1 – Skippy has a trust fund that pays him $1000/month, which he can supplement by working and earning wages of $10/hr. Skippy’s preference over goods and leisure are captured by the Cobb-Douglas utility function \( u(q_c, \ell) = q_c^{0.6} \ell^{0.4} \). Skippy has 400 hours a month that he can use for leisure or work.

Suppose the government decides to raise revenue by taxing his labor market income at 25%. Skippy will increase his labor supply in reaction to the tax. True, False, or do we need more information? (Explain why you give the answer that you do)

\textit{Answer:} False. Given his Cobb-Douglas utility function, we know that before the tax, Skippy’s demand for leisure will be given by

\[ \ell = 0.4 \times (1000 + 10 \times 400) / 10 = 200, \] which means he will work \( L = (400 - 200) = 200 \) hrs.

After the tax, Skippy’s demand for leisure will be given by

\[ \ell = 0.4 \times (1000 + (1-0.25) \times 10 \times 400) / (1-0.25) \times 10 = 213, \] which means he will work \( L = (400 - 213) = 187 \) hrs.

So, given the Cobb-Douglas assumption regarding preferences, Skippy will decrease his labor supply in reaction to the tax.

2 – Consider the labor supply curve depicted below.

(a) Sketch a carefully labeled indifference curve/budget constraint graph that would lead to such a labor supply graph.
Answer:

(b) Suppose everyone in the economy had a labor supply curve similar to the one depicted above. If the tax on wage earnings was increased, what will this do to the amount of labor supplied to the labor market? Describe your answer in detail.

Answer: It is ambiguous. Such a tax increase would effectively shift the labor supply curve in the manner depicted below (bold line). For example, at a market wage of $10/hr, individuals would now supply what they used to supply at $10-t/hr, where $t$ is the amount of the increase in the tax (as now at a market wage of $10/hr they are only taking home $10-t$). This would mean at market wages below $20/hr, individuals would work less than they used to meaning the demand curve would be shifted back.

Alternatively, at a market wage of $25/hr, individuals would now supply what they used to supply at $25-t/hr, where $t$ is the amount of the increase in the tax (as now at a market wage of $25/hr they are only taking home $25-t$). This would mean at market wages above $20/hr, individuals would work more than they used to, so the demand curve would be shifted out.

So the net effect on labor supply would depend on what fraction of the population makes more than $20/hr versus less than $20/hr.
3 – Penelope is endowed with $50,000 this year and $50,000 next year. The current annual interest rate at which she can borrow or save is 0.05. At this interest rate she chooses to consume $40,000 this year, saving the rest (at an interest rate of 0.05) to consume along with the rest of her endowed money next year.

(a) How much money will she consume next year?

*Answer:* If she consumes $40,000 this year, that means she must save $10,000. So, next year she will consume her $50,000 endowment, plus the $10,000 she saved, plus $500 in interest, meaning she will consume $60,500 next year.

(b) Sketch Penelope's budget constraint, including the intercepts. Indicate and label her endowment and her optimal bundle.

*Answer:*
(c) Given what you know about Penelope, would a rise in the interest make her better off, worse off, the same, or can't you say without more information. State/show why you give the answer that you do.

Answer: Given she is already saving, a rise in the interest rate will reinforce what she is already doing, so she will be better off.

4 – Edgar’s preferences over consumption today versus consumption one year from now are captured by the utility function $U(c_1, c_2) = c_1^{0.6} c_2^{0.4}$.

(a) If Edgar is endowed with a payment stream of $100 per year and the going real interest rate is 0.10, what will Edgar's optimal consumption bundle be? (Hint: look at his utility function)

Answer: Working in present value terms, Edgar’s budget constraint is

$$c_1 + c_2(1/1.10) \leq 100 + 100(1/1.10)$$

Therefore, given his Cobb-Douglas utility function, his demand for consumption today and consumption next year are given by

$$c_1 = 0.6\left[100 + 100/(1.10)\right]/1 = 114.55$$
$$c_2 = 0.4\left[100 + 100/(1.10)\right]/\left[1/1.10\right] = 84$$

Note, we can also do this all in future value terms, in which case his budget constraint would be written

$$c_1(1.10) + c_2 \leq 100(1.10) + 100$$

and his demand for consumption today and consumption next year are given by

$$c_1 = 0.6\left[100(1.10) + 100\right]/1.10 = 114.55$$
$$c_2 = 0.4\left[100(1.10) + 100\right]/1 = 84$$

(b) Sketch your answer to (a) on a budget set/indifference curve graph (label carefully).
(c) Given your answer in (a), will Edgar be a borrower or a saver/lender?

Answer: Edgar is currently a borrower, as his consumption today exceeds what he is endowed with in the present (i.e. $100). To become a lender he will need an interest rate \( r \) such that the following equation holds:

\[
0.60\left[\frac{100 + 100}{1+r}\right]/1 < 100
\]

Solving this we get:

\[ r > 0.50 \]