

Keeping It Real: Teach ACRL Information Literacy Frames with FRED® Data



Data **LITERACY**

Standards and Benchmarks (see page 14)

Lesson Description

NOTE: This lesson supplements the “FRED® Interactive: Information Literacy” online lesson available through www.econlowdown.org, which needs to be completed by students individually prior to this lesson.

In the lesson, students first review a graph made in the “FRED® Interactive: Information Literacy” online lesson and define the concepts nominal, real, and inflation. They then learn about basic strategies for establishing the reliability of a data source. Next, students build on the skills learned in the online lesson to create new graphs and then discuss the new information created as a result of their work. There are two options for creating the new graphs: With Option A, students work in FRED® and use the formula $\text{real} = (\text{nominal}/\text{CPI}) * 100$ to plot inflation-adjusted minimum wage rates for two states and compare the results. With Option B, students work in FRED® to plot and compare nominal and real earnings differentials for men and woman.

Objectives

Students will be able to

- create new FRED® graphs;
- define minimum wage, nominal and real wages, and consumer price index (CPI);
- identify metadata in a FRED® graph;
- identify additional questions for further research;
- describe the difference between data sources and aggregators;
- describe the difference between nominal and real wages; and
- understand the issues of authority regarding trustworthiness, reliability, and credibility of data sources.

Essential Question

How can you determine the purchasing power of wages and earnings over time?

Time Required

45 minutes (excluding the “FRED® Interactive: Information Literacy” online lesson to be completed before class, which takes about 20 minutes)

Materials

- Access to a computer lab
 - Handout 1: Option A (Steps 7-11) or Handout 2: Option B (Steps 12-18), one copy for each student
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Procedure

Reviewing “FRED Interactive: Information Literacy” Online Lesson Content

1. Display the graph the students built and read as part of the FRED® Interactive lesson. The graph is accessible here: <https://fred.stlouisfed.org/graph/?g=eO7T> (and should be set up before class).

OPTIONAL: Review unique features of FRED® graphs. For example, the shaded bars indicate U.S. recessions, also known as economic downturns. The National Bureau of Economic Research (NBER) “calls” recessions and dates them. FRED® graphs display recession bars so that users can notice the impact of business cycles on economic data patterns.

2. Ask questions, such as the following, to help students recall the work they did to create the graph:
 - What was the first step you took to create the graph?
 - What does it mean for data to be “nominal”? (See *definition below*.)
 - What does it mean for data to be “real”? (See *definition below*.)
 - What was the formula you used to calculate the real wage? ($real = (nominal/CPI) * 100$ or $(a/b) * 100$)

NOTE: Because the concept of adjusting a nominal figure for inflation is central to this lesson plan, it is important to spend enough time reviewing this topic before moving forward.

3. Write the terms “nominal,” “real,” and “inflation” on the board and ask students to provide definitions. (The following definitions are from the [econlowdown.org glossary](http://econlowdown.org/glossary)).

Nominal—Monetary values, wages, or prices, measured in current prices.

Real—Monetary values, wages, or prices, adjusted for inflation and measured in constant prices—that is, in prices of a given or base period. Real monetary values are obtained by adjusting nominal wages or prices with a price measure such as the consumer price index (CPI).

Inflation—A general, sustained upward movement of prices for goods and services in an economy.

4. Explain that it is important to decide when/if to use particular data sets. Direct students' attention to the data sources under the FRED® graph (the U.S. Department of Labor and the U.S. Bureau of Labor Statistics). Discuss the following:
 - Why does it matter to know who the source of the data is? (*Identifying the source can help with determining the credibility of the data.*)
 - What are some data sources that would be more/less authoritative? (*These data are probably the most authoritative for this particular exercise; less authoritative data might be surveys with a small sample size or that are relatively old or data collected by a partisan group.*)
 - What else would you want to know besides the source to evaluate the data? (*The age of the data—to determine whether it is timely, the frequency at which the data were collected, and the length of the date series—over what period the data were collected*)

5. Review the following basic strategies for establishing the reliability of a source:
 - **Determine if the source/aggregator has a credible reputation.** For example, FRED® can be considered credible because the Federal Reserve Bank of St. Louis is a well-established organization with a long-standing, non-partisan tradition.
 - **Be able to assert the independence of the data generator.** For example, in late 2009, the Hellenic Statistical Authority could not report macroeconomic statistics without fear or favor. (See [this](#) euobserver.com article on the topic.)
 - **Compare and contrast recurring anecdotal evidence against the data.** For example, developing countries with fixed exchange rates and high inflation rates release “official exchange rates” not truly reflecting the actual exchange value of their currencies. (See, for example, [this](#) Financial Times article.)

OPTIONAL: Arrange students into several groups, have them establish data reliability criteria independently, and then ask them to present their ideas to the class. Emphasize the common themes among their criteria, and fill in the gaps in their arguments.

OPTIONAL: List a variety of sources of information on a single topic, and have students work in small groups to evaluate and contrast the way each is constructed and what the goals of the tool are. (See the CPI example in Appendix A.) Ask each group the following:

 - How are these data created, and what is their purpose?

OPTIONAL: Highlight the fact that data are produced with varying frequency—some are daily, some hourly, some monthly, some annual. Discuss the following:

 - Why do you think different types of data are available with varying frequencies? (*Answers will vary, but students' attention should be directed to the cost, ease of collection, and importance of collecting information/data with higher [or lower] frequencies.*)

6. Explain that it is important to provide an accurate citation of data used. The citation gives the data provider credit and allows others to access the data and replicate research that used the data. Use the elements of the suggested citation structure in FRED® as an example: Data Source; Series Name; Series ID; Retrieval Site; URL Address; Date Accessed.

OPTIONAL: Discuss the format of data-series IDs and the value of systematic naming for finding similar (or related series). Discuss the following:

- What does a series ID mean? (*In some cases, the series ID provides abbreviated descriptions of the data. For example, CAWRET = CA (California) + W (Wages and Salaries) + RET (Retail Trade). In some cases, the series ID reflects database structures and codes. For example, SMU06000004200000001 = survey abbreviation (SM) + seasonal (code) (U) + state_code (06) + area_code (00000) + supersector_code (42) + industry_code (000000) + data-type_code (01).*)

ACRL Information Literacy Frames as FRED®-Integrated Abilities

To further develop the concepts from the first portion of the lesson, you will have the students create new graphs that build on the skills developed in the online lesson and discuss these graphs. Students may work in pairs or small groups. Choose from one of the two options below:

Option A: Plotting Nominal and Real Wages Across Individual States (Step 7-11)

Option B: Plotting the Nominal and Real Earnings Gaps Between Men and Women
(Steps 12-18)

Option A: Plotting Nominal and Real Wages Across Individual States

NOTE: Figure 1, referenced in Option A, is accessible through the following FRED® public dashboard: <https://research.stlouisfed.org/dashboard/18382>, which also includes the same graph-building steps and discussion questions provided below for Option A.

7. Distribute a copy of *Handout 2: Option B* to each student. Assign each student a state minimum wage series from the following FRED® page: <https://fred.stlouisfed.org/categories/33831>.
8. Tell the students they will plot a FRED® graph of the state minimum wage series assigned and adjust the data for inflation using the formula $\text{real} = (\text{nominal}/\text{CPI}) * 100$. They will then add a similar series for another state (perhaps one they'd like to move to) and compare the two. Instruct the students to complete Handout 1. (NOTE: Figure 1 was created using the steps in #2 on Handout 1 and minimum-wage data for California and Missouri.)



Figure 1

9. Allow time for student to work, and then invite students to report the following information for the graphs created:
 - Sources: (*State minimum wages: U.S. Department of Labor. CPI: U.S. Bureau of Labor Statistics.*)
 - Latest observations: (*The last data point in each series*)
 - Date updated: (*Answers will vary based on when the graph was created. The updated date is found on the top left of each dataset's individual FRED® page.*)
 - Frequencies: (*State minimum wages: Annual. CPI: Monthly.*)

10. Discuss the following:
 - What is a minimum wage? (*A price floor for paid work; the lowest wage that employers may legally pay for an hour of labor*)
 - Who decides a state's minimum wage? (*A state's minimum wage, or lack thereof, is generally controlled by the legislature within that state.*)
 - On FRED®, where do you find the source information for the data? (*In the "NOTES" section at the bottom of the page*)
 - What is the source of the minimum wage data? (*The source is the U.S. Department of Labor, a federal agency.*)
 - Why does the date the data were updated matter? (*Data may not reflect current values; data that change frequently may not be accurate if the data are months/years out of date.*)
 - Notice the different sources for the wages and the CPI data (*the U.S. Department of Labor and the U.S. Bureau of Labor Statistics, respectively*). How do the two agencies complement one another? (*Because the two agencies have separate responsibilities and employ different methodologies, they each provide a different view of the data.*)

11. Emphasize that the students have created a new piece of information—real wages—by combining two existing pieces of information (i.e., nominal wages and the price level). In this case, the whole of the new concept is larger than the sum of the two parts that make it. Stress that the sources of the data are important here. (You may want to reference spring water as a metaphor: What is the source? Where did it come from? What is inside it?)

Option B: Plotting the Nominal and Real Earnings Gaps Between Men and Women

NOTE: Figures 2 through 4, referenced in Option B, are accessible through the following FRED public dashboard: <https://research.stlouisfed.org/dashboard/18397>, which also includes the same graph-building steps and discussion questions provided for Option B.

12. Arrange students into small groups. Direct them to the following website: <https://fred.stlouisfed.org/release/tables?rid=332&eid=46359>. Distribute a copy of *Handout 2: Option B* to each student. Instruct the groups to complete #1 and #2 on Handout 2 to create a single graph with two data sources. (Figure 2 was created using the steps in #2 on Handout 2).



Figure 2

13. Allow time for students to work, and then invite students to report the following information for the graph created:

- Sources: (*U.S. Bureau of Labor Statistics for both data series*)
- Latest observations: (*The last data point in each series*)
- Date updated: (*Answers will vary based on when the graph was created. The updated date is found on the top left of each dataset's individual FRED® page.*)
- Frequencies: (*Both are quarterly.*)

14. Discuss the following:

- What is the trend in nominal weekly earnings for men and women? (*Increasing*)
- Whose weekly earnings are higher? (*Men's*)
- Over time, has the nominal earnings gap between men and women been increasing, decreasing, or constant? (*Although the naked eye suggests that the nominal earnings gap has not changed in magnitude, in truth it has increased.*)

15. Instruct the groups to complete #3 on Handout 2 to create a new FRED® graph (Figure 3) showing the nominal earnings gap between men and women.



Figure 3

16. Allow time for students to work, and then discuss the following:

- Over time, has the nominal earnings gap between men and women increased, decreased, or remained constant? (*Although the naked eye suggests that the nominal earnings gap has not changed in magnitude, in truth it has increased.*)

17. Instruct the students complete #4 on Handout 2 to adjust (on the graph just created) the nominal earnings gap between men and women for the CPI (Figure 4).



Figure 4

18. Allow time for students to work, and then discuss the following:

- Over time, has the real earnings gap between men and women increased, decreased, or remained constant? (*The answer depends on the time range considered: The real earnings gap markedly decreased between 1980 and 1995, remained relatively constant between 1995 and 2001, and declined [on average and at a very uneven rate] thereafter.*)
- How is it possible for the real earnings gap between men and women to decrease while the nominal earnings gap between men and women increases? (*The cost of living rises faster than the nominal earnings gap between men and women.*)

Assessment

1. Choose from among the following activities:

In-Class Activities

- A. Have students report on individual or group work (kind of a verbal gallery walk).
- B. Assign a “minute paper.” Have students write (or verbally state) their answers to these questions, giving them a minute to answer each:
 - What worked during the lesson?
 - What was confusing about the lesson?
 - How will you apply what you learned today?
 - Other, optional, questions: What surprised you about what you learned today? What questions were left unanswered for you? Was there anything you did not understand?
- C. Develop a short, individual, multiple-choice questionnaire with attitudinal statements such as, for example, the following: With which of these statements do you agree the most?
 - I found the instructions to build the FRED® graph easy to follow.
 - I was surprised to learn about the differences in minimum wages across states.
 - I had a hard time building the FRED® graph on my own.
 - I now have a better understanding about citations and sources.
 - I want to learn more about the topic we discussed before making my mind up about it.

Out-of-Class Activities

- D. Assign a short written report in which students summarize what they learned during the instructional session and reflect on the in-class activities, identifying one aspect they thought worked well and one aspect they found confusing.
- E. Assign a short writing assignment, such as the following, where students answer a follow-up question by building additional FRED® graphs and interpreting the data patterns:
 - Compare the real median household income between the state where you are now and the state you want to move to after graduation. For each state, how many hours would you have to work each year at the state’s current minimum wage rate to reach the state’s median income?
 - Compare the number of men and women holding multiple part-time jobs. How does that difference impact the total real earnings for all men and women—not just those employed full time?
 - Compare nominal and real median weekly earnings across age, sex, and race groups. What patterns do you observe?
 - The nominal (current-dollars) data are available here:
<https://fred.stlouisfed.org/release/tables?rid=332&eid=46373>.
 - The real (inflation-adjusted-dollars) data are available here:
<https://fred.stlouisfed.org/release/tables?rid=332&eid=46420&snid=46432>.

Resources

The Great Inflation

https://www.federalreservehistory.org/essays/great_inflation

The Great Inflation Online Course for Teachers and Students

<https://www.stlouisfed.org/education/the-great-inflation-online-course-for-teachers-and-students>

Lack of Independence in the Hellenic Statistical Agency

<https://euobserver.com/economic/29258>

Nigerian Official and Parallel Exchange Rates

<https://www.ft.com/content/686ceaa5-81a6-375e-b4c1-e7a2981f52bf>

Data Manipulation and the Big Mac Index

<http://www.economist.com/node/18014576>

Data Manipulation and the Credibility of Official Statistics

<http://www.economist.com/node/21548242>

Glossary of Economics and Personal Finance Terms

<https://www.stlouisfed.org/education/glossary>

Handout 1: Option A

1. Select the assigned state minimum wage series from the following FRED® page:
<https://fred.stlouisfed.org/categories/33831>.
2. Plot a FRED® graph of the state minimum wage series assigned and adjust the data for inflation using the formula $\text{real} = (\text{nominal}/\text{CPI}) * 100$. Then add a similar series for another state (perhaps one you'd like to move to) and compare the two, following the steps below:

Step 1. Use the FRED® search box to search for and select your first state minimum wage series, then click "Add to Graph" to create the graph.

Go to the "EDIT GRAPH" panel to complete the next steps:

Step 2. "EDIT LINE 1": Use the search box under "Customize data" to search for and select "Consumer Price Index for All Urban Consumers: All Items, Index 1982-1984=100, Seasonally Adjusted (CPIAUCSL)," then click "Add."

Step 3. In the "Formula" box, enter "(a/b)*100" and click "Apply."

Step 4. Select "ADD LINE." Search for your second state minimum wage rate, select it, and click "Add data series."

Step 5. "EDIT LINE 2": Use the search box under "Customize data" to search for and select "Consumer Price Index for All Urban Consumers: All Items, Index 1982-1984=100, Seasonally Adjusted (CPIAUCSL)," then click "Add."

Step 6. In the "Formula" box, enter "(a/b)*100" and click "Apply."

3. Identify the following information for the graph you created:
 - Sources:
 - Latest observations:
 - Dates updated:
 - Frequencies:

Handout 2: Option B

1. Go to the following website: <https://fred.stlouisfed.org/release/tables?rid=332&eid=46359>. Create a single graph with two data sources according to the following steps:
 - Step 1. Under "Median weekly earnings (current dollars)," select "Men, 16 years and over."
 - Step 2: Under "Median weekly earnings (current dollars)," select "Women, 16 years and over."
 - Step 3: Click the "Add to Graph" button at the top of the table.
2. Identify the following information for the graph you created:
 - Sources:
 - Latest observations:
 - Dates updated:
 - Frequencies:
3. Create a new FRED® graph showing the nominal earnings gap between men and women according to the following steps:
 - Step 1. Use the FRED® search box to search for and select "Employed full time: Median usual weekly nominal earnings (second quartile): Wage and salary workers: 16 years and over: Men, Quarterly, Seasonally Adjusted (LES1252881800Q)," then click "Add to Graph" to create the graph.

Go to the "EDIT GRAPH" panel to complete the next steps:
 - Step 2. "EDIT LINE 1": Use the search box under "Customize data" to search for and select "Employed full time: Median usual weekly nominal earnings (second quartile): Wage and salary workers: 16 years and over: Women, Quarterly, Seasonally Adjusted (LES1252882700Q)," then click "Add."
 - Step 3. In the "Formula" box, enter "a-b" and click "Apply."
4. Adjust the nominal earnings gap between men and women for the CPI according to the following steps:
 - Step 1. In the graph just created, go to the "EDIT GRAPH" panel. "EDIT LINE 1": Use the search box under "Customize data" to search for and select "Consumer Price Index for All Urban Consumers: All Items, Index 1982-1984=100, Seasonally Adjusted (CPIAUCSL)," then click "Add."
 - Step 2. In the "Formula" box, enter " $((a-b)/c)*100$ " and click "Apply."

Appendix

Example Optional Activity on Sources: CPI

In the “FRED® Interactive: Information Literacy” online course, real wages are expressed as a ratio between nominal values and the consumer price index (CPI). The CPI is the most common measure of the cost of living in the United States used by economists and policymakers. It is useful to understand some basic facts about the CPI:

CPI: <https://www.bls.gov/cpi/questions-and-answers.htm>

- **What is it?** *It is an index that measures the average change over time in the prices paid by urban consumers for a basket of consumer goods and services.*
- **What's its source?** *The U.S. Department of Labor, Bureau of Labor Statistics, a federal agency*
- **What's its frequency?** *Monthly*
- **Who holds the intellectual property rights for the CPI?** *Created by a U.S. federal agency, the data are in the public domain. This means they can be freely used.*

NOTE: CPI is the most frequently reported measure of inflation and the most popular series in FRED®. Inflation was high in the United States between 1965 and 1982, a period known as “The Great Inflation.” [This](#) online course, from Econ Lowdown of the Federal Reserve Bank of St. Louis, centers on this time period and discusses the (bad) effects of high inflation.

There are alternatives to the CPI to measure the cost of living. These alternative price indexes can offer insights into relative prices across countries, differences in the cost of living, and different ways of collecting data. If you use different price indexes, the value of real wages will change. Some alternatives are the following:

Big Mac Index: <http://www.economist.com/content/big-mac-index>

- **What is it?** *It is an index that evaluates the exchange rate between currencies through the concept of “purchasing power parity.” It allows people to intuitively understand price differences and the cost of living across countries by showing the cost of a McDonald's Big Mac hamburger in different countries.*
- **What's its source?** *The Economist, a weekly news magazine*
- **What's its frequency?** *Annual*
- **Who holds the intellectual property rights?** *The data are created and owned by The Economist. This means that the data cannot be reproduced without permission (but it can be cited).*

NOTE: The Big Mac Index has been cited as evidence of statistical manipulation. In 2011, *The Economist* reported that the index strongly suggested that the Argentine government was [manipulating](#) its official statistics by underreporting the rate of inflation. As a response,

allegedly, the Argentine government pressured local McDonald's to either sell the Big Mac with other items (thus masking its price) or lower the price. *The Economist* wrote [this](#) article about the (lost) credibility of “fudged” data.

The Billion Prices Project: <http://www.thebillionpricesproject.com/>

- **What is it?** *It is a project that builds indexes using prices collected daily from hundreds of online retailers around the world. It is primarily intended for use by researchers.*
- **What's its source?** *Started by two economists at the Massachusetts Institute of Technology (MIT), it is housed at that institution.*
- **What's its frequency?** *Daily*
- **Who holds the intellectual property rights?** *Only historical data sets from peer-reviewed publications are available and free to download.*

NOTE: This an example of what people sometimes refer to as “big data” because it uses millions or billions of micro-level transactions to capture changes in the cost of living.

Students might find it useful to explore other well-regarded indexes that are not price indexes:

Human Development Index: <http://hdr.undp.org/en/content/human-development-index-hdi>

Corruption Perceptions Index: <https://www.transparency.org/research/cpi/overview>

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Standards and Benchmarks

ACRL Information Literacy Frames and Knowledge Practices Aligned with This Lesson Plan

Research as Inquiry—Select Knowledge Practices

Learners who are developing their information literacy abilities

- draw reasonable conclusions based on the analysis and interpretation of information.

Information Creation as a Process—Select Knowledge Practices

Learners who are developing their information literacy abilities

- articulate the capabilities and constraints of information developed through various creation processes.

Authority Is Constructed and Contextual—Select Knowledge Practices

Learners who are developing their information literacy abilities

- use research tools and indicators of authority to determine the credibility of sources, understanding the elements that might temper this credibility and
- understand that many disciplines have acknowledged authorities in the sense of well-known scholars and publications that are widely considered “standard,” and yet, even in those situations, some scholars would challenge the authority of those sources.