Examples of homework assignments for Spring 2016 Temple University GenEd Orientation
January 7, 2016
Finance 0922 (Fall 2015): Homework #1 Key

• Due on Wednesday, January 21, before class. Late assignments incur a 2-point penalty. No assignment will be accepted after January 23.
• You may do the assignment in Excel if you want but you must write the formulas you use in a comment box or in a cell next to your answer and hand in a physical copy. You must show all of your work (whether or not you use Excel)
• Be sure to put your name in the top-right corner of the assignment.

1. Manipulating exponents
   a. If your investment account currently has a balance of $1000 and increases to $5,000 over 10 years, what is the (annual) percentage change over this period? = 50% (arithmetic) or 17.5% (geometric)
   b. \( \frac{3,000}{1,500} \)\(^{1/10} - 1 = .0718\)
   c. \( 100 \times (1+.03)^{-5} = 86.26\)
   d. \( 750 \times (1+.04)^{8}/(1.02)^{8} = 876.04\)
   e. \( 35,000 \times (1.04)^{30} = 113,518.9\)
   f. \( 500 \times (1-(1+.08)^{40})/.08 = -129,528.3\)
   g. \( 1200 \times ((1.07)^{25} -1)/.07 = 441,428.5\)

2. Suppose that Jenna, a Temple graduate, has found her first job that will pay her $40,000 per year and the company is located within the Philadelphia city limits.
   a. What is Jenna’s marginal federal tax rate using a $6,300 standard deduction and $4000 personal exemption for 2015? 15%
   b. What is Jenna’s expected Federal Income tax for 2015?
      \[ 922.5+0.15\times(29,700-9,225) = 3,993.75 \]
   c. What is Jenna’s effective federal tax rate?
      \[ \frac{3,993.75 (FIT)}{45,000 (gross income)} = 9.98\% \]
   d. Suppose that Jenna’s employer provides healthcare insurance at a cost of $125 per month. In addition, she decides to establish a Flexible Spending Account for $750 because of the high deductibles on the health care plan. What is her expected Federal Income tax with these changes?
      \[ 922.50+0.15\times(27,450-9,225) = 3,656.25 \]
   e. (OMIT) Using the IRS website, what number of withholding allowance should Jenna use for 2015 and what is her anticipated tax based on (c)? One
      Gross Income $35,000 – Company Health $1,500 – FSA $750
      Anticipated Tax using the calculator is: $2,910
f. How much are her taxes reduced by the company-provided healthcare and FSA deductions?

$337.50

g. Compute Jenna’s after-tax income after considering all income taxes. What is her overall effective tax rate?

9.14%

h. Suppose Jenna found a similar job in northern Virginia (Reston, VA). How would her take-home pay change? Answer in 1 sentence.

Virginia has a 5.75% state income tax, higher than Pennsylvania’s 3.07% but there is no city wage tax (a 3.91% savings). Net she is ahead 1.23% on her gross income or .0123 x $40,000 = $492

3. Suppose that Jenna found an apartment in Center City for $1,200/month utilities included; however her phone/cable bill will be $150 per month. She has $40,000 in student loans and will have a $250/month student loan payment that begins in September. Jenna has $4,000 in outstanding credit card debt with a minimum payment of $106. She is also considering purchasing a Prius so she can get away on the weekends. Her monthly payment will be $420 and she expects gas will be only $25 per month, but insurance will be $2,000 per year (it is Philadelphia!).

i. Develop a budget for Jenna using the information above and the percentages we used in class.

<table>
<thead>
<tr>
<th>Original Budget</th>
<th>Possible Revised Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rent $1,200.00</td>
<td>$600.00</td>
</tr>
<tr>
<td>Utilities $150.00</td>
<td>$150.00</td>
</tr>
<tr>
<td>Transportation $611.67</td>
<td>$325.00</td>
</tr>
<tr>
<td>Food 15% $353.02</td>
<td>$353.02</td>
</tr>
<tr>
<td>Clothing 5% $117.67</td>
<td>$117.67</td>
</tr>
<tr>
<td>Medical $0.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>Loans $356.00</td>
<td>$356.00</td>
</tr>
<tr>
<td>Entertainment 5% $117.67</td>
<td>$117.67</td>
</tr>
<tr>
<td>Savings 10% $235.35</td>
<td>$235.35</td>
</tr>
<tr>
<td>Total $2,906.04</td>
<td>$2,019.37</td>
</tr>
<tr>
<td>Surplus/Deficit $552.56</td>
<td>$334.11</td>
</tr>
</tbody>
</table>

ii. Should Jenna buy the car and sign the lease for the apartment? Why
or why not? You can answer in 1 sentence.

No, Jenna is using over half her budget on rent and utilities alone, which makes it impossible for her to cover all costs without using her credit card.

iii. What if she found a roommate to split the rent and used ZipCar ($200 per month – no insurance required) instead of buying the car? Develop a new budget and explain in 1-2 sentences the changes you made.

I split the shared costs in half and got rid of the cost of the Prius and the insurance. This had money left over, so I added the leftover money to the credit card payments so that she wasn’t just making the minimum payments.

4. Consider the following information about Jenna’s credit cards:
   a. Using the credit limits below with Jenna’s cards, what is her overall debt-to-credit limit? \[ \frac{41.67\% = \frac{2,500}{6,000}}{41.67\%} \]

<table>
<thead>
<tr>
<th>Card A</th>
<th>Card B</th>
<th>Card C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit limit</td>
<td>$3,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>Amount borrowed</td>
<td>$1,500</td>
<td>$0</td>
</tr>
</tbody>
</table>

   b. Please read these articles: [https://beta.creditkarma.com/article/CreditCardUtilizationAndScore](https://beta.creditkarma.com/article/CreditCardUtilizationAndScore) and [http://credit.org/blog/what-is-a-good-credit-score-infographic/](http://credit.org/blog/what-is-a-good-credit-score-infographic/).

   i. All else equal, using your answer in (a), what is Jenna’s likely FICO score?

   ![Credit Score Chart]

   ii. With this FICO score, how much more (on average) will she pay for interest on her credit card debt and auto loans compared to “Excellent” credit?

   **Auto loans**
   - Acceptable: $7,614 11%
   - Excellent: $3,375 5.1%
   - Difference: $4,239 5.9%

   **Credit Card**
   - Acceptable: 13.9%
   - Excellent: 7.99%
Difference: 5.91%
The assignment is due on Monday, September 14. I will give you time in class on September 11 to get a head start on this assignment.

All answers should be rounded to two decimal places. For example, if you compute 0.456%, you should round to 0.46%. If you compute $3.473, you should round to $3.47.

1. If a gallon of gas cost $0.36 in 1972 and $2.75 in 2014, what is the cost of gas today in constant (1972$)?

2. A 2-bedroom apartment in San Francisco rented for $435/month in 1979; in 1999 the same apartment rented for $1,995 per month. What is the 1979 rental rate in current (1999) dollars?

3. The average Broadway ticket price in 2012 was about $120; in 1985 the average price was $40. What is the current dollar (2012) price of a Broadway ticket?

4. Suppose the "standard PC" for college in 2004 cost $1,800 and today it would be around $600 (but with much more power and functionality). What is the constant dollar (2004$) cost of a college ready PC today (2014)?

5. Suppose that your aunt has a pension that pays a fixed $50,000 per year that began in 2010.
   a. What is the real or constant dollar (2010) value of her pension in 2014?
   b. Is inflation good or bad for pensioners on a fixed amount? Explain.
1. Suppose that you can invest $3,000 for 10 years and earn a rate equal to 5%
   a. What is the future value?
   b. What is the total interest?
   c. What is the simple interest?
   d. What is the compound interest?

2. Go to Bankrate.com, click on the Bank Accounts tab and then click on Calculators and then scroll down to the Compound Interest Calculator.
   a. Enter $5,000 at 6% interest for 5 years (either directly or using the sliders to the right). Compute the future value to show that the reported number of $6691 is the correct answer.
   b. Verify that $6,734 is the correct future value on Bankrate.com if interest is compounded quarterly.

3. Temple’s Fox School of Business charged $17,484 for in-state tuition in 2013. If Temple’s tuition rises at 5% over the next 5 years, what will Fox in-state tuition be?

4. Suppose Jenna starts work January 1, 2014 and is paid $45,000 at the end of the year (December 31). If her salary grows at 5% per year, what will her salary be in 45 years?

5. If the number of incarcerated Americans was 500,000 in 1980 and 2,000,000 in 2000, what is the compounded annual growth rate of incarcerations over this period?

6. How long would it take you to double $5,000 if the rate of return (interest rate) is 5%?
   a. Show using the Rule of 72
   b. Show using natural logs to solve directly for “t”
Due on Monday, September 28 before class through the Blackboard Homework Submission link.
All answers should be rounded to the nearest two decimal places. For example, if you compute .456%, you should round to .46%; if you compute $3.473, you should round to $3.47.

1. What is the effective annual rate on a credit card that has an APR=24%?

2. Go to Bankrate.com, click on the Bank Accounts tab and then click on Calculators and then scroll down to the Compound Interest Calculator. Enter $5,000 at 6% interest for 5 years (either directly or using the sliders to the right).
   a. Compute the future value using monthly compounding to show that the reported number of 6744 is the correct answer.
   b. Compute the effective annual rate using monthly compounding.

3. What is the present value of $1,000 in 10 years if you can earn a rate equal to 5%? At 8%? What do your answers tell you about the relationship between present value and the interest rate used?

4. Suppose that you win $1 million in a lottery. After the excitement subsides, you discover that the the payout is $100,000 today, $200,000 in one year, $300,000 in two years and the remainder in 5 years.
   a. What is the pre-tax value of the lottery in today if you could earn 3%?
   b. What is the future value of the lottery payments in 5 years?
   c. Using your answer in (a) and (b), compute the compounded annual growth rate (or interest rate).

5. Suppose that you want to buy a house in 10 years and need $30,000 for a down payment.
   a. How much do you need to invest today to reach your goal if you can earn 5%?
   b. How much do you need to save each year to meet your goal if you can earn 5%? In this problem you have to solve for the payment given the future savings goal (Hint: $30,000 is a future value). You need to solve for: \( \text{PMT} = \frac{\text{FV}}{(1+r)^n - 1)/r} \)

6. Suppose that you need $250,000 to pay for your child’s college in 18 years. If you can earn 7% on your money,
   a. How much do you need to invest today if you wanted to make no further computation?
   b. How much do you need to invest each year for the next 18 years to meet your goal at the end of 18 years?
   c. How much do you need to save each month? In this problem you need to adjust the Future Value Annuity Factor: \( \frac{[(1+ \frac{r}{12})^{18x12} - 1]}{(r/12)} \)

7. Alexander, Jenna’s significant other, estimated that he needs $5 million to retire in 48 years (go big or go home he says).
   a. If he can earn 8% on his investments (going big), how much does he need to save each year to meet his retirement goal?
   b. If Alex received an inheritance windfall of $150,000 and invested and earned 8%, would he need to save for retirement? Explain.
   c. How does your answer to (a) and (b) change if he can earn only 6%?
1. You decided that you want $2 million in your savings for retirement in 47 years. Suppose you were given a $45,000 graduation gift and invested it at 7% for retirement
   a. How much would you have at the end of 47 years?
   b. How much would you have to save each year 47 years to reach your $2 million goal if you can earn 7% on your money?

2. Jenna will earn $45,000 per year when she starts her job at age 22 and expects that her salary will increase at 3% per year over the next 47 years (assuming she gets paid $45,000 at the end of her first year when she is 23).
   a. What is her salary when she retires at age 70?
   b. Suppose the current CPI is 230 (today when Jenna is 22) and inflation is expected to be 2% per year. What is the expected CPI in 48 years?
   c. What is Jenna’s salary at age 70 in current dollars?

3. Suppose Jenna’s friend, Alex, thought he could live per year on 80% of the $200,000 he was earning at the time of his retirement in 48 years.
   a. If he expected to live 30 years after retirement and could earn 3% on his money, how much does Alex need at retirement, i.e. his nest egg?
   b. How much does Alex need today to meet his “next egg” requirements in 48 years if he can earn 7% on his money?
   c. How much would he need to save per year to reach the nest egg?

4. Bath Bank offers you several alternatives for a $20,000 car loan: 3-years/3%; 5-years/4%; and 7-years/5%.
   a. What is the monthly payment for each loan?
   b. What is the outstanding balance at the end of 24 months for each loan? You can use Excel or the formula given in class.
Use the Retirement tab in the class workbook to provide answers to these questions. Note!!!
You will be required on the next test to be able to do these calculations using the formulas I put
on the board. Excel makes it easier to change the calculations.

1. Suppose your employer will match 1:1 your retirement contributions up to 10% of your salary.
   Assume that you make $45,000 per year and all contributions are made at the end of the year.
   Using the tables from Forbes (http://www.forbes.com/sites/kellyhillipserb/2014/10/30/irs-
   announces-2015-tax-brackets-standard-deduction-amounts-and-more/):
   a. If you elect a 401(k) contribution, what is your after-tax income?
   b. If you elect a Roth contribution, what is your after-tax income?
   c. What is your total retirement balance at the end of the first year including the employer
      contribution?
      i. 401(k)
      ii. Roth

2. What is the size of your nest egg using the base assumptions on having your salary grow at:
   a. Slower rate relative to inflation (+.50%)
   b. Faster rate (2.0%)?

3. What is the size of your nest egg using the base assumptions if your investment rate is:
   a. 8%
   b. 5%

4. What is the size of your nest egg using the base assumptions if your retirement income as a % of
   your last year’s income is:
   a. 70%
   b. 90%

5. Returning the salary growth to 3.8%, if you retire at 70 instead of 67,
   a. What is the size of your nest egg?
   b. What is the size of your inflation-adjusted nest-egg? Show using the formula and check with
      using the NPV formula in Excel.
   c. What is savings as a % of income required to achieve your nest-egg at age 70? Either use
      trial and error or Goal Seek.

6. Suppose in pursuing your life’s dream, you start out at $30,000 and will see your salary increase only
   .5% more than inflation. Your plan is to keep on working as long as you can (to age 75) and think
   you will live to 95 based on your family’s average life span.
   a. What is the size of your required nest egg?
   b. How much will you have to save as a percent of your salary to reach your nest egg
      requirement?
MAKE SURE YOU HAVE V2.0. In preparation for the next test, you should do all of these calculations using the formulas given in class. This is an integrated problem, which means that if you make a mistake at the beginning it will carry through to the end. You can use Excel to check your answer.

Jenna’s significant other (Josh) is an accounting major who is currently 22 and expects to work for one of the Big Four firms at a starting salary of $65,000 upon graduation. He expects his salary to increase at 5% per year and plans on working until he is 60. He expects to live another 30 years after retirement. Note carefully: he believes he can invest his retirement contributions at a rate of 7%, but when he retires he is going to take less risk and only expects to earn 4% on his nest egg until he expires. He is not sure how much he requires for his retirement income as a percent of his final salary but believes that is will be 70%.

1. What will his salary be at retirement? Remember that he receives his salary at the end of his first year of work at age 23.
2. Josh was astounded at the number you provided in #1. What is the real value in today’s dollars to bring him back to earth if inflation is expected to be 2%?
3. How much income does he need to have each year after he retires (not inflation-adjusted)?
4. What is his nest egg requirement upon retirement at age 60?
5. How much would he have to save on annual basis to reach his nest egg requirement by age 60?
6. Suppose Josh is currently in the 25% tax bracket and wants to save 10% of his pre-tax income. His employer will match ½ of his contribution. As a result of recent changes in the tax law, Josh is permitted to elect either a 401(k) or a Roth for his contribution.
   a. How much would his total (employee + employer) first year contribution be for each alternative assuming that his cash outflow will be the same?
   b. What is the after-tax future value of his first year’s contribution under both plans when he retires if he can earn 7% on his investments and he is now in the 28% tax bracket?
7. If Josh expects inflation to be 2% over the time of his retirement, what is his inflation-adjusted nest egg?
8. What would the balance be in his nest egg at the end of the first year of retirement?
9. Josh was reminded that he needs to include Social Security. He used the calculator and it estimated his benefits in future dollars at $9,000 per month. He knows that it is possible his benefits will be reduced if the Congress cannot agree on a solution and thus he conservatively factors in 70% of the promised benefits. He also knows Social Security benefits are adjusted for inflation annually. What is the present value of these benefits – adjusted for inflation – as of his retirement date?
10. How much does Josh now need to save per month after adjusting for Social Security benefits?
11. If Josh thinks he could earn 6% instead of 5% on his nest egg, what would the impact be on the size of his nest egg? I’m looking for a directional answer, not a number.
After researching mutual funds and reading more from Vanguard’s website, Jenna has decided to look into asset allocation funds. On Vanguard’s website she found Target Retirement and LifeStrategy® Funds and has a several questions.

1. What is the difference between a Target Retirement and a LifeStrategy® fund?

2. List the distribution of Holdings and the percentage for each the Target Retirement 2060 Fund (VTTSX) and the LifeStrategy Growth Fund (VASGX) as of October 31.

<table>
<thead>
<tr>
<th>Target Retirement 2060 Holdings</th>
<th>%</th>
<th>LifeStrategy Growth Holdings</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vanguard Total Stock Market Index</td>
<td></td>
<td>Vanguard Total Stock Market Index</td>
<td></td>
</tr>
<tr>
<td>Vanguard Total International Stock Index</td>
<td></td>
<td>Vanguard Total International Stock Index</td>
<td></td>
</tr>
<tr>
<td>Vanguard Total Bond Market II Index</td>
<td></td>
<td>Vanguard Total Bond Market II Index</td>
<td></td>
</tr>
<tr>
<td>Vanguard Total International Bond Index</td>
<td></td>
<td>Vanguard Total International Bond Index</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td></td>
<td>100.0%</td>
</tr>
</tbody>
</table>
3. Jenna thought it would be prudent to compare Vanguard’s funds with similar ones at Fidelity and T Rowe Price. Help her by filling in the table below.

<table>
<thead>
<tr>
<th>Fund Manager</th>
<th>Vanguard</th>
<th>T Rowe Price</th>
<th>Fidelity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fund symbol</td>
<td>VASGX</td>
<td>TRSGX</td>
<td>FAMRX</td>
</tr>
<tr>
<td>Fund name</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum IRA contribution</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expense ratio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Stocks/% Bonds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-year rate of return (qtr end)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-year benchmark</td>
<td>Growth Composite</td>
<td>Combined Index</td>
<td>Fidelity Composite</td>
</tr>
<tr>
<td>10-year benchmark return</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difference</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. And finally, Jenna wanted to compare the Target Retirement Funds.

<table>
<thead>
<tr>
<th>Fund Manager</th>
<th>Vanguard</th>
<th>T Rowe Price</th>
<th>Fidelity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fund symbol</td>
<td>VFIFX</td>
<td>TRRMX</td>
<td>FFFHX</td>
</tr>
<tr>
<td>Fund name</td>
<td>Target Retirement 2050</td>
<td>Retirement 2050</td>
<td>Freedom 2050</td>
</tr>
<tr>
<td>Minimum IRA contribution</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expense ratio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asset allocation: Briefly describe the distribution of holdings in terms of % domestic stock, % foreign stock and % bonds.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-year rate of return (qtr end)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Fin 0922 (Fall 2015): Homework #10

This assignment is due on Monday, November 30 at 2359 (1159 pm). There is an attached workbook to assist in completion of the assignment. You use the workbook for your calculations but place your answers in this document. You should consult my teaching note on Understanding Returns, which provides examples for all of these calculations.

1. Suppose that you have the portfolio shown in HW 10 tab in the workbook (dated 20-Nov-15).
   a. What is the return on each fund?
   b. What is the return on the portfolio?

2. Suppose you are invested in an S&P 500 index fund shown in the workbook.
   a. Fill in the table to show your end of year investment value if the dividends are paid at the end of the year and are reinvested in shares of the fund. The dividend is based on a 4% yield based on the end of year price.
      i. What is the portfolio value at the end of year 2?
      ii. What is the portfolio value at the end of year 3?
      iii. What is the portfolio value at the end of year 4?
      iv. What is the portfolio value at the end of year 5?
   b. What is the modified Dietz return for:
      i. Year 2
      ii. Year 3
      iii. Year 4
      iv. Year 5

3. Using your results in problem #2:
   a. What is the 5-year total return? Find the beginning investment value, ending value and total contributions to make this calculation using the modified Dietz method.
   b. What is your (arithmetic) average annual return over the 5-year period?
   c. What is your (geometric) average annual return over the 5-year period? You need to use your 1+ returns in 2(b) to compute this average following the examples in the Understanding Returns teaching note.

4. Using the data in the HW 10 tab, compute the return on your aunt and uncle’s retirement account for 2015 using the modified Dietz method.