	(67,760)	(79,860)
plus: Capital Expenditures (Capex)	\$ 400,000	\$ 80,000	\$ 92,000	\$ 105,600	\$ 121,000	\$ 138,424
Net Property Plant and Equipment (Ending Balance)	\$ 400,000	\$ 440,000	\$ 484,000	\$ 532,400	\$ 585,640	\$ 644,204

2.6 SUMMARY

The value of an investment project is determined by the cash flows it is expected to produce. In this chapter, we have discussed valuing investment opportunities using discounted cash flow (DCF) analysis that can be implemented using the three-step process outlined below:

Steps	Project Valuation
Step 1: Forecast the amount and timing of future cash flows.	Forecast project FCF.
Step 2: Estimate a risk-appropriate discount rate (covered in Chapters 4 and 5).	Combine the debt and equity discount rate, which is the weighted average cost of capital (WACC).
Step 3: Discount the cash flows.	Discount the project's FCF using the WACC to estimate the value of the project as a whole.

The main focus of this chapter is on identifying and forecasting the *incremental* revenues and costs that are required to estimate expected cash flows. Although cash flow analysis is a key element in investment valuation, the process used to make forecasts is necessarily subjective and fraught with potential estimation errors. Consequently, cash flow forecasting is part art and part science. This does not mean that the analyst should simply throw caution to the wind and engage in crystal-ball gazing. Good forecasting is grounded in sound economic analysis and rigorous attention to the details of proper cash flow definition.

Key learning points from this chapter are that forecasting is hard work and it is subject to potentially very large errors. To minimize the effect of these forecast errors, good analysts follow a three-pronged approach: First, they take the forecasting problem very seriously and utilize all the information and technology they have at their disposal to arrive at their forecast. Second, as we will discuss in Chapter 3, they do post-forecast risk analysis, which helps them prepare for a wide range of possible outcomes. Third, to the extent possible, they try to maintain flexibility in how the investment is implemented so that they can respond to unforeseen future events. We will have more to say about this latter point in Chapters 3 and 12.

EXERCISES

2-1 CALCULATING PRESENT VALUES Calculate the present value of each of the following cash flow streams. Use a discount rate of 10%.

- \$500 received at the end of five years
- \$500 received annually for each of the next five years
- \$500 received annually for each of the next fifty years
- \$500 received annually for 100 years

2-2 CALCULATING THE INTERNAL RATE OF RETURN Singular Construction is evaluating whether to build a new distribution facility. The proposed investment will cost Singular

Table 2-5 Estimating Project Free Cash Flows for the Proposed Warehouse Distribution Center**Panel (a) Assumptions and Predictions**

Predicted sales for 2016	\$	1,000,000
Sales growth rate for 2017–2021		10%
Gross profit margin (t) = Gross profit (t)/Sales (t)		40%
Operating expenses (before depreciation)/(OEBD) (t)/Sales (t)		25%
Tax rate		30%
Net Property, Plant, and Equipment (Net PP&E) (t)/Sales ($t + 1$)		40%
Accounts receivable and inventories (AR&Inv) (t)/Sales ($t + 1$)		20%
Accounts payable plus accrued expenses (t)/Sales ($t + 1$)		15%
Short-term debt (STD) (t)/total assets (t)		0%
Short-term debt (STD) borrowing rate (RateSTD)		5%
Long-term debt (LTD) (t)/total assets (t)		0%
Long-term debt (LTD) borrowing rate (RateLTD)		6%
Depreciable life of plant and equipment		10 years
Depreciation method		Straight line
Residual values of working capital and net fixed assets/Book Value		100%
Cost of capital		18%

Panel (b) Pro Forma Income Statements

(% of Sales corresponds to the estimates found in Panel a)

	2016	2017	2018	2019	2020
Formulas					
Sales	\$1,000,000	\$1,100,000	\$1,210,000	\$1,331,000	\$1,464,100
Cost of goods sold (COGS)	(600,000)	(660,000)	(726,000)	(798,600)	(878,460)
Gross profit (GP)	\$ 400,000	\$ 440,000	\$ 484,000	\$ 532,400	\$ 585,640
Operating expenses before depreciation (OEBD)	(250,000)	(275,000)	(302,500)	(332,750)	(366,025)
Depreciation expense (Depr)	(40,000)	(48,000)	(57,200)	(67,760)	(79,860)
Earnings before interest and taxes (EBIT)	\$ 110,000	\$ 117,000	\$ 124,300	\$ 131,890	\$ 139,755
Interest expense (IntExp)	—	—	—	—	—
Earnings before taxes (EBT)	\$ 110,000	\$ 117,000	\$ 124,300	\$ 131,890	\$ 139,755
Taxes	(33,000)	(35,100)	(37,290)	(39,567)	(41,927)
Net Income (NI)	\$ 77,000	\$ 81,900	\$ 87,010	\$ 92,323	\$ 97,829

Panel (c) Pro forma Balance Sheet

	2015	2016	2017	2018	2019	2020
Formulas						
Accounts receivable plus inventories (AR&Inv)	\$ 200,000	\$ 220,000	\$ 242,000	\$ 266,200	\$ 292,820	\$ 322,102
Gross plant and equipment (Gross PP&E)	400,000	480,000	572,000	677,600	798,600	937,024
Less: Accumulated depreciation expense (AccDepr)	—	(40,000)	(88,000)	(145,200)	(212,960)	(292,820)
Net property, plant and equipment (Net PP&E)	\$ 400,000	\$ 440,000	\$ 484,000	\$ 532,400	\$ 585,640	\$ 644,204
Total Assets (TA)	\$ 600,000	\$ 660,000	\$ 726,000	\$ 798,600	\$ 878,460	\$ 966,306
Accounts payable plus accrued expenses (AP)	\$ 150,000	\$ 165,000	\$ 181,500	\$ 199,650	\$ 219,615	\$ 241,577
Short-term notes payable (STD)	—	—	—	—	—	—
Current Liabilities (CL)	\$ 150,000	\$ 165,000	\$ 181,500	\$ 199,650	\$ 219,615	\$ 241,577
Long-term debt (LTD)	—	—	—	—	—	—
Common Equity (CE)	450,000	495,000	544,500	598,950	658,845	724,730
Total Liabilities plus Common Equity (TL + CE)	\$ 600,000	\$ 660,000	\$ 726,000	\$ 798,600	\$ 878,460	\$ 966,306

Panel (d) Project Free Cash Flows (FCF)

	2015	2016	2017	2018	2019	2020
Formulas						
Earnings before interest and taxes (EBIT)	\$ —	\$ 110,000	\$ 117,000	\$ 124,300	\$ 131,890	\$ 139,755
Taxes	—	(33,000)	(35,100)	(37,290)	(39,567)	(41,927)
Net operating profit after taxes (NOPAT)	\$ —	\$ 77,000	\$ 81,900	\$ 87,010	\$ 92,323	\$ 97,829
plus: Depreciation expense (Depr)	—	40,000	48,000	57,200	67,760	79,860
less: Capital expenditures (CAPEX)	(400,000)	(80,000)	(92,000)	(105,600)	(121,000)	(138,424)
less: Change in operating net working capital (ChgONWC)	(50,000)	(5,000)	(5,500)	(6,050)	(6,655)	(7,321)
Residual value	—	—	—	—	—	—
Free Cash Flow (FCF)	\$ (450,000)	\$ 32,000	\$ 32,400	\$ 32,560	\$ 32,428	\$ 998,250

(Continued)