Elements of Macroeconomics

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Summer 2018

Lectures

Email: msolism1@jhu.edu

Lecture Times: Mon, Wed, Fri 2:00 pm - 5:00 pm

July 2- August 3

Textbook

Macroeconomics

R. Glenn **Hubbard** and Anthony P. **O'Brien**

7th Edition, Pearson Education

Optional: Study Guide for Hubbard and O'Brien's Macroeconomics, 5th Edition, Pearson Education

Exams and Grading Policy

- Problem sets – Jul 9th, 16th 10%
- Midterm exam – July 18th 30%
- Problem sets – Jul 25th, Aug 1st 10%
- Final exam – August 3rd 40%
- Participation – 10%

Illness or Family Emergency & Exams

1. **Pre-Notification**: If you are sick or have a family emergency and cannot take an exam, you **must contact me** by phone or e-mail **before** the exam
2. **Written Verification**: Illness or family emergency must be subsequently **verified in writing** by a physician, the Student Health & Wellness Center or Academic Advising

- If **both** steps are not followed, you will **not be excused** from the exam

Make-Up Exams

- A student properly excused from the **midterm** exam will **not** be given a make-up exam
  - The final grade will be based on the other grades with revised weights

- **Make-up** exams will be given to students properly excused from the **final** exam

Academic Integrity

- The strength of the university depends of academic and personal **integrity**. In this course, you must be **honest and truthful**
- Students are welcome to **discuss problem sets** with one another, but each student must write and submit his or her own answers
- Students will **not** be allowed to use any notes, books, calculators, or computers on exams (except as specifically allowed for the accommodation of disabilities)

Course Website

https://pavelsolis.github.io/teaching

- Slides
- Problem sets
- Answers to problem sets and midterm
- Recommended readings
- Videos about current macroeconomic developments
- Announcements

Office Hours

When: Mon 12:30 pm - 1:30 pm, or by appointment

Location: Gilman Atrium

About the Course

- Principles of macroeconomics
  - Basic concepts and models
- Apply what we learn
  - Discuss current developments and policy issues
  - Interpret historical events: 2008-09 financial crisis
- *Pre-requisites*: Basic facility with graphs and algebra

Brief Outline

- Key concepts
  - Key economic ideas, supply and demand, macroeconomic data (output, inflation, unemployment)
- Long-run growth
- Short-run fluctuations
  - Financial system, aggregate demand and aggregate supply, monetary and fiscal policy
- Open economy

Key Economic Ideas

Outline

1. Economic Principles

2. Key Fundamental Questions for Societies

3. Skill Set for Successful Economists

- Textbook Readings: Ch. 1 pp. 2-19,

Economics

- **Unlimited** desires but **limited** resources
- **Scarcity:** mismatch between unlimited wants and limited means
- How **people make decisions** under **scarcity**?
  - Economists have developed tools to think about all sorts of human behavior

Why Study Economics?

- **Individuals**: What career to pursue, what financial investment, lease or buy a house, political narratives
- **Firms**: What prices to charge, sell in foreign market, invest in new software
- **Policymakers**: raise taxes on cigarettes, raise interest rates, allocate funds to research on cancer

Micro & Macro

- **Micro**economics provides theories of decision making
  - Focus on individual units: consumers, firms, markets

- **Macro**economics studies the economy as a whole
  - Focus on output, prices and employment

Micro & Macro

- How consumers react to changes in product prices?
- Why, over the long run, some economies have grown much faster than others?
- What determines the value of the US dollar in exchange for other currencies?
- How firms decide what prices to charge for their products?
- Costs and benefits of allowing two giant firms to merge
- Why economies experience periods of recession and increasing unemployment?

Key Assumptions in Economics

- People make **rational** economic decisions

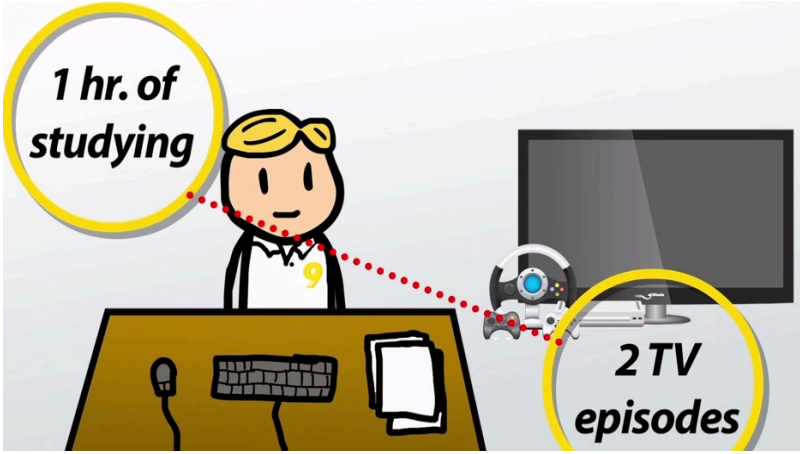
- People respond to **economic incentives**

- Optimal decisions are made **at the margin**
  - The marginal —last— pizza slice is less gratifying than the coke

Trade-offs

- Societies have **limited** resources
  - Numbers of workers, machines, natural resources
- … and **unlimited** desires

- **Trade-offs**
  - More of one good means less of another
  - Involve **opportunity costs**



https://study.com/academy/lesson/opportunity-cost-definition-calculations-examples.html

- **Opportunity cost**: Highest-valued alternative that must be given up to engage in an activity

Key Fundamental Questions for Societies

- **What** goods and services are produced?
  - Spaghetti vs. Smartphones, Repairing Highways vs. Space Travel
- **How** will they be produced?
  - Home made vs. store bought
  - Using more workers vs. using more machines
  - Production in US vs. in China
- **Who** will receive the goods and services?
  - Winner takes all vs. government redistribution

Market Economies

- **Adam Smith** (1776): markets, run by **self-interested people**, push society toward desirable ends
  - **Market economy**: The decisions of households and firms interacting in markets allocate economic resources

- This '**invisible hand**' takes market signals and delivers outcomes that match peoples' desires

- Most economists agree that **free markets** successfully resolve many economic issues

Free Market Failures and Centrally Planned Economies

- Enthusiasm for market wisdom/invisible hand swooned, amid the **Great Depression**

- **John Maynard Keynes** created a framework that explained how markets can fail, and how governments must remedy things

- In Russia and China governments took over the job of running the economy
  - **Centrally planned economy**: The government decides how economic resources will be allocated

The Soviet Gosplan: It Never Did Work

- Centrally planned economies are run by government bureaucrats — Usually quite badly
- ‘From each according to his ability, to each according to his need’ (Karl Marx)
- ‘We pretend to work, they pretend to pay us’ (Soviet workers, circa 1985)
- The Soviet Union started in 1917 and collapsed in 1991

Modern Day Mixed Economies

- **Mixed economy**: Most economic decisions result from the interaction of buyers and sellers in markets but in which the government plays a significant role in the allocation of resources

- Chinese Premiere Deng Xiaoping declared '**to get rich is glorious**', in the 1980s

- Today's economies are '**mixed**'
  - In Europe and the USA, governments provide many services: health care, pensions, defense

Key Macro Questions for Mixed Economies

- What determines **income** and **output** levels?
- What determines **growth rates** for output?
- What determines the level of **employment**?
- What determines the **inflation rate**?

Consensus on Certain Objectives

- Avoid "**social bads**" or achieve important "**social goods**"
  - High income per capita
  - Low unemployment
  - High growth rate of income
  - Equitable distribution of income
  - Low inflation

- Why?
  - High and rising standards of living and a low cost of living

Mixed Economy Public Policy Challenges

- What **strategies** can policy-makers pursue **to achieve** the macroeconomic **goals** of society?

- Specifically, **what** can governments do to promote
  - Strong growth
  - Rising per capita incomes
  - Equitable income distribution
  - Low unemployment
  - Low inflation

Key Macroeconomic Questions

- **Monetary** policy:
  - Raise or lower interest rates?
- Government **tax** / **spending** policies:
  - Size of government as a share of total economy?
  - Raise or cut federal taxes and/or federal spending?
- **How do these policy tools work?**
  - If policies don't work, should government stay out of the way?

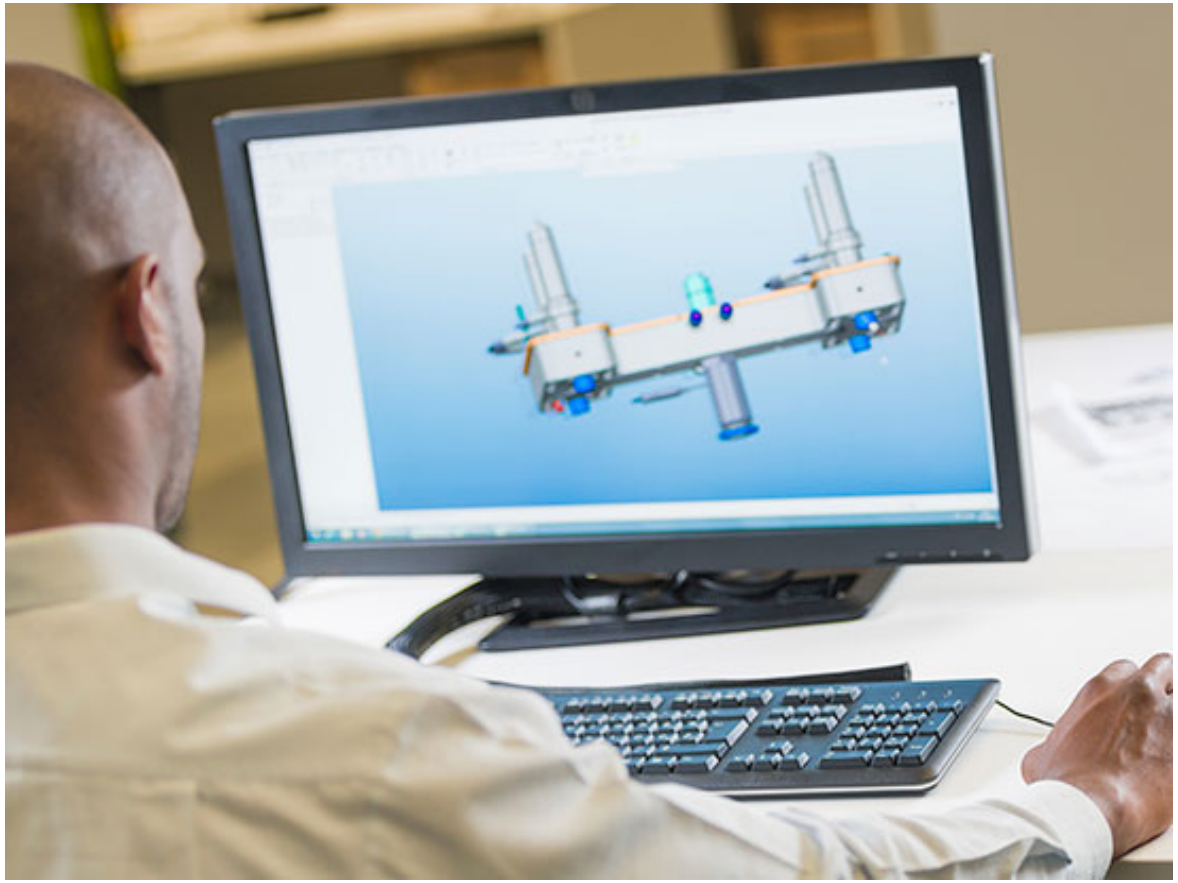
- Need **analytical framework** to
  - Understand movements in key macro variables
  - Analyze government-run vs. market economies

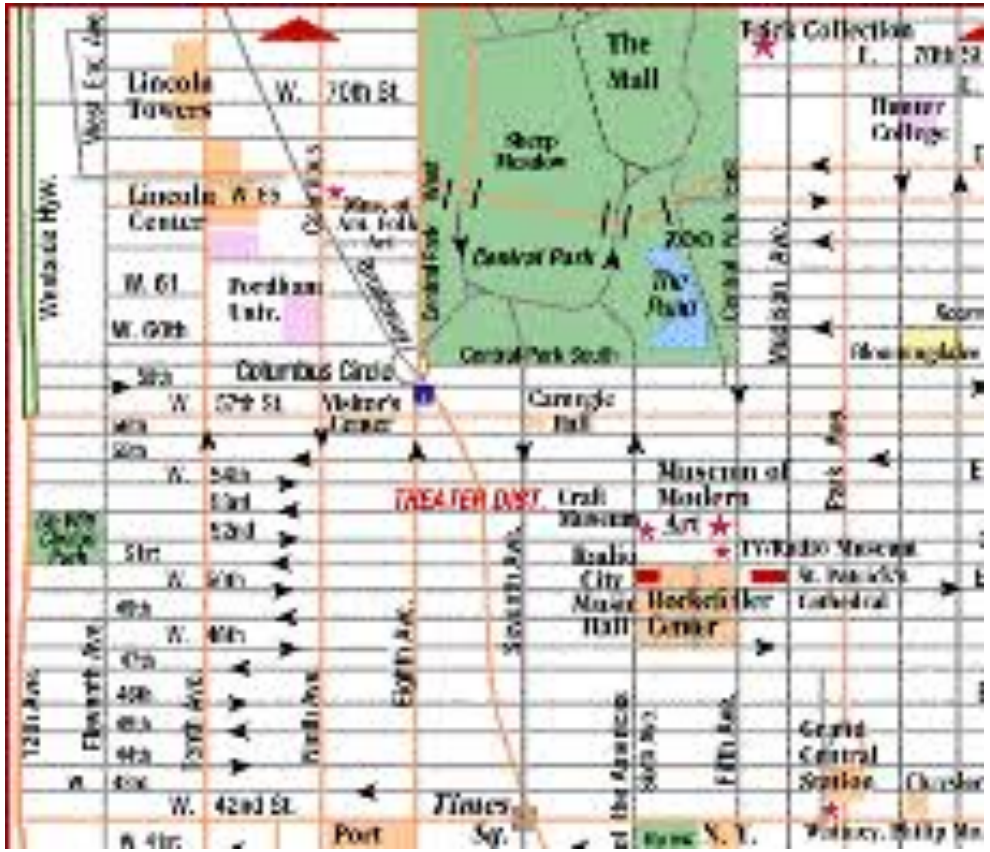
Economic Models

- There are **326 million** people in the USA
- Roughly **7.3 billion** people inhabit the planet
- All make thousands of economic decisions every year—and we can't possibly follow each
- How can we, nonetheless, venture forth with ideas about economic trends?

- We create stylized **models**

Models

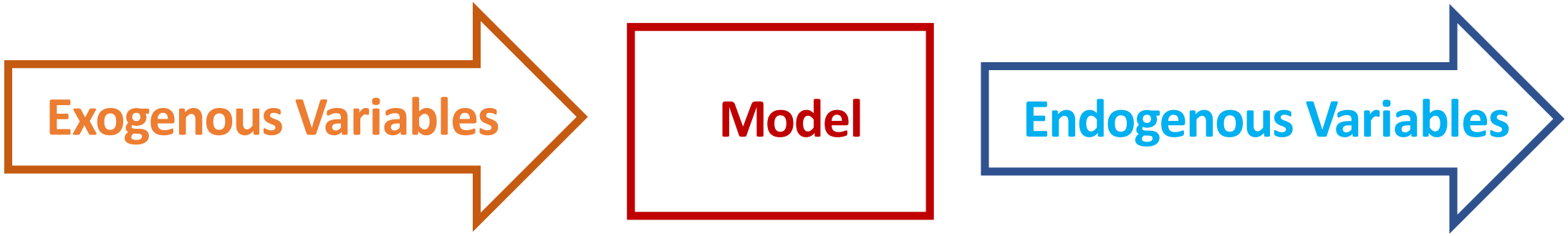



The Mall
Lincoln Towers
W. 70th St.
Lincoln Center
Columbus Circle
Carnegie Hall
Museum of Modern Art
Grand Central Station
W. 42nd St.
Times Sq.
Port

How Models Work

- Models are simplified theories that show the key relationships among economic variables
  - **Exogenous** variables come from outside the model
  - **Endogenous** variables are explained by the model

- The model show how changes in the exogenous variables affect the endogenous variables



Economic Models: Example

- We **define** variables, **write** equations, and **test** (statistically) how well these equations work

- **Example**: What drives the spending decisions of U.S. consumers?
  - C = all spending by U.S. consumers
  - Y_d = all income, after tax, available to consumers
  - W = the wealth of all consumers
  - C = (0.9 x Yd) + (0.002 x W)

- Parameters '0.9' and '0.002' were statistically derived

Positive and Normative Analysis

- We will build economic models and use them to answer questions

- Two types of analyses:
  - **Positive** analysis is concerned with ***what is***
  - **Normative** analysis is concerned with ***what ought to be***

- Economics is about positive analysis
  - Measures the costs and benefits of different courses of action

What It Takes To Be a Good Economist

- The master-economist must possess a **rare combination** of gifts. S/He must be:
  - Mathematician
  - Historian
  - Statesman
  - Philosopher

- S/He must study the **present**, in the light of the **past** for the purposes of the **future**

(John Maynard Keynes)

What Is Needed to Succeed in Intro Macroeconomics?

- You must understand some **symbols**:
  - Be ready to manipulate algebraic formulas
  - Be prepared to work with graphs

- You must learn to **connect** symbols to words:
  - Learning to determine **what model best applies** to a given set of circumstances is the **'art' part of economics**

Economics as Science and Art

- **Math** is necessary but the **art** part of economics is what makes it **fun**!
  - Think logically
  - Separate signal from noise
  - Think outside the box
  - Stay humble

There are only two kinds of economists in the world. Those who know they don't know. And those who don't know they don't know (J.K. Galbraith)

What Will Happen vs. What Cannot Happen

- We **never** can be sure of what will happen!
- But we often can say what **cannot** happen!

- Example:
  - Trump administration: 25 million jobs in 10 years
  - That is 2.5 million jobs per year
  - How many Americans are unemployed?
  - 8 million people, 4% of labor force
  - How low can unemployment go?
  - How else can we get population growth?

Some Important Economic Terms

- **Goods:** Tangible merchandise
- **Services:** Activities performed for others
- **Technology:** Processes used to produced goods and services
- **Revenue:** (Price per unit) x (Number of units sold)
- **Profit:** Revenue - Costs
- **Factors of production, economic resources or inputs:** labor, capital and natural resources
- **Capital:** financial capital vs. physical capital
  - *Capital stock*: total amount of physical capital available in a country

Using Graphs and Formulas

Outline

1. Graphs: 1, 2 and 3 Variables

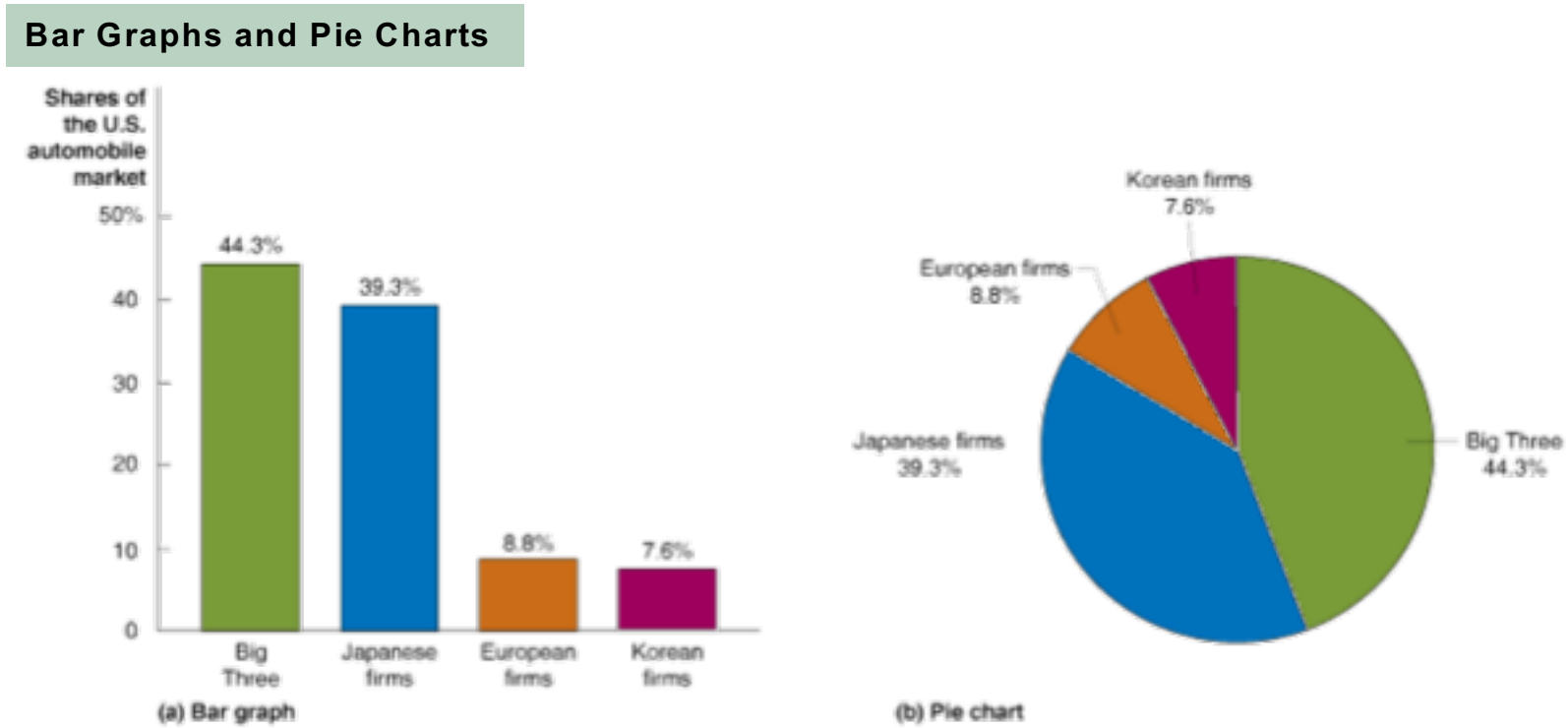
2. Causality

3. Annualized Growth

- Textbook Readings: Ch. 1 Appendix pp. 28-38

Graphs of **One** Variable

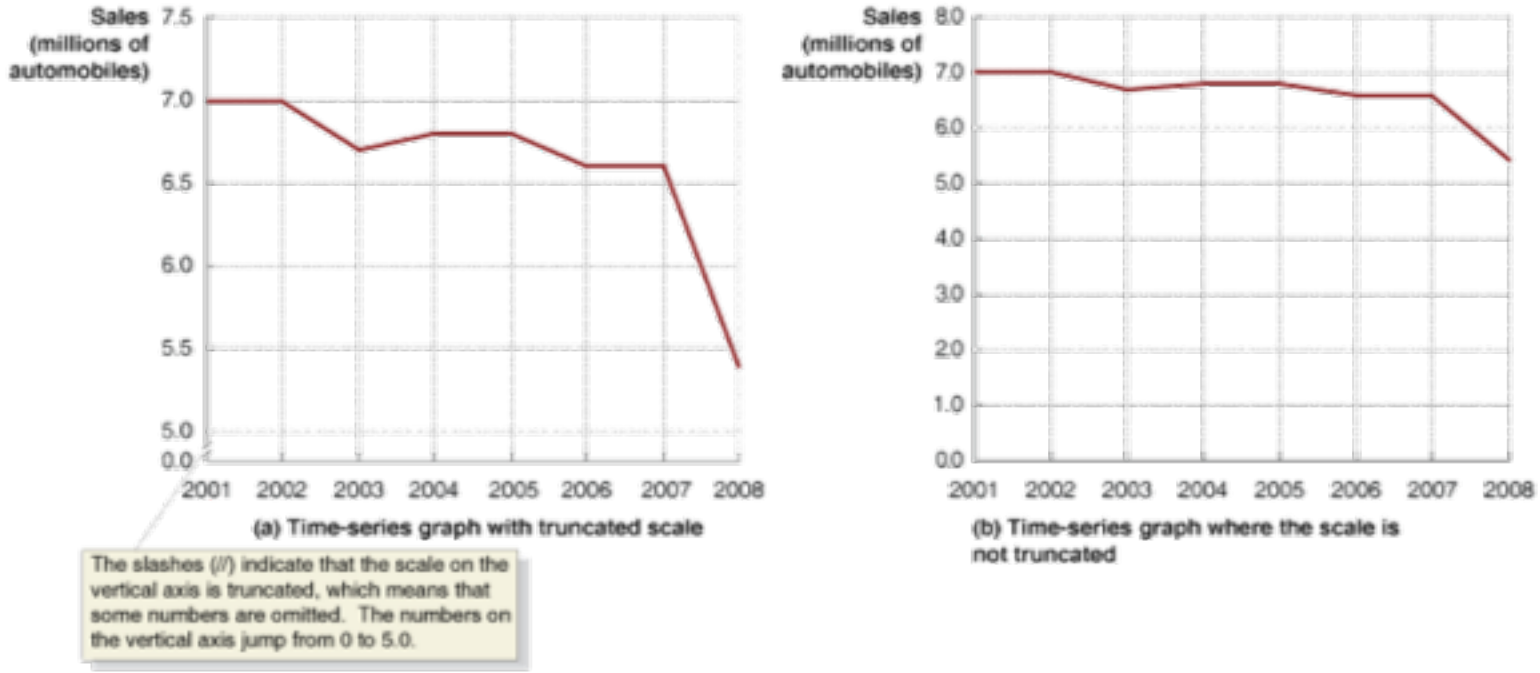
- Economists often want to **visualize** data and use **graphs** to do so
- Data for **discrete groups** can be represented by bar or pie charts



Graphs of **One** Variable: Time Series

- Economic variables are also often displayed in **time series graphs**
- Time series data – how an economic variable moves **over time**
  - The **scale** can significantly affect how the graph looks!

Time-Series Graphs



Graphs of **Two** Variables

- Relationship between 2 variables
  - Example: Demand curves (Price vs Quantity)

Price (dollars per pizza)	Quantity (pizzas per week)	Points
$15	50	*A*
14	55	*B*
13	60	*C*
12	65	*D*
11	70	*E*

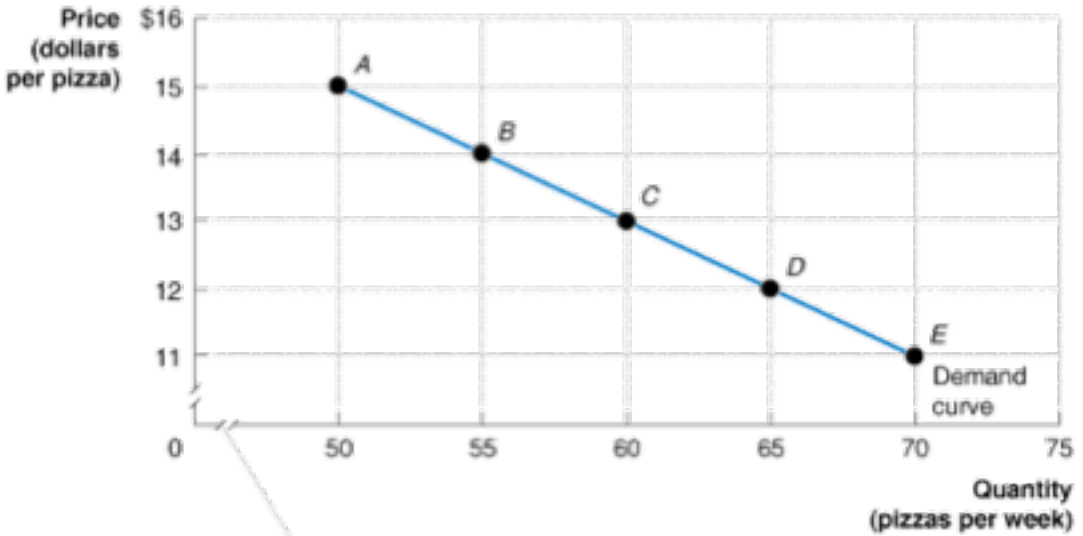
Demand Curve

Graphs of Two Variables

Plotting Price and Quantity Points in a Graph

The figure shows a two-dimensional grid on which we measure the price of pizza along the vertical axis (or *y*-axis) and the quantity of pizza sold per week along the horizontal axis (or *x*-axis).

Price (dollars per pizza)	Quantity (pizzas per week)	Points
$15	50	*A*
14	55	*B*
13	60	*C*
12	65	*D*
11	70	*E*



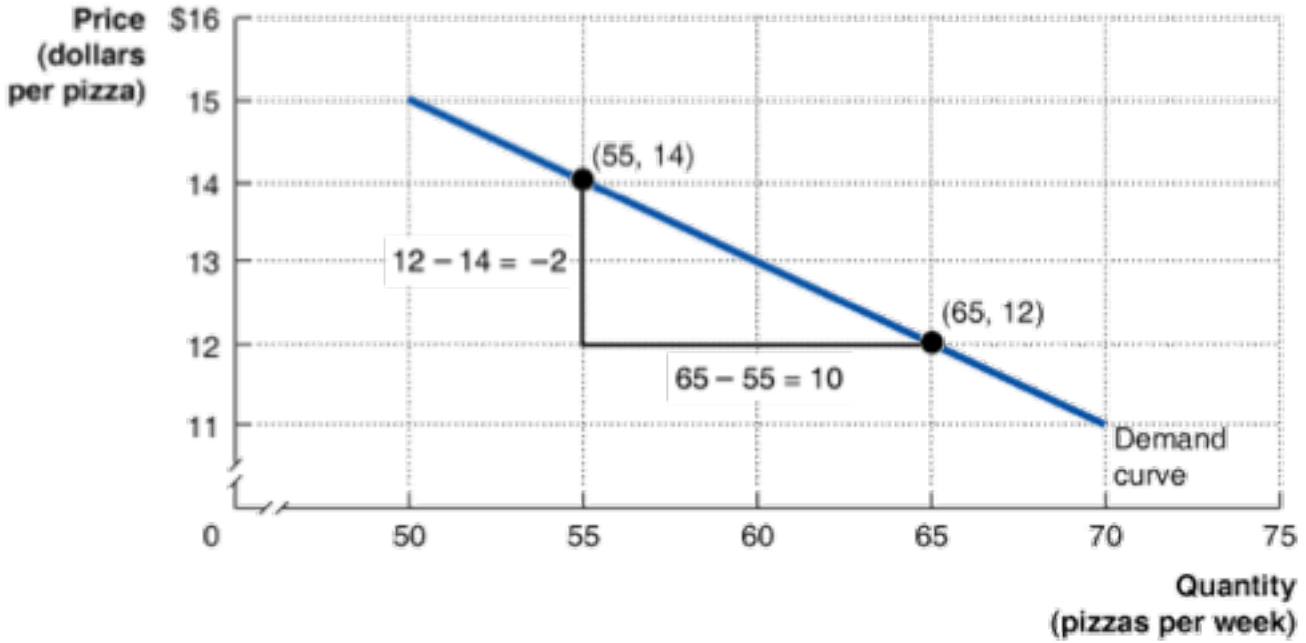
As you learned in Figure 1A-2, the slashes (//) indicate that the scales on the axes are truncated, which means that numbers are omitted: On the horizontal axis numbers jump from 0 to 50, and on the vertical axis numbers jump from 0 to 11.

Slope of Lines

- **How much** P decreases when Q increases?

Calculating the Slope of a Line

We can calculate the slope of a line as the change in the value of the variable on the *y*-axis divided by the change in the value of the variable on the *x*-axis. Because the slope of a straight line is constant, we can use any two points in the figure to calculate the slope of the line.



$$Slope = \frac{Change\ in\ value\ on\ the\ vertical\ axis}{Change\ in\ value\ on\ the\ horizontal\ axis} = \frac{\Delta y}{\Delta x} = \frac{Rise}{Run}$$

$$Slope = \frac{\Delta\ Price\ of\ pizza}{\Delta\ Quantity\ of\ pizza} = \frac{(\$12 - \$14)}{(65 - 55)} = \frac{-2}{10} = -0.2$$

Shifts in the Demand Curve

- **Difference** between a **shift** in the demand curve and a **movement along** the demand curve is **critical**

- What happens to the demand for pizza when the price of a **substitute** –hamburgers– change?
  - A **shift** in the demand for pizza

- Original price of a hamburger is $1.50

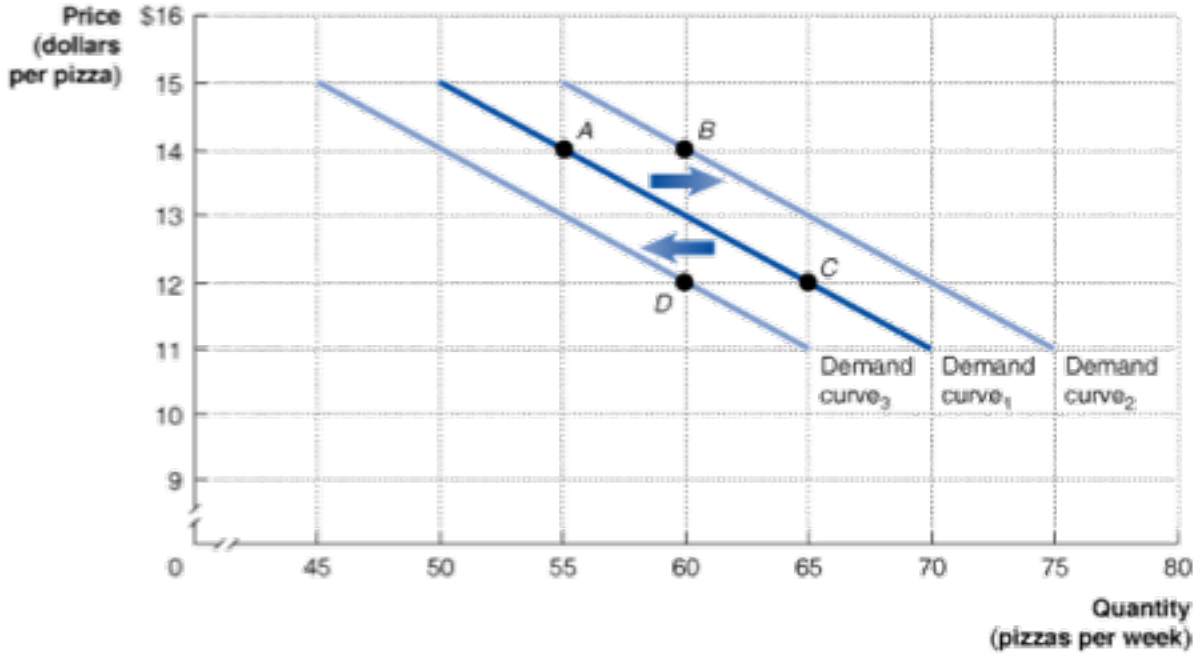
Shifts in the Demand Curve

Taking into Account More Than Two Variables on a Graph

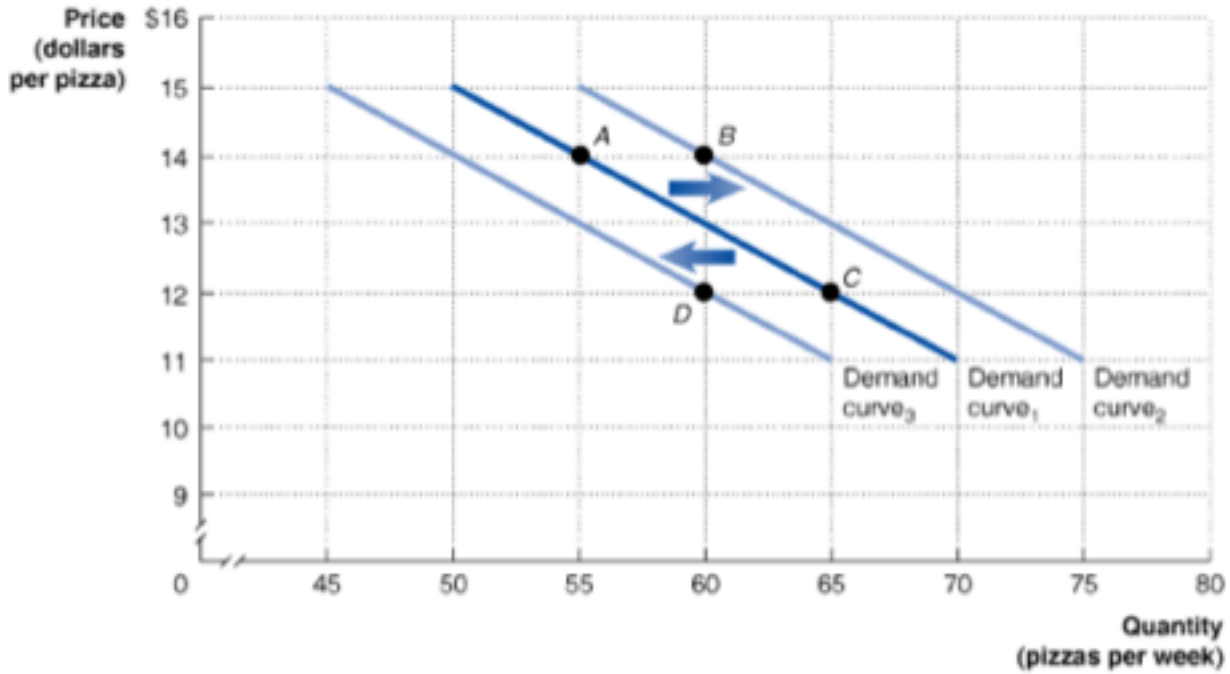
Showing Three Variables on a Graph

The demand curve for pizza shows the relationship between the price of pizzas and the quantity of pizzas demanded, *holding constant other factors that might affect the willingness of consumers to buy pizza.*

	Quantity (pizzas per week)		
Price (dollars per pizza)	When the Price of Hamburgers = $1.00	When the Price of Hamburgers = $1.50	When the Price of Hamburgers = $2.00
$15	45	50	55
14	50	55	60
13	55	60	65
12	60	65	70
11	65	70	75



Shifts in the Demand Curve



- Demand curve 1 is the original one (when hamburgers cost $1.50)
- Demand curve 2 represents an **increase** in the **price of hamburgers**
- Demand curve 3 represents a **decrease** in the **price of hamburgers**

Shifts vs Movements Along

- When the **price** of the good depicted changes, there is a **movement along** the curve
- When a variable **other than the price** of the good depicted changes, there is a **shift** of the curve

Positive and Negative Relationships

- **Negative** relationship: As one variable increases, the other variable decreases
  - Demand curve

- **Positive** relationship: The values of both variables increase or decrease together
  - Disposable personal income and consumption spending

Causality

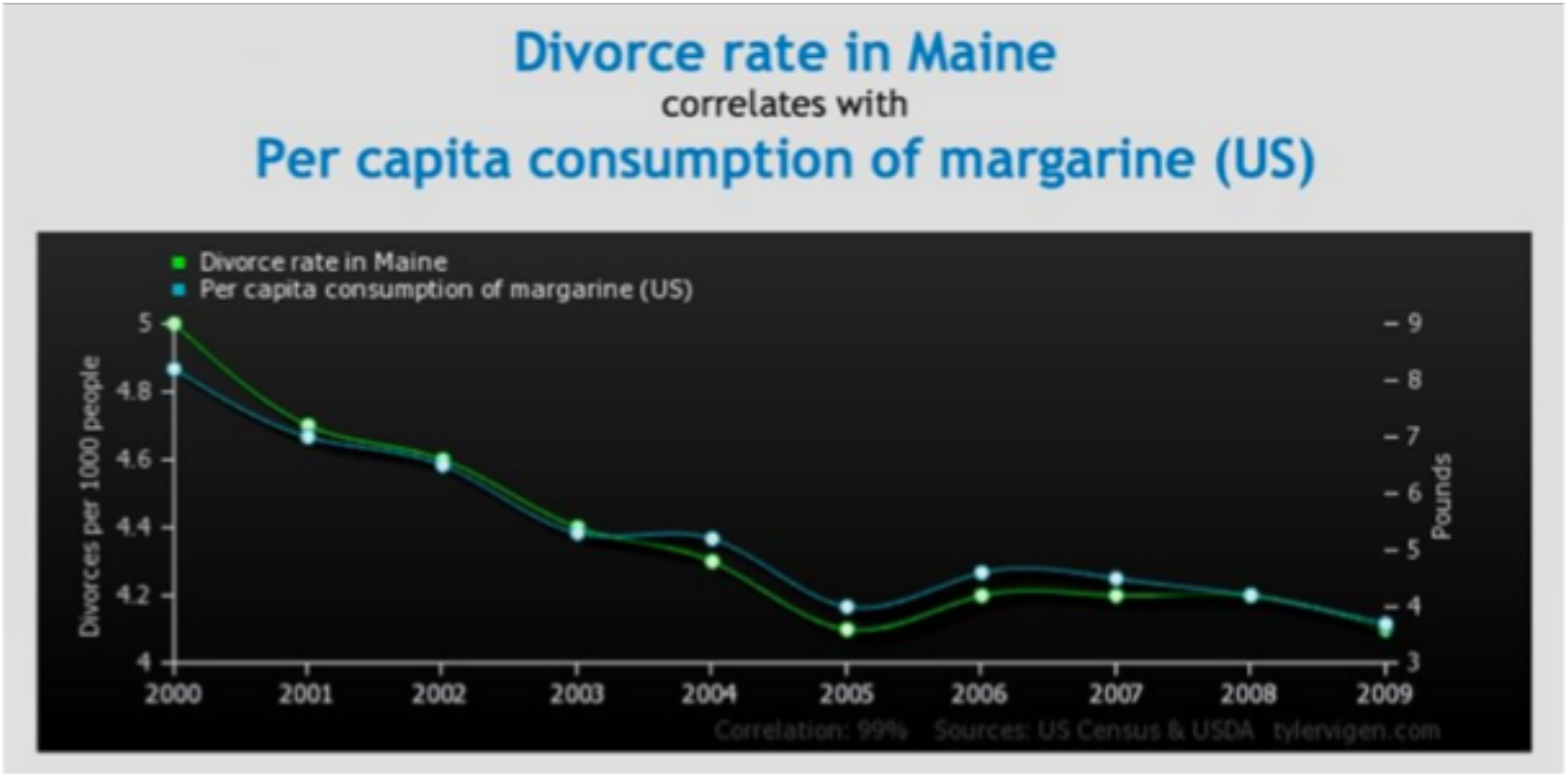
- Drawing conclusions of causation from the relationship of two variables can lead to mistakes

- Determining **cause and effect** is a **key problem** in economics
  - Most of the time we cannot do experiments

- A positive or negative relationship between 2 variables **does not** imply causality

Correlation Does NOT Imply Causation

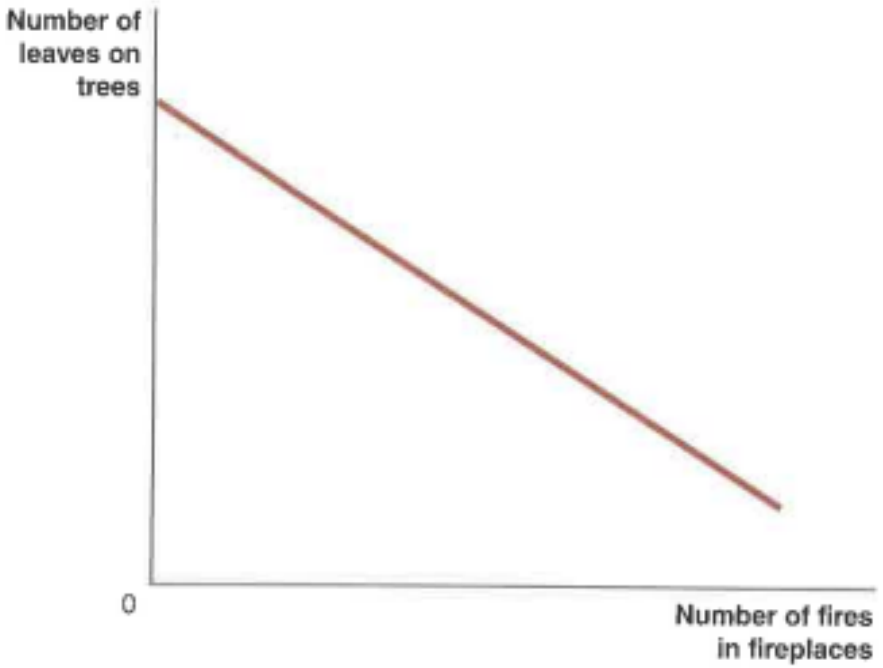
- Example: High correlation between two random, unrelated statistics



http://twentytwowords.com/funny-graphs-show-correlation-between-completely-unrelated-stats-9-pictures/

Omitted Variables

- An **omitted variable** affects the 2 variables and its omission can lead to **false conclusions** about cause and effect

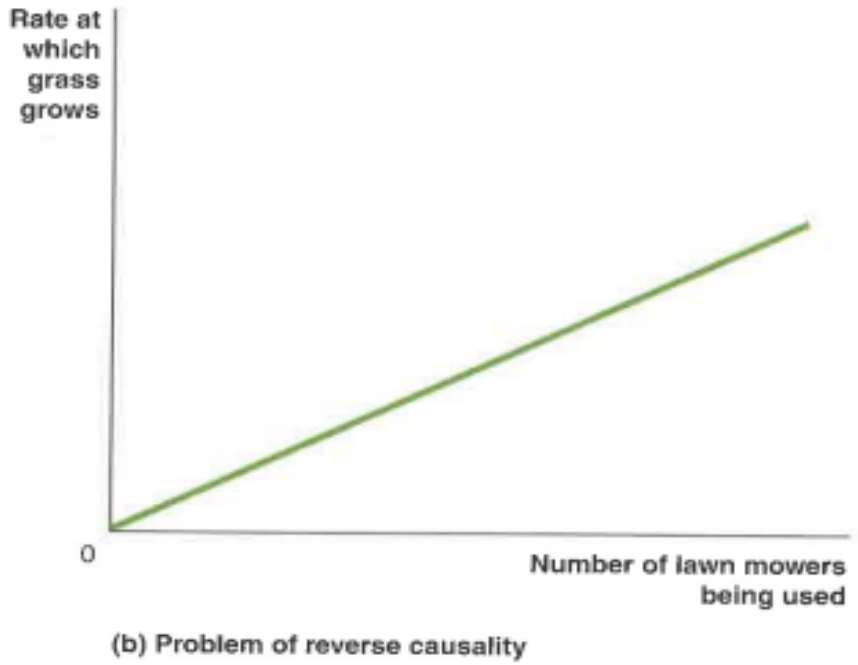


(a) Problem of omitted variables

- Using fireplaces causes trees to lose their leaves?

Reverse Causality

- **Reverse causality**: conclude X cause Y when in fact Y cause X

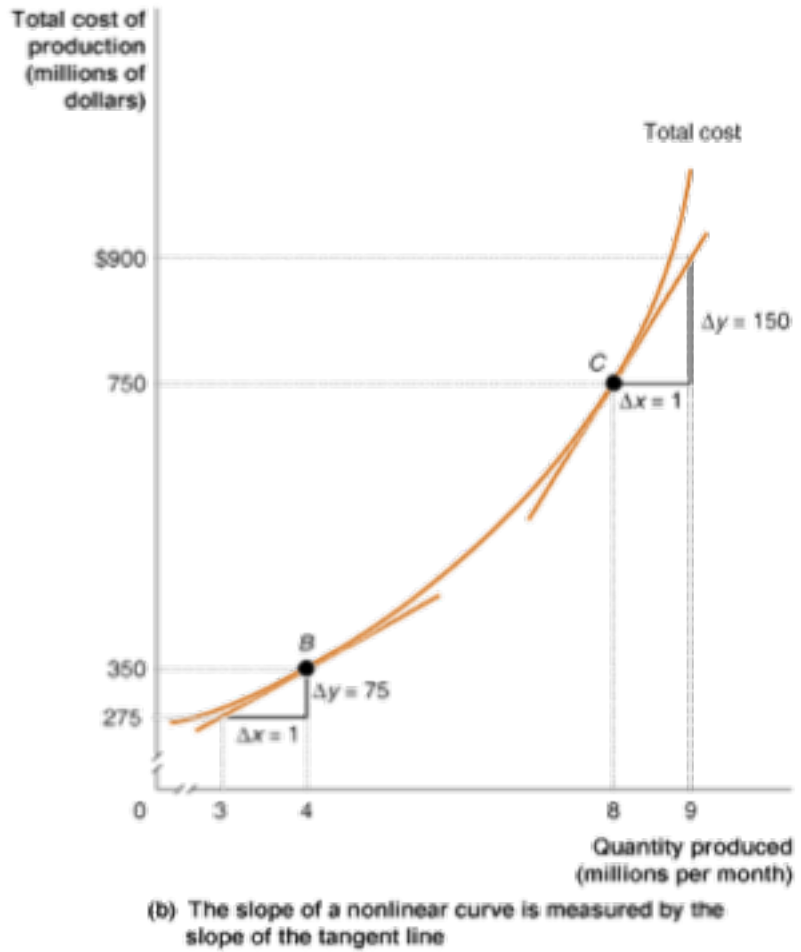


(b) Problem of reverse causality

- Using lawn mowers *causes* the grass to grow faster?

Slopes of Non-Linear Curves

- So far *linear* relationships
- Are relationships between economic variables always straight lines?
  - Few are but is useful to approximate
- Example: Increasing marginal production costs



(b) The slope of a nonlinear curve is measured by the slope of the tangent line

Formulas

- We have used **graphs** so far
- **Formulas** are useful to summarize data and calculate important relationships
  - Percentage change
  - Annualized growth
- When using formulas:
  - Understand the economic concept the formula represents
  - Use the correct formula for the problem you are using
  - Result is economically reasonable?

Lending Money for One Period

- If I lend $150 with an annual interest rate of 10% for 1 year, how much will I have after 1 year?

- In one year I will receive my $150 back plus an interest of $150x10%=$15

$$\$150 + \$150 \times 10\% = \$150 \times (1 + 10\%)$$

$$\$150 \times (1 + 0.1) = \$165$$

Percentage Change

- Formula:

$$Final\ Value = Initial\ Value \times (1 + Percentage\ Change)$$

- If we want to know the percentage change:

$$Percentage\ Change = \left(\frac{Final\ Value\ - Initial\ Value}{Initial\ Value}\right) \times 100$$

- When calculating percentage changes, the *units don't matter*!

Arithmetic Tricks for Working with Percentage Changes

- Product:

$$\begin{aligned} &Percentage\ Change\ in\ A{\times}B \\ &\approx Percentage\ Change\ in\ A \\ &+ Percentage\ Change\ in\ B \end{aligned}$$

- Ratio:

$$\begin{aligned} &Percentage\ Change\ in\ C/D \\ &\approx Percentage\ Change\ in\ C \\ &- Percentage\ Change\ in\ D \end{aligned}$$

Lending Money for More than One Period

- In one year I will have $165. Lending the money for 1 more year at 10% is equal to lending $150 for 2 years at 10% per year

$$\$165 \times (1 + 0.1) = \$181.5$$

$$[\$150 \times (1 + 0.1)] \times (1 + 0.1) = \$150 \times (1 + 0.1)^2 = \$181.5$$

Annualized Growth

- Formula:

$$Final\ Value = Initial\ Value \times (1 + Growth\ Rate)^{Periods}$$

- If we want to know the annualized growth rate:

$$Annualized\ Growth\ = \left[\left(\frac{Final\ Value}{Initial\ Value}\right)^{\frac{1}{Periods}} - 1\right] \times 100$$

Annualized Growth

- Examples:
  - Annualized growth from Jun 2018 to Jul 2018: $\left(\frac{Value_{Jun2018}}{Value_{Jul2018}}\right)^{12} - 1$
  - Annualized growth from Q1 to Q2: $\left(\frac{Value_{Q2}}{Value_{Q1}}\right)^{4} - 1$
  - Annualized growth from 2000 to 2010: $\left(\frac{Value_{2010}}{Value_{2000}}\right)^{\frac{1}{10}} - 1$
  - Annualized growth from Dec 2017 to May 2018: $\left(\frac{Value_{May2018}}{Value_{Dec2017}}\right)^{\frac{12}{5}} - 1$
- Annualized growth is useful to make comparisons
  - Amount a variable would have changed over a year's time had it continue to grow at the given rate