Practice Quiz 4: Saving and Investing (Solutions)

1. Sally is an avid corporate bond buyer and is looking to purchase some bonds in the secondary market through her broker. She's currently considering an issue from Acme Inc. that promises to pay quarterly coupons of 8% for the next ten years. Interest rates in the economy have fallen since the issue, but the demand for Acme's products has fallen recently and Sally considers them to now be at a higher risk of defaulting. On net, Sally, requires a return of 12% on the bond issue. Will she buy the bond if it is currently selling at a premium? Calculate the price at which Sally will value the bond. If the bond is selling at $850 per $1,000 par, will Sally buy the bond?

Ans. Because Sally's discount rate is much higher than the bond's coupon rate, it is immediately obvious that Sally will not buy the bond at a premium, but instead will demand a discount.

For every $1,000 par, the bond will pay 8%*$1,000 = $80 in coupons each year. Because the bond pays quarterly coupons, each coupon will be $80/4 = $20 per quarter for the next ten years. To price the bond, per $1,000 par, each cash flow must be discounted by Sally's discount rate of 12%. This can be done using a financial calculator:

Time Value of Money	
P/Y	4
PMT	$20
FV	$1,000
N	40
I/Y	12%
PV=	-$768.85

Sally will price the bond at $768.85 per $1,000 par. If the bond is selling for $850 per $1,000 par, Sally will not achieve her 12% required rate of return from purchasing this bond, and so will choose not to do so.

2. The bond of Acme Inc. in the problem above that pays quarterly coupons of 8% for the next ten years is indeed currently selling at $850 per $1,000 par. Is the bond selling at par, a discount, or a premium? Without performing any calculations, determine whether the current yield-to-maturity on this issue is above or below the coupon rate of 8%. Calculate the yield-to-maturity of this issue.

Ans. Because the bond is selling at less than $1,000 per $1,000 par, the bond is selling at a discount. Therefore, the yield-to-maturity on the bond must be above the coupon rate of 8%. The yield to maturity can be found by first calculating the quarterly interest rate:

Time Value of Money	
P/Y	4
PV	-$850
PMT	$20
FV	$1,000
N	40
I/Y	10.43%

As predicted, this is greater than the bond's coupon rate of 8%.

Note that this is less than Sally's required return of 12% in the problem above, which is why she will not pay $850 for the bond.

3. Two years ago, Allison started her own dry-cleaning business. She put up $25,000 of her own savings, collected investments totaling $20,000 from friends and family, and financed the remainder with a bank loan. At incorporation, she split ownership of the company into 4,500 shares. How many shares did Allison receive and how many went to her friends and family? This year, Allison's dry-cleaning business generated net profits of $7,500. She reinvests $1,875 of these profits and distributes the remaining $5,625 as dividends. What is the dividend per share? If Allison has neither sold nor purchased any new shares over the past two years, how much will she receive in dividends?

Ans. Because the company was funded with $45,000 in capital, the original price per share was $45,000/4,500 = $10. Allison therefore received $25,000/$10 = 2,500 shares, and her friends and family received the remaining 2,000.

The divided per share in the second year was $5,625/4,500 = $1.25. Allison, therefore, received dividends of $1.25*2,500 = $3,125.

4. Last year, Acme Inc. paid dividends of $20 per share. Value the company using a discount rate of 15% assuming constant dividends. Value the company using the same discount rate of 15% assuming that dividends grow by 4% per year.

Ans. Assuming constant dividends, the company can be valued using the constant dividend model:

$$P = \frac{D}{r} = \frac{\$20}{0.15} = \$133.33$$

If dividends are assumed to grow by 4% per year, the Gordon Growth Model may be applied:

$$P = \frac{D_0(1+g)}{r-g} = \frac{\$20(1.04)}{0.15 - 0.04} = \$189.09$$

5. Last year, Bubble Co. earned profits of $10 per share, but reinvested all of those profits. Analysts from a popular brokerage conclude that Bubble Co. can earn an average annualized return of 20% on its investment for the next ten years. Using a discount rate of 15%, price Bubble Co. stock assuming no dividends over the next ten years, during which profits grow by 20% per year, and constant dividends equal to all of the company's profits thereafter. Compare this to the price per share if, instead of reinvesting its profits, Bubble Co. paid out constant dividends equal to today's profits of $10 per share using a discount rate of 15%. What if instead the reinvested profits had grown at 10% per year?

Ans. If profits grow at an average rate of 20% per year for ten years, the profit per share in ten years will be:

$$\$10 * 1.20^{10} = \$61.92$$

If all of the profits are paid out as dividends thereafter, and dividends are then constant, the price per share in ten years can be calculated using the constant dividend model:

$$P_{10} = \frac{D}{r} = \frac{\$61.92}{0.15} = \$412.80$$

Discounted back to today, this implies a price today of:

$$P = \frac{P_{10}}{(1+r)^T} = \frac{\$412.80}{(1.15)^{10}} = \$102.04$$

This can be compared to the price if the company does not reinvest its $10 profits and instead pays out all profits as dividends, which will then be constant. Using a discount rate of 15%:

$$P = \frac{\$10}{0.15} = \$66.67$$

Therefore, the shares will be more valuable if the company reinvests the profits at 20% for the first ten years. This is because the 20% growth is greater than the 15% return investors require.

If instead, the company was only able to earn only 10% on its reinvested profits, the price per share would be:

$$P = \frac{P_{10}}{(1+r)^T}$$

$$P_{10} = \frac{D}{R} = \frac{D_0(1+g)^T}{R} = \frac{\$10(1.10)^{10}}{.15} = 172.92$$

$$P = \frac{172.92}{(1+.15)^{10}} = 42.74$$

Because the profit growth in this case is less than the required return by its investors, it is better for the company to return the profits to its shareholders as dividends.