Course Learning Outcomes for Unit IV

Upon completion of this unit, students should be able to:

4. Apply measures of risk in financial analysis.
   - 4.1 Explain risk-return relationships including decomposing sources and measures of risk.
   - 4.2 Calculate holding period returns.
   - 4.3 Apply two models of risk-return including the capital asset pricing model and portfolio theory.

Reading Assignment

Chapter 7
An Introduction to Risk and Return - History of Financial Market Returns, pp. 190-219

Chapter 8
Risk and Return - Capital Market Theory, pp. 220-251

Unit Lesson

In the last unit, the time value of money concepts highlighted how investments come about over time. For this unit, the discussion will explain how risk and return influence capital costs. Risk and return accounts for why investments have different values depending on their risk. Take the case of Ronald Garner.

Ronald Garner is starting his career and wants to set aside money for retirement. Ronald's dad, Henry Garner, has just retired and wants to keep his retirement so money is available when he needs it. Both Ronald and his dad have a goal of having enough money for retirement, but Ronald has 40 years before he expects to retire, and Henry is at retirement age now.

Because Ronald has 40 years until he retires, he thinks he can take a more gutsy investment strategy, allowing him to invest in securities offering higher returns. Ronald has heard about some new high-tech digital printing companies getting started and wants to invest in them. Although these companies have not yet perfected their product, he believes the company has great potential.

Conversely, Ronald's dad, Henry, wants to not risk losing his invested capital. Henry looks for safer investments with a track record of paying consistent dividends. Henry can keep his portfolio and ensure enough is available for retirement. Henry had a conversation with his son about risk and return explaining higher risk results in higher expected returns. This principle separates father and son in their investment strategies.

Although Ronald has a willingness to take greater risk, he also exposes his portfolio to greater risk. Henry wants to avoid added risk and looks for stability and consistent returns. Expected returns come from returns expected based on expected cash flows from dividends and appreciation realized in the past. Appreciation results from gains resulting from holding an investment. Henry can estimate his holding return by assigning a probability a certain return will result from a given investment and adding any cash return from dividends paid. For example, holding or cash return results from the ending stock price plus any cash dividends minus the beginning stock price.

Henry could also assign probabilities of different economic states that could result like a recession, moderate growth, or strong growth. These estimates, when applied to holding gain, will result in an expected value as follows:

$E(r) = (r_1 \times Pb_1) + (r_2 \times Pb_2) + \ldots + (r_n \times Pb_n)$
where E means expected return; r is rate of return, and Pb is probability.

Henry can further measure risk by calculating variance and standard deviation of his investments. Variance is simply the square of any difference between realized return and expected returns. Squaring the difference removes any negative values measuring differences between realized and expected returns in positive terms. For example, a negative times a negative results in a positive number. Once calculated, Henry needs to apply a probability of occurrence to each investment resulting in the variance.

After calculating variance, Henry can calculate standard deviation (σ) by taking the standard deviation of variance as follows (Titman, Keown, & Martin, 2014, p. 197):

$$\partial = \sqrt{([r_1 - E(r_1)]^2 Pb_1) + ([r_2 - E(r_2)]^2 Pb_2) + \ldots + ([r_n - E(r_n)]^2 Pb_n)}$$

For example, the following table shows how to calculate expected values, variance, and standard deviation:

	Economic Condition	Rate of Return	Chance of Occurrence	Expected Return *E* (r)	Variance
r_n		(r_n)	(Pb_n)	$(r_n \times Pb_n)$	$[r_n - E(r)]^2$
r_1	Recession	-0.04	0.30	-0.01200	0.00078
r_2	Moderate growth	0.10	0.40	0.04000	0.00360
r_3	Strong growth	0.15	0.30	0.04500	0.01103
			1.00		
Expected return $E(r)$				**0.07300**	
Variance $[r_n - E(r)]^2$					**0.01541**
Standard deviation $\partial = \sqrt{[r_n - E(r)]^2}$					**0.12413**

Despite these measures' usefulness in assessing risk exposure, no assurance exists things will go as planned. Under the efficient market theory, markets will reflect varying degrees of information at a given time but not always as quickly as thought. Ronald talked with his dad about different theories of market efficiency, such as the weak, semi-strong, and strong-form models of market efficiency. These theories address the extent to which markets reflect information in security prices. Weak-form efficient markets theory asserts securities reflect all past market information. Semi-strong efficient markets theory says securities reflect all publicly available information. Strong-form market efficiency espouses the idea that securities reflect all public and private information. Behaviorists assume markets are not always rational and market prices do not always reflect all information. Ronald has much to think about after discussing these views with his dad.

Another theory Ronald discussed with his dad is portfolio theory, which showed him he could erase certain risks through diversification because risk for various securities can move in different directions than the market. Henry explained to Ronald, he can remove most market risk by keeping a diversified portfolio. Ronald can calculate portfolio risk using the following formula (Titman, Keown, & Martin, 2014, p. 226):

$$\sigma_{portflio} = \sqrt{W_1^2\sigma_1^2 + W_2^2\sigma_2^2 + 2W_1W_2\rho_{1,2}\sigma_1\sigma_2}$$
where σ stands for standard deviation, W_i stands for a weighting for proportionate share of a portfolio, $\rho_{i,j}$ stands for correlation between rate of return on assets i and j.

Henry explained to Ronald only firm-specific risk (unsystematic risk) does not benefit from diversification because such risk does not stem from market movements but from risk unique to a given firm. Portfolio diversification eliminates market (systematic) risk exposure because investments in different industries do not

all move with the market in the same direction. A diversified portfolio allows an investor to balance risk movements.

Besides portfolio theory, Henry said another way to explain systematic risk is to use the capital asset pricing model (CAPM). CAPM is a simple risk measure explaining how an investment contributes to risk of a market portfolio. A beta coefficient notated by β explains to what extent an investment's returns vary with market risk. Henry expressed CAPM for a portfolio by the following formula (Titman, Keown, & Martin, 2014, p. 237):

$$E(r_j) = r_j + \beta_j\left[(E_{r_m}) - r_j\right]$$

where $E(r_j)$ stands for expected return of an investment, β_j stands for its beta, and (E_{r_m}) stands for expected market return.

Although Henry explained these two models to Ronald, he had to still think about different mixes of investments for his portfolio. Ronald has an interest in an investment with high reward potential, but it comes with a high risk. Ronald needed to balance his portfolio by finding securities to invest in with beta coefficients that run counter to one another to eliminate risk. Henry is in a different position wanting stable returns without taking on any added risk. Steady returns may come from investments in more mature companies with a track record of paying dividends.

In a world where people sky-dive and bungee jump for pleasure, and gambling is a multi-billion dollar business, it is clear that human beings collectively are sometimes attracted to risk and that some are more susceptible to its attraction than others. While psychoanalysts—at the beginning of the twentieth century—considered risk-taking behavior to be a disease, the fact that it is so widespread suggests that it is part of human nature to be attracted to risk, even when there is no rational payoff to being exposed to risk. The seeds, it could be argued, may have been planted in our hunter-gatherer days when survival mandated taking risks and there were no "play it safe" options (New York Stern School of Business, n.d.).

At the same time, there is evidence that human beings try to avoid risk in both physical and financial pursuits. The same person who puts his life at risk climbing mountains may refuse to drive a car without his seat belt on, or to invest in stocks because he considers them to be too risky. Some people are risk takers on small bets but become more risk averse on bets with larger economic consequences. Risk-taking behavior can change as people age, become wealthier, and have families. In general, understanding what risk is and how we deal with it is the first step to effectively managing that risk (New York Stern School of Business, n.d.).

In summary, both risk and return influence securities values. Investors rarely have identical aversion to risk. Some investors prefer a more aggressive strategy with more risk but with an expectation of greater returns. Other investors prefer a stable strategy sacrificing higher returns for less risk. Investors expect returns commensurate with what they risk. Markets have some investors with superior information to others under the behavioral view. Efficient markets assume investors cannot beat the market because market prices reflect information instantaneously. Measures of risk include portfolio theory, which looks at variations from mean returns through measures like variance and standard deviation. Another measure is beta, which is a key component of the capital asset pricing model. Beta measures movement of an investment with or against the market. Most often investors have different views influencing their aversion to risk.

References

New York Stern School of Business. (n.d.). Risk aversion. Retrieved from http://pages.stern.nyu.edu/~adamodar/New_Home_Page/risk/riskaversion.htm

Titman, S., Keown, A. J., & Martin J. D. (2014). *Financial management: Principles and applications* (12th ed.). Upper Saddle River, NJ: Pearson.

Suggested Reading

The following video provides more information and examples of risk, return, and CAPM.

Simon, B. (2013, February 17). *Finance lecture - risk, return and CAPM* [Video file]. Retrieved from https://youtu.be/3BIIiUyr3-w

Learning Activities (Non-Graded)

The following video tutorials will help you with the concepts covered in the textbook chapters. It is strongly encouraged to watch these videos prior to starting the unit assessment.

Click here for Checkpoint 7.1: Calculating WACC
Click here for Checkpoint 7.2: Arithmetic and Geometric Means

Non-graded Learning Activities are provided to aid students in their course of study. You do not have to submit them. If you have questions, contact your instructor for further guidance and information.