Lifetime Inflation Activity

Lesson Authors



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Standards and Benchmarks (see page 9)

Description

This online activity shows how to use FRED[®], the Federal Reserve's free online economic data website, to measure changes in the cost of living in one's lifetime. Following simple instructions, students will locate consumer price index data and plot these data into a highly informative line graph. They will also use FRED[®]'s ability to customize the units of the data to visualize the rise in consumer prices over their lifetime.

Economic Concepts

- **Bureau of Labor Statistics (BLS):** A research agency of the U.S. Department of Labor that compiles statistics on employment, unemployment, and other economic data.
- Cost of living: The amount of income needed to achieve a given living standard.
- **Consumer price index (CPI):** A measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services.
- Inflation: A general, sustained upward movement of prices for goods and services in an economy.
- **Inflation rate:** The percent change in the price level determined by comparing the percentage increase or decrease in the price level of goods and services from one time period to another.
- **Price index:** Numbers expressed in terms of a base year value of 100; for instance, a value of 105 means the variable measured by the index has risen by 5 percent compared with the base year.
- Purchasing power: The amount of goods and services that a unit of currency can buy.
- **Standard of living:** A measure of the goods and services available to each person in a country; a measure of economic well-being; also known as per capita real GDP (gross domestic product).

Objectives

Students will be able to

- describe the use of the consumer price index to measure changes in the cost of living,
- identify the year used to calculate the base value of an index number, and
- assess the rate of consumer price inflation during their lifetime.

Grade Level

8-12

Compelling Question

How does a line graph show the increase in the cost of living over time?

Time Required

15-30 minutes

Preparation

- Make sure you are comfortable navigating FRED[®], finding values for data series used in this lesson, and identifying data sources. A demonstration is located here: <u>https://fredhelp.stlouisfed.org/</u>.
- Go to <u>https://www.stlouisfed.org/education/economic-lowdown-video-series/epi-sode-9-inflation to review the definition of inflation</u>.

Procedure

- 1. Open a web browser and navigate to the FRED[®] website: <u>https://fred.stlouisfed.org/</u>. (Or just search the internet for FRED[®].)
- 2. On the FRED[®] website, create a graph by following these steps:
 - Use the search box to find "Consumer Price Index for All Urban Consumers: All Items in U.S. City Average."
 - Select the series "Index 1982-1984=100, Monthly, Seasonally Adjusted."

Your final graph will look like this one: <u>https://fred.stlouisfed.org/graph/?g=1C8yu</u>.



Figure 1: Consumer price index

- 3. Explain the following:
 - **Source:** Data on the US consumer price index is reported by the US Bureau of Labor Statistics (BLS). The BLS is an agency of the Department of Labor. It is the principal fact-finding agency in the broad field of labor economics and statistics and serves as part of the U.S. Federal Statistical System. BLS collects, calculates, analyzes, and publishes data essential to the public, employers, researchers, and government organizations.
 - **Units:** Data are reported as an "Index 1982-1984=100." They are "Seasonally adjusted" to remove the dips and bumps in prices that occur regularly during a typical calendar year. Further, they are reported with "Monthly" frequency.
 - **Series:** The consumer price index (CPI) is a great way to measure inflation because it uses a single number to track changes in the amount that consumers must spend to reach a certain standard of living.
- 4. Interpret the data in the graph by discussing the following:
 - How is the CPI calculated? In short, the BLS surveys prices each month for a specific market basket of consumer goods and services, calculates a total cost for the market basket, and reports the market basket's cost as a number that is indexed (scaled) to a base year. The base year, which can be any year (or an average of consecutive years, as with the CPI), is assigned an index value of 100. With this method, the CPI for any year can be expressed as a single value that marks the change from the base year's value of 100. Ignoring absolute values in favor of movements of index values makes comparisons over time simple to calculate and easy to understand.
 - You may ask yourself if a monthly price survey for a collection of goods and services is a reliable inflation measure. Consider this: Guided by diaries of purchased items and interviews with thousands of urban households about individual consumption habits, the BLS designs a virtual market basket of goods and services drawn from over 200 separate categories. Each month, BLS employees cast a wide statistical net over consumer purchasing behavior

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by visiting retail stores, service establishments, rental units, and even doctors' offices and sampling about 80,000 separate prices. The price data collected are checked for accuracy and consistency before complex statistical analyses are made. You'll learn more about the CPI as we move through this activity. (For more information about the CPI, however, see http://www.bls.gov/cpi/cpifaq.htm.)

- A glance at the graph's left vertical axis shows the units: Index 1982-84=100. In this case, the average of the price levels for the years 1982, 1983, and 1984 is set equal to 100, so the base year is actually an average of 3 years. Later (and earlier) monthly price levels are easily compared with the base year's value of 100. As the BLS explains, a CPI value of 110, for example, means there has been a 10 percent increase in the price level (inflation) since the base year, and each consumer must spend an additional 10 percent to maintain the previous year's standard of living. (SOURCE: http://stats.bls.gov/cpi/cpifaq.htm#Question_1) A CPI value of 200 would mean that overall prices—the cost of living—doubled from the base year; that is, there was 100 percent inflation. Looking at inflation in terms of money, with 100 percent inflation, each dollar you earn would lose one-half its purchasing power.
- To confirm the level of the base year, move your cursor along the graph line to see the index values for each month. When you hover over the line for the years 1982 to 1984, you see values above and below 100. For example, May 1982 = 95.900 and April 1984 = 103.300. If you sum the monthly readings for the years 1982 to 1984 and divide by 36, you get 100. Now that you understand the CPI and how the BLS uses it to measure inflation from month to month, you are ready to measure inflation over your lifetime.
- The CPI data from the BLS stretch back to 1947, so if your birthdate was during that year or later, this activity will be a perfect fit.
- 5. **Developing discussion prompts and questions:** Graphs, through a variety of visual configurations, can present large amounts of data in a compact area. When developing questions that depend on graphic depictions of data, consider how well the graph displays the relationship between two or more variables. FRED[®] hosts thousands of data time series, and each one can be displayed in multiple graphing formats (e.g., line, area, or bar). These datasets are called "time series" because each one reports a value on a linear time scale at a specific frequency (e.g., monthly or annually). In other words, FRED[®] graphs show how one or more variables changed over time.

Graphs, of course, provide a visual prompt for discussions about data relationships. FRED[®] graphs, each with a horizontal time axis, provide historical context, which is a crucial dimension for analyses, questions, and discussions. Discuss the following related to the line graph of the CPI created above (https://fred.stlouisfed.org/graph/?g=1C8yu.):

- The next step in this activity is to enter your birthdate in the first date-range window at the top-right of the graph. In the box (currently showing "1947-01-01"), type in your birthdate in the format shown (so, e.g., "1998-05-15" for May 15, 1998). Notice the graph is automatically redrawn to start at that date.
- Now you need to change the graph's base year of the index to your birthdate. You do this by changing the units: Click on the "Edit Graph" button above the graph and use the dropdown

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menu under "Units" to select "Index (Scale value to 100 for chosen period)." Additional boxes will pop up. Now type in your birthdate in the box showing the date "1947-01-01." Use the format described above (e.g., "1998-05-15" for May 15, 1998). The graph is automatically redrawn.

- Take a look at the graph. It now plots the CPI only since your birthdate—the newly selected base year. Note that the new base year is shown in the legend label at the top of the graph. Checking the graph's vertical axis shows that it is now labeled "(Index)". You have now customized the graph to show inflation over your lifetime.
- Now let's check your understanding of the CPI: Where on this graph will an index value of exactly 100 be found? (You will find it in your birth month. In our example it's in May 1998, the beginning of the data range. When you selected the observation date in the graph's Units section, you changed the base year—the starting point—for tracking changes in the CPI.)
- Customizing the base year simplifies arriving at your personal lifetime inflation, which can be expressed as a percentage. Hover your cursor over the far-right side of the line to see the most recent CPI value. Recall that a CPI value of 110 means that there has been a 10 percent increase in the price level (inflation) since the base year reference period. So, a CPI of 145.1 signals that a typical household would have to spend about 45 percent more today to purchase the same level of goods and services it consumed in 1998
- How does your CPI-measured lifetime inflation compare with our 1998 example? How have prices for goods and services inflated in your lifetime? (*Answers will vary*.) Repeat the steps, changing the first date-range window and the base year to a parent's or a grandparent's birthdate. How does your relative's lifetime inflation compare with yours? (*Answers will vary*.)
- The gray bars on your graph show recessions (periods of declining real income and rising unemployment; a significant decline in general economic activity extending over a period of time). At the time of this writing and since 1929, there have been 15 such periods in the United States. Is there a pattern in how the CPI changes during a recession? (*It depends on the historical context of the recession. During the 1970s, the CPI rose due to oil price shocks. During the 2007-2009 recession, the CPI fell due to reduced consumer spending.*)

6. Additional discussion prompts and questions:

- Repeat steps 1 and 2 in the "Procedure" section above to view the graph "Consumer Price Index for All Urban Consumers: All Items." Study the graph. Describe how inflation—as measured by the CPI—has changed since 1947, just two years after the end of World War II. (Prices rose relatively slowly until the mid-1970s when inflation began to rise dramatically. It took over 25 years—until 1973—for inflation to double the 1947 price level; a persistently high rate of inflation for the remainder of the 1970s doubled the price level by 1980, a period of only seven years. Inflation again moderated: It took 20 years, from 1980 to 2000, for consumer prices to inflate by 100 percent [double].)
- Today, teenagers have experienced approximately 45 percent inflation in consumer prices in their lifetime, and 21-year-olds have experienced nearly 60 percent inflation. Recall past prices of some items that you frequently purchase (e.g., food, beverages, or gas). Have these

price changes affected your standard of living? (Answers will vary. In making your analysis, consider that the CPI's 80,000-item market basket of goods and services scales changes in the overall price level experienced by all urban consumers, not just a handful of prices most familiar to the typical younger consumer. Equally important, consider that purchasing power lessens only when income fails to keep up with increases in the overall price level [inflation.])

- Is it possible for prices consumers pay for goods and services to rise significantly without lowering the standard of living? (Yes, that is possible if incomes rise at the same rate as inflation. For example, a 100 percent rise in the CPI joined with a matching rise in incomes would leave consumers no better or worse off than before the price level [CPI] doubled.)
- What evidence can you find to show that your personal income has kept up with the rise in overall prices during your life? (*Consider all your sources of income. Do you earn wages from a job or receive an allowance for household chores? Calculate the changes in your sources of income and compare them to the growth in the CPI to see if they match or exceed it.*)
- At the time of this writing, the CPI data shows that only one year since 1955 has had a lower price level than the prior year. That year was 2009, which began with a still-shrinking economy mired in what has become known as the Great Recession. To view this section of the graph more closely, click and drag your mouse on the graph around the 2007-2009 dates. Notice the date changing in the date-range window at the top-right of the graph. Focus on the gray vertical bars that mark periods of economic recession. What reasons can you think of to explain why the CPI might fall during a deep, prolonged recessionary period? (*A recession is characterized by elevated unemployment and reduced national output of goods and services. Households with an idled worker often reduce consumption when faced with a reduction in personal income. For producers, higher unemployment means that more workers are available for each job, so wages are likely to remain the same or decrease. Consumers may become pessimistic about the future and reduce consumption, especially of so-called big-ticket items such as houses and cars. These supply and demand considerations along with others can result in a temporary reduction of the overall price level.)*
- Here is a quick exercise to help you further understand price level comparisons using the CPI: • In the far-left top section of the graph page, click on "Observations." A new box will open. Click on "View All." The monthly "raw" CPI data (displayed on the graph) will open in a separate browser tab. Scroll down the page and find the CPI value for your birth month (for example, in May 1998, the CPI in that month was 162.600) and write it down. Next, scroll to the end of the data column and record the final value. Using a calculator, compute and record the percentage increase in the CPI during your lifetime. Why is this result identical to the percent increase you saw on the graph when you used your birth month and year as the CPI base year? (Returning to the example of a person born in May 1998, the CPI in that month was 162.600. The index as of April 2015 is 235.186 [235.982 – 162.600 = 73.328. 73.328/162.600 = 0.451, or 45 percent]. This is the same increase shown in the graph built above which used a May 1998 base year and has a beginning value of 100 and an end value of 145.1. Despite different beginning and end values, the overall change is identical because you calculated the percent change in CPI over time, not the difference between monthly values. Keeping that in mind, the base year is unimportant, and the percentage difference between any two months is the same.)

- A final question: Consumers may conclude that prices in their city increased at a faster rate than reflected by changes in the CPI. How might it be possible for some consumers to experience more inflation than the national average reported by the CPI? (*It is possible because as the BLS acknowledges in its responses to Frequently Asked Questions, the market basket and pricing procedures are based "on the experience of the relevant average household, not of any specific family or individual. It is unlikely that your experience will correspond precisely with either the national indexes or the indexes for specific cities or regions.") (SOURCE: <u>http://www.bls.gov/cpi/cpifaq.htm.</u>)*
- 7. Make the most out of the FRED[®] website by noting the following:
 - Each data series in FRED[®] has a series ID. For example, the series ID for "Consumer Price Index for All Urban Consumers: All Items in U.S. City Average" is CPIAUCSL. Each series in FRED[®] has a dedicated webpage, like this one: <u>https://fred.stlouisfed.org/series/CPIAUCSL</u>.
 - You can easily save any FRED[®] graph by creating a (free) FRED[®] account. (To create an account, click REGISTER from the top-right corner of the website and fill in the fields under "Create New Account.") To save your graph, click "Account Tools" under the graph and follow the prompts. You may name a graph anything you choose, and you can create categories for sorting your graphs. You also can set the observation range to graph all new data as they become available, or you can limit the range to specific dates.
 - To recall a saved graph, once you have signed into your FRED[®] account, you will see "My Account" at the top of the page. Click on this and select "Graphs" from the drop-down menu. Titles of all the graphs you have created and saved will appear along with other information about the graphs. You can create categories for new and existing graphs.
 - You can share FRED[®] graphs via permanent links. Click "Share Graph" under the graph to access the sharing options.
 - "Custom Graph Link" provides a URL that links to FRED[®] and the specific graph you created.
 - "Embed in website" inserts the graph you created and when clicked links back to FRED[®], allowing the viewer to use FRED[®]'s interactivity. This option also provides a link to download the graphed data directly.
 - "Graph Image Link" provides a link to the image of the graph.
 - Click the clipboard icon to copy the link you created.
 - The icons shown under the graph allow you to share your graphs through social media, such as X (formerly Twitter) and Facebook. Select an option and follow the prompts.
 - Click the "Download" button above the graph to access your downloading options. The "Excel (data)" option downloads the "raw" data in the form of a Microsoft Excel spreadsheet. Other download options are a .csv file, a high-quality .png format image, or a hyperlinked PowerPoint slide. Choose the option that best meets your needs.

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Closure

- 8. Review the purpose of the activity by reviewing the following:
 - The purpose of the activity was to provide an easy way for you to learn about FRED[®]'s ability to create custom graphs and view data in different forms.
 - To help you reach that goal, you created a line graph of the consumer price index and learned to change the date range of the data.
 - You encountered additional concepts during this activity, including inflation, the base year of an index number, and economic recessions.
 - Finally, you customized the units of the consumer price index in the graph, showing what the inflation rate was during your lifetime.

Assessment

- 1. Open a web browser and navigate to the FRED[®] page <u>https://fred.stlouisfed.org/series/CPHPT-</u> <u>T01EUM661N</u>.
- 2. Examine the graph and answer the following questions:
 - What country or region's consumer price index data are these?
 - What is the source of the data?
 - What are the units of the data?
 - What is the base year of the index number?
 - When were the data first reported?
 - Assuming you were born after 2000, what was the inflation rate in the European Union during your lifetime?

Assessment—Answer Key

- 1. Open a web browser and navigate to the FRED[®] page <u>https://fred.stlouisfed.org/series/CPHPT-</u> <u>T01EUM661N</u>.
- 2. Examine the graph and answer the following questions:
 - What country or region's consumer price index data are these? (*The European Union*).
 - What is the source of the data? (The Organization for Economic Co-operation and Development).
 - What are the units of the data? (*An index number*).
 - What is the base year of the index number? (2015).
 - When were the data first reported? (1999).
 - Assuming you were born after 2000, what was the inflation rate in the Eurozone during

your lifetime? (Answers will vary).

Standards and Benchmarks

Voluntary National Content Standards in Economics

Standard 11: Money makes it easier to trade, borrow, save, invest, and compare the value of goods and services. The amount of money in the economy affects the overall price level. Inflation is an increase in the overall price level that reduces the value of money.

• Benchmark: Grade 8

4. Compare the groceries that could be purchased for \$10 in 1977 with those that can be purchased for \$10 today. Explain how the value of money has changed.

• Benchmark: Grade 12

- 3. Determine the current price for a pair of designer sunglasses that cost \$50 in 1982-84, assuming the price has increased at the average rate of inflation.
- 4. Calculate the annual rate of inflation when the CPI changes from 200 to 205 in one year.

Standard 19: Unemployment imposes costs on individuals and the overall economy. Inflation, both expected and unexpected, also imposes costs on individuals and the overall economy. Unemployment increases during recessions and decreases during recoveries.

• Benchmark: Grade 8

2. Compare the prices of a market basket of goods in 1983 with similar prices today. Explain how inflation reduces purchasing power for people whose income is either fixed or increasing slower than the rate of inflation.

• Benchmark: Grade 12

6. For each of the following cases, explain who would be harmed and who would benefit from an unexpected 10 percent inflation: (1) Mike's retirement income is fixed at \$24,000 a year;
(2) Bonnie borrowed \$5,000 last year and must pay it back at the end of this year; (3) John lent the \$5,000 to Bonnie last year and will be paid back at the end of this year.