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Economic policy uncertainty and labor market volatility: ARDL analysis of short and long-run effects on U.S. unemployment

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Abstract

This paper explores the nexus between economic policy uncertainty (EPU) and unemployment in the United States from 1990 to 2022, recognizing the necessity of grasping how unpredictable policy shifts affect labor market stability. The purpose is to evaluate how fluctuations in EPU impact U.S. unemployment rates in the short and long term. Employing time series analysis and an Autoregressive Distributed Lag (ARDL) cointegration approach, this research incorporates key economic indicators such as GDP growth, inflation, and population growth, alongside the EPU index to capture the different dynamic interactions over time. Our empirical results indicate a cointegration link between the variables based on the ARDL bounds tests. The results reveal that economic policy uncertainty has a delayed and nonlinear impact on unemployment in the short term. However, in the long run, the results elucidate that a 1% increase in economic policy uncertainty results in a 0.019% growth in the unemployment rate. Additionally, inflation and population positively affect unemployment volatility in both the short and long run. Conversely, economic growth considerably stabilizes the labor market by reducing short and long-run unemployment fluctuations. The study underscores the need for stable, predictable policies to reduce unemployment volatility. These results suggest that policymakers should consider the broader implications of economic uncertainty on labor market dynamics.

Keywords: ARDL Cointegration, Economic Growth, Economic Policy Uncertainty, Labor Market Stability, Unemployment Dynamics, United States.

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1. Introduction

Due to the importance of having appropriate and stable economic policies in increasing employment opportunities, their influence on employment trends has attracted scholarly attention: economic policy uncertainty (EPU). EPU is often determined by tracking the occurrence of particular phrases in publications, which signals a lack of clarity regarding future policies. This uncertainty postpones investment and hiring decisions, influencing the unemployment rate [1, 2].

Important economic events like financial catastrophes and global geopolitical conflicts have been linked to high levels of economic policy uncertainty (EPU) during periods of recession. An example is the increase in EPU during the 2008 global financial crisis and its contribution to rising unemployment in the U.S. [3, 4]. That is why there is a need for more research based on the relationship between EPU and unemployment, as it could help devise policies that would stabilize the labor market. Past studies show us the extent of the impact of EPU, such as its impact on markets and overall economic stability, which in turn alters the labor market. To illustrate, Arouri et al. [5] showed how significantly uncertainty over policy frameworks (76.9% during bull markets and 87% during bear markets) reduces stock market returns, especially during heightened volatility. This follows Smales [6], who documented increased employment volatility in G7 financial markets due to increased EPU leading to firms changing their investment and recruitment policies, which affected employment levels and increased unemployment rates. Zhao [7] also showed the influence that policy risks have on economic stability, both nationally and internationally, alongside global labor markets. Suppose there is uncertainty in dealing with policies. In that case, firms are more precarious regarding unemployment, especially in sensitive fields like healthcare, construction, and finance [8].

Despite substantial progress in learning about the economic effects of EPU, important gaps remain on the direct and indirect effects of unemployment over various economic cycles. Payne [9] extended the analysis by studying how EPU correlates with entrepreneurship, finding that increased uncertainty deters potential entrepreneurs, slowing the pace of job creation. This finding is consistent with the work of Caggiano et al. [10] who used the Smooth Transition VAR model to reveal that the effect of EPU on unemployment is considerably more significant during the period of economic recession, and uncertainty shocks are called particularly important factors of unemployment volatility in all business cycles. These findings also align with recent research examining a nonlinear relationship between economic policy uncertainty (EPU) and economic volatility, suggesting that the impact of uncertainty differs according to prevailing economic conditions [11]. These findings highlight the necessity for further investigation into the nuanced implications of EPU on unemployment rates, which comprise the main focus of this study.

In light of this context, this study contributes to the existing literature by analyzing the short-run and long-run effects of EPU on unemployment in the U.S. using the Autoregressive Distributed Lag (ARDL) model. This allows dynamic relationships among EPU and significant macroeconomic indicators such as inflation, GDP growth, and population growth. While the study of Moutinho and Silva [12] discussed the role played by fiscal and trade policies in addressing unemployment, our research introduces EPU as a key analytical variable. It delves into the complex relationship between policy uncertainty and unemployment. Our methodological framework is based on the results of Dajčman et al. [13], who studied the spillover effects of EPU on adults and youth unemployment in Europe to highlight the heterogeneity of labor markets in their effects of uncertainty shocks. Concentrating specifically on the United States, this study fills a relevant literature gap, conducting a detailed investigation of the role of EPU in the American labor markets, considering both the local cyclical and structural aspects.

The findings yield three key contributions to this paper. First, it provides empirical evidence for a long-run relationship between economic policy uncertainty and the unemployment rate in the U.S. labor market. Second, it examines the short-term dynamics and speeds of adjustment after EPU shocks, shedding light on how quickly the economy responds to changes in policy-related uncertainty. Thirdly, we highlight the need for policymakers to adopt stable and predictable economic policies to reduce labor market instability. This is consistent with Leonardi et al. [14], who emphasize the importance of health and social factors in determining employment outcomes. With increasing uncertainty in economic policy, understanding and addressing its effects on unemployment is more important than ever.

The remainder of the paper is structured as follows: Section 2 provides a comprehensive literature review emphasizing the relationship between economic policy uncertainty, unemployment, and other macroeconomic indicators. Section 3 details the research methodology, including data sources, variable definitions, and the ARDL econometric model applied. Section 4 presents empirical results illustrating how economic policy uncertainty impacts unemployment in both short- and long-term contexts. Section 5 discusses these findings, their implications, limitations, and avenues for future research. Finally, Section 6 summarizes this study's key insights and implications.

2. Literature Review

Economic policy uncertainty (EPU) has been identified as a significant determinant of critical economic indicators, especially under unpredictable economic conditions. This study investigates the impact of EPU on unemployment in the United States, emphasizing the significance of policy uncertainty during periods of economic volatility. Given its prominent

role in the global economy, the United States provides an appropriate context for examining these dynamics. Employing a comprehensive approach, the research seeks to expand existing knowledge regarding how economic policy fluctuations influence labor markets in conjunction with inflation patterns, economic growth trajectories, and demographic trends. The findings aim to inform policymakers by clarifying the interconnected effects of policy uncertainty and key macroeconomic indicators on employment stability.

2.1. Economic Policy Uncertainty and Unemployment

Studies examining EPU indicate that elevated uncertainty leads to higher unemployment rates, especially during the recession. For instance, Caggiano et al. [10] show more nonlinearly that unexpected rises in policy uncertainty have more significant negative effects on unemployment during downturns. Following this view, Payne [9] demonstrated the causal relationships between entrepreneurship and unemployment, and subsequently, less uncertainty facilitates job creation. Building on these insights, Haldar and Sethi [4] show how COVID-19 containment measures enhance the effects of EPU on labor market volatility. Moutinho and Silva [12] present further evidence by connecting categorical EPU shocks with surging unemployment rates. Dajčman et al. [13] focus on differential spillover effects of foreign and domestic policy uncertainties on adult and youth unemployment.

2.2. Inflation and Unemployment

The interplay between inflation and unemployment has generated mixed empirical results. Uddin and Rahman [15] report that, under certain conditions, inflation can positively affect economic activity while simultaneously influencing unemployment levels. Victor et al. [16] compare the dynamics in different economies, noting that recessionary episodes can trigger stagflation, where inflation and unemployment rise together. In a novel asymmetric exploration, Rehman et al. [17] show that the adverse impacts of inflation may exacerbate unemployment disparities, particularly in low-income settings. Pham and Sala [18] further elaborate that cross-country volatility spillovers magnify the inflation–unemployment trade-offs during economic turbulence.

2.3. Economic Growth and Unemployment

A robust body of research has examined the bidirectional relationship between economic growth and unemployment. Pasara and Garidzirai [19] identify a significant long-term linkage wherein higher investment and capital formation positively influence growth, yet unemployment dynamics may not immediately reflect these changes. Pal et al. [20] provide international evidence that remittance inflows can stimulate growth while exerting mixed effects on unemployment, highlighting regional disparities. Rodríguez-Caballero and Vera-Valdés [21] argue that pandemics can permanently alter growth trends and elevate unemployment persistence. Almutairi [22] reveals that oil price shocks can significantly drive fluctuations in both growth and unemployment, whereas Ragmoun [23] underscores the moderating role of institutional quality in this relationship. Ngubane et al. [24] and Chuttoo [25] lend further support by testing the validity of Okun's law in different settings, and Daştan and Eygü [26] extend the analysis by integrating environmental considerations with economic performance.

2.4. Population Growth and Unemployment

While other macroeconomic factors have been more extensively discussed, population dynamics are critical in shaping unemployment rates, primarily via indirect mechanisms through their pressure on the economy and environment. Demographic transitions are driving broader changes in labor market outcomes. However, not through direct economic effects, as Wang and Li [27] stress: They come indirectly through changes in environmental and economic conditions caused by population aging and density. Islam et al. [28] conducted a similar investigation using a dynamic ARDL framework to show that population growth, inflation, and carbon emission jointly drive unemployment mainly through their effect on general economic performance. Economic growth has a powerful effect on unemployment rates in developing economies, where frequent surges in population outpace the creation of new jobs, resulting in higher levels of unemployment. Research done by Nawaz and Anwar [29] and Shomurodov et al. [30] draws from countries like Pakistan, Somalia, or similar to provide evidence of considerable demographic expansions correlating with unemployment surges. These studies highlight the effects of demographic growth on labor markets, demonstrating that demographic growth can indeed overwhelm the adjustment capacities of labor markets. Despite this, though rapid population growth may increase the likelihood of unemployment in the short term, it can lead to economic dynamism, innovation, and the creation of jobs beyond the short term when combined with conducive economic policies and strategic investment in education and skill development [31, 32]. So, ensuring that demographic expansion matches economic growth strategies and labor market needs is key; it would be sure to prevent rising population numbers from translating into continued and damaging spikes in unemployment.

2.5. Research Gap

While extensive studies have examined the impact of economic policy uncertainty (EPU) on macroeconomic stability, critical gaps remain concerning its precise effects on unemployment in the short and long term. Previous research often overlooks the simultaneous influence of inflation, GDP growth, and demographic trends within unified analytical frameworks. Most analyses adopt linear models, potentially missing significant nonlinear or asymmetric relationships during economic fluctuations. Moreover, sector-specific impacts of EPU and indirect pathways through investment and consumer behavior have received limited attention. The interaction of demographic shifts and recent global disruptions like COVID-19 with EPU's employment effects remains underexplored. Comparative assessments of adjustment speeds to policy shocks

across diverse economic contexts are notably scarce. This study addresses these limitations using an ARDL cointegration approach, providing comprehensive insights into the EPU's complex relationship with unemployment in the United States.

3. Materials and Methods

This study examines the unemployment rate-economic policy uncertainty nexus in the United States from 1990 to 2022, recognizing the importance of understanding how unpredictable policy shifts affect labor market stability. The ARDL econometric method is advantageous because it applies to data of mixed integration orders, captures both the immediate impacts and the long-term equilibrium connections, and provides a detailed EPU's impact on labor market stability. We use statistical data from the World Bank (World Development Indicators) and the EPU Index, focusing on unemployment, EPU, inflation, GDP growth, and population growth. The following sections detail our data sources, variables, and econometric approach, laying out the methodology for replicating and validating our findings.

3.1. Data Sources and Descriptions

Table 1 outlines the data sources and descriptions for key variables in this study. Unemployment (UEM), inflation (CPI), GDP growth, and population growth (POP) are collected from the World Bank (*World Development Indicators*-WDI). The Economic Policy Uncertainty (EPU) index, specifically tracking policy-related uncertainty, is drawn from the Economic Policy Uncertainty database. Together, these variables provide a foundation for analyzing the economic policy uncertainty effects on unemployment trends and other economic indicators in the U.S.

Table 1.
Data sources and Descriptions.

Variables	Description	Sources
UEM	(% of total labor force)	WDI
EPU	EPU Index	Economic Policy Uncertainty
CPI	Inflation based on Consumer Price Index (%)	WDI
GDP	GDP Growth (%)	WDI
POP	POP Growth (%)	WDI

3.2. Model Specification

The mathematical model:

$$UEM_t = \mathrm{f}(EPU_t, CPI_t, GDP_t, POP_t) \qquad (01)$$

Equation 1 is transformed into an econometric Equation, as follows:

$$UEM_t = \alpha_0 + \alpha_1\, EPU_t + \alpha_2\, CPI_t + \alpha_3 GDP_t + \alpha_4 POP_t + \varepsilon_t \qquad (02)$$

Uncertainty in economic policies, inflation, and population growth are expected to increase unemployment rates, i.e: $\alpha_1 = \frac{\partial UEM}{EPU} > 0\ ,\ \alpha_2 = \frac{\partial UEM}{CPI} > 0\ and\ \alpha_4 = \frac{\partial UEM}{POP} > 0.$ On other hand, GDP growth is expected to dampen Unemployment rates, i.e: $\alpha_3 = \frac{\partial UEM}{POP} < 0\ \alpha_3 = \frac{\partial UEM}{POP} < 0$.

The ARDL technique's typical functional structure is given by the following:

$$\begin{aligned}\Delta UEM_t = \ \alpha_0 &+ \sum_{i=1}^{p} \gamma_0 \Delta UEM_{t-i} + \sum_{i=0}^{p} \gamma_1 \Delta EPU_{t-i} + \sum_{i=0}^{p} \gamma_2 \Delta CPI_{t-i} \\ &+ \sum_{i=0}^{p} \gamma_3 \Delta GDP_{t-i} + \sum_{i=0}^{p} \gamma_4 \Delta POP_{t-i} + \alpha_1 UEM_{t-1} + \alpha_2 EPU_{t-1} \\ &+ \alpha_3 CPI_{t-1} + \alpha_4 GDP_{t-1} + \alpha_5 POP_{t-1} + \varepsilon_t \qquad (03)\end{aligned}$$

Equation 3 is employed to estimate the long-run convergence of the variable series, reflecting the formulation of the null and alternative hypotheses:

$$H_0: \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5\ vs\ H_1: \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5$$

Accordingly, H_0 signifies the null hypothesis, which assumes no cointegration relationship, whereas H_1 reflects the alternative hypothesis, indicating a cointegration relationship between variables. Therefore, the study will confirm a cointegration relationship among series if the null hypothesis is rejected with strong evidence.

4. Results

The results section presents empirical findings of the unemployment rate–economic policy uncertainty nexus in the U.S. Using the ARDL model, the analysis examines short- and long-term effects, supported by unit root and cointegration tests for model reliability. The results indicate that EPU substantially impacts unemployment, and heightened policy uncertainty

increases unemployment. The model passes diagnostic and stability tests that ensure its suitability for policy analysis. The results show that there is a need to have stable economic policies to support the labor market.

4.1. Descriptive Statistics

Table 2 reports a descriptive statistics overview for all variables employed in the study, offering insights into their central tendencies and variability across observations. The unemployment rate (UEM) averages 5.83% with a median of 5.53%, indicating that it generally centers around these values, with moderate variability (standard deviation of 1.62). The unemployment rate (UEM) varies between a minimum of 3.65% and a maximum of 9.63%, suggesting fluctuations influenced by economic conditions over time. The Economic Policy Uncertainty (EPU) index shows a mean of 107.06 and a median of 108.35, with substantial variation (standard deviation of 42.25). This widespread variation, reflected from 56.06 to 278.87, highlights periods of relatively stable and highly uncertain policy environments. Inflation (CPI) averages 2.65%, with a median close to this value at 2.61%. However, the variability (1.51) and range, extending from -0.36% to 8.00%, indicate notable fluctuations in price levels, likely due to economic shocks or cyclical pressures. The average GDP growth value is 2.40%, while the median stands at 2.68%, with a standard deviation of 1.83, showing that growth rates varied significantly, from -2.77% during downturns to a peak of 5.95%. Population growth (POP) is relatively stable, with an average of 0.91% and a narrow range from 0.16% to 1.39%. The low standard deviation (0.29) suggests limited fluctuation in population growth rates over the period. These statistics provide a foundational understanding of the economic landscape, enabling further exploration of how EPU influences unemployment and other economic indicators.

Table 2.
Descriptive Statistics Overview.

Variables	UEM	EPU	CPI	GDP	POP
Mean	5.832	107.055	2.6478	2.3961	0.9101
Median	5.529	108.352	2.6074	2.6842	0.9277
Maximum	9.633	278.871	8.0028	5.9454	1.3868
Minimum	3.65	56.0621	-0.3555	-2.7678	0.1567
Std. Dev.	1.6159	42.246	1.5145	1.8349	0.2868
Observations	33	33	33	33	33

Note: Monthly data for the EPU variable were converted to annual data by taking the average Monthly during the year for each year, this annual average represents the annual EPU value for the USA.

4.2. ADF and PP Stationarity Tests

Table 3 displays the findings of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests, used to assess the stationarity of each variable at both levels and first differences. For each test, the null hypothesis assumes that the variable has a unit root, implying non-stationarity. Most variables do not reject the null hypothesis under the ADF and PP tests at the level form, suggesting non-stationarity in their original form. Notably, EPU and GDP show significant results under certain conditions (e.g., with trend and intercept in the ADF test), indicating potential stationarity for these variables. However, most variables, including UEM, CPI, and POP, exhibit non-stationarity at levels. After taking the first differences, the results change markedly. The ADF and PP tests indicate that all variables reject the null hypothesis across all conditions (intercept, trend, intercept, and none), confirming stationarity in the first-differenced form. This implies that the variables become stationary after differencing, making them suitable for further analysis in models requiring stationary series, such as the ARDL model employed in this study. These results highlight the need for differencing to achieve stationarity and suggest that analyzing economic policy uncertainty's effects on unemployment and other economic indicators should proceed with first-differenced data to ensure reliable results.

Table 3.
ADF and PP Stationarity Test Summary.

Variables	ADF [a]			PP [a]		
	Intercept	Trend & intercept	None	Intercept	Trend & intercept	None
UEM	-2.2176	-2.1785	-0.7971	-2.3972	-2.3627	-0.7418
EPU	-3.9340***	-3.9762**	-1.2281	-3.9349***	-3.8599**	-0.9277
CPI	-2.3454	-1.7097	-0.6468	-2.3573	-1.5973	-0.5114
GDP	-5.0812***	-5.2986***	-1.0896	-5.0756***	-5.2929***	-2.2963**
POP	-0.0730	-7.0858***	-2.5570**	-1.4989	-7.5522***	-1.4855
Δ(UEM)	-4.9373***	-4.8651***	-5.0038	-4.9883***	-4.8872***	-5.0579***
Δ(EPU)	-7.5321***	-7.4436***	-7.6609***	-11.5925***	-16.6165***	-11.8764***
Δ(CPI)	-4.9808***	-5.3730***	-5.0561***	-4.8729***	-5.3679***	-4.9592***
Δ(GDP)	-9.7856***	-9.5833***	-9.9254***	-13.6868***	-13.3007***	-14.1856***
Δ(POP)	-5.5888***	-5.5135***	-10.0621***	-17.5556***	-18.6032***	-10.3797***

Note: Statistical significance in the ADF and PP stationarity tests is denoted by (*), (**), and (***), corresponding to the 10%, 5%, and 1% significance levels, respectively.
[a] H_0 = the series have a unit root.
$\Delta(x)$ denotes the first-order difference of the variable x.

4.3. Cointegration Test Results

Table 4 reports the outcomes of the F-Bounds cointegration test, which examines the presence of a long-run connection among the variables in the model. The null hypothesis of this test posits that there are no levels of relationship, meaning that the variables do not exhibit a cointegration relationship. The reported F-statistic is 15.14799, which is substantially higher than the critical values for both asymptotic (large sample) and finite sample distributions at all conventional significance levels (10%, 5%, 2.5%, and 1%) for both I(0) and I(1) bounds. Specifically, for a finite sample size close to 29, the critical value at the 1% level for the upper bound (I(1)) is 5.532, well below the calculated F-statistic. Since the F-statistic is greater than the upper bound values at every significance level, the null hypothesis of no cointegration is rejected, suggesting a long-run equilibrium connection between the variables. Thus, economic policy uncertainty, unemployment, inflation, GDP growth, and population growth move together in the long run. This study's outcome supports the adoption of ARDL analysis to uncover the effects of economic policy uncertainty on unemployment trends alongside other economic indicators throughout the United States.

Table 4.
Cointegration Test Results.

F-Statistic Bounds Test		**H_0: No long-run relationship exists**		
Test Statistic.	**Value.**	**Significant**	**I(0)**	**I(1)**
			Asymptotic: n=1000	
F-statistic	15.14799	10%	2.29	3.099
k	4	5%	2.569	3.499
		2.5%	2.889	3.875
		1%	3.299	4.37
Actual Sample Size	29		Finite Sample: n=35	
		10%	2.456	3.46
		5%	2.947	4.088
		1%	4.093	5.532

4.4. ARDL Long Run Form Results

Table 5 provides an overview of the ARDL model's long-run estimates, corresponding coefficients, standard error measurements, t-statistics, and p-values for all independent variables. Our obtained results reveal the existence of a long-term nexus between Economic Policy Uncertainty (EPU), inflation (CPI), GDP growth, population growth (POP), and unemployment (UEM) within the United States. The long-run findings demonstrate that EPU has a positive coefficient (0.0197) and a statistically significant effect (*p-value* = 0.0009) on the unemployment rate (UEM), indicating that an increase in the unemployment rate is associated with higher levels of policy uncertainty. A 1% increase in economic policy uncertainty leads to a 0.019% rise in the unemployment rate. Similarly, the long-run unemployment rate (UEM) has a positive and strong connection with inflation (CPI) and population (POP). A long-run increase of 1% in the inflation rate and population causes an increase of 1.25% and 10% in the unemployment rate, respectively. However, on the other hand, the economic expansion (GDP) exhibits a negative coefficient (-2.3) and a statistically significant effect (*p-value* = 0.0000) on the unemployment rate (UEM) in the long term. The latter finding suggests that economic expansion is associated with a lower unemployment rate (UEM) caused by the creation of new jobs due to economic expansion, which is consistent with economic theory. These results consider economic policy uncertainty, inflation, economic expansion, and population growth as the main determinants of unemployment in the long term, with each variable exerting a distinct effect on the labor market. In the ECM framework, short-run dynamics are adjusted toward the long-run equilibrium, as captured by the error correction term.

Table 5.
ARDL Long Run Estimation Findings.

Variables	**Coefficients**	**t-Statistic**	**Prob.**	**Std. Error**
EPU	0.019725	5.529342	0.0009	0.003567
CPI	1.255030	7.624380	0.0001	0.164607
GDP	-2.303938	-12.58560	0.0000	0.183061
POP	10.00842	9.808650	0.0000	1.020366
C	3.743732	8.590662	0.0001	0.435791

EC = UEM - (0.0197*EPU +1.2550*CPI -2.3039*GDP + 10.0084*POP + 3.7437)

4.5. ARDL Error Correction Regression Results

Table 6 provides the Error Correction Model (ECM) results, reflecting the short-run dynamics and adjustment mechanism towards long-run equilibrium. The error correction term, denoted as CoinEq(-1), has a coefficient of -0.5353 and is statistically significant (p = 0.0000). This negative and significant coefficient confirms that any short-term deviation from the long-run equilibrium will be corrected by approximately 53.53% in the subsequent period, indicating an intense adjustment speed toward equilibrium. The lagged differenced terms of unemployment (D(UEM)) reveal that past unemployment values significantly impact its current value. The coefficients for D(UEM(-1)), D(UEM(-2)), and D(UEM(-

3)) are positive and significant, indicating that past unemployment levels contribute positively to current unemployment levels in the short run. The coefficients for EPU and its lagged terms provide mixed results. The contemporaneous change in EPU (D(EPU)) is insignificant. However, the lagged terms (D(EPU(-1)) and D(EPU(-2))) are significant but with contradictory signs. Therefore, we can notice that, in the short run, economic policy uncertainty (EPU) has a delayed and nonlinear impact on the unemployment rate, first reducing it before leading to an increase. Thus, we can consider this unexpected sign to reflect short-term adjustments in response to uncertainty. For inflation (D(CPI)), both the lagged and contemporaneous terms are positive and significant, indicating that increases in inflation are associated with higher unemployment in the short run. The impact of GDP growth (D(GDP)) and its lagged terms is negative and significant, implying that short-run economic growth reduces unemployment, aligning with the expected economic relationship. This result seems logical given the unique economic conditions faced by the U.S. economy, such as the 2008 global financial crisis and the COVID-19 crisis, which disrupted the relationship between unemployment and inflation during these periods. Additionally, unemployment and inflation can rise simultaneously due to unconventional economic pressures. Also, the short-run impact of population growth (D(POP)) on unemployment is significantly positive, consistent with long-term trends. This suggests that population growth pressures may contribute to higher unemployment levels in the short and long run.

Overall, the ECM findings demonstrate the presence of significant short-term dynamics, with inflation, GDP growth, and population growth playing key roles in shaping unemployment. The significant and appropriately signed error correction term further supports the model's reliability, indicating that the system corrects toward the long-run equilibrium at a considerable rate.

Table 6.
ARDL.
Model-Based Error Correction Regression Outcomes.

Restricted Intercept and Trend Exclusion				
Variables	**Coefficients**	**t-Statistic**	**Prob.**	**Std. Error**
D(UEM(-1))	0.217274	3.019694	0.0194	0.071952
D(UEM(-2))	0.146769	2.372673	0.0494	0.061858
D(UEM(-3))	-0.185505	-4.340748	0.0034	0.042736
D(EPU)	3.64E-05	0.045675	0.9648	0.000797
D(EPU(-1))	-0.009677	-7.214470	0.0012	0.001341
D(EPU(-2))	0.002669	2.930220	0.0220	0.000911
D(EPU(-3))	0.006108	6.110769	0.0005	0.001000
D(CPI)	0.075909	3.484070	0.0102	0.021787
D(CPI(-1))	0.678430	9.773712	0.0003	0.069414
D(CPI(-2))	0.607586	9.687853	0.0107	0.062716
D(CPI(-3))	0.221360	5.894592	0.0006	0.037553
D(GDP)	-0.585789	-26.91155	0.0004	0.021767
D(GDP(-1))	0.343566	5.534653	0.0009	0.062075
D(GDP(-2))	0.181562	5.614237	0.0008	0.032340
D(POP)	4.399874	14.44066	0.0000	0.304687
D(POP(-1))	2.083767	6.463576	0.0003	0.322386
CointEq(-1)*	-0.535266	-12.48230	0.0000	0.042882

4.6. Diagnostic Tests

Table 7 reports the diagnostic test outcomes for the ARDL model, along with Fig.1, which shows the CUSUM and CUSUM of Squares tests for model stability. The R^2 statistic equals 0.5977 implies that nearly 59.77% of the changes in unemployment are captured by the model. In contrast, the $\overline{R}^2$ of 0.5948 confirms a good model fit after considering the number of predictors. The statistical value of the Breusch-Godfrey Lagrange Multiplier test equals 1.1996 (*p-value* = 0.5489), indicating no significant serial correlation in the model residuals, suggesting that the empirical model does not suffer from autocorrelation. Testing the problem of the presence of heteroscedasticity in residuals, the Breusch-Pagan-Godfrey diagnostic test indicates a computed test statistic of 0.9217 (*p-value* = 0.5926), confirming homoscedasticity in the residuals. This result indicates that the model maintains a constant error variance throughout the dataset. The CUSUM and CUSUM of Squares tests, depicted in Fig. 1, evaluate the stability of the model's estimated parameters over the observed period. Both lines are within the 5% significance threshold, ensuring the model's stability and the parameters do not vary over the sample period. These results confirm that the ARDL model is both statistically valid and stable, making it suitable for analyzing the influence of economic policy uncertainty on unemployment trends in the U.S.

Table 7.
Diagnostic Test Results.

R-Squared (R^2)	0.5977
Adjusted R-Squared ($\bar{R}^2$)	0.5948
Serial Correlation Detection/Breusch-Godfrey LM Test	1.1996 (0.5489)
Heteroscedasticity Detection/Breusch-Pagan-Godfrey Test	0.9217 5926)

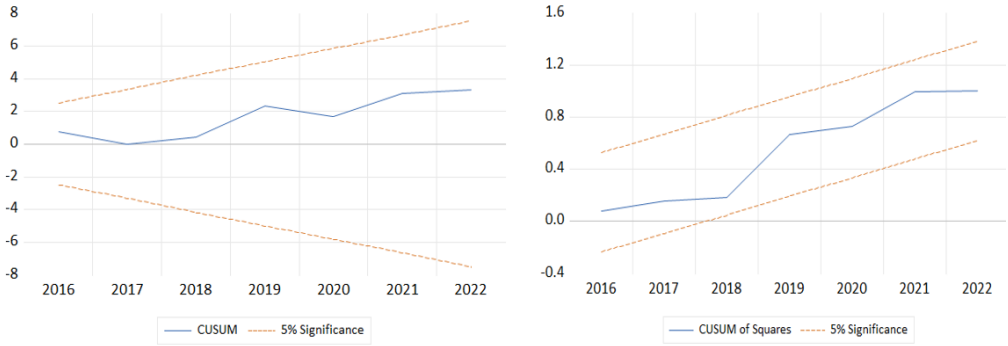

Figure 1.
CUSUM and CUSUM of Squares Test.

5. Discussion

The primary takeaways from this research point to economic policy uncertainty (EPU), both in the short and long run, deeply affecting the unemployment rate in the U.S. According to the ARDL model results, greater EPU leads to increases in unemployment, supporting the existing literature that connects uncertainty to turbulence in the labor market. Furthermore, unemployment is further worsened by inflation and population growth, whereas GDP growth helps alleviate the situation. Findings from the error correction model indicate that the EPU can elicit a rapid response mechanism that drives unemployment toward equilibrium, reinforcing the idea of low EPU sensitivity. These findings indicate that heightened uncertainty regarding policies renders economic conditions more unstable, which most likely dampens investment and hiring intentions by firms. This aligns with earlier work; for instance, Baker et al. [1] demonstrated the negative relationship EPU has with investment and employment in economically active areas. During the study period, Caggiano et al. [10] also reasoned that the impact of EPU on unemployment trends is more pronounced in recessions, which is also a finding of this study. On the contrary, some studies, for instance, Payne [9], focused on how EPU constrains entrepreneurial activity and, thus, employment opportunities, while this study expands the scope to other macroeconomic impacts. This leads to a different view of EPU's impact on unemployment. Some other scholars, however, have contradictory evidence. For example, Haldar and Sethi [4] observed that EPU subjects' unemployment to diverse effects across countries, probably due to the varying economic frameworks, suggesting that EPU impacts may not be uniform in different settings. These are some shortcomings of the study. Using a single EPU index does not capture all aspects of policy uncertainty. Moreover, even if the ARDL Model can handle mixed integration orders, it does not seem to deal with nonlinear relationships, which could further explain EPU's impact on different phases of the economic cycle. Some of the lagged EPU terms in the short-run model have unexpected signs that could indicate some short-lived reactive behavior from the market, or the EPU index may have to measure difficulties. Future studies could expand this analysis using nonlinear models to reflect the differing impacts of EPU on the economy, as proposed by Eksi and Tas [11]. Given that, analyzing the effect of EPU on unemployment at the sector level may enable us to better design policy initiatives to enhance labor market resilience under changing policies. Researching how EPU affects different sectors of unemployment would lead to tailored policy measures that could enhance labor market stability while governments change policies.

6. Conclusion

This paper analyzes the impact of economic policy uncertainty (EPU) on the United States unemployment rate from 1990 to 2022, using an Autoregressive Distributed Lag (ARDL) model. Considering the significance of policy stability on the productivity of the labor market, this research explores the range of economic policy uncertainty to evaluate its impact on the dynamics of unemployment while also including important macroeconomic factors such as economic growth, inflation, and demographic growth to explain the explicit dependence of unemployment on these factors. Both short-term and long-term impacts of EPU on unemployment are studied with a focus on gaps in the literature, and findings highlight that there are impacts in both cases. The ARDL analysis verifies a long-term cointegration relationship among the variables under consideration. Notably, this study showed that in the long run, a 1% increase in economic policy uncertainty causes a 19% increase in unemployment. Additionally, inflation and population growth appear to increase the volatility of unemployment. In contrast, GDP growth tends to decrease the unemployment problem by increasing the level of available job opportunities. In the short term, EPU has a lagged nonlinear effect, initially decreasing unemployment and then increasing it. Concerning the deviations from the equilibrium level, nearly 53.5% are corrected within one year, as revealed by the error correction mechanism. These outcomes suggest that high levels of economic policy uncertainty have a detrimental effect on the stability of the economy and the state of the labor market, most likely due to reduced firm investment and employment decision-making. Such measures will serve as a reminder for lowering economic policies to stabilize the labor market. It becomes fundamental to understand these dynamics when designing policies that help effectively lower unemployment volatility, i.e., promote long-term sustainable economic growth.

Nonetheless, the findings have several limitations. To begin with, the use of aggregate data may hide specific sectoral differences in what EPU impacts. Further, the assumption of linearity of the ARDL model is likely to ignore nonlinearities and asymmetric effects in different phases of the economic cycle. These gaps can be addressed in future research by employing nonlinear econometric techniques and carrying out sectoral studies, which may explain how economic policy uncertainty affects different economic sectors, thereby leading to more precise policy recommendations.

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