

## Homework 8 (18 Points)

*Note.* This homework needs to be written in `R Markdown` and submitted in either `html` or `pdf` format.

### Problem Only (18 Points)

The FRED database at the Federal Reserve Bank of St. Louis contains monthly data on U.S. **unemployment rates** and **job vacancy rates** (also called the “job openings rate”). You can either download the monthly data or average the monthly data into quarterly or annual data<sup>1</sup>.

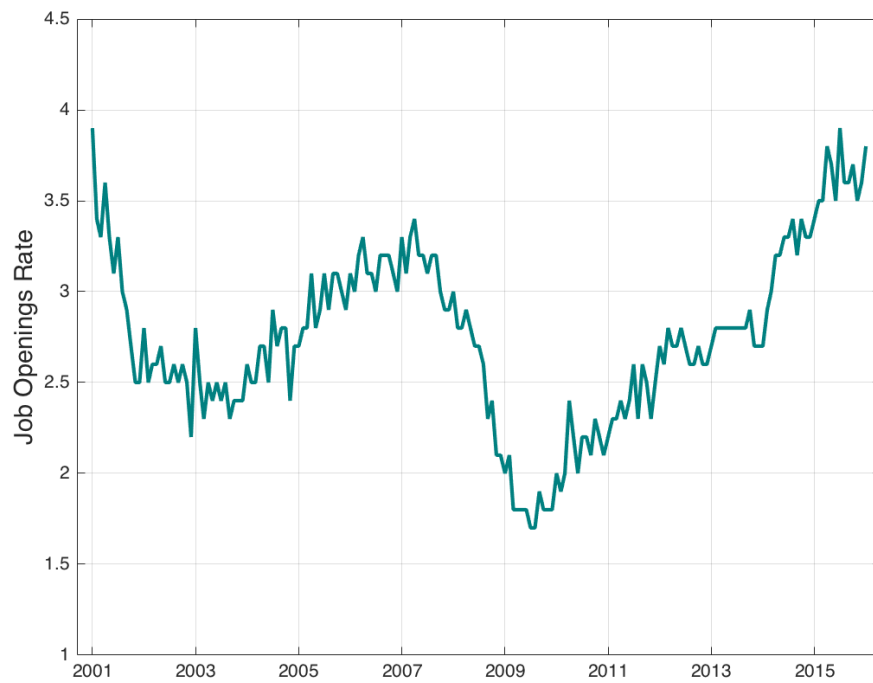
1. Plot U.S. unemployment rate from 2001 to 2017<sup>2</sup>. (2 Points)
2. Plot U.S. job vacancy rate from 2001 to 2017<sup>3</sup>. (2 Points)

---

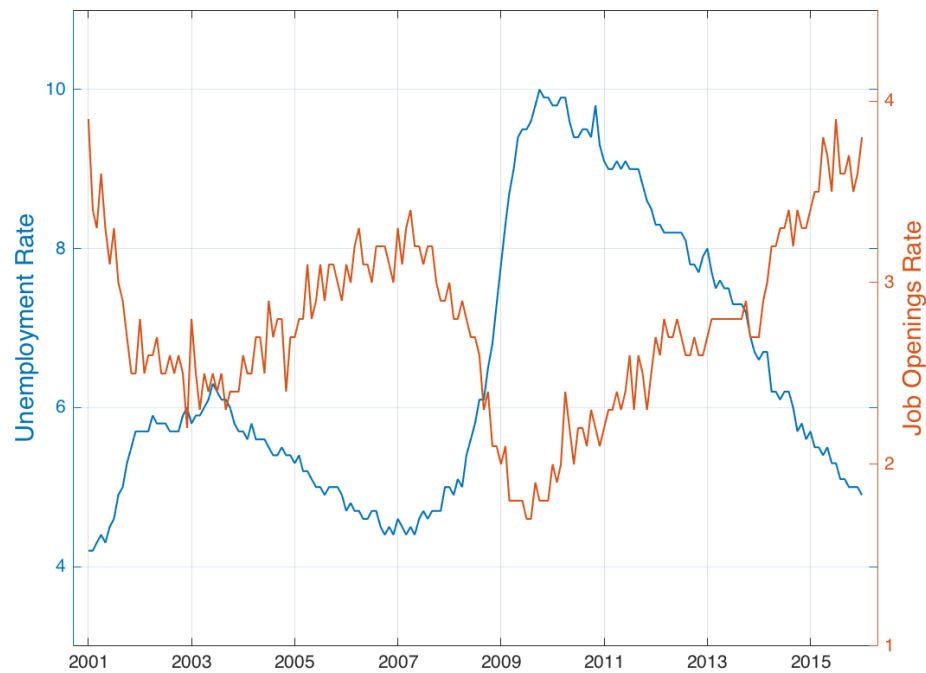
<sup>1</sup>To do so, on the FRED website, click “Edit Graph” and then choose “Modify frequency”.

<sup>2</sup>If you use monthly data, plot from Jan. 2001 to Dec. 2017. If you use quarterly data, plot from 2001.Q1 to 2017.Q4.

<sup>3</sup>See footnote to question 1.



Or, put them together:



3. Describe the movement of unemployment and vacancy rates during this time period. (2 Points)
4. What is the correlation between the two rates over this time period? (2 Points)

About  $-0.7$ <sup>4</sup>

---

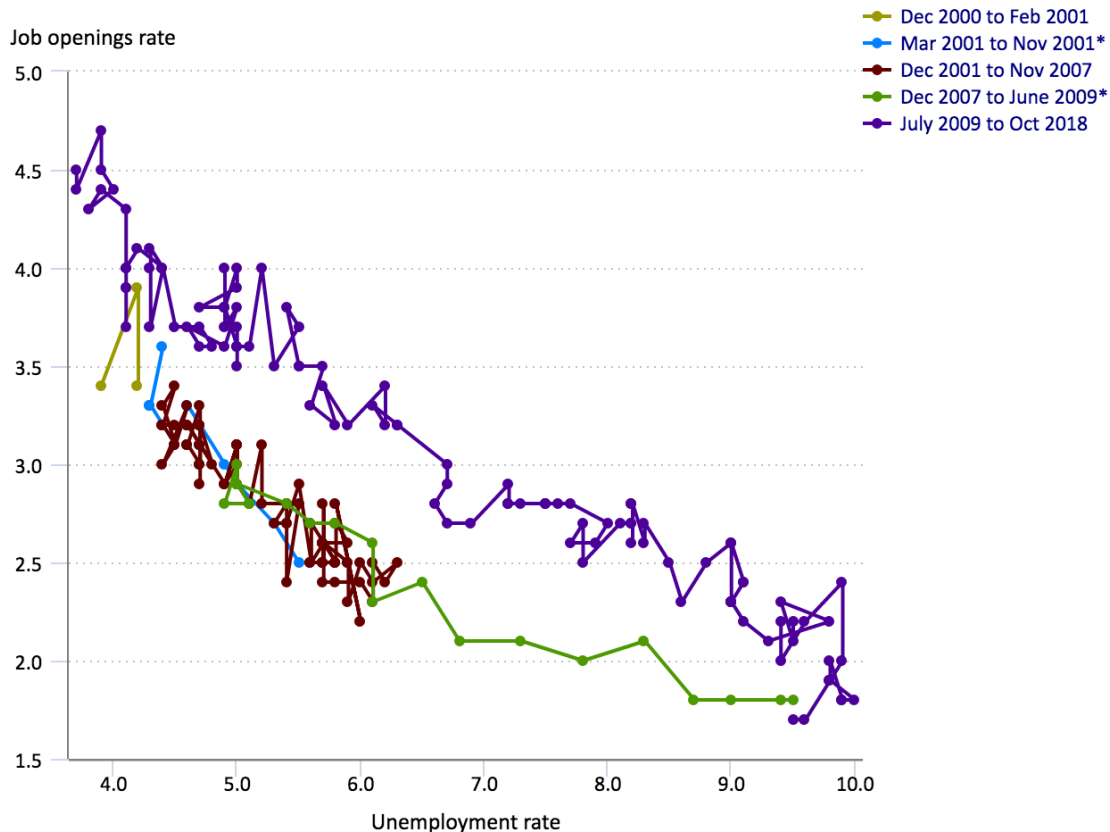
<sup>4</sup>The correlation coefficient depends on whether you use annual, quarterly, or monthly data.

5. Plot the Beveridge curve for the U.S. labor market using a *connected scatter plot*<sup>5</sup>. (2 Points)

See: <https://www.bls.gov/charts/job-openings-and-labor-turnover/job-openings-unemployment-beveridge-curve.htm>

### The Beveridge Curve (job openings rate vs. unemployment rate), seasonally adjusted

Click and drag within the chart to zoom in on time periods



Note: \* represents recession, as determined by the National Bureau of Economic Research  
Source: U.S. Bureau of Labor Statistics.



6. Describe the movement along the Beveridge curve. What does the curve say about the U.S. economy during this time period? (2 Points)
7. Has the curve shifted during this period? If so, what might be the reason? (2 Points)

<sup>5</sup>See [An Introduction to Connected Scatterplots](#).

8. Read the following notes on **unemployment** and **job openings**. Then,

- **in 1 – 2 paragraphs**, clearly define the concept of unemployment and describe how unemployment rates are measured in practice. (2 Points)

The following statistics are produced from the **Current Population Survey (CPS)**:

**Unemployed persons:** Persons aged 16 years and older who had no employment during the reference week, were available for work, and had made specific efforts to find employment sometime during the 4-week period ending with the reference week. Persons who were waiting to be recalled to a job from which they had been laid off need not have been looking for work to be classified as unemployed.

**Employed persons:** Persons 16 years and over in the civilian noninstitutional population who, during the reference week, (a) did any work at all (at least 1 hour) as paid employees; worked in their own business, or on their own farm, or worked 15 hours or more as unpaid workers in a family enterprise; and (b) all those who were not working but who had jobs or businesses from which they were temporarily absent. Excluded are persons whose only activity consisted of work around their own house or volunteer work for religious, charitable, and other organizations.

**Labor force:** All employed and unemployed persons.

**Unemployment Rate:** The number of unemployed persons as percentage of the labor force.

- **in 1 – 2 paragraphs**, clearly define the concept of job openings and describe how job openings rates are measured in practice. (2 Points)

The following statistics are produced from the **Job Openings and Labor Turnover Survey (JOLTS)**:

**Job opening:** A position to be filled at an establishment; conditions include the following: there is work available for that position, the job could start within 30 days, and the employer is actively recruiting for the position. Included are full-time, part-time, permanent, short-term, and seasonal openings.

*Employees*<sup>6</sup>: Persons on the payroll who worked or received pay for the pay period that includes the 12th day of the reference month. Proprietors or partners of unincorporated businesses, unpaid family workers, or persons on leave without pay or on strike for the entire pay period, are not counted.

**Job openings rate:** The number of job openings on the last business day of the month as a percentage of the sum of itself and the number of employees in the pay period that includes the 12th of the month.

---

<sup>6</sup>Note that the CPS and the JOLTS define employment differently. The CPS is used to produce the official employment statistic, while the JOLTS uses its own definition and data to produce the job openings rate statistic.