Midterm 1

1. (12 points) What is the effective annual interest rate in each situation?
   a. A savings account with 4% annual interest rate compounded daily (assume a year consists of 365 days)?
   b. A savings account with 4% annual interest rate compounded monthly?

2. Northwestern’s endowment bought a year ago a bond with face value $10,000, paying semiannual coupons at an annual coupon rate of 10%.

   2.1 (5 points) What is the dollar amount of each coupon payment?
      (a) $1200
      (b) $1000
      (c) $600
      (d) $500
      (e) zero
      (f) Something else.
      (g) More information is required to answer the question.

   2.2 (10 points) The bond’s yield fell by 1.5% (150 basis points) over the last year. This implies that:
      a) The value of this bond increased.
      b) The value of this bond stayed the same.
      c) The value of this bond fell.

3. (10 points) You need to invest money for one year and decide to buy a 30-year Treasury bond issued this month with a 5% yield. What risk results from this mismatch of when you need the money and when the bond matures?
   a) inflation risk
   b) interest-rate risk
   c) reinvestment risk
   d) credit risk
   e) funding liquidity risk

4. (10 points) Which type of risk is most relevant for the bond issuer?
   a) inflation risk
   b) interest-rate risk
   c) reinvestment risk
   d) credit risk
   e) funding liquidity risk

[More problems are on the back.]
5. (11 points) Consider the following cashflow stream and a bank account paying 3% annual interest. What is the present value? Is the account value ever negative?

<table>
<thead>
<tr>
<th>Year</th>
<th>Cashflow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>-15</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
</tr>
</tbody>
</table>

6. (24 points) Which of the following cashflows do you most prefer using a discount rate of 10%? Using a discount rate of 1%? Show and explain all supporting calculations!

- **Cashflow A**: receive $10 every year, forever, with the first payment next year
- **Cashflow B**: receive $19 every other year, forever, with the first payment being next year
- **Cashflow C**: pay $5 every year for 20 years, with the first payment being today, and then subsequently receive $30 every year for 20 years.
- **Cashflow D**: receive $70 today and then receive $50 in five years.

7. (18 points) Irene Engels recently graduated with an MBA. In August 2007, she borrowed $50,000, and she borrowed another $50,000 in August 2008. Her student loan has an annual interest rate of 2% compounded monthly. Irene doesn’t make any payments on her student debt until she starts a lucrative Wall St. job. Then starting in September 2009 she makes a payment of $1000 every month. Now bonus time is coming near. For January 2010 she plans to make another $1000 payment (her 5th) and also apply her bonus to the debt. How big must her bonus be so that she will have completely paid-off the debt at the end of this January?

8. (10 points extra credit) You are analyzing the value of the company Twitter using a 15% discount rate. You expect its cashflows over the next 4 years to be as shown below and you estimate its NPV as $1B. Explain.

<table>
<thead>
<tr>
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</tr>
</thead>
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<td>-20M</td>
</tr>
<tr>
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<td>-10M</td>
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<tr>
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</tr>
<tr>
<td>3</td>
<td>12M</td>
</tr>
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<td>4</td>
<td>40M</td>
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