Extension Plan

Analyzing effects of COVID-19 on Unemployment Rate and Housing Prices in Monroe County, NY

Problem Statement

Unemployment has been a major concern for many years now. There are numerous reasons that impact unemployment – such as reduction of labor force, workforce fluctuations, technological changes, and economic conditions.
Unemployment and the economy have a direct impact on each other. A high unemployment rate affects the economy in many ways. Unemployed people tend to spend less, may accrue more debt, and unemployment may lead to higher payments from state and federal governments for things like food stamps[1].
And when economic activity is low, firms cut jobs and unemployment rises. In that sense, unemployment is countercyclical, meaning that it rises when economic growth is low and vice versa[2].

Towards the end of 2019, the human race faced one of the worst pandemics of all times – COVID-19. The COVID-19 pandemic has had far-reaching economic consequences including the COVID-19 recession, the second largest global recession in recent history, decreased business in the services sector during the COVID-19 lockdowns, the 2020 stock market crash, which included the largest single-week stock market decline since the financial crisis of 2007–2008 and the impact of the COVID-19 on financial markets. The pandemic was also a factor in the 2021–2022 global energy crisis and 2022 food crises[3].

There have been several impacts of COVID-19 – it had widespread impact on economy in terms of GDP, unemployment, changes in housing prices, health infrastructure, food availability, amongst other impacts that are less visible – such as taking a toll on mental health of people, long term changes in work patterns as work from home gained traction, and in how people communicate with each other.

This is a strong human centered problem as there is a direct negative impact of unemployment on the population, and we can keep human perspective in mind while arriving at the result. I also hope to answer some important ideas that are a consequence of the pandemic that has impacted a huge chunk of the world's population in direct and indirect ways.

Research Questions

In part 1 of the project, we saw how the daily cases and rate of infection varied over the course of the pandemic in Monroe County, NY. Now, we want to study how unemployment changed in this duration in Monroe County.
Here, we will observe the unemployment numbers (and percentages) changed over the years, and then in particular in the duration COVID-19 was at its peak. We will also consider

certain other metrics, such as change in GDP, change in housing prices, and change in overall population in Monroe County, NY, during the same period.

Thus, the major research questions are:

- How was employment impacted by the pandemic in Monroe County, NY?
- Is there a correlation in the median housing price of Monroe County on a month-to-month basis with the rate of infection in Monroe County?

Data

I will be using the following data for this analysis:

- Unemployed Persons in Monroe County, NY[4] – This has been obtained from the U.S. Bureau of Labor Statistics, and contains the number of people who are unemployed, as obtained from the Current Population Survey (CPS), also known as the household survey.

- Unemployment Rate in Monroe County, NY [5] - This has been obtained from the U.S. Bureau of Labor Statistics and contains the percentage of people who are unemployed, as obtained from the Current Population Survey (CPS), also known as the household survey.
  The unemployment rate is the unemployed percent of the civilian labor force - [100 times (unemployed/civilian labor force)].

- Housing Inventory: Median Listing Price in Monroe County, NY[6] - This has been obtained from Realtor.com and shows the median listing price in a given market during the specified month.

- Gross Domestic Product: All Industries in Monroe County, NY[7] – This has been obtained from the U.S. Bureau of Economic Analysis and contains the yearly GDP in units of thousands of US dollars.

Methodology

To see if unemployment trends changed with respect to change in COVID-19 cases, I plan to use Granger causality test[10] , which is used to determine if one time series is useful in forecasting another.
This will require a bit more research and data modification so that our two time series – COVID-19 case counts and unemployment percentages – can fit the parameter requirements of this test. Since one data is captured daily and the other is monthly, I will bring them to the same scale and perform this test to ascertain if unemployment is actually dependent on COVID-19 cases in a strong way.
I will use the grangercausalitytests() function from the statsmodels library in Python for this analysis.

For our second research question, which tries to understand how housing prices are correlated with rate of infection, I plan to use Pearson Correlation coefficient[11]. Again, this will require data cleaning to get the rate of infection monthly instead of daily/weekly basis, as I currently have it. Moreover, the Pearson test requires normally distributed data. As we know, COVID-19 case counts are largely normally distributed. However, I will perform more analysis to make sure the data satisfies all the conditions - such as being normally distributed - before applying this test.
I will use pearsonr() function[12] from the scipy library in Python for this analysis.

Finally, I aim to plot the results – how temporal data changed over the months, change point detection in all the time series, and correlation plot between housing prices and rate of infection.
For this purpose, I will use seaborn and matplotlib libraries in Python to come up with easy to understand visualizations.

This methodology should work based on current analysis of datasets and research questions.

Timelines

The task break-down and timeline estimates are as follows:

Tasks/Milestones	Estimated Date of Completion
Data collection and cleaning	November 14, 2022
Model building and tuning	November 18, 2022
Analysis of results	November 23, 2022
Visualization of results	November 26, 2022
Buffer time for refining methodology as per new insights gathered from initial analysis	November 29, 2022
Documentation of process followed	December 1, 2022
Presentation preparation	December 5, 2022
Final report creation	December 12, 2022

Detailed description of milestones -

- Data collection and cleaning – Analyze the data in the above-mentioned links and clean it to make it useful for analysis.
- Model building and tuning – Perform EDA, build a model, or in this case, perform statistical tests to see if there is a correlation between COVID-19 case counts and unemployment, and whether the change in housing prices in the same period is of significance.
- Analysis of results – The results from the above step are analyzed to arrive at a conclusion regarding our assumptions and hypotheses.

- Visualization of results – Plot easy to understand charts and graphs showing trends in unemployment percentages, COVID-19 case count, and housing prices over a particular duration of the pandemic to see the immediate trends at a glance.
- Buffer time for refining methodology as per new insights gathered from initial analysis – Putting aside some extra time to allow for refinement of analysis, models, and techniques, and indulge in iterations of arriving at a strong and correct result.
- Documentation of process followed – Document each step of the analysis – data collection and cleaning, model creation, tests performed, visualizations created, to allow the process to be replicated and easily understandable for an unacquainted audience.
- Presentation preparation – Prepare a final presentation.
- Final report creation – Create the final report of the end-to-end project.

References

[1] The Cost of Unemployment to the Economy

[2] Unemployment: The Curse of Joblessness - Back to Basics: Finance & Development

[3] Economic impact of the COVID-19 pandemic - Wikipedia

[4] U.S. Bureau of Labor Statistics, Unemployed Persons in Monroe County, NY [LAUCN360550000000004], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/LAUCN360550000000004, November 10, 2022.

[5] U.S. Bureau of Labor Statistics, Unemployment Rate in Monroe County, NY [NYMONR5URN], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/NYMONR5URN, November 10, 2022.

[6] Realtor.com, Housing Inventory: Median Listing Price in Monroe County, NY [MEDLISPRI36055], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/MEDLISPRI36055, November 10, 2022.

[7] U.S. Bureau of Economic Analysis, Gross Domestic Product: All Industries in Monroe County, NY [GDPALL36055], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/GDPALL36055, November 10, 2022.

[8] A Guide to Time Series Analysis in Python | Built In

[9] Pearson Product-Moment Correlation - When you should run this test, the range of values the coefficient can take and how to measure strength of association.

[10] How to Perform a Granger-Causality Test in Python - Statology

[11] How to use Pearson correlation correctly with time series - Cross Validated

[12] scipy.stats.pearsonr — SciPy v0.14.0 Reference Guide