1. Why should a financial manager use the NPV decision rule? [2 pts]

The goal of the financial manager is to make decisions that increase the value of the firm. The NPV decision rule says to value the benefits and costs of a decision in terms of their present values (cash value today) and then subtract the present value of the costs from the present value of the benefits to get the NPV. If the NPV is positive, then the decision creates value, adding value to the firm and the NPV decision rule says to take it and otherwise reject it. Thus, the NPV decision rule is perfectly aligned with the goal of the financial manager.

2. Your bank sends you a notice saying that it will change the way it computes interest on your savings. Rather than an APR of 2.40%, compounded monthly, they will pay an APR of 2.41%, compounded semi-annually. Show whether you are better or worse off. [2 pts]

The only way to compare these two rates is to convert them into their effective annual rates (EARS). To compute the EAR, you must first convert to the true rate at the appropriate compounding interval and then compound that rate over one year. The first rate is given as 2.40% compounded monthly, so you have to first compute the true monthly rate. The second rate is given as 2.41% compounded semi-annually, so you must first compute the true 6-month (semi-annual) rate:

\[
EAR = \left(1 + \frac{r}{m}\right)^m - 1
\]

For the first rate:
\[
r = \frac{0.024}{12} = 0.002
\]
\[
EAR = \left(1 + 0.002\right)^{12} - 1 = 0.02427
\]

For the second rate:
\[
r = \frac{0.0241}{2} = 0.01205
\]
\[
EAR = \left(1 + 0.01205\right)^{2} - 1 = 0.02425
\]

So you are slightly worse off.

3. Let’s say that social security promises you $40,000 per year starting when you retire 45 years from today (the first $40,000 will come 45 years from now). If your discount rate is 7%, compounded annually, and you plan to live for 15 years after retiring (so that you will get a total of 16 payments including the first one), what is the value today of social security’s promise? [2 pts]

This is a deferred annuity:

<table>
<thead>
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<th>0</th>
<th>1 …</th>
<th>44</th>
<th>45…</th>
<th>60</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>…</td>
<td>0</td>
<td>40,000</td>
<td>…</td>
</tr>
</tbody>
</table>

The value of the annuity in year 44, one period before it is to start is straightforward:

\[
PV = \frac{CF}{r} \left[ 1 - \frac{1}{r(1+r)^n} \right] = \frac{40,000}{0.07} \left[ 1 - \frac{1}{(1.07)^{16}} \right] = 377,865.94
\]
To get its value today, we need to discount that lump sum amount back 44 years to the present:

\[ \frac{377,865.94}{(1.07)^{44}} = $19,250.92 \]