Integrating Data Analysis into an Introductory Macroeconomics Course*

Marketa Halova Wolfe†

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Abstract

Data analysis and applying knowledge to real-world settings rank among key skills of college graduates. This paper shows how to completely integrate data analysis and application of knowledge to real-world settings into an introductory macroeconomics course. Every class meeting is structured as a series of activities that students work through using free, publicly available data. Time can be allotted to these activities during class because the course takes advantage of two previously documented active learning pedagogies (flipped classroom and team-based learning). Students benefit by gaining data analysis skills, applying knowledge to real-world settings, digging deeper into the material and contentious topics, and learning that results from combining the data analysis approach with the active learning approaches.

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†Associate Professor, Department of Economics, Skidmore College, Saratoga Springs, NY 12866, Phone: +1-518-580-8374, Email: mwolfe@skidmore.edu

1 Motivation

Data analysis and applying knowledge to real-world settings have been highlighted as key skills of college graduates by academic research, employers, and students. For example, Santos and Lavin (2004) argue for implementing an empirical economics research curriculum to share with students what economists do, and Maier, Bangs, Blunch, and Peterson (2010) emphasize teaching with context-rich problems, an active learning technique that uses practical scenarios for students to practice applying economic concepts. 2018 QS Global Employer Survey ranks data analysis among top skills (Chang 2018), Hart Research Associates (2013) identifies applying knowledge to real-world settings as one of the most deficient skills, and employers hiring economics majors report that students lack practical data-handling skills and awareness of history and real-world context (Coyle 2012). A survey of economics majors at U.S. undergraduate institutions echoes these findings: when asked what modifications they would make in their economics program, 63% of students selected "more discussion of real-world issues" (Jones et al. 2009).

This paper shows how to completely integrate data analysis and application of knowledge to real-world settings into an introductory macroeconomics course. Every class meeting is structured as a series of activities that students work through using free, publicly available data such as the Federal Reserve Economic Data (FRED) database and the GeoFRED mapping tool. Time can be allotted to these innovative activities during class because the course takes advantage of two previously documented pedagogies: the flipped classroom pedagogy that transfers some tasks traditionally carried out during class meetings to mandatory pre-class preparation and the team-based learning pedagogy that provides guidelines for working

through the in-class activities.[1]

Benefits of active learning pedagogies have been documented in numerous studies. For example, Salemi (2002) cites a deeper understanding of concepts, promoting a positive attitude toward learning, and students benefiting from in-class peer interactions. The flipped classroom and team-based learning pedagogies were selected due to their proven success. For example, the flipped classroom has been shown by Balaban, Gilleskie, and Tran (2016) to result in an increased effort during the semester and higher final exam scores in introduction to economics. In introduction to microeconomics, the effects of the flipped classroom include students believing that they learn more than in a traditional lecture (Lage, Platt, and Treglia 2000), students believing that the flipped classroom helped them learn (Roach 2014), higher scores on midterm and final exams (Calimeris and Sauer 2015), higher scores on final exams (Calimeris 2018; Caviglia-Harris 2016), more improvement during the semester (Olitsky and Cosgrove 2016), higher scores on the Test of Understanding in College Economics (Swoboda and Feiler 2016), and students more strongly believing that the course learning goals were achieved and a decrease in the odds of grades D and F and withdrawing from the course (Lombardini, Lakkala, and Muukkonen 2018). Aricò and Lancaster (2018) report that the flipped classroom supports development of metacognitive skills such as self-assessment in introduction to macroeconomics, Wozny, Balser, and Ives (2018) demonstrate a positive effect on medium-term, high-stakes assessments in introductory econometrics, and Becker and Proud (2018) show positive student perceptions toward the flipped classroom and qualita-

[1]See O'Flaherty and Phillips (2015) and Michaelsen and Sweet (2008) for a description of the flipped classroom and team-based learning pedagogies, respectively. The team-based learning approach falls within the cooperative learning framework that includes four main elements – positive interdependence, individual (and group) accountability, equal participation, and simultaneous interaction – discussed by, for example, Bartlett (2006) and McGoldrick, Rebelein, Rhoads, and Stockly (2010).

tive, pedagogical benefits in statistics and econometrics. The team-based learning has been shown to result in, for example, higher final exam scores of female students in introduction to microeconomics (Epsey 2018) and higher final exam scores, higher course grades, students performing better on assessments of basic concepts, and students reporting increased engagement and ability to think independently in introduction to macroeconomics (Odell 2018).

This paper therefore builds on the flipped classroom and team-based learning pedagogies to implement a new, active learning approach: in-class data analysis activities that are fully integrated into the course. In macroeconomics, the FRED and GeoFRED data tools have gained popularity in recent years. Suiter and Stierholz (2009) provide a brief description of GeoFRED. Suiter and Taylor (2016) present examples of activities with both FRED and GeoFRED. Mendez-Carbajo (2015) describes seven FRED data activities for intermediate macroeconomics and financial economics courses on topics of purchasing power parity, corporate risk premium, inflation expectations, sovereign debt risk premium, interest swap spread, nominal and real interest rates, and Taylor rule; these activities can be instructor-led with the instructor displaying the data or carried out by students. Comparing in-class practices and observing student behavior, Mendez-Carbajo (2015) argues that these activities led students to develop connections between economic theories and empirical evidence. Mendez-Carbajo (2016) then observes that the students became more proficient in analyzing information and provided positive feedback in student evaluations. Staveley-O'Carroll (2018) describes six FRED data homework assignments for a money and banking course where the first five assignments cover inflation, bonds and stocks, monetary aggregates, Taylor rule, and employment, and the sixth assignment is a short paper where students recommend

policy to the Federal Open Market Committee (FOMC);[2] based on observations in the classroom, Staveley-O'Carroll (2018) reports improved ability to read and interpret visual data. Mendez-Carbajo and Asarta (2017), Mendez-Carbajo, Taylor, and Bayles (2017), and Suiter and Mendez-Carbajo (2018) use FRED to teach specific topics of price elasticity of demand, Taylor rule, and forecasting, respectively. Mendez-Carbajo and Asarta (2017) argue that the data exercise helps students connect the course material to historical and current events and increases students' engagement in the course, Mendez-Carbajo et al. (2017) assert that explaining economic theory through data leads to deeper discussions of the theory, and Suiter and Mendez-Carbajo (2018) point out that forecasting with data can reinforce students' understanding of the theoretical relationships.

This paper does not claim to be the first paper to utilize data in teaching economics. However, it contributes to the previous literature in three ways. First, expanding the above literature on the use of FRED and GeoFRED in intermediate and advanced macroeconomics courses, this paper documents how to utilize FRED and GeoFRED as well as other data sources in an *introductory macroeconomics course*. Second, the data analysis activities are *completely integrated* into the course by being the overarching structure of the class meetings instead of addressing a specific topic or being used in separate assignments as in the above studies. Third, the paper shows *how to combine the data analysis approach with active learning approaches* (flipped classroom and team-based learning); the paper thus connects two strands of the economics instruction literature: the literature on utilizing data sources (such as FRED and GeoFRED) and the literature on active learning (such as flipped classroom and team-based learning).

[2]Whiting (2006) also describes homework assignments to prepare for a mock FOMC meeting.

Section 2 provides information about the course, implementation of the flipped classroom and team-based learning pedagogies, and grading. This gives background for the description of the in-class data analysis activities including their student learning outcomes and data sources utilized in the activities in Section 3. Section 4 discusses resource requirements, benefits, student feedback, and lessons learned. Section 5 presents a brief conclusion.

2 Course Set-Up, Pedagogies, and Grading

This section provides information about the course, describes implementation of the flipped classroom and team-based learning pedagogies and outlines the grading structure.

2.1 Course Set-Up

This introductory macroeconomics course was taught in the Fall of 2017 at a private, four-year, liberal arts college comprised mainly of traditional students.[3] The course was taught in three sections capped at 28 students. The course enrollment was 25, 28, and 28 students. The course was a four-credit course that met three times a week (55 minutes on Mondays and 80 minutes on Tuesdays and Thursdays). Excluding an introductory class meeting, exam reviews, exams, and a concluding class meeting, there were 30 regular class meetings. These class meetings were organized into four parts: Part 1 on Jobs/Unemployment, Business

[3]This course is of the standard length for institutions that have two semesters. If a course were shorter such as courses in institutions that use trimesters or quarters, the pedagogical approach with in-class data analysis activities would still be useful. The flipped classroom pedagogy would still transfer some tasks traditionally carried out during class meetings to mandatory pre-class preparation and the team-based learning pedagogy would still provide guidelines for efficiently working through the in-class activities. Time could then still be allotted to the in-class data analysis activities. The only suggestion for instructors teaching with different time frames would be adjusting the length of the assignments (pre-class preparation as well as in-class data analysis activities) to fit the length of their class meetings.

Cycles, Economic Growth, Income Inequality, and Poverty, Part 2 on Fiscal Policy, Federal Budget and Debt, and Social Security, Part 3 on Monetary Policy and Inflation, and Part 4 on International Trade and Immigration;[4] however, the pedagogical approach is flexible, and any other selection and sequence of topics can be used. First-, second-, third-, and fourth-year students comprised 41%, 37%, 16%, and 6%, respectively. As is typical for this course, some students were economics majors while most students were majoring in other fields.

2.2 Flipped Classroom and Team-Based Learning Pedagogies

The innovative feature of the course is the in-class data analysis activities provide the overarching structure for the class meetings. Time can be allotted to these activities because the course takes advantage of two previously documented active learning pedagogies: the flipped classroom pedagogy that transfers some tasks traditionally carried out during class meetings to mandatory pre-class preparation and the team-based learning pedagogy that provides guidelines for working through the in-class activities. Success of these pedagogies in economics has been documented in a variety of courses and settings ranging from small to large enrollment classes and from small liberal arts colleges to large research universities.

The flipped classroom approach has students actively prepare for each class meeting.

[4]Some of the topics included in these four parts were: Part 1 - Unemployment, labor force participation, business cycles, economic growth, income inequality, Gini coefficient, and absolute and relative poverty; Part 2 - Classical model, components of aggregate expenditures, marginal propensities to consume and save, Keynesian consumption function, aggregate expenditure model, aggregate demand-aggregate supply model, fiscal policy, automatic stabilizers, federal budget and debt, and social security; Part 3 - Money, money supply, loanable funds model, financial system, financial crisis, central bank, monetary policy, inflation, and Phillips curve; Part 4 - Production factors, opportunity cost, production possibilities frontier, absolute and comparative advantages, gains from trade, modeling the effect of tariffs and quotas, winners and losers from international trade, and immigration. The course used the Chiang (2016) textbook, and any other textbook or materials can be used.

In this course, the mandatory class preparation takes place on the FlipItEcon website (www.flipitecon.com) designed to provide pre-class preparation for introductory economics courses. However, the pedagogical approach is flexible, and a variety of other flipped classroom materials can be used such as lecture videos pre-recorded by the instructor in Balaban et al. (2016) and Khan Academy videos in Caviglia-Harris (2016).

The technology-based preparation assignments on the FlipItEcon website begin with watching a series of "Prelecture" tutorials, which are short animations where students learn basic definitions and concepts. For example, in animations about unemployment, the students learn the definition of unemployment rate and the concepts of who classifies as employed and unemployed. These Prelecture tutorial animations can be paused and watched again. The Prelecture tutorials include multiple-choice questions where students practice their learning. The Prelecture tutorials are followed by "Bridge" questions that are more complex. In these Bridge questions, in addition to answering a multiple-choice question, students write a short explanation for their answer, which gives the instructor insight into the students' understanding of the material. For the multiple-choice questions in both the Prelecture and Bridge, the FlipItEcon website interactively shows whether the answer is correct or not after the question is answered to provide immediate feedback.

Students were assigned a pre-class preparation assignment consisting of a Prelecture tutorial and Bridge questions on the FlipItEcon website before each of the 30 regular class meetings. Each assignment took about twenty minutes. The assignments were due at midnight before each class meeting, although the instructor can choose the assignment deadline. The completion rate was high: the average across all assignments and students was 93% with approximately a third of the students completing 100% of assignments. To ensure that

students put effort into these pre-class preparation assignments, each Monday class meeting begins with a short (approximately ten-minute) assessment where students answer questions similar to the pre-class preparation questions.

The team-based learning approach has students work in teams to actively learn during class meetings. In this course, teams of four to five students are formed at the beginning of the semester. The team-based learning approach emphasizes that the teams be diverse along dimensions important to the course. The dimensions used for this course are whether students have already taken another economics course (to account for a varied level of incoming knowledge), which year they are in (to account for academic maturity), and whether they are international students (to facilitate sharing experiences across borders). Following the team-based learning pedagogy, students work in the same teams for the entire semester, which builds accountability. On Mondays, after taking the assessment individually, students take the same assessment with their teams. The remainder of the Monday class meeting as well as Tuesday and Thursday class meetings are structured as a series of team in-class data analysis activities with teams occasionally sharing their findings with the whole class and the instructor providing explanations for more difficult parts of the material. These in-class activities including their student learning outcomes are described in Section 3.1.

2.3 Grading

The course grade breakdown is pre-class preparation assignments 5%, individual assessments 5%, team assessments 5%, team in-class data analysis activities 35%, and exams 50%. Because students complete the pre-class preparation assignments before the material is cov-

ered in class meetings, the pre-class preparation assignments are graded based on completion rather than correct answers. The individual assessments that include questions similar to the pre-class preparation assignments are then graded based on correct answers, which provides an incentive to put effort into the pre-class preparation assignments. The team assessments are also graded based on correct answers.[5] Students do not receive team grades for team assessments and team in-class activities (described in Section 3.1 and shown in the Appendix) if they do not contribute to their teams due to absences.[6] Exams are taken individually and test the material standardly in calculations, models, and short answers. However, the pedagogical approach is flexible, and any other grade breakdown and approach to grading can be used.

3 In-Class Data Analysis Activities

This section describes the pedagogical innovation of in-class data analysis activities followed by data sources utilized in these activities.

[5]In addition to the handouts for the in-class activities shown in the Appendix, each team receives an Immediate Feedback Assessment Technique scratch card from www.epsteineducation.com. This card has has the answer choices (A, B, C, and D) covered with an opaque covering. The team scratches off the covering for the answer choice that the team believes to be correct. If the answer is correct, a star appears on the card, and the team receives full credit. If the answer is incorrect, the team continues in their discussion and tries again by scratching off another choice. If this second choice is correct, the team earns a partial credit. This tool gives the teams immediate feedback about each question and speeds up grading. However, these scratch cards are not necessary because the teams can standardly mark their answers on the handout.

[6]A potential concern arises related to students not participating in the teamwork (team assessments and team in-class activities). However, this concern is alleviated through the team-based learning pedagogy. Because team members are required to take turns in sharing their team findings with the whole class, all students participate. Also, a peer review can be implemented to ensure team accountability (Kibble, Bellew, Asmar, and Barkley 2016; Michaelsen and Sweet 2008) where team members evaluate all members of their team on, for example, pre-class preparation, participation in team discussions, and respecting other team members. The peer review grade can then be a part (for example, 10%) of the total course grade.

3.1 Description of In-Class Data Analysis Activities

The in-class data analysis activities that provide the overarching structure for the class meetings. There are 30 activities during the semester; to save space, only the first eight activities related to Part 1 on Jobs/Unemployment, Business Cycles, Economic Growth, Income Inequality, and Poverty, and one activity related to Part 3 on Monetary Policy and Inflation are described.[7]

At the beginning of every class meeting, each team receives a handout for the in-class activity including the student learning outcome (SLO) and multiple-choice questions. After a brief introduction by the instructor (and on Mondays after the individual and team assessments described in Section 2.2), the teams immediately get to work. For example, the SLO for the first activity is extracting the unemployment rate data from the FRED database and interpreting it. Because for most students this is the first encounter with macroeconomic data, In-Class Activity 1 provides step-by-step instructions for downloading the data. Since students prepared for the class meeting by watching short animations and answering questions on the Internet described in Section 2.2, the students are familiar with basic definitions and concepts. The in-class activity then reinforces the material and allows to dig deeper into it by, for example, examining historical trends in unemployment rate.

Students access the data using their personal devices. Typically, students prefer to use laptops or tablets, but sometimes they use cell phones.[8] Each student analyzes the data individually; however, the team has to agree before answering each question.

[7] The Appendix shows In-Class Activities 1, 2, 4, 7, 8, and 25 that are discussed in more detail. In-Class Activities 3, 5, and 6 are provided in the Supplemental Materials.

[8] A survey by Pew Research Center found that 94% of adults between ages 18 and 29 in the United States owned a smart phone in 2018 (Pew Research Center 2018). Imazeki (2014) demonstrated that students can effectively use their devices for in-class work.

In-Class Activity 2 digs deeper into the unemployment rate and labor force participation by examining geographic and demographic differences. Students use the GeoFRED mapping tool to create maps of the unemployment rate by state and county to see the striking differences in economic fortunes.[9] After examining the geographic differences, the students extract unemployment rate by race from FRED to see the disparities in economic outcomes by race.

The activity then continues with analyzing labor force participation data. Again, students are already familiar with basic definitions (such as how the labor force participation rate is defined) and concepts (such as who classifies as participating and not participating in the labor force) from the mandatory pre-class preparation. The activity then again reinforces the material and allows to dig deeper into it by, for example, examining historical trends.

During the in-class data analysis activities, the instructor circulates around the classroom engaging in discussions with the teams. The instructor occasionally brings the class together, so that the teams can share answers with each other and the instructor can provide explanations for more challenging parts of the material, which is important especially later in the semester when the course covers more theory.[10] The instructor can also circle back to the pre-class preparation questions if responses showed that any of them were unclear.

The subsequent In-Class Activities 3 through 8 (where instructions are more succinct as students already know how to extract the data) focus on the natural rate of unemployment, fluctuations in the unemployment rate, gross domestic product (GDP), GDP per capita,

[9]Questions 3 and 4 in the In-Class Activity 2 on unemployment rate by county were inspired by Bayles (2015) and Suiter and Taylor (2016).

[10]PowerPoint slides and the whiteboard are used as aids during these instructor explanations. The PowerPoint slides are made available to students on a course website after each class meeting.

GDP growth rate long-run trend and business cycle fluctuations, components of GDP[11], and income inequality.

The activities often conclude with a discussion of an article that was assigned as a part of the mandatory pre-class preparation (for example, in In-Class Activity 2) or with readings such as the Economic Report of the President and a short video (for example, in In-Class Activity 8) related to the data analyzed in the activity. Crucially, the interactive, hands-on in-class data analysis activities do not lead to a reduction of topics; the course not only covers all the standard topics but also allows digging deeper into them.

The in-class data analysis activities also provide an engaging way to introduce macroeconomic theory. For example, the Phillips curve in Part 3 on Monetary Policy and Inflation is introduced after students examine inflation and federal funds rate data in In-Class Activity 25. Because the students already studied unemployment data in In-Class Activities 1, 2, and 3, the Phillips curve topic is set in the real-world context. After examining the data, students read and discuss with the whole class a short article about the Phillips curve and how it relates to the current monetary policy. The instructor then brings the class together to highlight the key points by drawing the Phillips curve graph on the whiteboard (and/or displaying the graph on a slide). Here, it needs to be noted that the instructor does not provide a full lecture of the Phillips curve; because students already explored the inflation and unemployment data, the instructor does not need to explain these variables. Because students read and discussed the article, students know what the Phillips curve predicts. The instructor then formally presents the theory by illustrating it graphically. Because students have already explored the monetary policy data, the instructor can quickly reiterate the

[11] In-Class Activity 4 on GDP components was inspired by Suiter and Taylor (2016) and Bayles (2018).

relationship between the Phillips curve and current monetary policy.

3.2 Data Sources Utilized for In-Class Data Analysis Activities

The in-class data analysis activities utilize numerous sources of macroeconomic data. This section discusses some of them. The FRED database (fred.stlouisfed.org) provides an ever-increasing amount of data (670,000 U.S. and international time series from 89 sources as of January 7, 2020) that can be easily visualized. This database is useful for creating time series graphs of macroeconomic variables such as unemployment rate, labor force participation rate, GDP, etc. The Federal Reserve Bank of St. Louis website Tools for Teaching with FRED (www.stlouisfed.org/education/tools-for-teaching-with-fred) offers ideas for teaching with the FRED data.

GeoFRED (geofred.stlouisfed.org) allows creating geographical maps for many of the FRED data series. This mapping tool is useful for creating maps showing how the macroeconomic variables vary by country as well as by U.S. county and state. Ideas for teaching with the GeoFRED data are available on the Federal Reserve Bank of St. Louis website Tools for Teaching with GeoFRED (www.stlouisfed.org/education/tools-for-teaching-with-geofred).

The Gapminder website (www.gapminder.org) offers visualization tools such as bubble charts that allow comparing macroeconomic variables across countries. This tool is useful for exploring relationships between variables such as income and life expectancy or child mortality rate in In-Class Activity 4. The Central Intelligence Agency website (www.cia.gov) includes data such as Gini coefficients. This data can be used to analyze income inequality in In-Class Activity 7. World Bank (www.worldbank.org) and International Monetary Fund

(www.imf.org) offer other abundant possibilities for exploring international economic data. In addition, many government agencies provide data about economies of their countries such as the Bureau of Census (www.census.gov) and Congressional Budget Office (www.cbo.gov) for U.S. poverty data and fiscal data, respectively. All the above sources are free and publicly available. However, the pedagogical approach is flexible and other sources of macroeconomic data can be used.

4 Resource Requirements, Benefits and Student Feedback, and Lessons Learned

This section outlines resource requirements, discusses benefits, presents feedback provided by students in course evaluations and shares lessons learned.

4.1 Resource Requirements

Strasser and Wolfe (2014) note that a necessary condition for any successful teaching idea is feasibility for the instructor and Goffe and Kauper (2014) find that one third of introductory economics instructors would prefer active learning approaches but find them too resource intensive. For this course, the resource constraints are the instructor's preparation time and grading time. Since the course uses the previously documented flipped classroom pedagogy to be able to allot time to the in-class data activities, the preparation time is particularly concerning because the flipped classroom has been highlighted as having substantial start-up costs due to the instructor having to commit time to self-recording lectures. However, while

self-recording lectures is one way of implementing the flipped classroom, recent advances in technology, such as FlipItEcon and Khan Academy, have offered alternatives for the pre-class preparation assignments to instructors who cannot self-record lectures. In addition, Lage et al. (2000) offer tips for reducing the upfront fixed costs such as prerecording the existing lectures for future use as the flipped component, working with a colleague to divide the labor, and hiring a student in a program such as technical writing or computer science for an independent study project to develop the materials.

Designing the in-class data analysis activities is also feasible; it is not any more time-consuming than designing other types of assignments traditionally used in introductory macroeconomics such as homework assignments. Furthermore, updating the activities to fit the current state of the economy is trivial: for example, in In-Class Activity 1, only multiple choices in Questions 3 and 4 need to be updated. Overall, the preparation time is comparable to courses taught in a traditional lecture-style format.

Grading time is also comparable. The pre-class preparation assignments are graded automatically on the FlipItEcon website. There are more frequent assignments to be graded (individual assessments and team assessments once a week and in-class data analysis activities three times a week) than in a lecture-style course; however, these assignments are structured as multiple-choice questions, which speeds up grading.[12] The grading and grade entry are straightforward, so a teaching assistant can be easily utilized if available.

Since the in-class data activities were implemented in small classes, implementation in larger classes deserves a special mention. Here, the key is that the two pedagogies utilized in

[12] Although the questions are structured in the multiple-choice format to enable efficient grading, the learning occurs via a combination of data analysis, team discussion, class discussion, instructor sharing additional thoughts, and readings or videos related to the topics as described in Section 3.1.

the course, i.e., flipped classroom and team-based learning, have been shown to be effective in large classes. For example, Roach (2014), Balaban et al. (2016), Olitsky and Cosgrove (2016), and Lombardini et al. (2018) implement the flipped classroom and Kibble et al. (2016) and Prange-Kiel, Champine, Winkler, and Twickler (2017) implement the team-based learning. These studies provide guidelines for ensuring that large numbers of students prepare before the class meetings and effectively work in teams during the class meetings. The studies offer numerous helpful suggestions such as graduate teaching assistants and undergraduate learning assistants who circulate around the room along with the instructor to engage with students (Balaban et al. 2016), radiomicrophones for students to speak to the class (Kibble et al. 2016), and a peer review to ensure team accountability (Kibble et al. 2016).

There are several additional resources that need to be committed to implement the in-class data analysis activities in the large classes. Copies of the activities need to be made before the class meetings. Here, it is helpful to number the teams and set up a folder for each team with the team number on the folder cover. It is also helpful to make the teams responsible for picking up the folders from the instructor's desk at the beginning of the class meeting because it saves time when the instructor does not have to distribute the folders. As mentioned in Section 2.3, grading can be made more efficient by the Immediate Feedback Assessment Technique scratch card; alternatively, Scantrons can be used.

If assistants are used, it would be helpful to train them. In their implementation of the flipped classroom, Becker and Proud (2018) suggest that an additional (one-hour) meeting be scheduled with the assistants to discuss the flipped classroom pedagogical approach; a similar meeting could be organized to train the assistants on the in-class data analysis pedagogical approach. It would also be helpful to require the assistants to complete the data analysis

activities before class meetings (which would be straightforward for graduate and/or upper-level undergraduate students) and provide the assistants with solutions, so that they are prepared to engage with the students. If the teaching assistants teach their own sections rather than assist the instructor during the class meetings, it may also be helpful to hold regular meetings with the assistants to ensure consistency across sections.[13]

4.2 Benefits and Student Feedback

This section discusses the benefits of the pedagogical innovation based on in-class observations and shows how the benefits align with student feedback. Student evaluations consist of quantitative evaluations administered on the institution level and qualitative evaluations administered on the department level. 90% and 89% of students completed the quantitative and qualitative evaluations, respectively. The quantitative evaluations were high with an average across all questions equal to 4.7 on a scale from 1 to 5. Even more telling was the feedback that students shared in qualitative evaluations: 97.5% of these written responses were positive and students often wrote about the pedagogical innovation and its benefits. While the selected student quotes are not necessarily statistically representative, they do offer insight into students' views. Another piece of evidence of the pedagogical effectiveness is a high retention rate: 80 out of 81 enrolled students completed the course that 93% of students considered as "challenging your thought process" in the institution-level evaluations. The following discussion begins with four benefits of the in-class data analysis activities and

[13] Although the in-class data analysis activities were implemented in a course that was taught face-to-face, the pedagogical approach is promising also for online courses as long as proper infrastructure exists to, for example, help students if they are having trouble retrieving the data. The activities should also work in hybrid classes because the activities could be assigned in the online portion along with the pre-class preparation activities and then discussed in the face-to-face portion along with articles and more challenging parts of theory.

concludes with a summary of benefits of the active learning pedagogies (flipped classroom and team-based learning).

Data Analysis Skills

As noted in Section 1, data analysis has been highlighted as a key skill of college graduates. The in-class data analysis activities are designed to address this shortcoming. Instead of passively viewing data in the textbook or on slides prepared by the instructor, students get to actively work with the data. This builds six higher-order skills identified by Hansen (2001). The following discussion provides examples of how students improved on these skills.

The first skill is accessing existing knowledge which involves, for example, retrieving information and identifying data sources. Students significantly improved this skill. The improvement could be seen, for example, in how much guidance the students needed and how long it took them to complete the activities. For example, In-Class Activity 1 provided step-by-step instructions on downloading data including print screens. In-Class Activity 2 then omitted the print screens but still included step-by-step instructions. In-Class Activity 3 then included only brief instructions. Students also improved in identifying data sources: whereas in In-Class Activity 1 students had to take time to look for the data source, students were able to locate the sources quickly during the following activities.

The second skill is displaying command of existing knowledge. Although the vast majority of the exam questions focused on macroeconomic theory, a few questions asked about knowledge of the economic data (for example, what is the current unemployment rate, when did the last recession begin and end, etc.) Students were able to answer these questions very successfully, which is likely due to improved retention of the knowledge when working with

the data rather than passively viewing the data in a textbook or on instructor slides.

The third skill is interpreting existing knowledge where Hansen (2001) targets explaining and evaluating economic concepts and principles used, for example, in daily newspapers and weekly news magazines. There was a visible improvement on this skill. Whereas at the beginning of the semester, students had to be guided through the discussions of articles and videos to ensure that they were making connections between the classroom materials and the real world, toward the end of the semester the students were able to make these connections more independently and faster.

The fourth skill is interpreting and manipulating economic data. Students became much more proficient in tasks such as modifying the data frequency and units, converting levels into growth rates, interpreting slopes, comparing values between different periods, and breaking down data into components because the data analysis activities took place in every class meeting and the skills became more ingrained than when data activities are structured as, for example, occasional homework assignments.

The fifth and sixth skills are applying existing knowledge where Hansen (2001) focuses on an analysis of current economic problems and creating new knowledge where Hansen (2001) focuses on formulating questions that should be researched, respectively. The data analysis activities promote both of these skills. For example, In-Class Activity 25 described in Section 3.1 leads to a discussion of the Phillips curve theory and how it relates to the current monetary policy. Because students have already examined unemployment, inflation, and federal funds rate data, they grasp the current monetary policy problem and understand the need for more monetary policy research quicker than one would expect in an introductory macroeconomics course.

Students highlight this in comments such as *"We learned about the tools used in economic research through the use of it in class, for example, one instance of this being FRED."* and *"I was forced to view the government in a strictly unbiased way and strictly gather data from statistics."*

Applying Knowledge to Real-World Settings

Applying knowledge to real-world settings is considered another key skill of college graduates by academic research, employers, and students as also noted in Section 1. The in-class data analysis activities are inherently "real-world." Furthermore, they are a natural starting point for discussions about current topics. The activities often build up to a discussion of articles or videos about current events related to the data analyzed in the activity.[14] For example, after comparing Gini coefficients across countries, analyzing the U.S. Gini coefficient trend, the U.S. real median household income, and the U.S. real median household income by race in In-Class Activities 7 and 8, the In-Class Activity 8 concludes with analyzing arguments for and against income inequality based on two videos and discussing the chapter of the Economic Report of the President related to income inequality.

Students appreciate the real-world focus in comments such as *"It made me think differently about many different topics concerning our country and the world and helped me understand current events."* and *"The instructor related all of the material to current events and other topics that affect our lives, which encouraged deeper engagement with the material."*

[14]These articles and videos about current events can be assigned either as a part of mandatory pre-class preparation or in-class activities.

Digging Deeper into the Course Material and Introducing Contentious Topics

Hennessey (2014) and Weisman (2017) note that current topics that are provocative and interesting to students can be challenging for the instructor. The in-class data analysis activities provide a starting point for discussions of such contentious topics. For example, after analyzing the average unemployment rate in In-Class Activity 1, students analyze the unemployment rate by race to see the disparities in economic outcomes in In-Class Activity 2. For many students this is the first exposure to such data and different points of view. The data-based approach leads to informed and respectful discussions about topics such as economic disparities even in the first weeks of the first year in college. The data-based approach also facilitates bringing narratives of groups traditionally underrepresented in economics into an otherwise standard introductory macroeconomics curriculum. Crucially, the in-class data analysis activities do not lead to a reduction of topics; instead, they allow for digging deeper into the material by covering the topics more in-depth.

Students reflect on this in comments such as *"It challenged me in a lot of ways by making me at least listen to the other side."* and *"Professor made us really consider all sides of economic arguments. Truly one of the most thought provoking classes that I have ever taken."*

Complete Integration into the Course

Previous literature referenced in Section 1 shows how to utilize FRED and GeoFRED for several assignments or addressing specific topics. This paper extends this literature by showing how to completely integrate the data analysis activities into the course. The activities

take place during each class meeting and are the overarching structure of the class meetings. They are embedded in the sequence of tasks comprising mandatory pre-class preparation assignments, weekly individual and team assessments, data analysis activities followed by discussions of articles and videos on current events, and instructor's explanations of more challenging material.

This is reflected in comments about the overall structure of the course such as *"We learned by examining data, textbooks, articles, and videos, which often presented two different sides of an argument or issue, which really challenged my thought process."* and *"The course did challenge my thought process because I feel that we did a lot more than things we would learn in a traditional classroom setting. A lot of discussions regarding current affairs and policies which really made it easier for students to compare things we learn in class to real world."* While being completely integrated into the course, the in-class data analysis activities offer flexibility in the choice of topics, textbook, grade breakdown, flipped classroom materials, and teamwork approaches.[15]

Flipped Classroom and Team-Based Learning Benefits

Benefits of the flipped classroom and team-based learning have been documented qualitative and quantitatively by numerous studies referenced in Section 1. In addition to these advantages, this course benefits from the flipped classroom because the flipping creates time during class meetings for the data analysis activities and increases the quality of the in-class work as students come to the class meeting familiar with basic concepts and definitions. Students note this in comments such as *"Watching videos on the new material prior to discussing it*

[15]While this course utilized the team-based learning, the in-class data analysis activities could be implemented in other types of teamwork such as think-pair-share.

in class was helpful."

The team-based learning also brings multiple benefits in addition to those documented by the previous studies. Students help each other with the in-class data analysis activities, preventing students less experienced with data analysis from falling behind. A team discussion is generated because students submit only one set of answers for the whole team; this builds team skills such as realizing that the loudest person does not always have the best answers. Students with lower academic performance benefit from participating in the team discussions.[16] Students with a tendency to not prepare for class meetings become more diligent as they do not want to be the one student who contributes wrong answers every week. Because team members are required to take turns in sharing their team findings with the whole class, all students participate, which builds communication skills also for students who may otherwise hesitate to speak up. Students are also likelier to ask the instructor for clarification as a team than as individuals because the lack of understanding is not an isolating experience when multiple team members need the clarification. Overall, the team-based learning strengthens team collaboration, another skill highlighted as critical (for example, Chang 2018; Hart Research Associates 2013). Students acknowledge this in comments such as *"Team activities made it even more engaging and fostered a friendly class environment making it easy to ask for help."* These benefits described based on in-class observations and and supported by student feedback are consistent with previous literature such as Michaelsen and Sweet (2008) noting that instructors have observed the team-based-learning leading to at-risk students staying on track perhaps due to the increased social support.

[16]The average team assessment score was seven percentage points higher than the average individual assessment score, which agrees with Odell (2018) who finds that the team-based learning pedagogy shifts the course grade distribution in the direction of higher grades.

4.3 Lessons Learned

Section 4.2 showed that student feedback was overwhelmingly positive. This section shares some of the learning from the experience of implementing the pedagogical approach. First, because time needs to be created during class meetings for the data analysis activities, it is useful to take advantage of pedagogies that create this time. In this course, the two pedagogies were the flipped classroom and team-based learning. In the flipped classroom, it is useful to take advantage of findings from the literature on the flipped classroom such as focusing the pre-class preparation assignments on basic definitions and concepts and setting realistic expectations for the length of these assignments. In the team-based learning, it is again useful to take advantage of findings from the literature on team-based learning such as ensuring that teams are diverse along dimensions important for the course.

Second, during the in-class activities it is useful for the instructor to occasionally bring the class together, so that the teams can share answers with each other and the instructor can provide explanations for more challenging parts of the material. Third, it is also useful to require that students take turns in sharing their answers with the class, so that all students participate. Fourth, because the in-class team activities take place during every class meeting, it is important that the activities be set up to allow efficient grading.

5 Conclusion

Previous literature has shown that the flipped classroom transfers some tasks traditionally carried out during class time such as covering basic definitions and concepts to mandatory pre-class preparation to create time during class meetings for more value-adding activities.

This paper shows that in an introductory macroeconomics course this newly gained in-class time can be effectively utilized for data analysis activities. These activities take advantage of free, publicly available data such as the FRED database and the GeoFRED mapping tool. While previous literature has shown how to use these resources in intermediate and advanced macroeconomics courses, this paper shows that utilizing the resources is feasible even in introductory macroeconomics. Students benefit by gaining data analysis skills, applying knowledge to real-world settings, digging deeper into the material and contentious topics, and active learning that results from integrating the data analysis into the flipped classroom and team-based learning. For some students the introductory macroeconomics course is the only economics course that they will take while other students will continue to become economics minors or majors. The pedagogical innovation in introductory macroeconomics described in this paper is useful for both groups of students either in gaining a more in-depth understanding of current events and becoming more knowledgeable voters or in acquiring a solid foundation for the next course in the macroeconomics sequence.

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00220485.2018.1438860.

Appendix:
In-Class Data Analysis Activities 1, 2, 4, 7, 8, and 25 Including Student Learning Outcomes

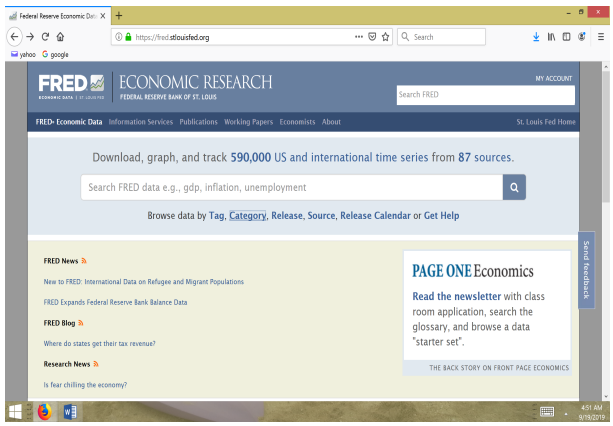
In-Class Activity 1
Unemployment Rate

Student learning outcome is learning:

1. How to extract the unemployment rate data from FRED and interpret it

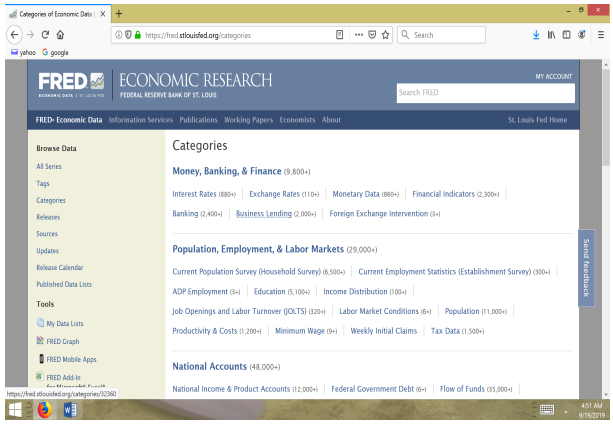
Steps:

1. How to extract the unemployment rate data from FRED and interpret it:
   i) Go to `fred.stlouisfed.org`. You will get:



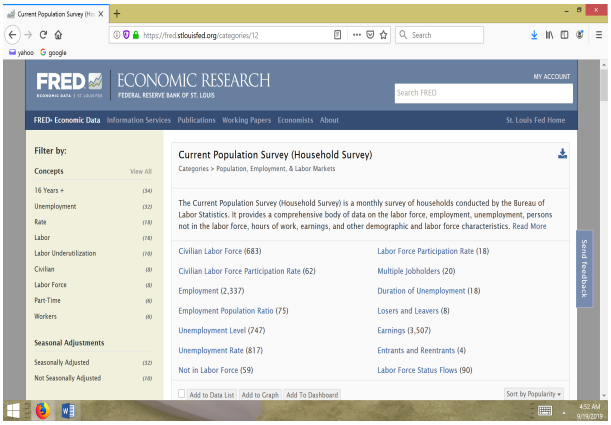
   Notice how many data series and sources there are!

   ii) Click on *Category*. You will get:

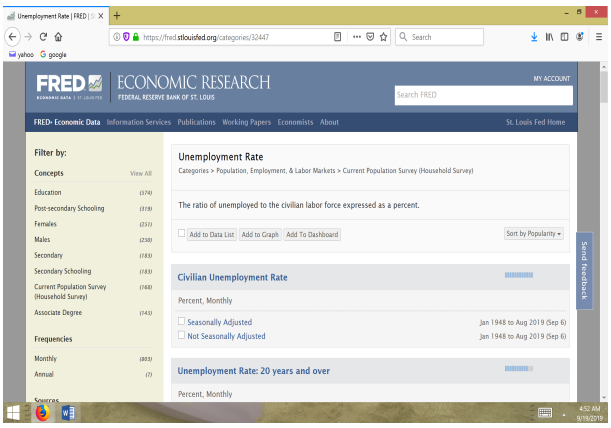


   Notice that the numbers in parentheses indicate how many data series are in these categories.

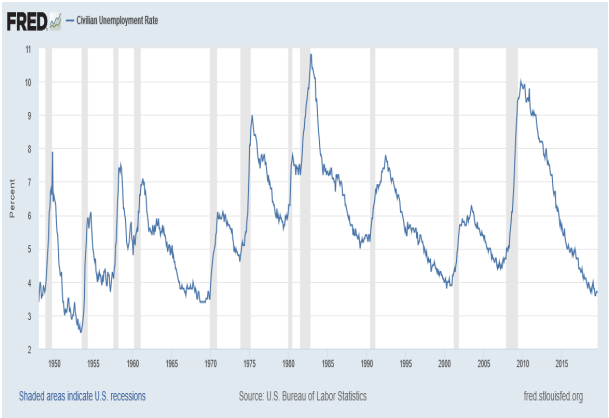
   iii) Click on *Current Population Survey*. You will get:



iv) Click on *Unemployment Rate*. You will get:



v) We will learn later in the semester what is the difference between seasonally adjusted vs. not seasonally adjusted data. For now, let's use seasonally adjusted data. Click on it, and you will get the unemployment rate graph:



vi) Notice:
- Above the graph, the ticker is displayed. In this case, it is UNRATE. This is a "nickname" for this data series.
- Above the graph, the last available data point is shown under *Observation*.
- Below the graph in the middle you can see the data source.
- Notice the gray bars. We will learn later in the semester what they mean.

- Try changing the time period using arrows below the graph or date boxes above the graph.
- Notice that the value is displayed when your cursor is over the data series.
- The *Notes* section shows data description.

vii) Notice the *Suggested Citation* located below Notes, which is helpful if you write a paper using this data.

vii) There are several helpful features in the *Edit Graph* tab:
- Under *Format*, you can edit the graph by changing the font, colors, etc.
- Under *Edit Line*, you can edit the data series. Notice that you can choose the data frequency such as monthly, quarterly, etc. Notice that you can change the units.

viii) The *Download* tab allows you to export the data in various formats. You can download the graph by clicking on *Image (graph)* and save it. You can also export the data into Excel.

ix) Answer Questions 1 through 5.

QUESTIONS

1. What is the source of this unemployment rate data?
   a) Congressional Budget Office (CBO)
   b) Census Bureau
   c) Bureau of Economic Analysis (BEA) in the Department of Commerce
   d) Bureau of Labor Statistics (BLS) in the Department of Labor
2. How frequently is this data collected?
   a) Monthly
   b) Quarterly
   c) Annually
   d) Weekly
3. What is the most recent value?
   a) 0%
   b) 1%
   c) 2%
   d) 3.7%
4. What is the highest value in the last two decades? In which month/year did it occur?
   a) 10% in October of 2009
   b) 10% in June of 2007
   c) 5% in October of 2009
   d) 5% in June of 2007

5. How does the highest value that you found in Question 4 compare to the post-World War II era?
   a) The unemployment rate has always been higher than the value from Question 4.
   b) The unemployment rate has often been higher than the value from Question 4.
   c) The unemployment rate has never been higher than the value in Question 4.
   d) There has been only one period when the unemployment rate was higher than the value in Question 4.

In-Class Activity 2
Digging Deeper into Unemployment Rate and Learning about Labor Force Participation Rate

Student learning outcomes are learning:

1. How to create maps of the unemployment rate by state and county from GeoFRED
2. How to extract the unemployment rate by race from FRED
3. How to extract the labor force participation rate from FRED and interpret it

Steps:

1. How to create maps of the unemployment rate by state and county from GeoFRED
   i) Go to `geofred.stlouisfed.org`.
   ii) Click on *Build New Map* in top right corner.
   iii) Click on *Tools* in top left corner.
   iv) Under *Region*, select *State*.
   v) Under *Data*, type "unemployment rate" in the search box.
   vi) Under *Frequency*, select "Monthly".
   vii) Under *Month*, select the month that you identified as the month with the highest unemployment rate in the last two decades in In-Class Activity 1.
   viii) Notice that you can change colors, etc. and save the graph.
   ix) Answer Questions 1 and 2.
   x) Create the same graph on county level.
   xi) Answer Questions 3 and 4. *Stop here, so that we can discuss Questions 1 through 4 with the whole class.*
2. How to extract the unemployment rate by race from FRED
   i) In FRED, search for "Unemployment Rate Asian." Use Not Seasonally Adjusted data.
   ii) Click on *Edit graph* in top right corner.
   iii) Click on *Add line* (top middle button), type in "Unemployment Rate Black or African American", and click on *Add data series* below it.
   iv) Similarly, add "Unemployment Rate Hispanic or Latino".
   v) Similarly, add "Unemployment Rate White".
   vi) Answer Question 5. *Stop here, so that we can discuss Question 5 with the whole class.*
3. How to extract the labor force participation rate from FRED and interpret it:
   i) Go through the same steps that we took in In-Class Activity 1 to extract the unemployment rate or type "Civilian Labor Force Participation Rate" in the search box in the top right corner.
   ii) Answer Questions 6 through 9.

When you are finished, discuss with your team the questions about the article "In North Dakota's oil patch, a humbling comedown" as of May 18, 2016 that was assigned as a part of the pre-class preparation for today.

QUESTIONS

1. In In-Class Activity 1, you found the month that had the highest unemployment rate in the last two decades. Which state had the highest unemployment rate in that month?
   a) Texas
   b) Alabama
   c) Mississippi
   d) Nevada
   e) Michigan
2. Which state had the lowest unemployment rate in that month?
   a) Texas
   b) Massachusetts
   c) North Dakota
   d) Oklahoma
   e) New York
3. What was the unemployment rate in XYZ County in that month? *(Note: The county in which our educational institution is located was used. This county is de-identified for the peer-review process.)*
   a) 0%
   b) 3.3%
   c) 4.3%
   d) 5.3%
   e) 6.3%
4. What was the unemployment rate in Imperial County (CA) in that month?
   a) 29.5%
   b) 19.5%
   c) 9.5%
   d) 5.5%
   e) 0%
5. For that month, what was the difference between the lowest unemployment rate of these four demographic groups and the highest unemployment rate of these four demographic groups?
   a) 0%
   b) 1%
   c) 7.5%
   d) 7.8%
   e) 15.3%
6. What is the most recent value of the labor force participation rate?
   a) Approx. 50%
   b) Approx. 55%
   c) Approx. 63%
   d) Approx. 90%
   e) 100%
7. What was the trend since World War II until 1990s?
   a) Downward trend

   b) Upward trend
   c) No change
8. What has been the trend since approximately 2000?
   a) No change
   b) Upward trend
   c) Downward trend
9. A decrease in the unemployment rate is always a good thing.
   a) False
   b) True

In-Class Activity 4
Gross Domestic Product (GDP) and GDP per Capita: Examples of India, Costa Rica, and Other Countries

Student learning outcomes are learning:

1. How to extract GDP data from FRED and interpret it on an example of India and Costa Rica
2. How to extract GDP per capita data from FRED and interpret it on an example of India and Costa Rica
3. What variables are correlated with GDP per capita using the Gapminder website

Steps:

1. How to extract GDP data from FRED and interpret it on an example of India and Costa Rica:
   i) In FRED, search for "GDP India" and select "Real GDP at Constant National Prices for India."
   ii) Click on *Edit Graph*. Click on *Add Line* and type in "GDP Costa Rica" and select "Real GDP at Constant National Prices for Costa Rica".
   iii) Observe that both series are in the same units (Millions of U.S. dollars), so we can plot them on the same graph.
   iv) Answer Question 1.
2. How to extract GDP per capita data from FRED and interpret it on an example of India and Costa Rica:
   i) In FRED, search for "GDP per capita India" and select "Constant GDP per capita for India."
   ii) Click on *Edit Graph*. Click on *Add Line* and type in "GDP per capita Costa Rica" and select "Constant GDP per capita for Costa Rica"
   iii) Observe that both series are in the same units (U.S. dollars), so we can plot them on the same graph.
   iv) Answer Question 2. *Stop here, so that we can discuss Questions 1 and 2 with the whole class.*
3. What variables are correlated with GDP per capita using the Gapminder website:
   i) Go to `www.gapminder.org`
   ii) Click on GAPMINDER TOOLS on the top bar.
   iii) Notice that each bubble represents a country. Bubbles are color-coded based on continents in the top right corner. The larger the bubble, the larger the country. If you want to see a particular country, check the country name in the right bar.
   iv) On the horizontal axis, select "Income per person."
   v) On the vertical axis, select "Life expectancy."
   vi) Answer Questions 3 and 4.
   vii) On the vertical axis, change the variable to "Child mortality rate."
   viii) Answer Questions 5 and 6.
   ix) Find another interesting relationship that you can share with the class.

QUESTIONS

1. Compare 2014 GDP of India and Costa Rica:
   a) GDP of India is approximately 5 times smaller than that of Costa Rica.
   b) GDP of India is about the same as that of Costa Rica.
   c) GDP of India is approximately 5 times larger than that of Costa Rica.
   d) GDP of India is more than 100 times larger than that of Costa Rica.
2. Compare 2016 GDP per capita of India and Costa Rica:
   a) GDP per capita of Costa Rica is approximately 5 times smaller than that of India.
   b) GDP per capita of Costa Rica is about the same as that of India.
   c) GDP per capita of Costa Rica is approximately 5 times larger than that of India.
   d) GDP per capita of Costa Rica is more than 100 times larger than that of India.
3. The relationship between income per person and life expectancy is:
   a) The higher the income per person, the lower the life expectancy.
   b) The higher the income per person, the higher the life expectancy.
   c) There is no relationship between income per person and life expectancy.
4. The lowest life expectancy among all countries is:
   a) Approximately 70 years
   b) Approximately 60 years
   c) Less than 50 years
5. The relationship between income per person and child mortality rate is:
   a) The higher the income per person, the lower the child mortality rate.
   b) The higher the income per person, the higher the child mortality rate.
   c) There is no relationship between income per person and child mortality rate.
6. The highest child mortality rate among all countries is:
   a) 500 deaths per 1,000 births
   b) 160 deaths per 1,000 births
   c) 60 deaths per 1,000 births
   d) 6 deaths per 1,000 births
   2) 2 deaths per 1,000 births

In-Class Activity 7
Measuring Income Inequality: The Gini Coefficient

Student learning outcomes are learning:

1. Where the United States falls in the ranking of countries based on the Gini coefficient using the Central Intelligence Agency (CIA) data
2. How has income inequality changed in the United States in the last fifty years based on the Gini coefficient using data in the FRED database

Steps:

1. Where the United States falls in the ranking of countries based on the Gini coefficient using the Central Intelligence Agency (CIA) data:
   i) Find the Gini coefficient data on the Central Intelligence Agency (CIA) website. You can either Google "cia gini coefficient data" or go to `https://www.cia.gov/library/publications/the-world-factbook/rankorder/2172rank.html`. Note that this data has a limitation: the date of information varies across countries.
   ii) Give an example of a country that has high income inequality.
   iii) Give an example of a country that has low income inequality.
   iv) Answer Question 1.
2. How has income inequality changed in the United States in the last fifty years based on the Gini coefficient using data in the FRED database:
   i) In the FRED database, find "Income Gini Ratio for Households by Race of Householder, All Races". Note a small discrepancy between the CIA data that we used to answer Question 1 and this FRED data: The CIA shows Gini coefficient of 45 for 2007 whereas the FRED database shows 46.3.
   ii) Answer Question 2.

QUESTIONS

1. Where does the Unites States fall in the ranking of countries based on the Gini coefficient on the CIA website?
   a) The United States is approximately among 25% of countries with the highest income inequality.
   b) The United States is around the median (i.e., in the middle) in the ranking of countries based on income inequality.
   c) The United States is approximately among 25% of countries with the lowest income inequality.
2. What has happened to income inequality measured by the Gini coefficient in the United States over the past fifty years?
   a) Income inequality has not changed.
   b) Income inequality has increased.
   c) Income inequality has decreased.

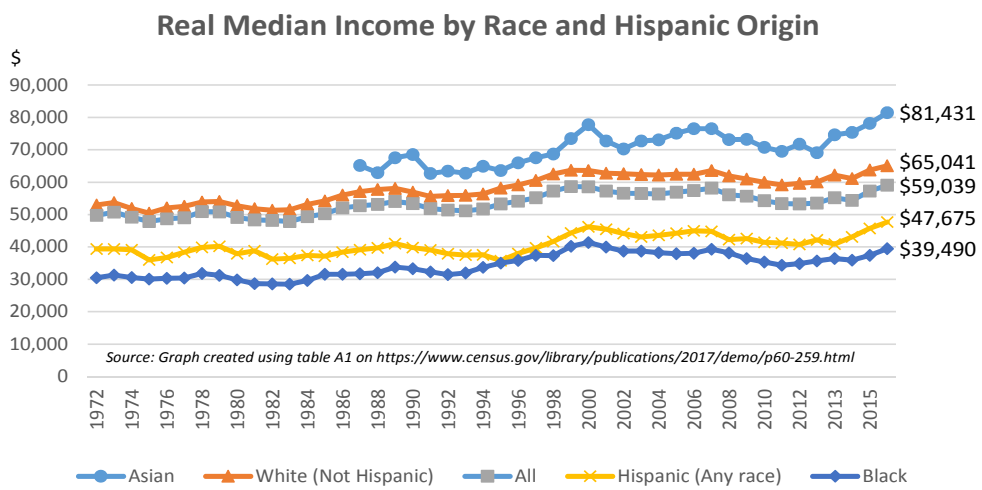
In-Class Activity 8
Income Inequality in More Detail

Student learning outcomes are learning:

1. About income inequality measured by percentiles of household income
2. What are the arguments for and against income inequality
3. About the Economic Report of the President

Steps:

1. About income inequality measured by percentiles of household income:
   i) In FRED, find "Real Median Household Income in the United States." Answer Questions 1 and 2.
   ii) What do you think about how the real median household income has evolved over the last thirty years? Has it increased, decreased or stayed the same? If you conclude that it has changed, has it changed a lot in your opinion? *Stop here, so that we can discuss this and Questions 1 and 2 with the whole class.*
   iii) Look at the below graph showing real median household income by race. Answer Questions 3 and 4.



2. What are the arguments for and against income inequality:
   i) Discuss at least three arguments in the video by John Tamny (Political Economy Editor at Forbes) arguing that income inequality is good: `www.youtube.com/watch?v=1e35Vf-9n8E`. Discuss at least three concerns about income inequality from the article by Laura Tyson (a former chair of the U.S. President's Council of Economic Advisers).
3. About the Economic Report of the President:
   i) Find the Economic Report of the President as of January 2017 by googling it or at `obamawhitehouse.archives.gov/administration/eop/cea/economic-report-of-the-President/2017`. Find Chapter 3 Progress Reducing Inequality. Find some concept/variable that we have already covered. Find one other thing that interested you.

QUESTIONS

1. What is the source of the U.S. real median household income data?
   a) Congressional Budget Office (CBO)
   b) Census Bureau
   c) Bureau of Economic Analysis (BEA) in the Department of Commerce
   d) Bureau of Labor Statistics (BLS) in the Department of Labor
2. The current value of the U.S. real median household income is:
   a) $263,000
   b) $163,000
   c) $63,000
   d) $23,000
3. In the graph showing real median household income by race, which line corresponds to the real median household income that you found in FRED?
   a) Dark blue line with diamonds
   b) Yellow line with $\times$
   c) Grey line with squares
   d) Orange line with triangles
4. In which variable have we already seen disparities by race similar to the real median income?
   a) Unemployment rate
   b) Consumption
   c) Investment

In-Class Activity 25
The Great Recession and Its Aftermath

Student learning outcomes are learning:

1. Monetary policy before the Great Recession
2. What happened to home prices before, during, and after the Great Recession
3. What happened in the stock market before, during, and after the Great Recession
4. Monetary policy during the Great Recession
5. Inflation

Steps:

1. Monetary policy before the Great Recession:
   i) In FRED, find the effective federal funds rate. Use the monthly frequency. Answer Question 1. *Stop here, so that we can discuss this question with the whole class.*
2. What happened to home prices before, during, and after the Great Recession:
   i) In FRED, find home prices. The variable is called "SP Case-Shiller U.S. National Home Price Index". Answer Question 2. *Stop here, so that we can discuss this question with the whole class.*
3. What happened in the stock market before, during, and after the Great Recession:
   i) In FRED, find a stock market index. For example, you can use the "NASDAQ Composite Index" variable. Answer Question 3. *Stop here, so that we can discuss this question with the whole class.*
4. Monetary policy during the Great Recession:
   i) In FRED, look at the effective federal funds rate that you found in Step 1. Answer Question 4. *Stop here, so that we can discuss this question with the whole class.*
5. Inflation:
   i) In FRED, find the inflation data. Use the "Consumer Price Index: Total All Items for the United States" variable. Choose "Index 2010=1, Monthly, Seasonally Adjusted". Click on "EDIT GRAPH". Under Units, choose "Percent Change from Year Ago". Answer Questions 5 and 6.
   ii) Read *The Economist* article "The Phillips curve may be broken for good" from November 1, 2017.
      - What does the Phillips curve theory tells us about the relationship between the unemployment rate and the inflation rate?
      - Does this relationship currently hold?

QUESTIONS

1. The federal funds rate was:
   a) Decreased during the dot-com recession but increased immediately after the recession.
   b) Decreased during the dot-com recession and continued to decrease for a couple of years after the recession.
   c) Decreased during the dot-com recession and stayed the same after the recession.
   d) Increased during the dot-com recession.
2. The home prices, measured by the SP Case-Shiller U.S. National Home Price Index:
   a) Stayed about the same during the Great Recession.
   b) Decreased during the Great Recession but started increasing immediately after the end of the recession and recovered to their pre-recession levels shortly after the end of the recession.
   c) Decreased during the Great Recession, continued to decrease for another couple of years after the recession and still have not recovered to their pre-recession levels.
   d) Decreased during the Great Recession, continued to decrease for a couple of years after the recession and have since then recovered to their pre-recession levels.
3. The stock market:
   a) Decreased during the Great Recession and still has not recovered to the pre-recession level.
   b) Decreased during the Great Recession and has since then surpassed the pre-recession level.
   c) Stayed about the same during the Great Recession.
   d) Increased during the Great Recession.
4. The federal funds rate:
   a) Decreased during the first half of the Great Recession but started increasing during the second half of the recession.
   b) Decreased during the Great Recession to near zero but it has now recovered to pre-recession levels.
   c) Decreased during the Great Recession to near zero. The rate is still at zero.
   d) Decreased during the Great Recession to near zero. In the last couple of years, it started increasing. The current value is a little over 1%.
5. In which period was the inflation rate the highest:
   a) The mid-1970s to the early 1980s.
   b) The late 1980s to the early 1990s.
   c) The late 1990s.
   d) Since 2000.
6. Since the Fed announced its target of 2% inflation rate in 2012:
   a) The inflation rate has always been below this target.
   b) The inflation rate has been below this target most of the time.
   c) The inflation rate has been above this target most of the time.
   d) The inflation rate has always been above this target.

Supplemental Materials:
In-Class Data Analysis Activities 3, 5, and 6
Including Student Learning Outcomes

In-Class Activity 3
"Natural Rate of Unemployment"

Student learning outcomes are learning:

1. What is the "natural rate of unemployment"
2. About the timing of unemployment rate peaks in relation to recessions

Steps:

1. What is the "natural rate of unemployment"
   i) In FRED, plot the unemployment rate that you plotted in In-Class Activity 1. Use the seasonally adjusted unemployment rate.
   ii) Add a line for the "Natural Rate of Unemployment (Long Run)"
   iii) Answer Questions 1-2.
   iv) What is an example of a period that had an unemployment rate higher than the "natural rate of unemployment"?
   v) What is an example of a period that had an unemployment rate lower than the "natural rate of unemployment"?
2. About the timing of unemployment rate peaks in relation to recessions
   i) Answer Question 3.

QUESTIONS

1. What was the "natural rate of unemployment" in the second quarter of 2017?
   a) 4.10%
   b) 5.08%
   c) 4.55%
   d) 4.62%
2. Is the unemployment rate currently above or below the "natural rate of unemployment"?
   a) Above
   b) Below
3. The shaded bars in the graph denote recessions. We will define recessions in In-Class Activity 5 in more detail. For now, let's say that recessions are periods of economic decline. Observe the timing of the unemployment rate peaks in relation to the recessions. Which statement is correct?
   a) The unemployment rate rate tends to peak before recessions.
   b) The unemployment rate rate tends to peak during recessions.
   c) The unemployment rate rate tends to peak after recessions.

In-Class Activity 5
GDP Growth Rate: The Long-Run Trend and Variations around the Business Cycles

Student learning outcomes are learning:

1. How to extract GDP growth rate data from FRED and interpret it
2. What variables are sometimes used to predict the business cycle and how difficult it is to make accurate predictions

Steps:

1. How to extract GDP growth rate data from FRED and interpret it:
   - i) In FRED, click on *Category*. Under *National Accounts*, click on *National Income and Product Accounts*. Click on *GDP/GNP*. Select "Real gross domestic product per capita." This data is for the U.S. Notice that the variable is in dollars, i.e., not thousands of dollars or millions of dollars.
   - ii) Answer Questions 1-5.
   - iii) Click on *Edit Graph*. Under *Units*, select "Percent Change from Year Ago." Notice that the vertical axis now shows %, so we are looking at the GDP per capita growth rate.
   - iv) Answer Questions 6-7.
   - vii) Click on *Download* in the top right corner and select "Excel (data)", which will download the data into Excel. *Useful tip: In Excel, highlight the numbers for all the quarters that you are analyzing, and you will see the average in the bottom right corner of your screen.*
   - viii) Answer Question 8.
   - ix) Give an example of a period when the GDP growth rate was negative. What was happening in that period?
   - x) Consider the period of recovery from the most recent recession. Was the recovery smooth based on the GDP per capita? Consider the unemployment rate that we discussed in previous class meetings. Was the recovery smooth based on the unemployment rate?
   - xi) The National Bureau of Economic Research (NBER) decides when recessions begin and end. Per NBER, the most recent recession started in December 2007 and ended in June 2009. Do you agree with this timing? Why or why not? *Stop here, so that we can discuss this with the whole class.*
2. What variables are sometimes used to predict the business cycle and how difficult it is to make accurate predictions:
   - i) In FRED, search for "Chicago Fed National Activity Index" which combines 85 variables related to business activity. Zero value means that the economy is growing at the historical trend growth rate. Values below zero mean that the economy is growing at a rate below the historical trend growth rate. Values above zero mean that the economy is growing at a rate above the historical trend growth rate. What is your prediction for the upcoming months? Is the U.S. economy going to be in a boom or a recession?

QUESTIONS

1. What is the source of this GDP data?
   a) Congressional Budget Office (CBO)
   b) Census Bureau
   c) Bureau of Economic Analysis (BEA) in the Department of Commerce
   d) Bureau of Labor Statistics (BLS) in the Department of Labor
2. How frequently is the GDP data collected?
   a) Annually
   b) Weekly
   c) Monthly
   d) Quarterly
3. What is the most recent value of GDP per capita?
   a) Approximately $580,000
   b) Approximately $100,000
   c) Approximately $5,800
   d) Approximately $58,000
4. How does this value compare to GDP per capita in 1947 Quarter 1?
   a) The most recent value is about the same as that of 1947 Quarter 1.
   b) The most recent value is about two times larger than that of 1947 Quarter 1.
   c) The most recent value is about four times larger than that of 1947 Quarter 1.
   d) The most recent value is about four times smaller than that of 1947 Quarter 1.
5. What is the trend in the GDP per capita?
   a) The GDP per capita is always decreasing.
   b) The GDP per capita is always increasing.
   c) The GDP per capita is increasing but has ups and downs.
   d) The GDP per capita is about the same in all periods.
6. The GDP per capita <u>growth rate</u> is:
   a) Usually positive and sometimes negative
   b) Always positive
   c) Always negative
   d) Usually zero
7. The most recent GDP per capita growth rate is:
   a) -2.7%
   b) -1.7%
   c) 0%
   d) 0.7%
   e) 1.7%
8. The average GDP per capita growth rate since 1990 Quarter 1 (i.e., in the last three decades or so) is:
   a) 0%
   b) 1.5%
   c) 2.5%
   d) 3.5%
   e) 4.5%

In-Class Activity 6
Expenditure Approach to GDP: Four Components

Student learning outcomes are learning:

1. How to extract four components of GDP from FRED and interpret them
2. How volatile the consumption and investment components are relative to GDP

Steps:

1. How to extract four components of GDP from FRED and interpret them
   i) In FRED, search for "real personal consumption expenditures." Click on "Billions of Chained 2009 Dollars, Quarterly, Seasonally Adjusted Annual Rate". This represents "Consumption, C."
   ii) Click on *Edit Graph*. Click on *Add Line*. Type in "real government consumption expenditures and gross investment." Select "Quarterly, Billions of Chained dollars, Seasonally Adjusted Annual Rate". Click on *Add data series*. This represents "Government, G."
   iii) Click on *Add Line*. Type in "real gross private domestic investment." Select "Quarterly, Billions of Chained dollars, Seasonally Adjusted Annual Rate". Click on *Add data series*. This represents "Investment, I."
   iv) Click on *Add Line*. Type in "real exports of goods and services." Select "Quarterly, Billions of Chained dollars, Seasonally Adjusted Annual Rate". Click on *Add data series*. This represents "Exports, X."
   v) Now, we need to subtract Imports from Exports to get Net Exports. Under *Edit Line*, find the box *You can begin by adding a series to combine with your existing series* and type in "real imports of goods and services." Select "Quarterly, Billions of Chained dollars, Seasonally Adjusted Annual Rate". Click on *Add*. In the *Formula* box, type in: *a-b*. This will subtract the two variables. Click *Apply*.
   vi) Click on *Format*. Under *Graph type*, change from *Line* to *Area*. This will fill in the colors of the four components.
   vii) Let's stack them up on top of each other. Under *Stacking*, choose *Normal*. Notice that the four components are now on top of each other, so that they add up to the total of about $18 trillion GDP.
   viii) Answer Questions 1-2.
2. How volatile the consumption and investment components are relative to GDP
   i) In FRED, search for "real GDP". Select "Billions of Chained dollars, Quarterly, Seasonally Adjusted Annual Rate". This represents "Output, Y."
   ii) Under *Units*, select *Percent Change from Year Ago*, so that we can see the growth rate.
   iii) Click on *Add Line*. Type in "real personal consumption expenditures." Select "Quarterly, Billions of Chained dollars, Seasonally Adjusted Annual Rate". Click on *Add data series*. This represents "Consumption, C." Notice the vertical scale (i.e., what is the range of negative to positive values of the growth rate.)
   iv) Answer Question 3.

v) Click on *Add Line*. Type in 'real gross private domestic investment." Select "Quarterly, Billions of Chained dollars, Seasonally Adjusted Annual Rate". Click on *Add data series*. This represents "Investment, I." Notice how the vertical scale changed.

vi) Answer Question 4.

QUESTIONS

1. Which component of GDP is the largest? What % of GDP does it comprise?
   a) Personal Consumption Expenditures
   b) Gross Private Domestic Investment
   c) Government Spending
   d) Net Exports
2. Are the Net Exports positive or negative? What does this tell us?
   a) Net Exports are positive which means that Exports are higher than Imports
   b) Net Exports are positive which means that Exports are lower than Imports
   c) Net Exports are negative which means that Exports are higher than Imports
   d) Net Exports are negative which means that Exports are lower than Imports
3. Observe what happened to GDP in the recent recession. Observe what happened to consumption. How do the changes in these two variables compare? Think of a possible explanation.
4. Observe what happened to investment. How do the changes in investment compare to the changes in consumption and GDP? Think of a possible explanation.