

Chapter 20

Hybrid Financing: Preferred Stock, Leasing, Warrants, and Convertibles

Learning Objectives

After reading this chapter, students should be able to:

- ◆ Identify the basic features of preferred stock and explain its advantages and disadvantages.
- ◆ Differentiate among the types of leases, discuss the financial statement effects of leasing, and evaluate a lease.
- ◆ Explain what warrants are, how they are used, and analyze their cost to the firm.
- ◆ Explain what convertibles are, how they are used, and analyze their cost to the firm.

Lecture Suggestions

This chapter discusses four types of hybrid securities: preferred stock, leases, warrants, and convertibles. We have mixed feelings about coverage of the chapter. On the one hand, we are tempted not to spend much time on it because it gets into relatively technical analysis that would be better left for later courses. On the other hand, the material is important, and students who will not be taking additional finance courses ought to be exposed to the subjects covered here. Also, leasing and warrants/convertibles are good subjects on which to lecture, as they contain a nice mix of new versus review material, and of quantitative versus qualitative analysis. Lease analysis serves as a good review of time value of money and risk/return analyses, and the warrants/convertibles analysis is a good review of valuation theory.

What we cover, and the way we cover it, can be seen by scanning the slides and Integrated Case solution for Chapter 20, which appears at the end of this chapter solution. For other suggestions about the lecture, please see the "Lecture Suggestions" in Chapter 2, where we describe how we conduct our classes.

DAYS ON CHAPTER: 2 OF 56 days (50-minute periods)

Answers to End-of-Chapter Questions

- 20-1** Preferred stock can be classified only when the one doing the classification is considered. From the standpoint of the firm, preferred stock is like equity in that it cannot force the firm into bankruptcy, but it is like debt in that it causes fluctuations in earnings available to the common stockholders. Consequently, if the firm is concerned primarily with survival, it would probably classify preferred stock as equity. However, if there is essentially no danger of bankruptcy, management would view preferred stock as simply another fixed-charge security and treat it internally as debt. Equity investors would have a similar viewpoint, and in general they should treat preferred stock in much the same manner as debt. For creditors, the position is reversed. They take preference over preferred stockholders, and the preferred issues act as a cushion. Consequently, a bond analyst would probably want to treat preferred as equity. Obviously, in all these applications, there would have to be some qualifications; in a strict sense, preferred stock is neither debt nor equity, but a hybrid.
- 20-2** Since 70% of preferred dividends received by a corporation are not taxable, the corporation with the higher (35%) tax rate is more likely to have bought the preferred. In addition, the company in the 35% tax bracket would be less likely to issue the preferred since preferred dividends paid out are not a tax deductible expense.
- 20-3** If dividends from preferred stock and interest received from bonds were taxed in the same manner, bonds would have a lower yield rate. Corporations represent the principal investor group that holds preferred stock. The reason for this is that current tax laws allow a 70% tax exclusion for intercorporate dividends received; thus, preferred stock is attractive to corporations and prices are bid up, lowering before-tax yields below those for bonds.
- 20-4** Floating-rate preferred stock, because of the floating rate of return, has a relatively stable price. This constant price, as well as the 70% tax exemption for preferred dividends, makes floating-rate preferred attractive to corporate investors and, thus, allows the issuing firm to raise capital at a low cost.
- 20-5** An operating lease is frequently cancelable and includes maintenance. Operating leases are, frequently, for a period significantly shorter than the asset's economic life, so the lessor often does not recover his full investment during the period of the basic lease. A financial lease, on the other hand, is not cancelable, is fully amortized, and generally does not include maintenance provisions. For these reasons, an operating lease would probably be used for a fleet of trucks, while a financial lease (or a sale-and-leaseback) would be used for a manufacturing plant.
- 20-6** Pros:
1. The use of the leased premises or objects is actually an exclusive right, and the payment for the premises is a liability that often must be met. Therefore, leases should be treated as both assets and liabilities.
 2. A fixed policy of capitalizing leases among all companies would add to the comparability of different firms.
 3. The capitalization highlights the contractual nature of the leased property.
 4. Capitalization of leases could help management make useful comparisons of operating results; that is, return on investment data.

Cons:

1. Because the firm does not actually own the leased property, the legal aspect can be cited as an argument against capitalization.
2. Capitalizing leases worsens some key credit ratios; that is, the debt-to-equity ratio and the debt-to-total assets ratio. This may hamper the future acquisition of funds.
3. There is a question of choosing the proper discount rate at which to capitalize leases.
4. Some argue that other items should be listed on the balance sheet before leases; for example, service contracts, property taxes, and so on.
5. Capitalizing leases violates the principle that liabilities should be recorded when assets are purchased.

20-7 Lease payments, like depreciation, are deductible for tax purposes. If a 20-year asset were depreciated over a 20-year life, depreciation charges would be $1/20$ per year (more if MACRS were used). However, if the asset were leased for, say, 3 years, tax deductions would be $1/3$ each year for 3 years. Thus, the tax deductions would be greatly accelerated. The same total taxes would be paid over the 20 years, but they would be deferred more under the lease—no taxes at all in Years 1 through 3. The PV of the future taxes would be reduced under the lease.

20-8 Permitting equipment to be depreciated over a shorter period increases the tax shelter value of leasing. Lowering corporate tax rates decreases the tax shelter value of leasing; however, lowered corporate tax rates decrease the tax deductibility of interest—the net effect is indeterminate. Reinstating the investment tax credit increases the tax shelter value of leasing. The general rule is, if a company is in a high tax bracket it will generally own equipment, while if a company is in a low tax bracket it is generally to its benefit to lease. Companies in low tax brackets can “sell” their tax shelters through leasing arrangements, being “paid” in the form of lower lease payments. A high-bracket lessor can earn a higher after-tax return with a lower rental charge because the lessor will get larger depreciation write-offs. If the ITC were reinstated, leases would become even more attractive.

20-9 The trend in stock prices subsequent to an issue influences whether or not a convertible issue will be converted, but conversion itself typically does not provide a firm with additional funds. Indirectly, however, conversion may make it easier for a firm to obtain additional funds by lowering the debt ratio, thus making it easier for the firm to borrow. In the case of warrants, on the other hand, if the price of the stock rises sufficiently, the warrants are likely to be exercised and thus to bring in additional funds directly.

- 20-10 a.**
1. The value of a warrant depends primarily on the expected growth of the underlying stock's price. This growth, in turn, depends in a major way on the plowback of earnings; the higher the dividend payout, the lower the retention (or plowback) rate; hence the slower the growth rate. Thus, other things held constant, the higher the firm's dividend payout policy, the lower the value of the warrant. This effect is more pronounced for long-term than for short-term warrants.
 2. The same general arguments as in Part 1 hold for convertibles. If a convertible is selling above its conversion value, raising the dividend will lower growth prospects, and, at the same time, increase the “cost” of holding convertibles (or warrants) in terms of forgone cash returns. Thus, raising the dividend payout rate before a convertible's conversion value exceeds its call price will lower the probability of eventual conversion, but raising the dividend after a convertible's conversion value exceeds its call price raises the probability that it will be converted soon.
 3. The same arguments as in Part 2 apply to warrants.

- b. An investor who held warrants or convertibles would probably be displeased if the firm raised its payout ratio since the higher payout ratio would lower the prospects for an increase in the firm's stock price. However, if you held bonds convertible into a stock whose market value exceeded its call price and you desired current income, you would probably go ahead and convert. In this case, you might prefer the higher payout ratio.

20-11 The statement is made often. It is not really true, as a convertible's issue price reflects the underlying stock's present price. Further, when the bond is converted, the holder receives shares valued at the then-existing price.

20-12 The convertible bond has an expected return that consists of an interest yield (9%) plus an expected capital gain. We know the expected capital gain must be at least 3%, because the total expected return on the convertible must be at least equal to that on the nonconvertible bond, 12%. In all likelihood, the expected return on the convertible would be higher than that on the straight bond, because a capital gains yield is riskier than an interest yield. The convertible would, therefore, probably be regarded as being riskier than the straight bond, and r_c would exceed r_d . However, the convertible, with its interest yield, would probably be regarded as being less risky than common stock. Therefore, $r_d < r_c < r_s$.

Solutions to End-of-Chapter Problems

- 20-1** If the company purchased the equipment its balance sheet would look like:

Current assets	\$300	Debt	\$500
Fixed assets	<u>600</u>	Equity	<u>400</u>
Total assets	<u>\$900</u>	Total claims	<u>\$900</u>

Therefore, the company's debt ratio = $\$500/\$900 = 55.6\%$.

If the company leases the asset and does not capitalize the lease, its debt ratio = $\$400/\$800 = 50\%$.

The company's financial risk (assuming the implied interest rate on the lease is equivalent to the loan) is no different whether the equipment is leased or purchased.

- 20-2** First issue: 20-year straight bonds with an 8% annual coupon. Second issue: 20-year bonds with 6% annual coupon with warrants. Both bonds issued at par \$1,000. Value of warrants = ?

First issue: $N = 20$; $PV = -1000$, $PMT = 80$, $FV = 1000$ and solve for $I/YR = r_d = 8\%$. (Since it sold for par, we should know that $r_d = 8\%$.)

Second issue: $\$1,000 = \text{Bond} + \text{Warrants}$.

This bond should be evaluated at 8% (since we know the first issue sold at par) to determine its present value. Then, the value of the warrants can be determined as the difference between \$1,000 and the bond's present value.

$N = 20$; $I/YR = r_d = 8$; $PMT = 60$, $FV = 1000$, and solve for $PV = \$803.64$.

Value of warrants = $\$1,000 - \$803.64 = \$196.36$.

- 20-3** Convertible bond's par value = \$1,000; Conversion price, $P_c = \$40$; CR = ?

$$CR = \frac{\text{Par Value}}{P_c} = \frac{\$1,000}{\$40} = 25 \text{ shares.}$$

- 20-4 a.** McDaniel-Edwards balance sheet (thousands of dollars):

		Debt	\$400
		Equity	<u>200</u>
Total assets	<u>\$600</u>	Total liabilities and equity	<u>\$600</u>

Debt/assets ratio = $\$400/\$600 = 67\%$.

Jordan-Hocking balance sheet (thousands of dollars); lease not capitalized:

		Debt	\$200
		Equity	<u>200</u>
Total assets	<u>\$400</u>	Total liabilities and equity	<u>\$400</u>

Debt/assets ratio = $\$200/\$400 = 50\%$.

b. Balance sheet after lease is capitalized:

Jordan-Hocking balance sheet (thousands of dollars):

Assets	\$400	Debt	\$200
Value of leased asset	200	PV of lease payments	200
		Equity	200
Total assets	<u>\$600</u>	Total liabilities and equity	<u>\$600</u>

Debt/assets ratio = $\$400/\$600 = 67\%$.

- c.** Perhaps. Net income, as reported, might well be less under leasing because the lease payment might be larger than the interest expense plus reported depreciation. Additionally, total assets are significantly less under leasing without capitalization. The net result is difficult to predict, but we can state positively that both ROA and ROE are affected by the choice of financing.

20-5 a.

		Year				
		0	1	2	3	4
I.	Cost of owning:					
	Net purchase price	(\$1,500,000)				
	Depr. tax savings ^a		\$198,000	\$270,000	\$ 90,000	\$ 42,000
	Cash flow	<u>(\$1,500,000)</u>	<u>\$198,000</u>	<u>\$270,000</u>	<u>\$ 90,000</u>	<u>\$ 42,000</u>
	PV cost of owning at 9%	(\$ 991,845)				
II.	Cost of leasing:					
	Lease payment (AT)		(240,000)	(240,000)	(240,000)	(240,000)
	Purch. option price ^b					(250,000)
	Cash flow	<u>\$ 0</u>	<u>(\$240,000)</u>	<u>(\$240,000)</u>	<u>(\$240,000)</u>	<u>(\$490,000)</u>
	PV cost of leasing at 9%	(\$ 954,639)				
III.	Cost comparison:					
	Net advantage to leasing (NAL)	= PV cost of owning – PV cost of leasing				
		= \$991,845 – \$954,639				
		= \$37,206.				

^a Cost of new machinery: \$1,500,000.

Year	MACRS		Deprec. Tax Savings T(Depreciation)
	Allowance Factor	Depreciation	
1	0.33	\$495,000	\$198,000
2	0.45	675,000	270,000
3	0.15	225,000	90,000
4	0.07	105,000	42,000

^b Cost of purchasing the machinery after the lease expires.

Note that the maintenance expense is excluded from the analysis since Morris-Meyer will have to bear the cost whether it buys or leases the machinery. Since the cost of leasing the machinery is less than the cost of owning it, Morris-Meyer should lease the equipment.

- b. We assume that Morris-Meyer will buy the equipment at the end of 4 years if the lease plan is used; hence the \$250,000 is an added cost under leasing. We discounted it at 9%, but it is risky, so should we use a higher rate? If we do, leasing looks even better. However, it really makes more sense in this instance to use a lower rate so as to penalize the lease decision, because the residual value uncertainty increases the uncertainty of operations under the lease alternative. In general, for risk-averse decision makers, it makes intuitive sense to discount riskier future inflows at a higher rate, but risky future outflows at a lower rate. (Note that if Morris-Meyer did not plan to continue using the equipment, then the \$250,000 salvage value (less taxes) should be a positive (inflow) value in the cost of owning analysis. In this case, it would be appropriate to use a higher discount rate.) The cash flows for borrowing and leasing, except for the residual value cash flow, are relatively certain because they're fixed by contract, and thus, are not very risky.

20-6 a. Exercise value = Current price – Striking price.

$P_s = \$18$: Exercise value = $-\$3$ which is considered $\$0$.

$P_s = \$21$: Exercise value = $\$0$.

$P_s = \$25$: Exercise value = $\$4$.

$P_s = \$70$: Exercise value = $\$49$.

- b. No precise answers are possible, but some "reasonable" warrant prices are as follows:

$P_s = \$18$: Warrant = $\$1.50$; Premium = $\$4.50$.

$P_s = \$21$: Warrant = $\$3.00$; Premium = $\$3.00$.

$P_s = \$25$: Warrant = $\$5.50$; Premium = $\$1.50$.

$P_s = \$70$: Warrant = $\$50.00$; Premium = $\$1.00$.

- c.
1. The longer the life, the higher the warrant value.
 2. The less variable the stock price, the lower the warrant value.
 3. The higher the expected EPS growth rate, the higher the warrant price.
 4. Going from a 0 to 100% payout would have two possible effects. First, it might affect the stock price causing a change in the exercise value of the warrant; however, it is not at all clear that the stock price would change, let alone what the change would be. Second, and more important here, the increase in the payout ratio would drastically lower the expected growth rate. This would reduce the chance of the stock's price increasing in the future. This would lower the expected value of the warrant, hence lower the premium and the price of the warrant.

- d. $V_{\text{package}} = \$1,000$

$$= \text{Straight debt value of the bond} + \text{Value of the warrants}$$

$$= V_B + 50(\$1.50).$$

$$\$1,000 = V_B + \$75$$

$$V_B = \$1,000 - \$75$$

$$V_B = \$925.$$

Using a financial calculator, input the following: $N = 20$, $I/YR = 10$, $PV = -925$, $FV = 1000$, $PMT = ?$ $PMT = \$91.19 \approx \90 . Consequently, the coupon interest rate = $\$90/\$1,000 = 9\%$.

- 20-7 a.** Investment bankers sometimes use the rule of thumb that, to serve as a sweetener, the premium over the present price should be in the range between 20% and 30%. Since the stock has an indicated growth in earnings of 10% a year, a good argument could be made for setting the premium near the midpoint of the range, that is, 25%. A 25% premium results in a conversion price of $\$21(1.25) = \26.25 . There has been heavy use of 20% to 30% premiums in recent years.
- b.** Yes, to be able to force conversion if the market price rises above the call price. If, in fact, EPS rises to \$2.42 in 2017, and the P/E ratio remains at 14 \times , the stock price will go to \$33.88, making forced conversion possible. However, potential investors will insist on call protection for at least 5 and possibly for 10 years.

20-8 a.

	0	1	2	3	4
		6%			
Net purchase price	(250,000)				
Depr'n tax savings ^a		20,000	32,000	19,000	12,000
Maintenance (AT)		(12,000)	(12,000)	(12,000)	(12,000)
Salvage value					42,500
Cash flow	(250,000)	8,000	20,000	7,000	42,500

PV cost of owning at 6% = -\$185,112.

Notes:

- There is no tax associated with the loom's salvage value since salvage value equals book value.
- The appropriate discount rate is the after-tax cost of debt = $r_d(1 - T) = 10\%(1 - 0.4) = 6\%$.

^a Depreciation tax savings are calculated as follows:

Year	MACRS Allowance Factor	*Depreciation Expense	End of Year Book Value	Depreciation Tax Savings
1	0.20	\$50,000	\$200,000	\$20,000
2	0.32	80,000	120,000	32,000
3	0.19	47,500	72,500	19,000
4	0.12	30,000	42,500	12,000

*Note that the loom's depreciable basis is \$250,000.

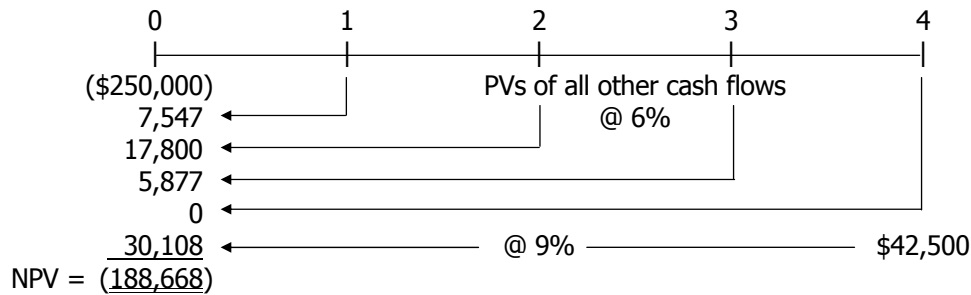
The cost of leasing can be placed on a time line as follows:

	0	1	2	3	4
		6%			
Lease payment (AT)	-42,000	-42,000	-42,000	-42,000	-42,000

PV at 6% = -\$187,534.

Thus, the present value of the cost of owning is $\$187,534 - \$185,112 = \$2,422$ less than the present value of the cost of leasing. Tanner-Woods Textile should purchase the loom.

- b. Here we merely discount all cash flows in the cost of owning analysis at 6% except the salvage value cash flow, which we discount at 9%, the after-tax discount rate $[15\%(1 - 0.4)]$:



When differential risk is considered, the cost of owning is now higher than the \$187,534 cost of leasing; thus, the firm should lease the loom.

- c. This merely shifts the salvage value cash flow from the cost of owning analysis to the cost of leasing analysis. If Tanner-Woods Textile needed the loom after four years, it would have it if the loom were purchased, but would have to buy it if the loom were leased. The decision would remain the same. If differential salvage value risk is not considered, the loom should be purchased. In fact, the advantage to purchasing would be exactly the same.

20-9 a. Howe Computer Company balance sheet:

Alternative 1:

		Total current liabilities	\$ 50,000
		Long-term debt	—
		Common stock, par \$1	75,000
		Paid-in capital	225,000
		Retained earnings	25,000
Total assets	<u>\$375,000</u>	Total liabilities and equity	<u>\$375,000</u>

Alternative 2:

		Total current liabilities	\$ 50,000
		Long-term debt	—
		Common stock, par \$1	70,000
		Paid-in capital	230,000
		Retained earnings	25,000
Total assets	<u>\$375,000</u>	Total liabilities and equity	<u>\$375,000</u>

Alternative 3:

		Total current liabilities	\$ 50,000
		Long-term debt (10%)	250,000
		Common stock, par \$1	70,000
		Paid-in capital	230,000
		Retained earnings	25,000
Total assets	<u>\$625,000</u>	Total liabilities and equity	<u>\$625,000</u>

b.		Original	Plan 1	Plan 2	Plan 3
Number of Keith Howe's shares		40,000	40,000	40,000	40,000
Total shares		50,000	75,000	70,000	70,000
Percent ownership		<u>80%</u>	<u>53%</u>	<u>57%</u>	<u>57%</u>

	Original	Plan 1	Plan 2	Plan 3
c. Total assets	\$275,000	\$375,000	\$375,000	\$625,000
EBIT	\$ 55,000	\$ 75,000	\$ 75,000	\$125,000
Interest	<u>15,000</u>	<u>0</u>	<u>0</u>	<u>25,000</u>
EBT	\$ 40,000	\$ 75,000	\$ 75,000	\$100,000
Taxes (40%)	<u>16,000</u>	<u>30,000</u>	<u>30,000</u>	<u>40,000</u>
Net income	<u>\$ 24,000</u>	<u>\$ 45,000</u>	<u>\$ 45,000</u>	<u>\$ 60,000</u>
Number of shares	50,000	75,000	70,000	70,000
Earnings per share	<u>\$0.48</u>	<u>\$0.60</u>	<u>\$0.64</u>	<u>\$0.86</u>
d. Total debt	\$200,000	\$ 50,000	\$ 50,000	\$300,000
Debt/assets ratio	<u>73%</u>	<u>13%</u>	<u>13%</u>	<u>48%</u>

- e.** Alternative 1 results in the lowest percentage ownership, but Keith Howe would still maintain control. Indicated earnings per share increases, and the debt ratio is reduced considerably (by 60%). Alternative 2 also results in maintenance of control (57%) for Keith Howe. Earnings per share increases, while a reduction in the debt ratio like that in Alternative 1 occurs. Under Alternative 3 there is also maintenance of control (57%) for Keith Howe. This plan results in the highest earnings per share (86 cents), which is an increase of 79% on the original earnings per share. The debt ratio is reduced to 48%.

Conclusions: If the assumptions of the problem are borne out in fact, Alternative 1 is inferior to 2, since earnings per share increases more in the latter. The debt-to-assets ratio (after conversion) is the same in both cases. Thus, the analysis must center on the choice between 2 and 3. The differences between these two alternatives, which are illustrated in Parts c and d, are that the increase in earnings per share is substantially greater under Alternative 3, but so is the debt ratio. With its low debt ratio (13%), the firm is in a good position for future growth under 2. However, the 48% ratio under 3 is not unbearable and is a great improvement over the original situation. The combination of increased earnings per share and reduced debt ratios indicates favorable stock price movements in both cases, particularly under Alternative 3. There is the remote chance that Howe could lose its commercial bank financing under 3, since it was the bank that initiated the permanent financing suggestion. The additional funds, especially under 3, may enable Howe to become more current on its trade credit. Also, the bonds will doubtless be subordinated debentures. Both Alternative 2 and Alternative 3 are favorable alternatives, with 3 being slightly more attractive, if Howe is willing to assume the risk of higher leverage. The actual attractiveness of Alternative 3 depends, of course, on the assumption that funds can be invested to yield 20%. It is this fact that makes the additional leverage favorable and raises the earnings per share. (Note that Alternatives 2 and 3 also assume that convertibles will be converted and warrants will be exercised; this involves uncertainty plus a time lag!)

20-10 Facts and analysis in the problem:

$$r_d = 12\%; D_0 = \$2.46; g = 8\%; P_0 = \$38.$$

$$r_s = D_1/P_0 + g = \$2.66/\$38.00 + 8\% = 15\%.$$

Convertible: Par = \$1,000, 20-year; Coupon = 10%; CR = 20 shares.

Call = Five-year deferment; Call price = \$1,075 in Year 6, declines by \$5 per year.

Will be called when $C_t = 1.2(\text{Par}) = \$1,200$.

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Answers and Solutions 547

Find N (number of years) to anticipated call/conversion:

$$\begin{aligned}(P_0)(CR)(1+g)^N &= \$1,200 \\ (\$38)(20)(1+0.08)^N &= \$1,200 \\ (\$760)(1.08)^N &= \$1,200.\end{aligned}$$

Using a financial calculator, input the following:

I/YR = 8, PV = -760, PMT = 0, FV = 1200, N = ? N = 5.93 \approx 6.

Straight-debt value of the convertible at t = 0: (Assumes annual payment of coupon)

Using a financial calculator, input the following:

N = 20, I/YR = 12, PMT = 100, FV = 1000, PV = ? PV = \$850.61 \approx \$851.

PV at t = 5 (N = 15): \$864. PV at t = 10 (N = 10): \$887.

PV at t = 15 (N = 5): \$928. PV at t = 20 (N = 0): \$1,000.

Conversion value:

$C_t = P_0(1.08)^N(20)$. $C_0 = \$38(20) = \760 . $C_5 = \$38(1.08)^5(20) = \$1,117$.

$C_6 = \$38(1.08)^6(20) = \$1,206$. $C_{10} = \$38(1.08)^{10}(20) = \$1,641$.

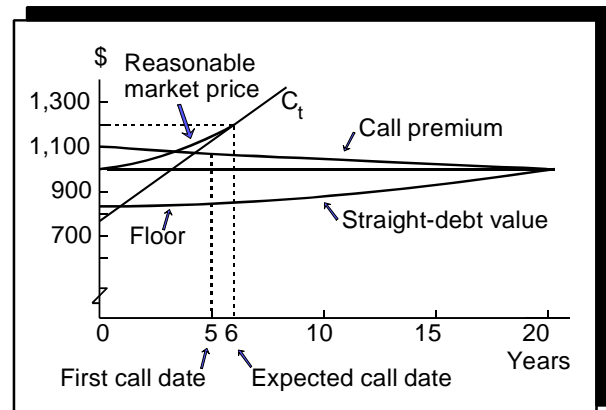
a. See the graph to the right.

b. $P_2 = \$38(1.08)^2 = \44.32 = Price of stock just before change in growth expectation. $P_3 = \$2.87/0.15 = \19.13 = Price of stock after changed growth expectations. Percentage decline in stock price = 57%.

Assuming zero future growth, the value of the stock will not increase, and the value of the convertible will depend only upon its value as a straight bond. Since the firm's interest payments are relatively low compared to what they would have been had straight debt been issued originally, the firm is unlikely to call the bond issue. Therefore, it would be valued according to its coupon, the current market rate on debt of that risk, and years remaining to maturity (18):

$$V_{\text{Bond}} = \sum_{t=1}^{18} \frac{\$100}{(1.12)^t} + \frac{\$1,000}{(1.12)^{18}} = \$855.$$

Prior to the change in expected growth from 8% to 0%, the market value would have been above the straight-bond value: According to the graph, the bond would sell for about \$1,025. Thus, there would be a percentage decline of 17% in the value of the convertible, about one-third the 57% loss on the stock.



Comprehensive/Spreadsheet Problems

Note to Instructors:

The solution for Part a of Problem 20-11 is provided at the back of the text; however, the solutions to the other parts are not. Instructors can access the *Excel* file on the textbook's web site or the Instructor's Resource CD.

20-11 a. First, we want to lay out all of the input data in the problem.

INPUT DATA

Invoice Price	\$250,000
Length of loan	4
Loan Interest rate	10%
Maintenance fee	\$20,000
Tax Rate	40%
Lease fee	\$70,000
Equipment expected life	8
Expected salvage value	\$0
Market value after 4 years	\$42,500
Book value after 4 years	\$42,500

Before proceeding with our NPV analysis we must determine the schedule of depreciation charges for this new equipment.

MACRS 5-year Depreciation Schedule

Year	1	2	3	4	5	6
Depr. Rate	20%	32%	19%	12%	11%	6%
Depr. Exp.	\$50,000	\$80,000	\$47,500	\$30,000	\$27,500	\$15,000

We can now construct our table of incremental cash flows from these two alternatives. Remember, that the appropriate discount rate in this scenario is the after tax cost of borrowing, or $10\% \times (1 - 40\%) = 6\%$.

NPV LEASE ANALYSIS OF INCREMENTAL CASH FLOWS

	0	1	2	3	4
<i>Cost of ownership</i>					
Net invoice price	(\$250,000)				
Maintenance cost		(\$20,000)	(\$20,000)	(\$20,000)	(\$20,000)
Tax savings from maintenance cost		\$8,000	\$8,000	\$8,000	\$8,000
Tax savings from depreciation		\$20,000	\$32,000	\$19,000	\$12,000
Salvage value					\$42,500
Cash flow from ownership	(\$250,000)	\$8,000	\$20,000	\$7,000	\$42,500
PV cost of ownership	(\$185,112)				
<i>Cost of leasing</i>					
Lease payment	(\$70,000)	(\$70,000)	(\$70,000)	(\$70,000)	(\$70,000)
Tax savings from lease payment	\$28,000	\$28,000	\$28,000	\$28,000	\$28,000
Cash flow from leasing	(\$42,000)	(\$42,000)	(\$42,000)	(\$42,000)	(\$42,000)
PV cost of leasing	(\$187,534)				
<i>Cost Comparison</i>					
PV ownership cost @ 6%	(\$185,112)				
PV of leasing @ 6%	(\$187,534)				
Net Advantage to Leasing	(\$2,423)				

Our NPV analysis has told us that there is a negative advantage to leasing. We interpret that as an indication that the firm should forego the opportunity to lease and buy the new equipment.

- b. All cash flows would remain unchanged except the salvage value. Our new array of cash flows would resemble the following:

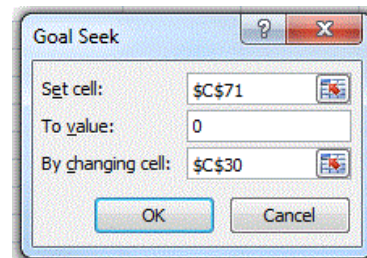
Standard discount rate	10%					
Salvage value rate	15%					
Year =	0	1	2	3	4	4
Cash flow	(\$250,000)	\$8,000	\$20,000	\$7,000	\$0	\$42,500
PV of cash flow	(\$250,000)	\$7,547	\$17,800	\$5,877	\$0	\$30,108

NPV of ownership	(\$188,667)
<i>New Cost Comparison</i>	
PV ownership cost @ 6%	(\$188,667)
PV of leasing @ 6%	(\$187,534)
Net Advantage to Leasing	\$1,133

Under this new assumption of using a greater cost of capital for the salvage value, we find that the firm should lease, and not buy, the equipment.

- c. We will use Excel's Goal Seek function to determine the cost of capital when the NPVs of the leasing and purchasing alternatives are equal.

Crossover = 10.787%



- 20-12 a. The value of the 9% coupon bonds, evaluated at 12%, can be found as follows:

$N = 20$; $I/YR = 12$; $PMT = 90$; and $FV = 1000$. Solve for $PV = \$775.92$.

If investors are willing to pay \$1,000 for these bonds with warrants attached, then the value of the warrants must be $\$1,000 - \$775.92 = \$224.08$. Since there are 20 warrants issued with each bond, the value per warrant must be $\$224.08/20 = \11.20 .

- b. The firm's current market value of equity is $\$25 \times 10$ million shares = \$250 million. Combined with a \$100 million bond issue ($\$1,000 \times 100,000$ bonds), the firm's current total value is \$350 million. The firm's operations and investments are expected to grow at a constant rate of 11.4%. Hence, the expected total value of the firm in 10 years is:

Total firm value ($t = 10$) = $\$350,000,000 \times (1.114)^{10}$
 Total firm value ($t = 10$) = \$1,030,196,222.

With 10 years left to maturity, each of the 100,000 bonds will be worth;

$N = 10$; $I/YR = 12$; $PMT = 90$; and $FV = 1000$. Solve for $PV = \$830.49$.

Thus, the total value of debt would be $830.49 \times 100,000 = \$83,049,331$. Hence, the value of equity would be $\$1,030,196,222 - \$83,049,331 = \$947,146,891$. If no warrants were issued, there would still be 10 million shares outstanding, which would each have a value of \$94.71.

With warrants being issued and exercised, there would be 20 warrants exercised for each of the 100,000 bonds, resulting in 2 million new shares. Therefore, there will be 12 million shares outstanding if the warrants are exercised, and an additional \$60 million of equity (2 million warrants \times \$30 exercise price). The value of each share of stock would be $(\$947,146,891 + \$60,000,000)/12,000,000 = \83.93 .

The investors would be expected to receive \$90 per year and \$1,000 in Year 20 (the face value). In addition, if warrants are exercised then the investors will receive a profit of $\$83.93 - \$30.00 = \$53.93$ per share, or a total cash flow of \$1,078.60 ($\53.93×20) in Year 10. Therefore, in Year 10 investors will receive $\$90 + \$1,078.60 = \$1,168.60$. Hence, the component cost of these bonds can be found by determining the IRR of a cash flow stream consisting of each coupon payment, the face value, and the profit from exercising the warrants.

Input $CF_0 = -1000$, $CF_{1-9} = 90$, $CF_{10} = 1168.60$, $CF_{11-19} = 90$, and $CF_{20} = 1090$. Solve for IRR = 13.46%.

The component cost is 13.46%, and the premium associated with the warrants is $13.46\% - 12\% = 1.46\%$, or roughly 146 basis points.

Integrated Case

20-13

Fish & Chips Inc., Part I ***Lease Analysis***

Martha Millon, financial manager for Fish & Chips Inc., has been asked to perform a lease-versus-buy analysis on a new computer system. The computer costs \$1,200,000; and if it is purchased, Fish & Chips could obtain a term loan for the full amount at a 10% cost. The loan would be amortized over the 4-year life of the computer, with payments made at the end of each year. The computer is classified as special purpose; hence, it falls into the MACRS 3-year class. The applicable MACRS rates are 33%, 45%, 15%, and 7%.

If the computer is purchased, a maintenance contract must be obtained at a cost of \$25,000, payable at the beginning of each year. After 4 years, the computer will be sold. Millon's best estimate of its residual value at that time is \$125,000. Because technology is changing rapidly, however, the residual value is uncertain.

As an alternative, National Leasing is willing to write a 4-year lease on the computer, including maintenance, for payments of \$340,000 at the beginning of each year. Fish & Chips' marginal federal-plus-state tax rate is 40%. Help Millon conduct her analysis by answering the following questions.

<p>A. (1) Why is leasing sometimes referred to as "off-balance-sheet" financing?</p>

Answer: [Show S20-1 and S20-2 here.] If an asset is purchased, it must be shown on the left-hand side of the balance sheet, with an offsetting debt or equity entry on the right-hand side. However, if an asset is leased, and if the lease is not classified as a capital lease, then it does not have to be shown directly on the balance sheet, but,

rather, must only be reported in the footnotes to the company's financial statements.

A. (2) What is the difference between a capital lease and an operating lease?

Answer: Capital leases are differentiated from operating leases in three respects: (1) they do not provide for maintenance service, (2) they are not cancelable, and (3) they are fully amortized. (That is, the lessor receives rental payments that are equal to the full price of the leased asset plus a return on the investment.)

A. (3) What effect does leasing have on a firm's capital structure?

Answer: Leasing is a substitute for debt financing—lease payments, like debt payments, are contractual obligations that if not met will force the firm into bankruptcy. Thus, leasing uses up a firm's debt capacity. To illustrate, if Fish & Chips' optimal capital structure is 50% debt and 50% equity, and if the firm leases half its assets, then the other half should be financed by common equity.

B. (1) What is Fish & Chips' present value cost of owning the computer? (Hint: Set up a table whose bottom line is a "time line" that shows the cash flows over the period $t = 0$ to $t = 4$. Then find the PV of these cash flows, or the PV cost of owning.)

Answer: [Show S20-3 through S20-7 here.] In order to determine the cost of owning, it is first necessary to construct a depreciation schedule. This schedule is given below.

Depreciation schedule: depreciable basis = \$1,200,000.

Year	MACRS Rate	Depreciation Expense	End-of-Year Book Value
1	0.33	\$ 396,000	\$804,000
2	0.45	540,000	264,000
3	0.15	180,000	84,000
4	<u>0.07</u>	<u>84,000</u>	0
	<u>1.00</u>	<u>\$1,200,000</u>	

The costs associated with owning are laid out on a time line below:

Cost of owning time line:

	0	1	2	3	4
	<div style="text-align: center;"> -----6%----- ----- ----- ----- </div>				
Cost of asset	(1,200,000)				
Dep. tax savings*		158,400	216,000	72,000	33,600
Maintenance (AT)	(15,000)	(15,000)	(15,000)	(15,000)	
Residual value (AT)**					<u>75,000</u>
Cash flow	<u>(1,215,000)</u>	<u>143,400</u>	<u>201,000</u>	<u>57,000</u>	<u>108,600</u>

PV cost of owning (@ 6%) = -\$766,948.

*Depreciation is a tax-deductible expense, so it produces a tax savings of $T(\text{Depreciation})$. For example, the savings in Year 1 is $0.4(\$396,000) = \$158,400$.

**The book value is \$0, so taxes must be paid on the full \$125,000 salvage value, leaving $\$125,000(1 - T) = \$75,000$.

B. (2) Explain the rationale for the discount rate you used to find the PV.

Answer: The discount rate used depends on the riskiness of the cash flow stream and the general level of interest rates. The cost of owning cash flows, except for the residual value, is fixed by contract, and hence not very risky. In fact, they have about the same risk as the firm's debt flows, which are also contractual in nature. Further,

leasing uses up debt capacity, and thus has the same impact on the firm's financial risk as does debt financing. Thus, the appropriate interest rate is Fish & Chips' cost of debt, and since the flows are after-tax flows, the rate is the after-tax cost of debt. Fish & Chips' before-tax debt cost is 10%, and since the firm is in the 40% tax bracket, its after-tax cost of debt is $10.0\%(1 - 0.40) = 6.0\%$.

C. (1) What is Fish & Chips' present value cost of leasing the computer? (Hint: Again, construct a time line.)

Answer: [Show S20-8 here.] If Fish & Chips leases the system, its only cash flow would be its lease payment, as shown below:

	0	1	2	3
		6%		
Lease payment (AT)	(204,000)	(204,000)	(204,000)	(204,000)

PV cost of leasing (@ 6%) = -\$749,294.

C. (2) What is the net advantage to leasing? Does your analysis indicate that the firm should buy or lease the computer? Explain.

Answer: [Show S20-9 here.] The net advantage to leasing (NAL) is \$17,654:

$$\begin{aligned}\text{NAL} &= \text{PV cost of owning} - \text{PV cost of leasing} \\ &= \$766,948 - \$749,294 = \$17,654.\end{aligned}$$

Since the NAL is positive, Fish & Chips should lease the computer system rather than purchase it. The cost of owning outweighs the cost of leasing.

D. Now assume that Millon believes the computer's residual value could be as low as \$0 or as high as \$250,000, but she stands by \$125,000 as her expected value. She concludes that the residual value is riskier than the other cash flows in the analysis, and she wants to incorporate this differential risk into her analysis. Describe how this can be accomplished. What effect will it have on the lease decision?

Answer: [Show S20-10 here.] To account for increased risk, the rate used to discount the residual value cash flow would be increased, resulting in a lower present value. Since the residual value is an inflow, the lower PV leads to a higher cost of owning. Thus, the greater the risk of the residual value, the higher the cost of owning, and the more attractive leasing becomes. The owner of the asset bears the residual value risk, so leasing passes this risk to the lessor. Of course, the lessor recognizes this, and assets with highly uncertain residual values would carry higher lease payments than assets with relatively certain residual values.

E. Millon knows that her firm has been considering moving its headquarters to a new location, and she is concerned that these plans may come to fruition prior to the expiration of the lease. If the move occurs, the company would obtain new computers; hence, Millon would like to include a cancellation clause in the lease contract. What effect would a cancellation clause have on the risk of the lease?

Answer: [Show S20-11 here.] A cancellation clause would lower the risk of the lease to Fish & Chips, the lessee, because the firm would not be obligated to make the lease payments for the entire term of the

lease. If its situation changes, and the firm no longer needs the computer, or if it wants to change to a more technologically advanced system, then it can terminate the lease.

Conversely, a cancellation clause makes the contract more risky for the lessor. Now the lessor not only bears the residual value risk, but also the uncertainty of when the contract will be terminated. To account for the additional risk, the lessor would increase the annual lease payment. Additionally, the lessor might include clauses that would prohibit cancellation for some period and/or impose a penalty fee for cancellation that might decline over time.

20-14

Fish & Chips Inc., Part II

Preferred Stock, Warrants, and Convertibles

Martha Millon, financial manager of Fish & Chips Inc., is facing a dilemma. The firm was founded 5 years ago to develop a new fast-food concept; and although Fish & Chips has done well, the firm's founder and chairman believes that an industry shake-out is imminent. To survive, the firm must capture market share now, which requires a large infusion of new capital.

Because the stock price may rise rapidly, Millon does not want to issue new common stock. On the other hand, interest rates are currently very high by historical standards; and with the firm's B rating, the interest payments on a new debt issue would be too much to handle if sales took a downturn. Thus, Millon has narrowed her choice to bonds with warrants or convertible bonds. She has asked you to help in the decision process by answering the following questions.

A. How does preferred stock differ from common equity and debt?

Answer: [Show S20-12 here.] Preferred dividends are fixed, but they may be omitted without placing the firm in default. Most preferred stock prohibits the firm from paying common dividends when the preferred is in arrears. Preferred dividends are usually cumulative up to a limit.

B. What is adjustable-rate preferred?

Answer: [Show S20-13 here.] With a floating-rate preferred issue, dividends are indexed to the rate on Treasury securities instead of being fixed. It is an excellent short-term corporate investment because only 30% of the dividends are taxable to corporations and the floating rate generally keeps the issue trading near par. However, if the issuer is risky, the adjustable-rate preferred stock may have too much price instability for the liquid portfolios of many corporate investors.

C. How can a knowledge of call options help a person understand warrants and convertibles?

Answer: [Show S20-14 here.] Warrants and convertibles are types of call options, and hence an understanding of options will help financial managers make decisions regarding warrant and convertible issues.

- D.** One of Millon's alternatives is to issue a bond with warrants attached. Fish & Chips' current stock price is \$10, and the company's investment bankers estimate its cost of 20-year annual coupon debt without warrants to be 12%. The bankers suggest attaching 50 warrants to each bond, with each warrant having an exercise price of \$12.50. It is estimated that each warrant, when detached and traded separately, will have a value of \$1.50.
- D. (1)** What coupon rate should be set on the bond with warrants if the total package is to sell for \$1,000?

Answer: [Show S20-15 through S20-17 here.] If the entire package is to sell for \$1,000, then

$$V_{\text{Package}} = V_{\text{Bond}} + V_{\text{Warrants}} = \$1,000.$$

It is expected that the 50 warrants will be worth \$1.50 each, so

$$V_{\text{warrants}} = 50(\$1.50) = \$75.$$

Thus,

$$V_{\text{Bond}} + \$75 = \$1,000$$

$$V_{\text{Bond}} = \$925.$$

Therefore, the bonds must carry a coupon, INT, such that each bond will sell for \$925. We can solve for $\text{INT} = \text{PMT}$ as follows:

Using a financial calculator enter $N = 20$, $I/\text{YR} = 12$, $PV = -925$, $FV = 1000$, and solve for $\text{INT} = \text{PMT} = \110 .

With an 11% coupon, the bonds would have a value of \$925, and hence the package of one bond plus 50 warrants would be worth \$1,000.

D. (2) Suppose the bonds are issued and the warrants immediately trade for \$2.50 each. What does this imply about the terms of the issue? Did the company “win” or “lose”?

Answer: If the warrants traded immediately for \$2.50, then the 50 warrants would be worth $50(\$2.50) = \125 , and the package would actually be worth $\$925 + \$125 = \$1,050$. Selling something worth \$1,050 for \$1,000 imposes a \$50 per bond cost on Fish & Chips' shareholders, because the package could have been sold with a lower-coupon-rate bond, and hence lower future interest payments. Thus, the company “lost” because the firm is paying more in interest expense than it could have been paying if the bond had been issued with a lower coupon rate.

D. (3) When would you expect the warrants to be exercised?

Answer: In general, a warrant will sell on the open market for a premium above its exercise value. Thus, prior to expiration, investors would sell their warrants in the marketplace rather than exercise them, provided the stock sells at a price over the exercise price.

Some warrants contain exercise price step-up provisions, whereby the exercise price increases in steps over the life of the warrant. Since the value of the warrant falls when the exercise price is increased, step-up provisions encourage holders to exercise their warrants.

Finally, warrant holders will tend to exercise voluntarily if the dividend on the stock becomes high enough. No dividend is earned on a warrant, and high dividends increase the attractiveness of stocks over warrants.

D. (4) Will the warrants bring in additional capital when exercised? If so, how much and what type of capital?

Answer: When exercised, each warrant will bring in the exercise price, or \$12.50 of equity capital, and holders will receive one share of common stock per warrant. Note that the exercise price is typically set at 10% to 30% above the current stock price. High-growth firms would set the exercise price towards the high end of the range, and low-growth firms would set the price towards the bottom end.

D. (5) Because warrants lower the cost of the accompanying debt, shouldn't all debt be issued with warrants? What is the expected cost of the bond with warrants if the warrants are expected to be exercised in 5 years, when Fish & Chips' stock price is expected to be \$17.50? How would you expect the cost of the bond with warrants to compare with the cost of straight debt? With the cost of common stock?

Answer: [Show S20-18 and S20-19 here.] Even though the coupon rate on the debt component is lowered, the overall cost of the issue is higher than straight debt. For investors, some of the return (the debt portion) is contractual in nature, but the rest of the return (the warrant portion) is related to stock price movements, and hence has a cost much higher than debt. The overall risk of the issue, and hence the overall cost, is greater than the cost of debt.

If the warrants are exercised in 5 years, when $P = \$17.50$, then Fish & Chips would be exchanging stock worth \$17.50 for 1 warrant plus \$12.50. Thus, the firm would realize an opportunity cost of \$5 on each warrant. Since each bond has 50 warrants, the total cost per bond would be \$250. Fish & Chips must also make the interest

payments over the bond's 20-year life, as well as repay the principal after 20 years.

Combining these flows, we have the following situation:

0	1	...	4	5	6	...	19	20
1,000	(110)		(110)	(110)	(110)		(110)	(110)
				(250)				(1,000)
				(360)				(1,110)

The IRR of this cash flow stream, 12.93%, is the overall cost of the debt with warrants issued. This cost is higher than the 12% cost of straight debt because, from the investors' standpoint, the issue is riskier than straight debt; however, the bond with warrants is less risky than common stock, so the bond with warrants would have a lower cost than common stock.

E. As an alternative to the bond with warrants, Millon is considering convertible bonds. The firm's investment bankers estimate that Fish & Chips could sell a 20-year, 10% annual coupon, callable convertible bond for its \$1,000 par value, whereas a straight-debt issue would require a 12% coupon. Fish & Chips' current stock price is \$10, its last dividend was \$0.74, and the dividend is expected to grow at a constant rate of 8%. The convertible could be converted into 80 shares of Fish & Chips stock at the owner's option.

(1) What conversion price, P_c , is implied in the convertible's terms?

Answer: [Show S20-20 and S20-21 here.]

$$\begin{aligned}\text{Conversion price} = P_c &= \frac{\text{Par value}}{\text{\# shares received}} \\ &= \frac{\text{Par value}}{\text{CR}} = \frac{\$1,000}{80} = \$12.50.\end{aligned}$$

The conversion price can be thought of as the convertible's exercise price, although it has already been paid. As with warrants, the conversion price is typically set at 20% to 30% above the prevailing stock price.

E. (2) What is the straight-debt value of the convertible? What is the implied value of the convertibility feature?

Answer: [Show S20-22 and S20-23 here.] Since the required rate of return on 20-year straight debt is 12%, the value of a 10% annual coupon bond is \$850.61 as follows:

Using a financial calculator, $N = 20$, $I/YR = 12$, $PMT = 100$, $FV = 1000$, and solve for $PV = \$850.61$.

But the convertible would sell for \$1,000, $PV = 1000$, so the implied value of convertibility is $\$1,000 - \$850.61 = \$149.39$. Since each bond can be converted into 80 shares, the convertibility value is $\$149.39/80 = \1.87 per share.

E. (3) What is the formula for the bond's conversion value in any year? Its value at Year 0? At Year 10?

Answer: [Show S20-24 here.] The conversion value in any year is simply the value of the stock obtained by converting. Since Fish & Chips is a constant growth stock, its price is expected to increase by g each year, and hence $P_t = P_0(1 + g)^t$. The value of converting at any year is $CR(P_t)$ where CR is the number of shares received. Thus, the conversion value in any year is

$$C_t = CR(P_t) = CR(P_0)(1 + g)^t = 80(\$10)(1.08)^t.$$

Year 0: $C_0 = 80(\$10)(1.08)^0 = \$800.$

Year 10: $C_{10} = 80(\$10)(1.08)^{10} = \$1,727.14.$

E. (4) What is meant by the term floor value of a convertible? What is the convertible's expected floor value in Year 0? In Year 10?

Answer: [Show S20-25 here.] The floor value is simply the higher of the straight-debt value and the conversion value. At Year 0, the straight-debt value is \$850.61 while the conversion value is \$800, and hence the floor value is \$850.61. At Year 10, the conversion value of \$1,727.14 is clearly higher than the straight-debt value, and hence the conversion value sets the floor price. The convertible, however, will sell above its floor value at any time prior to maturity, because the convertibility option carries additional value.

E. (5) Assume that Fish & Chips intends to force conversion by calling the bond when its conversion value is 20% above its par value, or at $1.2(\$1,000) = \$1,200$. When is the issue expected to be called? Answer to the closest year.

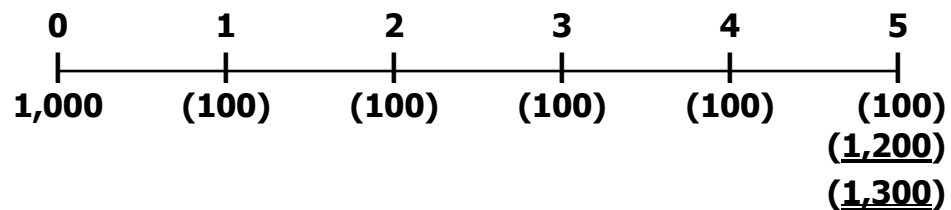
Answer: [Show S20-26 here.] If the issue will be called when the conversion value reaches \$1,200, then

$$\begin{aligned}C_t &= 80(\$10)(1.08)^t = \$1,200 \\ \$800(1.08)^t &= \$1,200 \\ (1.08)^t &= 1.50 \\ t \ln(1.08) &= \ln 1.50 \\ 0.0770t &= 0.4055 \\ t &= 5.27 \text{ years} \approx 5 \text{ years.}\end{aligned}$$

This value can also be found with a financial calculator. Input I/YR = 8; PV = -800; PMT = 0; and FV = 1200. Press N to find N = 5.27 years \approx 5 years.

E. (6) What is the expected cost of the convertible to Fish & Chips? Does this cost appear consistent with the risk of the issue? Assume conversion in Year 5 at a conversion value of \$1,200.

Answer: [Show S20-27 and S20-28 here.] The firm would receive \$1,000 now, pay coupon payments of \$100 for about 5 years, and then issue stock worth \$1,200. The cash flow stream looks like this:



The IRR of this stream, which is the cost of the convertible issue, is 13.08%.

Note that Fish & Chips' cost of straight debt is 12%, while its cost of equity is 16%:

$$r_s = \hat{r}_s = \frac{D_0(1 + g)}{P_0} + g = \frac{\$0.74(1.08)}{\$10} + 8\% = 16\%.$$

The firm's convertible bond has risk that falls between the risk on its debt and equity, and thus a 13.08% cost appears reasonable.

F. Millon believes that the cost of the bond with warrants and the cost of the convertible bond are essentially equal, so her decision must be based on other factors. What are some factors she should consider when making her decision between the two securities?

Answer: [Show S20-29 and S20-30 here.] One factor that Millon should consider is the firm's future need for capital. If Fish & Chips anticipates a continuing need for capital, then warrants may be favored because their exercise brings in additional equity capital

without retirement of the accompanying low-cost debt. Conversely, the convertible issue brings in no new funds at conversion.

Another factor is whether Fish & Chips wants to commit to 20 years of debt at this time. Conversion removes the debt issue, while exercise of warrants does not. Of course if Fish & Chips' stock price does not rise over time, then neither the warrants nor the convertibles would be exercised, and the debt would remain outstanding in both cases.