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 thi material in this lecture is not covered in KW.)

For the individual, scarcity represents itself in terms of constraint on her behavior–the consumer's consumption is constrained/limited by what she can, and cannot, afford. Your budget constraint is is one of two factors that determine what you purchase and do not purchase, and why demand curves slope down. The other 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.

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

Let p_S be the money cost of a shopping trip with the boyfriend (gas, cloths, coffee, etc.) and let p_B be the 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 time cost of a shopping trip and t_B is the time cost of a boarding trip.

Given you 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?

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

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 if all you do is shop? $\frac{m}{p_S}$

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

If you spend all of your money on shopping and boarding (likely, nothing else to do)

$$p_s S + p_B B = m$$

Solving this for S one gets

$$S = \frac{m}{p_S} - \frac{p_B}{p_s} B$$

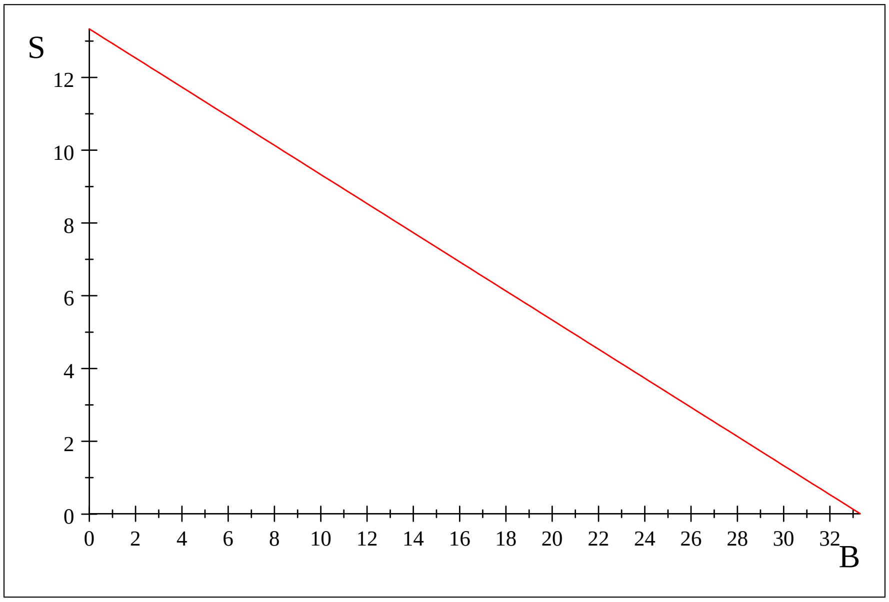
This says what? If you spend all of your money on shopping, you can buy $\frac{m}{p_S}$ trips. But every time you take another trip to Eldora (B increases by one), the number of shopping trips you can afford declines by $\frac{p_B}{p_s}$, $-\frac{p_B}{p_s}$ is the slope of the line.

For example, if $p_S = \$150$ (the guy is expensive) 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. This is your opportunity cost of boarding: how many shopping trips you give up every time you take another boarding trip.

Said another way, the opportunity cost of a shopping trip is $\frac{p_S}{p_B} = \frac{150}{60} = 2.$ 5 boarding trips.

Let's graph your budget constraint (budget set) assuming you have \$2000 a week to spend on boarding alone and shopping with the boyfriend.

$S = \frac{2000}{150} - \frac{60}{150}B = 13.333 - 0.4B$. (Draw this as well on the floor.)



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

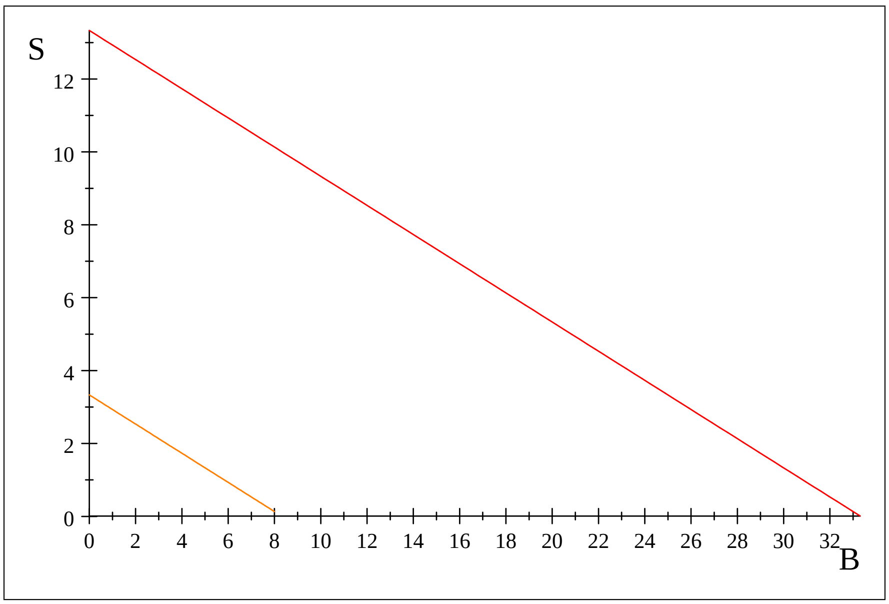
In terms of money, you can affort to board 30+ times a week.

If you are consuming a bundle to the left of the red line, you are? 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 $S = \frac{2000}{150} - \frac{60}{150}B$

Orange budget line is $S = \frac{500}{150} - \frac{60}{150}B$

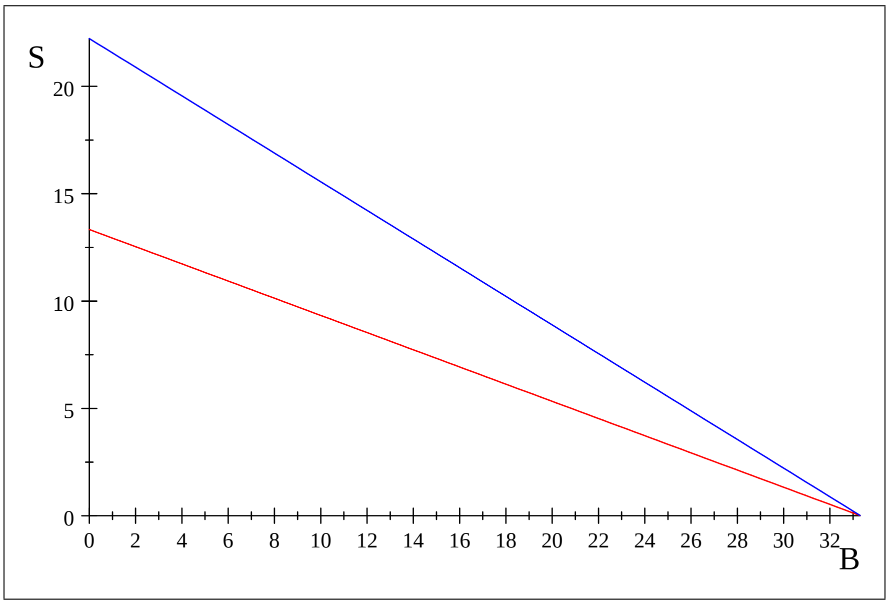


red: m=2000, ps=150, pb=60, orang: m=500, ps=150, pb=60

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 and Nordstrom's slashes their prices because of the recession, causing p_S to decrease from $150 to $90?

Red budget line is $S = \frac{2000}{150} - \frac{60}{150}B$
Blue budget line is $S = \frac{2000}{90} - \frac{60}{90}B$



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 affor more bundles. Some of us, those on fixed incomes, have been made better off by the recession

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

$$t_s S + t_B B \leq 84$$

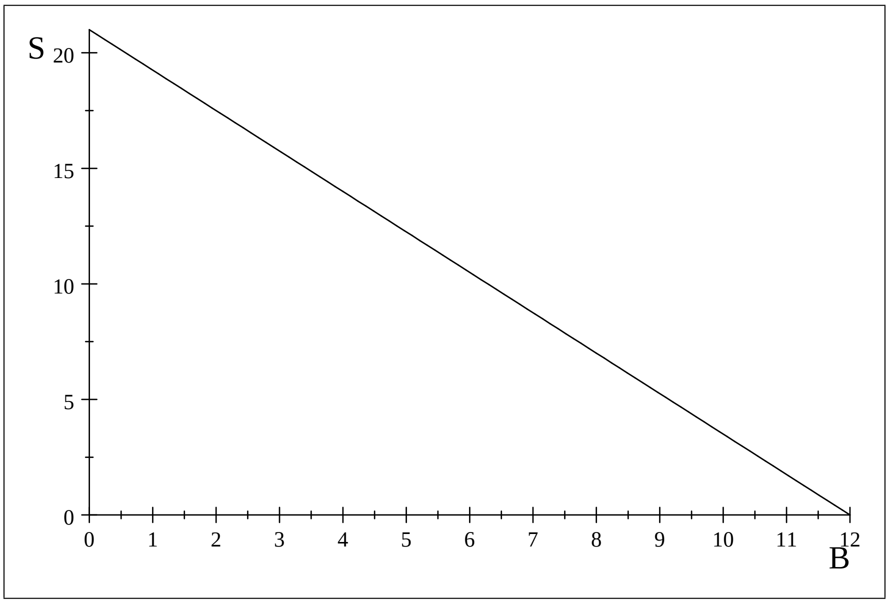
t_B and t_S are the time prices of boarding and shopping, in contrast to the money prices.

Continue to assume that $t_S = 4$ and $t_B = 7$, so

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

Solving this for S one gets $S = \frac{84}{4} - \frac{7}{4}B = 21.0 - 1.75B$

Graphing the time constraint:
$S = \frac{84}{4} - \frac{7}{4}B$



Time constraint: 84hrs, tb=7, ts=4

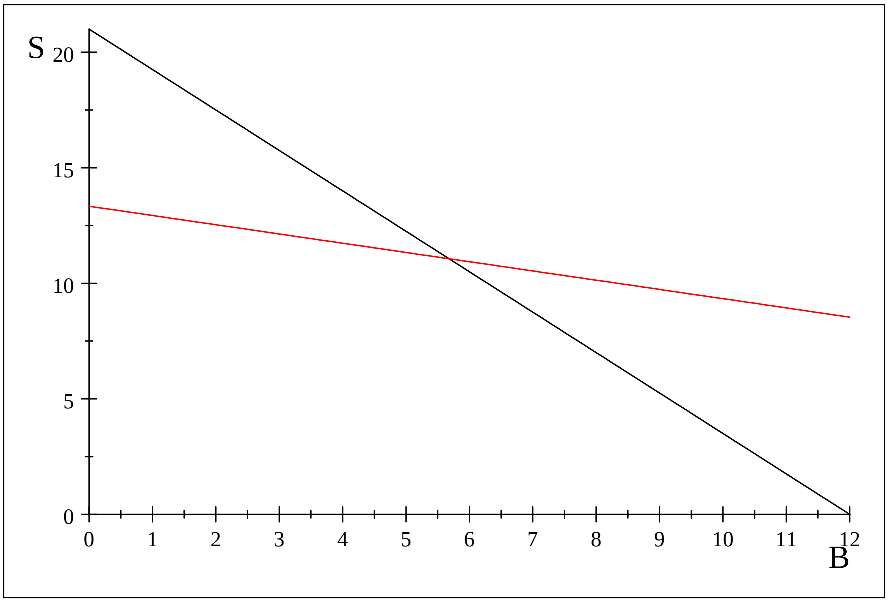
in terms of time, you can only affort do board 10+ times

If you spend all of your time boarding and skiing you will be? 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 $S = \frac{2000}{150} - \frac{60}{150}B$; it is drawn in red.
Your time budget line is $S = \frac{84}{4} - \frac{7}{4}B$; it is drawn in black

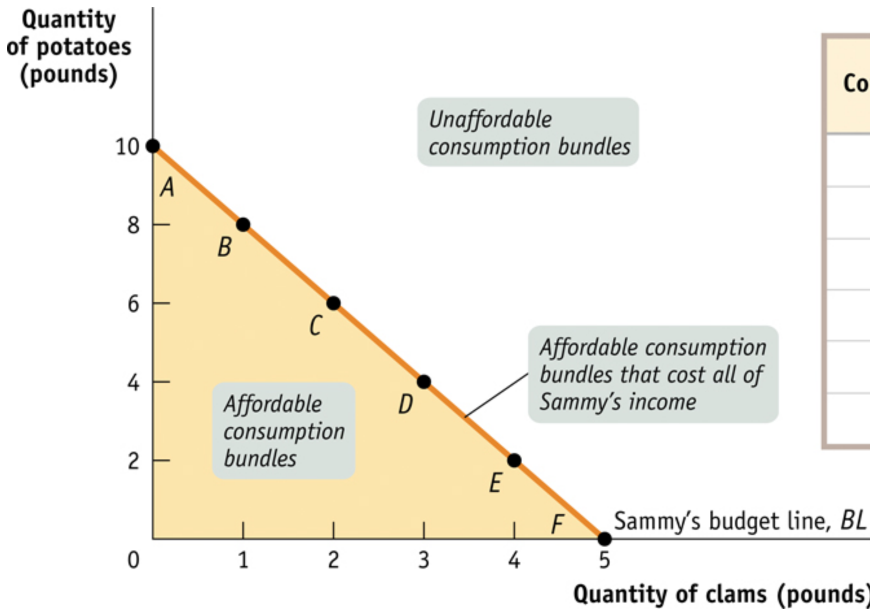


Black is budget line wrt time, red wrt money

Your life is complicated. You cannot violate either your time constraint or your money constraint. What can you afford?

Are you likely to spend all of your time and all of your money boarding and shopping? NO.

What happens if you have time or money left over?



Consumption bundle	Quantity of clams (pounds)	Quantity of potatoes (pounds)
A	0	10
B	1	8
C	2	6
D	3	4
E	4	2
F	5	0

Your T.A.s are busily working making up multiple-choice problems with two more more budget constraints.

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

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, $\frac{\triangle x_2}{\triangle x_1}|_{\triangle m=0} = -\left(\frac{p_1}{p_2}\right)$, 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)

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.