Practice Quiz 11: Risk, Leverage, and Retirement Planning (Solutions)

1. Discuss the concept of leverage and state the formula for leverage ratio. Explain how leverage relates to both risk and interest.

Ans. Leverage is the use of debt to increase returns. An investment is said to be leveraged if it is partially financed by debt, and one effect of leverage is that it magnifies returns. Leverage is sometimes measured by the leverage ratio, which is the total investment divided by the amount the investor contributes (the investor's equity, or capital):

$$L = \frac{A}{E}$$

A general rule of finance is that increased return cannot be had without increased risk, and a levered return is no exception: leverage magnifies profits, but it also magnifies losses. While leveraging an investment increases the expected return, it also increases the dispersion of the returns, and hence, the risk.

A more explicit cost of leverage is the interest rate charged on the debt. The interest expense associated with debt will reduce an investor's leveraged returns to less than what they otherwise would be. Leverage magnifies not only the return on assets, but also the interest expense. If the interest expense on the debt exceeds the return on assets, leverage reduces the return to lower than what it would be without debt.

2. Discuss life-cycle investing as a retirement strategy.

Ans. Investing in higher-yielding but riskier assets when young and transitioning into more conservative assets as retirement approaches is known as life-cycle investing. Riskier assets, such as stock, have offered and should continue to offer a return premium over long horizons. Young investors with a long investment horizon are better positioned not only to take advantage of this long-term premium, but also to withstand the risks; because they still have a large amount of future earnings, and less accumulated wealth in savings, they can withstand negative shocks. Investors are less able to recover from shocks as they approach and enter retirement and so it's important that they preserve their wealth. This logic suggests investors should invest aggressively when young but transition to more conservative assets as retirement approaches.

3. For her town's annual summer festival, Abbey plans to open a hot dog stand with a $4,000 investment. She contributes $500 of her own money and borrows the remaining $3,500 from her parents (with no interest). If the project returns 6% on the $4,000 investment, what is the return on Abbey's equity?

Ans. Abbey has a leverage ratio of 8:

$$L = \frac{A}{E} = \frac{\$4{,}000}{\$500} = 8$$

Her return on equity is (note that the interest on her debt is zero):

$$R = L * r = 8 * 6\% = 48\%$$

4. Jack invests $80,000 in a start-up, $60,000 of which is borrowed at an interest rate of 12%. If the project returns 20%, what is Jack's return on equity?

Ans. Jack's return on equity is 44%:

$$R = r + \frac{D_0}{E_0}(r - i) = 20\% + \frac{\$60{,}000}{\$20{,}000}(20\% - 12\%) = 44\%$$

5. Calculate the return that would cause Jack's start-up in problem 4 to go insolvent.

Ans. The loss rate, *l*, that would make Jack's start-up go insolvent is 16%:

$$l = \frac{100\%}{L} - \frac{D_0}{A_0} * i = \frac{100\%}{4} - \frac{\$60{,}000}{\$80{,}000} * 12\% = 16\%$$

In other words, if Jack's start-up returns *negative* 16% on the full $80,000 investment, this will completely wipe out Jack's $20,000 in equity.