

Unit 8

Investing

Lesson 8A:

Managing Risk—Time and Diversification

Rule 8: Grow your wealth safely.

Investing requires three simple steps: (i) saving a portion of your income each year to invest, (ii) letting your investments grow (avoiding withdrawals), and (iii) managing your investment risk. These lessons look at investment options, criteria for evaluating investments (using the PACED decisionmaking model), and strategies for managing investment risk.

Lesson Description

Students are introduced to investment risk—the chance of losing some or all money invested. That is, the actual rate of return on an investment may vary from the projected rate of return and may even be negative. Students investigate the trade-off between the expected rate of return on an investment and the risk. Finally, they play the role of investors in a simulation that shows how time and diversification may lower risk.

Standards and Benchmarks (see page 178)

Grade Level

9-12

Concepts

Diversification
Expected rate of return
Range
Risk
Risk averse

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Compelling Question

How can investors reduce risk?

Objectives

Students will be able to

- define risk,
 - evaluate risk as it applies to investment options, and
 - describe ways of reducing investment risk.
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Materials

- Visual 8A.1: Risk and Return
 - Visual 8A.2: The Impact of Time on Risk
 - Handout 8A.1: Option 1 Cards, four copies cut apart and stacked into four separate sets
 - Handout 8A.2: Option 2 Cards, four copies on colored paper, cut apart, and stacked into four separate sets
 - Handout 8A.3: Assessment, one copy for each student
 - Handout 8A.3: Assessment—Answer Key
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Time required

45 minutes

Procedure

1. Review as necessary the definition and determination of an investment's rate of return. Explain that the rate of return on an investment can vary from year to year. For example, house and commodity prices can vary, interest rates on savings accounts can vary, stock dividends can vary, and so on.
 2. Define the **expected rate of return** on an investment as the weighted average of all possible rates of return, where each possibility is weighted by its chance, or probability, of occurring. Explain that if all possible rates of return the investment can earn are equally likely, then the expected rate of return is just the average of all the possible rates of return.
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3. Display *Visual 8A.1: Risk and Return*. Explain each of the investment options as follows:
 - Investment Option A has only one possible rate of return: 6%.
 - Investment Option B has three possible rates of return that are each equally likely: 5%, 6%, and 7%.
 - Option C has five possible rates of return that again are equally likely: –4% (a negative rate of return), 1%, 6%, 11%, and 16%.
 - The expected rate of return on each of these options is the same: 6%. For example, for Investment Option B, the average of the three possibilities is 6%: $(5\% + 6\% + 7\%)/3 = 18\%/3 = 6\%$.
4. Discuss the following:
 - Since each of these options has the same expected rate of return, would an investor be just as satisfied with any of them? *(If an investor wants a 6 percent rate of return, it is possible that Options B and C could end up with less than that. In fact, Option C could lose money. Lead students toward the understanding that Options B and C are riskier than Option A because their rates of return could be less than 6 percent.)*
5. Define **risk** as the chance of loss. Explain the following:
 - Investments come with risk because the rate of return is not guaranteed.
 - The risk of investing is that the actual rate of return can vary from its expected rate of return and even be negative—you could lose money.
 - One simple measure of variation in risk is the range (or spread) of the possible outcomes. The **range** is the difference between the largest possible return and the smallest possible return. For example, for Option B, the range is 2% (7% – 5%).
6. Discuss the following:
 - What is the range for Options A and C? *(For Option A it is zero; for Option C it is 20%.)*
7. Explain that Option A has no risk because there is only one possible outcome—therefore the range is zero. The investor is certain to earn a 6% rate of return. However, with Option C the investor could earn as much as 16% but could also lose as much as 4%. Thus, Option C is riskier—it has a larger range than Options A or B.
8. Ask students to choose their preferred investment option on Visual 8A.1 by raising their hands. Call out each option and tally the results. *(Answers will vary. Students often select the riskier options because they tend to be greater risk-takers than the general population and because they realize it is a hypothetical situation with no real losses.)*

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9. Explain that since these options all have the same expected return, but different amounts of risk, the option an investor chooses will depend on how the investor feels about risk. Generally, investors tend to be **risk averse**, which means they would rather avoid or lower the risk of loss. Thus, most investors would choose Option A or Option B. Discuss the following:
- Since risk-averse investors would view risk as a negative aspect of an investment, what positive aspect of an investment might offset this cost and make a risky investment more attractive? (*A higher expected rate of return*)
10. Explain the following:
- There is often a trade-off between investment risk and the rate of return.
 - Investments with greater risk usually have higher expected rates of return. For example, as the risk a company will default on its bonds rises, it must pay higher interest rates on its bonds to induce investors to buy them.
 - Conversely, U.S. Treasury and savings bonds tend to have lower interest rates because the federal government has never defaulted on any of its obligations.
 - One way to reduce risk is to choose investments with smaller ranges, but it is important to realize that the trade-off for less risk is a lower expected rate of return.
11. Display *Visual 8A.2: The Impact of Time on Risk*. Explain that Investment Option 1 has five possible rates of return: 4%, 5%, 6%, 7%, or 8%. Investment Option 2 also has five possible rates of return: -4%, 2%, 8%, 14%, or 20%. There are several ways to reduce risk, and the next activity will explain two of them. Discuss the following:
- Which option has the higher expected rate of return? (*Since each rate of return is equally likely, the expected rate of return for both options is determined by averaging the five rates.*)
 - *Option 1: $[4\% + 5\% + 6\% + 7\% + 8\%]/5 = 30\%/5 = 6\%$.*
 - *Option 2: $[-4\% + 2\% + 8\% + 14\% + 20\%]/5 = 40\%/5 = 8\%$. So, the expected rate of return for Option 2 is higher.)*
 - Which option is riskier? (*The range for Option A is 4%, a low of 4% to a high of 8%, while the range for Option 2 is 24%, a low of -4% to a high of 20%. Using range as a measure of risk, Option B is riskier because it has the greater range.*)
12. Divide the class in half and designate one half as Group 1 and the other as Group 2. Divide the groups in half again (or more groups if you wish) to create Groups 1A and 1B and Groups 2A and 2B. Give Groups 1A and 1B one set of cards from *Handout 8A.1: Option 1 Cards*. Give Groups 2A and 2B one set of cards from *Handout 8A.2: Option 2 Cards*. Explain the following:
- Groups 1A and 1B will invest in Option 1. Groups 2A and 2B will invest in Option 2.

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- There will be several rounds of investing, with each round representing 1 year.
 - During each round, each group will randomly draw one card from its own set of cards, which includes one card for each of the possible rates (outcomes). The chosen rate will be the rate of return the group earns for that year. After recording the result, return the card to the deck.
 - Each group's rate of return will be recorded on the board as well as a running average of the rates of return over the rounds (years).
13. Begin Round 1 by having the groups each draw a card from their given set. Record the results on the board.
 14. Begin Round 2—have the groups each draw another card. Record the results on the board and also record the average for each group after the two rounds. (For example, if a group from Option 1 drew 5% in Round 1 and 8% in Round 2, their average after two rounds would be $(5\% + 8\%)/2 = 6.5\%$.)
 15. Continue for three to six more rounds as time permits—the more rounds, the better the results of the simulation.
 16. After the final round, review the average rates of return recorded on the board and ask the students to draw some conclusions. (*Two results should be evident: (i) For both options, the average rate of return for all groups should be approaching or getting closer to the expected rate of return for that option and (ii) while the average rate of return for Option 2 groups likely varied widely in the early rounds, they varied much less toward the end of the rounds as they all approached 8%.*)
 17. Explain the following:
 - The point of the demonstration was to show how time reduces the variability of the actual rate of return from the expected rate of return.
 - The reduction in variability is also reduced risk.
 - While the variability—or risk—may be great in any given year, the longer an investment is held, the lower the risk will likely be.
 - Financial planners often advise young investors to invest in riskier investments with potentially higher rates of return because over time the rates of return are more likely to approach the expected rates of return.
 - Conversely, over a short investment horizon (i.e., you need the money sooner rather than later), less-risky investments are a better choice.

(Teacher note: Step 18 is optional.)

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18. Explain that as the demonstration showed, time tends to lower the difference between the actual rate of return and the expected rate of return. Technically, it lowers the spread by a factor of $1/\sqrt{n}$, where n is the number of years. Thus, for Option 2, after 4 years (or rounds) the spread would only be $1/\sqrt{4} = 1/2$, or one-half of what it was after 1 year, so only 12% ($24\% \times 1/2$). Discuss the following:
- What would the spread be for Option 2 after 9 years? (8%; since $1/\sqrt{9} = 1/3$, the spread would be $24\% \times 1/3 = 8\%$.)
 - What would the spread be for Option 2 after 36 years? (4%; since $1/\sqrt{36} = 1/6$, the spread would be $24\% \times 1/6 = 4\%$.) Note that this is exactly the same spread Option 1 has after 1 year. Thus, holding on to investment Option 2 for 36 years has the same risk as holding investment Option 1 for 1 year, *but* it will have earned a higher rate of return for those 36 years! (Remember that the expected rate of return is 6 percent for Option A and 8 percent for Option B, as explained in Step 11.)
19. Ask the class to suppose an investor has 1 year to invest and wants higher rates of return than possible from Option B but not all the risk. Another way this investor could reduce risk and still take advantage of investment options with higher rates of return is to diversify. Define **diversification** as investing in various financial instruments to reduce risk. In other words, instead of investing totally in one asset, an investor invests in several assets, for example, both Option 1 and Option 2.
20. Refer students to Visual 8A.2. Discuss the following:
- If an investor invested half of his or her funds in Option 1 and half in Option 2, what would be the worst and best possible rates of return over 1 year? (*Worst case: 4% for Option 1 and -4% for Option 2. Best case: 8% for Option 1 and 20% for Option 2.*)
 - What is the worst case and best case for an investor who invested \$50 in each option?
 - (*Worst case: The return would be $[\$50 \times 4\%] + [\$50 \times -4\%] = \$2 - \$2 = \$0$, so the rate of return would be $\$0/\100 , or 0%.*)
 - (*Best case: The return would be $[\$50 \times 8\%] + [\$50 \times 20\%] = \$4 + \$10 = \$14$, so the rate of return would be $\$14/\100 , or 14%.*)
 - (*Thus, the range would be 14% [14% - 0%].*)
21. Explain that the range when diversifying and investing in each option is less than the range of investing in Option 2 alone, which was 20%. Thus, by diversifying, the investor is able to lower the risk. Risk could be lowered further by putting more than half of the funds in Option 1. So, an investor can control his or her risk by diversifying. However, note that by diversifying, it is not possible to get a rate of return higher than 14% (which was potentially possible with Option 2).

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Closure

22. Explain the following:

- Risk refers to the chance of loss. For financial investments, risk is the degree to which the actual rate of return on an investment can vary from the expected rate of return on the investment.
- There are three ways investors can lower the amount of risk on their investments: (i) choose investments with small expected rates of return ranges, (ii) hold investments for longer periods of time, or (iii) diversify by holding several different investments.
- Each of these options comes with a cost. Choosing investments with small ranges and diversification are likely to result in lower rates of return. By holding investments for long periods, you will not be able to access your investment funds in the short run. Investors must weigh the benefits of less risk against these costs.

Assessment

23. Distribute a copy of *Handout 8A.3: Assessment* to each student and allow time for students to work (or assign as homework). Review the answers with *Handout 8A.3: Assessment—Answer Key*.

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Visual 8A.1: Risk and Return**Option A**

One possible rate of return: 6%

Expected rate of return: 6%

Option B

Three possible rates of return: 5%, 6%, or 7%

(All equally likely to occur)

Expected rate of return: 6%

(Average of the three rates)

Option C

Five possible rates of return: -4%, 1%, 6%, 11%, or 16%

(All equally likely to occur)

Expected rate of return: 6%

(Average of the five rates)

Visual 8.A2: The Impact of Time On Risk**Option 1**

Five possible rates of return: 4%, 5%, 6%, 7%,
or 8%

(All equally likely to occur)

Expected rate of return: _____

Range (risk): _____

Option 2

Five possible rates of return: -4%, 2%, 8%, 14%,
or 20%

(All equally likely to occur)

Expected rate of return: _____

Range (risk): _____

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Handout 8A.1: Option 1 Cards

4%

5%

6%

7%

8%

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Handout 8A.2: Option 2 Cards

-4%

2%

8%

14%

20%

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Handout 8A.3: Assessment—Answer Key

1. What is risk?

Risk is the chance of loss. For a financial investor, investment risk is the degree to which the actual rate of return on an investment can vary from the expected rate of return on the investment.

2. Imagine you have two investment options with the noted possible rates of return:

Option 1: 2%, 3%, 4%, or 5%

Option 2: -2%, 2%, 8%, or 12%

- a. Calculate the expected rate of return for each option.

- Option 1 rate of return: 3.5%
- Option 2 rate of return: 5%

- b. To assess risk, calculate the range for each option, and then explain which option is riskier and why.

- Option 1 range: 3%
- Option 2 range: 14%

Option 2 is riskier because it has more variation. The investor could earn as much as 12% or lose as much as 2%.

- c. If you were presented with investment Options 1 and 2, what strategies could you use to reduce investment risk?

- *Strategy 1: Choose Option 1 because the range is smaller.*
- *Strategy 2: Choose either Option 1 or Option 2 and hold the investment for a long time.*
- *Strategy 3: Diversify by buying both Options 1 and 2.*

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Standards and Benchmarks

National Standards for Financial Literacy

Standard 5: Financial Investing. Financial investment is the purchase of financial assets to increase income or wealth in the future. Investors must choose among investments that have different risks and expected rates of return. Investments with higher expected rates of return tend to have greater risk. Diversification of investment among a number of choices can lower investment risk.

- **Benchmark: Grade 8**
 5. The rate of return on financial investments consists of interest payments, dividends, and capital appreciation expressed as a percentage of the amount invested.
 6. Financial risk means that a financial investment has a range of possible returns, including possibilities of actual losses. Higher-risk investments have a wider range of possible returns.
 7. The rate of return earned from investments will vary according to the amount of risk. In general, a trade-off exists between the security of an investment and its expected rate of return.
- **Benchmark: Grade 12**
 5. An investment with greater risk than another investment will commonly have a lower market price, and therefore a higher rate of return, than the other investment.
 7. Diversification by investing in different types of financial assets can lower investment risk.

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