Student: _____ Class: _____ Date: _____

Decision Making in Finance: Future Value of an Investment

VI.A Student Activity Sheet 1: You Have to Get Money to Make Money

1. Kafi is considering three job offers in educational publishing.

- One is a full-time position as an editor that pays a salary of $37,500 per year.
- Another is a full-time position as an e-Learning designer that pays an hourly wage of $26.50. The job assumes five 8-hour days per week.
- The final offer is for a sales representative that pays a 5% commission. Sales representatives typically sell an average of $100,000 per month in textbooks.

Record the income information for the editor, designer, and sales representative in Row 1 of Job Summary Table 1 at the end of this activity sheet.

2. Estimate the gross *annual* income for each job offer. Record your estimate in Row 3 of Job Summary Table 1. Use Row 2 for any calculations that are needed to determine the income.

3. Estimate the gross *monthly* income for each job offer. For the purposes of his comparison, Kafi assumes that each job pays monthly. Record your estimate in Row 5 of Job Summary Table 1. Use Row 4 for any calculations that are needed to determine the income.

4. Based on the gross monthly income, which job do you recommend Kafi take? Why?

5. Determine the after-tax income for each job offer. Use the following information:

- The U.S. government deducts Social Security (6.2%) and Medicare (1.45%).
- Kafi will deduct 15% of gross income to cover federal income tax.
- Kafi does not live in a state with state income tax.

Record your estimate in Row 7 of Job Summary Table 1. Use Row 6 for any calculations that are needed to determine the income.

6. Kafi determines that he needs at least $3,000 per month in after-tax income to cover his monthly expenses. Based on this budget estimate, are there any jobs that Kafi should not take? Why?

Another consideration in comparing jobs is the benefits each provides, such as health insurance, retirement plan, vacation time, and sick leave.

- The editor position includes two weeks of paid vacation and five paid sick days per year, paid health insurance, life insurance costing $35 per month, and a fully paid retirement plan.
- The designer position includes five paid vacation days and three paid sick days per year, paid health insurance, life insurance costing $35 per month, and a retirement plan that costs 3% of after-tax income.
- The sales position has no paid vacation or sick days, paid health insurance, paid life insurance, and a retirement plan costing $400 per month.

7. Estimate the *monthly cost* that will be deducted from Kafi's pay for benefits. Use the following information:

- Kafi plans on taking two weeks (10 days) for vacation per year.
- In the past, Kafi averaged three sick days per year.
- Kafi plans to purchase life insurance and save for his retirement.

Record your estimate in Job Summary Table 1 in Rows 8 through 12.

8. Estimate the monthly take-home income in Row 13 of Job Summary Table 1.

9. Based on the completed Job Summary Table 1, which job do you recommend that Kafi take? Explain your recommendation based on the net income.

10. Are there any factors that could affect the accuracy of the estimated net incomes? If *yes*, does this change your recommendation? Explain your reasoning.

11. Are there any other factors that Kafi should consider when deciding which job to take? If *yes*, does this change your recommendation? Explain your reasoning.

12. EXTENSION: You are considering two job offers: a full-time permanent position that pays $55,500 annually and a full-time contract job that pays $29 per hour. Estimate the gross annual income, gross monthly income, and the after-tax monthly income for each job offer. Record your estimates in Job Summary Table 2 at the end of this activity sheet. Use the information for calculating income, taxes, and costs that Kafi used. The contract job is self-employment, which is taxed an additional 7.65% of gross income.

Based on the gross monthly income, which job should you take? Why?

Based on the after-tax income, which job should you take? Why?

13. EXTENSION: The permanent position will cost you $95 per month in health care benefits and 4% of your after-tax income in retirement contributions. The contract job will cost you $150 per month in health care benefits and 8% of your after-tax income in retirement contributions.

Estimate the take-home income for each job offer and record it in Job Summary Table 2. Based on this information, which job should you take? Why?

14. REFLECTION: Did your decision on which job to take change throughout the analysis? What does that say about the decision process for considering any job offer? When considering various job offers, what will factor into your decision?

Student: _____ Class: _____ Date: _____

Decision Making in Finance: Future Value of an Investment

VI.A Student Activity Sheet 1: You Have to Get Money to Make Money

Job Summary Table 1

Row No.	Job:	Editor	Designer	Sales Representative
1	Income information			
2	*Process*			
3	Gross annual income			
4	*Process*			
5	Gross monthly income			
6	*Process*			
7	After-tax monthly income			
8	*Process: Vacation*			
9	*Process: Sick leave*			
10	*Process: Health insurance*			
11	*Process: Life insurance*			
12	*Process: Retirement plan*			
13	Monthly take-home income			

Decision Making in Finance: Future Value of an Investment

VI.A Student Activity Sheet 1: You Have to Get Money to Make Money

Job Summary Table 2

Job:	Permanent Position	Contract Position
Income information		
Process		
Gross annual income		
Process		
Gross monthly income		
Process		
After-tax monthly income		
Process: Health insurance		
Process: Retirement plan		
Monthly take-home income		

Decision Making in Finance: Future Value of an Investment

VI.A Student Activity Sheet 2: What Makes Money Work for You?

Amanda is analyzing how to invest $500. She is considering the two investments described below.

- **Savings accounts** are insured and vary in the way in which interest is calculated. Some accounts pay simple interest, but other accounts compound interest at varying frequencies. *Amanda is considering a savings account that pays 3.75% interest compounded annually.*
- A **certificate of deposit** (CD) is an interest-bearing instrument that is similar to a savings account—it is insured and pays interest. Unlike savings accounts, CDs have a fixed time period and usually a fixed interest rate. CDs also vary in the way in which interest is calculated. Sometimes the interest is compounded, but simple-interest CDs also exist. Simple interest is calculated only on the original deposit. The CD must be held until the date of maturity, at which time the original money deposited may be withdrawn with the accrued interest. *Amanda is considering a CD that pays 4% simple annual interest for five years.*

1. Amanda wants to evaluate each investment for the first five years. Use the spreadsheet below to record your calculations.

CD/Year	Beginning Balance	Interest Earned	Ending Balance	Savings Account/ Year	Beginning Balance	Interest Earned	Ending Balance
1	$500			1	$500		
2				2			
3				3			
4				4			
5				5			

2. If Amanda is using this investment as an emergency fund, in which should she invest? Explain your reasoning.

3. Based on the processes you used to fill in the spreadsheet in Question 1, write a function rule to model each investment. Let ***y*** represent the value of the investment at the end of any year ***x***.

4. What types of functions did you use to model each investment option? How are the functions related to the type of interest earned in each option?

Decision Making in Finance: Future Value of an Investment

VI.A Student Activity Sheet 2: What Makes Money Work for You?

Amanda has decided to keep the investment until retirement—40 years from now. Assume that she can invest in the same CD or savings account at the same rate for the life of the investment.

5. Use your graphing calculator to graph both functions. Describe your axes and scaling and sketch your graphs.

6. Compare and contrast the graphs of the two different functions. Explain what you see in terms of the function rules and the tables.

7. Why is there a difference between the two models? Explain your answer using the information from the tables, graphs, or function rules.

8. **REFLECTION:** Which investment should Amanda use: the CD or the savings account? Explain your reasoning.

9. **EXTENSION:** One of the greatest contributors to lowering the value of money is inflation, which is a percentage representing the annual increase in the value of money. Find the current annual rate of inflation on the Internet.

   Consider the investment you recommended for Amanda. Taking inflation into account, what is her actual rate of earning on the investment? Based on your findings, would you make any recommendations to Amanda?

Student: _____ Class: _____ Date: _____

Decision Making in Finance: Future Value of an Investment

VI.A Student Activity Sheet 3: Time Value of Money

The future value of an investment is the amount it will be worth after so many months or years of earning interest. The following table lists a savings account's future values in selected years.

Year	Balance
0	$2,600.00
5	$3,201.50
10	$3,942.20
15	$4,854.16
20	$5,977.16
25	$7,359.95
30	$9,062.70

1. Create a scatterplot of the given data. Label the axes and scales, and provide a title.

What type of function would best model the data? Explain your reasoning.

2. Calculate the regression equation for the given data. Graph the regression equation on the scatterplot in Question 1.

3. According to the model, what is the interest rate of the savings account?

Is the interest simple or compound? How do you know?

4. Using the model, how much will be in the account in 50 years?

Decision Making in Finance: Future Value of an Investment

VI.A Student Activity Sheet 3: Time Value of Money

5. Use the regression equation from the previous problems to write a general formula for future value of an investment compounded annually. Use the following variables:

- ***FV*** for future value
- ***t*** for time (in years)
- ***i*** for interest rate (in decimal form)
- ***PV*** for the principal or present value

6. All of the investments so far have compounded and paid interest annually. However, some investments compute interest in compounding periods that are quarterly or monthly. If the annual interest rate is divided evenly, how would the interest rate be calculated for each compounding period?

7. Write a general formula for future value that takes into account any compounding period. Use the variables from Question 5, in addition to ***n*** for number of compound periods in one year.

8. Suppose you invest $2,600 into a savings account with a 4.25% annual interest rate that compounds interest quarterly. Use the formula you wrote in Question 7 to determine the balance in the account after five years.

9. How much would the same savings account be worth in 50 years if the interest is compounded quarterly?

10. **REFLECTION:** Is there a difference between the account balance in Question 8 and the account balance from the problem described in the table? If so, is the difference large or small? How might this difference influence your decision about investments?

Decision Making in Finance: Future Value of an Investment

VI.A Student Activity Sheet 3: Time Value of Money

11. REFLECTION: Is there a difference between the account balance in Question 9 and the account balance in Question 4? If so, is the difference large or small? How might this difference influence your decision about investments?

12. EXTENSION: Research interest rates for a savings account, checking account, and money market account at different financial institutions. Note the compounding period for each.

How much would $10,000 be worth in each account in 50 years?

Decision Making in Finance: Present Value of an Investment

VI.B Student Activity Sheet 4: Road to $1 Million

In Student Activity Sheet 3, you analyzed the future value of an investment over time. You began with $2,600 invested in a savings account for 30 years. After 30 years, your initial investment would be worth $9.062.70. In this activity, you will look at the same investment in a different way. The question relates to the **time value of money** (TVM). *What is that $9,062.70 future value worth at various times in the 30-year investment?*

The following table lists the principal required to obtain the same future value of $9,062.70 for various investment lengths. So, in the table, the 30-year investment is the one you have already explored. The other values in the table show how much principal you would need to invest and the length of time of the investment for the same yield. This can be thought of as the **present value** of the investment.

Years Till Maturity	Principal Required
0	$9,062.70
5	$7,359.95
10	$5,977.16
15	$4,854.16
20	$3,942.20
25	$3,201.50
30	$2,600.00

1. Create a scatterplot of the given data. Label the axes and scales, and provide a title.

2. Calculate the regression equation for the given data. Graph the regression equation on the scatterplot. Explain why the function model you used makes sense in the problem situation.

3. Josephine is 20 years old and wants to save $1 million for retirement in 50 years. Assume she invests in a savings account that earns at least the current rate of inflation. Determine how much Josephine must save today to reach her retirement goal.

Recall the future-value formula $FV = PV\left(1 + \frac{i}{n}\right)^{nt}$, using

- ***FV*** for future value
- ***t*** for time (years)
- ***i*** for interest rate (in decimal form)
- ***n*** for number of compound periods per year
- ***PV*** for the principal or present value

4. Suppose Josephine does not want to begin saving for her retirement immediately. Fill in the following table to show the amount of money that Josephine must invest to retire 50 years from now with $1,000,000 based on the number of years that she waits to start saving.

Years of Waiting to Save	Principal Required
0	
10	
20	
30	
40	
50	

5. REFLECTION: Suppose Josephine believes in spending now and saving later. How could you use the table from Question 4 to convince her otherwise?

6. Blaine wants to have $1,000 in 10 years. The following are the choices in which he can invest:

- a savings account earning 3% compounded quarterly,
- a checking account earning 1% compounded monthly, or
- a money market account earning 4.5% compounded semiannually.

Blaine plans on making no withdrawals or deposits for 10 years.

Rewrite the formula from Question 3 for present value and allow for any compounding period (***n***).

7. Rewrite the present-value formulas for each account that Blaine is considering. Make sure that the formulas include compounding periods other than annual and incorporate the different rates.

8. Graph the present-value formula for each account. Label the axes, scales, and curves, and provide titles.

Which factor has the most significant effect on the curve: the interest rate or compounding periods? Why?

9. REFLECTION: In which account should Blaine invest? Why?

10. EXTENSION: Locate an article about what investments financial experts are currently recommending for clients at various times of life (young, middle age, etc.). Prepare a short presentation to share with the class regarding your findings.

Decision Making in Finance: Present Value of an Investment

VI.B Student Activity Sheet 5: A Cool Tool!

Vanessa is a financial planner specializing in retirement savings. She realizes the importance of using mathematical formulas and the appropriate tools to help her clients understand the reasoning behind the advice she is giving.

One of her favorite tools is a time-value-of-money (TVM) calculator. In Student Activity Sheet 4, you met Josephine, one of Vanessa's clients who wanted to retire with $1 million in savings.

1. In Josephine's initial situation, she plans to retire in 50 years with $1 million in savings. Vanessa advised her to find an account that earned at least the current rate of inflation. Use this information to complete the table below.

Variable	Definition of Variable	Value in Josephine's Situation
FV	future value, or value of the investment at maturity	
t	number of years of investment until maturity	
i	annual interest rate (as a decimal)	
PV	principal, or present value	
n	number of compounding periods per year	

Decision Making in Finance: Present Value of an Investment

VI.B Student Activity Sheet 5: A Cool Tool!

Vanessa uses a TVM calculator to help Josephine understand how the different variables affect one another.

2. Identify the values in Josephine's situation for each variable that the TVM calculator uses.

Variable	Definition of Variable	Value in Josephine's Situation
N	number of compounding periods between the time of investment and the time of retirement	
I%	annual interest rate (as a percent)	
PV	principal, or present value	
PMT	amount of each regular payment	
FV	future value, or value of the investment at maturity	
P/Y	number of payments per year (usually the same as the number of compounding periods per year, ***C/Y***)	
C/Y	number of compounding periods per year	

3. Use the TVM calculator to determine the present value (***PV***) of the investment required to meet Josephine's retirement goal. How does this amount compare to what you determined in Student Activity Sheet 4?

Decision Making in Finance: Present Value of an Investment

VI.B Student Activity Sheet 5: A Cool Tool!

Use the TVM calculator to answer the following questions for some of Vanessa's other clients.

4. Reginald wants to find the future value of an investment of $6,000 that earns 6.25% compounded quarterly for 35 years.

Variable	Definition of Variable	Value in Reginald's Situation
N	number of compounding periods between the time of investment and the time of retirement	
I%	annual interest rate (as a percent)	
PV	principal, or present value	
PMT	amount of each regular payment	
FV	future value, or value of the investment at maturity	
P/Y	number of payments per year (usually the same as the number of compounding periods per year, ***C/Y***)	
C/Y	number of compounding periods per year	

Decision Making in Finance: Present Value of an Investment

VI.B Student Activity Sheet 5: A Cool Tool!

5. Hilda wants to have $10,000 in 10 years after investing in an account that earns 3.6% compounded monthly.

Variable	Definition of Variable	Value in Hilda's Situation
N	number of compounding periods between the time of investment and the time of retirement	
I%	annual interest rate (as a percent)	
PV	principal, or present value	
PMT	amount of each regular payment	
FV	future value, or value of the investment at maturity	
P/Y	number of payments per year (usually the same as the number of compounding periods per year, ***C/Y***)	
C/Y	number of compounding periods per year	

Decision Making in Finance: Present Value of an Investment

VI.B Student Activity Sheet 5: A Cool Tool!

6. Juan wants to invest $1,250 in an account that earns 2.34% interest, compounded monthly. How many years will it take for the account to have a value of $5,000?

Variable	Definition of Variable	Value in Juan's Situation
N	number of compounding periods between the time of investment and the time of retirement	
I%	annual interest rate (as a percent)	
PV	principal, or present value	
PMT	amount of each regular payment	
FV	future value, or value of the investment at maturity	
P/Y	number of payments per year (usually the same as the number of compounding periods per year, ***C/Y***)	
C/Y	number of compounding periods per year	

Decision Making in Finance: Present Value of an Investment

VI.B Student Activity Sheet 5: A Cool Tool!

7. Another of Vanessa's clients, Ronnie, wants to save for retirement. Ronnie believes that he will need $2,000,000, since he is planning to be retired for 20 to 30 years. He can save in investments that have the following parameters:

- The number of years to save is 20 to 40.
- The number of compounding periods is annually, quarterly, monthly, weekly, and daily.
- The interest rate can be 2.77% to 5.23% or any rate between.

Ronnie wants to know the effect that each variable has on the present value. Select a variable, and use the following steps to complete the table below:

- Start with the minimum value of your variable.
- Use the average value of the other variables that have parameters.
- Calculate the present value of the investment.
- Decide the next value of your variable to test and repeat the process for a total of five different values.

Present-Value Analysis

Variable Value:	**Present Value (*PV*)**	**Percent Change in Present Value**
Minimum:		
Maximum:		

Decision Making in Finance: Present Value of an Investment

VI.B Student Activity Sheet 5: A Cool Tool!

Present-Value Analysis

Variable Value:	Present Value (*PV*)	Percent Change in Present Value
Minimum:		
Maximum:		

8. Overall, what impact on the present value does each variable have?

9. **REFLECTION:** Of all the variables, which seems to have the greatest effect on lowering the present value of Ronnie's investment? Explain your reasoning.

10. EXTENSION: Prepare a short presentation of your findings for one of the following scenarios to share with the class.

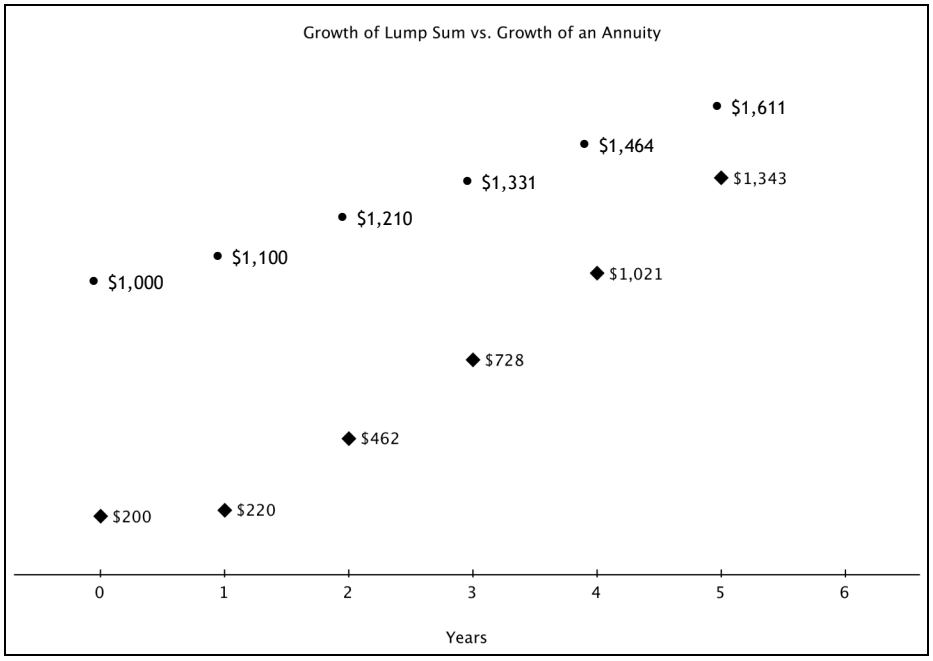
- Sarah wants to save for a car. She has $4,250 in a savings account earning 1.49% compounded quarterly. If Sarah has four years until she gets her driver's license, will she have enough to buy a car? If not, what do you recommend that she do to reach her goal?
- Find the median price of a home in your area and the current annual rate of growth for home values. If you buy a home at the median price and expect it to increase in value at the current growth rate, what will the future value of your home be in 30 years? Would you buy the house knowing that the interest rate on the mortgage (that is, the loan needed to buy the house) is 6% and you must invest an additional 2% of the home's value in upkeep per year? Why or why not?
- Students often take out large loans to go to college. Currently, these loans have a payoff time of 25 years at an interest rate of about 7.5% compounded monthly. Suppose the remaining principal of Dexter's student loans is $33,760 and the remaining payoff time is 15 years at the 7.5% rate. Dexter recently inherited $40,000 and wants to know if he should pay off his student loans or invest the money. What do you recommend? Why?
- The state lottery offers to pay winnings in 25 annual payments or one lump sum, sometimes called a cash-out option. This week's lottery has a jackpot of $30 million and a cash-out value of $18.2 million. Granted that the odds are highly unlikely one would win, which option should a winner take—annual payments or a lump sum? Why?
- Pick an expensive item you want to buy within the next five years. Using current interest rates, find out how much you would have to save today. List the possible roadblocks to reaching the goal.

Decision Making in Finance: Building an Investment

VI.C Student Activity Sheet 6: Investing As You Go

An **annuity** is a financial product that accepts and grows funds and then, upon annuitization, pays out regular payments to the investor. Annuities are often used as retirement funds. Some annuities are funded with a lump-sum investment, while others are funded with an initial investment and additional regular deposits before retirement. What complicates the time value of money (TVM) of an annuity that you pay into is that the investment increases in value due to both compound interest and increasing principal.

The following graph shows the value of a lump-sum investment of $1,000 earning 10% compounded per year (•) versus an annuity with an initial investment of $200 earning 10% compounded per year with additional $200 deposits made each year (♦).



1. How is the process different for calculating the future value of each investment?

2. Refer to the future-value formula in Student Activity Sheet 3. How is the process different in calculating the future value of an annuity when compared to using the future-value formula?

3. An annuity can be thought of as a series of values connected by a common ratio. What common ratio connects the values of the annuity over time shown in the graph at the beginning of this activity sheet? How is the ratio related to the problem situation?

4. The following formula can be used to calculate the sum of a series connected by a common ratio, such as the previous annuity example.

$$S_n = \frac{a_1(1 - r^n)}{(1 - r)}, \text{ where}$$

a_1 = the first term in the series, n = the number of terms in the series, and r = the common ratio.

Use the formula to calculate the value of the annuity described in the graph, and compare the results after five years.

5. In Student Activity Sheet 5, you learned to use a TVM calculator to determine different variables related to TVM. In your prior work with the TVM calculator, you only considered lump-sum investments (and the payment variable was always 0).

Explore using the TVM calculator to determine the future value of the $200 annuity over five years, and compare your answer with the known future value of $1,343.12. List the values you assigned to each variable and explain why.

(***Note:*** Interest is typically paid at the end of the compounding period. In this case, you make payments at the beginning of each period. Therefore, you must change appropriate variable from END to BEGIN.)

Variable	Definition of Variable	Value in This Situation
N	number of compounding periods between the time of investment and the time of retirement	
I%	annual interest rate (as a percent)	
PV	principal, or present value	
PMT	amount of each regular payment	
FV	future value, or value of the investment at maturity	
P/Y	number of payments per year (usually the same as the number of compounding periods per year, ***C/Y***)	
C/Y	number of compounding periods per year	

6. Amy is 25 years old and has attended some retirement planning seminars at work. Knowing she should start thinking about retirement savings early, Amy plans to invest in an annuity earning 5% interest compounded annually. She plans to save $100 from her monthly paychecks so that she can make annual payments of $1,200 into the annuity. Use the TVM calculator to determine the future value of the investment after 35 years.

Variable	Definition of Variable	Value in This Situation
N	number of compounding periods between the time of investment and the time of retirement	
I%	annual interest rate (as a percent)	
PV	principal, or present value	
PMT	amount of each regular payment	
FV	future value, or value of the investment at maturity	
P/Y	number of payments per year (usually the same as the number of compounding periods per year, ***C/Y***)	
C/Y	number of compounding periods per year	

7. Amy seeks the advice of a financial planner, who recommends $850,000 for retirement. Will Amy's annuity plan provide the necessary funds for her retirement? If not, what could she do to increase the value of the investment at retirement? Of those actions, which does she have relative control over?

8. Amy finds another annuity that accounts for **monthly** compounding and **monthly** payments. The annuity pays 6% annual interest, compounded monthly. Use the TVM calculator to determine the monthly payments Amy needs to make over 40 years to have $850,000 at the time of her retirement.

Variable	Definition of Variable	Value in This Situation
N	number of compounding periods between the time of investment and the time of retirement	
I%	annual interest rate (as a percent)	
PV	principal, or present value	
PMT	amount of each regular payment	
FV	future value, or value of the investment at maturity	
P/Y	number of payments per year (usually the same as the number of compounding periods per year, ***C/Y***)	
C/Y	number of compounding periods per year	

9. **REFLECTION:** What recommendations would you make to Amy about her retirement goals and using an annuity to financially support those goals?

10. **EXTENSION:** Contact a financial planner or conduct research via the Internet to determine what recommendations might be available for a client such as Amy in today's financial environment. Prepare a report of your findings to share with the class.

Decision Making in Finance: Building an Investment

VI.C Student Activity Sheet 7: Investment Probability

Interest rates are a measure, among many other factors, of risk. The more risky an investment is in actuality and perception, the higher the rate of return. In general, stocks (an investment security that gives you ownership in a company) are riskier than bonds (a security in which you actually lend money to a company). Thus, the rate of return is much higher for stocks than bonds; on average, stocks have a rate of return of 10% annually and bonds 5% annually.

Use the following information when working through these activities:

- All investments have a rate of return (which sometimes can be negative).
- The rate of return on stocks is a percentage called a *return on investment* (ROI) that compounds not from interest payments but from an overall annual increase based on a price per share that changes daily.
- The rate of return on bonds is an actual interest rate percentage that is assumed to compound (much like a certificate of deposit), but may not if you decide not to reinvest the interest.
- Financial analysts use the time value of money (TVM) based on risk, rate of return, and the relationship it has with other investments to determine the market value or price of a share of stock or bond.
- Although interest rates are used in bonds, financial experts use *interest* as the lending rate that the Federal Reserve sets for banks. This may not seem related to stock prices or bonds, but the interest rate set by the Federal Reserve affects the value of all investments.

1. Stock Texas is worth $14.92 per share on Monday. The interest rate drops on Tuesday, and Stock Texas is worth $15.04 per share. What type of relationship can you assume that Stock Texas has with interest rates? Why?

What does this relationship imply about the risk of stocks compared to bonds? Explain your reasoning.

2. On Wednesday, Bond Austin has the best risk rating, *Aaa,* at a price of $72. On Thursday, the risk rating drops to a lower rating of *Aa,* and the price drops to $64. What type of relationship can you assume that the price of Bond Austin has with its risk ratings? Why?

Do you think that this is a reasonable assumption about the relationship between bonds and risk ratings? Why or why not?

3. Assume losing a letter is considered one unit of risk and you assign the highest (meaning better) rating a 9. What does the price of Bond Austin drop to if the risk rating suddenly becomes *Bb* (a risk rating of 5)?

4. Stock Texas has a price of $156 per share when Bond Austin has a price of $23 per bond. Use an equation modeling the inverse variation between the stock and bond prices to predict the price of Stock Texas when Bond Austin is worth $75.

What is the bond price if the stock price is $71.76?

5. REFLECTION: How certain is this prediction? What other factors could affect the price of either investment?

6. **EXTENSION:** Emily, who is 25 years old, has $25,000 to invest. She wants to invest in stocks, bonds, and/or cash accounts (collectively called an investment **portfolio**). Currently interest rates (and inflation) are relatively low, but seem to be on the rise. Decide the percentage and amount that Emily should invest in each category.

   Suppose interest rates go up, but overall risk in investments increases. Should Emily consider adjusting her portfolio? Explain your reasoning.

   Emily will keep her investment for 35 years, which is the time of her retirement. Using the portfolio you developed, find the future value of each category if stocks have an average annual rate of increase of 12%, bonds an average annual rate of increase of 6%, and cash an average annual rate of increase of 3%.

   What is the expected value of each category if the probability of realizing the average rate for stocks is 0.65, bonds 0.8, and cash 0.95?

7. **EXTENSION:** Create your own portfolio and explain what factors influence its expected value. Prepare a report of your information and predictions to share with the class.

Student: _____ Class: _____ Date: _____

Decision Making in Finance: Using Credit

VI.D Student Activity Sheet 8: Making Sense of Credit

Anatomy of a Credit Card Statement

The following is a monthly statement from a typical credit card company. Parts left out intentionally are denoted by *???* and highlighted in gray.

TEXAS CREDIT

Opening/Closing Date:	7/19/08 – 08/18/08
Payment Due Date:	9/12/08
Minimum Payment Due:	$93.30

Card Summary — Account Number 5555 5555 5555 5555

Previous Balance	$2,342.51	Total Credit Line	$3,000
Payment, Credits	-$150.21	Available Credit	$376
Purchases, Cash, Debits	$410.89	Cash Access Line	$500
Finance Charges	???	Available for Cash	$376
New Balance	???		

Transactions

Date	Description	Credit	Debit
7/23	Gas		$70.61
7/24	Payment – Thank You	$100	
7/24	Hardware Store		$139
7/28	Flowers		$24.95
8/03	Groceries		$176.33
8/18	Hardware Store Return	$50.21	

Finance Charges

Type	Daily Periodic Rate 31 Days in Cycle	APR	Average Daily Balance	Finance Charge Due to Periodic Rate
Purchases	???	28.99%	???	???
Cash	???	28.99%	$0	$0

1. Use the information in the statement to determine the balances throughout the month and then calculate the average daily balance for these purchases.

2. The **daily periodic rate** describes the interest you are paying on your credit every day.

- Use the following formula to calculate the daily periodic rate to five decimal points.
- Use this rate to determine the finance charge to the nearest cent. (***Note:*** *APR* stands for *annual percentage rate*.)

$$\text{daily periodic rate} = \frac{\text{APR}}{\text{days in year}}$$

3. Calculate the new balance, considering credits, debits, and finance charges.

4. What percentage is the minimum payment to the new balance before interest?

5. Marley has a credit card with an APR of 22.75% and a current balance of $14,677.90. If Marley uses the same percentages from the previous questions, what is her minimum payment (to the nearest cent)?

6. Using the minimum payment from Question 5, how long will it take Marley to pay off the current balance, assuming she does not add any more charges to her credit card? How much in interest would paying only the minimum every month cost her?

Variable	Definition of Variable	Value in Marley's Situation
N	number of compounding periods	
I%	annual interest rate (as a percent)	
PV	principal, or present value	
PMT	amount of each regular payment	
FV	future value	
P/Y	number of payments per year	
C/Y	number of compounding periods per year	

7. Suppose Marley makes $2,500 per month. Create a budget for Marley to find how much she has left over to pay the minimum on her credit card. (Remember to consider the taxes taken out of her paycheck: Social Security—6.2%, Medicare—1.45%, and federal income tax—15%.)

Can Marley afford the minimum payment? If so, how much more than the minimum can she pay? If not, what do you recommend she do to afford the payment and pay off the credit card?

8. The credit statement shows the APR. However, most credit card companies compound interest more often than annually. The actual interest rate you pay each year, taking into account compounding, is called the **effective annual rate** (EAR). It can be calculated with the following formula:

$$\text{EAR} = \left(1 + \frac{\text{APR}}{n}\right)^n - 1, \text{ where } n \text{ is the number of compounding periods per year.}$$

Benny's credit card APR is 26.55% compounded daily. What is his actual interest rate per year—that is, his EAR?

9. REFLECTION: Is the EAR higher than the APR? Why or why not?

10. EXTENSION: Research nonprofit consumer debt counseling sites that explain the elements of a credit card statement, some misconceptions about credit, and the pitfalls that get credit card users in trouble.

Decision Making in Finance: Using Credit

VI.D Student Activity Sheet 9: Understanding Credit Card Debt

J.R. owes $9,000 on a credit card charging a 16.8% annual percentage rate (APR). He stopped using the card and has a debt plan to pay $319.97 per month to pay off the balance in 36 months.

1. Create an amortization table for the 36 months of J.R.'s debt plan.

2. Graph the principal and interest portions as separate bar graphs for the 36 months.

3. **REFLECTION:** Compare and contrast the two graphs.

4. Will the payment in the 36th month be the same as all the rest? Why or why not?

5. **EXTENSION:** Prepare a short presentation of your findings for one of the following scenarios to share with the class.

   - Phoenix has gotten herself in a bit of trouble with credit cards. The following are the current balances and interest rates on her credit cards:
     - Visa: $6,750 at 19.8% APR
     - MasterCard: $8,267 at 16.5% APR
     - Gas card: $1,579 at 22.65% APR
     - Department store card: $3,345 at 21.99% APR

     Phoenix earns $3,000 per month as a painter. Can she afford this debt? Develop a debt plan so that her credit cards are paid off in two years.
   - Horace paid for a $0.79 pack of gum with a credit card. Due to his revolving balance, he will end up paying 23.49% interest on that pack of gum for 10 years. How much did it really cost Horace to charge that pack of gum? How much would a $1,000 couch really cost him?
   - Neeraj will pay $350 per month toward his credit card debt for five years. Create a report that demonstrates how Neeraj could have used that money differently had he not used his credit cards.
   - You want to buy $10,000 in furniture and electronics for your new home. Research different credit card offers and, assuming you qualify for the full amount, choose the card(s) on which you will charge this purchase and explain your choice.

Decision Making in Finance: Using Credit

VI.D Student Activity Sheet 10: Buying a Losing Investment

1. Christina is considering buying a new car with a sticker price of $23,599. Her credit union offers her a three-year car loan at 5.99% annual percentage rate (APR) with 10% as a down payment. Find the monthly payment.

Variable	Definition of Variable	Value in Christina's Loan Situation
N	number of compounding periods	
I%	annual interest rate	
PV	principal, or present value	
PMT	amount of each regular payment	
FV	future value	
P/Y	number of payments per year	
C/Y	number of compounding periods per year	

2. Christina's car will be worth $14,250 in three years. What will the total cost of the car be at the end of the loan?

What is the benefit of this type of financing? What is the cost of this type of financing?

3. Christina considers a different option. The dealership offers 0% down and 0% APR for two years. The car will be worth $17,629 in two years.

What will the monthly payments be under these conditions? How much will the total cost of the car be if Christina takes this loan?

Which loan should Christina take? Why?

4. Christina has an offer to lease the same car for three years at $349 per month. The lease has a balloon payment of $1,200 at the end of three years. What is the total cost of the lease?

5. What interest rate is Christina being charged for leasing the car?

Variable	Definition of Variable	Value in Christina's Leasing Situation
N	number of compounding periods	
I%	annual interest rate	
PV	principal, or present value	
PMT	amount of each regular payment	
FV	future value	
P/Y	number of payments per year	
C/Y	number of compounding periods per year	

Should Christina take the lease? Why or why not?

6. The car manufacturer offers a lease-to-purchase option at 1.9% APR for three years. At the end of this option, Christina can keep the vehicle by paying the depreciated value or walk away for a fee of $150. What is the monthly payment of the lease-to-purchase option? What is the total cost of the purchase option if she walks away?

Variable	Definition of Variable	Value in Christina's Lease-to-Purchase Situation
N	number of compounding periods	
I%	annual interest rate	
PV	principal, or present value	
PMT	amount of each regular payment	
FV	future value	
P/Y	number of payments per year	
C/Y	number of compounding periods per year	

7. **REFLECTION:** Which alternative should Christina choose: the loan, the lease, or the purchase option? Why?

8. Christina works for a law firm and makes $42,350 a year. Based on standard budgeting used in Student Activity Sheet 8 and using your choice in Question 7, can she afford the car? Explain your answer.

9. EXTENSION: Wanda wants to buy a new car for $34,650. The bank will give her a car loan for five years at 4.5% APR with $0 down payment. What will her monthly payment be?

Variable	Definition of Variable	Value in Wanda's Loan Situation
N	number of compounding periods	
I%	annual interest rate	
PV	principal, or present value	
PMT	amount of each regular payment	
FV	future value	
P/Y	number of payments per year	
C/Y	number of compounding periods per year	

Decision Making in Finance: Using Credit

VI.D Student Activity Sheet 10: Buying a Losing Investment

a. Wanda's car will be worth $18,935 in five years. The manufacturer offers a lease-to-purchase option at 7% APR. At the end of the purchase option, Wanda can keep the vehicle by paying the depreciated value or walk away for a fee of $180. What will her monthly payment be?

Variable	Definition of Variable	Value in Wanda's Lease-to-Purchase Situation
N	number of compounding periods	
I%	annual interest rate	
PV	principal, or present value	
PMT	amount of each regular payment	
FV	future value	
P/Y	number of payments per year	
C/Y	number of compounding periods per year	

b. What is the total cost for the loan? What is the total cost for the purchase option if Wanda walks away for $180? Which alternative should Wanda choose: the loan or the purchase option? Why?

10. EXTENSION: Research websites that calculate and compare all three methods of financing vehicles. Select a vehicle, determine the monies involved in each type of financing, and make a decision regarding which is the best option. Prepare a short presentation to share with the class.