University of Southern California

Understanding the Fed’s Influence on the Labor Market:

How Interest Rates Affect Unemployment

By: Andy Yang, Derek Zhang, Nathan Zhang, Tiffany Nguyen, Yeojun Yun

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Professor Ratika Narag

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Abstract

This paper explores the relationship between interest rates and unemployment rates within the United States from 2015 to 2025, with a special focus on the mediating effects of macroeconomic factors, demographics, as well as structural shocks. Our research question is: How significantly do interest rates affect unemployment rates, and how are these mutually impacted by the overall state of the macroeconomy, with a major shock event such as the COVID-19 pandemic? Based on theoretical frameworks such as the Phillips Curve and Okun's Law, we use ordinary least squares (OLS) regression models on monthly observations of essential macroeconomic indicators: Personal Consumption Expenditures (PCE), Consumer Price Index (CPI), and Gross Domestic Product (GDP) growth rate, Federal Funds Rate (FEDR), and a COVID dummy variable. We use three models: a basic macroeconomic relationship, a regression that incorporates worker demographics (which exhibited perfect multicollinearity), and a model that includes the impact of COVID shock. The best-performing Model 3 has an R-squared of 69.4%, with significant contributions from PCE, CPI, and GDP growth rate, and a strong positive effect from the COVID that identifies COVID's shock effect on the labor markets. It is particularly evident that the Federal Funds Rate is non-significant, mainly because of lagged effects. This result identifies that interest rates' relationship with unemployment is structurally explained by macroeconomic factors but dampened by extraordinary shocks. Future research can expand this study by (1) applying timeline specific hypothesis testing since monetary policy has stronger imprints on long term market trends and (2) broadening the scope of research into different international case studies to strengthen external validity.

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I. Introduction

1.1 Topic and Question Statement

One of the most basic linkages in macroeconomic policy is the rates of interest and unemployment. In this paper, we investigate the effects of changes in the interest rate, proxied by the federal funds rate, on the rate of unemployment in the U.S. economy between 2015 and 2025. We allow for important macroeconomic factors to influence these relationships, such as inflation- proxied by Consumer Price Index (CPI) inflation, Personal Consumption Expenditures (PCE) inflation, and GDP growth-along with structural shocks, notably the inception of the COVID-19 pandemic. Our research question is: How significantly do interest rates affect unemployment rates, and how are these mutually impacted by the overall state of the macroeconomy, with a major shock event such as the COVID-19 pandemic?

1.2 Rationale for Choice of Topic

As students coming into the job market, we were interested in studying external factors that contribute to our employment opportunities. Especially considering the unprecedented levels of economic volatility over the past decade with the COVID-19 pandemic, which sent unemployment rates up significantly despite aggressive monetary easing (*Unemployment Rates during the COVID-19 Pandemic*, n.d.). By studying how interest rates can affect unemployment rates within the past decade, it will help give us a timely understanding of the macroeconomic factors that influence the labor market.

1.3 Road Map for Organization of Paper

The structure of this research paper is broken down into the following components. Section II is a literature review which focuses on thoughts on monetary policy transmission, macroeconomic relationships (such as the Phillips Curve, Okun's Laws), demographics, structural shocks, such as COVID-19, etcetera. Section III is a theoretical component where a description and explanation of our models procure from such literature. Section IV is where the empirical component of our research takes place, with the goal of hypothesis testing, hypothesis measurement, as well as chart interpretation. Lastly, Section V concludes by repeating our research question, identifying our best model, a comparison with existing literature, and directions for future research.

II. Literature Review

Decades of data and research have shown that expansionary monetary policy reduces unemployment, while contractionary policy raises unemployment rates. Yet, evidence highlights that the positive relationship between interest and unemployment rate is far from uniform. Traditional aggregate models fail to completely capture macroeconomic variables; shifting labor-market structures; and unprecedented shocks, such as the COVID-19 pandemic; alter the effectiveness and transmission of monetary policy.

Foundational studies demonstrate that monetary policy affects real economic variables through multiple transmission channels. Startz (1981) rejected the neutrality of inflation, showing that unemployment responds systematically to monetary shocks. This study confirmed that policy actions have tangible labor-market effects. A more recent macroeconomic analysis by Zhu (2023) deepens this understanding by examining the joint dynamics between inflation, GDP, and unemployment using a vector autoregression (VAR). Zhu's findings reaffirm two core macroeconomic relationships central to monetary transmission: the Phillips Curve, where inflation and unemployment are inversely related, and Okun's Law, where declines in employment lead to proportionally larger declines in GDP. By employing Dickey–Fuller and

Phillips–Perron tests to ensure stationarity and by estimating dynamic interactions across key aggregates, Zhu provides clear evidence that macroeconomic variables co-move in consistent and predictable ways when monetary conditions change. This research strengthens the theoretical foundation for analyzing unemployment responses in a macro-driven framework rather than through firm-level heterogeneity.

Incorporating structural shocks into our research, the COVID-19 pandemic provides direct evidence of how structural shocks reshape unemployment dynamics and monetary policy effectiveness. Bok et al. (2023) show that the non-inflationary unemployment rate moves sharply during shocks such as COVID-19, while the natural rate of unemployment transforms slowly with demographic and structural conditions. Their Phillips-curve model finds that while the long-run natural rate remains stable around 4.5–5%, the short-run non-inflationary rate surged above 7% during the pandemic, suggesting that monetary policy must adjust to temporary deviations rather than structural changes. This distinction explains why understanding macroeconomic variables is critical as monetary policy interacts with evolving structural conditions rather than a static labor market.

Sun (2024) applies a Vector Autoregression (VAR) model using monthly Bureau of Labor and Statistics (BLS) data and explicit lockdown-based COVID shock multipliers. The data demonstrates that unemployment rose to 14.8% in April 2020, while long-term unemployment doubled. The study concludes that ultra-low interest rates played a crucial role in reducing the economic downturn and preventing permanent labor-market scarring. An example of how aggressive monetary easing interacts with shock-induced unemployment dynamics. Ahmad et al. (2021) similarly expresses through an Autoregressive Integrated Moving Average Artificial Neural Networks (ARIMA–ANN) hybrid model that COVID-19 created nonlinear disruptions to unemployment trends across Europe, projecting that its effects will persist for up to five years. Their findings motivate the inclusion of structural shocks in unemployment modeling, particularly for the 2015 to 2025 time period.

Moreover, worker demographics play a role in heterogeneous unemployment responses to monetary policy stimulus. Feldmann (2013) uses an Ordinary Least Squares (OLS) regression model to find a significant, positive correlation between real interest rates and unemployment globally, with particularly strong effects on younger workers (ages 15–24). This underscores the demographic sensitivity of macroeconomic cycles with respect to worker age. Likewise, Leahy and Thapar (2022) designate the effects of monetary policy on the young, those under 35; the middle-aged, those between 40 to 64; and the old, those over 64. The paper concludes that the younger demographic dampens the aggregate effect of monetary policy contractions or expansions, while the middle-aged amplifies the effect; the old have no significant effect.

Further demographic studies demonstrate that apart from age, monetary policy affects workers across gender, race, and income differently. Bergman et al. (2022) show that expansionary policy during tight labor markets disproportionately benefits historically marginalized groups. Similarly, Lee, Macaluso, and Schwartzman (2024) find that Black households experience roughly twice the unemployment volatility of white households, indicating that stabilization effects of monetary policy remain uneven across racial lines. These studies highlight why models incorporating demographic composition are essential for capturing the full spectrum of monetary transmission.

Together, these studies show that the effects of monetary policy on unemployment are conditioned not only by economic frictions, but also by macro structures, demographic evolution, and large shocks. The literature converges on three insights:

(1) Monetary policy has real and persistent labor-market effects that transmission differently based on worker demographics

(2) Structural shocks like COVID-19 can dramatically shift unemployment dynamics and alter policy effectiveness; and

(3) Macroeconomic variables directly shape how unemployment responds to policy across time.

Despite these insights, few studies integrate macro variables, worker demographics, and structural shocks into a unified framework to evaluate how monetary policy affects unemployment in the post-2015 period, particularly across the COVID-19 shock.

Our contribution lies in combining these factors into a comprehensive analysis of unemployment responses to monetary policy using macroeconomic variables and structural shocks from 2015 to 2025. By integrating monetary, macroeconomic, and shock-driven forces, this study evaluates the extent to which economic conditions and structural disruptions influence the transmission of monetary policy to unemployment.

III. Theoretical Analysis

3.1 Brief Descriptions and Justification of Models

Two economic theories drove the initial ideas for our models: the Phillips Curve and Okun's Law. The Phillips Curve shows us that there's an inverse relationship between unemployment and inflation. This means that as inflation rises, unemployment lowers and vice versa. The logic is that when the economy is active with lots of employed individuals, employers will offer higher wages to attract or keep more workers which raises inflation. However, we make a distinction between the Short-Run Phillips Curve and the Long-Run Phillips Curve.

In the short run, it suggests that the tradeoff between unemployment and inflation is much higher because wages and prices take time to adjust. But, in the long run, the tradeoff is less prevalent because workers and firms can adjust their expectations as wages rise in line with inflation and employment returns to the natural rate. Since we estimate using a short time frame (2015-2025) for this study, we rely on the Short-Run Phillips Curve more. Motivated by the Phillips Curve, we included the CPI and PCE to test the short-run inverse relationship between inflation and unemployment because (1) CPI measures the inflation rate for consumers and (2) PCE measures consumer spending behavior, which corresponds to inflation relationships.

The second theoretical basis is Okun's Law, which assumes a systematic negative correlation between real economic growth and unemployment. This principle indicates that when real GDP rises relative to potential GDP, enterprises will expand production, which requires an increase in labor input and thereby a reduction in the unemployment rate. On the contrary, periods of weak or negative output growth are often accompanied by higher unemployment rates, as businesses tend to cut back on recruitment or reduce their demand for labor. Driven by this relationship, we incorporate GDP growth as an explanatory variable into our model to capture how broad economic performance translates into labor market outcomes. This approach enables us to examine whether the traditional mechanism - stronger output growth leading to lower unemployment - holds true within our sample period and in the context of additional macroeconomic controls.

IV. Empirical Analysis

4.1 The Data

This dataset contains a total of 14 variables: 12 independent variables, 1 dependent variable, and 1 dummy variable captured during the COVID-19 period. Each variable includes 118 months of observations (11/2015-08/2025). All variables have been cleared and converted into a consistent monthly basis; the missing values are input linearly. It is worth noting that the original data on GDP growth rate is reported quarterly; for the missing monthly GDP data, the actual observation data that are closest in the two directions are used to fill in. In short, this series should accurately reflect all macroeconomic indicators. The data has been cleaned up to the minimum extent to ensure its accuracy.

Macroeconomic indicators show significant variability and are thus included in the analysis as benchmarks. The average inflation rates of PCE and CPI were 5.55% and 3.11% respectively, reflecting the main driving factors of the economy, personal consumption expenditure, and the impact of inflation on the broader labor market conditions. The growth of real GDP shows the most dispersed distribution, ranging from -28.00% to 34.90%, with a standard deviation of 7.34. It is included in the measurement of how the cyclical state of the economy affects the unemployment rate. The federal funds rate, as an indicator, is used to estimate the impact of interest rates on the unemployment rate and enables the model to take into account changes in the monetary policy stance over time. The average unemployment rate, the dependent variable, was 4.59%, but it peaked at 14.80%, highlighting the severity of the labor market turmoil.

Finally, the manually set COVID dummy variable (03/2020-03/2023) marks the structural disruption period of inflation, output, and employment patterns caused by the special event of the COVID-19 pandemic, which needs to be handled independently. In summary, the dataset and statistics show that the impact of key macroeconomic categories on the unemployment rate has been taken into account within the time range of nearly ten years (2015-2025), adjusting for structural breaks. In the subsequent research, their correlation in explaining the changes in the unemployment rate during the sample period has been confirmed.

4.2 Model Building

(A) Hypothesis Testing

To achieve the objectives of understanding how macroeconomic variables and structural shocks shape the dynamics of unemployment in the US economy, the third model will be subjected to an individual t-test and then to a joint F-test. These hypotheses are tied to the macroeconomic relationships of consumption and inflation, which, in the short run, are believed to decrease unemployment because of the demand-driven economy. The decrease of unemployment is believed to be a negative relationship with the growth of GDP due to Okun's Law, the inflation of rates may affect the conditions of the labor market, and the COVID-19 pandemic is an external shock that is believed to increase unemployment in the short run. These tests will help in determining how each of the variables can explain variations in the model.

Hypothesis Testing Table

Variable	H_0	H_a	t - statistics	P value	Result
PCE	$\beta_{PCE} = 0$	$\beta_{PCE} < 0$	-2.72	0.007	Reject H_0
CPI	$\beta_{CPI} = 0$	$\beta_{CPI} < 0$	- 6.89	$3.5 * 10^{-10}$	Reject H_0
GDP Growth	$\beta_{GDP} =0$	$\beta_{GDP} <0$	–3.34	0.001	Reject H_0
Federal Funds Rate	$\beta_{FEDR} =0$	$\beta_{FEDR} >0$	–0.80	0.42	Failed to reject
Covid - 19	$\beta_{COVID} =0$	$\beta_{COVID} >0$	10.09	2×10^{-17}	Reject H_0
Overall	$\beta_{PCE} = \beta_{CPI} = \beta_{GDP} = \beta_{FEDR} = \beta_{COVID} =0$	At least one slope coefficient not equal to 0	50.77	3.1×10^{-27}	Reject H_0

The empirical estimates indicate that macroeconomic conditions do, in fact, affect unemployment. The coefficient for PCE is negative and statistically significant ($t = -2.72$, $p = 0.007$), suggesting that improved employment conditions occur with stronger household demand. The negative effect of inflation bears are statistically significant ($t = -6.89$, $p = 3.5 * 10^{-10}$), which corresponds with short-run Phillips Curve behavior that with higher inflation, the labor market is tighter. Additionally, the significant negative effect produced by GDP growth ($t = -3.34$, $p = 0.001$) provides further empirical support for the validity of Okun's Law and shows that real output growth leads to reductions in the unemployment rate.

On the other hand, the federal funds rate does not appear to have statistically significant effects with unemployment ($t = -0.80$, $p = 0.42$), which is consistent with the theory of monetary transmission: changes to interest rates are unlikely to yield real activity changes, especially in the short run, due to large structural shocks. The dominance of this latter theory is further evidenced by the large and significant positive coefficient ($t = 10.09$, $p = 2 * 10^{-17}$) of the COVID-19 dummy which captures the unprecedented rise in unemployment during the pandemic.

While individual predictors differ in terms of statistical relevance, the entire model still shows a high level of explanatory ability. The joined F-test from the regression very strongly rejects the null hypothesis that all the slope coefficients are equal to zero ($F = 50.77$, $p \approx 3.1\times10^{-27}$), confirming that the explanatory variables out of the various regression equations, consider a statistically significant portion of the variation concerning the dependent variable of unemployment. More clearly, the unemployment figures primarily respond to aggregate demand and significant structural shocks, with GDP growth and the COVID-19 pandemic dominating short-run labor-market fluctuations. This evidence confirms the validity of the structure of Model 3 and the need to consider macroeconomic fundamentals and extraordinary events simultaneously to analyze unemployment behavior within the years 2015-2025.

(B) Presentation and Interpretation of Each Model

Figure 1. A comparison between all of our different models.

	Model 1	Model 2	Model 3
Intercept	6.3950 (0.254)	-0.0053 (0.906)	5.8842 (0.192)
PCE	-0.13399 (0.036)	0.0006 (0.604)	-0.0732 (0.027)
CPI	-0.0386 (0.080)	-0.0035 (0.187)	-0.5151 (0.075)
GDP	-0.0382 (0.017)	-0.0006 (0.276)	-0.0417 (0.013)
Fed Funds Rate	-0.3828 (0.066)	0.0022 (0.528)	-0.0472 (0.058)
Male UR		0.4253 (0.000)	
Female UR		0.3881 (0.000)	
Black UR		0.0022 (0.790)	
Hispanic UR		0.0111 (0.366)	
Ages 16-24		0.0151 (0.279)	
Ages 20-24		0.0091 (0.488)	
Ages 25-54		0.1547 (0.005)	
College Grad UR		-0.0137 (0.070)	
Covid			2.8797 (0.286)
n	118	118	118
R^2	0.416	1.00	0.694

Model 1

Starting with our first model, it's a multiple regression model of PCE, CPI, GDP, and the Federal Funds rate on our dependent variable, the unemployment rate. The R squared tells us that 41.6% of the variation in the unemployment rate is captured by our current independent variables. While this is a good baseline, as we move forward with other models, we'll compare which variables will give us the best explanation for capturing the unemployment rate.

As we look into our independent variables, there are only two that are significant and align with our intuition: PCE and GDP. Both PCE and GDP are negatively correlated with the unemployment rate which aligns with our intuition that (1) as consumers spend more it leads to higher demand and less unemployment and (2) stronger economic growth is associated with lower unemployment. Both of these variables are also significant at a p value of 0 for PCE and p value of 0.029 for GDP.

However, CPI isn't statistically significant despite aligning with our expectations, and the Federal Funds Rate is statistically significant but doesn't align with our intuition. With a p value at 0.629 (see Appendix Figure 5) it indicates that CPI could be correlated with another variable, making it harder for the model to determine which variable is driving the variation in unemployment rate. CPI is most likely correlated with PCE because both variables measure consumer goods, but we decided not to remove either one to avoid committing omitted variable bias in our model.

Model 2

Model 2 builds on the foundation of model 1, adding worker demographics: unemployment rates for gender, race, age, and new college graduates. However, the addition of demographical subcomponents of unemployment led to a case of perfect multicollinearity, particularly under male and female unemployment rates. It was found that the model for unemployment rate could be perfectly explained by male and female rates because our workforce is only comprised of male and female workers. This oversight led to an R-squared and adjusted R-squared value of 1 coupled with insignificant p-values across all variables outside of gender demographics. A simple look into the correlation matrix and VIF table in Figure 6 (See Appendix) would echo the effects of multicollinearity as all worker-demographic variables had approximate correlation values of 1 and extremely high VIF values.

To address the glaring issue within the model, population metrics were suggested to find the microeconomic effect of worker demographics; a method that would find the specific effects on a worker's unemployment rate using gender, race, age, and new college graduates as dummy variables while keeping GDP-related variables constant. Dummy variables would find the actual numerical impact of worker demographics on unemployment rates, but this microeconomic methodology conflicted with the macroeconomic variables of PCE, CPI, GDP, and the Federal Funds Rate. Hence, worker demographics could not be used as dummy variables and including the actual unemployment rates tied to worker demographics was invalid as the demographical rates were subcomponents of the national unemployment rate. Ultimately, worker demographics had to be removed from the overall model to avoid multicollinearity and erroneous assumptions.

Model 3

Model 3 is based on Model 1 and incorporates dummy variables representing COVID Structural breaks. Model 3 explains approximately 69% of the unemployment rate variations and yields highly significant F-statistics. After adding the COVID dummy, the macroeconomic variables (except FEDR) retained economic statistical significance. Both PCE and CPI are significantly negatively correlated with the unemployment rate, which is consistent with the short-term Phillips curve dynamics under the neoclassical economic assumption: higher inflation coincides with a lower unemployment rate. The GDP growth rate is also correlated with a negative coefficient, which is consistent with Okun's Law. Although the federal funds rate was negative, it was not statistically significant, indicating that during this period, interest rate changes did not have a stable short-term predictive effect on the unemployment rate. The impact factor of COVID dummy is positive and very significant: during the COVID period, the unemployment rate was, on average, 2.88 percentage points higher than that during the non-COVID period, when all other factors remain unchanged. This captures event-driven structural shocks in the economy and the labor market. Correlation and VIF diagnosis indicate no harmful multicollinearity, which means the coefficients are reliable and will not be distorted by linear dependencies among predictors (See Figure 7 in the Appendix). Overall, Model 3 provides strong evidence that COVID, inflation, and output shocks have had a meaningful impact on monthly unemployment dynamics. Meanwhile, the Federal Funds Rate did not have a significant impact on the unemployment rate.

4.3 Analysis of Research Question

In Model 3, at a 95% confidence level, the Federal Funds Rate (FEDR) becomes statistically insignificant. However, the macroeconomic theories suggest that interest rates should affect the unemployment rate. The insignificance of FEDR highlights several important econometric and economic findings that help explain why the variable lost its predictive power after the inclusion of the COVID dummy.

Firstly, monetary policy has a lag effect and usually takes 6 to 18 months to have a meaningful impact on the outcomes of the labor market. Our model uses monthly unemployment data, which responds to the actual economic situation more quickly than changes in policy interest rates. The Federal Reserve system has not effectively changed the unemployment rate reflected in the monthly data in the short term - its impact is too slow and has no statistical significance. Therefore, the non-significance of this coefficient is consistent with the existing research on the lag of macroeconomic policies.

Secondly, the COVID dummy variable captured a drastic spike in the unemployment rate from 2020 to 2023. As the largest deviation in the entire dataset, the sharp increase in the unemployment rate is not caused by changes in interest rates, but rather the pandemic shock. When the COVID dummy captured this structural break, the federal funds rate lost most of its explanatory power, and the change in interest rates had a trivial impact on unemployment.

Thirdly, FEDR partially relies on CPI and GDP, which remain significant in Model 3. The Federal Reserve adjusts interest rates partially based on inflation and economic growth. Since CPI and GDP directly reflect the actual economic situation and are already included in the model, they absorb some changes that FEDR can explain.

Finally, the unemployment rate is declining while the Federal Reserve is raising interest rates, implying a negative correlation between interest rates and the unemployment rate. This does not mean that raising interest rates will cause a decline in the unemployment rate; instead, it reflects a short-term dynamic in the economy.

V. Conclusion

5.1 Restating the Question

This study worked to investigate the extent to which monetary policy, macroeconomic variables, and structural shocks shape the unemployment dynamics of the US economy between

2015 to 2025. At its core, the research focused on whether monetary policy tools were a decisive indicator for unemployment rate fluctuations after accounting for inflation-related variables and structural shocks. Restating this question clarifies our goal of evaluating how impactful monetary policy was in its effects on the labor market amidst the interaction of various macroeconomic indicators and the COVID-19 pandemic.

5.2 Choosing the Best Model

We chose Model 3 (Basic + COVID dummy) as the first choice because it provides the most reliable and economically interpretable results among the three models, while avoiding the major statistical problems observed in the other models: Model 1 is straightforward and clear, but it doesn't include important variables like our COVID dummy. Its residual pattern shows obvious heteroscedasticity, and the key macroeconomic coefficients are unstable. Model 2 increases the unemployment rates of different population groups. Due to extreme multicollinearity, the model cannot be used. In contrast, Model 3 maintained a very low correlation between coefficients and healthy VIF values, with no evidence of harmful multicollinearity, ensuring that the coefficient estimates were reliable.

Model 3 is also the most in line with macroeconomic intuition. PCE, CPI, and GDP all bear the expected negative sign and are statistically significant, conforming to the Phillips curve and Okun's Law. COVID dummies are of great significance as they capture a major structural shock, enhancing explainability without introducing multicollinearity. In the case of lagging monetary policy, the only insignificant FEDR will not harm the model. In contrast to Model 1, the residual diagnosis shows lower heteroscedasticity, indicating that Model 3 better captures the systemic changes of unemployment.

In conclusion, among all three models, Model 3 avoids the instability of Model 2 and the distortion of omitting our COVID dummy in Model 1, offering the strongest combination of theoretical rationality, statistical validity, and clean diagnosis; it is the most reasonable and economical choice to explain the unemployment rate.

5.3 Answering Research Question in Comparison to Literature

In Model 3, at a 95% confidence level, the federal funds rate (FEDR) becomes statistically insignificant. However, basic macroeconomic theories suggest that interest rates should affect the unemployment rate. Foundational studies by Startz (1981) demonstrated the systematic unemployment response due to monetary policy shocks. Thus, the insignificance of FEDR highlights several important econometric and economic findings that help explain why the variable lost its predictive power after the inclusion of the COVID dummy.

Firstly, monetary policy has a lag effect and usually takes 6 to 18 months to have a meaningful impact on the outcomes of the labor market. This assertion is consistent with Zhu's (2023) VAR analysis that showed the dynamic relationship between interest rates and unemployment are not instantaneous, reinforcing that high-frequency unemployment data may not fully capture short-run policy effects. Therefore, because our model uses monthly unemployment data, which responds to the actual economic situation more quickly than changes in policy interest rates, the full effect of monetary policy on unemployment rates is not properly captured. As a result, the non-significance of this coefficient is consistent with the existing research on the lag of macroeconomic policies.

Secondly, the COVID dummy variable captured a drastic spike in the unemployment rate from 2020 to 2023. As the largest deviation in the entire dataset, the sharp increase in the unemployment rate is not caused by changes in interest rates, but rather the pandemic shock.

This finding falls in line with Bok et al. (2023) which found that non-inflationary shocks cause unemployment rates to move rapidly as opposed to the slow progression of the natural unemployment rate in response to macroeconomic variable; this implies that structural breaks large explain sharp inclines or declines in unemployment. Hence, when the COVID dummy captured this structural break, the federal funds rate lost most of its explanatory power, and the change in interest rates had a trivial impact on unemployment.

Thirdly, FEDR partially relies on CPI and GDP, which remain significant in Model 3. The Federal Reserve adjusts interest rates partially based on inflation and economic growth as inflation is part of the Fed’s dual mandate. Since CPI and GDP directly reflect the actual economic situation and are already included in the model, they absorb some changes that FEDR can explain, lowering the FEDR variable’s significance.

Finally, the unemployment rate is declining while the Federal Reserve is raising interest rates, implying a negative correlation between interest rates and the unemployment rate. This does not mean that raising interest rates will cause a decline in the unemployment rate; instead, it reflects a short-term dynamic in the economy.

5.4 Future Avenues for Further Research

Further research on the relationship between monetary policy and unemployment rate would benefit from structural refinements and broader empirical context. The inclusion of lagged variables would allow researchers to more accurately capture the delayed transmission of monetary policy. As existing literature and foundational studies indicate, monetary policy often takes several quarters for its influence on labor markets and macroeconomic measures. Consequently, the absence of lagged variables constrains the accuracy of the model and obscures the true relationship between interest rates and unemployment.

Secondly, future studies should apply timeline specific hypothesis testing. Understanding that monetary policy has a stronger imprint on long-term market trends, it is important to assess the extent to which monetary policy influences short, medium, and long-term market conditions. The current model looks at the instantaneous effect of interest rates on unemployment through a 10-year period, but using lagged variables with differing timelines, improved models would create a clearer depiction of the Federal Reserve's influence on differing timelines.

Lastly, broadening the scope of research into several international case studies would strengthen the external validity of our findings. Countries differ in their monetary policy frameworks, which gives us a large pool of data to study to assess which strategies were most influential during certain market periods. Particularly focusing on mature, OECD countries, extensive research would help determine if the patterns of transmission in the US are internationally echoed or simply stuck within our borders. Ultimately, incorporating international evidence would provide a more comprehensive understanding of how structural conditions and policy interact to shape unemployment dynamics.

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Appendix

Figure 1: Variables

	Observations	Mean (%)	Std. Dev.	Min(%)	Max(%)
PCE	118	5.55	4.83	-14.30	29.90
CPI	118	3.11	2.14	0.10	9.10
GDP	118	2.66	7.43	-28.00	34.90
UR	118	4.59	1.74	3.40	14.80
FEDR	118	2.10	1.92	0.05	5.33
male_ur	118	4.63	1.59	3.50	13.50
female_ur	118	4.55	1.92	3.30	16.20
black_ur	118	7.32	2.19	4.80	16.90
hisp_ur	118	5.65	2.35	3.90	18.90
ur_1624	118	9.65	2.86	6.60	27.50
ur_2024	118	8.17	2.89	5.50	25.50
ur_2554	118	3.96	1.57	2.90	12.80
ur_cg_2534	118	3.12	1.56	1.50	10.60
covid_dummy	118	--	--	--	--

Figure 2: Variable Information

Column	Source	Timeframe	Variable Definition
Date	Index	N/A	Act as index

PCE	Bloomberg	Monthly	Personal consumption expenditures (%, YoY)
CPI	Bloomberg	Monthly	Consumer price index (%, YoY)
GDP	Bloomberg	Quarterly	Real GDP growth rate (%, YoY)
FEDR	Bloomberg	Daily	Federal funds effective rate (%)
UR	Bloomberg	Monthly	Unemployment rate (%)
Male_ur	FRED	Monthly	Male unemployment rate (%)
Female_ur	FRED	Monthly	Female unemployment rate (%)
Black_ur	FRED	Monthly	Black unemployment rate (%)

Hisp_ur	FRED	Monthly	Hispanic unemployment rate (%)
Ur_1624	FRED	Monthly	Unemployment rate, age 16–24 (%)
Ur_2024	FRED	Monthly	Unemployment rate, age 20–24 (%)
Ur_2554	FRED	Monthly	Unemployment rate, age 25–54 (%)
Ur_cg_2534	FRED	Monthly	College graduates age 25–34 unemployment rate (%)
covid_dummy	Manual	N/A	COVID period (03/2020-03/2023) indicator (1 = COVID, 0 = pre-COVID)

Figure 3: Model 1 Residual Plot

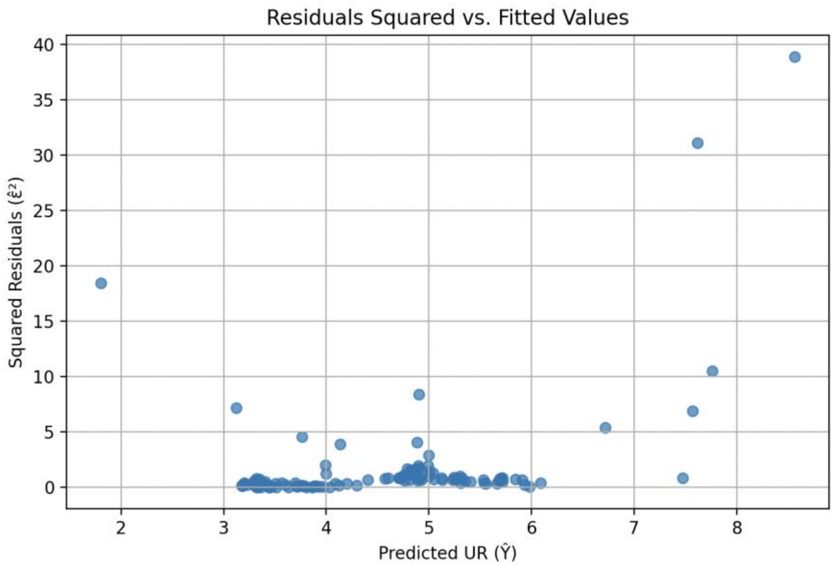


Figure 4: Model 3 Residual Plot

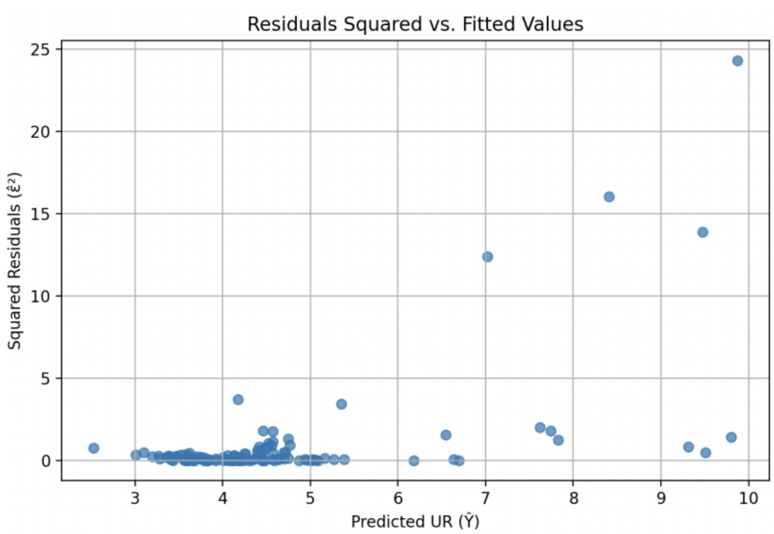
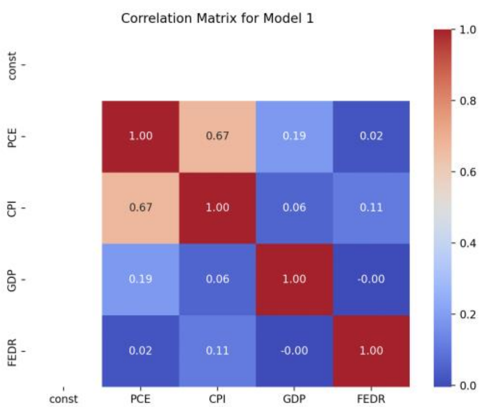


Figure 5: Model 1 Stata Output

```
                            OLS Regression Results
==============================================================================
Dep. Variable:                     UR   R-squared:                       0.416
Model:                            OLS   Adj. R-squared:                  0.395
Method:                 Least Squares   F-statistic:                     20.11
Date:                Fri, 12 Dec 2025   Prob (F-statistic):           1.58e-12
Time:                        13:22:21   Log-Likelihood:                -200.52
No. Observations:                 118   AIC:                             411.0
Df Residuals:                     113   BIC:                             424.9
Df Model:                           4
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const          6.3950      0.254     25.165      0.000       5.892       6.899
PCE           -0.1399      0.036     -3.908      0.000      -0.211      -0.069
CPI           -0.0386      0.080     -0.484      0.629      -0.197       0.119
GDP           -0.0382      0.017     -2.219      0.029      -0.072      -0.004
FEDR          -0.3828      0.066     -5.819      0.000      -0.513      -0.252
==============================================================================
Omnibus:                       67.309   Durbin-Watson:                   0.505
Prob(Omnibus):                  0.000   Jarque-Bera (JB):              260.997
Skew:                           2.071   Prob(JB):                     2.11e-57
Kurtosis:                       8.994   Cond. No.                         19.6
==============================================================================
```

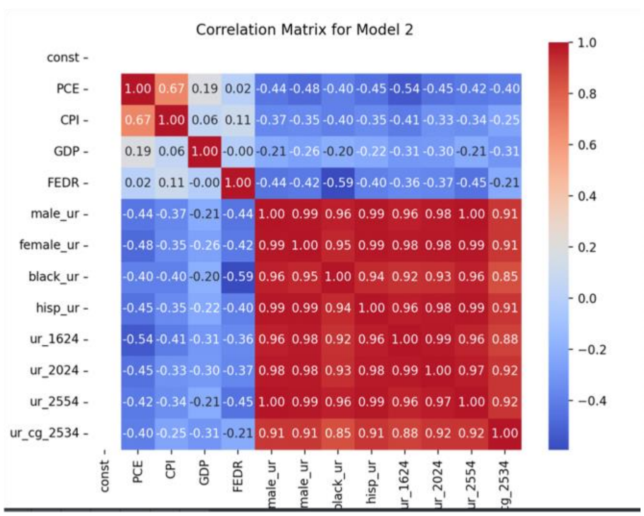


VIF Table:

	variable	VIF
0	const	4.165087
1	PCE	1.908652
2	CPI	1.869222
3	GDP	1.045585
4	FEDR	1.017908

Figure 6: Model 2 Stata Output

```
                            OLS Regression Results
==============================================================================
Dep. Variable:                     UR   R-squared:                       1.000
Model:                            OLS   Adj. R-squared:                  1.000
Method:                 Least Squares   F-statistic:                 2.483e+04
Date:                Fri, 12 Dec 2025   Prob (F-statistic):          2.23e-175
Time:                        13:23:17   Log-Likelihood:                 236.88
No. Observations:                 118   AIC:                            -447.8
Df Residuals:                     105   BIC:                            -411.7
Df Model:                          12
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const         -0.0053      0.045     -0.118      0.906      -0.094       0.083
PCE            0.0006      0.001      0.520      0.604      -0.002       0.003
CPI           -0.0035      0.003     -1.329      0.187      -0.009       0.002
GDP           -0.0006      0.001     -1.095      0.276      -0.002       0.000
FEDR           0.0022      0.003      0.633      0.528      -0.005       0.009
male_ur        0.4253      0.037     11.622      0.000       0.353       0.498
female_ur      0.3881      0.032     12.264      0.000       0.325       0.451
black_ur       0.0022      0.008      0.268      0.790      -0.014       0.018
hisp_ur        0.0111      0.012      0.908      0.366      -0.013       0.035
ur_1624        0.0151      0.014      1.088      0.279      -0.012       0.042
ur_2024        0.0091      0.013      0.696      0.488      -0.017       0.035
ur_2554        0.1547      0.054      2.874      0.005       0.048       0.261
ur_cg_2534    -0.0137      0.008     -1.829      0.070      -0.029       0.001
==============================================================================
Omnibus:                        5.904   Durbin-Watson:                   1.894
Prob(Omnibus):                  0.052   Jarque-Bera (JB):                3.014
Skew:                          -0.122   Prob(JB):                        0.222
Kurtosis:                       2.256   Cond. No.                         421.
==============================================================================
```

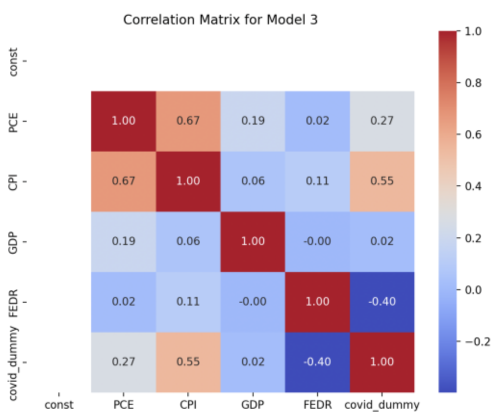


VIF Table:

	variable	VIF
0	const	197.366266
1	PCE	3.523334
2	CPI	3.084883
3	GDP	1.487293
4	FEDR	4.286367
5	male_ur	333.914759
6	female_ur	363.526467
7	black_ur	31.572393
8	hisp_ur	81.877163
9	ur_1624	154.499163
10	ur_2024	141.830969
11	ur_2554	706.097271
12	ur_cg_2534	13.568230

Figure 7: Model 3 Stata Output

```
                            OLS Regression Results
==============================================================================
Dep. Variable:                     UR   R-squared:                       0.694
Model:                            OLS   Adj. R-squared:                  0.680
Method:                 Least Squares   F-statistic:                     50.77
Date:                Fri, 12 Dec 2025   Prob (F-statistic):           3.10e-27
Time:                        13:23:33   Log-Likelihood:                -162.40
No. Observations:                 118   AIC:                             336.8
Df Residuals:                     112   BIC:                             353.4
Df Model:                           5
Covariance Type:            nonrobust
===============================================================================
                  coef    std err          t      P>|t|      [0.025      0.975]
-------------------------------------------------------------------------------
const           5.8842      0.192     30.710      0.000       5.505       6.264
PCE            -0.0732      0.027     -2.724      0.007      -0.126      -0.020
CPI            -0.5151      0.075     -6.886      0.000      -0.663      -0.367
GDP            -0.0417      0.013     -3.335      0.001      -0.067      -0.017
FEDR           -0.0472      0.058     -0.809      0.420      -0.163       0.068
covid_dummy     2.8797      0.286     10.085      0.000       2.314       3.445
==============================================================================
Omnibus:                       38.636   Durbin-Watson:                   1.168
Prob(Omnibus):                  0.000   Jarque-Bera (JB):              458.730
Skew:                           0.569   Prob(JB):                    2.44e-100
Kurtosis:                      12.592   Cond. No.                         31.3
==============================================================================
```



VIF Table:

	variable	VIF
0	const	4.478051
1	PCE	2.031907
2	CPI	3.109469
3	GDP	1.046423
4	FEDR	1.510649
5	covid_dummy	2.171101