



UNLEASHING THE POWER OF ECONOMIC FORCES: EXPLORING THE RELATIONSHIP BETWEEN MACROECONOMIC FACTORS AND UNEMPLOYMENT IN NORWAY AND UK USING ARDL APPROACH

Desencadeando o poder das forças econômicas: explorando a relação entre fatores macroeconômicos e desemprego na Noruega e no Reino Unido usando a abordagem ARDL

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ABSTRACT

The problem of unemployment is a global issue and it is vital to carry out detailed examination of this issue. We need to identify and analyze several factors affecting unemployment in a country. The aim of this research is to determine how various macroeconomic factors and unemployment interact with each other. This includes trade, oil consumption, domestic credit to private sector, gross capital formation and inflation in context of Norway and UK. The basic purpose of this study is to analyze whether the effect of these macroeconomic factors on unemployment is significant or insignificant. In order to conduct this study, period of 1979-2021 is used. In order To find out the impact of independent variables on unemployment, this study executes the KPSS and NG- Perron test to determine whether a variable is stationary or not, and then apply ARDL in order to test the long run and short run Co-integration between unemployment and independent variables. According to our findings, there is a significant long run Cointegration present between Unemployment and trade, domestic bank lending to the private sector, gross capital formation, Oil consumption and show insignificant relation with inflation in case of Norway. If we talk about UK all these factor are significantly Co-integrated with unemployment in long run. Diagnostic tests are also considered in this study which include Serial correlation, Heteroscedasticity, normality, functional form, CUSUM and CUSUM square. The results provide a non-significant probability value higher than 0.1 which implies that the error term has no serial correlation issue and variance of error is homoscedastic along with well-defined functional forms and errors exhibit characteristics of a normal distribution. CUSUM and CUSUM SQUARE for both countries show stability of mean of error term and variance of error term.

Keywords: Unemployment, Macroeconomics Factor, UK and Norway, ARDL bounce test

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DESENCADEANDO O PODER DAS FORÇAS ECONÔMICAS: EXPLORANDO A RELAÇÃO ENTRE FATORES MACROECONÔMICOS E DESEMPREGO NA NORUEGA E NO REINO UNIDO USANDO A ABORDAGEM ARDL

Unleashing the power of economic forces: exploring the relationship between macroeconomic factors and unemployment in Norway and uk using ARDL approach

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RESUMO

O problema do desemprego é uma questão global e é vital realizar um exame detalhado desta questão. Precisamos identificar e analisar vários fatores que afetam o desemprego em um país. O objetivo desta pesquisa é determinar como vários fatores macroeconômicos e o desemprego interagem entre si. Isso inclui comércio, consumo de petróleo, crédito doméstico ao setor privado, formação bruta de capital e inflação no contexto da Noruega e do Reino Unido. O objetivo básico deste estudo é analisar se o efeito desses fatores macroeconômicos sobre o desemprego é significativo ou insignificante. Para realizar este estudo, é utilizado o período de 1979-2021. Para descobrir o impacto de variáveis independentes no desemprego, este estudo executa o teste KPSS e NG-Perron para determinar se uma variável é estacionária ou não e, em seguida, aplica o ARDL para testar a cointegração de longo e curto prazo entre desemprego e variáveis independentes. De acordo com nossas descobertas, há uma Cointegração de longo prazo significativa presente entre desemprego e comércio, empréstimos bancários domésticos ao setor privado, formação bruta de capital, consumo de petróleo e mostram relação insignificante com a inflação no caso da Noruega. Se falarmos sobre o Reino Unido, todos esses fatores são significativamente co-integrados com o desemprego a longo prazo. Testes diagnósticos também são considerados neste estudo, que incluem correlação serial, heterocedasticidade, normalidade, forma funcional, CUSUM e CUSUM SQUARE. Os resultados fornecem um valor de probabilidade não significativo superior a 0.1 o que implica que o termo de erro não tem problema de correlação serial e a variância do erro é *homoscedastic* juntamente com formas funcionais bem definidas, e os erros exibem características de uma distribuição normal. CUSUM e CUSUM SQUARE para ambos os países mostram estabilidade da média do termo de erro e variância do termo de erro.

Palavras-chave: Desemprego, Fator Macroeconômico, Reino Unido e Noruega, ARDL bounce test

INTRODUCTION

The definition of unemployment is the difference between labor demand and labor supply, in addition to when man/women remains alive without a Job that situation is also called Unemployment. By dividing the total population of a country by the number of unemployed citizens living there, the unemployment rate is determined. According to Moreno-Galbis (2012), involuntary idleness of a person willing to work at the prevailing rate of pay but unable to find it" is the definition of unemployment. Moore and Donaldson (2016) find that the individuals who are voluntarily unemployed and choose not to work at the prevailing wage rate should not be classified as unemployed. This implies that the definition of unemployment should exclude those who are unwilling or unprepared to engage in employment.

Furthermore, Moore and Donaldson (2016) define poverty as the inability to access and afford essential goods and services, including clothing, shelter, and food. Poverty is characterized by a lack of resources to obtain the necessary quantity of these essential items. Unemployment contains multidimensional phenomenon, because it effects both economy and social structure of a country. So due to these two factors, complexity is created and imposes adopting extensive analysis in order to get solution of this problem. The aim of every policy maker is to get high economic growth either from monetary policy side or from fiscal policy side. High unemployment is one significant factor among many reasons due to which a country growth goes down. Okun's law states that there is a diametrically opposed link between economic growth and unemployment. For example when gross national product is increased by one percent then it leads to unemployment decreased by three percent. Any nation's economic policies are primarily designed to promote high economic growth, which promotes the demand for additional jobs through the development of investment programs. In our sample ,we select Norway and UK and decide to test the impact of macroeconomics determinants on unemployment (Figure 1 & 2).

Figure 1 - Unemployment in Norway

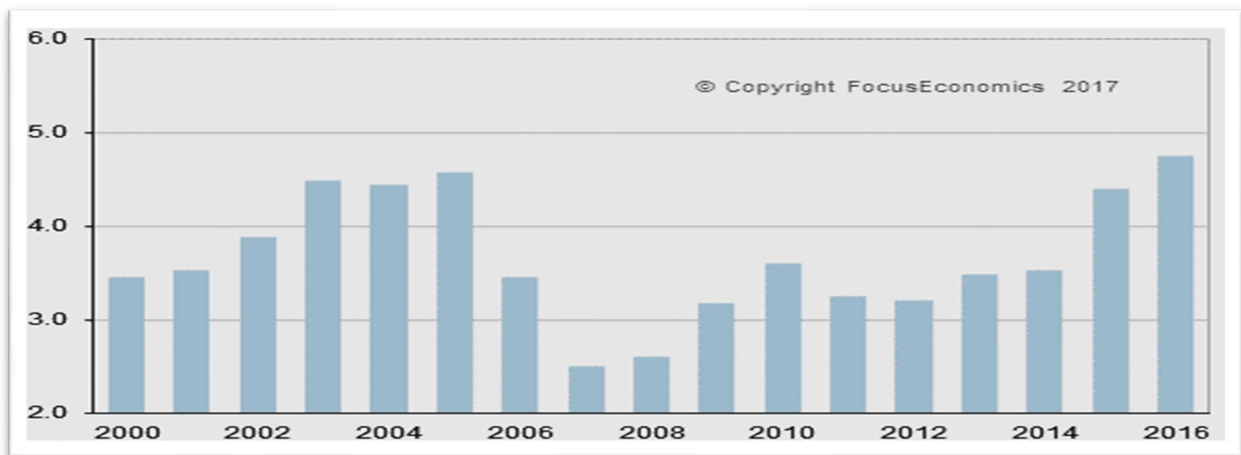
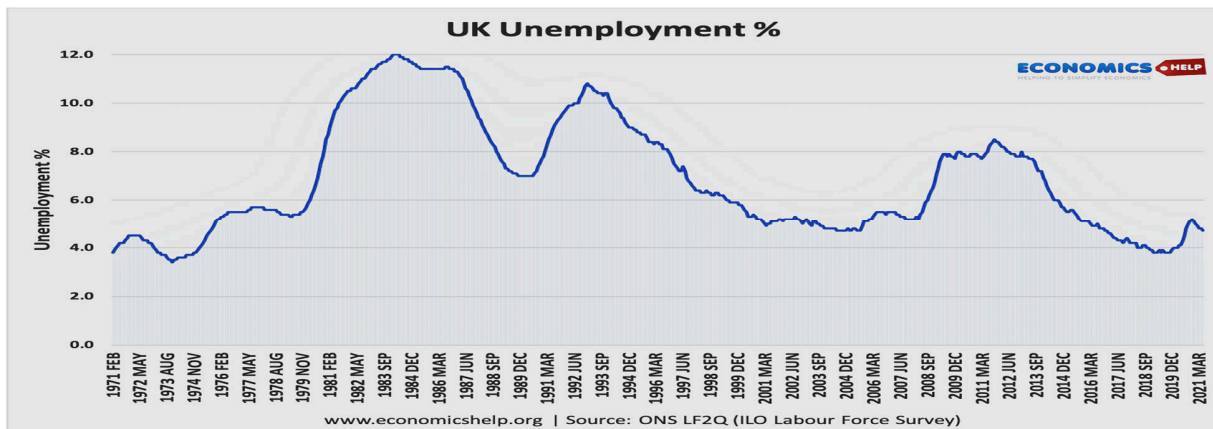


Figure 2 - Unemployment in UK



A country's unemployment rate frequently rises in response to its rapidly increasing population growth. As a result of a lack of capacity for absorption, this issue has become a concern for nations in recent times. In general, the government aims to create employment opportunities in productivity industries using all of its resources because unemployment not only has the potential to impact a nation's socioeconomic problems but also has the potential to significantly increase the rate of migration. The governments routinely devote a great deal of attention and concern to this issue. If residents are unable to find work in their home country, they try to find work overseas if they can. As a result, a nation's economic growth would be severely impacted long-term issues include financial difficulties, gang activity, poverty, inequality in standard of living, and mental health issue (Maqbool et al., 2013). Unemployment is one of the problems which make country economy go down. As we see in upper graphs, the UK and Norway also have an unemployment issue. According to World Development Indicators (2023) WDI Norway unemployment in 1990 to 1994 is approx 5% and in 1995 it rose by 1% and become 6% approx and currently in 2020 and 2021 Norway unemployment rate is about 4%. If we talk about UK, it also faced unemployment problem since 1972 to 2021. In 1980s UK unemployment rate is 10 to 11% and currently in 2019 to 2021 it is fall in 3.5% to 4.5% approx. Therefore, the aim of this study is to examine how macroeconomic factors including oil consumption, trade inflation, domestic bank lending to the private sector, and gross capital formation in Norway and UK affect unemployment rates.

1 LITERATURE REVIEW

The long-run Cointegration between unemployment rates, oil prices, oil price uncertainty, and interest rates by employing the Autoregressive Distributed Lag method applied in this study. According to Sköld (2020) the FMOLS regression's long-run coefficients, rising oil prices cause Denmark and Sweden's unemployment rates to rise. With the exception of Denmark, oil prices and unemployment all show evidence of causality, indicating a strong connection between these two variables.

I. Khan et al. (2022) empirically investigate the effects of economic growth, industrialization, population growth, gross capital formation, and gross domestic income on employment opportunities. According to the findings of the ARDL model, it is evident that industrialization, gross capital formation and foreign direct investment have a positive impact on employment opportunities in Pakistan, both in the long and short term. Conversely, there is a negative correlation between Pakistan's long-term and short-term employment opportunities and economic growth, gross domestic product and population growth. Using Johansen for the error correction model's joint integration procedure, Nayyf et al. (2021) conducted a study sought to determine how much the growth of Chile's financial sector contributed to lowering unemployment between 1991 and 2017. Furthermore, the study estimated the short-term and

long-term elasticity, revealing a complementary relationship between the variables. The error correction factor exhibited a long-term relationship of (-0.024) with the model's variables. To calculate the elasticity, the short-term association between two variables, namely (LnX1) representing domestic credit provided to the private sector as a percentage of GDP and (LnX3) representing the market value of regional firms, was utilized. Diagnostic tests conducted on the model indicated the absence of any significant issues. Initially, the variable (LnX2) denoting the money supply in a broad sense as a percentage of GDP had a positive impact on reducing unemployment. However, over the time, it split into two variables, (LnX1) and (LnX3). Conversely, (LnX3), expressed as a percentage of GDP, displayed a negative relationship with unemployment, suggesting that it causes to increase the unemployment rate. The study conducted by Nwosa et al. (2020) examined the relationship between Nigeria's unemployment rate and trade openness from 1980 to 2018. The study employed the Autoregressive Distributed Lag (ARDL) method and found that trade openness had a negative but significant effect on Nigeria's unemployment. This implies that increased trade openness leads to a reduction in the unemployment rate in Nigeria, as it creates employment opportunities. Using annual data from 1995 to 2015, Dritsakis and Stamatiou (2016) investigate the connection between Greece's inflation, unemployment rate and economic growth. Both the short-term and long-term empirical findings of the study demonstrated that both the unidirectional causal relationship between economic growth and unemployment, and the relationship between inflation and economic growth exist (M. I. Khan et al., 2023). The primary objective of this study is to analyze the issue of unemployment in Pakistan from a macroeconomic perspective, considering factors such as foreign direct investment (FDI), private investment, exports, and government spending. The results reveal that in Model (1), both FDI and exports contribute to a reduction in unemployment. However, in Model (2), government spending shows a limited impact on unemployment. Additionally, Model (3) indicates an inverse relationship between unemployment and private investment. When all variables are combined in Model (4), the findings demonstrate a long-term association between FDI, exports, government spending, private investment, and unemployment (Riniati et al., 2022). Another study conducted by Shah et al. (2022) indicate that economic globalization has led to various approaches in addressing youth unemployment in ASEAN. The variables of financial and trade globalization significantly contribute to increase in youth unemployment in the ASEAN region. Another research focused on investigating the impact of unemployment on Pakistan's growth rate from 1974 to 2020, as revealed by (Popescu & Diaconu, 2022). The empirical findings of the study demonstrate a negative and statistically significant relationship between unemployment and economic growth, as well as between inflation rates and economic growth. However, population expansion has a statistically significant positive effect on economic growth. In the study conducted by (Adekoya, 2021), the focus was on examining the impact of economic policy actions on the dynamics of inflation and unemployment in the G7 nations. The findings of the study indicate that in the short run, there is an inverse relationship between the inflation rate and the unemployment rate in the G7 countries over the entire studied period. However, in the long run, the findings suggest that inflation and unemployment can coexist, which aligns with the perspectives of monetarist theories. This study sheds fresh light on the relationship between energy (oil) consumption and economic growth by taking into account the impact of natural resource endowments. The baseline model results show that economic development in resource-rich nations responds unfavorably to oil consumption in the long run, despite a beneficial influence in the short term (Khobai et al., 2020). This study investigates the association between renewable energy usage and unemployment in South Africa from 1990 to 2014. The findings show that using renewable energy has an adverse and significant long-run influence on unemployment. However, the factors have a negligible association in the short run (Butiong et al., 2023). The research examines inflation and unemployment in the Philippines. Education, regional mismatch, mobility, inflation, poor consumption overcrowding, sluggish economic growth, and the 1985 political upheaval were all identified as factors influencing unemployment in the Philippines. Money supply, unemployment, and the currency rate may all have an impact on inflation in the Philippines. The research also looked at the negative relationship between economic indicators and unemployment and inflation rates in the Philippines throughout the course of the country's seven presidential terms, from 1985 to 2022. Furthermore, Al-Taie et al. (2023) examine trade policy developments in Iraq and their long-term and short-term impacts on unemployment rates. The

main conclusion drawn from the study is that trade policy in Iraq has remained disconnected from other economic policies due to the country's heavy reliance on the oil sector and the inflexible production system. As a result, there is a lack of economic diversification and a diminished contribution from non-oil sectors, leading to a continued dependence on imports and high unemployment rates. In the research conducted by Salad (2023) the focus is on investigating the relationship between Somalia's unemployment rate and economic development. The findings suggest a long-term association between the unemployment rate in Somalia and economic growth, with a negative correlation between unemployment and GDP. The long-term results indicate a mixed predicted impact between the dependent and independent factors. Moreover, Sekwati and Dagume (2023) conducted research to examine the impact of inflation and unemployment on South African economic development. The Johansen co-integration test revealed a long-term association between the variables, and the Vector error correction model demonstrated that unemployment and inflation had a negative influence on economic growth. In their study, Pasara and Garidzirai (2020) utilized a Vector Autoregressive framework and analyzed the causal impacts of three variables using time series data from 1980 to 2018. The findings from the first model indicated a long-term positive relationship between gross capital formation (GCF) and economic growth (GDP). However, in the short run, the first model suggested that unemployment (UNEMP) does not have a significant effect on economic growth (GDP). In contrast, the results of the second model demonstrated a significant and positive association between UNEMP and GCF. Lastly, the findings from the third model revealed an inverse relationship between GDP and UNEMP. In the study by Sahoo and Sahoo (2019) the focus was on exploring the connection between key macroeconomic indicators and unemployment in India. The Johansen co-integration test revealed a substantial long-term link between UNEMP, GDP, INFL, LF, LR, and GFCF. Gross domestic output, domestic private investment (GFCF), and the labor force were found to significantly influence unemployment based on their probability values.

There have been studies by (Emerson, 2011; Khobai et al., 2020; Obisike et al., 2020) which look at the effects of energy consumption, government social spending, and labor force on unemployment in various countries. However, no studies have been done in Norway and UK which account for all of these variables, including Inflation, domestic lending, gross capital formation, oil consumption and trade. In this study, we will examine the effects of above independent variables on unemployment. Additionally, this study is unique in that we will employ a big data set spanning 41 years in order to produce more precise results.

2 RESEARCH METHODOLOGY

Data source: Our study is based on 2 European countries which are Norway and United Kingdom. For our analysis in the current study, we will use annual data that covers 1979 to 2021 and collected all data from WDI and British petroleum website. Unemployment, Gross capital formation, population growth, inflation, Domestic credit to private sector, and trade are collected from WDI and oil consumption is collected from British petroleum website. Note- Norway unemployment data for 2021 and 2020 are missing so we forecast their values with the help of regression, we take original unemployment data from 1972 to 2019 and regress it with their lag term values and after getting alpha beta values we use it in equation and get 2020 and 2021 values.

Method: We download all data from WDI and British petroleum website and take that data in excel after apply transformation approaches, then we take that data in E-views for analysis and use Micro-fit estimate the results of ARDL, Long run and short run.

Model of study

$$Y(\text{UNEMP}) = \beta_0 + \beta_1 \text{INF}_t + \beta_2 \text{DCTPS}_t + \beta_3 \text{OC}_t + \beta_4 \text{GCF}_t + \beta_5 \text{TRD}_t + \epsilon_t \quad (1)$$

Here,

Y= Unemployment, of Norway and UK

α = refers to each entity's unidentified intercept.

INF= Inflation Norway and UK

DCTPS = Domestic credit to private sector of Norway and UK

OC = Oil consumption of Norway and UK

TRD = Trade of Norway and UK

GCF = Gross capital Formation OF NORWAY AND UK

ε = refers to the error term

We are using entire variable in log form because when we use variable in log form then unit of all variable become same and they are easily comparable with rest of the world and we easily interoperate them but population growth used in original form because it represents Growth and can't convert into LOG form. Following table 1 shows the variables information.

Table 1 - Variables Information

Variable name	Log form	Proxy of variable	Data source
Unemployment	LNUNEMP	total (% of total labor force) (national estimate)	WDI from 1979 to 2021
Oil consumption	LNOC	(Constant US\$)	British petroleum from 1979 to 2021
Gross capital formation	LNGCF	(Constant 2015 US\$)	WDI from 1979 to 2021
Domestic credit to private sector by banks	LNDCTPS	(% of GDP)	WDI from 1979 to 2021
Trade	LNTRD	(% of GDP)	WDI from 1979 to 2021
Inflation	LNINF	GDP deflator (annual %)	WDI from 1979 to 2021

Log transformed model is present in below:

$$\text{LN}(\text{UNEMP}) = \beta_0 + \beta_1 \text{Ln}(\text{INF}_t)_t + \beta_2 \text{Ln}(\text{DCTPS})_t + \beta_3 \text{Ln}(\text{OC})_t + \beta_4 \text{Ln}(\text{GCF})_t + \beta_5 \text{Ln}(\text{TRD})_t + \varepsilon_t \quad (2)$$

3 FINDING AND DISCUSSIONS

This section presents the findings and provides an explanation. We are starting with descriptive statistics table of both UK and Norway variables. Table 2 represent descriptive stats of both Norway and UK. In case of Norway and UK unemployment, Gross capital formation, oil consumption, domestic sector by banks, Trade, and Inflation all these variables means value as compare to their S.D greater, this shows that all these factors are under-dispersed and other then this if we see Jarque-bera probability values of Norway, they show natural log of unemployment, oil consumption,

Gross capital formation, Banks domestically credit the private sector, and trade show insignificant value which give us evidence that all these factors follow attribute of normal distribution except inflation and if we talk about Jarque-Bera test of UK shows unemployment, Gross capital formation, trade and inflation probability value is insignificant expect domestic credit to private sector and oil consumption its mean all factors follow attribute of normal distribution except domestic credit to private sector and oil consumption.

After discussing the descriptive statistic now we are discussing Correlation and VIF in table 3 and Table 4 that are appears in below.

Table 2 - Descriptive Statistics of Norway and UK

Norway	LNUNEMP	LNOC	LNGCF	LNDCTPS	LNTRD	LNINF
Mean	1.248797	5.324649	24.99765	4.276999	4.260684	1.249912
Median	1.305626	5.343908	24.94091	4.232838	4.256449	1.449624
Maximum	1.842136	5.422809	25.51933	4.944829	4.375556	2.827985
Minimum	0.500775	5.17131	24.49433	3.414755	4.179459	-1.85844
Std. deviation.	0.358943	0.068762	0.341781	0.450632	0.049182	1.064882
Skewness	-0.483834	-0.570738	0.079737	-0.48296	0.47336	-1.04009
Kurtosis	2.386988	2.344085	1.480587	2.138142	2.506512	3.760346
Jarque-Bera	2.350965	3.105298	4.181833	3.002447	2.04216	8.788668
Probability	0.30867	0.211686	0.123574	0.222857	0.360206	0.012347
Sum	53.69828	228.9599	1074.899	183.9109	183.2094	53.74623
Sum Sq. Dev.	5.411274	0.198584	4.906211	8.528902	0.101594	47.62693
Observations	43	43	43	43	43	43
UK	LNUNEMP	LNOC	LNGCF	LNDCTPS	LNTRD	LNINF
Mean	1.913761	7.407084	26.53935	4.602177	3.981366	1.072638
Median	1.941615	7.438467	26.65234	4.657489	3.960235	0.975783
Maximum	2.443216	7.561039	27.02113	5.257789	4.160915	2.980811
Minimum	1.319086	7.066352	25.76016	3.252773	3.814107	-1.18659
Std. Deviation.	0.340219	0.095691	0.360892	0.536038	0.091601	0.886194
Skewness	0.015494	-1.566824	-0.5397	-1.28271	0.428673	-0.19118
Kurtosis	1.760877	6.366604	2.165166	3.710158	2.253881	3.22283
Jarque-Bera	2.752692	37.9005	3.336153	12.69518	2.31436	0.350897
Probability	0.252499	0	0.18861	0.001751	0.314371	0.839081
Sum	82.29174	318.5046	1141.192	197.8936	171.1987	46.12345
Sum Sq. Dev.	4.861464	0.384584	5.4702	12.06815	0.35241	32.9843
Observations	43	43	43	43	43	43

In Correlation table 3, for Norway we see that there is a positive correlation exist between unemployment and Oil consumption, Gross capital formation and DCTPS sector with the value of 0.07, 0.13 and 0.41 and show negative correlation with trade and inflation with the value of -0.52, and -0.34, and 0.18, while in second column oil consumption show positive correlation with GCF and DCTPS and show negative correlation with trade and inflation while other independent variables also show mixed positive and negative correlation with each other . If we talk about

UK unemployment show positive correlation with oil consumption and Inflation with the value 0.21 and 0.39 also show negative correlation with GCF, trade and DCTPS with the value of -0.77, -0.74 and -0.47. While in second column oil consumption show positive correlation inflation with the value of 0.23 and show negative correlation with gross capital formation, domestic credit to private sector, and trade with -0.29, -0.11, -0.48, values if we talk about other independent variable correlation with each other so they show mixed results of both positive and negative correlation.

The predicted results in Table 3 (for Norway) and table 4 (for UK) display the size of the Variance inflation factor across all the independent variables. This test contend that explanatory variables would not be significantly related to one another if the estimated value of VIF, calculated using the formula $[1/(1- R_{square})]$, is less than 10. Hence, GCF, oil consumption, DCTPS, trade and inflation no one reports Multicollinearity problem.

Table 3 - Correlation and VIF matrix of Norway

Correlation Norway	LNUNEMP	LNOC	LNGCF	LNDCTPS	LNTRD
LNUNEMP	1				
LNOC	0.0792246	1			
LNGCF	0.13543044	0.744566316	1		
LNDCTPS	0.41997385	0.781741801	0.89378764	1	
LNTRD	-0.5252584	-0.38532666	-0.3505559	-0.61178	1
LNINF	-0.3462209	-0.09012326	-0.0452406	-0.19243	0.37078
VIF	LNUNEMP	LNOC	LNGCF	LNDCTPS	LNTRD
LNUNEMP	-				
LNOC	1.006316	-			
LNGCF	1.018684	2.244059	-		
LNDCTPS	1.214149	2.571489	4.971571	-	
LNTRD	1.381018	1.174366	1.140107	1.598142	-
LNINF	1.136194	1.008189	1.002051	1.038454	1.159391

Table 4 - Correlation and VIF matrix of UK

Correlation UK	LNUNEMP	LNOC	LNGCF	LNDCTPS	LNTRD	LNINF
LNUNEMP	1					
LNOC	0.21063274	1				
LNGCF	-0.7722086	-0.28649526	1			
LNDCTPS	-0.471112	-0.11403592	0.85784849	1		
LNTRD	-0.4473218	-0.47654761	0.61088946	0.364784	1	
LNINF	0.38194597	0.225018743	-0.6884656	-0.58635	-0.37097	1
VIF UK	LNUNEMP	LNOC	LNGCF	LNDCTPS	LNTRD	LNINF
LNUNEMP	-					
LNOC	1.046426	-				
LNGCF	2.477125	1.089419	-			
LNDCTPS	1.285259	1.013176	3.786502	-		
LNTRD	1.250151	1.293824	1.595369	1.153492	-	
LNINF	1.170799	1.053334	1.901086	1.52394	1.15958	-

Following table 5 represents hypothesis for unit test root test. Whereas, table 6 shows the results of KPSS and NG-Perron unit root test both at level and first difference. Lm stats is used for testing the KPSS unit root and NG-Perron already show with their name in below table so in case of Norway, NG-Perron results shows GCF and DCTPS are non-stationery at level because their calculated value correspondent to their critical value is greater at 10% significance level so we accept null hypothesis that Series is non stationery and inflation, oil consumption, unemployment and trade are stationary at level because their calculated value is less then critical value so we reject null hypothesis that series is non stationary and accept alternative hypothesis that series is stationary while lm stats also present evidence of non stationary in case of GCF and DCTPS sector because their test value is greater than their critical value at 1% significance level so we reject null hypothesis that series is stationery and accept alternative hypothesis that series is non stationary and level and unemployment is non stationary at stationary in case of inflation, oil consumption, unemployment and trade because their test value is less than their critical value at 1% significance level so we accept null hypothesis that series is stationery and reject alternative hypothesis that series is non stationery other then Norway. If we talk about UK in case of both LM stats and NG-Perron, Trade, inflation, oil consumption, gross capital formation and domestic credit to private sector are stationary and unemployment is non stationary at level. In case of First difference all variables of UK and Norway are stationary. We draw the conclusion that the data series included in our study have a mixed order of integration based on these findings. Estimates of ordinary least square become erroneous when there is a unit root problem. So now we are applying ARDL bounce test method in our study to calculate our results.

Table 5 - Hypothesis in Unit root test

Null hypothesis for KPPSS Series is stationary	Alternative hypothesis for KPSS Series is non stationary
Null hypothesis for NG-Perron Series is non- stationary	Alternative hypothesis for NG-Perron Series is stationary

Table 6 - Unit Root Test

	Norway						UK					
	Unit Root test at level			First Difference			Unit Root test at level			First Difference		
	Variabl es	LM stats	Ng- Perron	Decision	LM STATS	Ng- Perron	Decision	LM Stats	NG- Perron	Decision	LM Stats	NG- Perr on
LNUN EMP	0.24	-6.23	stationary	0.12	-17.55	Stationary	0.54	-8.26	Stationary	-9.66	0.16	Stationary
LNTRD	0.43	-9.42	stationary	0.40	-19.33	Stationary	1.44	-4.95	Non Stationary	-18.33	0.21	Stationary
LNOC	0.58	-6.75	stationary	0.17	-20.34	Stationary	0.85	-3.28	Non Stationary	-9.08	0.56	Stationary
LNINF	0.13	-19.58	stationary	0.5	-18.78	Stationary	0.75	0.51	Non Stationary	-79.49	0.11	Stationary

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LNGCF	0.78	-0.22	Non stationary	0.05	-18.82	Stationary	0.78	0.44	Non Stationary	-12.71	0.11	Stationary
LNDCT PS	0.77	-0.36	Non stationary	0.26	-16.84	Stationary	0.85	-0.31	Non Stationary	-18.80	0.53	Stationary

Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1) Asymptotic Critical Value at various levels of significance for LM statistic are 0.739 (1%), 0.463 (5%) and 0.347 (10%) level of significance.

Asymptotic Critical Values for unit root test for NG-Perron are – 13.8 (1%), – 8.1 (5%) and – 5.7 (10%) level of Significance. Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Table 7 and 8 shows the lag in case of Norway and UK respectively. In case of Norway according to lag order selection table there are 5 criteria suggesting lag order 1 should be taken as optimal lag whereas according to minimum value of (AIC criteria) so we concluding that lag order 1 is optimal lag. In case of UK according to lag order selection table there are 3 criteria suggesting lag order 3 should be taken as optimal lag whereas according to minimum value of (AIC criteria) so we concluding that lag order 3 is optimal lag.

Table 7 - VAR Lag Order Selection Criteria - Norway

Lag	Log L	LR	FPE	AIC	SC	HQ
0	96.19677	NA	4.43E-10	-4.509838	-4.256507	-4.418242
1	264.9068	278.3715*	5.95e-13*	-11.14534*	-9.372016*	-10.50416*
2	293.72	38.89778	9.65E-13	-10.786	-7.492683	-9.595239
3	324.9448	32.78608	1.74E-12	-10.54724	-5.733933	-8.8069
Endogenous variables: LNUNEMP LNTRD LNINF LNDCTPC LNGCF LNOC						
Sample: 1979 2021						
Included observations: 40						

Table 8 - VAR Lag Order Selection Criteria - UK

Lag	Log L	LR	FPE	AIC	SC	HQ
1	249.7549	NA	9.32E-13	-10.68774	-9.167751*	-10.13816*
2	285.095	49.47618	1.07E-12	-10.65475	-7.614766	-9.555587
3	333.2017	52.91742*	7.87e-13*	-11.26009*	-6.700112	-9.611343
Endogenous variables: LNUNEMP LNTRD LNINF LNDCTPC LNGCF LNOC						
Sample: 1979-2021						
Included observations: 40						

As we see in table 6 above, all variable of Norway and UK show mixed results some are stationary and some are non-stationary at level. So we apply ARDL bound test after identifying order of integration now we present Cointegration between unemployment and their determinants using ARDL bound testing approach. Table 9 below, shows the hypothesis for the ARDL diagnostic tests. In case of Norway, As we see in table 10 f-stats test value are 5.623 which is greater than their upper and lower critical bound 2.9214 and 4.2360 at 5 per significance level and in case of w-stats their test value is 31.3075 are greater than their upper and lower critical bound 25.4159, 17.5282 at 5 per level of significance. So this situation allows us to confirm the evidence of long run Cointegration between unemployment and their determinants. If we talk about UK f-stats test value are 6.033 which is greater than their upper and lower critical bound 2.9214 and

4.2360 at 5 per significance level and in case of w-stats their test value is 36.199 is greater than their upper and lower critical bound 25.4159, 17.5282 at 5 per level of significance. So this situation also allows us to confirm the evidence of long run Cointegration between unemployment and their determinants in UK. R^2 Value is 0.95 and 0.91 for UK and Norway respectively which show that 95% and 91% variation in model of UK and Norway is due to independent variable and remaining 5% and 9% are due to error term. Adjusted R square tells that this model is 95% and 81% fit for both UK and Norway data and f-stats show that models whole is significant with the probability value of 0.000. The null hypothesis is accepted since all four diagnostics yield negligible probability values greater than 0.1, error term has no serial correlation problem the error term's variance is homoscedastic, the functional forms are well-specified, and errors exhibit characteristics of a normal distribution.

Table 9 - Hypothesis for Diagnostics tests

Serial correlation H0: Error term is not serially correlated	Normality test Ho: Error term is not abnormally distributed
Heteroskedasticity test Ho: variance of error term is not heteroskedastic.	Functional test Ho: functional form is not miss specified
CUSUM CUSUM tell us about stability of mean of error term if its line is in between confidence interval it means it is stable.	CUSUM SQUARE CUSUM SQUARE tells us about stability of variance of error term.

Table 10 - ARDL Bound testing approach

UK			NORWAY		
Estimate models	LNUNEMP=f (LNUNEMP, LNTRD LNINF, LNDCTPC LNGCF, LNOC)	Estimate models	LNUNEMP=f (LNUNEMP, LNTRD LNINF, LNDCTPC LNGCF, LNOC)		
LAG ORDER	(1,0,0,0,0)		(1,0,1,0,0)		
F- STATISTIC	6.033	F- STATISTIC	5.623		
W- STATISTIC	36.199	W- STATISTIC	31.3075		
SIGNIFICANCE LEVEL	LOWER CRITICAL BOUND	UPPER CRITICAL BOUND	LOWER CRITICAL BOUND	UPPER CRITICAL BOUND	
5%	2.9214 (F)	4.2360(F)	2.9214 (F)	4.2360(F)	
10%	2.4542(F)	3.6175 (F)	2.4542 (F)	3.6175 (F)	
5%	17.5282(W)	25.4159(W)	17.5282(W)	25.4159 (W)	
10%	14.7252 (W)	21.7053(W)	14.7252 (W)	21.7053(W)	
DIAGNOSTIC					
R^2	0.95873		0.91144		
Adjusted R^2	0.95185		0.89373		
F-STATS	119.9058[0.369]		51.4596[0.000]		
Serial correlation	0.80624[0.225]		0.66498[0.415]		

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Functional	0.03619[0.849]		0.014519[0.904]		
Normality	1.3318[0.514]		2.5645[2.77]		
Heteroskedasticity	0.026315[0.871]		1.3810[0.253]		

Table 11 present both Norway and UK long and short run results. If we talk about Norway its results show that oil consumption, trade, domestic credit to private sector, and gross capital formation have significant impact on Unemployment. The coefficient of LNOC has found to be -4.338 and significant, which shows that by increasing oil consumption by 1 percent will significantly decrease Unemployment by 4.338 per cent in the long run in Norway. (Sköld, 2020) also show there is negative relation between relationship between unemployment and oil consumption. Whereas, the coefficient of Trade is found to be -3.855 and significant, and this demonstrates that by increasing 1 per cent in trade would decrease unemployment by 3.855 percent in the long run in Norway (Nwosa et al., 2020)also conclude in their study that there is negative relation between trade and unemployment and theory also confirms that when trade in country specially in face of exports become more then more employment opportunities are created. Moreover, the coefficient of domestic credit to private sector is found to be positive and significant, which reveals that if domestic credit to private sector by banks increases by 1 per cent then it will significantly increase unemployment by 1.558 percent in long run in Norway and the coefficient of Gross capital formation is -1.3689 found to be negative and significant, which reveals that if GCF increases by 1 per cent then it will significantly reduce unemployment by 1.3689 percent in Norway our results are similar with the study of Khan, Xue et al. (2022). f we talk about UK its results show that oil consumption, trade, domestic credit to private sector, gross capital formation and Inflation have significant impact on Unemployment. The coefficient of LNOC has found to be -0.726 and significant, which shows that by increasing oil consumption by 1 percent will significantly decrease Unemployment by 0.726 per cent in the long run in UK. (Sköld, 2020) also show there is negative relation between relationship between unemployment and oil consumption. Whereas, the coefficient of Trade is found to be 1.2373 and significant, and this demonstrates that by increasing 1 per cent in trade would increase unemployment by 1.23 percent in the long run in UK. As we know that when exports increase then unemployment within country become decrease and with the increases of percentage of imports will significantly increase unemployment in country and that's the main reason behind positive relation between unemployment and trade in UK, basically in UK imports share in trade is high as compare to exports due to high percentage of imports in total trades will increases unemployment in UK. Moreover, the coefficient of domestic credit to private sector is found to be positive and significant, which reveals that if domestic credit to private sector by banks increases by 1 per cent then it will significantly increase unemployment by 0.754 percent in long run in UK. As we see in both UK and Norway domestic credit to private sectors by bank increases unemployment, there are several factors behind positive relation between unemployment and domestic credit, first one is inflation (an increase in domestic credit to private sector could lead to higher inflation which may cause employers to reduce their hiring or even lay off employees to manage their cost) other factor is Interest rate (when domestic credit to private sector by banks increase will leads to an increase in interest rate also so businesses may find it more expensive to borrow money so they may reduce their investment, hiring less employees and create unemployment. According to world development indicator UK and Norway have on average inflation from 1972 to 2021 is 5.5 and 5.6 that's why in both countries with the increase of domestic credit will leads to increase in unemployment. Moreover the coefficient of Gross capital formation is -2.2974 found to be negative and significant, which reveals that if GCF increases by 1 per cent then it will significantly reduce unemployment by 2.297 percent in UK. If talk about inflation it also shows negative relationship with unemployment. If one percent increases in inflation it will significantly decreases unemployment by 0.099% in long run in UK. Okan's law also confirms that there is negative relation between inflation and unemployment.

After discussing the long-run coefficients, now in this section we discussing short run coefficients of both Norway and UK based on ARDL method. The empirical results presented in Table 6 Show that coefficient of DLNOC

has found to be -1.7346 and significant, which shows that by increasing oil consumption by 1 percent will significantly decrease Unemployment by 1.736 per cent in the long run in Norway. Whereas, the coefficient of Trade is found to be insignificant in short run in Norway, Moreover, the coefficient of domestic credit to private sector is found to be positive and significant, which reveals that if domestic credit to private sector by banks increases by 1 per cent then it will significantly increase unemployment by 0.663 percent in short run in Norway and the coefficient of Gross capital formation is found to be negative and significant, Cointegration with unemployment in short run in Norway which reveals that if GCF increases by 1 per cent then it will significantly reduce unemployment by -0.55 percent in Norway. The first period-lagged component of the error term's coefficient was likewise discovered to be negative and significant, supporting the convergence hypothesis for the model. The first period lagged term of error term was found to have a coefficient of -0.40, indicating that any disequilibrium brought on by a macroeconomic shock will be eliminated by 40% annually and that our model is stable and returns to long-run equilibrium after almost 2.27 years. If we talk about UK its results shows that inflation, gross capital formation and oil consumption show negative and significant Cointegration with unemployment in short run in UK on the other hand trade and domestic credit to private sector by banks show positive and significant Cointegration with unemployment in short run in UK and the first period-lagged component of the error term's coefficient was likewise discovered to be negative and significant, supporting the convergence hypothesis for the model. The first period lagged term of error term was found to have a coefficient of -0.414, indicating that any disequilibrium brought on by a macroeconomic shock will be eliminated by 41% annually and that our model is stable and returns to long-run equilibrium after almost 2.4 year.

Table 11 - Long Run and short run Coefficients for the selected ARDL Model of Norway and UK

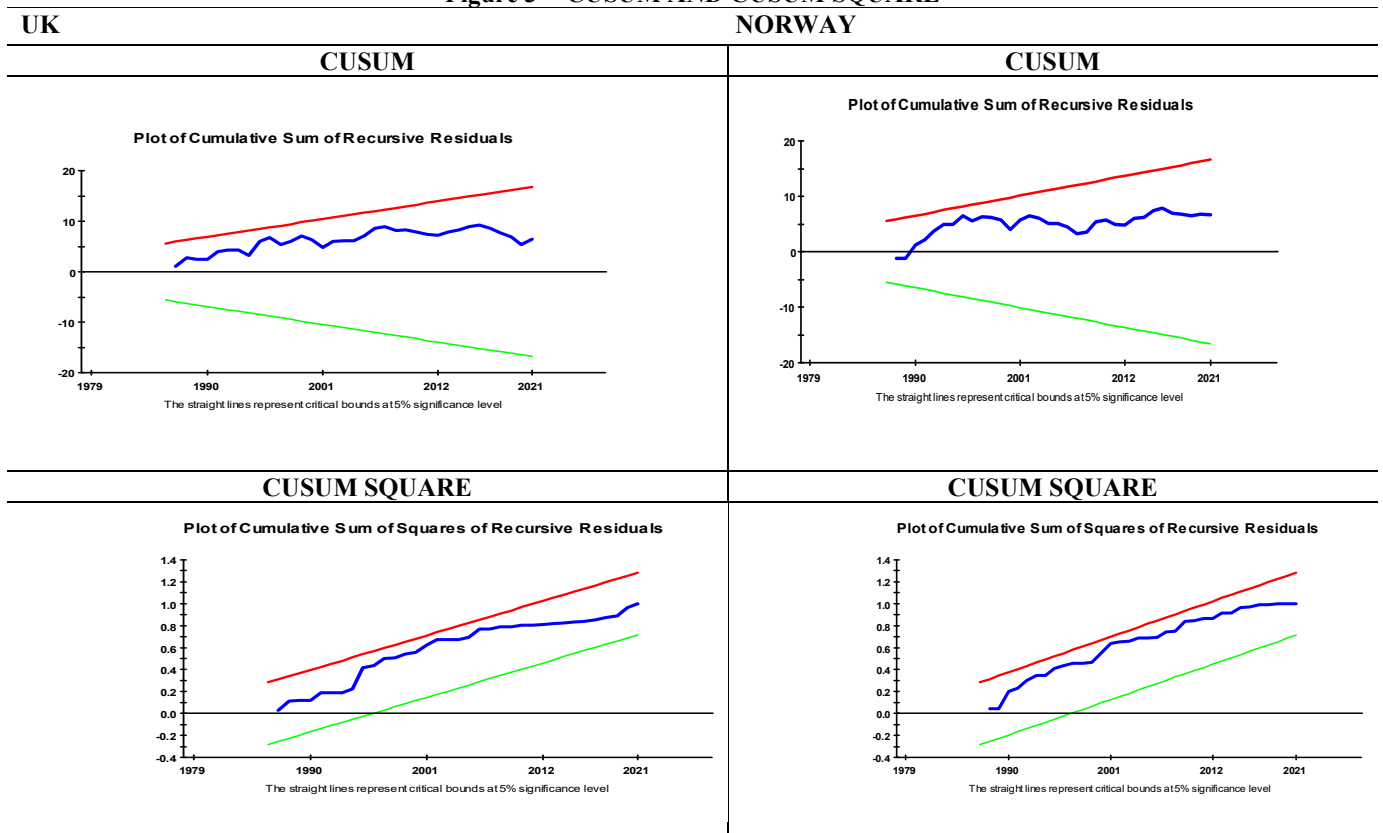
Long run Norway			Long run UK		Short run Norway			Short run UK	
Independent variables	Coefficients	Decisions	Coefficients	Decision	Independent variables	Coefficients	Decision	Coefficients	Decision
					D(LNOC)	-1.7346	Significant	-0.38836	Significant
LNOC	-4.3338	Significant	-0.72642	Significant		0.44441		1.39293	
	1.1777		0.35852			[0.000]*		[0.037]*	
	[0.001]*		[0.050]*						
					D(LNTRD)	0.22572	Insignificant	0.51246	Significant
LNTRD	-3.8550	Significant	1.2373	Significant		0.66148		0.19028	
	1.6658		0.44716			[0.735]		[0.011]*	
	[0.027]*		[0.009]*						
					D(LNDCTPS)	0.66271	Significant	0.31225	Significant
LNDCTPS	1.5558	Significant	0.75392	Significant		0.15479		0.052320	
	0.35850		0.11729			[0.000]*		[0.000]*	
	[0.000]*		[0.000]*						
					D(LNGCF)	-0.54791	Significant	-0.95153	Significant
LNGCF	-1.3689	Significant	-2.2974	Significant		0.15269		0.12066	
	0.37441		0.23408			[0.001]*		[0.000]*	
	[0.001]*		[0.000]*						
					D(LNINF)	0.0060797	In Significant	-0.040635	Significant
LNINF	0.15189	In Significant	-0.099812	Significant		0.020361		0.019559	
	0.051978		0.043922			[0.767]		[0.045]*	

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	[0.772]		[0.032]*					
C	68.3280		59.9667		Ect-1	-0.40026		-0.41417
	6.05[0.00]		9.30[0.00]			0.070278		0.054518
						-5.69[0.00]		-7.59[0.00]

After discussing long term and short term Cointegration now we are discussing CUSUM and CUSUM SQUARE results of both UK and Norway. Figure 3 coefficients are tested for stability using the CUSUM and squared-CUSUM methods. In case of both countries blue line are lies within confidence interval its mean both countries show stability of mean and variance of error term.

Figure 3 - CUSUM AND CUSUM SQUARE



CONCLUSION

The study investigated the relationship between unemployment and trade, GCF, DCTPS, inflation and oil consumption of UK and Norway using annual data from 1975 to 2021. This study uses ARDL approach to estimate the long-run relationship between variables. In case of Norway, the results show that oil consumption, trade, DCTPS and GCF have significant impact on Unemployment and if we talk about UK, the results show that oil consumption, trade, domestic credit to private sector; gross capital formation and Inflation have significant impact on Unemployment. Short run results of Norway and UK conclude that inflation, gross capital formation and oil consumption show negative and significant Co-integration with unemployment in short run in UK. On the other hand, trade and domestic credit to private sector by banks show positive and significant Cointegration with unemployment in short

run in UK. Gross capital formation and trade show negative and significant impact on unemployment in Norway in short run and domestic credit to private sector shows positive significant Cointegration with unemployment in short run in Norway. In addition, study also applied diagnostic to test reliability of our results. All four diagnostics show insignificant probability value which is greater than 0.1 so we accept the null hypothesis that the error term has no serial correlation problem, that its variance is homoscedastic, that functional forms are well specified, and that errors exhibit normal distribution characteristics. If we talk about CUSUM and CUSUM SQUARE in case of both countries blue line is within confidence interval. It means that both countries show stability of mean and variance of error term.

POLICY IMPLICATION

The study therefore suggests that in order to reduce unemployment, the government should urgently develop new work opportunities. In case of Norway and UK Government should take initiatives to decrease oil prices and increase oil consumption to reduce unemployment as oil consumption and unemployment have negative relation. While in case of governments of those countries where trade creates negative impact on unemployment, they must enhance their exports to reduce unemployment in their countries. It is need of the day to improve the Law and order condition to enhance the local as well as foreign investments to reduce the unemployment as well.

REFERENCES

- Adekoya, O. B. (2021). Revisiting oil consumption-economic growth nexus: Resource-curse and scarcity tales. *Resources Policy, 70*, 101911.
- Al-Taie, A. H. H., Ali, F. K., & Mohammad, A. H. (2023). Analysis of Relationship Between Trade Policy Trends and Unemployment Rates in Iraq. *International Journal of Professional Business Review, 8*(1), e0935-e0935. <https://doi.org/10.26668/businessreview/2023.v8i1.935>.
- Butiong, E. J., Gocalin, N., Garcia-Vigonte, F., & Abante, M. V. (2023). A Study on the Inflation and Unemployment of the Philippines through the Years. *Available at SSRN 4368961*.
- Dritsakis, N., & Stamatiou, P. (2016). The effects of unemployment on economic growth in Greece. An ARDL bound test approach. *The Romanian Economic Journal, 19*(62), 53-72.
- Emerson, J. (2011). Unemployment and labor force participation in the United States. *Economics Letters, 111*(3), 203-206.
- Khan, I., Xue, J., Zaman, S., & Mehmood, Z. (2022). Nexus Between FDI, Economic Growth, Industrialization, and Employment Opportunities: Empirical Evidence from Pakistan. *Journal of the Knowledge Economy*. doi:10.1007/s13132-022-01006-w. <https://doi.org/10.1007/s13132-022-01006-w>
- Khan, M. I., Ghauri, S. P., Siddiqui, A. A., & Iqbal, A. (2023). Causality between Economic Development and Unemployment: Using ARDL Model. *International Journal of Social Science & Entrepreneurship, 3*(1), 466-488.
- Khobai, H., Kolisi, N., Moyo, C., Anyikwa, I., & Dingela, S. (2020). Renewable energy consumption and unemployment in South Africa.
- Maqbool, M. S., Mahmood, T., Sattar, A., Bhalli, M. J. P. E., & Review, S. (2013). Determinants of unemployment: Empirical evidences from Pakistan. 191-208.
- Moore, J. D., & Donaldson, J. A. (2016). Human-scale economics: economic growth and poverty reduction in Northeastern Thailand. *World Development, 85*, 1-15.
- Moreno-Galbis, E. (2012). The impact of TFP growth on the unemployment rate: Does on-the-job training matter? *European Economic Review, 56*(8), 1692-1713.
- Nayyf, Y. S., Ali, Z. T., & Kareem, B. A. A. (2021). Estimating the impact of financial sector development in reducing unemployment in Chile (1991-2017). *Academy of Entrepreneurship Journal, 27*, 1-11.

- Nwosa, P., Keji, S., Adegboyo, S., & Fasina, O. (2020). Trade openness and unemployment rate in Nigeria. *Oradea Journal of Business and Economics*, 5(2), 52-62.
- Obisike, N. E., Okoli, U. V., Onwuka, I. N., & Mba, S. E. (2020). Impact of government expenditure on unemployment in Nigeria: Evidence from social expenditure. *International Journal of Social Sciences and Management Research*, 6(1), 65-76.
- Pasara, M. T., & Garidzirai, R. (2020). Causality effects among gross capital formation, unemployment and economic growth in South Africa. *Economics*, 8(2), 26. <https://doi.org/10.3390/economics8020026>.
- Popescu, C. C., & Diaconu, L. (2022). Inflation–Unemployment Dilemma. A Cross-Country Analysis. *Scientific Annals of Economics and Business*, 69(3), 377-392.
- Riniati, M., Yunitasari, D., & Arishanti, D. (2022). Study of Response Analysis of Youth Unemployment Rate in Economy Globalization In Asean. *Media Trend*, 17(2), 424-432.
- Sahoo, M., & Sahoo, J. (2019). The relationship between unemployment and some macroeconomic variables: Empirical evidence from India. *Theoretical & Applied Economics*, 26(1).
- Salad, S. O. (2023). *Effects of unemployment on economic growth in Somalia*. İstanbul Gelişim Üniversitesi Lisansüstü Eğitim Enstitüsü.
<http://95.183.203.22/xmlui/bitstream/handle/11363/4509/786582.pdf?sequence=1&isAllowed=y>
- Sekwati, D., & Dagume, M. A. (2023). Effect of Unemployment and Inflation on Economic Growth in South Africa. *International Journal of Economics and Financial Issues*, 13(1), 35. <https://doi.org/10.32479/ijefi.13447>.
- Shah, S. Z. A., Shabbir, M. R., & Parveen, S. (2022). The Impact of Unemployment on Economic Growth in Pakistan: An Empirical Investigation. *iRASD Journal of Economics*, 4(1), 78-87.
- Sköld, E. (2020). The Relationship between Unemployment and Oil Price, Oil Price Uncertainty, and Interest Rates in Small Open Economies: A study on Sweden, Norway, Denmark, and Finland. In. World Development Indicators. (2023). from The World Bank. <https://databank.worldbank.org/source/world-development-indicators>