SOLUTIONS MANUAL

Web Chapter 1

Financial Decision Making

# Questions

1. Explain the following terms:

i. Compound returns

ii. Principal

iii. Rate of return on an investment

iv. Holding period

*Answer:*

i. **Compound returns** are generated when short-term returns are repeatedly reinvested, thereby causing an investment to earn returns on *both* the initial investment *and* on past investment returns.

ii. An investor’s **principal** is the value of her initial investment.

iii. The **rate of return on investment** is calculated by (i) dividing the final value of an investment by the initial investment (one year earlier), and (ii) subtracting one from the ratio.

iv. The time delay between the initial investment and the final withdrawal is referred to as the **holding period.**

A-head: INVESTMENT RETURNS

Concept: Compound returns, principal, interest, holding period

2. Suppose you choose an investment that has historically generated an average nominal return of 5 percent per year. Explain how inflation and risk may affect your future real rate of return on this investment.

*Answer:*

Inflation reduces the buying power of money. Any appreciation in the value of the final balance will need to be adjusted to account for rising prices. In other words, if the prices of goods and services increase during the holding period, the real rate of return on the initial investment is lower than the nominal rate of return. The real rate of return is the nominal rate of return minus the inflation rate.

Risk implies that the return on the investment is not guaranteed. So the rate of return that you experience may be greater or lower than the historical average rate of return.

A-head: INVESTMENT RETURNS

Concept: Inflation, risk

3. Explain the following terms:

i. Securities

ii. Bonds

iii. Stocks

iv. Stock market index

*Answer:*

i. Bonds, stocks, and other financial claims that can be traded among investors are called securities.

ii. Bonds are long-term loans made to a borrower (debtor) by a lender (creditor).

iii. Stocks, also known as shares or equity, are ownership rights in a corporation.

iv. A stock market index is an average of the prices of many stocks.

A-head: INVESTMENT RETURNS

Concept: Securities, stock market index

4. Given that shares are riskier than bonds, why do investors invest in equity?

*Answer:* Equity investors are rewarded for taking on higher risk with an average rate of return that is greater than the average rate of return on bonds. Although equity returns fluctuate from year to year, investors who are willing to bear the additional risk of investing in shares also benefit from a higher average return.

A-head: INVESTMENT RETURNS

Concept: Risk

5. What is a patent race?

*Answer:* A patent race refers to a winner-take-all race. Suppose two investors are racing to develop an invention or to patent a discovery. The investor who develops the invention first or files the patent first will reap all the benefits. Although the other investors may have invested the same amount of money in research and development as the investor who filed the patent, they will not get any return on their investment.

A-head: DIVERSIFICATION

Concept: Patent race

6. What is meant by diversifying an investment portfolio? What are the advantages of diversification?

*Answer:* Diversification means that investors spread their investment across more than one asset. Diversification allows investors to reduce risk as individual assets are hit by different economic shocks. Putting a little bit of money in all of these different investment baskets reduces exposure to any single shock.

A-head: DIVERSIFICATION

Concept: Diversification

7. Which types of investment accounts are investors likely to choose if they are trying to minimize risk? Why?

*Answer:* Bank accounts insured by the Federal Deposit Insurance Corporation are the safest way of storing and investing money. Investors trying to minimize risk will invest in FDIC-insured certificates of deposit or money market deposit accounts.

A-head: INVESTMENT ACCOUNTS

Concept: Bank accounts

8. What is the difference between directly holding stock in a company like Apple and investing in a mutual fund that holds Apple stock?

*Answer:*

 Some investors purchase Apple shares directly and hold them in a brokerage account.

 Most investors buy pre-mixed pools of assets, called mutual funds. A mutual fund is a pool of money that is collected from many investors. Mutual funds typically invest in hundreds of stocks, bonds, and/or short-term money market instruments.

A-head: INVESTMENT ACCOUNTS

Concept: Brokerage accounts

9. The following questions are about mutual funds:

i. What are index funds?

ii. What is an expense ratio? How do expense ratios affect the value of an investor’s portfolio?

*Answer:*

i. An index fund is a mutual fund that is passively managed, which means that the mutual fund manager simply tries to track the return of an index, like the Standard & Poor’s 500 stock index.

A-head: INVESTMENT ACCOUNTS

Concept: Mutual funds

ii. Expense ratios are annual fees charged by mutual funds in order to pay mutual fund managers and to pay other record-keeping and marketing costs of the fund. Expense ratios make a very big difference in the long-run performance of investments. Paying an annual fee of even 1 percent will reduce the annual rate of return on the investment from say, 10 percent to 10 – 1 = 9 percent.

A-head: INVESTMENT ACCOUNTS; CHOICE AND CONSEQUENCE: OVERLOOKING FEES

Concept: Expense ratios

10. What are the four core ways that households save for retirement?

*Answer:* There are four core types of retirement savings plans:

 Social Security: Social Security is a mandatory retirement savings program. Each worker pays a Social Security payroll tax into a general government account called the Social Security trust fund. Using these funds, the Social Security trust fund pays out benefits to those workers who are currently retired.

 Defined benefit pension plans: Defined benefit pensions are contractually specified employment benefits, in which the employer promises to pay the employee a fixed annuity after retirement. The magnitude of the annuity is adjusted to reflect years of service at the employer and the level of the employee’s salary.

 Defined contribution pension plans: Defined contribution pensions are individual accounts that are owned and controlled by the employee. In most cases, the employee decides how much to contribute to these accounts, and most employers match these contributions. These accounts are commonly referred to as 401(k) accounts.

 Individual Retirement Accounts (IRA): IRAs are retirement savings accounts that anyone can set up; they are usually not sponsored by a person’s employer. If an individual does not contribute to her employer’s defined contribution savings plan, then she can use an IRA to save for retirement.

A-head: INVESTMENT ACCOUNTS

Concept: Retirement savings plans

11. How easy is it for fund managers and investment management companies to outperform or “beat” the stock market once their fees are taken into account?

*Answer:* When a single stock is picked at *random*, there is a 50 percent chance that the stock will outperform the total stock market in the next year. Consequently, it is possible to outperform the stock market in a single year even if the investment manager has no skill. It has been discovered that successful historical asset managers tend to perform *no better* in the next period than pure chance would predict.

A-head: INVESTMENT ACCOUNTS

Concept: Outperforming the stock market

12. How could return-chasing explain why many of Enron’s employees lost most of their retirement savings when Enron went bankrupt?

*Answer:* Return-chasing occurs when people invest in assets that have realized a high rate of return in the past. Return-chasing explains why many of Enron’s employees chose to forgo the benefits of diversification and invested the overwhelming majority of their retirement savings in Enron stock. Enron stock had gone up by a factor of 10 in the decade before Enron went bankrupt—that’s a 1,000 percent return. This led Enron employees to mistakenly believe that Enron stock was a great investment for the future. Consequently, employees allocated more and more of their contributions to employer stock, under the assumption that Enron stock prices would continue to increase in the future.

A-head: EVIDENCE-BASED ECONOMICS: DO INVESTORS CHASE HISTORICAL RETURNS?

Concept: Return chasing

# Problems

1. Congratulations! You have just won a $1,000,000 (delayed) prize in the lottery. Your state offers you the following alternatives: you can take $750,000 now, or 10 years from now you can receive the full $1,000,000. The delay isn’t a problem, because you weren’t planning to use any of the prize money for at least 10 years.

If you take the lump sum now, you figure you can invest it at an annually compounded rate of 3 percent.

Should you take the $750,000 now, or wait to get the full $1,000,000 in 10 years? Why or why not? Show any calculations.

*Answer:* You should take the $750,000 now.

Here are the relevant calculations:

$750,000 × (1 + 0.03)10 = $1,007,937.

So you would be $7,937 better off by taking the smaller amount now than receiving the full prize in 10 years. This assumes that you will, in fact, achieve an annually compounded return of 3 percent for the next 10 years.

A-head: INVESTMENT RETURNS

Concept: Comparing future values

Difficulty: Easy/Moderate

Problem-type: Calculation

2. Ten years ago, you set aside $1,000. For the first 6 years, you earned a return of 6 percent per year, but for the following 4 years, that rate of return dropped to 3 percent. How much money do you now have at the end of the 10 years?

*Answer:* At the end of the first 6 years, you would have $1,000 × (1 + 0.06)6.

After investing that money for an additional 4 years, you will have a total of

[$1,000 × (1.06)6] × (1.03)4 = [$1,000 × 1.4185] × 1.1255 = $1,596.56.

A-head: INVESTMENT RETURNS

Concept: Finding the future value at differing interest rates

Difficulty: Easy/Moderate

Problem-type: Calculation

3. You get your first job when you are 23. Prudently, you set aside $5,000 of your earnings to open an IRA.

a. You know that stocks have returned a nominal 10 percent per year on *average* historically. If you keep your money invested in a portfolio of stocks that returns 10 percent per year until you retire 40 years later at age 63, how many dollars will that $5,000 have turned into?

b. Assuming an inflation rate of 3 percent, how much will that $5,000 have turned into in real terms? In other words, redo the previous calculation, taking inflation into account.

c. Given this investment plan, should you depend on having that much money available in the IRA account when you retire? Why or why not?

*Answer:*

a. 

b. 



This means that your purchasing power grew by a factor of 15 (15 × $5,000 = $75,000), and you didn’t have to do anything but postpone consumption. Of course, even if interest rates were 0 percent, and there were no interest at all, it’s still worth putting money away because the only way to have money in retirement is to save.

c. As discussed in the section entitled Risky Returns, investing in stocks is inherently risky. Whether you end up with a great deal of money or very little depends on whether your particular holding period happens to be period with high or low returns.

A-head: INVESTMENT RETURNS; RISKY RETURNS

Concept: Compound returns; Risky returns

Difficulty: Easy

Problem-type: Hypothetical real-world scenario

4. Ernest calculates that he will need $220,000 to provide for his 8-year-old daughter’s college tuition and expenses. Due to a recent inheritance, he will have some money to put aside now but will not be able to add to it over time. He is confident that he can realize a return of 5 percent, compounded annually, on the money he puts aside. Assume his daughter will start college at the age of 18.

Calculate how much money Ernest needs to invest now in order to fund his daughter’s college education.

*Answer:* We can start with the formula given in the chapter:

(Initial Investment) × (1 + *r*)*T* = $220,000.

where *r* = 0.05 is the rate of return, and *T* = 18 – 8 =10 is the number of years the money is invested (in other words, *T* is the holding period).

So, all we really need to do is to solve the above equation for the Initial Investment:



So Ernest needs to invest $135,060.92 of his inheritance at 5 percent in order to realize a final value of $220,000 after a 10-year holding period.

A-head: INVESTMENT RETURNS

Concept: Finding the present value given the future value

Difficulty: Hard

Problem-type: Hypothetical real-world scenario; calculation

5. The following table shows the nominal return on the 10-year Treasury bond as well as the 3-month Treasury bill from year-end 1999 to year-end 2016.

|  |  |  |
| --- | --- | --- |
| **Year** | **3-MonthT-Bill Rate (Annualized)** | **10-Year Treasury Bond Total Return** |
| 2000 | 5.76% | 16.66% |
| 2001 | 3.67% | 5.57% |
| 2002 | 1.66% | 15.12% |
| 2003 | 1.03% | 0.38% |
| 2004 | 1.23% | 4.49% |
| 2005 | 3.01% | 2.87% |
| 2006 | 4.68% | 1.96% |
| 2007 | 4.64% | 10.21% |
| 2008 | 1.59% | 20.10% |
| 2009 | 0.14% | -11.12% |
| 2010 | 0.13% | 8.46% |
| 2011 | 0.03% | 16.04% |
| 2012 | 0.05% | 2.97% |
| 2013 | 0.07% | -9.10% |
| 2014 | 0.05% | 10.75% |
| 2015 | 0.21% | 1.28% |
| 2016 | 0.51% | 0.69% |

*Source*: NYU Stern Historical Return data compiled by Aswath Damodaran. 10-Year Treasury total return includes coupon payments and price appreciation

a. Use the data points to plot a graph for both the data series.

b. Which security has given a higher rate of return over this period? Why do you think this is the case?

*Answer:*

a. The following graph plots the returns on Treasury bonds and bills listed in the table.



b. The return on the 10-year Treasury bond is usually higher than the return on the 3-month Treasury bill. This is because long-term loans are riskier than short-term loans. Bond investors are rewarded for bearing this risk with a rate of return that usually exceeds the rate of return on money market accounts, or short-term loans.

A-head: RISKY RETURNS

Concept: Treasury bills, bonds

Difficulty: Moderate/Hard

Problem-type: Data-based problem

6. The following table shows data on the nominal return in the Standard & Poor’s 500 stock market index (including dividends and price appreciation) and the return on the 3-month Treasury bill. The table reports returns from year-end 1999 to year-end 2016.

|  |  |  |
| --- | --- | --- |
| **Year** | **3-MonthT-Bill Rate (Annualized)** | **Return on S&P Index (Including Dividends)** |
| 2000 | 5.76% | -9.03% |
| 2001 | 3.67% | -11.85% |
| 2002 | 1.66% | -21.97% |
| 2003 | 1.03% | 28.36% |
| 2004 | 1.23% | 10.74% |
| 2005 | 3.01% | 4.83% |
| 2006 | 4.68% | 15.61% |
| 2007 | 4.64% | 5.48% |
| 2008 | 1.59% | -36.55% |
| 2009 | 0.14% | 25.94% |
| 2010 | 0.13% | 14.82% |
| 2011 | 0.03% | 2.10% |
| 2012 | 0.05% | 15.89% |
| 2013 | 0.07% | 32.15% |
| 2014 | 0.05% | 13.52% |
| 2015 | 0.21% | 1.38% |
| 2016 | 0.51% | 11.74% |

*Source*: NYU Stern Historical Return data, compiled by Aswath Damodaran. Returns on S&P 500 are equal-weighted and include dividends

a. Use the data points to plot a graph for both the data series.

b. What does Standard & Poor’s 500 represent? Would it have been riskier to invest in the S&P 500 or the 3-month Treasury bill during this period? Why?

*Answer:*

a. The following graph shows the annual return in the S&P 500 and the 3-month Treasury bill.



b. The Standard and Poor’s 500 is a stock market index that summarizes the value of 500 of the largest U.S. companies, representing about 75 percent of the value of all companies traded on U.S. stock exchanges. The variability of the returns of the S&P 500 stock index is higher than the variability of the annual returns of holding 3-month Treasury bills. Stocks are, in general, riskier than corporate bonds as companies make payments to shareholders only after making payments to bondholders. This means that shareholders are the ones who primarily suffer when a company earns less income. Moreover, lending to the government is less risky than lending to a corporation. Putting these observations together, 3-month Treasury bill returns are less risky than short-term corporate bonds, which are less risky than corporate shares. Because shares are therefore riskier than 3-month Treasury bills, shares offer higher returns in order to compensate for the higher level of risk. Although equity investors receive a higher return on *average*, the return on equity also fluctuates a lot, even going negative from time to time.

Link to graph: http://www.research.stlouisfed.org/fred2/graph/?g=t1w

A-head: RISKY RETURNS

Concept: Stock market index, Treasury bonds, risk

Difficulty: Moderate/Hard

Problem-type: Data-based problem

7. The following table shows the income distribution for American households in terms of percentiles in the United States in 2015.

|  |  |
| --- | --- |
| Percentile | Income |
| 10 | 13,259 |
| 20 | 22,800 |
| 40 | 43,511 |
| 50 | 56,516 |
| 60 | 72,001 |
| 80 | 117,002 |
| 90 | 162,180 |
| 95 | 214,462 |

a. What was the median income in 2015? What does this number mean?

b. Suppose you are told that, in 2015, 60 percent of the population earned an average income of $72,001. Refer to the table and explain whether you would agree with this statement or not.

*Answer:*

a. The median in a distribution is the 50th percentile. The median household income in 2015 was $56,516. This number divides the distribution into half, which means that 50 percent of the U.S. households earned less than $56,516, while the remaining 50 percent earned more than $56,516.

b. No, the statement is incorrect. The 60th percentile is a cutoff that divides the data so that 60 percent of the population is below the cutoff. This means that, of the total number of households in the country, 60 percent of the households earned less than $72,001, while the rest of the 40 percent of the households earned more than this amount.

Data credit: United States Census Bureau

A-head: RISKY RETURNS

Concept: Percentiles

Difficulty: Moderate/Hard

Problem-type: Calculation problem

8. Alexander Graham Bell was credited with inventing the telephone in 1876. What many do not know is that Bell filed for the telephone patent hours before Elisha Gray, who also had a prototype for the telephone.

a. Since Bell filed the patent first, his company went on to earn millions of dollars in profits from the sales of the telephone. Because Elisha Gray’s patent came second, he did not earn profits from his invention. What is this situation called?

b. Suppose you are an investor who was willing to invest in either Bell’s or Gray’s telephone companies. You expect that the value of the company that files the patent first will double in value. Assume that each inventor had an equal chance of filing the telephone patent. If you did not know who would file the patent first, what investment strategy would minimize your risk?

*Answer:*

a. This is an example of a patent race, where the winner takes all. Only the inventor who files the patent first reaps all the profits from the invention. Other companies or inventors do not gain, although they may have spent the same or more time and money on a similar invention.

b. Given that either company has an equal chance of filing the patent and doubling its value, you should invest an equal amount of money in both companies. By diversifying your investment across both companies, you reduce the risk that you face if you invest in only one company and happen to pick the company that loses.

A-head: DIVERSIFICATION

Concept: Patent race; diversification

Difficulty: Easy/Moderate

Problem-type: Real world scenario

9. You have $100 to invest, and you are considering two stocks. In the next year, each stock will either have a return of +30 percent or –10 percent. Assume as well that the performance of one stock is unrelated to the performance of the other (in other words, the stock returns are uncorrelated). The table shows the resulting four possibilities, depending on whether each of the two stocks gains or loses value. (To read the table, note that the first outcome listed in each cell is for Stock 1, and the second outcome in each cell is for Stock 2.)

|  |  |  |  |
| --- | --- | --- | --- |
| Stock 1 | Stock 2 | | |
|  | **Gain** | **Lose** |
| **Gain** | Stock 1 Gain  Stock 2 Gain | Stock 1 Gain  Stock 2 Lose |
| **Lose** | Stock 1 Lose  Stock 2 Gain | Stock 1 Lose  Stock 2 Lose |

Assume that the probability of Stock 1 gaining is 50 percent. Assume that the probability of Stock 2 gaining is 50 percent. Assume that each of the four possibilities listed in the table above is 25 percent.

a. If you put all of your money into Stock 1 or Stock 2, what is the average return that you will receive? (*Hint*: average the returns of +30 percent and –10 percent.)

b. If you split your money equally between the two stocks ($50 in Stock 1 and $50 in Stock 2), what would be your total return at the end of the year in each of the boxes above? Fill out the following table to indicate the total return you would have in each of the four possible situations. (*Hint*: average the returns of the two investments in each box.)

|  |  |  |  |
| --- | --- | --- | --- |
| **Stock 1** | **Stock 2** | | |
|  | **Gain** | **Lose** |
| **Gain** |  |  |
| **Lose** |  |  |

c. If you split your money between the two stocks, what is the average return that you will receive? (*Hint*: take the total return for each box in part (b) and calculate the average across the four boxes giving each box equal weight.)

d. Is there any benefit in splitting your money between the two stocks? How does this relate to the concept of diversification?

*Answer:*

a. There is a one-half chance that you will gain 30 percent, and a one-half chance that you will lose 10 percent, so the average return is



b. Because half of your portfolio is in each stock, we multiply the returns for that stock by their portfolio weight (0.5) in each situation.

|  |  |  |  |
| --- | --- | --- | --- |
| **Stock 1** | **Stock 2** | | |
|  | **Gain** | **Lose** |
| **Gain** |  |  |
| **Lose** |  |  |

c. There is a 25 percent chance you will end up in each of the four possibilities, so the expected value is



d. We saw in parts a and c that the expected value of your investment is the same whether you invest in a single stock or split your money between the two stocks. However, there is less volatility in your payout if you diversify by investing half your money in both stocks rather than investing all of your money in a single stock. In other words, if you invest all of your money in a single stock, you will either win big or lose big. However, if you split your money between the two stocks, there is a third possibility that one stock will gain and the other one will lose, and the two effects will cancel each other out. This leads to a less volatile return. When you are planning for retirement, it is very important, when budgeting, to know approximately how much money you will have. Finding out that all of your stocks have lost value at the same time can be quite a blow. Therefore, people are advised to diversify so that they do not have “all of their eggs in one basket.”

A-head: RISKY RETURNS; DIVERSIFICATION

Concept: Risky returns; Diversification

Difficulty: Moderate/Hard

Problem-type: Calculation

10. Suppose that a mutual fund, Washington Peak Strategic Bond Fund, believes it has hit upon a winning investment strategy. The fund uses an active management strategy to try to outperform the bond market. According to Washington Peak’s prospectus, investors need to pay fees of 2 percent annually. Based on the historical success of their active investment strategy, the strategy is projected to generate annual returns (once fees are paid) of 8 percent. A friend of yours is considering investing in Washington Peak and asks you for investment advice. What would you suggest?

*Answer:* One of the problems with Washington Peak’s investment strategy is the lack of diversification. By investing most of the fund’s money in one investment strategy, Peak will not be able to diversify its returns. It should therefore not be a *large* fraction of your friend’s total investment portfolio. Second, Peak’s traders base their strategy on historical data. It is not necessarily the case that historical trends will continue to play out in the future. This fact introduces some additional risk. The third factor that your friend will need to consider is the expense ratio that Washington Peak is charging. An expense ratio of 2 percent is generally considered to be very high for a mutual fund. High expense ratios lower the net annual return that your friend receives on his investment.

A-head: RISKY RETURNS; DIVERSIFICATION; INVESTMENT ACCOUNTS

Concept: Diversification, expense ratios

Difficulty: Easy/Moderate

Problem-type: Fictional ‘real-world’ scenario

11. Tom, a government employee, has a defined benefit pension. He has worked for his employer for 35 years before retiring at age 65. His final salary was $85,000. Calculate how much of his final preretirement income a standard defined benefit pension plan would replace.

*Answer:* Using the formula given in the chapter, Tom’s pension would equal:

0.02 × 35 × $85,000 = $59,500.

This would replace $59,500/$85,000 = 0.70 or 70 percent of his preretirement income.

A-head: INVESTMENT ACCOUNTS

Concept: Retirement savings plans

Difficulty: Easy

Problem-type: Hypothetical real-world scenario

12. Recency bias refers to a psychological bias whereby people believe that recent past trends and patterns will continue in the future. How would recency bias explain why investors chase returns? Does return-chasing lead investors to realize a higher rate of return on investments?

*Answer:* Return-chasing involves investing in assets that have realized a high rate of return in the past. Recency bias could explain return-chasing. Recency bias leads people to mistakenly believe that recent past trends and patterns will continue into the future, leading people to chase recent historical returns. As discussed in the Evidence-Based Economics feature in the chapter, research has shown that return-chasing does not usually benefit investors. At 154 of the largest U.S. corporations, employees did not benefit from return chasing.

A-head: EVIDENCE-BASED ECONOMICS: DO INVESTORS CHASE HISTORICAL RETURNS?

Concept: Return chasing

Difficulty: Easy/Moderate

Problem-type: Fictional ‘real-world’ scenario