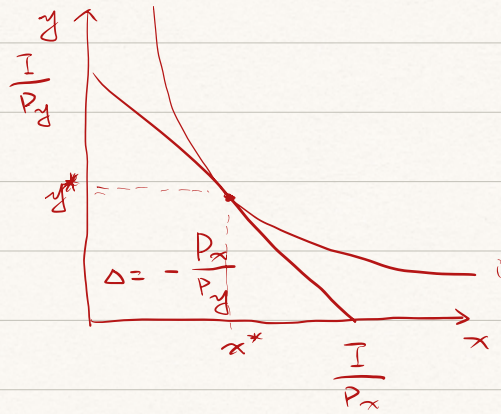
The consumer's problem.

$\max_{(x,y)} \quad u(x,y)$.

Subject to $P_x x + P_y y \leq I$.



The optimal bundle is on the budget line at a point where the line is just tangent to an indifference curve.

Budget line and an indifference curve tangent when

$-\frac{P_y}{P_x} = -MRS_{xy}(x,y)$.

The tengency will hold whenever the consumer buys any positive amount of each goods. This is called an interor solution. If the solution is interor use tangency and budget line to solve for x, y.

$u(x,y) = xy$. $P_x = 20$ $P_y = 40$ $I = 800$. Tangency. $MRS_{xy} = \frac{P_x}{P_y}$.

$MU_x = y$, $MU_y = x$ $\Big\}$ $MRS_{xy} = \frac{y}{x} = \frac{P_x}{P_y} = 1/2 \rightarrow y = 1/2 x$

Budget line: $20x + 40y = 800$

$20x + 40(1/2 x) = 800$

$x = 20$ ← from tangent.

$y = 10$.

Another viewpoint:

- can think of u max as a cost min problem.

$$\min_{(x,y)} \; P_x x + P_y y$$

subject to $u(x,y) = u^*$.

Corner solution: Sometimes consumer would consume zero quantity of one or more goods. This is a corner solution tangent solution may not hold.

Composite good.

- we'll designate y as a composite good i.e the combined quantity of all other goods besides x

$11x + y = I \quad x \leq 9$.

Borrow & lending.

- Consumer have 2 period.

  I_1 today I_2 tmr.

  choose: C_1 to consume today C_2 tmr

  consumer can save at rate r_s, borrow at rate r_b.

  save amount S.

  $S \geq 0$: today $C_1 - S = I_1$

  tmr $C_2 = I_2 + (1+r_s)S$.

  $S \leq 0$ today $C_1 + S = I_1$

  $C_2 = I_2 - (1+r_b)S$.