First Midterm Exam Answers

1. **Jumping.**

   (a) With no insurance, you receive expected income

   \[ E(C) = 0.95(40,000) + 0.05(40,000 - 15,000) = 39,250 \]

   Your expected utility is then

   \[ EU = 0.95 \ln[4(40,000)] + 0.05 \ln[4(25,000)] = 11.959 \]

   \[ \begin{array}{c|c|c}
   \$ & U & \$ \\
   \hline
   40,000 & 11.983 & 39,250 \\
   25,000 & 11.959 & \end{array} \]

   (b) First, we need to calculate the actuarially fair premium which is defined as the expected loss for the insurance company:

   \[ \gamma = 0.05(10,000) = 500. \]

   Now, we can use this premium to calculate expected utility if you buy this type of insurance:

   \[ EU = 0.95 \ln[4(40,000 - 500)] + \\
   0.05 \ln[4(40,000 - 15,000 + 10,000 - 500)] = 11.964 \]
2. Future.

(a) The key is to write down the problem correctly:

\[
\max_{c_1, c_2} u(c_1, c_2) = c_1^{2/10} c_2^{3/10}
\]

s.t. \(c_1 + \frac{c_2}{1 + r} = 30 + \frac{100}{1 + r}\)

The rest is just a standard Lagrangian or MRS problem:

\[
\mathcal{L} = c_1^{2/10} c_2^{3/10} - \lambda \left( \frac{c_2}{r + 1} + c_1 - \frac{100}{r + 1} - 30 \right)
\]

FOCS:

\[
\frac{c_2^{3/10}}{5c_1^{4/5}} - \lambda = 0, \quad \frac{3c_1^{1/6}}{10c_2^{7/10}} - \frac{\lambda}{r + 1} = 0, \quad -\frac{c_2}{r + 1} - c_1 + \frac{100}{r + 1} + 30 = 0
\]

Solution for \(c_1\):

\[c_1(r) = 12 + \frac{40}{1 + r}\]

(b) Using the formula above, \(c_1(0.05) = 50.1\). Plotted on a graph, we have:

It is evident that this person borrows in period 1 since the consumption level \(c_1 = 50.1\) is greater than the period 1 income level \(m_1 = 30\).
(c) Since the original bundle is still affordable, you can't have lower utility. If the price ratio changes, in either direction, you change your bundle to achieve greater utility.