

Problem Set 3

Due Wednesday January 29, 4pm

Data Exercises

1. The Census Bureau (www.census.gov) released data on Housing Starts (look for the report on “New Residential Construction” under Topics/Business and Economy/Economic Indicators) for December 2024 on January 17, 2025.
 - (a) What was the number of seasonally adjusted units of “New Privately-Owned Housing Units Started” in December 2024 for the U.S.?
1499 thousands
 - (b) What was the estimated percentage change for December 2024 from December 2023 for the U.S.?
the estimated percentage change is -4.4% and has a 90% confidence interval ± 11.3
 - (c) What was the estimated percentage change for the South region?
the estimated percentage change for
 - i. Dec. 2024 from Dec. 2023 is 0.1% in total.
 - ii. Dec. 2024 from Dec. 2023 is -1.8% in 1 unit.
 - iii. Dec. 2024 from Nov. 2024 is 17.7% in total.
 - iv. Dec. 2024 from Nov. 2024 is 0.0% in 1 unit.
 - (d) Notice that the Census Bureau gives confidence intervals for these percentages. Why do you think they do this? What was the confidence interval for the South region? How does this change your interpretation of the estimate?

It has a confidence interval because as the document mentioned: “The statistics in Tables 2-5 in this release are estimated from sample surveys and are subject to sampling variability as well as nonsampling error including bias and variance from response, nonreporting, and undercoverage”. The Building Permits Survey Methodology has a sample design, which means the results are not a result derived from the population but based on sample data. The result would give a range of likely values for true parameters from the population. Thus, the change we calculated has a Confidence interval.

The confidence interval for the South region is

- i. ± 17.6 for Dec. 2024 from Dec. 2023 in total.
- ii. ± 19.9 for Dec. 2024 from Dec. 2023 in 1 unit.
- iii. ± 19.6 for Dec. 2024 from Dec. 2023 in 1 unit.
- iv. ± 14.9 for Dec. 2024 from Dec. 2023 in 1 unit.

It changes the interpretation. Now we cannot say the change is exactly 0.1 percent but say, on average, the percentage change is 0.1. The 90 % CI means that we are 90% confident that the true percentage change of the units stays within $[-17.5, 17.7]$

2. The Census Bureau released data on Home Ownership Rates on October 29. (You can find the release using the same steps as above.)

- (a) What was the rental vacancy rate in the third quarter of 2024?

6.9 percent

- (b) Using Table 2 from this release, what is the “margin of error” for this estimate? What is the meaning of the “margin of error”?

The marginal error of this estimate, the 2024 rate, is 0.2 percent.

As the paper said:” A margin of error is a measure of an estimate’s reliability. The larger the margin of error in relation to the size of the estimate, the less reliable the estimate. This number, when added to and subtracted from the estimate, forms the 90 percent confidence interval.” Marginal error is the value we used to construct a confidence interval. For example, in a normal distribution, the margin of error is σZ_{α} . range of uncertainty around a survey or estimate, It expresses how much the value may vary due to sampling variability. It accounts for random sampling errors.

- (c) Calculate a 90% confidence interval for the vacancy rate.

The 90% confidence interval for the vacancy rate is $[6.7, 7.1]$ percent of 2024 rate and $[6.6, 7.2]$ percent of difference

3. The Excel file `realgdpgrowth.xlsx` is posted on Canvas. It contains quarterly series of U.S. national accounts data, from 1947q2 through 2024q3. All are real percent changes from the previous period, seasonally adjusted. The time index is `date`.

- (a) The series “pce nondurables” is personal consumption expenditures on non-durable goods. Estimate the mean of the series, and plot the series along with the fitted mean.

- (b) Using the constant mean model, generate point and interval forecasts for non-durables for the next 4 quarters. Plot your forecasts. Discuss.

The fitted mean of the series is 2.5742. Its 90% confidence interval is $[-3.5074, 8.6558]$. The larger 90% confidence interval means the point forecasting has many uncertainty. Meanwhile, since the confidence interval includes 0, we cannot reject the null hypothesis that the fitted value is 0.

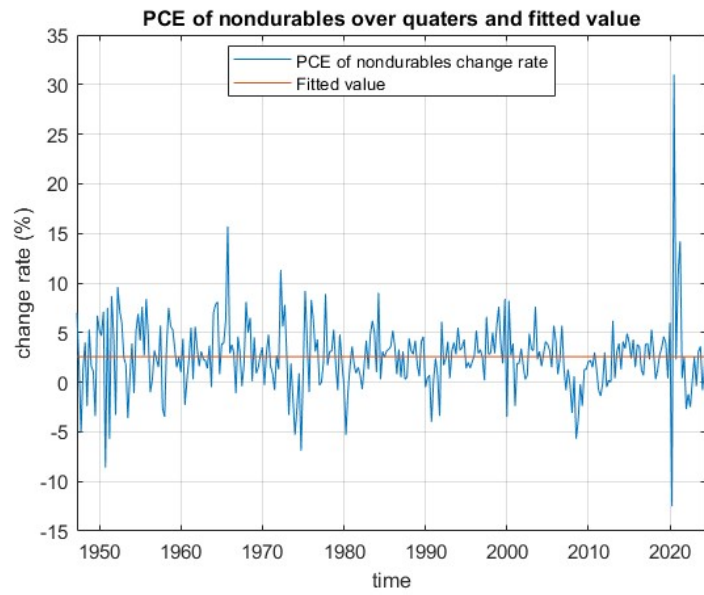


Figure 1: Q3a

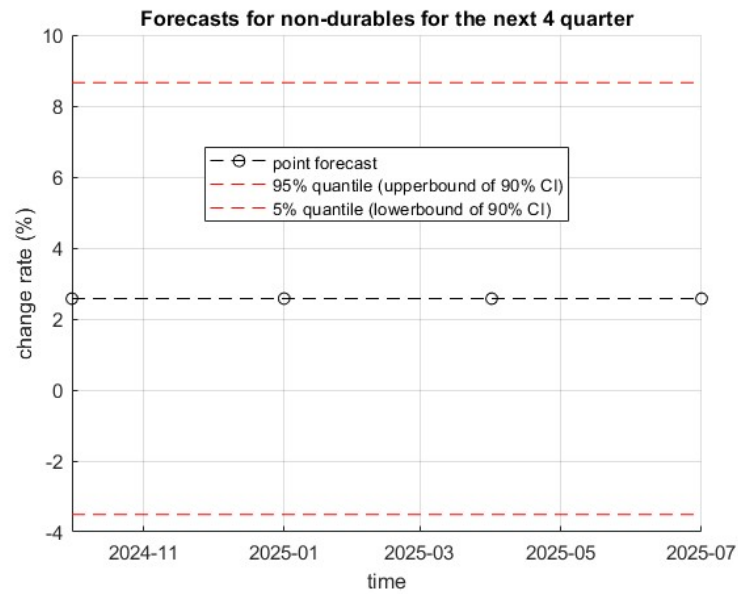


Figure 2: Q3b