

# USING THE FEDERAL RESERVE BANK OF SAN FRANCISCO'S ONLINE FED CHAIRMAN GAME IN THE CLASSROOM

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## ABSTRACT

We describe the interactive Fed Chairman Game available on the Federal Reserve Bank of San Francisco's website. We discuss how the game can be used in principles of macroeconomics and provide an assignment to go along with it. Also, we discuss an assignment that can be used to adapt the game for an upper division course such as intermediate macroeconomics or money and banking, using Microsoft Excel. The game is a type of active learning.

## INTRODUCTION

"So you want to be in charge of monetary policy?" asks the introductory screen of the Federal Reserve Bank of San Francisco's "[Fed Chairman Game](#)". The game is part of their website's educational resources section (Federal Reserve Bank of San Francisco, n.a). One of the challenges in any course is providing clear explanations of complex topics in an informative and memorable way. We demonstrate how this game can be used to accomplish that in discussing monetary policy and its effects over the business cycle in an aggregate demand and aggregate supply model. We also provide sample assignments for two different courses: principles of macroeconomics and an upper-division macroeconomics course such as intermediate macroeconomics or money and banking. For the latter, the assignment is part of a web-based assignment that requires students to use Microsoft Excel.

Using an online simulation and corresponding assignments we describe here is an example of active learning. Along with examples, Salemi (2002) provides a summary of the benefits of active learning in the classroom. While the content of a course may be more important than the delivery (Colander, 2004), the fact that students have heterogeneous learning styles suggests that a varied delivery of teaching material is more likely to improve student interest and performance in a course (Lage, Platt, and Treglia, 2000). As many economics courses are still dominated by a standard lecture format (Becker and Watts, 2001), active learning represents an attractive way to add variety and appeal to those varied learning styles. Simkins (1999) and Schmidt (2003) discuss the specific use of web-based resources and simulations as an active learning tool. Millerd and Robertson (1987) provide evidence of the benefits of computer simulation in intermediate macroeconomics.

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Before we continue, it is useful to note that the Federal Reserve Bank of San Francisco has [another simulation](#) available on line. It involves working with the Federal Reserve to prepare and then execute a half-day symposium where students serve as Federal Open Market Committee (FOMC) members and conduct an FOMC meeting simulation (Federal Reserve Bank of San Francisco, n.a). A similar but less intensive version can be found at the Federal Reserve Bank of New York's website, with a direct link<sup>1</sup> (Federal Reserve Bank of New York, n.a.). Simkins (1999) discusses a similar FOMC simulation. The relative advantage of these more involved simulations is that students are more immersed in the role-playing scenario and are required to process more information. This increases the likelihood of moving further up the taxonomy of deeper understanding described in Bloom, Engelhart, Furst, Hill and Krathwohl (1956). The main drawback is the time commitment involved, as these simulations become a focal point for a course. In contrast, the simulation we are discussing, while relatively simpler in comparison, only consumes one class period and/or one homework assignment. A further benefit is that the simulation we discuss provides dynamic feedback as the students receive the result of their policy choice and then have to make additional choices whereas the more involved simulations only require making a one-time policy choice. The main drawback to the simulation we discuss is that there is far less information for the students to base their decisions on than in the more involved simulations provide.

### FED CHAIRMAN GAME

In order to use the game in the classroom, access to a computer with the capability to play flash video, an Internet connection, and the ability to project the screen to students are required. The initial screen from the link in Section 1 has a "Click Screen to Begin" area. Clicking on that takes you to another introductory page that gives you a brief statement that the player will be in charge of monetary policy. There are two clickable links: "Begin Game" and "Learn More". Clicking "Learn More" takes the player to another part of the site where information about how monetary policy works and how it affects the economy is available. That information is general and no more or less relatable to the game than a similar description from a principles textbook. Thus an instructor may simply assign students the relevant chapter(s) on monetary policy and if desired aggregate demand and aggregate supply prior to the day the game will be played in class. The "Play Game" link takes you to the page where the game is played. There is a brief explanation of how the game works and also the initial information needed to make the first move.

The game itself is simple. The player is Fed Chairman and has control over the federal funds rate (which is initially set at 4.5%). The Fed Chairman serves for 16 quarters (4-year term) and each quarter the player is able to change the federal funds rate (or keep it the same). The objective is to keep the unemployment rate and the inflation rate as close to the natural rate of unemployment (5%) and the target level of inflation (2%) as possible by setting the federal funds rate. The left hand side of the page

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<sup>1</sup> <http://www.newyorkfed.org/education/fomcsim.html>

gives a brief explanation of how the federal funds rate affects those two variables (raising the funds rate pushes up unemployment and pushes down inflation).

A brief description of the page layout (the page from clicking “Play Game”) and initial information follows. The screen can be viewed as broken into four columns from left to right. On the left side is the description of the game objective. In the next column is a “dial” for the federal funds rate (set at 4.5% initially). There are clickable plus and minus buttons below the dial that allow the player to increase or decrease the federal funds rate in 25 basis point increments. Below that is a “Go” button, which is clicked once the federal funds rate is set and the player wants to advance the game one-quarter (one turn). Finally there is a “Start Over” button if you want to re-start the game. The next column has two pieces of information. First, there is a newspaper with a headline. The headline provides the player with information about events taking place in the economy and how the player’s changes to the federal funds rate are affecting the economy. The initial headline in the game is the same every time, “Fed Chair Appointed; Inflation rising; Fed expected to raise rates”. Below that headline is a graph. The graph plots the federal funds rate (green line), unemployment rate (blue line), and the inflation rate (red line) as they change during the course of the game. The graph also shows the natural rate of unemployment (blue dotted line) and the targeted inflation rate (red dotted line). This graph is especially useful to students as it visually illustrates how their policies affect the economy with a lag as they play the game. The final column gives numerical information. The number of quarters remaining (16), the federal funds rate (4.5%), the unemployment rate (4.75%), and inflation rate (2.14%). These initial values are the same every time the game is played.

The ongoing game play is straightforward. A player picks a federal funds rate, clicks “Go” and watches as the unemployment rate and inflation rate change due to the decision as well as outside events in the economy. The player then receives a new newspaper headline, and repeats the process until their term as Chairman is over. The final headline either declares the player’s reappointment or dismissal as Fed Chair.

To illustrate the game further, we provide an example of the game play. To do that, we need to explain the timing convention we’ve adopted. There are a couple of options and we’ve chosen what we believe is the easiest for students to understand. At the start of time “t”, the player sets the change in the federal funds rate. Then at the end of time “t”, the news headline, the inflation rate, and unemployment rate are revealed. This means at the start of the game, the player observes the federal funds rate (4.5%), unemployment rate (4.75%), and inflation rate (2.14%) from the previous period. This convention means that the decision at time t is based on information from time t-1 and as a practical matter makes entry into a spreadsheet marginally easier for students.

Table 1 shows the results from one completed game. The columns show the quarters remaining in the game, the federal funds rate, unemployment rate, inflation rate, and the newspaper headline given. As mentioned before the initial information provided is always the same at the start of the game. Also, in every game, with 12 quarters remaining a “shock” hits the economy that the player must contend with. The

**TABLE 1**  
**FED CHAIRMAN GAME EXAMPLE**

Quarters Remaining	Federal Funds Rate	Unemployment Rate	Inflation Rate	Newspaper Headline
16	4.50	4.75	2.14	Fed Chair Appointed - Inflation rising; Fed expected to raise rates
15	5.00	4.69	2.26	Rising inflation fears - Experts say interest rates must go higher
14	5.50	4.73	2.37	Fed raises funds rate - Policy adjusted to lower inflation rate
13	5.50	4.86	2.41	Economic Reports ok - But some reports of rising inflation
12	6.00	4.13	2.59	EXTRA! - Millions get tax relief - big refund checks trigger spending spike
11	6.75	3.64	3.07	EXTRA! - Retail spending spree continues - Fed expected to tighten to restrain economy
10	7.25	3.46	3.63	EXTRA! - Tax refunds ending - Spending returning to normal levels
9	7.50	4.2	3.95	Inflation fears high - Price gains show no signs of slowing down
8	7.50	4.72	3.86	Fed rate is unchanged - Fed taking 'wait and see' attitude for now
7	7.50	5.00	3.61	Inflation fears high - But reports show price gains are slowing
6	7.00	5.19	3.29	Fed cuts interest rates - Interest rates still restrain economy
5	6.50	5.28	2.95	Inflation remains high - But reports show price gains slowing
4	6.50	5.28	2.65	Fed rate is unchanged - Fed taking 'wait and see' attitude for now
3	6.00	5.33	2.4	Economic Reports OK - Reports show price gains are slowing
2	5.50	5.35	2.16	Fed cuts interest rates - Interest rates still restrain economy
1	5.00	5.29	1.95	Economic Reports OK - Reports show price gains are slowing
0	4.50	5.18	1.86	Fed guru reappointed - Solid policies sustain economic recovery

Note: The first row of data (with the border) is the initial information given.

particular shock varies from game to game but it is always a standard positive or negative aggregate demand or aggregate supply shock. So in the example in Table 1, we have a sudden change in fiscal policy (temporary tax cut), a positive aggregate demand shock. As is obvious from reading the headlines, the game gives clear hints as to the direction that policy moves should take. However, unless you've specifically discussed in the course that the Fed typically makes changes in 25 or 50 basis point moves and students remember that fact, students may make moves in rather large increments. Also, as added realism, policy changes take a couple of quarters to start affecting the economy. Clearly the shock cannot be anticipated but towards the end of the game, it becomes important for students to be able to anticipate the momentum in the unemployment rate and inflation rate and start "leaning against the wind" before they've hit the targets. Failing to do so will typically produce overshooting of the targeted levels and possible dismissal as Fed Chair. If that happens, it is not a bad thing, as it opens up an avenue for discussion and provides a "teachable moment".

Having described the game and provided an example of play, we next discuss assignments that can be used along with the game. We begin with principles of macroeconomics and then move on to intermediate macroeconomics or money and banking.

### **PRINCIPLES OF MACROECONOMICS**

To start, we'll describe using the game in a small principles of macroeconomics setting (20-25 students, similar to the classes we teach). The initial question is where in a course sequence should the game be used? We use Greg Mankiw's Brief Principles of Macroeconomics, Fifth Edition as a textbook. The game can be used as an introduction to the topic of policy in the business cycle or aggregate demand and supply model (prior to starting chapter 16). Alternatively it could be used after policy has been added to the aggregate demand and supply model. Of course, it could be used both before and after the topic has been presented as a method of assessment. As a graded homework, the assignment we describe can be used to form a summative assessment of student mastery of the topic (Walstad, 2006). Without the assignment or using it but not grading it, the simulation can provide a formative assessment to help students and the instructor understand particular struggles with the material (Walstad, 2006). For principles of macroeconomics a relevant learning outcome to assess could be similar to "demonstrate understanding of the effects of monetary policy on the macroeconomy and demonstrate understanding of monetary policy objectives and challenges of implementing monetary policy."

First, the instructor should explain the game to the class. Also, an instructor may want to let the class know that an assignment will come from the game, so they need to pay attention. Next, choose a volunteer to be Fed Chairman and bring them up to the front to run the game. At this point, you can let the game play out one of two ways depending on whether you want a more rambunctious class or a more controlled class.

If an instructor wants a rambunctious class, run the game similar to "The Price Is Right" game show and have your Fed Chairman ask the audience for help and let the

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students shout out their suggestions. The instructor may have to interject (as de facto host) and try to solicit suggestions from the students for the first couple of turns if the class is reluctant to participate. Whenever the Fed Chairman has decided, let them choose the funds rate, hit “Go” and advance the game one period. Give the class a few seconds to read the headline and see where the unemployment rate and inflation rate end up or let the Chairman read it to them. Then repeat the process until the game is over. The entire process takes approximately 20 minutes.

If an instructor would prefer a more controlled experience (which may be better in smaller sections of 10-15 students), after explaining the game, tell the class that they will play the role of the FOMC. Explain that they will discuss and then vote to decide monetary policy. Then select a volunteer to be Fed Chairman who will have to run the meeting, soliciting opinions and rationales of FOMC members. Then have the Fed Chairman call a vote. Playing the game this way takes longer, but may engender a more informative discussion as students attempt to synthesize the information from the game with course concepts. If the game does start to take too long, the process can be sped up by forcing the decisions to be made in a “lightning round” with a 1-minute time limit per turn per federal funds rate decision.

If an instructor were going to use the game in a large lecture class we would recommend one of the two following approaches. Explain the game to the class and then ask for a couple of student volunteers. Let each student play the game in front of the class largely on their own. Make sure to note the difficulty of the game and difficulty of policymaking if one of the students plays particularly poorly. The instructor can also allow some calling out of suggestions from the class if more interaction is desired. Alternatively, if the class uses an automated response system (“clickers”) in the course, the instructor can simply run the game letting the class vote on the moves. Setting that up depends on the capabilities of the “clicker” you’ve adopted. For example, suppose you have one that only has 4 options (A through D). We suggest two successive rounds of voting for each turn in that case. The first round to decide if the federal funds rate should be a) increased, b) decreased, or c) unchanged. If a) or b) is selected they have a second round of voting on the amount of the change. An example could be a) 25 basis points, b) 50 basis points, c) 75 basis points, or d) 100 basis points. A more outrageous choice could be included, such as a 200 basis point federal funds rate move. Most classes have at least some students that will attempt to “sabotage” the game for fun, which is not a bad thing as long as the instructor links back to course concepts such as the high price of bad policy or a discussion of real policymakers goals and objectives.

After the game is played, students are given an assignment, which can be used to assess the learning outcome. The assignment can be completed in-class or as a homework assignment if there is insufficient time remaining. If the game is played as an introduction to the topic of aggregate supply and demand, we suggest a simple assignment of a 1-page or even 1-paragraph reflection paper that asks the following.

- 1) In the Federal Funds Rate game from class, what happened in the economy?
- 2) How does monetary policy affect the economy? Briefly describe.

- 3) What are policymakers trying to achieve?
- 4) Briefly explain whether you think a policymaker's job is easy or hard and why you think so?

If the game is played after aggregate demand and supply has been developed through lecture or other means, then we might suggest the following questions to augment or replace the above questions.

- 1) Draw a well labeled aggregate demand and aggregate supply diagram. Assume the economy is initially at its long-run equilibrium. Show on your diagram the effects of the shock that hit the economy during the game. Briefly explain your diagram in words and the effect of the shock on the economy in the short-run.
- 2) What was the policy response to the shock during the game? Explain in words the policy undertaken and briefly explain whether it was the correct policy to take or not. Also explain how the policy undertaken affected the economy. In a separate aggregate demand and supply diagram, show the effects of the policy on the economy in the short-run.
- 3) In playing the game, would you say it was relatively easy or difficult to achieve the normal rate of unemployment and the target level of inflation? Describe any difficulties that were encountered. Briefly comment on what difficulties, if any, you believe policymakers face in the "real world" and how they are similar or different to the game.

Based on student answers to these questions, we can judge whether the learning outcome described at the start of the section has been achieved. Thus the assignment is a good assessment tool in addition to being a fun and engaging way of explaining monetary policy in an aggregate demand and aggregate supply model to students. We would suggest the assignment be used both formatively as a way of gaining an initial assessment of student's understanding prior to exam and a summative assessment as part of the student's homework grade or class participation grade.

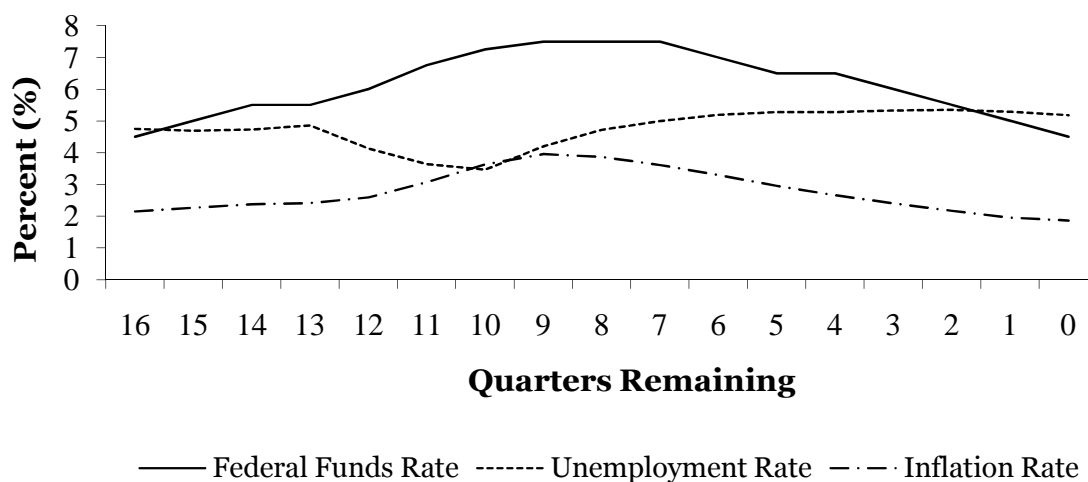
### **UPPER DIVISION MACROECONOMICS COURSE**

Given the complexities of intermediate theory courses and elective courses, it can be difficult to find ways of connecting the material accessibly to students while still maintaining the crux of the material. Intermediate macroeconomics courses may be well-suited introducing awareness of data sources, basic data analysis, and basic research skills (Erikson, Raynold, and Salemi, 1996). Here we explore a way to adapt this simple game to an intermediate macroeconomics or money and banking course. In those courses, the game can be used to assess a learning outcome similar to "demonstrate an understanding of the Federal Reserve's policy challenges and be able to describe historical episodes involving economic events and the response by monetary policy." Of course, the assignment from *Section 3* could be used "as is" in order to

provide a simple review but would not be sufficient for this more advanced learning outcome.

To use the game for this learning outcome it is helpful if the students have some understanding of spreadsheets and the use of a program like Microsoft Excel. Alternatively, if they have knowledge and access to an econometrics package, that would also suffice. We teach at a management college where all students are required to take a 1-unit freshman level course in Microsoft Office. As a result, students are management rather than economics majors and tend to have relatively weaker math skills but relatively stronger spreadsheet skills. For the assignment, students need to be able to graph variables and use the regression tool in Microsoft Excel. The regression tool is part of the “Data Analysis” tool, which is an add-in for Excel. It is part of the standard Excel software but is not part of the standard installation. As a result it is helpful to check how easy or not it is for it to be added in by students at the campus or department computer lab. Some computer labs have tight security that does not allow users to make any adjustments to software, so you may want to check with the lab’s administrator and either have them add it in or make certain students will be able to do so. Also, it is helpful to go through an example in-class of using Excel to refresh student memories. The in-class example doesn’t have to relate to the game, it just has to show them how to use the regression tool in Excel. We suggest using actual data to estimate Okun’s law as a simple example.

**Figure 1, Data from Table 1**



For the assignment itself, have students go to the Federal Reserve Bank of San Francisco’s website, play the Fed Chairman game and record the data in Microsoft Excel. Their table should look like Table 1 and we would suggest providing students the first two rows of Table 1 along with the assignment so they see the desired format (recall the start of the game is the same every time). Next have students graph the data and comment on any interesting facts or relationships they see. Figure 1 shows the graph of

the data from Table 1. Next, have students use the regression tool to estimate Equation (1).

$$ffed_t = \alpha + \beta_1 unem_{t-1} + \beta_2 infl_{t-1} + \varepsilon \quad (1)$$

In equation (1), *ffed* is the federal funds rate, *unem* is the unemployment rate, and *infl* is the inflation rate.  $\alpha$ ,  $\beta_1$ , and  $\beta_2$  are the intercept and slope coefficients to be estimated and  $\varepsilon$  is the error term. Equation (1) is a simple Taylor rule (Taylor, 1993) and similar to the simple Taylor rule estimated in Ball (2002). Also, equation (1) is consistent with the timing convention described in *Section 2*. In the game the federal funds rate can only be changed in 25 basis point increments, so technically, the dependent variable is discrete. That suggests ordinary least squares (OLS) is inappropriate. However, we would recommend simply doing a little “hand-waving” and not have students deal with that fact, as it is not the central purpose of the assignment. Thus, have students estimate equation (1) by OLS. The estimation results based on the data from Table 1, is equation (2) with standard errors in parentheses.

$$ffed_t = 5.00 - 0.46unem_{t-1} + 1.20infl_{t-1} + \varepsilon \quad (2)$$

(0.22)      (0.15)                      (0.13),              Adjusted R-squared: 0.90

Here are a couple of suggested questions to ask once students have their regression estimate.

- 1) During the game, were you more responsive to inflation rate changes or unemployment rate changes? Use the results from your regression to briefly explain.
- 2) In their policy decision about the federal funds rate, do you think the Federal Reserve looks at more information than the unemployment rate and inflation rate? Briefly explain and if you answer “yes”, what else do they look at?

The next part of the assignment is to link the game’s results to the real world. There are a number of possibilities and we suggest the following exercises. Have students try to find an historical episode in the United States where a similar shock to the one they faced in the game occurred. Ask students to look up on the Internet how the federal funds rate changed during that time period. Have them briefly explain whether the Federal Reserve responded to the shock the same as they did in the game or not?

An alternative (or addition) is to provide students a Taylor rule estimate for an historical time period, ask students to interpret it, and explain how their estimate from the game compares to it. For example, Ball (2002) provides simple estimates for 2 periods: 1987:4 to 1995:4 and 1996:1 to 2000:4. Ball (2002) is an attractive example because the estimated Taylor rule uses the unemployment rate as aggregate demand indicator, so it is directly comparable. More common Taylor rule estimates using the output gap may require students to be familiar with Okun’s law in order to make a

comparison. For example, you could ask students to explain how the Taylor rule they estimated compares to the rule estimated by Taylor in his original article (Taylor, 1993).

Another alternative is to extend the data analysis and research aspect of the assignment<sup>2</sup>. Have students go the [Federal Reserve Economic Data \(FRED\)](#) site, hosted by the Federal Reserve Bank of St. Louis (Federal Reserve Bank of St. Louis, n.a.). Students should download the unemployment rate, the federal funds rate, and the inflation rate. Students can select to download the percentage change from a year ago of the price level in FRED or construct the inflation rate from the level themselves. Students should then complete the following tasks. Using the downloaded data, estimate equation (1). To illustrate we downloaded the unemployment rate (civilian rate, UNRATE in the database), federal funds rate (effective rate, FEDFUNDS in the database) and the inflation rate (consumer price index all items, CPIAUCSL in the database). Data are monthly and the common sample is 1954:07 to 2009:07.

$$\begin{aligned} \text{ffed}_t = 1.61 + 0.11\text{unem}_{t-1} + 0.86\text{infl}_{t-1} + \varepsilon \\ (0.36) \quad (0.06) \quad (0.03), \quad \text{Adjusted R-squared: } 0.57 \end{aligned} \quad (3)$$

Equation (3) is the simple Taylor rule estimated over a very long sample (660 monthly observations). The coefficient on the unemployment rate is not what we would expect. It indicates a rise in the unemployment rate will lead to a slight rise in the federal funds rate. The simple model is likely suffering from an omitted variables problem. More lags are necessary and given the long sample, there is an increased likelihood that additional variables (output for example) that influence both the federal funds rate and unemployment rate are confounding the estimated relationship. We note that in the Ball (2002) article, the focus is on much shorter time series and we would recommend an instructor consider assigning students a short sub-sample to estimate. This would be either in addition or instead of doing the estimate for the full sample. Assigning a shorter sub-sample would also be a nice way to enable students to discuss a specific historical episode.

As an additional suggestion, which we would only recommend for classes where the instructor is confident in the econometric abilities of the students, ask the students to construct the fitted values from the Taylor rule from the game (equation 2) and the data-based Taylor rule (equation 3) using the actual unemployment rate and inflation rate data they downloaded from FRED. Then have them graph those fitted values against the actual federal funds rate. Figure 2 shows the results using equation (2) and equation (3).

After students have completed this task, we suggest the following questions.

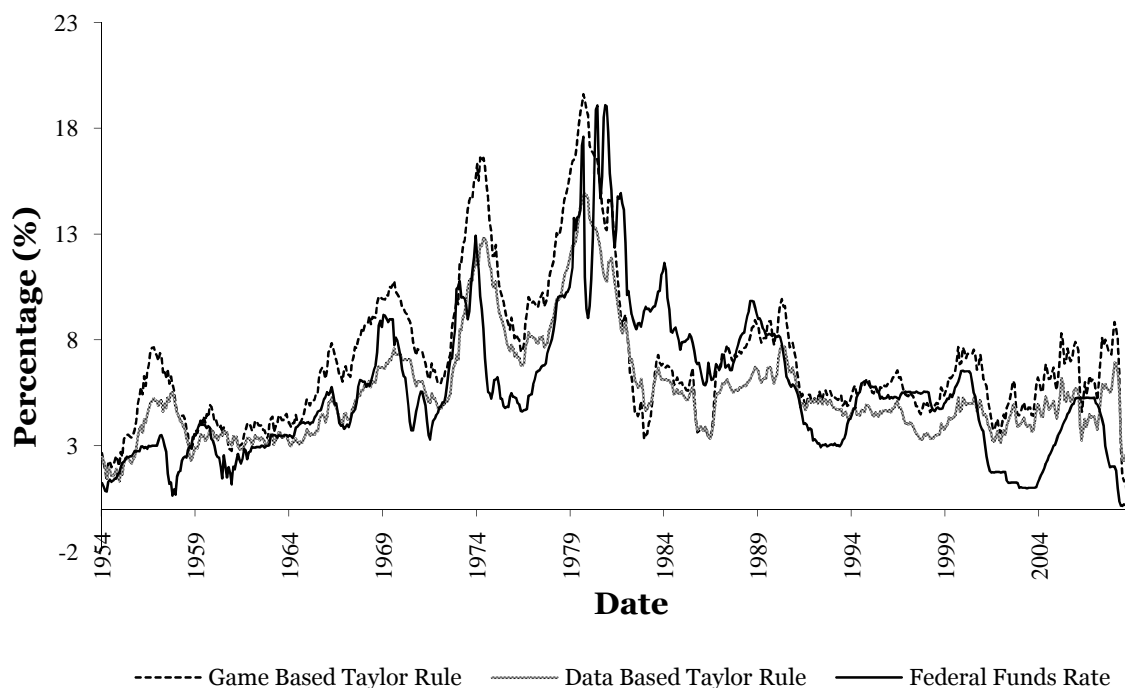
- 1) Why are the fitted values not exactly the same as the actual federal funds rate? Briefly explain.

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<sup>2</sup> We thank an anonymous referee for this suggested alternative.

- 2) Do you think your estimated Taylor rule performs better or worse than the Taylor rule estimated with actual data? Briefly explain.

**Figure 2, Fitted Values  
Equation (2) and Equation (3)  
1954:08 to 2009:07**



An instructor needs to make a decision as to how much data analysis they feel is appropriate for an intermediate macroeconomics course or an elective course like money and banking. What we have tried to do here is provide a variety of options. At the minimal end is simply asking students to record their results in Excel, graph them, and then comment on the results. At the other end of the spectrum is requiring students to do the regressions and the graphs of the fitted values. If the heavier data analysis option is chosen, we suggest this form the basis of a small research project rather than a homework assignment, as the amount of work required to do everything may be time consuming for students that are not as familiar with data analysis.

### SUMMARY AND CONCLUSION

Faculty members face many challenges. In the classroom those challenges include explaining complex information to students. Engaging their interest and attention is necessary, though not sufficient, to do that. Here we described one resource, the Fed Chairman Game, which on its own is interesting and could be used to simply illustrate the basics of monetary policy, but would not be sufficient activity to demonstrate much beyond that. However, that game, augmented by assignments linked

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to course material, can be leveraged to provide a more enriching learning experience. The game becomes a more engaging active learning activity that can be used as both a formative and summative assessment tool.

The current economic situation raises some questions about what we teach in macroeconomics at any level. Briefly we want to address this game in the context of our ongoing recession. The relevance of this online simulation depends a lot on an individuals' view of the current situation. If one is inclined to believe our current situation is relatively unique, that we are in a liquidity trap for example, then the game we discuss is less relevant. While the game allows a player to move the federal funds rate down to zero, the result, with a lag, is large inflation increases and large unemployment rate declines. One aspect of a liquidity trap is that conventional monetary policy is not stimulating or very inflationary. If one believes that the current situation is simply a very large and negative aggregate demand shock, but with nothing particularly unusual except perhaps the magnitude, then the game is relevant as conventional policy will apply.

In this article we give examples that would be applicable to principles of macroeconomics and to an intermediate macroeconomics or money and banking course. The suggestions we provide are certainly not exhaustive but we hope illustrate how some creativity can enhance and extend the value of a simple web-based simulation. Hopefully, this enhances the "real world" understanding and appreciation of students for macroeconomics.

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