

## 18.1: Overview of Purchasing Power Parity (PPP)

### Learning objectives

1. Identify the conditions under which the law of one price holds.
2. Identify the conditions under which purchasing power parity holds.

**Purchasing power parity (PPP)** is a theory of exchange rate determination and a way to compare the average costs of goods and services between countries. The theory assumes that the actions of importers and exporters (motivated by cross-country price differences) induce changes in the spot exchange rate. In another vein, PPP suggests that transactions on a country's current account affect the value of the exchange rate on the foreign exchange (Forex) market. This is in contrast with the interest rate parity theory, which assumes that the actions of investors (whose transactions are recorded on the capital account) induce changes in the exchange rate.

PPP theory is based on an extension and variation of the “law of one price” as applied to the aggregate economy. To explain the theory it is best to first review the idea behind the law of one price.

### The Law of One Price (LoOP)

The law of one price says that identical goods should sell for the same price in two separate markets when there are no transportation costs and no differential taxes applied in the two markets. Consider the following information about movie video tapes sold in the U.S. and Mexican markets.

Price of videos in U.S. market ()	\$20
Price of videos in Mexican market ()	p150
Spot exchange rate ()	10 p/\$

The dollar price of videos sold in Mexico can be calculated by dividing the video price in pesos by the spot exchange rate as shown:

To see why the peso price is divided by the exchange rate rather than multiplied, notice the conversion of units shown in the brackets. If the law of one price held, then the dollar price in Mexico should match the price in the United States. Since the dollar price of the video is less than the dollar price in the United States, the law of one price *does not hold* in this circumstance.

The next question to ask is what might happen as a result of the discrepancy in prices. Well, as long as there are no costs incurred to transport the goods, there is a profit-making opportunity through trade. For example, U.S. travelers in Mexico who recognize that identical video titles are selling there for 25 percent less might buy videos in Mexico and bring them back to the United States to sell. This is an example of “goods arbitrage.” An arbitrage opportunity arises whenever one can buy something at a low price in one location, resell it at a higher price, and thus make a profit.

Using basic supply and demand theory, the increase in demand for videos in Mexico would push up the price of videos. The increase in supply of videos on the U.S. market would force the price down in the United States. In the end, the price of videos in Mexico may rise to, say, p180 while the price of videos in the United States may fall to \$18. At these new prices *the law of one price holds* since

The idea in the law of one price is that identical goods selling in an integrated market in which there are no transportation costs, no differential taxes or subsidies, and no tariffs or other trade barriers should sell at identical prices. If different prices prevailed, then there would be profit-making opportunities by buying the good in the low price market and reselling it in the high price market. If entrepreneurs took advantage of this arbitrage opportunity, then the prices would converge to equality.

Of course, for many reasons the law of one price does not hold even between markets within a country. The price of beer, gasoline, and stereos will likely be different in New York City and in Los Angeles. The price of these items will also be different in other countries when converted at current exchange rates. The simple reason for the discrepancies is that there are costs to transport goods between locations, there are different taxes applied in different states and different countries, nontradable input prices may vary, and people do not have perfect information about the prices of goods in all markets at all times. Thus to refer to this as an economic “law” does seem to exaggerate its validity.

## From LoOP to PPP

The purchasing power parity theory is really just the law of one price applied in the aggregate but with a slight twist added. If it makes sense from the law of one price that identical goods should sell for identical prices in different markets, then the law ought to hold for all identical goods sold in both markets.

First, let's define the variable  $CB_{\$}$  to represent the cost of a basket of goods in the United States denominated in dollars. For simplicity we could imagine using the same basket of goods used in the construction of the U.S. consumer price index ( $CPI_{\$}$ ). The **consumer price index (CPI)** uses a market basket of goods that are purchased by an average household during a specified period. The basket is determined by surveying the quantity of different items purchased by many different households. One can then determine, on average, how many units of bread, milk, cheese, rent, electricity, and so on are purchased by the typical household. You might imagine it's as if all products are purchased in a grocery store with items being placed in a basket before the purchase is made.  $CB_{\$}$  then represents the dollar cost of purchasing all the items in the market basket. We will similarly define  $CB_{P}$  to be the cost of a market basket of goods in Mexico denominated in pesos.

Now if the law of one price holds for each individual item in the market basket, then it should hold for the market baskets as well. In other words,

Rewriting the right-hand side equation allows us to put the relationship in the form commonly used to describe absolute purchasing power parity, which is

If this condition holds between two countries, then we would say PPP is satisfied. The condition says that the **PPP exchange rate** (pesos per dollar) will equal the ratio of the costs of the two market baskets of goods denominated in local currency units. Note that the reciprocal relationship is also valid.

Because the cost of a market basket of goods is used in the construction of the country's consumer price index, PPP is often written as a relationship between the exchange rate and the country's price indices. However, it is not possible merely to substitute the price index directly for the cost of the market basket used above. To see why, we will review the construction of the CPI in Chapter 6, Section 6.2.

### Key takeaways

- The law of one price says that identical goods should sell for identical prices in two different markets when converted at the current exchange rate and when there are no transportation costs and no differential taxes applied.
- The purchasing power parity theory is an aggregated version of the law of one price.
- The purchasing power parity condition says that identical market baskets should sell for identical prices in two different markets when converted at the current exchange rate and when there are no transportation costs and no differential taxes applied.

### Exercises

1. **Jeopardy Questions.** As in the popular television game show, you are given an answer to a question and you must respond with the question. For example, if the answer is "a tax on imports," then the correct question is "What is a tariff?"
  - The exchange rate value if toothpaste costs \$2.50 in the United States and 30 pesos in Mexico and the law of one price holds.
  - The exchange rate value if a market basket costs \$450 in the United States and 5,400 pesos in Mexico and purchasing power parity holds.
  - The term used to describe a collection of goods and services consumed by a typical consumer.
  - The term used to distinguish PPP based on price levels rather than inflation rates.
  - The term used to describe the economic principle that identical goods should sell at identical prices in different markets.
2. Use the information in the table below to answer the following question. Show your work.

The <i>Economist</i> Price per Issue		Exchange Rate (December 2, 1999)
United States	\$3.95	–
Canada	C\$ 4.95	1.47 C\$/\$
Japan	¥920	102 ¥/\$

- Calculate the implied purchasing power parity exchange rates between Canada and the United States and between Japan and the United States based on the price of the *Economist* magazine.

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