

# CHAPTER 14:

## WORKING CAPITAL:

### INVESTMENT DECISIONS AND FINANCING

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#### 14-1

- a. Current Ratio = Current Assets / Current Liabilities =  $91,524/50,596 = 1.81$
- b. Quick Ratio = (Cash + Marketable Securities)/Current Liabilities = 0.39
- c. Accounts Receivable Turnover = Sales/Accounts Receivable =  $154,951/61,469 = 2.52$   
Inventory Turnover Ratio = COGS / Inventory =  $103,817 / 10,128 = 10.25$
- d. Required Financing Period = Days Receivable Outstanding + Days Inventory Held - Days Accounts Payable =  $365/2.52 + 365/10.25 - 365/(103,817/11635) = 139.54$   
(Assumes that all cost of goods sold represent purchases )

#### 14-2

- a. Current Ratio = Current Assets / Current Liabilities =  $118/46.1 = 2.560$
- b. Quick Ratio = (Cash + Marketable Securities)/Current Liabilities = 0.141
- c. Accounts Receivable Turnover = Sales/Accounts Receivable =  $440.3/3.1 = 142.03$   
Inventory Turnover Ratio = COGS / Inventory =  $249.2 / 108.4 = 2.30$
- d. Required Financing Period = Days Receivable Outstanding + Days Inventory Held - Days Accounts Payable =  $365/142.03 + 365/2.30 - 365/(249.2/27.5) = 120.99$

#### 14-3

- a. Investment in Working Capital after Change =  $(54.2+3.1+6.5)-(27.5+18.6) = \$17.70$
- b. Savings in Cash Flow = Working Capital before change - Working Capital after change  
=  $(118-46.1) - \$17.70 = \$54.20$   
If these savings grow 6% a year forever,  
PV of Savings =  $\$54.20 (1.06)/(.11-.06) = \$1,149$

#### 14-4

a. Value of Firm at current working capital ratio

FCFF = After-tax Operating income - Change in Working Capital

$$= \$10 \text{ million } (1.05) - (\$105 - \$100) (.10) = 10$$

$$\text{Value of Firm} = \$10 \text{ million} / (.11 - .05) = \$166.67$$

b. Firm Valuation at different Working Capital Ratios

WC as % of Rev	Expected Growth	FCFF	Cost of Capital	Firm Value
0%	4.50%	10.45	10.90%	\$163.28
10%	5%	10	11%	\$166.67
20%	5.20%	9.48	11.11%	\$160.41
30%	5.35%	8.93	11.23%	\$151.87
40%	5.45%	8.365	11.36%	\$141.54
50%	5.50%	7.8	11.50%	\$130.00
60%	5.54%	7.23	11.65%	\$118.33
70%	5.55%	6.67	11.80%	\$106.72
80%	5.55%	6.115	11.95%	\$95.55
90%	5.55%	5.56	12.10%	\$84.89
100%	5.55%	5.005	12.35%	\$73.60

The optimal working capital policy for the firm is to maintain the working capital at 10% of revenues.

c. Firm Valuation at different Working Capital ratios

WC as % of Rev	Expected Growth	FCFF	Cost of Capital	Firm Value
0%	4.50%	10.45	11%	\$160.77
10%	5%	10	11%	\$166.67
20%	5.20%	9.48	11%	\$163.45
30%	5.35%	8.93	11%	\$158.05
40%	5.45%	8.37	11%	\$150.72
50%	5.50%	7.8	11%	\$141.82
60%	5.54%	7.23	11%	\$132.42
70%	5.55%	6.67	11%	\$122.39
80%	5.55%	6.12	11%	\$112.20
90%	5.55%	5.56	11%	\$102.02
100%	5.55%	5.01	11%	\$91.83

The optimal working capital is still 10% of revenues.

#### 14-5

Free Cash Flow to Firm = After-tax Operating Income - Change in Working Capital

$$= \$5 \text{ million } (1.05) - (\$100 \text{ million}) (.05) (.2) = \$4.25$$

$$\text{Value of Firm} = \$4.25 / (.12 - .05) = \$60.71$$

Increase in Current Cash Flow from cutting back inventory = \$8 million  
 Firm value has to be at least \$52.71 million to break even.

Let the revenues be X.

After-tax Operating Income = X (.05)! After-tax Operating Margin is 5%.

Change in Working Capital = X (.05) (.12)! Working Capital is now 12% of revenues

Free Cash Flow to Firm = X(.05) - X(.05)(.12)

Value of Firm = \$52.71 = X(.05)(.88)/(.12-.05)

Solve for X,

X = \$83.86

Revenues have to be at least \$83.86 million for firm to break even

If revenues drop more than \$16.14 million, the firm will be worse off.

#### 14-6

Company	Net WC	Revenues	Expected Beta	Expected Growth
Arco Chemical	\$579	\$3,423	0.8	13.00%
Dow Chemical	\$2,075	\$20,015	1.25	16.00%
Du Pont	\$3,543	\$39,333	1	17.50%
Georgia Gulf	\$127	\$955	1.7	26.50%
Lyondell Petro	\$264	\$3,857	1.1	23.50%
Monsanto	\$2,948	\$8,272	1.1	11.50%
Olin Corp	\$749	\$2,658	1	22.00%
Sterling Chemical	\$21	\$701	0.95	43.00%
Union Carbide	\$329	\$4,865	1.3	16.00%

Company	Market Value	WC/Revenues
Arco Chemical	\$4,517	16.91%
Dow Chemical	\$19,398	10.37%
Du Pont	\$44,946	9.01%
Georgia Gulf	\$1,386	13.30%
Lyondell Petro	\$2,080	6.84%
Monsanto	\$9,296	35.64%
Olin Corp	\$1,205	28.18%
Sterling Chemical	\$724	3.00%
Union Carbide	\$4,653	6.76%

a. Average WC as % of Revenues = 14.45%

Standard Deviation in WC as % of Revenues = 10.84%

b. Running a multiple regression, regressing WC as % of Revenues against the other variables

WC as % of Revenue = + Revenues + Beta + Expected Growth + Market Value

c. Optimal debt ratio for Monsanto, using the regression.

14-7

Period	Current Assets	Current Liabilities	Revenues	Working Cap	Current Assets as % of Revenues
1990-1	\$300	\$150	\$3,000	\$150	10.00%
1990-2	325	160	3,220	165	10.09%
1990-3	350	180	3,450	170	10.14%
1990-4	650	300	6,300	350	10.32%
1991-1	370	170	3,550	200	10.42%
1991-2	400	200	4,100	200	9.76%
1991-3	420	220	4,350	200	9.66%
1991-4	755	380	7,750	375	9.74%
1992-1	450	220	4,500	230	10.00%
1992-2	480	240	4,750	240	10.11%
1992-3	515	265	5,200	250	9.90%
1992-4	880	460	9,000	420	9.78%
1993-1	550	260	5,400	290	10.19%
1993-2	565	285	5,600	280	10.09%
1993-3	585	300	5,900	285	9.92%
1993-4	1010	500	1,0000	510	10.10%
1994-1	635	330	6,500	305	9.77%
1994-2	660	340	6,750	320	9.78%
1994-3	665	340	6,900	325	9.64%
<b>Average =</b>					<b>9.97%</b>

a. Current Assets are roughly 5% of revenues. The revenues themselves are seasonal.

Permanent Current Assets = 10% of Revenues in first three quarters

Seasonal Current Assets = 10% of Additional Revenue in Fourth Quarter

Transitory Component of Current Assets =

Difference between actual current assets and forecast current assets

For instance, in 1994

Permanent Current Assets = .10 (Average Revenues for first three quarters) = \$671.67

Seasonal Current Assets = .10 (Additional Revenue in fourth quarter): = \$520.60

See Calculation below:

Average Revenues in first 3 quarters of 1993 = \$5,633

Average Revenues in first 3 quarters of 1994 = \$6,717

Growth from 1993 to 1994 = 19.23%

Revenues in fourth quarter of 1993 = \$10,000

Expected Revenues in fourth quarter of 1994 = \$11,923

Additional Revenues in fourth quarter = 11,919 - 6717 = \$5,206

The transitory components can then be estimated

b. I would finance the permanent portion of working capital using current liabilities and long-term financing, the seasonal component with current liabilities and short term financing.

**14-8**

a. Processing float = \$5 (4) = \$20 million

b. Disbursement or payment float = \$4 (5) = \$20 million

c. Net Float = 0

d. If the number of days it takes to clear checks is reduced to three,

Processing Float = \$5 (3) = \$15 million

Net Float = \$20 million - \$15 million = \$5 million

**14-9**

a. Optimal Balance using Baumol Model = \$204,124

b. If the firm were able to earn 3% on cash, the annual interest rate can be lowered to 9%.

Optimal Balance using Baumol Model = \$235,702

**14-10**

If interest rates increase, I would expect the cost of holding non-interest bearing cash to increase leading to a drop in optimal cash balances.

**14-11**

Optimal Cash Balance = \$1 million

Opportunity cost = 10%

Cost per transaction = \$125

Annual Cash Usage Rate = \$400 million

Weekly Cash Usage Rate = \$7.69 million

**14-12**

a. Spread between upper and lower cash limits = \$120,498

b. The average cash balance will be between \$60,249 : half of \$120,498

c. If there is a safety balance of \$50,000,

Upper Limit = \$50,000 + \$120,498 = \$170,498

Average Balance will increase to \$110,249

**14-13**

If the standard deviation doubled:

New Spread between upper and lower cash limits = \$191,279

The firm will need much more of a cash cushion if there is variability in cash usage.

**14-14**

- a. Optimal Order Quantity = 424.26
- b. The delivery lag is one month; the safety inventory is therefore one month's sales which is 1,500 units.
- c. The average inventory maintained by the firm will approximately 1,712 units.

**14-15**

a. Projected CF for next year

	<b>Without credit</b>	<b>With credit</b>	<b>Differential CF</b>
Revenues	\$31.50	\$36.75	\$5.25
AT operating income	\$9.45	\$11.03	\$1.58
- Increase in WC	\$-	\$0.18	\$0.18
ATCF	\$9.45	\$10.85	\$1.40

Initial Investment needed to initial credit sales = 0.1 (\$35 million) = \$3.5 million

b. Present value of incremental CF assuming 5% growth forever and 12% cost of capital,  
 PV of incremental CF =  $\$1.58 / (.12 - .05) = \$22.57$  - Initial Investment needed = \$3.50  
 NPV of Project = \$19.07

**14-16**

- a. Implied Interest Rate =  $(1 + 2/98)^{(365/40)} - 1 = 20.24\%$
- b. Implied Interest Rate if customer takes 100 days = 7.65%

**14-17**

a. Interest Cost from Option 1 =  $0.09 * \$12 \text{ million} = \$1.08$

b. Interest Cost from Option 2 =  $\$8 \text{ million} * .09 + \$5 \text{ million} * (4/12) * .08 = \$0.85$   
 (The firm has to borrow \$5 million because of the need for a compensating balance.)

**14-18**

Days Receivable Outstanding =  $365 / \text{Receivable turnover} = 365 / (\text{Sales} / \text{Average A/R})$   
 $= 365 (150,000 / 20,548) = 50 \text{ days}$

Days inventory held =  $365 / (\text{Cost of Goods Sold} / \text{Average Inventory}) =$   
 $365 / (50\% * 150,000 / 4,110)$   
 $= 20 \text{ days}$

then Days accounts payable outstanding = Days receivable outstanding + Days inventory held

$$- \text{required financing period} = 50 + 20 - 40 =$$

30

Accounts payable turnover =  $365 / \text{days accounts payable outstanding} = 365 / 30 = 12.17$   
 So average accounts payable =  $\text{Purchases} / (\text{A/P turnover}) = 60\% * 150,000 / 12.17 = \$7,397$

**14-19**

Solving for N in the following equation,  
 $65,753 = 100,000,000 * 12\% * (N / 365)$

N = 2 days

If the float can be cut for only two days, it is economical to use the new collection system.

#### 14-20

The optimal amount withdrawn each time =  $\text{SQRT}(2 * 1200 * 1.00 / 0.03) = \$282.84$

So the average cash level =  $\$282.84 / 2 = \$141.42$

#### 14-21

The optimal order quantity before taking discount =  $\text{SQRT}(2 * 16,000 * 100/12.8) = 500$  units

The total inventory costs with EOQ =  $(16,000/500) * 100 + (500/2) * 12.8$   
 $= 3,200 + 3,200 = \$6,400$

If each order is in 2,000 units, total costs would be  $(16,000/2,000) * 100 + (2,000/2) * 12.8$

$$= 800 + 12,800 = \$13,600$$

There is an increase of total inventory costs by the amount of \$7,200 ( $=\$13,600 - \$6,400$ )  
However, the discounts amounts to the savings of  $1\% * 100 * 16,000 = \$16,000$ , which is greater than the increase in inventory costs.

So accept the offer of 1% discount and order 2,000 units each time.

#### 14-22

Total price discount =  $2\% * 10M = \$200,000$

The lost interest savings from using the trade credit =  $\$10M * 10\% * (25/365) = \$68,493$

Since the net savings would be  $\$200,000 - \$68,493 = \$131,507 > 0$

the company should pay on day 10 and take the 2% discount.

#### 14-23

a: First Loan: Effective Interest Rate =  $(1 + 10\%/4)^4 - 1 = 10.38\%$

Second Loan: Effective Interest Rate =  $9\% / (1 - 9\%) = 9.98\%$

b: The discount loan is less expensive.