Principles of Macroeconomics Version 8 0 8th edition Taylor Solutions Manual

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Chapter 2:
Observing and Explaining the Economy

Chapter Summary

This chapter presents a rationale for studying economics and describes the tools needed to begin forming an economic perspective. An understanding of economics gives us a framework for analyzing many of today's events and issues, such as the behavior of gasoline prices over time and the dynamics of rising health-care costs. More importantly, a strong understanding of economics is necessary to enable sound policy recommendations.

The foundation of all economic analysis is the use of data, graphs, and models, which are demonstrated using the relationship between vehicle miles traveled and the average retail price of gasoline. The chapter ends with a discussion of how economics can affect public policy and the distinction between positive and normative economics.

Chapter Objectives

- Communicate the importance of studying economics.
- Discuss and demonstrate how economics makes use of data and graphs. Make sure to highlight the problems of using data.
- Begin teaching an economic vocabulary, stressing that Economics has many specialized terms

2.1 Why Has Driving Shifted into Reverse

Section Objectives

- Discuss the role of data collection and examination in answering economic questions
- Explain that a variety of possibilities may need to be considered before a correct answer can be reached.

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Section Outline

- Virtually all the questions economists seek to answer come from observing the economy. Economists document and quantify their observations by collecting and examining data.
- The first task of most economic examinations is to collect data. The focus of this chapter is on the behavior of the price of gasoline.
    - This question is interesting: it has a variety of possible explanations which must be taken into account, and given the start time of the reduction in driving (after gas prices rose but before the recession, roughly 2005) the most plausible explanation must contain multiple parts.
    - Data on the vehicle miles traveled are given in **Figure 2.1** in the text. **Figure 2.2** shows the same data on a per person basis. The average retail price of gasoline is seen in **Figure 2.3**.
- When applying economic ideas to explain real-world trends and events, it is best to recognize the limitations of the analysis and think critically about all possible causal factors. For example, when studying changes over time, it is important to take account of changes in the population which have large effects

2.2 Variables, Correlation, and Causation

Section Objectives

- Introduce the concepts of **economic variables** and **economic models**
- Discuss negative and positive correlation between variables. Differentiate between correlation and causation.
- Discuss the absence of controlled experiments in economics and reinforce the idea that you must always consider the possibility of faulty and incomplete data.
- Introduce the concepts of **Microeconomics** and **Macroeconomics** and discuss the distinction.

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Section Outline

- We examined U.S driving trends and focused on two economic variables
    - Miles per person
    - The price of gasoline
    - An **economic variable** is any economic measure that can vary over a range of values.
- **Correlation** (positive and negative) measures the potential relationship between two data series. Correlated variables tend to move up and down together.
    - A **positive correlation** exists if the variables move in the same direction.
    - A **negative correlation** exists if the variables move in opposite directions.
    - Just because two variables are correlated does not necessarily mean that one caused the other; correlation does not imply causation. Determining causation can be very difficult.
- Many scientists can perform **controlled experiments** where one variable can be changed while all others are held steady. This is often not possible in economics.
- In recent years, economists have adapted some of the methods of experimental science and begun to conduct economic experiments in laboratory settings. This new field of **experimental economics** has yet to be applied as widely as the clinical or laboratory experiments in other settings, but the field is growing.

Economic Models

- To explain economic facts and observations, one needs an **economic model** or theory**.** An economic model is an explanation of how the economy or a part of the economy works. Most economists use the terms *theory* and *model* interchangeably, although sometimes *theory* suggests a general explanation and *model* suggests a more specific one. The term *law* is also used interchangeably with *theory* and *model*.
    - Economic models are always abstractions or simplifications of complicated phenomena in the real world.

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- Economic models may be classified as either **macroeconomics**, which seek to explain an economy, or **microeconomics**, which seek to explain aspects of individual behavior within an economy.
- Models are built on theories and tell economists whether variables are negatively or positively related. They are simplifications of reality, but are successful if they explain reality reasonably well. Models would be quite difficult to use if they were not simplified.
- Models can be described with words, numerical tables, graphs, or algebra.
    - To use economics, you must be able to work with these different types of descriptions.
    - You can see two graphs describing economic models in **Figures 2.4** and **2.5**. By looking at a graph, we can quickly see if it has an inverse or a direct relationship
        - If a model says one variable varies inversely with the other, the model is saying one variable rises while the other falls.
        - If a model says one variable varies directly with the other, the model is saying both variables rise or fall together.
        - In economics, these relationships are often described as being "positively" and "negatively related."
    - **Figure 2.6** shows a model describing how doctors employed in an HMO provide physical examinations. The model is represented in four different ways:
        - Words
        - A numerical table
        - A graph
        - Algebra
        - All four of these ways of representing models have advantages and disadvantages. This book will cover all four methods.

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- To use models for prediction, economists use the assumption of ***ceteris paribus***, which means "all other things being equal." Economists focus on the impact of a single variable on an economic event this way.
- Economists use existing models where possible, but new economic models come into being when existing models cannot explain new observations. Model development proceeds similarly to other sciences, with the development of a hypothesis and testing, but existing models are also constantly tested.

2.3 Recommending Appropriate Policies

Section Objectives

- Discuss the role of economics in the development of government policies.
- Explain the difference between **normative** and **positive** economics.
-

Section Outline

- Ever since the *Wealth of Nations* by Adam Smith, economists have been motivated by a desire to improve government policy.
  - Smith argued for a system of *lassiez faire* – little government control.
  - Karl Marx saw contradictions in capitalism and argued against the lassiez-faire approach and for **socialism**, an economic system where government owns the means of production
    - Marx said relatively little about what socialism would look like
    - His writings still inspired the centrally planned economies in Eastern Europe, China, and the former Soviet Union.
    - Most countries have now rejected the command economy, but in many modern market economies, the government plays a large role. These economies are sometimes referred to as **mixed economies**.
- In debating the role of government in the economy, economists distinguish between positive and normative economics.
  - **Positive economics** is about what *is*

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- **Normative economics** describes what *should be*

- Economics is independent of political parties; it is a set of tools that aid in thinking. However, it is not always used in a purely scientific way, often being referenced in the political sphere. Economics is not the only factor in policy issues.
- Economists do not always agree in their policy recommendations.

2.4 End-of-Chapter Material: Key Points

- Economics is a way of thinking that requires observation (describing economic events), explanation (identifying variables that are potential explanatory variables of the event), prediction (building and using economic models to predict future events), and policy recommendations (courses of action for government—and business—to follow, based on these observations and models).
- Finding the appropriate data series to explain economic events is a challenge because data often can be hard to find or incomplete, or can be misleading if they are not appropriately transformed.
- Finding explanations for why an economic event occurred is challenging because even if you can find variables that are correlated with the variable in which you are interested, correlation does not imply causation. The inability to run controlled experiments also makes it difficult for economists to definitively establish a causal explanation for an economic event.
- Economists have to explain the complex behavior of humans in economic situations. They often use models that are abstractions, or simplifications, of reality in their work. Economic models, like models in other sciences, can be described with words, tables, graphs, or algebra. All four ways are important and complement each other.
- Economists use the tools of economic analysis to come up with policy insights concerning what the government is doing, or what the government should be doing, with regard to the economist's area of interest. Improving economic policy has been a goal of economists since the time of Adam Smith.
- Economics is a discipline that requires a combination of analytical, algebraic, and verbal skills. You can apply the tools of economics to almost any problem that

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involves decision making by individuals. Many students are interested in studying economics because they find it relevant to events that occur in the world, but the study of economics can be an intellectually stimulating exercise in its own right.

End-of-Chapter Problems with Solutions

1) Which of the following variables are studied as part of microeconomics, and which are studied as part of macroeconomics?
   a) The U.S. unemployment rate.

      Macroeconomic

   b) The amount of tips earned by a waiter

      Microeconomic.

   c) The national rate of inflation.

      Macroeconomic

   d) The number of hours worked by a student.

      Microeconomic

   e) The price paid to obtain this economics textbook.

      Microeconomic

2) Consider the following table, which provides the price of chicken and the price of all foods from 1996 to 2006.

Year	Price of All Foods	Price of Chicken	Relative Price
1996	92	95	
1997	93	98	
1998	96	98	
1999	97	99	

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Year	Price of All Foods	Price of Chicken	Relative Price
2000	100	100	
2001	103	103	
2002	104	105	
2003	108	106	
2004	111	114	
2005	113	116	
2006	116	114	

a) Calculate the relative price of chicken for each year using the formula below

Year	Relative Price
1996	1.0326
1997	1.0538
1998	1.0208
1999	1.0206
2000	1.0000
2001	1.0000
2002	1.0096
2003	.9815
2004	1.0270
2005	1.0265
2006	.9828

b) Plot the relative price of chicken

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c) What can you say about how the price of chicken has varied in comparison to the price of all foods in the decade from 1996 to 2006.

Over the long term of the whole data series the relative price has fallen, while in a few shorter term periods the either did not change or actually increased. An economic model of the data should attempt to explain both the long term trend and the short term variability.

3) A change in the relative price of a good matters more than the change in the price of a good in analyzing the change in spending on that good. Show that the relative price of a good can fall on occasions when the price of that good is rising, falling, or remaining unchanged, using numerical examples from the table in Problem 2.

The relative price was lower than the previous year six times in Problem 2. In those six cases, when viewed from the previous year the (absolute) price increased in 1999, 2000, 2003 and 2005, decreased in 2006, and was unchanged in 1998.

4) Indicate whether you expect positive or negative correlation for the following pairs of variables, labeled *X* and *Y*. For each pair, state whether *X* causes *Y*, *Y* causes *X*, or both.

a) Sunrise (*X*) and crowing roosters (*Y*)

A positive correlation is expected. To show causation, it is necessary to argue that one of these causes the other. In this case, it would be useful to have both a theory explaining how roosters respond to sunrise and data supporting the positive relationship.

b) The use of umbrellas (*X*) and a thunderstorm (*Y*).

A positive correlation is expected. Thunderstorms cause the use of umbrellas.

c) The price of theater tickets (*X*) and the number of theatergoers *(Y*).

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A negative correlation could be expected. To show causation, it is necessary to have a theory and supporting data showing that people go to the theater less when the price of tickets rises. But, if it can be argued and supported by data that the more theatergoers there are, the higher will be the price of tickets then the correlation is expected to be positive.

d) Weekly earnings of a worker (*X*) and the number of hours a week she works at her job (*Y*).

As hours worked rise, then weekly earnings should rise. There is a positive correlation.

e) The number of children who were vaccinated against a disease (*X*) and the number of children who currently suffer from that disease (*Y*).

A negative correlation is expected. The more children vaccinated, the fewer children with the disease.

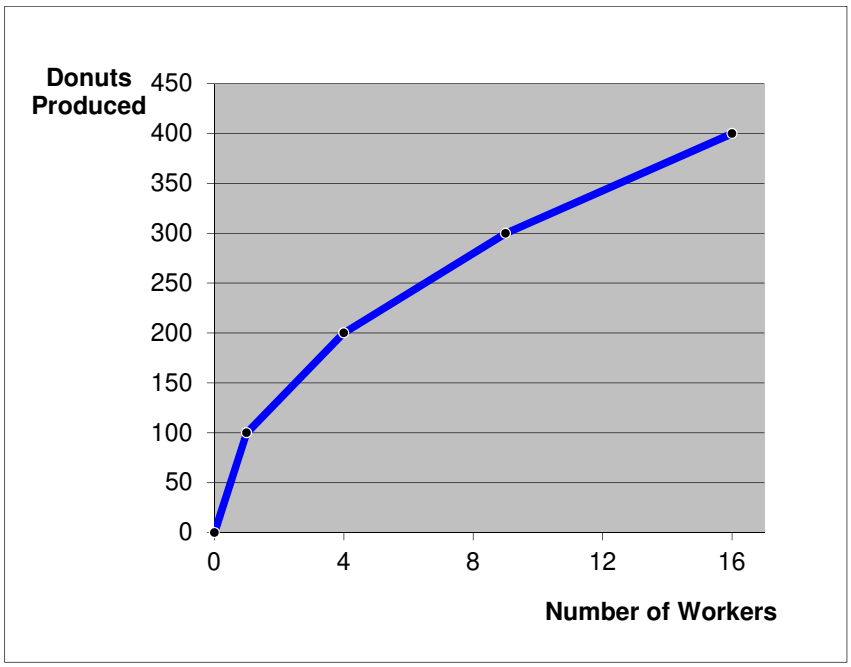
5) Consider an economic model of donut production. Show how to represent this model graphically, algebraically, and verbally, as in Figure 2.6.

Number of Workers	**Number of Donuts Produced**
0	0
1	100
4	200
9	300
16	400

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A graphical representation:



An algebraic representation would be donuts produced = (√number of workers) x 100.

A verbal representation could be the following. As the number of workers making donuts increases, so does the numbers of donuts produced. Moreover, to get equal increments of donuts, increasing amounts of workers must be added.

6) Suppose you decide to build a model to explain why the average worker in a particular occupation works more hours during some weeks than during others.

a) What data would you collect to describe this phenomenon?

The data should be for many workers in the same occupation over time.

b) What variable do you believe would supply the major part of the explanation of the variation in hours worked?

The explanatory variable would be calendar time on a week by week basis.

c) If you graph the data with hours worked on the vertical axis and your explanatory variable on the horizontal axis, will the relationship be upward-sloping or downward-sloping?

You would expect some oscillation about some average number of hours.

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d) What does your answer to part c imply for whether the data on hours worked and the data on your explanatory variable are positively or negatively correlated?

You would expect one or the other depending on the month of a year.

7) Why is it typical for economists to make the *ceteris paribus* assumption when making predictions? Now consider the statement: "If the local McDonald's reduces the price of a Big Mac hamburger, it will sell a lot more hamburgers." What other variables are most likely being held fixed under the *ceteris paribus* assumption when this statement is being made?

The variable the economist would like to predict may be influenced by many explanatory variables. The *ceteris paribus* assumption is made to isolate the impact one explanatory variable has on the main variable. If the local McDonald's reduces the price of a Big Mac hamburger, it will sell a lot more Big Mac's assuming the prices of items at other local fast food restaurants stay the same and given that the income of local residents stays the same.

8) Suppose you wanted to modify the Bertrand and Mullainathan study to focus on gender discrimination. Describe the "experiment" that you would run. Also be sure to explain how the *ceteris paribus* assumption is involved in terms of the names you would choose for the men and for the women.

To test gender one could run an experiment where resumes were sent out in which the individual had similar sounding names (to hold race constant), similar experiences (holding resume quality constant), but different genders. This format would only allow gender to vary, hence testing for its effect.

9) Identify whether the following policy statements are positive or normative. Explain.

a) The price of gasoline is too high.

This is a normative statement. This is a statement of opinion.

b) The average price of gasoline rose to a record high of $4.02 in June 2008.

This is a positive statement. This statement is a statement of fact. It is either true or false.

c) Forty-four million Americans lack access to health insurance.

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This is a positive statement. It can be tested by examining data.

d) The government needs to provide basic health care to the uninsured.

This is a normative statement. It is an opinion.

e) A collapse in the stock market will affect many Americans.

While the statement is somewhat vague, there is a suggestion of a testable hypothesis. Thus, this is a positive statement.

10) Suppose an economic study shows that increasing the tax rate on cigarettes will reduce the amount of smoking. Which of the following statements can be validly made on the basis of the study because they are positive statements, and which cannot be validly made because they are normative statements?

a) Increasing the cigarette tax rate is a method of reducing smoking.

b) If the government wishes to reduce smoking, it should raise the cigarette tax.

c) If the government wishes to reduce smoking, it can raise the cigarette tax.

d) The government should reduce smoking by raising the cigarette tax.

e) The government should not raise the cigarette tax on low-income smokers.

The statement in part (a) is clearly positive, while the statement in part (e) is clearly negative. The other three statements have the positive element made in the supposition, but enter the realm of normative economics with the recommendation of economic policy.

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2.5 Appendix: Reading, Understanding, and Creating Graphs

Appendix Overview

A good grasp of graphs is a prerequisite for understanding economics. This appendix explains Cartesian coordinates, time-series graphs (single and dual scale), scatter plots, and pie charts. To enhance future lectures, you should connect graphs to models. Words, tables, and mathematics can depict a model; all can convey the same information. The concept of slope and the distinction between movement along a curve and shifts in the curve are explained.

Section Objectives

- Describe the Cartesian coordinate graphing system
- Explain time-series graphing, bar charts, scatter plots, and pie charts
- Show how models may be expressed in words, tables, graphs, and algebra.
- Discuss the concept of slope and stress its importance.
- Differentiate between movement along a curve and shifts of a curve.

Section Outline

Visualizing Observations

- **Time-Series Graph**
  - Most economic graphs are drawn in two dimensions and constructed using a **Cartesian coordinate system**.
  - Cartesian coordinates are pairs of observations represented in a plane by designating one axis for one variable and the other axis for the other variable. Each point corresponds to one pair of observations.
  - Data listed in tables can be given a visual dimension by graphing, as we can see in the graph of the national debt over time in **Table 2.1** and **Figure 2.7**.
    - Figure 2.7 is what is known as a **time-series graph** because it plots a series – several values of the variable – over time.
    - Different scales give the same data a different look – for example, **Figures 2.7** and **2.8.** The same data is used, but because the time variables are put closer together or farther apart, the data looks more or less dramatic.

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        - An alternative to time-series graphs can be seen in **Figure 2.9**. This bar graph is showing the same information in a slightly different form.
    - Percentages can be used as in **Table 2.2** and **Figures 2.10,** which show the national debt as a percentage of GDP..
    - In **Figure 2.11** we see a graph where the range is started near the minimum value and ended near the maximum value.
        - This eliminates wasted space as there are no values near zero
        - It can prove confusing to people who do not look at the axis; a small cut is put on the axis to reduce confusion, but you have to look carefully.
- **Time-series Graphs with two or more variables**
    - We can show more than one variable on a time-series graph, as with the data in **Table 2.3** but there can be a problem with showing both variables if the scales are radically different.
        - Because of this issue, we can use a **dual scale**. An example of this can be seen in **Figure 2.12**.
        - In a dual scale, one sale is put on the left-hand vertical axis and on the right.
        - It is important to emphasize the different scales. In this case, that is accomplished through color.
    - Two variables can also usefully be compared with a **scatter plot.** A scatter plot is a Cartesian coordinate chart with one variable on one axis and one variable on the other. We can see this in **Figure 2.13**.

Visualizing Models

- **Slopes of Curves**
    - The **slope** of a curve tells us how much the variable on the vertical axis changes when we change the variable on the horizontal axis by one unit.
        - It is computed Slope = Change in variable on vertical axis/change in variable on horizontal axis, or
        - Slope = $\Delta y/\Delta x$ where Δ means change in, the y-axis is the vertical axis, and the x-axis is the horizontal.
    - **Figure 2.14** shows how to compute the slope. The steeper the curve, the larger the slope.
    - Curves can slope either up or down. A curve, such as that in **Figure 2.14** that slopes from left to right has a **positive slope** and we say the two variables are

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positively related. A curve such as that in **Figure 2.15** that slopes from left to right has a **negative slope** and we say that the two variables are negatively related.

- If the curve is a straight line, the slope is a constant as in figure 2.15. Economic relationships do not have to be constants; **Figure 2.16** shows six examples of curves and how they are described.

- **Graphs of Models with More than Two Variables**
  - Economic models usually have more than two variables.
  - When the relationship between *x* and *y* depend on a third variable *z*, there can be two kinds of movement in a graph:
    - When *x* shifts and *y* changes with it, this is a **movement along the curve**.
    - When *z* changes, this is a **shift of the curve**.

Appendix Problems with Solutions

1. Suppose the following table presents data on the debt (in billions of dollars), the debt to GDP ratio, and the interest rate predicted by the Congressional Budget Office for the United States for each year through 2021.

Year	Debt	Debt to GDP Ratio (percent)	Interest Rate
2010	9,018	62.1%	3.2
2011	10,439	69.4%	3.4
2012	11,598	73.9%	3.8
2013	12,386	75.5%	4.2

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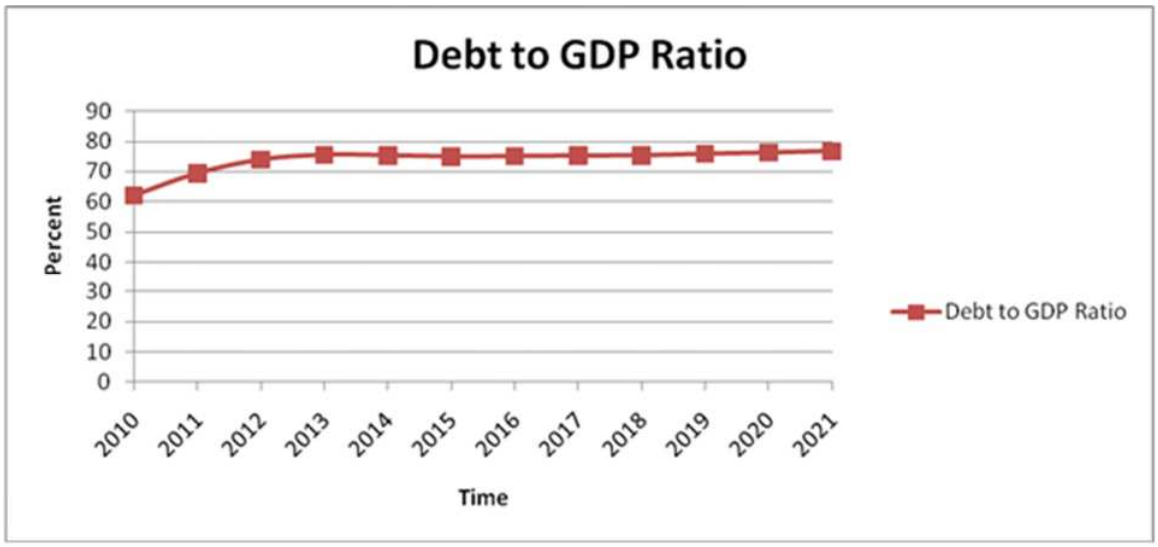
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Year	Debt	Debt to GDP Ratio (percent)	Interest Rate
2014	12,996	75.3%	4.6
2015	13,625	74.9%	5.0
2016	14,358	75.0%	5.3
2017	15,064	75.2%	5.4
2018	15,767	75.3%	5.4
2019	16,557	75.8%	5.4
2020	17,392	76.2%	5.4
2021	18,253	76.7%	5.4

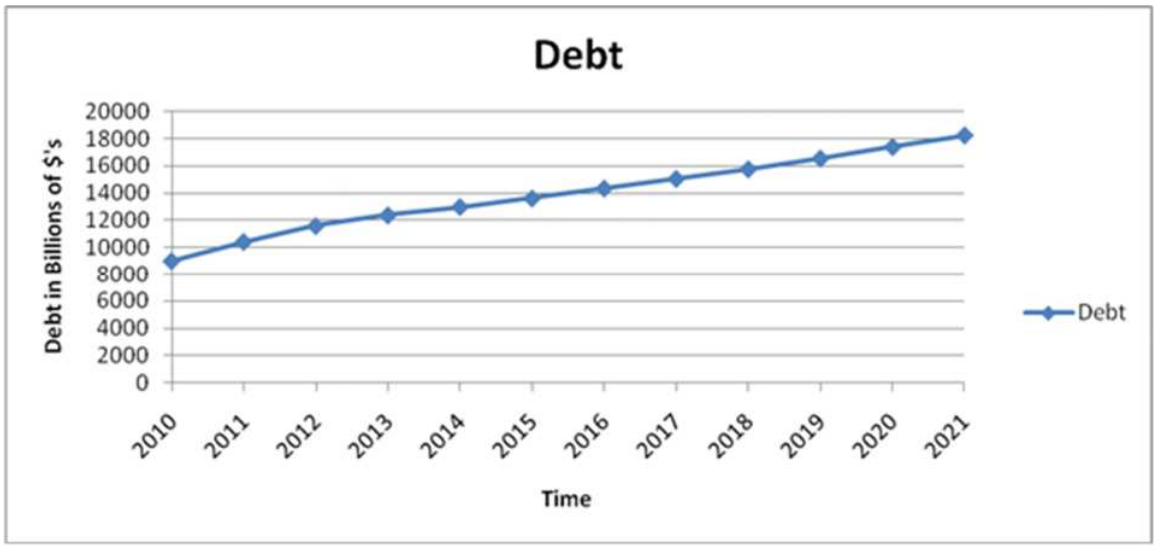
1)
   a) Construct a time-series plot of the ratio of government debt to GDP.

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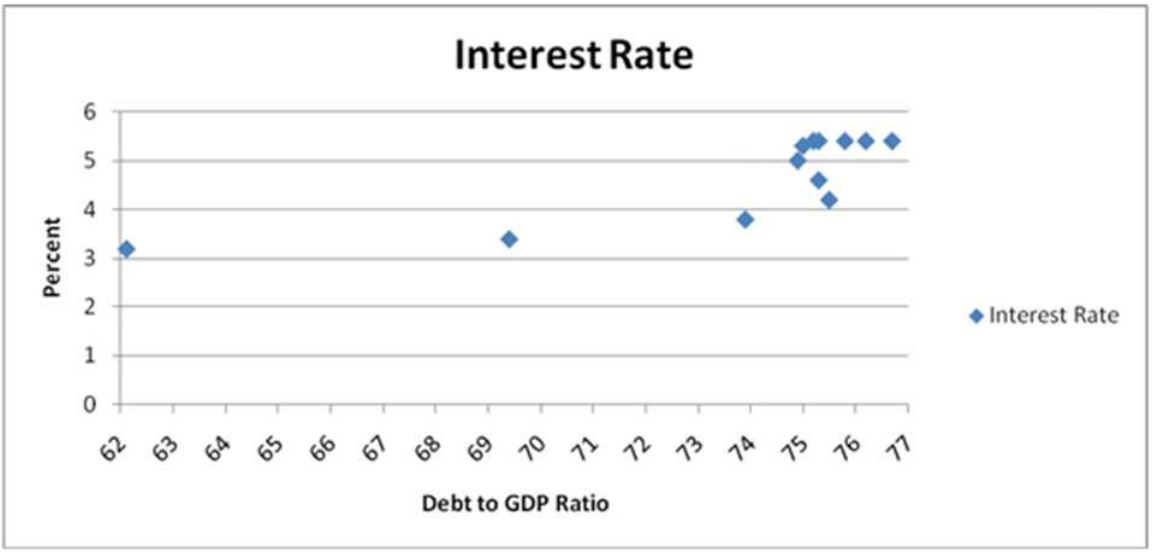
b) Construct a time-series plot of the debt.



c) Construct a scatter plot of the debt ratio and the interest rate.

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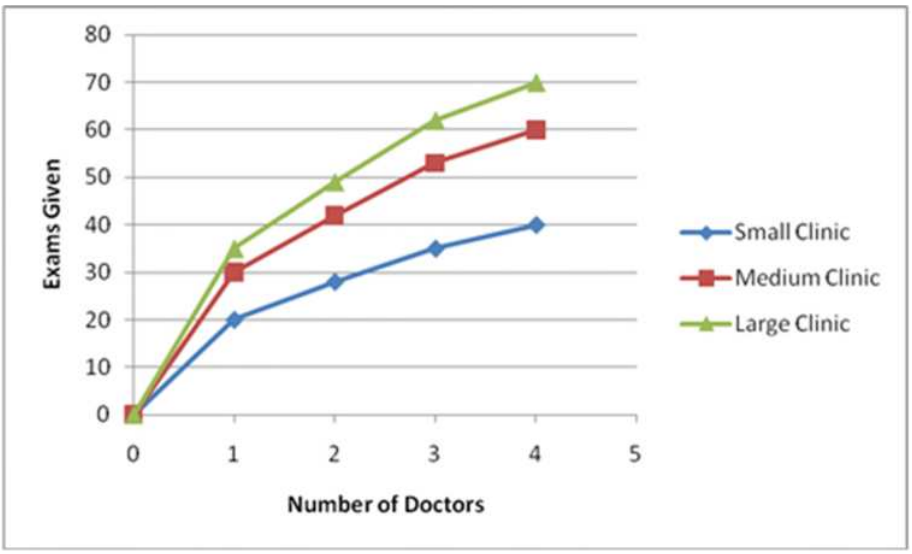
2) The following table shows the number of physical examinations given by doctors at health maintenance organizations with three different-size clinics: small, medium, and large. The larger the clinic, the more patients the doctors can handle.

Exams per Small Clinic	Exams per Medium Clinic	Exams per Large Clinic	Number of Doctors
0	0	0	0
20	30	35	1
28	42	49	2
35	53	62	3
40	60	70	4

a. Show the relationship between doctors and physical exams given with three curves, where the number of doctors is on the horizontal axis and the number of examinations is on the vertical axis.

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b) Describe how the three relationships compare with one another.

The number of exams given increases at a decreasing rate with the number of doctors, holding clinic size constant. Alternatively, a given number of doctors can give more physical exams as clinic size increases. This increase is also at a decreasing rate.

c) Is a change in the number of doctors a shift of or a movement along the curve?

A change in the number of doctors is a movement along the curve because the number of doctors is one of the variables shown explicitly in the graph.

d) Is a change in the size of the clinic a shift of or a movement along the curve?

A change in the size of the clinic is a shift in the curve because the size of the clinic is a third variable not shown explicitly as an axis in the graph.

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