MACROECONOMICS

A LAB COURSE

Norris Peterson • IntelliPro, Inc.

5 ¼"
IBM PC
FORMAT
DISK ENCLOSED

P/N 833422-5

Macroeconomics:
A Lab Course

by
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IntelliPro, Inc.

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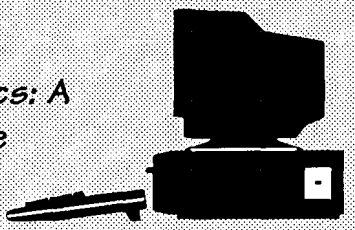
The editors were Jim Bittker and Bruce Marcus.

Contents

Preface

Welcome to *Macroeconomics: A Lab Course*. The courseware in this package represents a substantial departure from the standard "computerized workbooks" that accompany many other principles of economics texts.



As its name suggests, this package of simulations invites you to make hypotheses, set up experiments, test the results, and make comparisons. There is no magic box cranking out numbers — you tell the computer how to behave to coincide with the material you are learning in class.

Four major design objectives were followed as the courseware was developed:

- There will be a high degree of interaction to permit exploration and analysis
- To the greatest extent possible, concepts will be given a visual representation
- Real-world problems will be used to encourage your interest
- All material will be keyed to the text for easy integration

In addition, there were two major design requirements — ease of use and ease of understanding. We believe you will find that *Macroeconomics: A Lab Course* will provide you with a practical and flexible tool for in-depth investigation of macroeconomic concepts. Through exploration and problem solving, you will discover, expand, and apply the principles of macroeconomics.

A true complement

This courseware is a complement to, not a replacement for, the material in *your* lectures and *your* text. We suggest that you read the assigned material *before* attempting the experiments outlined in this book. It is in your text that you will find terms defined and concepts outlined. You may want to refer to your text's glossary from time to time to refresh your memory. This is the comparative advantage of the written word.

Being a true dynamic simulation, this courseware allows the computer to exploit *its* comparative advantage over textbooks and instructors. You can change assumptions, make hypotheses, test the results, and draw conclusions while letting the computer do the difficult work of computing information and representing it in a dynamic, visual way.

Easy to use

The courseware assumes little or no familiarity with computers. Each lesson is selected from an opening menu, and each lesson has the same distinctive "look and feel."

There is extensive use of color, graphics, pop-up windows and menus, and context-sensitive help to guide you through the experiments. Input from the

keyboard is kept to a minimum; functions are consistent from one lesson to the next.

Easy to understand

While the courseware does assume a moderate familiarity with many of the basic terms found in your text, it does not assume familiarity with macroeconomic concepts. The experiments are designed in such a way that you will come to understand these concepts through the conduct and analysis of your experiments.

The experiments themselves are easily conducted, and their connections to the text and lectures are clear and easily recognized. However, completing these lessons is not without work. Like any other laboratory course, you will need to familiarize yourself with the experiments, record information, and draw conclusions. With a minimum investment of your time, your understanding of macroeconomic concepts will be significantly enhanced.

Program contents

The courseware consists of ten lessons covering the basics of a standard macroeconomics course:

(1) Production possibilities and opportunity costs; (2) The circular flow; (3) Aggregate demand and supply; (4) Classical and Keynesian theories of employment; (5) Equilibrium output and the multiplier process; (6) Fiscal policy; (7) Money and banking; (8) Monetary policy; (9) Policy debates: Monetarists, Keynesians, and Rational Expectations; and (10) Inflation and Unemployment.

Using the software

Making a backup copy: You should make a backup copy of both disks before you begin using *Macroeconomics: A Lab Course*. Follow the instructions in your computer's reference manual for instructions.

Installation: The software may be run from the backup disks directly. Place the first program disk in drive A (or B). At the A (or B) prompt, simply type "Econ" and select the appropriate lesson from the menu. You will be prompted if you need to switch disks.

Alternatively, the software may be run from the hard disk if your machine is so equipped. This may substantially improve the speed of operation for you. An installation routine is included to make this task easier. Place the first program disk in drive A (or B). At the A (or B) prompt, type "Install" and you will be prompted for any additional information. Once the program is installed on the hard drive, switch to the appropriate directory and type "Econ" at the prompt; the opening menu will appear.

The lab manual

Each lesson contains three parts. "Introduction and objectives" will give you some background information on the questions to be addressed in the lesson and will serve to refresh your memory of the lecture and text readings on the subject.

"Setup" will provide you with a brief synopsis of the experiments you will be conducting and any special assumptions made to keep things simple and understandable. Here you will also find a brief description of what you can expect to see on screen and a detail of any special information specific to that exercise.

Following the setup is a series of exercises designed to pace your progress through the lesson and guide your experiments. You will find explicit directions for setting up experiments and analyzing the results. There may be a series of tables to fill in, graphs to sketch, or analytical questions to be answered. Should your instructor require that the questions be turned in for evaluation, these pages are perforated for easy removal from the manual.

The staff at Intellipro is confident that you will enjoy *Macroeconomics: A Lab Course*. More importantly, we are confident that it will significantly enhance your understanding and appreciation of macroeconomics.

LESSON ONE

Production possibilities and opportunity costs

Introduction and objectives

What if all of an economy's resources were focused on the production of a single good — how much could it produce? What happens as some resources are shifted into production of something else? Are there better and worse ways to do this? What factors might increase the potential production of the economy? The production possibilities curve, which tells us the potential output of the economy given its resources and technology, allows us to investigate the answers to these and other questions.

In this lab session you will be constructing a production possibilities curve for a hypothetical economy. As you use and become familiar with this curve, you will also explore the concept of opportunity cost. Opportunity cost helps to explain the shape of the curve and is also the natural consequence of the choices made by the economy. Finally, you will have the opportunity to investigate various other factors which explain the shape and position of the curve.

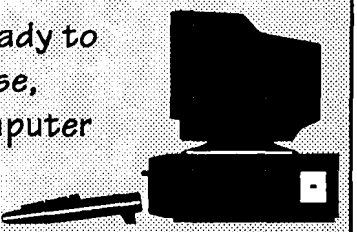
Setup

Our hypothetical economy consists of several worker-consumers but just four factories. To keep things simple, we'll assume that each factory produces pizzas (representative of all consumer goods) or robots (all capital goods). These factories are of different sizes, employ different technologies, and have access to different resources, so naturally their production capabilities differ substantially.

Specifically, Acme, Inc. is a highly specialized robot producer, capable of producing 4,000 robots per year. Bendix Co. is a younger firm and not quite as specialized. Its total robot production can reach 3,000 per year. Carla's and Dominic's do not have quite the same level of robotics expertise as the other two firms. Consequently, their maximum robot production levels are 2,000 and 1,000 per year, respectively.

As you can see, all of the factories can be set up to produce robots. But, with a little work, all could be adapted to pizza production. As it turns out, yearly production capacity at each of these factories is 100,000 pizzas. Of course, these factories need not completely specialize in either pizzas or robots. For example, Acme might find it profitable at some point to use half its factory to produce robots and the other half to produce pizzas. In that case, its production of both goods would be cut in proportion — 2,000 robots and 50,000 pizzas. Other proportions are also available if the company so desires.

When you are ready to begin the exercise, turn on the computer and type "Econ" at the prompt — select Lesson 1, "Production Possibilities" from the opening menu.



At the top of the screen there are four graphs summarizing the production possibilities for the four factories. The larger graph will contain the completed production possibilities curve for this hypothetical economy. Use these graphs and the on-screen prompts to answer the following questions.

1. If all four factories are set up to produce pizzas, what is the greatest possible number of pizzas that can be produced in this economy? Alternatively, if all the factories were adapted to robot production, what is the greatest possible number of industrial robots that can be produced?

Pizzas: _____

Robots: _____

2. Opportunity cost can be measured by the amount of other goods not produced. For each of the four firms, record the opportunity cost (in terms of robots) of producing one hundred thousand pizzas.

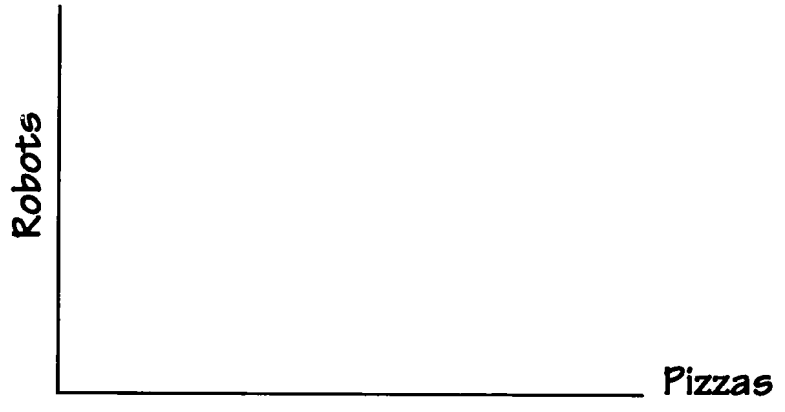
Acme: _____

Bendix: _____

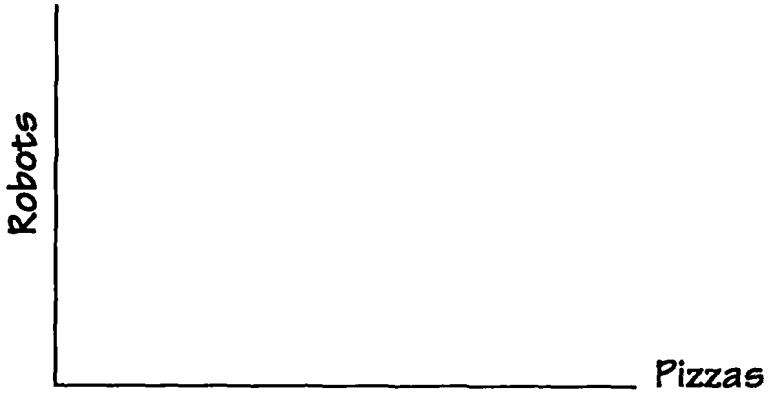
Carla's: _____

Dominic's: _____

3. In the space below, sketch the completed production possibilities curve and briefly explain why it is bowed out away from the origin.



4. Speculate: if all four firms had identical technology and identical resources, what would be the shape of the production possibilities curve? Sketch this on the following diagram.



5. The "Options Menu" appears once the production possibilities curve is completed. Select the "Inefficient Production" option from the menu. You should observe that the economy is initially producing only pizzas. However, by moving the cursor you can adapt each factory to any of its possible pizza-robot production combinations, not all of which will lead to efficient production plans. The "dot" on the production possibilities curve will reveal total output for the production plan you choose.

Suppose an overzealous economic planner directs Acme and Carla's to produce only robots, while Bendix and Dominic's are directed to produce only pizzas. Move the cursor to reflect this setup.

a. What is the economy's total production of pizzas and robots for this plan?

Pizzas: _____

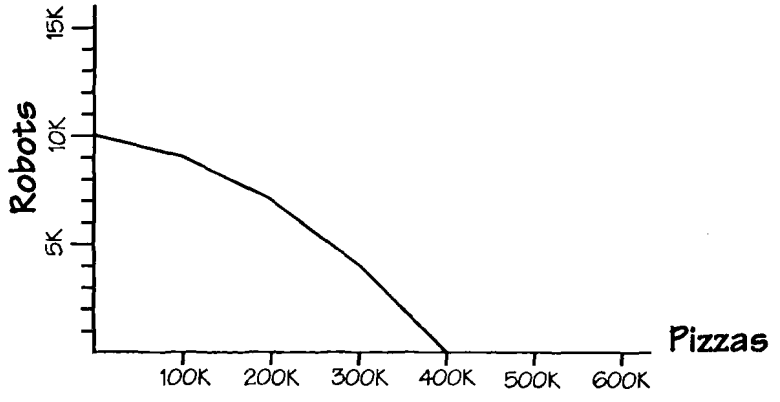
Robots: _____

b. Is the economy producing efficiently? Explain.

c. Remember that the production possibilities curve shows the maximum possible production options given the economy's resources and its technology. Has this production plan caused the production possibilities curve to shift inward? Explain carefully.

d. Experiment with other combinations. Try to generalize: "Efficient production requires..."

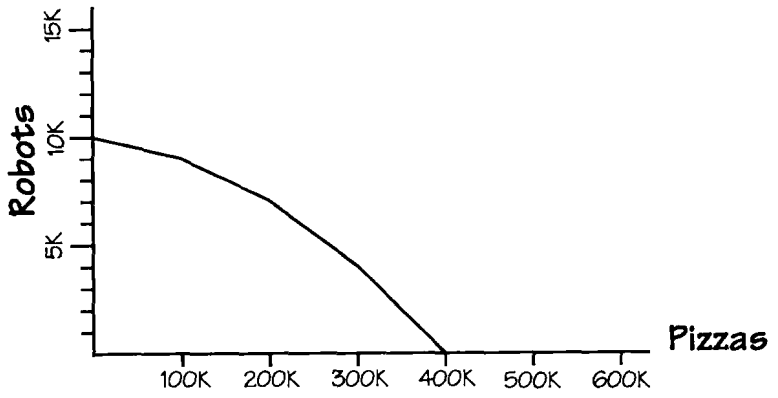
6. Select "Technological Innovation" from the Options Menu. What is the effect on the economy's production possibilities curve of a technological innovation in robot production? Sketch this on the diagram below and explain what is going on.



7. Experiment with other technological innovations. Generalize your findings.

8. Select "Economic Growth" from the Options Menu. Suppose several robots are used to build another factory capable of producing robots or pizzas.

a. How does this affect the future position of the production possibilities curve? Illustrate on the diagram below.



b. Experiment with increasing the level of robot production. How is the growth of the economy affected by its current choice of production levels?

c. Speculate: Why might some people object to increased current production of robots?

9. Speculate: Given all the possible combinations between robots and pizzas, how might this economy answer the question "What to produce?"

LESSON TWO

The circular flow

Introduction and objectives

Suppose you go to McDonald's for a Big Mac, fries, and Coke. As those three dollar bills change hands, you see a $3 *expenditure*; McDonald's sees $3 of *income*. That $3 of your consumption will be used to buy all-beef patties, special sauce, lettuce, cheese, pickles, onions, sesame seed buns, and a host of other materials. It will also help pay wages, interest on loans, rent, taxes, and maybe McDonald's will have some left over for profit. The point? Every time you make a purchase, your spending becomes someone else's income. And that person can use that income for later purchases which become yet someone else's income. By aggregating across all types of spending, from private consumption to the purchase of $200 hammers by the federal government, we realize the same principle holds: Every dollar of expenditure is a dollar of income to be spent again.

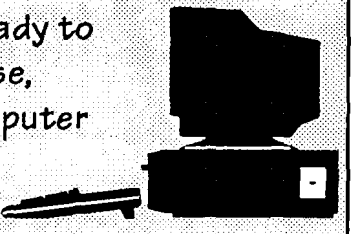
The circular flow is a model which attempts to capture this basic principle. In this lab session you will construct a circular flow model of the economy. As you progress through the lesson, you will discover the various components of spending and income and their relationship to GDP — Gross Domestic Product. Additionally, you will investigate the links between nominal GDP, real GDP, and inflation. The model you construct in this lesson will form the basis of many subsequent laboratory sessions.

Setup

Our hypothetical economy initially consists of just two sectors. *Households* own all of the resources, which they supply to the *firms* in exchange for income. This income takes the form of wages and salaries, interest, rent, and profits. Firms use the resources to produce goods and services for households in exchange for revenue. To keep the analysis simple, we will initially assume that households spend all the income they receive.

There are three product markets in the economy — apples, oranges, and pears. Three hundred apples are produced annually and sold for $.50 each. Five hundred oranges and 200 pears are produced yearly and sold for $.20 and $.25, respectively. As the session progresses, we will be adding a financial sector, a government sector and a foreign sector.

When you are ready to begin the exercise, turn on the computer and type "Econ" at the prompt — select Lesson 2, "Circular Flow" from the opening menu.



The first several screens of the lesson will simply illustrate the basic principles of the circular flow. By convention, income is shown on the top half of the flow and expenditures on the bottom. Once the flow shrinks to a smaller size, a table will appear which will allow you to analyze how the individual expenditures can be aggregated to measure Gross Domestic Product. Follow the on-screen prompts and answer the following questions.

1. Note the table on the upper right side of the screen showing "Annual Produce Sales." The total dollar value of apples or any other good produced is equal to the quantity of that good produced times its price. By adding up these dollar values we get an aggregate measure of total output. Use the table below (which matches the table on the screen) to construct such a measure.

Quantity	Price	Expenditure
300 apples	$.50	_____
500 oranges	$.20	_____
200 pears	$.25	_____
	Total:	_____

What is the name given to this measure?

2. The next several screen prompts investigate the relationship between expenditure and income. Given the total amount of expenditure from question 1, what is the dollar value of income earned per year? Carefully explain the link between income and the value of output, paying special attention to the role of profits.

3. Explore the economy by changing prices and outputs. What happens to the value of output if total production increases with no change in prices? If prices increase with no change in production?

4. Suppose prices and production both change. Specifically, enter the following quantities and prices into the table on screen.

Quantity	Price	Expenditure
280 apples	$.55	_____
600 oranges	$.25	_____
240 pears	$.40	_____
	Total:	_____

Complete the table to determine the new total value of output. (This is known as *nominal GDP.*)

Real GDP is constructed similarly, but uses the initial prices to compute the value of output. Enter these initial prices (shown in the table below) into the computer and complete the table.

Quantity	Price	Expenditure
280 apples	$.50	_____
600 oranges	$.20	_____
240 pears	$.25	_____
	Total:	_____

Which is larger in this case, real GDP or nominal GDP? Explain this result.

5. The value of the price deflator can be found by dividing nominal GDP by real GDP, then multiplying this result by 100. Calculate the value of the deflator for the example from question 4.

Before proceeding with the rest of the questions, go on to part 2 of the lesson on your computer. During this part of the lesson you will be developing the complete circular flow, incorporating the financial, government, and foreign sectors. Notice that as the flow diagram evolves, some of the flows will appear "thicker" than others. The software is designed so that the on-screen size of the flows is proportional to the dollar amount of the flow. This will prove useful in later lessons.

6. What are the four components of GDP using the expenditure approach?

7. Suppose there is an increase in net exports. Predict the effect of this change on:

a. total expenditures

b. national income

Speculate, with respect to the four components of expenditure: Increases in aggregate income can be caused by:

8. What is the basic lesson to be learned from the circular flow regarding the income versus the expenditure approach to GDP? (Hint: Pay close attention to the thickness of the flows representing aggregate income versus those representing aggregate expenditure.)

LESSON THREE

Aggregate demand and supply

Introduction and objectives

The first two lab sessions were primarily descriptive, offering a view of the workings of the modern macroeconomy. With this lesson, we begin a greater emphasis on macroeconomic analysis.

The primary tools of macroeconomic analysis are aggregate demand — the relationship between desired total spending and the price level — and aggregate supply — the relationship between desired production and the price level. In this session, you will be constructing the aggregate demand and supply curves, investigating their shapes, and determining those factors that cause them to shift over time. The interplay of these factors will determine the equilibrium values of the price level and real national output.

Setup

What you will be seeing on screen in this and all subsequent lessons is a graphical representation of a mathematical model of the economy.

You will see curves develop and shift, with numbers being reported as if from some magic box. However, as you progress through the lessons, most of the veils and mirrors will be stripped away and you will understand what makes a modern economy function. We think you will still find it somewhat magical.

Consumption spending, investment spending, and net export spending are all assumed to respond to changes in the price level. In short, everybody except the government responds to higher prices by cutting spending. (What a surprise!)

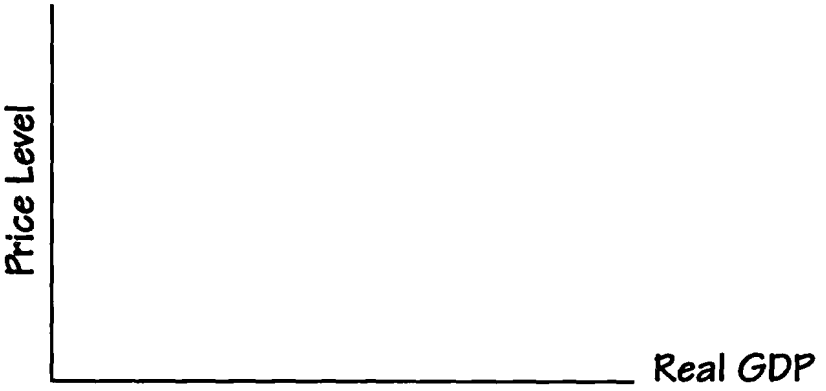
On the supply side, we assume that firms wish to expand production when prices rise. When producers' plans and buyers' plans match, the equilibrium price and corresponding output levels are established.

As the lesson progresses, you will have the option of changing each of the many factors which affect these spending and production plans, observing and recording their effects.

When you are ready to begin the exercise, turn on the computer and type "Econ" at the prompt— select Lesson 3, "Aggregate Demand and Supply" from the opening menu.

On the opening screen you will observe an aggregate demand-aggregate supply diagram. Where the two curves intersect is the equilibrium price level and the equilibrium real level of gross domestic product. Follow the on-screen instructions and use the diagrams to answer the following questions.

1. Sketch the basic shapes of the aggregate supply and aggregate demand curves on the graph below. Label the initial equilibrium price level "100" and the initial equilibrium value of real GDP "5000."

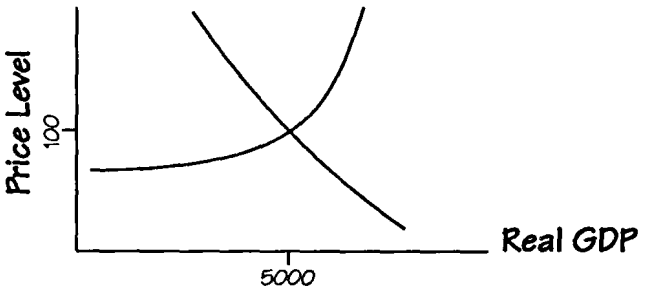


2. For each of the following changes, record the resulting equilibrium price and real national output, as provided by the model. Sketch the changes on the accompanying graphs.

a. Aggregate demand increases.

Price level =

Real output =



b. Aggregate demand decreases.

Price level =

Real output =