Lecture3

Tuesday, January 10, 2023 12:09 PM

Lecture3

Lecture 3: General Equilibrium

[illegible]

Lecture 3: General Equilibrium

Competitive equilibrium

Examples: Cobb-Douglas

Examples: Perfect Complements

Examples: Perfect Substitutes

Lecture 3: General Equilibrium

Competitive equilibrium

Examples: Cobb-Douglas

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Hidden assumptions

- There is a market for each good
- Every agent can access the market without any cost
- There is a unique price for each good and all consumers know this price
- Each consumer can sell her initial endowment in the market and use the income to buy goods and services
- Consumers seek to maximize their utility given their budget constraint, [illegible]
  - [illegible]
  - [illegible]
- There is perfect competition (i.e., everyone is a price taker)
- The only source of information is [illegible] prices

Competitive equilibrium - Definition

Definition

A pair of an allocation and a price vector [illegible] is a competitive equilibrium if the following conditions hold:

1. For all consumers $i = 1, 2, \ldots, I$, [illegible] solves the following maximization problem:

$$\max u^i(x)$$

$$\text{such that } [illegible] \sum_{l=1}^{L} p_l w_l$$

2. Markets clear: for each $l = 1, \ldots, L$, the following equation holds

$$\sum_{i=1}^{I} x_l^i = \sum_{i=1}^{I} w_l^i$$

DD = OO

Competitive equilibrium - Properties

Remark

Suppose that at least one consumer has strictly monotone preferences. Then if (x^i, p) is a competitive equilibrium, $p_1, p_2, \ldots, p_L > 0$.

Remark

Suppose that at least one consumer has weakly monotone preferences. Then if (x^i, p) is a competitive equilibrium, there is at least one l: $p_l > 0$.

Remark

If (x^i, p) is a competitive equilibrium, then (x^i, cp) for [illegible] is also a competitive equilibrium.

$(p_1, \ldots, p_L)$ $(cp_1, \ldots, cp_L)$

Competitive equilibrium - Walras' Law

Theorem (Walras' Law)

Suppose that consumer i has [illegible] preferences [illegible]. Then

$$[illegible] \sum_{l=1}^{L} [illegible] - \sum_{l=1}^{L} [illegible] = 0$$

$$\sum_{i=1}^{I} p x^i = \sum_{i=1}^{I} p \cdot w^i$$

$$p \cdot \Sigma x^i = p \cdot \Sigma w^i$$

Theorem (Walras' Law - II)

Suppose that utility functions are weakly monotone. Suppose that $p = (p_1, \ldots, p_L)$ is such that $p_L > 0$, [illegible] for which condition 1 holds for each consumer $i = 1, 2, \ldots, I$ and markets clear for all commodities $l = 1, 2, \ldots, L-1$. Then the market clearing condition also holds for commodity L as well.

Walras' Law - proof

- For each consumer i, we have

$$\sum_l p_l x_l^i = \sum_l p_l w_l^i$$

Walras' Law - proof

- For each consumer i, we have

$$\sum_l p_l x_l^i = \sum_l p_l w_l^i$$

- Then sum the budget constraints of all consumers, then we get

$$\sum_{i=1}^{I} \sum_{l=1}^{L} p_l x_l^i = \sum_{i=1}^{I} \sum_{l=1}^{L} p_l w_l^i$$

Walras' Law - proof

- For each consumer i, we must
$$\sum_{\ell=1}^{L} p_\ell x_\ell^{i*} = \sum_{\ell=1}^{L} p_\ell \omega_\ell^i.$$
- If we sum the above across all I consumers, then we get:
$$\sum_{i=1}^{I}\sum_{\ell=1}^{L} p_\ell x_\ell^{i*} = \sum_{i=1}^{I}\sum_{\ell=1}^{L} p_\ell \omega_\ell^i.$$
- Re-arranging:
$$\sum_{\ell=1}^{L}\sum_{i=1}^{I} p_\ell x_\ell^{i*} = \sum_{\ell=1}^{L}\sum_{i=1}^{I} p_\ell \omega_\ell^i.$$

Walras' Law - proof

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- Re-arranging:
$$\sum_{\ell=1}^{L}\sum_{i=1}^{I} p_\ell x_\ell^{i*} = \sum_{\ell=1}^{L}\sum_{i=1}^{I} p_\ell \omega_\ell^i.$$
- Re-arranging:
$$\sum_{\ell=1}^{L} p_\ell \sum_{i=1}^{I}\left(x_\ell^{i*} - \omega_\ell^i\right) = 0.$$

$$\sum_{\ell=1}^{L} P_\ell \sum_{i=1}^{I} X_\ell^i = \sum_{\ell=1}^{L} P_\ell \sum_{i=1}^{I} w_\ell^i$$
$$\sum_{\ell=1}^{L} P_\ell \sum_{i=1}^{I} X_\ell^i - \sum_{\ell=1}^{L} P_\ell \sum_{i=1}^{I} w_\ell^i = 0$$
$$\sum_{\ell=1}^{L} P_\ell \underbrace{\sum_{i=1}^{I}(X_\ell^i - w_\ell^i)}_{=0 \quad \ell=1,\dots,L-1} = 0$$
$$\underbrace{P_L}_{>0} \sum_{i=1}^{I}(X_L^i - w_L^i) = 0$$
$$\Rightarrow \sum_{i=1}^{I} X_L^i - w_L^i = 0$$

PRIMEROS $L-1$ EN EQ ⇓ L EN EQ.

Walras' Law - proof

-
$$\sum_{\ell=1}^{L} p_\ell \sum_{i=1}^{I}\left(x_\ell^{i*} - \omega_\ell^i\right) = 0.$$

Walras' Law - proof

-
$$\sum_{\ell=1}^{L} p_\ell \sum_{i=1}^{I}\left(x_\ell^{i*} - \omega_\ell^i\right) = 0.$$
-
$$p_L \sum_{i=1}^{I}\left(x_L^{i*} - \omega_L^i\right) = 0.$$

Walras' Law - proof

-
$$\sum_{\ell=1}^{L} p_\ell \sum_{i=1}^{I}\left(x_\ell^{i*} - \omega_\ell^i\right) = 0.$$
-
$$p_L \sum_{i=1}^{I}\left(x_L^{i*} - \omega_L^i\right) = 0.$$
-
$$\sum_{i=1}^{I}\left(x_L^{i*} - \omega_L^i\right) = 0.$$

Lecture 3: General Equilibrium

Competitive equilibrium

Examples: Cobb-Douglas

Examples: Perfect Complements

Examples: Perfect Substitutes

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Cobb-Douglas

$$u_A(x,y) = x^\alpha y^{1-\alpha}$$
$$u_B(x,y) = x^\beta y^{1-\beta}$$

Suppose

$$\alpha = 0.5$$
$$\beta = 0.5$$
$$\omega^A = (1.5, 0.5)$$
$$\omega^B = (0.5, 1.5)$$

① AGENTES MAX

i

$$\max_{x,y} U_i(x,y) = x^{1/2} y^{1/2}$$
s.t.
$$P_x X + P_y \cdot y \le I = w_i^x \cdot P_x + w_i^y P_y$$

$$\mathcal{L} = x^{1/2} y^{1/2} + \lambda\left(w_i^x P_x + w_i^y P_y - P_x \cdot X - P_y \cdot y\right)$$

$$\frac{\partial \mathcal{L}}{\partial x} = \frac{1}{2} x^{-1/2} y^{1/2} - \lambda P_x = 0 \Rightarrow \frac{1}{2} x^{-1/2} y^{1/2} = \lambda P_x$$
$$\frac{\partial \mathcal{L}}{\partial y} = \frac{1}{2} x^{1/2} y^{-1/2} - \lambda P_y = 0 \Rightarrow \frac{1}{2} x^{1/2} y^{-1/2} = \lambda P_y$$

$$\Rightarrow \frac{y}{x} = \frac{P_x}{P_y} \Rightarrow y = \frac{x P_x}{P_y}$$

Cobb-Douglas

Each individual solves
$$\max_{x_i, y_i} \sqrt{x^i y^i}$$
s.t.
$$p_x x^i + p_y y^i \le p_x w_x^i + p_y w_y^i$$

Cobb-Douglas

Each individual solves
$$\max_{x_i, y_i} \sqrt{x^i y^i}$$
s.t.
$$p_x x^i + p_y y^i \le p_x w_x^i + p_y w_y^i$$
We can set up a Lagrangean:
$$\mathcal{L} = \sqrt{x^i y^i} + \lambda\left(p_x w_x^i + p_y w_y^i - p_x x^i - p_y y^i\right)$$

$$P_x \cdot X + P_y \cdot y = w_x P_x + w_y P_y$$

Cobb-Douglas

Each individual solves

$$\max_{x_i, y_i} \sqrt{x^i y^i}$$

s.t.

$$p_x x^i + p_y y^i \le p_x w_x^i + p_y w_y^i$$

We can set up a Lagrangean:

$$\mathcal{L} = \sqrt{x^i y^i} + \lambda \left(p_x w_x^i + p_y w_y^i - p_x x^i - p_y y^i \right)$$

The FOC are:

$$\frac{1}{2}\sqrt{\frac{y^i}{x^i}} = \lambda p_x$$
$$\frac{1}{2}\sqrt{\frac{x^i}{y^i}} = \lambda p_y$$

Cobb-Douglas

Thus,

$$\frac{y^i}{x^i} = \frac{p_x}{p_y}$$
$$y^i = x^i \frac{p_x}{p_y}$$

Cobb-Douglas

Thus,

$$\frac{y^i}{x^i} = \frac{p_x}{p_y}$$
$$y^i = x^i \frac{p_x}{p_y}$$

We haven't used the budget restriction!

Cobb-Douglas

Thus,

$$\frac{y^i}{x^i} = \frac{p_x}{p_y}$$
$$y^i = x^i \frac{p_x}{p_y}$$

We haven't used the budget restriction!

$$p_x x^i + p_y y^i = p_x w_x^i + p_y w_y^i$$
$$p_x x^i + p_y x^i \frac{p_x}{p_y} = p_x w_x^i + p_y w_y^i$$
$$x^i = \frac{w_x^i p_x + w_y^i p_y}{2p_x}$$
$$y^i = \frac{w_x^i p_x + w_y^i p_y}{2p_y}$$

Cobb-Douglas

$$x^A = \frac{1.5p_x + 0.5p_y}{2p_x}$$
$$y^A = \frac{1.5p_x + 0.5p_y}{2p_y}$$
$$x^B = \frac{0.5p_x + 1.5p_y}{2p_x}$$
$$y^B = \frac{0.5p_x + 1.5p_y}{2p_y}$$

Now we can use condition 2 (market clear)

Cobb-Douglas

$$x^A = \frac{1.5p_x + 0.5p_y}{2p_x}$$
$$y^A = \frac{1.5p_x + 0.5p_y}{2p_y}$$
$$x^B = \frac{0.5p_x + 1.5p_y}{2p_x}$$
$$y^B = \frac{0.5p_x + 1.5p_y}{2p_y}$$

Now we can use condition 2 (market clear)

$$x^A + x^B = 2$$
$$y^A + y^B = 2$$

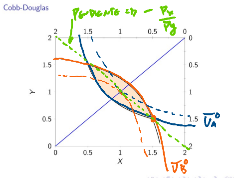
Cobb-Douglas

$$\frac{1.5p_x + 0.5p_y}{2p_x} + \frac{0.5p_x + 1.5p_y}{2p_x} = 2$$
$$\frac{p_x}{p_y} = 1$$

Cobb-Douglas

$$\frac{1.5p_x + 0.5p_y}{2p_x} + \frac{0.5p_x + 1.5p_y}{2p_x} = 2$$
$$\frac{p_x}{p_y} = 1$$
$$x^A = x^B = y^A = y^B = 1$$

Cobb-Douglas



Lecture 3: General Equilibrium

Competitive equilibrium

Examples: Cobb-Douglas

$$P_x \cdot X + P_y \cdot y = w_x P_x + w_y P_y$$

$$P_x \cdot X + P_y \left(X \frac{P_x}{P_y} \right) = w_x P_x + w_y P_y$$

$$2 \cdot P_x \cdot X = w_x P_x + w_y P_y$$

$$X = \frac{w_x P_x + w_y P_y}{2P_x} = X^*(P_x, P_y)$$

↳ DD MARSHALLIANA

$$y = \frac{X P_x}{P_y} = \frac{(w_x P_x + w_y P_y)}{2P_x} \cdot \frac{P_x}{P_y}$$

$$y^*(P_x, P_y) = \frac{w_x P_x + w_y P_y}{2P_y}$$

$$X_A^*(P_x, P_y) = \frac{1.5P_x + 0.5P_y}{2P_x}$$

$$X_B^*(P_x, P_y) = \frac{0.5P_x + 1.5P_y}{2P_x}$$

$$y_A^*(P_x, P_y) = \frac{1.5P_x + 0.5P_y}{2P_y}$$

$$y_B^*(P_x, P_y) = \frac{0.5P_x + 1.5P_y}{2P_y}$$

DD = OO

CONDICION 2

↓

$$X_A^* + X_B^* = w_x^A + w_x^B$$

$$\frac{1.5P_x + 0.5P_y}{2P_x} + \frac{0.5P_x + 1.5P_y}{2P_x} = 1.5 + 0.5$$

Lecture 6: General Equilibrium

Competitive equilibrium

Example: Cobb-Douglas

Example: Perfect Complements

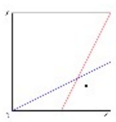
Example: Perfect Substitutes

Lecture 6: General Equilibrium

Example: Perfect Complements

Perfect complements

Suppose that



$$\frac{1.5P_x+0.5P_y}{2P_x} + \frac{0.5P_x+1.5P_y}{2P_x} = 1.5 + 0.5$$

$$\frac{2P_x+2P_y}{2P_x} = 2$$

$$1+\frac{P_y}{P_x} = 2$$

$$\frac{P_y}{P_x} = 1$$

$$P_y = P_x$$

$$X_A^* = 1,\ X_B^* = 1,\ Y_A^* = 1,\ Y_B^* = 1$$

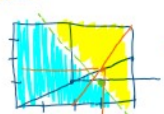
P^*

cP^*

$P=(1,1)$

$P=(2,2)$

① AGGREG. MAX



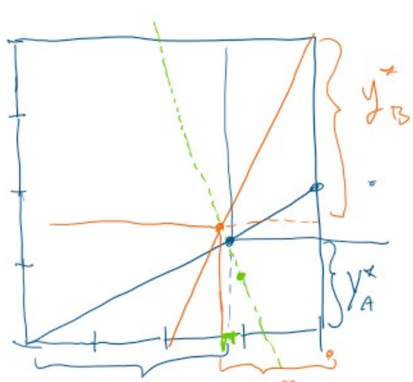
$x = 2y$

$y = \frac{x}{2}$

$P_x \cdot x + P_y \cdot y \le 3P_x + P_y$ (I)

$y \le \frac{3P_x+P_y}{P_y} - \frac{P_x}{P_y}\cdot x$

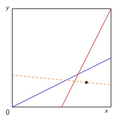
$y \le 3\frac{P_x}{P_y} + 1 - \frac{P_x}{P_y}\cdot x$



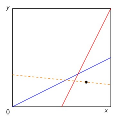
Note that, for the case $\frac{p_x}{p_y} = 1$, we have the following restriction:

$$y^A \leq 4 - x^A$$

$\frac{p_x}{p_y} < 1$

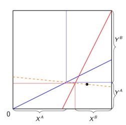


$\frac{p_x}{p_y} < 1$



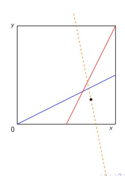
A can buy whats below the orange line, B what is above

$\frac{p_x}{p_y} < 1$

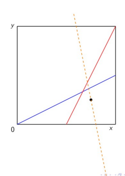


Excess demand of Y and excess supply of X

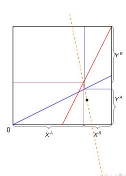
$\frac{p_x}{p_y} > 1$



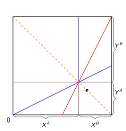
$\frac{p_x}{p_y} > 1$



$\frac{p_x}{p_y} > 1$



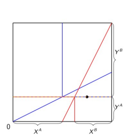
$\frac{p_x}{p_y} = 1$



No excess demand or supply

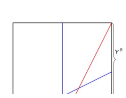
What about zero prices?

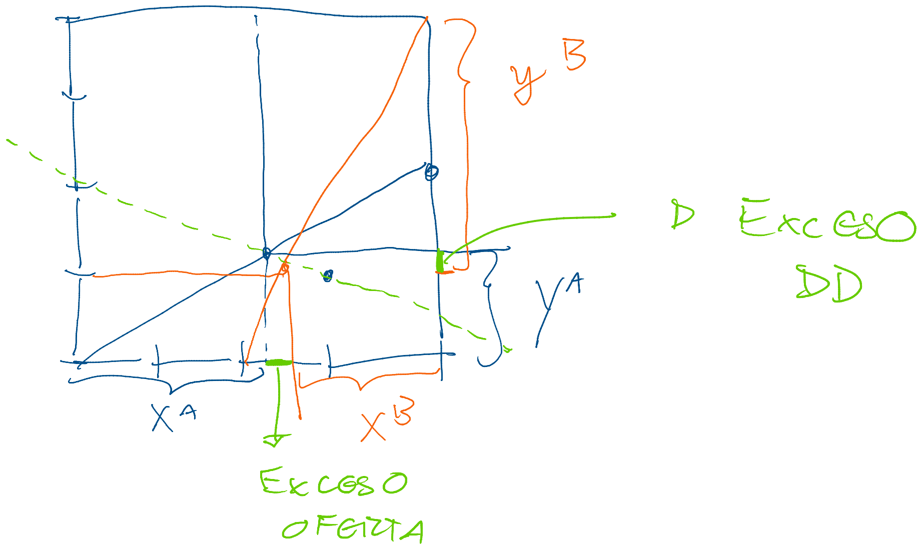
$p_x = 0$

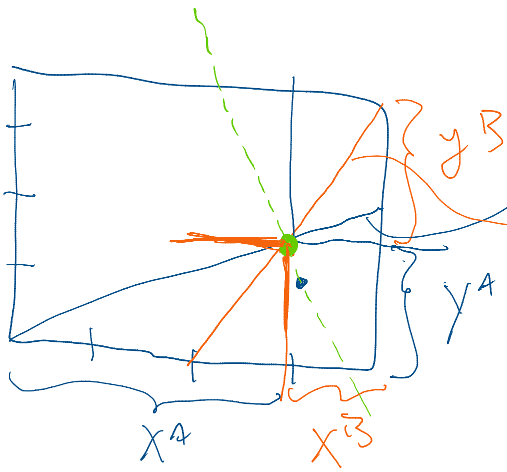


Excess supply of X? (and Y balanced?)

$p_x = 0$







→ $y_A = \frac{X_A}{2}$

→ $2X_B = y_B$ → $U_B = \text{MIN}$

$2(4 - X_A) = 4 - y_A$

$8 - 2X_A = 4 - y_A$

$\boxed{y_A = 2X_A - 4}$

$y_A = \frac{X_A}{2} = 2X_A - 4$

$X_A = 4X_A - 8$

$8 = 3X_A$

$\boxed{\frac{8}{3} = X_A^*}$

y_A ...

Restricción

$(2x, y)$

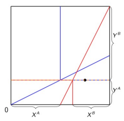
$$\frac{x_A}{2} = \frac{8}{6} = \frac{4}{3}$$

EQ

$$y_A = 3\frac{P_x}{P_y} + 1 - \frac{P_x}{P_y} \cdot x_A$$

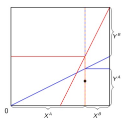
$$\frac{4}{3} = 3\frac{P_x}{P_y} + 1 - \frac{P_x}{P_y} \cdot \frac{8}{3}$$

$p_x = 0$



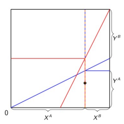
Excess supply of X? (and Y balanced?) Not really since both A and B are indifferent over a wide range that would make the market clear

$p_y = 0$



Excess supply of Y? (and X balanced?)

$p_y = 0$



Excess supply of Y? (and X balanced?) Not really since both A and B are indifferent over a wide range that would make the market clear

To sum up...

- There are multiple equilibria
- There are three price vectors associated with these equilibria
- One price vector has a unique resource allocation associated with it
- Two price vectors ($p_x = 0$ and $p_y = 0$) have *infinity* resource allocations associated with them

Perfect complements

Try at home:

$$u_A(x^A, y^A) = \min(x^A, y^A)$$
$$u_B(x^B, y^B) = \min(x^B, y^B)$$
$$\omega^A = (1,1)$$
$$\omega^B = (3,1)$$

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Competitive equilibrium

Examples: Cobb-Douglas

Examples: Perfect Complements

Examples: Perfect Substitutes

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Perfect Substitutes

$$u_A(x^A, y^A) = 2x^A + y^A$$
$$u_B(x^B, y^B) = x^B + y^B$$
$$\omega^A = (1,1)$$
$$\omega^B = (1,1)$$

Perfect Substitutes

$$u_A(x^A, y^A) = 2x^A + y^A$$
$$u_B(x^B, y^B) = x^B + y^B$$
$$\omega^A = (1,1)$$
$$\omega^B = (1,1)$$

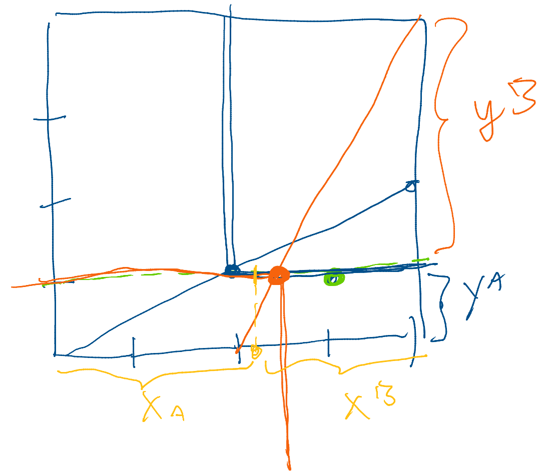
$p_x > 0$ and $p_y > 0$, why?

Perfect Substitutes

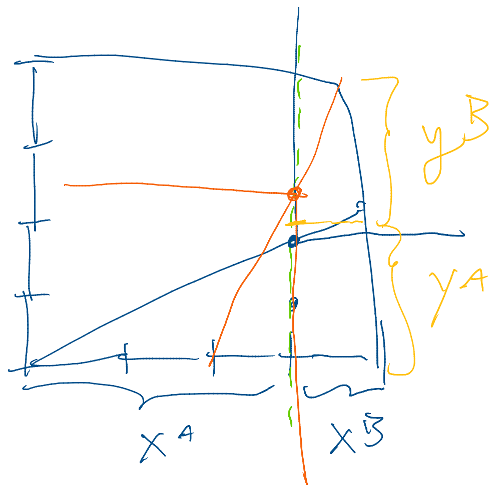
$$u_A(x^A, y^A) = 2x^A + y^A$$
$$u_B(x^B, y^B) = x^B + y^B$$
$$\omega^A = (1,1)$$
$$\omega^B = (1,1)$$

$p_x > 0$ and $p_y > 0$, why? hence, normalize $p_x = 1$

CASO $P_x = 0$



CASO $P_y = 0$



MAX $U^A = 2X^A + Y^A$

s.t.

$P_x \cdot X^A + P_y \cdot y^A \le P_x + P_y$

1) $P_x > 0,\ P_y > 0$

2) $P_x \cdot X^A + P_y \cdot y^A = P_x + P_y$

$y^A = \frac{P_x + P_y - P_x \cdot X_A}{P_y}$

$P = (P_x, P_y)$

$\frac{1}{P_y} \cdot P = \left(\frac{P_x}{P_y}, 1\right)$

$\max_{X_A} U_A = 2X_A + \left(\frac{P_x + P_y - P_x \cdot X_A}{P_y}\right)$

$\max_{X_A} 2X_A + \frac{P_x}{P_y} + 1 - \frac{P_x}{P_y} \cdot X_A$

$\max_{X_A} X_A\left(2 - \frac{P_x}{P_y}\right) + \frac{P_x}{P_y} + 1$

Si $2 - \frac{P_x}{P_y} > 0 \rightarrow X_A$ lo más alto posible $\rightarrow \frac{1 \cdot P_x + P_y \cdot 1}{P_x} = X_A^* = \frac{P_x + 1}{P_x} = X_A = 1 + \frac{1}{P_x} = X_A^*$

$0 = y_A^*$

Si $2 - \frac{P_x}{P_y} = 0 \rightarrow X$ cualquiera $\rightarrow X, Y$ q' cumplan rest. presupuestal

Si $2 - \frac{P_x}{P_y} < 0 \rightarrow X_A^* = 0$, $y_A^* = \frac{P_x + P_y}{P_y} = P_x + 1$

$$X_A^*(P_x) = \begin{cases} 1 + \frac{1}{P_x} & \text{si } P_x < 2 \\ [0, \text{I}] & \text{si } P_x = 2 \\ 0 & \text{si } P_x > 2 \end{cases}$$

AGENTE B

$$\frac{[illegible]}{3} = [illegible]\frac{[illegible]}{P_y} + [illegible]\frac{[illegible]}{P_y}\ 3$$

$$4 = 9\frac{P_x}{P_y} + 3 - 8\frac{P_x}{P_y}$$

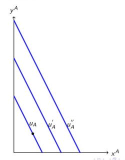
$$\boxed{1 = \frac{P_x}{P_y}}$$

$\omega^B = (1,1)$

$p_x > 0$ and $p_y > 0$, why? hence, normalize $p_x = 1$

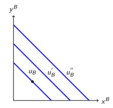
Perfect Substitutes

Peferences of person A:



Perfect Substitutes

Peferences of person B:



Perfect Substitutes

Algebraic solution

$$\max_{x^A, y^A} 2x^A + y^A$$

subject to:

$$I = x^A + p_y y^A$$
$$y^A \geq 0$$
$$x^A \geq 0$$

Perfect Substitutes

Algebraic solution

$$\max_{x^A, y^A} 2x^A + y^A$$

subject to:

$$I = x^A + p_y y^A$$
$$y^A \geq 0$$
$$x^A \geq 0$$

From the budget constraint we can obtain $y^A = \frac{I - x^A}{p_y}$, and adding the condition $y^A \geq 0$, we can conclude that $x^A \in [0, I]$.

Perfect Substitutes

Introducing y^A into the original maximization problem:

$$\max(2 - \frac{1}{p_y})x^A + \frac{I}{p_y} \quad s.t.\ x^A \in [0, I]$$

Which is a maximization of a straight line with slope $\left(2 - \frac{1}{p_y}\right)$ over an interval.

Perfect Substitutes

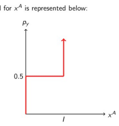
The demand for goods of individual A is

$$X^A = \begin{cases} 0 & \text{if } p_y < 0.5 \\ [0, I] & \text{if } p_y = 0.5 \\ I & \text{if } p_y > 0.5 \end{cases}$$

$$Y^A = \begin{cases} \frac{I}{p_y} & \text{if } p_y < 0.5 \\ [0, \frac{I}{p_y}] & \text{if } p_y = 0.5 \\ 0 & \text{if } p_y > 0.5 \end{cases}$$

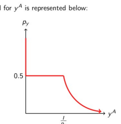
Perfect Substitutes

The demand for x^A is represented below:



Perfect Substitutes

The demand for y^A is represented below:



Perfect Substitutes

Algebraic solution

For person B the solution is analogous, but we have the following maximization problem: Introducing y^A into the original maximization problem:

$$\max(1 - \frac{1}{p_y})x^B + \frac{I}{p_y} \quad s.t.\ x^B \in [0, I]$$

Which is a maximization of a straight line with slope $\left(1 - \frac{1}{p_y}\right)$ over an interval.

Perfect Substitutes

The demand for goods of individual B is

$$X^B = \begin{cases} 0 & \text{if } p_y < 1 \\ [0, I] & \text{if } p_y = 1 \\ I & \text{if } p_y > 1 \end{cases}$$

si $2 - \frac{P_x}{P_y} < 0 \rightarrow X_A^* = 0$, $y_A^* = \frac{P_x + P_y}{P_y} = P_x + 1$

AGENTE B

MAX $U_B = X_B + Y_B$

s.a.

$P_x X_B + P_y \cdot y_B \leq \omega_x^1 \cdot P_x + \omega_y^1 P_y$

$P_x \cdot X_B + P_y \cdot y_B = P_x + P_y$

$P_x \cdot X_B + y_B = P_x + 1$

$y_B = P_x + 1 - P_x \cdot X_B$

MAX $U_B = X_B + \underbrace{(P_x + 1 - P_x \cdot X_B)}_{y_B}$

$= X_B(1 - P_x) + P_x + 1$

si $1 - P_x > 0 \longrightarrow X_B^* = \frac{P_x + P_y}{P_x} = \frac{P_x + 1}{P_x} = 1 + \frac{1}{P_x}$

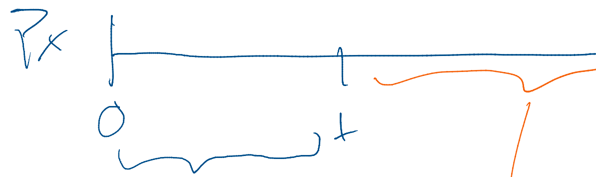
$y_B^* = 0$

si $1 - P_x = 0 \longrightarrow x_B$, y_B q' cumplan con rest. presupuestal

si $1 - P_x < 0 \longrightarrow X_B^* = 0$

$y_B = \frac{P_x + P_y}{P_y} = P_x + 1$

$$X_B^* = \begin{cases} 1 + \frac{1}{P_x} & P_x < 1 \\ [0, I] & P_x = 1 \\ 0 & P_x > \end{cases}$$



CASO 1 $\quad P_x \in (0, 1)$

$\downarrow$

$X^A + X^B$

$1 + \frac{1}{P_x} + 1 + \frac{1}{P_x}$

$2 + \frac{2}{P_x} > 2$ (OFERTA)

CASO 2 $\quad P_x = 1$

$\underbrace{1 + \frac{1}{P_x}}_{X_A} + X_B$

$X_B \downarrow$ CUALQUIERA

$2 + X_B$

LO TIENE Q' SER 0

(DEMANDA) $2 = 2$ (OFERTA)

¡HAY EQ!

>1

∞

2

CASO 3

$\rightarrow P_x \in (1, 2)$

$X_A + X_B$

$1 + \frac{1}{P_x} + 0$

$1 + \frac{1}{P_x} < 2$ (OFERTA)

CASO 4 $P_x = 2$

$X_A + X_B \rightarrow 0$

↓

CUALQUIER COSA

↓

$\frac{I}{P_x} = \frac{P_x + 1}{P_x}$

$1 + \frac{1}{P_x} = 1.5 < 2$

CASO 5

Perfect Substitutes

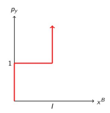
The demand for goods of individual B is

$$X^B = \begin{cases} 0 & \text{if } p_y < 1 \\ [0, I] & \text{if } p_y = 1 \\ I & \text{if } p_y > 1 \end{cases}$$

$$Y^B = \begin{cases} \frac{I}{p_y} & \text{if } p_y < 1 \\ [0, \frac{I}{p_y}] & \text{if } p_y = 1 \\ 0 & \text{if } p_y > 1 \end{cases}$$

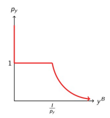
Perfect Substitutes

The demand for x^B is represented below:



Perfect Substitutes

The demand for y^B is represented below:



Perfect Substitutes

When is the market for good X balanced (how about good y?)

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- Try $p_y < 0.5$

Perfect Substitutes

When is the market for good X balanced (how about good y?)

- Try $p_y < 0.5$
- $X^A = 0$ and $X^B = 0$

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When is the market for good X balanced (how about good y?)

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- $X^A = 0$ and $X^B = 0$
- Try $p_y = 0.5$

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- Try $p_y < 0.5$
- $X^A = 0$ and $X^B = 0$
- Try $p_y = 0.5$
- $X^A = [0, I]$ and $X^B = 0$

Perfect Substitutes

When is the market for good X balanced (how about good y?)

- Try $p_y < 0.5$
- $X^A = 0$ and $X^B = 0$
- Try $p_y = 0.5$
- $X^A = [0, I]$ and $X^B = 0$
- Can't be an equilibrium since $I = 1.5$ when $p_y = 0.5$, thus $X^A + X^B < 2$
- Try $0.5 < p_y < 1$

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- Try $p_y < 0.5$
- $X^A = 0$ and $X^B = 0$
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- Try $0.5 < p_y < 1$
- $X^A = I$ and $X^B = 0$

HAY EQ!

$x_A^* = 2 \qquad y_A^* = 0$

$x_B = 0 \qquad y_B^* = 2$

$P^* = (1, 1)$

CASO 5

$P_x > Z$

$X_A^{3\,0} + Y_B^{0\,0}$

$0 < Z$ (OFERTA)

Perfect Substitutes

When is the market for good X balanced (how about good y?)

- Try $p_y < 0.5$
- $X^A = 0$ and $X^B = 0$
- Try $p_y = 0.5$
- $X^A = [0, I]$ and $X^B = 0$
- Can't be an equilibrium since $I = 1.5$ when $p_y = 0.5$, thus $X^A + X^B < 2$
- Try $0.5 < p_y < 1$
- $X^A = I$ and $X^B = 0$
- Can't be an equilibrium since $I = 1 + p_y$, thus $X^A + X^B < 2$
- Try $p_y = 1$

Perfect Substitutes

When is the market for good X balanced (how about good y?)

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- Can't be an equilibrium since $I = 1 + p_y$, thus $X^A + X^B < 2$
- Try $p_y = 1$
- $X^A = I = 2$ and $X^B = [0, 2]$
- One possible equilibrium $(X^A = 2, X^B = 0, Y^A = 0, Y^B = 2)$

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- Try $p_y < 0.5$
- $X^A = 0$ and $X^B = 0$
- Try $p_y = 0.5$
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- One possible equilibrium $(X^A = 2, X^B = 0, Y^A = 0, Y^B = 2)$
- Try $p_y > 1$

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- $X^A = I = 2$ and $X^B = [0, 2]$
- One possible equilibrium $(X^A = 2, X^B = 0, Y^A = 0, Y^B = 2)$
- Try $p_y > 1$
- $X^A = I$ and $X^B = I$
- $X^A = I = 1 + p_y$ and $X^B = I = 1 + p_y$
- Can't be an equilibrium since $I = 1 + p_y$, thus $X^A + X^B = 2 + 2p_y > 2$