



# Open-Economy Macroeconomics: Basic Concepts

## Goals

In this chapter you will

Learn how net exports measure the international flow of goods and services

Learn how net capital outflow measures the international flow of capital

Consider why net exports must always equal net capital outflow

See how saving, domestic investment, and net capital outflow are related

Learn the meaning of the nominal exchange rate and the real exchange rate

Examine purchasing-power parity as a theory of how exchange rates are determined

## Outcomes

After accomplishing these goals, you should be able to

Define net exports

Define net capital outflow

Explain why net exports and net capital outflow are two sides of the same coin

Explain why a trade deficit and a negative net capital outflow can be beneficial to a country if that country has a small savings rate

Show the relationship between the real and nominal exchange rate

Show why the nominal exchange rate between two countries' currencies should equal their relative price levels

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## Strive for a Five

The concepts presented in this chapter and the next fall under the international trade section of the AP macroeconomics course syllabus requirements, and can make up 10–15 percent of the multiple-choice section of the exam. In recent years, information from this chapter has been tested on the free-response portion also. Specific topics of importance:

- Balance of trade
- Current account
- Capital Account
- Net exports and capital flows
- An introduction to the exchange rate
- Real versus nominal exchange rates

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## Key Terms

- *Closed economy*—An economy that does not interact with other economies
- *Open economy*—An economy that interacts with other economies
- *Exports*—Goods and services produced domestically and sold abroad
- *Imports*—Goods and services produced in foreign countries and sold domestically
- *Net exports*—The value of exports minus the value of imports or the trade balance
- *Trade surplus*—The amount by which exports exceed imports
- *Trade deficit*—The amount by which imports exceed exports
- *Balanced trade*—A situation in which exports equal imports
- *Net capital outflow*—The purchase of foreign assets by domestic residents minus the purchase of domestic assets by foreigners
- *Nominal exchange rate*—The rate at which people can trade one currency for another currency
- *Appreciation*—An increase in the value of a currency measured in terms of other currencies
- *Depreciation*—A decrease in the value of a currency measured in terms of other currencies
- *Real exchange rate*—The rate at which people can trade the goods and services of one country for those of another country
- *Purchasing power parity*—The theory that a unit of a country's currency should buy the same quantity of goods in all countries
- *Arbitrage*—Taking advantage of two prices for the same commodity by buying where it is cheap and selling where it is expensive

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## Chapter Overview

### Context and Purpose

Chapter 31 is the first chapter in a two-chapter sequence dealing with open-economy macroeconomics. Chapter 31 develops the basic concepts and vocabulary associated with macroeconomics in an international setting: net exports, net capital outflow, real and nominal exchange rates, and purchasing-power parity. The next chapter, Chapter 32, builds an open-economy macroeconomic model that shows how these variables are determined simultaneously.

The purpose of Chapter 31 is to develop the basic concepts macroeconomists use to study open economies. We address why a nation's net exports must equal its net capital outflow. We also address the concepts of the real and nominal exchange rate and develop a theory of exchange rate determination known as purchasing-power parity.

## Chapter Review

**Introduction** Earlier in the text, we learned that people gain from trade because they can specialize in the production of goods for which they have a comparative advantage and trade for other people's production. However, until now, most of our study of macroeconomics has been based on a closed economy: one that does not interact with other countries. We now begin the study of macroeconomics in an open economy: an economy that interacts with other economies.

### The International Flows of Goods and Capital

An open economy interacts with other economies in two ways: It buys and sells goods and services in world product markets, and it buys and sells capital assets in world financial markets.

### The Flow of Goods and Services: Exports, Imports, and Net Exports

**Exports** Exports are domestically produced goods and services sold abroad while imports are foreign-produced goods and services sold domestically. Net exports are the value of a country's exports minus the value of its imports. Net exports are also called the trade balance. If exports exceed imports, net exports are positive and the country is said to have a trade surplus. If imports exceed exports, net exports are negative and the country is said to have a trade deficit. If imports equal exports, net exports are zero and there is balanced trade.

Net exports are influenced by the tastes of consumers for domestic versus foreign goods, the relative prices of foreign and domestic goods, exchange rates, foreign and domestic incomes, international transportation costs, and government policies toward trade. These factors will be addressed in the following chapter.

Since 1950, the U.S. economy has engaged in an increasing amount of international trade for the following reasons: (1) improved transportation such as larger cargo ships, (2) advances in telecommunications that allow for better overseas communication, (3) technologically advanced goods are more valuable per pound and easier to transport, and (4) governments look more favorably on trade as evidenced by their support of the North American Free Trade Agreement (NAFTA) and the General Agreement on Tariffs and Trade (GATT).

**The Flow of Financial Resources: Net Capital Outflow** Net capital outflow (also called net foreign investment) is the purchase of foreign assets by domestic residents minus the purchase of domestic assets by foreigners. When a domestic resident buys and controls capital in a foreign country, it is known as *foreign direct investment*. When a domestic resident buys stock in a foreign corporation but has no direct control of the company, it is known as *foreign portfolio investment*.

Net capital outflow is influenced by the relative real interest rates paid on foreign versus domestic assets, the relative economic and political risks, and government policies that affect foreign ownership of domestic assets. These factors will be addressed in the following chapter.

**The Equality of Net Exports and Net Capital Outflow** Net exports measure the imbalance of a country's imports and exports. Net capital outflow is the imbalance of a country's purchase and sale of assets. These two imbalances offset each other. That is, net capital outflow (NCO) equals net exports (NX):

$$NCO = NX$$

This is an identity because every international transaction is an exchange. When Ford sells a car to a Mexican resident, Ford receives pesos. NX and NCO have increased. Any subsequent transaction undertaken by Ford preserves the equality of NX and NCO. (1) If

Ford holds the pesos,  $NCO$  increases because Ford is now holding additional foreign assets (pesos). (2) If Ford uses the pesos to buy other Mexican assets (stocks, etc.), it maintains the increase in  $NX$  and  $NCO$ . (3) If Ford uses the pesos to purchase Mexican goods of equal value, it reverses the transaction so that  $NX$  and  $NCO$  return to their original values. (4) If Ford exchanges the pesos for dollars, the new owners of the pesos could buy Mexican assets, maintaining the increase in  $NX$  and  $NCO$ , or they could buy Mexican goods, reducing  $NX$  and  $NCO$  to their original levels. Simply put, when someone exports goods and receives foreign currency, the foreign currency will either be held, used to buy assets from the importing country, or used to buy goods from the importing country. In each case,  $NX = NCO$  is maintained. Alternatively, if a country runs a trade deficit ( $NX < 0$ ), then it must finance this by selling assets abroad ( $NCO < 0$ ).

### Saving and Investment in an Open Economy

Saving and investment are important for growth. Saving is the income of a nation that is left over after paying for consumption and government purchases. Recall, gross domestic product ( $Y$ ) is the sum of consumption ( $C$ ), investment ( $I$ ), government purchases ( $G$ ), and net exports ( $NX$ ). Therefore,

$$Y = C + I + G + NX$$

and saving is

$$Y - C - G = I + NX$$

or,

$$S = I + NX.$$

Since  $NX = NCO$ , we can write

$$S = I + NCO.$$

Thus, in an open economy, when the U.S. economy saves a dollar, it can invest in domestic capital ( $I$ ) or foreign capital ( $NCO$ ). It does not have to invest only in domestic capital ( $I$ ). When  $S > I$ ,  $NCO > 0$  and a nation is investing in foreign assets. When  $I > S$ ,  $NCO < 0$  and foreigners are helping finance a country's investment.

In summary, if a country runs a trade surplus, net exports ( $NX$ ) are positive, domestic saving is greater than domestic investment, and net capital outflow ( $NCO$ ) is positive. If a country runs a trade deficit, net exports ( $NX$ ) are negative, domestic saving is less than domestic investment, and net capital outflow ( $NCO$ ) is negative, indicating that the country is financing some investment by selling assets abroad. If a country has balanced trade, net exports ( $NX$ ) are zero, domestic saving is equal to domestic investment, and net capital outflow ( $NCO$ ) is zero.

When the U.S. trade deficit increased from 1980 to 1987, the accompanying decrease in net capital outflow (foreigners invested more in the United States) was largely due to a decrease in U.S. saving. While this is not the preferred method to finance investment, it is better to have foreigners than no one invest in the United States. When the U.S. trade deficit increased from 1991 to 2000, the accompanying decrease in net capital outflow (foreigners invested more in the United States) was largely due to an increase in U.S. investment. This type of trade deficit induced capital inflow in a country is not necessarily bad as long as the investment projects yield the desired returns. After 2000, government budget deficits have again reduced national saving and decreased net capital outflow.

### The Prices for International Transactions: Real and Nominal Exchange Rates

The nominal exchange rate is the rate at which people can trade one currency for another currency. An exchange rate between dollars and any foreign currency can be expressed in two ways: foreign currency per dollar or dollars per unit of foreign currency. For example, if 80 yen are equal to 1 dollar, the nominal exchange rate is 80 yen per dollar or .0125 (which is  $1/80$ ) dollar per yen. We will always express exchange rates as foreign currency per dollar. When the dollar buys more foreign currency, there has been an appreciation of the dollar. When the dollar buys less foreign currency, there has been a depreciation of the dollar. Because there are so many currencies in the world, the dollar exchange rate is often expressed by an exchange rate index that compares a group of currencies to the dollar.

The real exchange rate is the rate at which people can trade the goods and services of one country for the goods and services of another. Two things are considered when we directly compare the value of goods in one country to those in another: the relative values of the currencies (nominal exchange rate) and the relative prices of the goods to be traded. The real exchange rate is defined as:

$$\text{real exchange rate} = \frac{\text{nominal exchange rate} \times \text{domestic price}}{\text{foreign price}}$$

Just as the nominal exchange rate is expressed as units of foreign currency per unit of domestic currency, the real exchange rate is expressed as units of foreign goods per unit of domestic goods. For example, suppose that a case of Mexican beer is 20 pesos while a case of U.S. beer is \$10 and that the nominal exchange rate is 4 pesos per dollar. The real exchange rate of Mexican beer to U.S. beer is

$$\begin{aligned} \text{real exchange rate} &= \frac{(4 \text{ pesos/1 dollar}) \times (\$10/\text{case U.S. beer})}{20 \text{ pesos/case Mexican beer}} \\ &= \frac{40 \text{ pesos/case U.S. beer}}{20 \text{ pesos/case Mexican beer}} \\ &= \frac{40 \text{ pesos}}{\text{case U.S. beer}} \times \frac{\text{case Mexican beer}}{20 \text{ pesos}} \\ &= \frac{2 \text{ cases Mexican beer}}{1 \text{ case U.S. beer}} \end{aligned}$$

The real exchange rate is the true relative cost of goods across borders.

Since macroeconomists are concerned with the economy as a whole, they are concerned with overall prices rather than individual prices. Therefore, instead of using the price of beer to compute the real exchange rate, macroeconomists use each country's price index:

$$\text{real exchange rate} = (e \times P)/P^*$$

where  $e$  is the nominal exchange rate,  $P$  is a domestic price index, and  $P^*$  is a foreign price index.

When this measure of the real exchange rate rises, U.S. goods are more expensive relative to foreign goods and net exports fall. When this measure of the real exchange rate falls, U.S. goods are cheaper relative to foreign goods and net exports rise.

Many European countries now share a common currency called the *euro*. It has replaced the French franc, German mark, Italian lira, and so on. The euro is controlled by the European Central Bank (ECB). A single currency makes trade easier, is more convenient, and helps reduce nationalistic feelings in Europe.

### A First Theory of Exchange-Rate Determination: Purchasing-Power Parity

The simplest explanation of why an exchange rate takes on a particular value is called purchasing-power parity. This theory says that a unit of any given currency should buy the same quantity of goods in all countries. The logic of this theory is based on the *law of one price*. The law of one price says that a good must sell for the same price in all locations because, if there were different prices for the same good, people would buy the good where it is cheap and sell it where it is expensive. This behavior will continue to drive up the price where it was low and drive down the price where it was high until the prices are equalized. This process is called *arbitrage*. Thus, a dollar should buy the same amount of beer in Mexico as it buys in the United States. If it did not, there would be opportunities for profit and traders would buy where it is cheap and sell where it is expensive.

If purchasing-power parity is true, the nominal exchange rate between two countries' currencies depends on the price levels in those two countries. For example, if beer in Mexico is 20 pesos per case while beer in the United States is \$10 per case, then the exchange rate should be 20 pesos per \$10, or 2 pesos/dollar so that one dollar buys the same amount of beer in both countries. Notice, *the nominal exchange rate of 2 pesos/dollar is simply the ratio of the prices in the two countries.*

To put this concept into a formula, suppose  $P$  is the U.S. price level,  $P^*$  is the foreign price level, and  $e$  is the exchange rate in terms of foreign currency per dollar. A dollar

can buy  $1/P$  units in the United States and  $e/P^*$  units in the foreign country. Purchasing-power parity suggests that a dollar should buy the same amount in each country.

$$1/P = e/P^*$$

Solving for  $e$ ,

$$e = P^*/P.$$

Thus, if purchasing-power parity holds, the nominal exchange rate is the ratio of the foreign price level to the domestic price level.

Recall, a country's price level depends on how much money its central bank creates. If a central bank creates more money, its currency will buy fewer goods and services and fewer units of other currencies. That is, its currency will depreciate.

Purchasing-power parity is most likely to hold in the long run. However, even in the long run, the theory of purchasing-power parity is not completely accurate because (1) some goods are not easily traded (such as services) and (2) even tradable goods are not always perfect substitutes.

## Helpful Hints

1. Negative net capital outflow augments domestic investment. National saving is used to support domestic investment and net capital outflow:

$$S = I + NCO.$$

If  $NCO$  is negative, as it is for the United States, it means that foreigners invest more in the United States than Americans invest abroad. This allows domestic investment to remain adequate in spite of very small saving on the part of Americans. For example, suppose saving is \$700 billion and net capital outflow is  $-\$200$  billion. Domestic investment is  $I = \$700 + \$200$  or \$900 billion.

2. Always express nominal and real exchange rates in terms of foreign units to domestic units. Expressing exchange rates in terms of foreign units relative to domestic units helps avoid confusion because a rise in this exchange rate is associated with a rise in the value of the domestic unit. For example, suppose the nominal exchange rate between the yen and the dollar is expressed as 200 yen/dollar. If the exchange rate rises to 210 yen/dollar, the value of the dollar has risen.
3. When generating nominal or real exchange rates, always identify the units of measurement. A common mistake committed by students when calculating exchange rates (particularly real exchange rates) is to fail to identify the units of measurement throughout the problem and to try to attach the units of measurement at the end of the problem after a numerical solution has been found. This leaves much room for error and confusion. Notice in the real exchange rate example about Mexican and American beer that the units are attached to the numbers throughout. This is not just for your convenience. It is necessary to avoid making mistakes even if you have done it numerous times.
4. Purchasing-power parity should hold for goods of high value and low transportation costs. The law of one price applies to goods for which arbitrage is most likely. Hence, we might expect the dollar price of diamonds to be the same in all countries because small deviations in the price of diamonds create substantial profit opportunities. However, large deviations in prices of shoe shines between London and New York are unlikely to create profit opportunities and a movement of goods or services. While many goods and services are not currently traded across borders, growth in the production and trade of light, high-technology, high-value commodities should increase the applicability of the purchasing-power parity theory.

## Self-Test

## Multiple-Choice Questions

1. International trade
  - a. raises the standard of living in all trading countries.
  - b. lowers the standard of living in all trading countries.
  - c. leaves the standard of living unchanged.
  - d. raises the standard of living for importing countries and lowers it for exporting countries.
  - e. raises the standard of living for exporting countries and lowers it for importing countries.
2. Net exports of a country are the value of
  - a. goods and services imported minus the value of goods and services exported.
  - b. goods and services exported minus the value of goods and services imported.
  - c. goods exported minus the value of goods imported.
  - d. goods imported minus the value of goods exported.
  - e. goods exported minus services exported.
3. A country sells more to foreign countries than it buys from them. It has
  - a. a trade surplus and positive net exports.
  - b. a trade surplus and negative net exports.
  - c. a trade deficit and positive net exports.
  - d. a trade deficit and negative net exports.
  - e. a trade balance but negative net exports.

**Table 31-1 Argentinean Trade Flows**

Goods		Services	
Purchased Abroad	\$40 billion	Purchased Abroad	\$20 billion
Sold Abroad	\$10 billion	Sold Abroad	\$25 billion

4. **Refer to Table 31-1.** What are Argentina's exports?
  - a. \$60 billion
  - b. \$40 billion
  - c. \$35 billion
  - d. \$25 billion
  - e. \$10 billion
5. **Refer to Table 31-1.** What are Argentina's imports?
  - a. \$60 billion
  - b. \$40 billion
  - c. \$35 billion
  - d. \$25 billion
  - e. \$10 billion
6. **Refer to Table 31-1.** What are Argentina's net exports?
  - a. \$30 billion
  - b. \$5 billion
  - c. -\$5 billion
  - d. -\$25 billion
  - e. -\$60 billion

7. Net capital outflow is defined as the purchase of
  - a. foreign assets by domestic residents minus the purchase of domestic assets by foreign residents.
  - b. foreign assets by domestic residents minus the purchase of foreign goods and services by domestic residents.
  - c. domestic assets by foreign residents minus the purchase of domestic goods and services by foreign residents.
  - d. domestic assets by foreign residents minus the purchase of foreign assets by domestic residents.
  - e. domestic and foreign assets by domestic residents minus the purchase of domestic and foreign assets by foreign residents.
8. Bob, a Greek citizen, opens a restaurant in Chicago. His expenditures
  - a. increase U.S. net capital outflow and have no impact on Greek net capital outflow.
  - b. increase U.S. net capital outflow and increase Greek net capital outflow.
  - c. increase U.S. net capital outflow, but decrease Greek net capital outflow.
  - d. decrease U.S. net capital outflow, but increase Greek net capital outflow.
  - e. decrease U.S. net capital outflow and have no impact on Greek net capital outflow.
9. If you go to the bank and notice that a dollar buys more Mexican pesos than it used to, then the dollar has
  - a. appreciated. Other things the same, the appreciation would make Americans less likely to travel to Mexico.
  - b. appreciated. Other things the same, the appreciation would make Americans more likely to travel to Mexico.
  - c. depreciated. Other things the same, the depreciation would make Americans less likely to travel to Mexico.
  - d. depreciated. Other things the same, the depreciation would make Americans more likely to travel to Mexico.
  - e. devalued. Other things the same, this would have no effect on travel to Mexico.
10. You are staying in London over the summer and you have a number of dollars with you. If the dollar depreciates relative to the British pound, then other things the same,
  - a. the dollar would buy more pounds. The depreciation would discourage you from buying as many British goods and services.
  - b. the dollar would buy more pounds. The depreciation would encourage you to buy more British goods and services.
  - c. the dollar would buy fewer pounds. The depreciation would discourage you from buying as many British goods and services.
  - d. the dollar would buy fewer pounds. The depreciation would encourage you to buy more British goods and services.
  - e. the dollar would buy more pounds. The appreciation would encourage you to buy more British goods and services.
11. If the exchange rate were 0.8 Canadian dollars per U.S. dollar, a watch that costs 8 U.S. dollars would cost
  - a. 6.4 Canadian dollars.
  - b. 10 Canadian dollars.
  - c. 12.50 Canadian dollars.
  - d. 8 Canadian dollars.
  - e. 16 Canadian dollars.



12. If the dollar buys fewer bananas in Guatemala than in Honduras, then traders could make a profit by
- buying bananas in Honduras and selling them in Guatemala, which would tend to raise the price of bananas in Honduras.
  - buying bananas in Honduras and selling them in Guatemala, which would tend to raise the price of bananas in Guatemala.
  - buying bananas in Guatemala and selling them in Honduras, which would tend to raise the price of bananas in Guatemala.
  - buying bananas in Guatemala and selling them in Honduras, which would tend to raise the price of bananas in Honduras.
  - buying bananas in Guatemala and selling them in Honduras, which would tend to raise the price of bananas in both countries.

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## Free Response Questions

- Define an exchange rate. What would happen to exports from a country that experienced a decline in its exchange rate?
- In a world with two countries, Upper Sparta and Lower Sparta, and with flexible exchange rates, how would each of the following influence the value of the Upper Sparta Peso?
  - In Upper Sparta, goods from Lower Sparta become less popular with consumers.
  - The real interest rate in Lower Sparta increases, but not in Upper Sparta.

## Solutions

### Multiple-Choice Questions

1. a TOP: International trade
2. b TOP: Net exports
3. a TOP: Net exports | Trade balance
4. c TOP: Exports
5. a TOP: Exports
6. d TOP: Exports
7. a TOP: Net capital outflow
8. d TOP: Net capital outflow
9. b TOP: Nominal exchange rate
10. c TOP: Nominal exchange rate
11. a TOP: Nominal exchange rate
12. a TOP: Arbitrage | Real exchange rate

### Free Response Questions

1. An exchange rate is the price of one nation's currency expressed in terms of another nation's currency. If a country experienced a decline in its exchange rate, its currency would have fallen in value relative to the other country and would experience an increase in exports as the goods from that country would be relatively less expensive.

TOP: Trade balance

2. A. The value of the Upper Sparta Peso would rise. The increase in value would be due to a smaller supply of Upper Sparta Pesos in the foreign exchange market as consumers from Upper Sparta buy fewer Lower Sparta goods.
- B. The value of the Upper Sparta Peso would fall. The decrease in the value would be due to a larger supply of Upper Sparta Pesos in the foreign exchange market as investors in Upper Sparta would want to buy financial assets in Lower Sparta and would need to buy the currency of Lower Sparta in order to do so.

TOP: Net capital outflow | Net exports