FEDERAL RESERVE BANK of ST. LOUIS
CENTRAL TO AMERICA'S ECONOMY®

FRED® and Economic Education Resources from the St. Louis Fed

Beyond the Numbers Conference
November 7, 2023

Presenter

Diego Mendez-Carbajo, Ph.D.
Senior Economic Education Specialist
Federal Reserve Bank of St. Louis
diego.mendez-carbajo@stls.frb.org

This information is my opinion and does not represent the official views of the Federal Open Market Committee, the Federal Reserve System or the Federal Reserve Bank of St. Louis.

Highlights

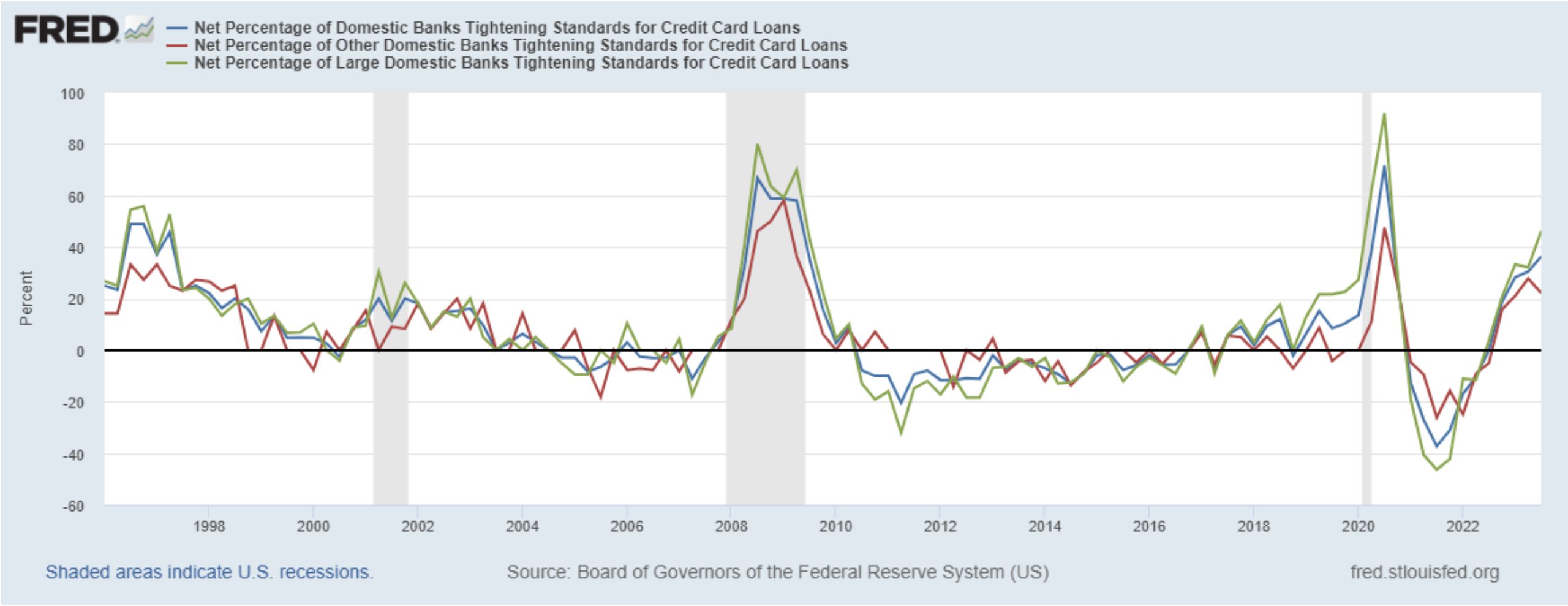
- New data series.
- Page One Data Primers.
- Micro-credentials.
- Recently published research.

FRED® Keeps Up With the Times

NEW DATA SERIES

How are lending conditions changing?

The Senior Loan Officer Opinion Survey



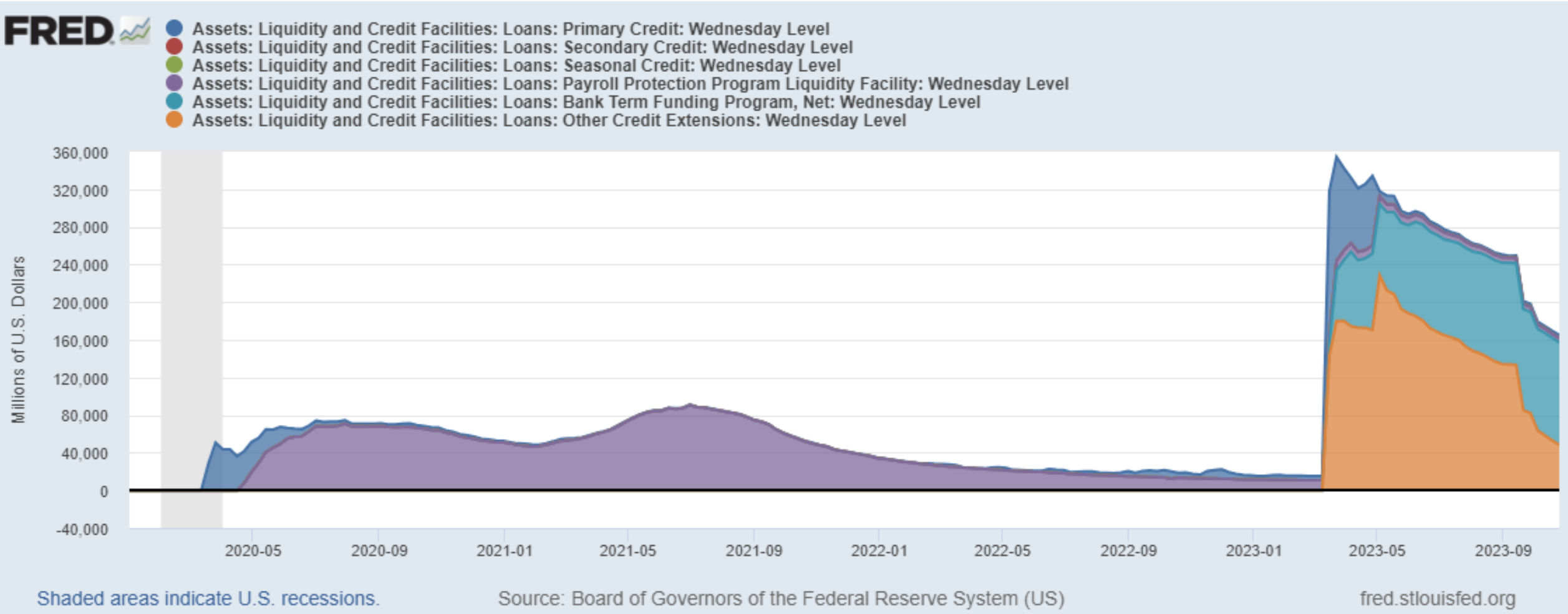
https://fred.stlouisfed.org/graph/?g=1aRkE

Learn more about it

- Release announcement: https://news.research.stlouisfed.org/2022/12/fred-expands-senior-loan-officer-opinion-survey/
- FRED Blog post: https://fredblog.stlouisfed.org/2023/01/cycles-in-lending-standards/

How does the Fed support financial stability?

Bank Term Funding Program Data



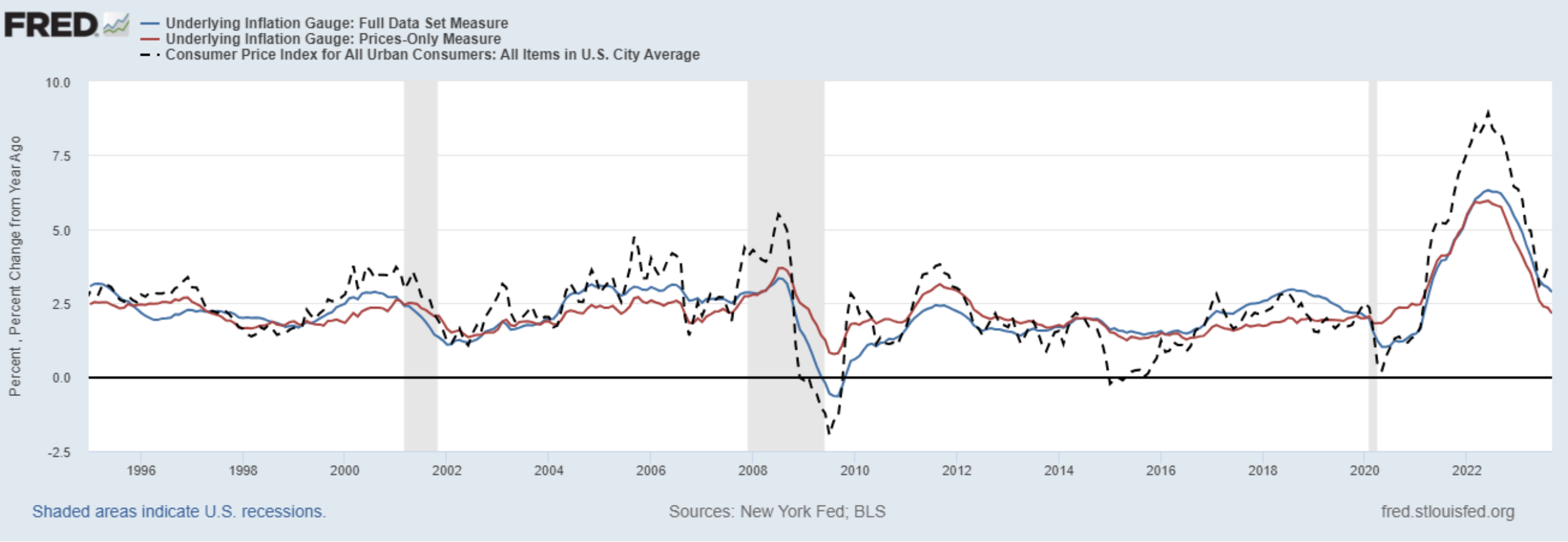
https://fred.stlouisfed.org/graph/?g=1aRla

Learn more about it

- Release announcement: https://news.research.stlouisfed.org/2023/03/fred-adds-bank-term-funding-program-data/
- FRED Blog post: https://fredblog.stlouisfed.org/2023/04/the-lender-of-last-resort/

How are inflation trends measured?

Underlying Inflation Gauge Data



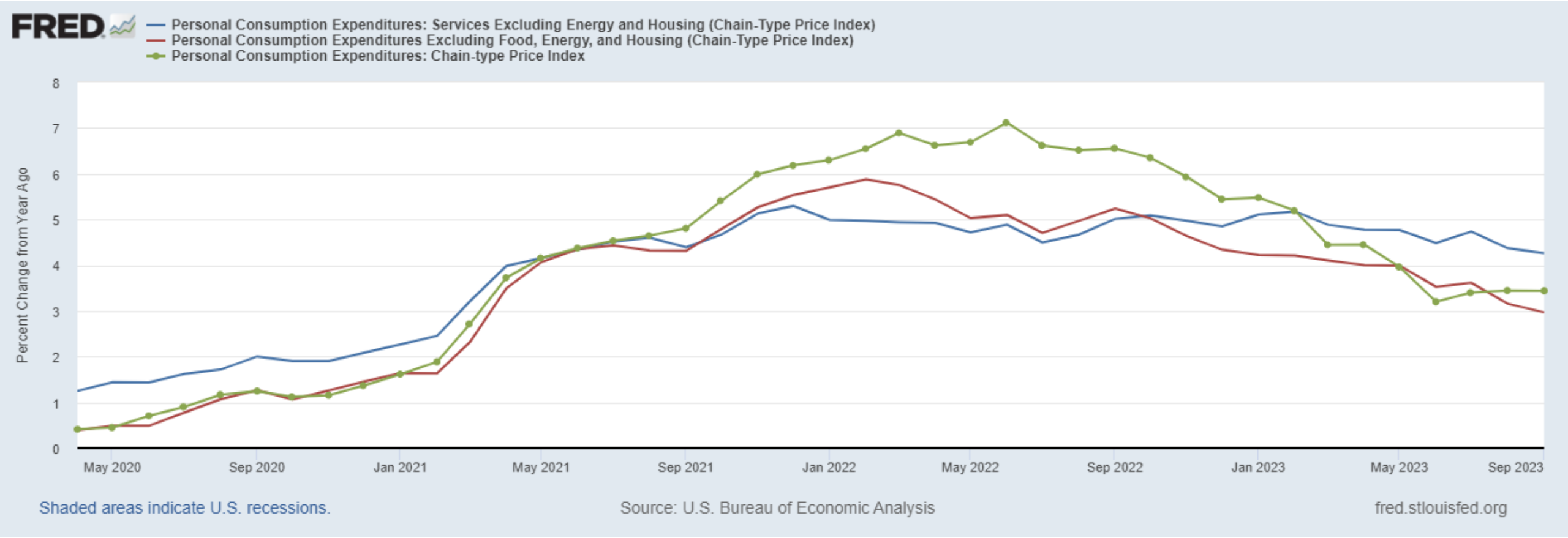
https://fred.stlouisfed.org/graph/?g=1aRlR

Learn more about it

- Release announcement: https://news.research.stlouisfed.org/2023/05/fred-adds-underlying-inflation-gauge-data/
- FRED Blog post: https://fredblog.stlouisfed.org/2023/06/gauging-underlying-inflation/

How is core inflation measured?

New PCE Price Index Data

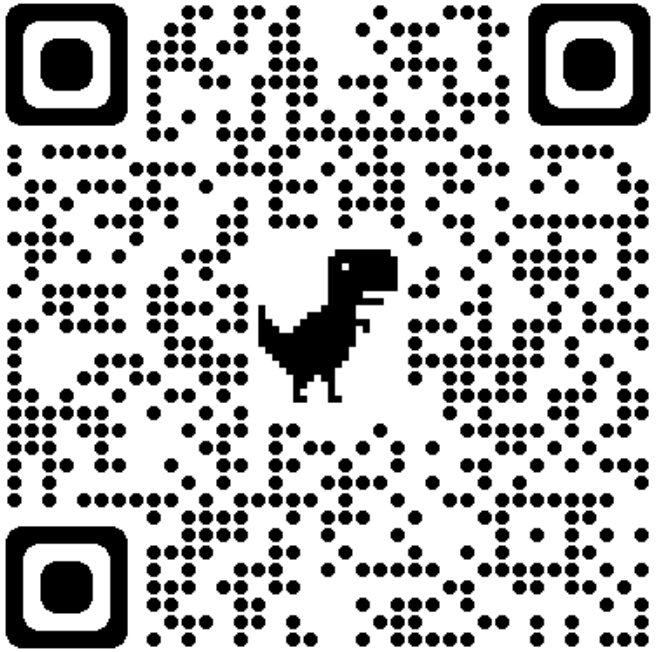


https://fred.stlouisfed.org/graph/?g=1aRm8

Learn more about it

- Release announcement: https://news.research.stlouisfed.org/2023/10/fred-adds-new-personal-consumption-expenditures-pce-price-index-data/
- FRED Blog post: https://fredblog.stlouisfed.org/2023/10/how-housing-prices-have-impacted-pce-inflation/

Keep up with FRED®



Where can FRED® data take you next?

Resources to Master FRED® Data

PAGE ONE DATA PRIMERS

Overview

- Short essays (under 2,000 words).
- Foundational data literacy skills.
- Advanced FRED® features.
- Find them at: https://research.stlouisfed.org/publications/page1-econ

Foundational data literacy skills

PAGE ONE Economics® Data Primer

Ethical Use of Data with FRED®

Diego Mendez-Carbajo, PhD, Federal Reserve Bank of St. Louis

GLOSSARY

Data mining: Analyzing large amounts of data to discover patterns.

Data mirroring: Replicating data obtained from a different location.

Data robots: Software-based automated processes that complete data-related tasks, such as downloading or checking for updates.

Hacking: Accessing data in a computer or a network without prior authorization from the owner.

Scraping: Copying and/or extracting information from a website, including the data, usually performed without permission via automated software.

Seasonal patterns (in data series): Ups and downs in data values that occur because of events that more or less follow a regular pattern each year.

Compelling Question

How should we use data?

Description

FRED® provides access to a wide range of time series data from more than 100 sources. Its terms of use describe the acceptable ways to gather and use data from FRED®. This guide describes ethical considerations regarding gathering, analyzing, storing, and distributing data for new data users and serves as a reference for advanced data users.

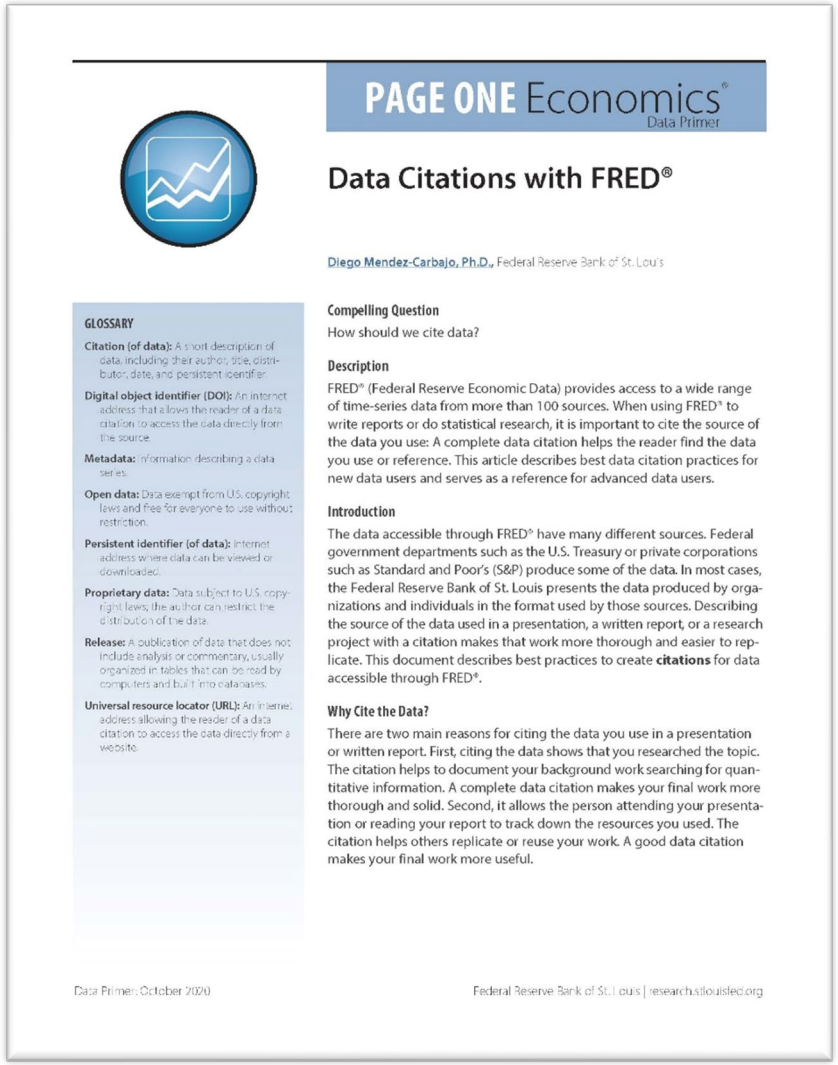
Introduction

Researchers must act ethically when gathering, analyzing, storing, and distributing data. If a dataset is constructed unethically, its use is also unethical, and no acceptable work can be done with it. Also, if a dataset is analyzed unethically, the conclusions drawn from it become invalid. Finally, if a dataset is not stored according to the conditions under which it was put together, or it is distributed after disregarding the conditions under which it was obtained, the researcher may be banned from conducting that type of work again.

The Ethics of Gathering Data

Data must be ethically obtained. If not, their use is rendered unethical—no matter the goals of the researcher. Stealing data is an example of an unethical way of constructing a dataset. **Hacking** into a data server or walking away with documents from someone's office breaks laws, and the person involved may be subject to criminal and civil charges. If the data describe persons, researchers must secure approval from an institutional review board protecting the people subject to the research before data can be collected. For example, an instructor studying how to improve the design and delivery of an academic course must receive clearance from her school's institutional review board to distribute surveys or collect data from the registrar's office about her students.[1]

Businesses and government organizations gather large amounts of data when people go shopping, pay taxes, or request public services. An ethical data-collection process lets people know they are the subject of data gathering and describes the intended use of those data.



PAGE ONE Economics® Data Primer

Data Citations with FRED®

Diego Mendez-Carbajo, Ph.D., Federal Reserve Bank of St. Louis

GLOSSARY

Citation (of data): A short description of data, including their author, title, distributor, date, and persistent identifier.

Digital object identifier (DOI): An internet address that allows the reader of a data citation to access the data directly from the source.

Metadata: Information describing a data series.

Open data: Data exempt from U.S. copyright laws and free for everyone to use without restriction.

Persistent identifier (of data): Internet address where data can be viewed or downloaded.

Proprietary data: Data subject to U.S. copyright laws; the author can restrict the distribution of the data.

Release: A publication of data that does not include analysis or commentary, usually organized in tables that can be read by computers and built into databases.

Universal resource locator (URL): An internet address allowing the reader of a data citation to access the data directly from a website.

Compelling Question

How should we cite data?

Description

FRED® (Federal Reserve Economic Data) provides access to a wide range of time-series data from more than 100 sources. When using FRED® to write reports or do statistical research, it is important to cite the source of the data you use: A complete data citation helps the reader find the data you use or reference. This article describes best data citation practices for new data users and serves as a reference for advanced data users.

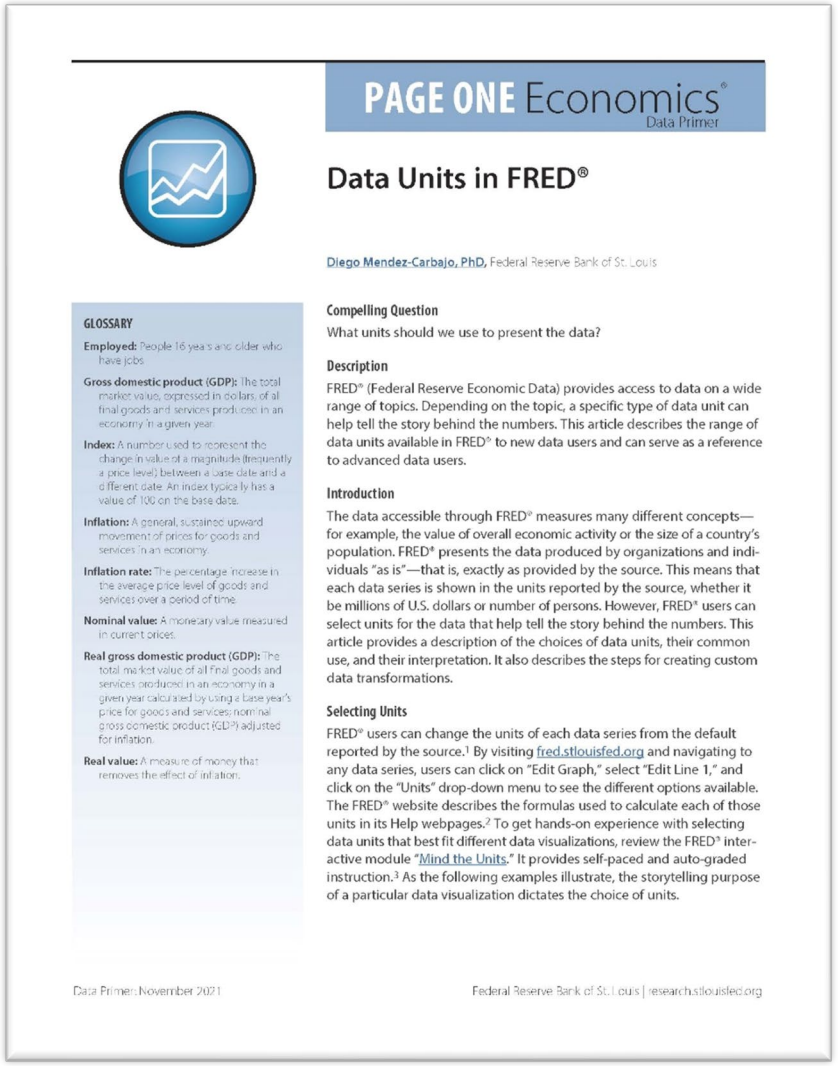
Introduction

The data accessible through FRED® have many different sources. Federal government departments such as the U.S. Treasury or private corporations such as Standard and Poor's (S&P) produce some of the data. In most cases, the Federal Reserve Bank of St. Louis presents the data produced by organizations and individuals in the format used by those sources. Describing the source of the data used in a presentation, a written report, or a research project with a citation makes that work more thorough and easier to replicate. This document describes best practices to create **citations** for data accessible through FRED®.

Why Cite the Data?

There are two main reasons for citing the data you use in a presentation or written report. First, citing the data shows that you researched the topic. The citation helps to document your background work searching for quantitative information. A complete data citation makes your final work more thorough and solid. Second, it allows the person attending your presentation or reading your report to track down the resources you used. The citation helps others replicate or reuse your work. A good data citation makes your final work more useful.

Economic data literacy skills



PAGE ONE Economics® Data Primer

Data Units in FRED®

Diego Mendez-Carbajo, PhD, Federal Reserve Bank of St. Louis

GLOSSARY

Employed: People 16 years and older who have jobs.

Gross domestic product (GDP): The total market value, expressed in dollars, of all final goods and services produced in an economy in a given year.

Index: A number used to represent the change in value of a magnitude (frequently a price level) between a base date and a different date. An index typically has a value of 100 on the base date.

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

Inflation rate: The percentage increase in the average price level of goods and services over a period of time.

Nominal value: A monetary value measured in current prices.

Real gross domestic product (GDP): The total market value of all final goods and services produced in an economy in a given year calculated by using a base year's price for goods and services; nominal gross domestic product (GDP) adjusted for inflation.

Real value: A measure of money that removes the effect of inflation.

Compelling Question

What units should we use to present the data?

Description

FRED® (Federal Reserve Economic Data) provides access to data on a wide range of topics. Depending on the topic, a specific type of data unit can help tell the story behind the numbers. This article describes the range of data units available in FRED® to new data users and can serve as a reference to advanced data users.

Introduction

The data accessible through FRED® measures many different concepts—for example, the value of overall economic activity or the size of a country's population. FRED® presents the data produced by organizations and individuals "as is"—that is, exactly as provided by the source. This means that each data series is shown in the units reported by the source, whether it be millions of U.S. dollars or number of persons. However, FRED® users can select units for the data that help tell the story behind the numbers. This article provides a description of the choices of data units, their common use, and their interpretation. It also describes the steps for creating custom data transformations.

Selecting Units

FRED® users can change the units of each data series from the default reported by the source.[1] By visiting fred.stlouisfed.org and navigating to any data series, users can click on "Edit Graph," select "Edit Line 1," and click on the "Units" drop-down menu to see the different options available. The FRED® website describes the formulas used to calculate each of those units in its Help webpages.[2] To get hands-on experience with selecting data units that best fit different data visualizations, review the FRED® interactive module "Mind the Units." It provides self-paced and auto-graded instruction.[3] As the following examples illustrate, the storytelling purpose of a particular data visualization dictates the choice of units.

PAGE ONE Economics® Data Primer

Data Revisions with FRED®

Diego Mendez-Carbajo, PhD, Federal Reserve Bank of St. Louis

GLOSSARY

Methodology: Any formal procedure used to gather and measure information to produce data.

Tradeoff: An exchange or a compromise between two different outcomes or features.

Vintage: A version of a data series available at a particular moment in time.

Compelling Question

How do revisions and updates improve data?

Description

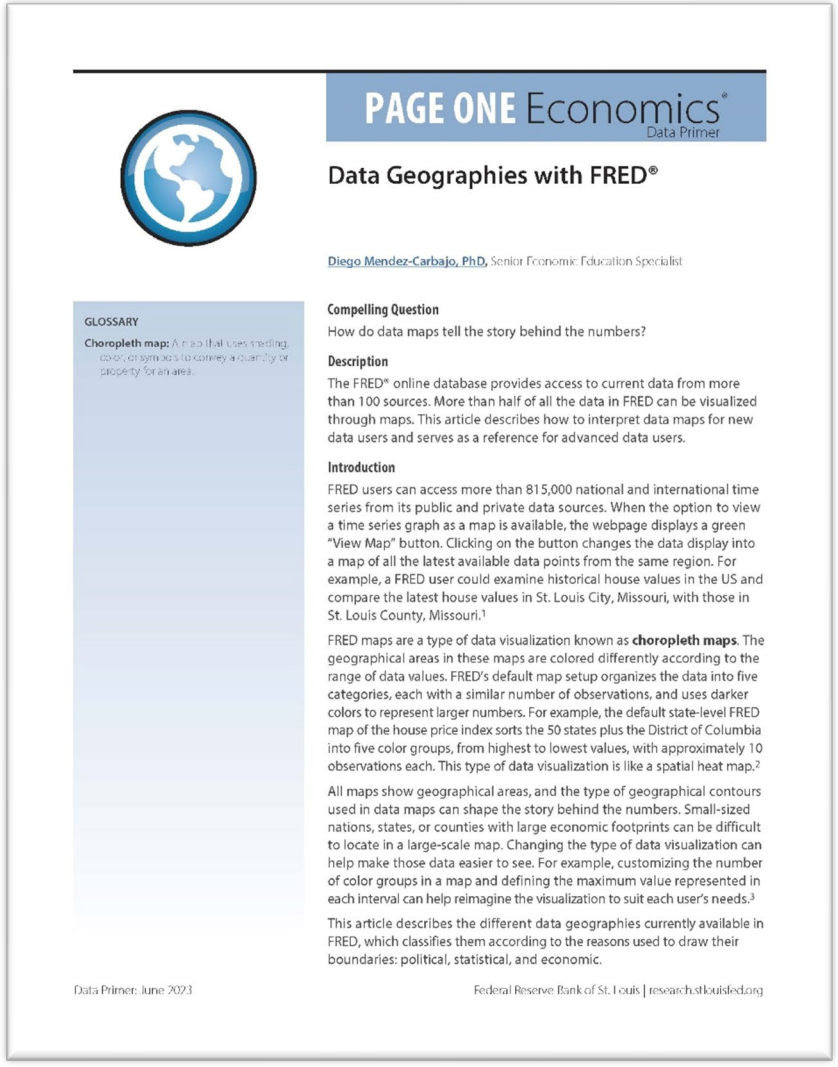
FRED® provides access to current data from more than 100 sources. Some of those sources revise and update their data, and ALFRED® stores all previous versions. This article describes to new data users why data are revised and updated and can serve as a reference to advanced data users.

Introduction

Sources revise data for several different reasons and at multiple moments in time. Occasionally, some data contain errors. Regularly, some data are revised to provide a more complete picture of current or very recent economic conditions. Periodically, some data are updated to produce a more accurate account of long-term trends and patterns.

Every time a new version, or **vintage**, of a data series is released, FRED displays the latest version, and the replaced version is archived in ALFRED. Economic researchers and consumers of data must reference the data vintage they use by citing the date they access the data.[1] Otherwise, discrepancies between data vintages can undermine the credibility of their work.

This article describes how headline economic data are revised and updated to provide a more complete and accurate description of economic conditions. High-quality data facilitate good decisionmaking, so the time and energy the data providers spend to improve their data benefits everybody who uses those data.



PAGE ONE Economics® Data Primer

Data Geographies with FRED®

Diego Mendez-Carbajo, PhD, Senior Economic Education Specialist

GLOSSARY

Choropleth map: A map that uses shading, color, or symbols to convey a quantity or property for an area.

Compelling Question

How do data maps tell the story behind the numbers?

Description

The FRED® online database provides access to current data from more than 100 sources. More than half of all the data in FRED can be visualized through maps. This article describes how to interpret data maps for new data users and serves as a reference for advanced data users.

Introduction

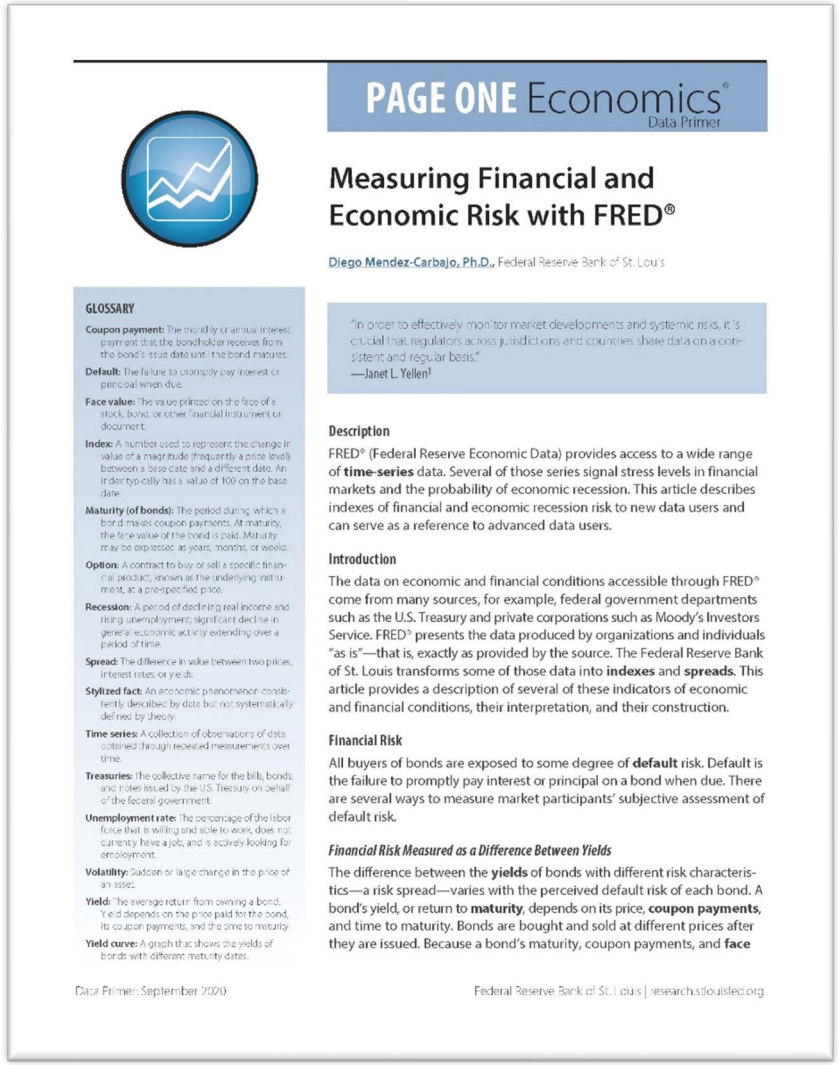
FRED users can access more than 815,000 national and international time series from its public and private data sources. When the option to view a time series graph as a map is available, the webpage displays a green "View Map" button. Clicking on the button changes the data display into a map of all the latest available data points from the same region. For example, a FRED user could examine historical house values in the US and compare the latest house values in St. Louis City, Missouri, with those in St. Louis County, Missouri.[1]

FRED maps are a type of data visualization known as **choropleth maps**. The geographical areas in these maps are colored differently according to the range of data values. FRED's default map setup organizes the data into five categories, each with a similar number of observations, and uses darker colors to represent larger numbers. For example, the default state-level FRED map of the house price index sorts the 50 states plus the District of Columbia into five color groups, from highest to lowest values, with approximately 10 observations each. This type of data visualization is like a spatial heat map.[2]

All maps show geographical areas, and the type of geographical contours used in data maps can shape the story behind the numbers. Small-sized nations, states, or counties with large economic footprints can be difficult to locate in a large-scale map. Changing the type of data visualization can help make those data easier to see. For example, customizing the number of color groups in a map and defining the maximum value represented in each interval can help reimagine the visualization to suit each user's needs.[3]

This article describes the different data geographies currently available in FRED, which classifies them according to the reasons used to draw their boundaries: political, statistical, and economic.

Advanced economic data literacy skills



PAGE ONE Economics®
Data Primer

Measuring Financial and Economic Risk with FRED®

Diego Mendez-Carbajo, Ph.D., Federal Reserve Bank of St. Louis

GLOSSARY

Coupon payment: The monthly or annual interest payment that the bondholder receives from the bond's issue date until the bond matures.

Default: The failure to promptly pay interest or principal when due.

Face value: The value printed on the face of a stock, bond, or other financial instrument or document.

Index: A number used to represent the change in value of a magnitude (frequently a price level) between a base date and a different date. An index typically has a value of 100 on the base date.

Maturity (of bonds): The period during which a bond makes coupon payments. At maturity, the face value of the bond is paid. Maturity may be expressed as years, months, or weeks.

Option: A contract to buy or sell a specific financial product, known as the underlying instrument, at a pre-specified price.

Recession: A period of declining real income and rising unemployment; significant decline in general economic activity extending over a period of time.

Spread: The difference in value between two prices, interest rates, or yields.

Stylized fact: An economic phenomenon consistently described by data but not systematically defined by theory.

Time series: A collection of observations of data obtained through repeated measurements over time.

Treasuries: The collective name for the bills, bonds, and notes issued by the U.S. Treasury on behalf of the federal government.

Unemployment rate: The percentage of the labor force that is willing and able to work, does not currently have a job, and is actively looking for employment.

Volatility: Sudden or large change in the price of an asset.

Yield: The average return from owning a bond. Yield depends on the price paid for the bond, its coupon payments, and the time to maturity.

Yield curve: A graph that shows the yields of bonds with different maturity dates.

"In order to effectively monitor market developments and systemic risks, it is crucial that regulators across jurisdictions and countries share data on a consistent and regular basis."
—Janet L. Yellen[1]

Description

FRED® (Federal Reserve Economic Data) provides access to a wide range of **time-series** data. Several of those series signal stress levels in financial markets and the probability of economic recession. This article describes indexes of financial and economic recession risk to new data users and can serve as a reference to advanced data users.

Introduction

The data on economic and financial conditions accessible through FRED® come from many sources, for example, federal government departments such as the U.S. Treasury and private corporations such as Moody's Investors Service. FRED® presents the data produced by organizations and individuals "as is"—that is, exactly as provided by the source. The Federal Reserve Bank of St. Louis transforms some of those data into **indexes** and **spreads**. This article provides a description of several of these indicators of economic and financial conditions, their interpretation, and their construction.

Financial Risk

All buyers of bonds are exposed to some degree of **default** risk. Default is the failure to promptly pay interest or principal on a bond when due. There are several ways to measure market participants' subjective assessment of default risk.

Financial Risk Measured as a Difference Between Yields

The difference between the **yields** of bonds with different risk characteristics—a risk spread—varies with the perceived default risk of each bond. A bond's yield, or return to **maturity**, depends on its price, **coupon payments**, and time to maturity. Bonds are bought and sold at different prices after they are issued. Because a bond's maturity, coupon payments, and **face**

PAGE ONE Economics®

Adjusting for Inflation

Diego Mendez-Carbajo, PhD, Senior Economic Education Specialist

GLOSSARY

Breakeven inflation rate: A measure of expected inflation calculated by comparing the interest rates of two types of bonds issued by the U.S. government.

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.

Index: A number used to represent the change in value of a magnitude (frequently a price level); between a base date and a different date. An index typically has a value of 100 on the base date.

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

Interest rate: The percentage of the amount of a loan that is charged for a loan. Also, the percentage paid on a savings account.

Price stability: A low and stable rate of inflation maintained over an extended period of time.

"The burdens of high inflation fall heaviest on those who are least able to bear them."
—Federal Reserve Chair Jerome Powell[1]

Introduction

Inflation raises the general price level for goods and services in an economy and reduces the purchasing power of a dollar over time. This means that, year after year, with a fixed amount of money you're able to buy fewer items at the grocery store or access fewer services like haircuts or car repairs.

Adjusting for inflation means measuring dollar amounts in constant prices. Economists use jargon to name dollar amounts that have been adjusted for the impact of inflation: That word is "real." For example, wages or **interest rates** can be adjusted for inflation, giving us a "real wage" or "real interest rate." You can compare real values today with real values from the past because the general price level is held constant.

Monetary values are called nominal values when measured in current prices. Comparing nominal values from the past with nominal values today makes very little sense because the purchasing power of the dollar changes as prices change.

The general price level is measured through an **index**—a number used to represent the change in value of prices between a base date and a different date. A price index typically has a value of 100 on the base date.[2] The percent growth rate in the price index is what economists call inflation.[3] For example, if the index rises from 100 in the base year to 105 today, we can say that inflation is 5 percent. A price index can be used to measure the change in prices over time and to transform nominal dollar values into real dollar values. It can also be used to adjust nominal values over time so that their real value stays constant. That type of adjustment is called indexing.

Stable prices are very important for making good economic decisions about spending and saving money. That is why promoting **price stability** is part of the Federal Reserve's mandate from Congress. Understanding how monetary values can be adjusted for inflation helps you make better

Resources to Demonstrate Your FRED® Data Skills

MICRO-CREDENTIALS

What are Micro-Credentials?

A micro-credential is a short, competency-based recognition that allows an individual to demonstrate mastery in a particular area.

Frequently visible in social media as digital badges, micro-credentials offer employers the opportunity to evaluate a potential employee in terms not only of the resume or the cover letter but also based on a more granular body of skill sets and experiences.

The use of digital badges to award micro-credentials has been around for a decade and is now considered mainstream.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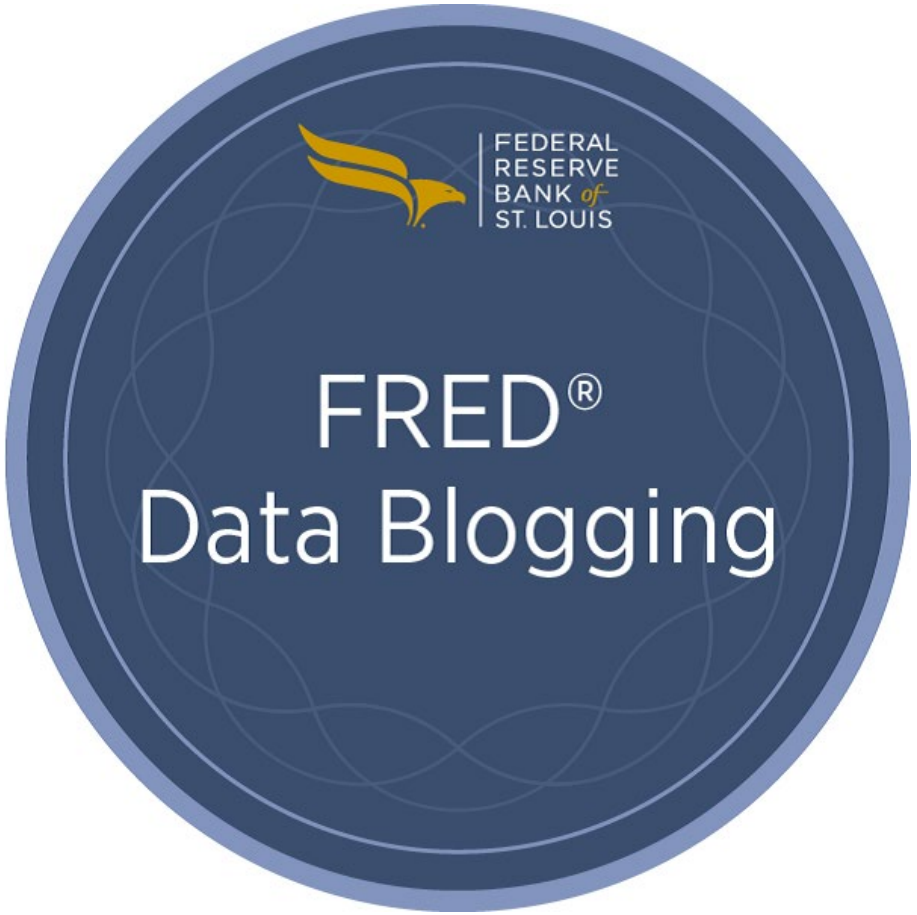
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Recognizing
Diversity in Data

Overview

- Scaffolded instruction.
- Fully asynchronous.
- Skills organized in modules.
- Find them at: https://www.stlouisfed.org/education/digital-badges

Recent Publications

RESEARCH ON ECONOMIC EDUCATION

We use the tools of economic analysis to improve economic education.

Our purpose

- Evaluation of current practices.
- Testing of alternatives.
- Evidence-based decision making.
- World dominance.

What do we know about?

ECONOMIC DATA LITERACY SKILLS

HDSR

HARVARD DATA SCIENCE REVIEW

https://doi.org/10.1162/99608f92.c2835391

Data

- Online assignment distributed via Qualtrics.
- Three-part assignment with seven closed-format questions.
- *N* = 501 (students from a large public university).
- Demographic controls.

Table 1. Data Literacy Skills

Scores, Misconceptions and Errors	Essay A	Essay B
Score Correctly Identifying Series	0.57	0.47
Score Correctly Identifying Source	0.21	0.03
Score Identifying Incomplete Citation	0.18	-0.04
Can't Identify Sources	0.05	0.12
Confuses Source with Distributor	0.72	0.73
Considers Citation to be Complete	0.25	0.40

The data literacy scores are calculated as:

$$Score = (N_{Correct\ Answers} - N_{Incorrect\ Answers}) / (N_{Correct\ Answers})$$

The scores can range between 1 (high skill, no incorrect answers) and -1 (low skill, no correct answers).

Summary.

- Very weak student data literacy competencies.
- Frequent misconception of confusing the data source with the distributor.

Instructional takeaways.

- Consistently name the sources of data.
- Embed the practice in all your teaching.

What do we know about?

ACTIVE LEARNING AND GENDER

Eastern Economic Journal
https://doi.org/10.1057/s41302-023-00258-x

ORIGINAL ARTICLE

Diving into the Gap: Recognizing Gender Differences in an Online Learning Activity

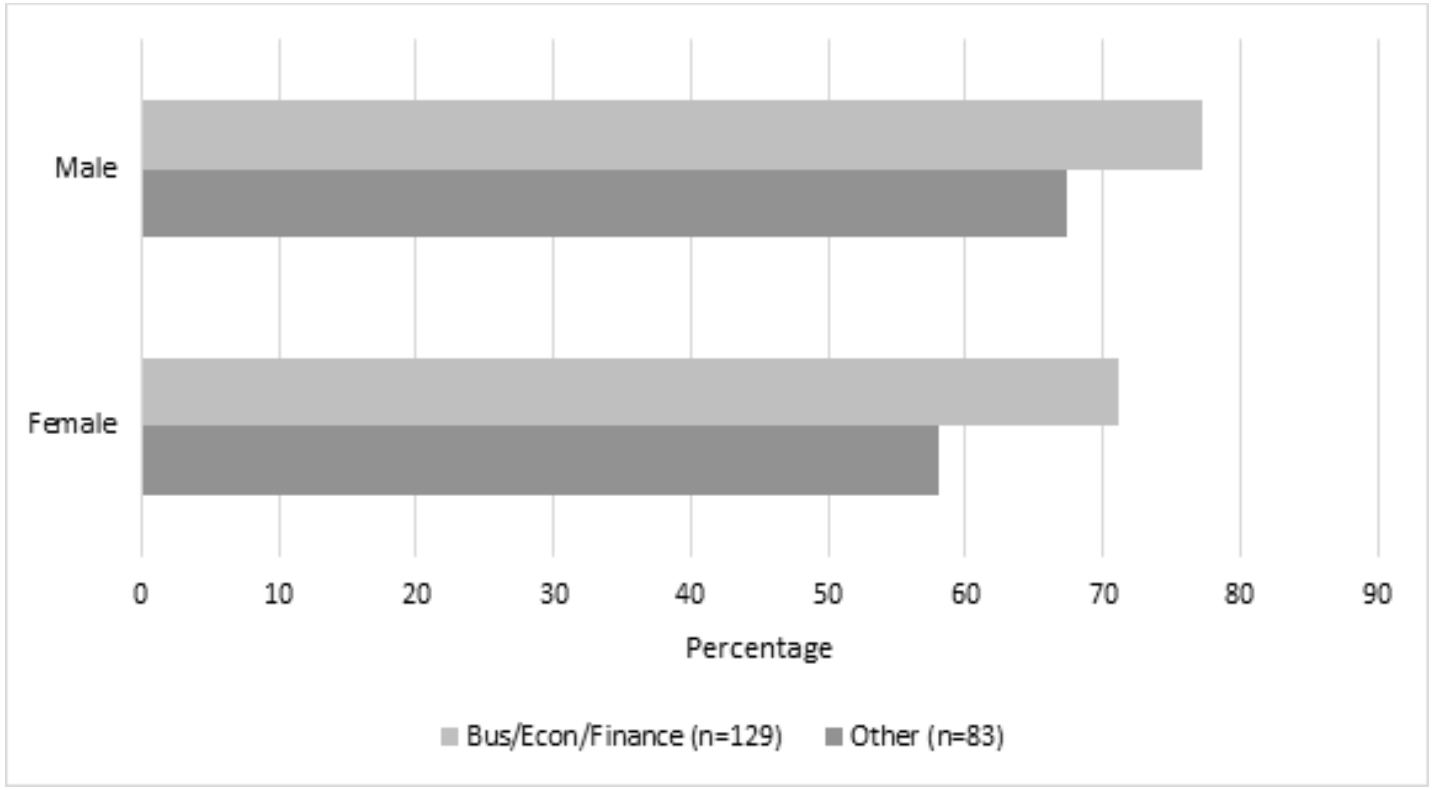
Cynthia Harter[1] · Diego Mendez-Carbajo[2]

https://link.springer.com/article/10.1057/s41302-023-00258-x

Data

- Online survey distributed via Qualtrics.
- Ten closed-format questions.
- *N* = 252 (students multiple colleges and universities).
- Demographic controls.

Figure 2. Enjoying FREDcast



Percentage of respondents within each major and gender combination group who agree or strongly agree that they enjoy FREDcast.

Summary.

- Different responses by gender to active learning with FREDcast.
- Different attitudes about Economics itself.

Instructional takeaways.

- Use active learning techniques.
- Design an inclusive curriculum

What do we know about?

CHOICE OF DATA VISUALIZATION TOOLS

International Review of Economics Education 44 (2023) 100275

Contents lists available at ScienceDirect

International Review of Economics Education

journal homepage: www.elsevier.com/locate/iree

Choice of data visualization tool: FRED or spreadsheets?

Diego Mendez-Carbajo [a,*], Alejandro Dellachiesa [b]

https://doi.org/10.1016/j.iree.2023.100275

Data

- Online assignment distributed via Qualtrics.
- A/B experimental design.
- Graph-building, graph reading, and evaluation.
- *N* = 471 (students from a large public university).
- Demographic controls.

Table 1.B. Summary Statistics for the Outcome Variables

Variable	Definition	FRED®	Google	Pearson Chi-square
Started	Proportion of students who started the assignment	0.79	0.82	0.8228
Finished	Proportion of students who completed the assignment	0.95	0.86	7.9766***

Note: Asterisks denote the significance level of a Pearson Chi-squared test of independence between groups (*** 0.01, ** 0.05, * 0.1)

Summary.

- FRED® was used more frequently than Google Sheets to build basic data graphs.
- No gender gap in confidence using FRED®.

Instructional takeaways.

- Use FRED® in your data assignments.
- Design inclusive assignments.

Connect With Us

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Thousands of data series, millions of users

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News and views about the economy and the Fed

Economic Education Resources
For every stage of life

Community Development
Promoting financial stability of families, neighborhoods

James Bullard
stlouisfed.org/from-the-president

SOCIAL MEDIA

ECONOMY MUSEUM

ECONOMY MUSEUM
AT THE ST. LOUIS FED