

Budget Constraints

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This lecture covers the topic of budget constraints.
Economics is all about modeling behavior in a world of scarcity.

(Note that a bunch of the material in this lecture is **not** covered in KW.)

For the individual, scarcity represents itself in terms of constraints on her behavior—the consumer’s consumption is constrained/limited by what she can, and cannot, afford.

Your budget constraint is one of the factors that determine what you purchase and do not purchase, and why demand curves slope down. Another factor is your preference ordering (ranking of bundles).

Imagine that you have only two options: spending quality time shopping with your boyfriend (all he wants to do is shop) or going snow-boarding at Eldora ski area. (In this world, going to school is not an option; you are either shopping or boarding.)

Your boyfriend neither skis nor boards, so if you board you are on your own.

The week has 168 hours and you are constrained to sleep at least 12 hours a night (shopping and boarding are exhausting). So you have $168 - 12(7) = 84$ hours/week to shop and ski.

Let p_S be the exogenous money-cost of a shopping trip with the boyfriend (gas, cloths, coffee, etc.) and let p_B be the exogenous money- cost of a trip to Eldora to board (gas, lift ticket, lunch)

Further assume it requires 4 hours for each shopping trip (boyfriend gets bogged down in the shoe department), $t_S = 4$, and it takes 7 hours for a trip to

Eldora, $t_B = 7$. So t_S is the exogenous time-cost of a shopping trip and t_B is the time-cost of a boarding trip.¹

Given your kind, and rich parents, you have m dollars a week to spend on boarding without boyfriend, and shopping with boyfriend.

What combinations of shopping and boarding trips can you afford?

¹You cannot do them faster or slower. But, maybe you could take half a shop.

Let S be your number of shopping trips with what's-his-name and let B be the number of trips to Eldora.²

1 Budget constraint in terms of money

Your budget constraint, in terms of money, is

$$p_s S + p_B B \leq m$$

The total amount of money you spend on shopping and boarding cannot be more than you have.

How many shopping trips can you afford in terms of money if all you do is shop? $\frac{m}{p_s}$

How many Eldora trips can you afford in terms of money if all you do is board? $\frac{m}{p_B}$

If you spend all of your money on shopping and boarding (this won't always be true).

$$p_s S + p_B B = m$$

Solving this for S one gets³

$$S_m = S_m(m, p_s, p_B, B) = \frac{m}{p_s} - \frac{p_B}{p_s} B$$

This says what? If you spend all of your money on shopping, you can buy $\frac{m}{p_s}$ trips. But every time you take another trip to Eldora (B increases by one), the number of shopping trips you can afford in terms of money declines by $\frac{p_B}{p_s}$, $-\frac{p_B}{p_s}$ is the slope of the line.

For example, if $p_s = \$150$ (it is expensive to shop with boyfriend) and $p_B = \$60$, every time you take another trip to Eldora you give up $\frac{p_B}{p_s} = \frac{60}{150} = 0.4$ shopping trips. Ignoring the time constraint, this is your opportunity cost of boarding: how many shopping trips you give up every time you take another boarding trip (but only in terms of the opportunity cost of the money).

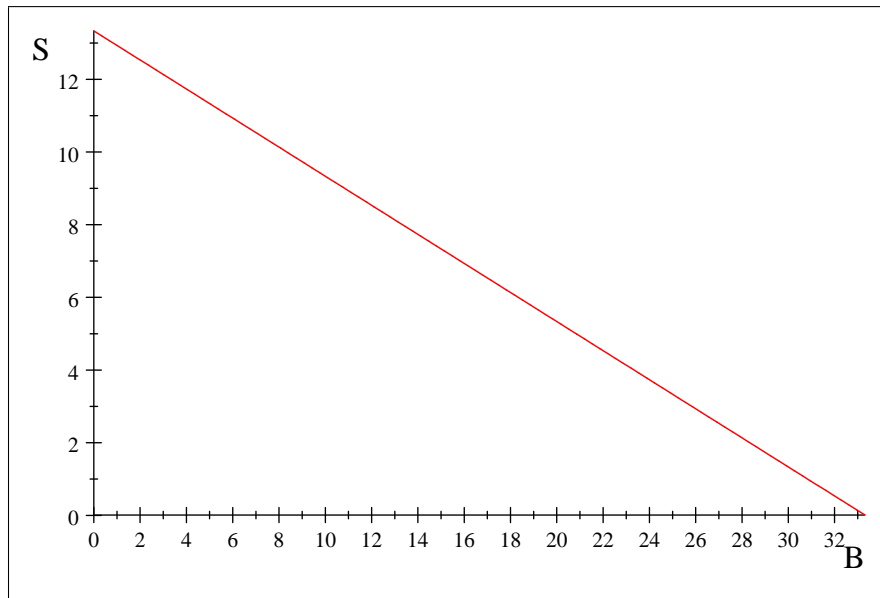
Said another way, the opportunity cost of a shopping trip is $\frac{p_s}{p_B} = \frac{150}{60} = 2.5$ boarding trips.

²I am going to use S and B rather than x_1 and x_2 , since there are only two goods: S stands for shop and B for board.

³I put an m subscript on the S so we would know it was S in terms of the money constraint, as compared to to time constraint).

Let's graph your budget constraint (budget set) assuming you have \$2000 a week to spend on boarding without him or shopping with him (you wish).

$$S_m = \frac{2000}{150} - \frac{60}{150}B = 13.33 - 0.4B. \text{ (also draw this on the floor.)}$$



budget constraint: $m=2000$, $ps=150$, $pb=60$

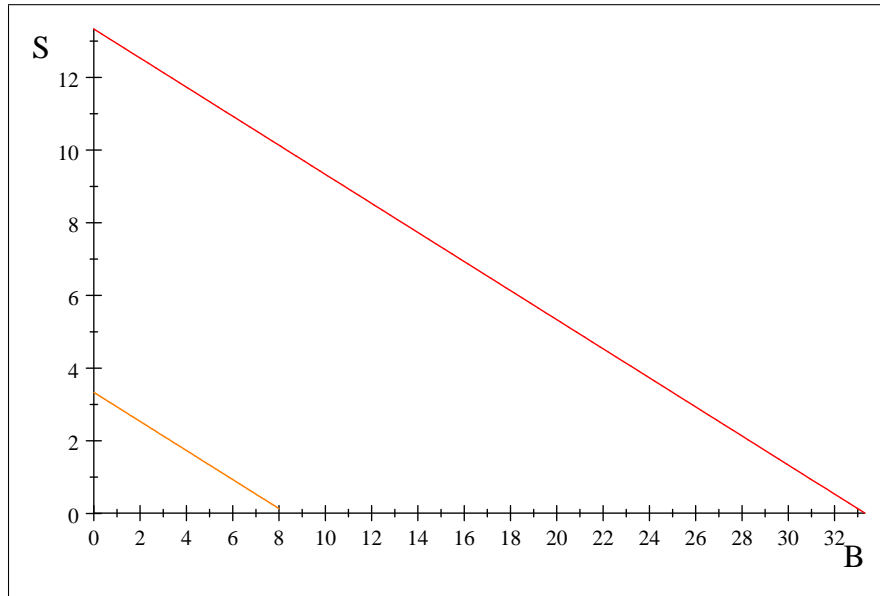
Make a distinction between your *budget line* and your *budget set*.

In terms of money, you can afford to board 30+ times a week.

If you are consuming a bundle to the left of the red line? If you consume a bundle on the red line? To the right of the red line?

What happens after the stock market crashes and your parents cut your weekly allowance back to \$500

Red budget line is $S_m = \frac{2000}{150} - \frac{60}{150}B = \frac{40}{3} - \frac{2}{5}B$ your original budget line
 Orange budget line is $S_m = \frac{500}{150} - \frac{60}{150}B = \frac{10}{3} - \frac{2}{5}B$ your new budget line.



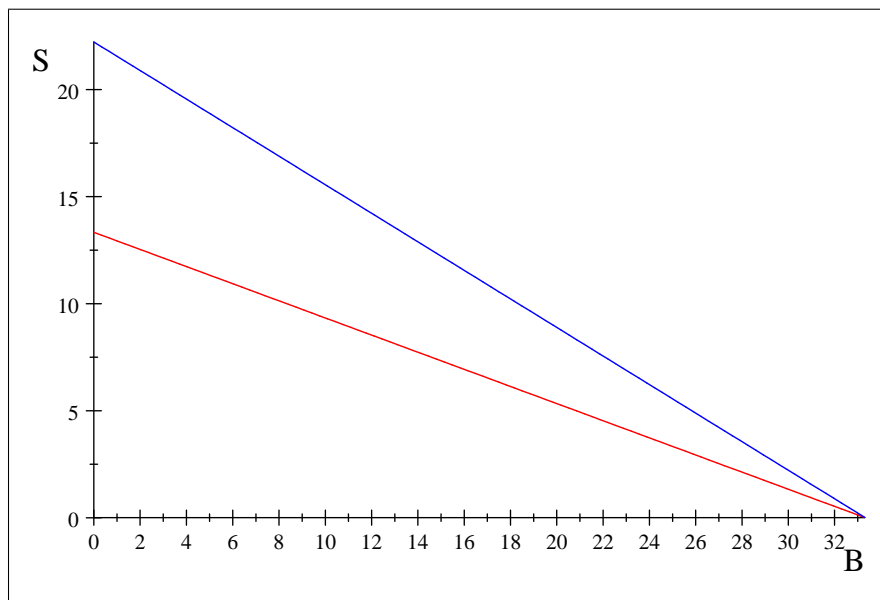
red: $m=2000$, $ps=150$, $pb=60$, orang: $m=500$, $ps=150$, $pb=60$

Recessions suck: your demand for both shopping trips and boarding trips declines because of the drop in your "income."

Alternatively what happens if your allowance stays at \$2000/week (your family is recession proof) and Nordstrom's slashes their prices because of the recession

Red budget line is $S_m = \frac{2000}{150} - \frac{60}{150}B = \frac{40}{3} - \frac{2}{5}B$ the original prices

Blue budget line is $S_m = \frac{2000}{90} - \frac{60}{90}B = \frac{200}{9} - \frac{2}{3}B$ after Nordstroms slashes prices



red: m=2000, ps=150, pb=60, blue: m=2000, ps=90, pb=60

Recessions have their silver linings. The recession makes you better off. You can now afford more bundles. Some of us, those on fixed salaries, are made better off if a recession causes prices to fall.

2 Budget constraint in terms of time

But **wait a minute**, or an hour - it takes time to board and shop.

Don't you also have a time constraint in addition to your money constraint?

We have just been looking at your money budget constraint: $p_s S + p_B B \leq m$

You also have a time constraint

$$t_s S + t_B B \leq T$$

t_B and t_S are the time prices of boarding and shopping, in contrast to the money prices. And T is how much time you have.

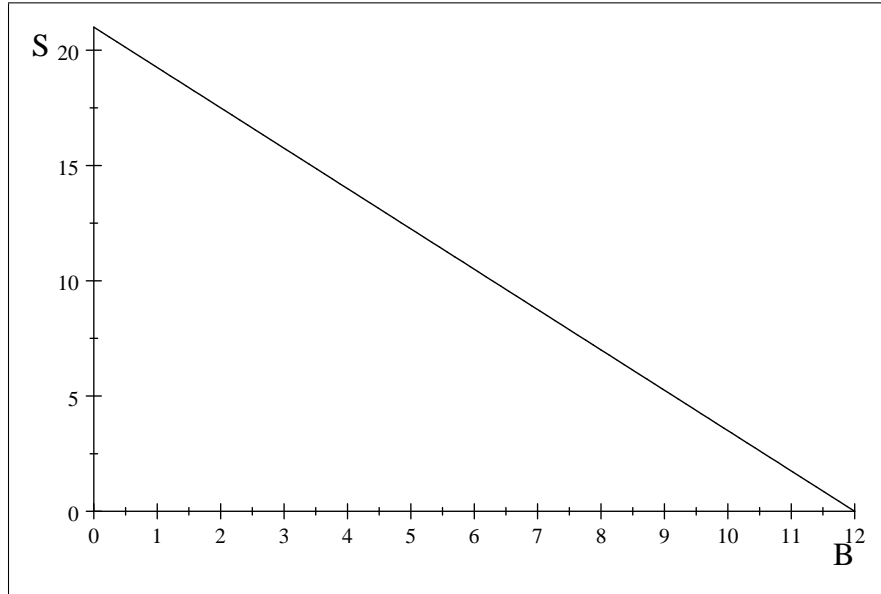
$$4S + 7B \leq 84$$

Solving this for S , assuming you have to spend all of your time shopping or boarding

$$\text{one gets } S_t = \frac{84}{4} - \frac{7}{4}B = 21.0 - 1.75B$$

Graphing the time constraint:

$$S_t = \frac{84}{4} - \frac{7}{4}B$$



Time constraint: 84hrs, $t_b=7$, $t_s=4$

in terms of time, you can only afford to board 10+ times

If you spend all of your time boarding and skiing you will be on this line?

Not all of your time? Can you be to the right of the line?

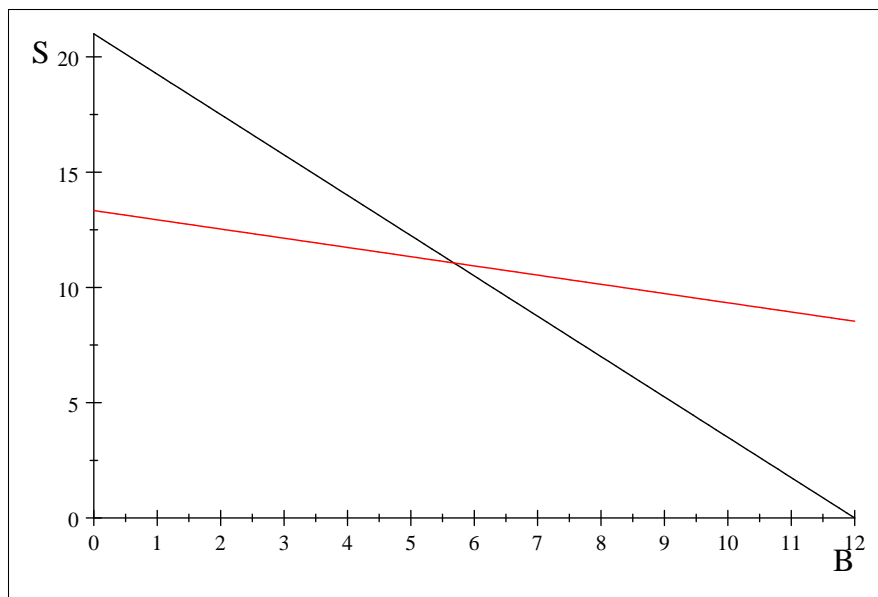
3 Budget constraint in terms of time and money

You are constrained to not violate your time constraint or your money constraint.

Continuing to assume $m = 2000$, $p_B = 60$ and $p_s = 150$

Your money budget line is $S_m = \frac{2000}{150} - \frac{60}{150}B = \frac{40}{3} - \frac{2}{5}B$; it is drawn in red.

Your time budget line is $S_t = \frac{84}{4} - \frac{1}{4}B$; it is drawn in black



Black is budget line wrt time, red wrt money

Your life is complicated. You cannot spend more time or money that you have. What can you afford?

Are you likely to spend all of your time and all of your money boarding and shopping? Maybe, just maybe, but, in general, NO.⁴

What happens if you have time or money left over? Assume extra time goes to sleeping (because there is nothing else to do) and left-over money simply disappears at the end of the week.

⁴In the example, there is only one bundle that exhausts both your money constraint and your time constraint.

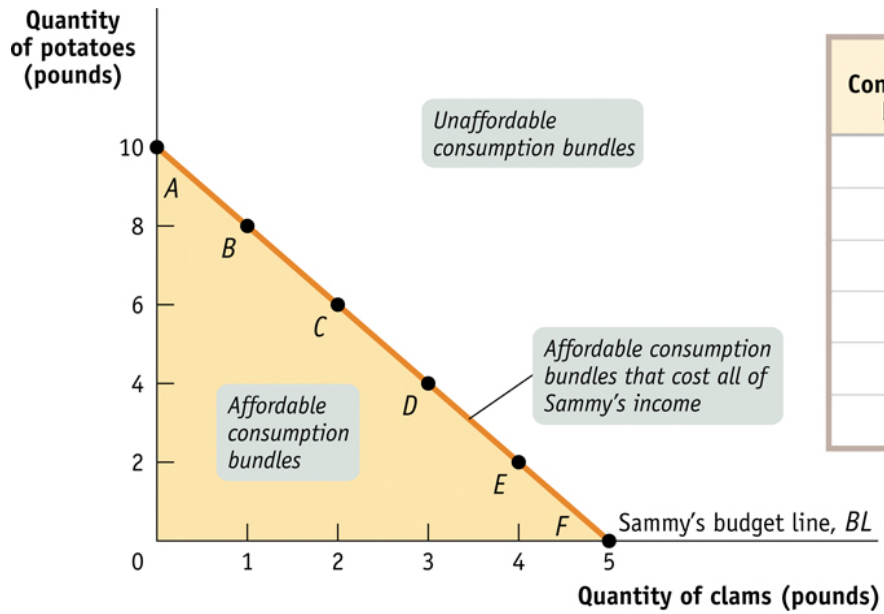
If both shopping and boarding are goods (more is always preferred to less) will you choose a point on your kinked budget line?

YES

What determines which point you will choose?

YOUR PREFERENCES

Your T.A.s are busily working making up multiple-choice problems with two or more budget constraints, including questions about opportunity cost.



Let's take a look at some of the money budget constraint stuff in KW (they choose, for their example, potatoes and clams—why?)

The shaded area is the budget set, the set of affordable bundles. Think about the slope of the money-budget line. What does it tell us?

How many potatoes we have to give up to get another pound of clams.

If the budget line is $m = p_1x_1 + p_2x_2$, Solving for $x_2 = \frac{m}{p_2} - \left(\frac{p_1}{p_2}\right)x_1$

So, the slope of the budget line, $\frac{\Delta x_2}{\Delta x_1} |_{\Delta m=0} = -\left(\frac{p_1}{p_2}\right)$, is, given you budget constraint, how much x_2 you have to give up to consume one more unit of x_1 .

It is the rate the **market** lets you **substitute** (trade off x_2 for x_1)
This rate is exogenous to you because prices are exogenous to you.

The slope of the budget line is an important concept.

It has nothing to do with what is inside your head (your preferences); it describes the constraint prices impose on you. Some of you, many of you, will confuse constraints and preferences.

Quiz question: Assume Edwina (the female form of the name Edward) shave her legs. Which of the following possibilities is both correct and most informative:

A: Edwina is constrained to shave her legs

B: Edwina chooses to shave her legs.

C: Without more information we don't know whether her shaving her legs is a choice or a constraint.