Youth Unemployment and Some Macroeconomic Variables in North African Countries: An Empirical Analysis for the Period 2004-2021

Fairouz cherayett [1] [*], Elhousseyn yousfi [2]

[1] Faculty of Economic, Commercial and Management Sciences, University of Tbessa (Algeria), *fairouz.cherayett@univ-tebessa.dz*
[2] Faculty of Economic, Commercial and Management Sciences, University of M'sila, PO Box 166 Ichebilia, 28000 M'sila (Algeria), *el-housseyn.yousfi@univ-msila.dz*

Abstract:

The main objective of this study is to analyze the relationship between youth unemployment rates and some macroeconomic variables: gross domestic product, inflation government expenditure and oil price, in four North African countries: Algeria, Egypt, Morocco and Tunisia. We use panel data cointegration and PMG-ARDL model during the period 2004 to 2021.

Our results confirm that there is a negative and significant impact of inflation and oil price on youth unemployment rate in North African countries. While the effect of gross domestic product is negative but insignificant, in long run. We also found that a positive relationship between fiscal policy represented by government expenditure and youth unemployment rate in North African countries. These results represent new insights for the policies in North African countries in order to promoting youth employment.

Keywords: Youth Unemployment; Economic Growth; Inflation; PMG-ARDL model; North African Countries.

Jel Classification Codes: C22, E31.

----

[*]**Corresponding author:** fairouz cherayett

1. Introduction

In over the past decades, there has been a growing interest among researchers about analysing the phenomenon of unemployment and its causes, due to unfavourable consequences of the phenomenon. Where unemployment is being consider as one of the main social and economic problems in the world, and one of the most difficult challenges facing the various economies.

However, the need to research the causes of this phenomenon among young people, is consider more important. Where youth unemployment is widely viewed as an important policy issue for both developed and developing countries. In this regard, International Labor Organization (ILO, World Employment Social Outlook, 2016) estimates, suggest that the global youth unemployment rate has increased from 12.9% in 2015 to 13.1% in 2016, and that are about 71 million young people unemployed around the world end of 2016.

In North African Countries like many other developing countries, youth unemployment represents one of the major problems, due to the lack of absorptive capacity for employment and providing job opportunities against a large number of new entrants to the labor market, especially since most of them are young. According to the International Labor Organization report (ILO, 2017) on youth and employment in North African countries, the demographic characteristics of these countries, which are characterized by high rates of youth ranging between 16% and 20% of the total population, make the employment a multidimensional problem. The same report also adds that the economic situation experienced by these countries during the period before 2011, and after the 2011 uprisings had an impact on the economic growth rates. In addition, the political instability, fiscal adjustment programmes, and fluctuations oil price have affected the labor markets of the region.

Therefore, this study aim to analyze the relationship between youth unemployment rates and some macroeconomic variables in four North African countries: Algeria, Egypt, Morocco and Tunisia. The diagnosis of the causes of spread unemployment among young people

and identification the factors affecting it; will make it possible to understand the nature of this phenomenon. In this study, we have relied on the definition of the United Nations and the International Labor Organization to define the concept of youth unemployment. Although there is much discussion about the pros and cons various definitions of youth and their consequences in the study of labor market performance and dynamics. Except that most official statistics tend to focus on the group aged 15-24. According to the definition of the International Labor Organization, the term "youth covers persons aged 15 to 24 years". While the definition provided by the United Nations is as follow: "youth is persons with age between 15 to 24 years".

1.1.Problematic:

In this study, we will try to answer the following research question:

What are the most important economic variables that affect youth unemployment rate in North African countries?

1.2.Hypothesis:

To reply to the problematic, we can make the following hypothesis:

Youth unemployment rate in North African countries is influenced by GDP growth, inflation and government expenditure and oil price.

2. Literature Review

In this section, a review of the available literature was carried out to understand this relationship between youth unemployment and its determinants in economic literature. Where many studies have focused on the analysis of the phenomenon of youth unemployment in the recent decades, as an important issue in economic research, whether in developed or developing countries. According to (Anyanwu, 2013, p. 115), the factors that affect youth employment are related to macroeconomic factors, globalization, infrastructure and access to credit by the private sector, as well as demographic factors and political systems.

In a recent related study, (Bayrak & Tatli, 2018)examines the determinants of youth unemployment in OECD countries, using Panel Data analysis during the period 2000-2015. The study concluded that

growth, inflation, savings and labor productivity are among the main determinants of youth unemployment in OECD countries. Where the results have shown that growth, inflation and savings are negatively linked to youth unemployment, while labor productivity is positively related with youth unemployment.

(Sam & G.P. Pokhariyal, 2016), examine the determinants of youth unemployment in Kenyan economy during the period 1993-2012. The study used the autoregressive distributed lag (ARDL) method. The empirical results shown that youth unemployment is negatively influenced by foreign direct investment, external debt and previous youth unemployment rate, while gross domestic product and population affect positively youth unemployment in Kenyan economy.

(Ebaidalla, 2016),discussed the relationship between youth unemployment and its determinants in OIC countries, focusing on the impact of economic, demographic and institutional factors. The study applied a dynamic panel data method based on time series data from the period 1993 to 2012.The results showed that youth unemployment in OIC countries is influenced by the economic factors represented in the GDP growth, inflation and domestic investment. The study also found that fertility rate affects positively the youth unemployment rate.While, the quality factor of bureaucracy affects negatively youth unemployment rate in OIC member countries.

(Choudhry, Enrico , & Marcello, 2012),discussed the relationship between financial crises and youth unemployment rate by employing fixed effects panel estimationin large group of countries in the world (about 75 countries) for the period 1980-2005. In this study, different types of financial crises were used such systemic banking crises, non-systemic banking crises, currency crises and debt crises. The results showed thatyouth unemployment rate are more affected by financial crisis compared to the overall unemployment rate, especially for high-income countries.

(Msigwa & Erasmus, 2013), provided a multinomial logistic regression model (MLM) to analyze determinants of youth unemployment in the Tanzanian economy. The empirical results

shown that youth unemployment in Tanzanian economy is influenced by social and demographic factors represented in gender, geographical location, education skills and marital status. In another study (Kakwagh & Ikwuba, 2010)tried to research the causes of youth unemployment in the context of declining economic situation in Nigerian economy. They found that increased population growth, geographical mobility, lack of employable skills and non involvement of youth in decision making processes are among the major causes determinants of youth unemployment in Nigeria. They also concluded that, the problem of unemployment is being exacerbated by the economic reforms in Nigeria.

In another study, (GÖÇER & ERDAL, 2015)discussed the relationship between economic growth and youth unemployment in the context of Okun's law, on group of Central and Eastern European countries (18 countries) during the period from 2006 to 2012. The study applied panel data analysis and cointegration tests.

The results showed that achieving higher growth rates would lead to lower youth unemployment rates in these countries.

(Ebaidalla, 2016), analyzed the causes of youth unemployment in Sub-Saharan Africa (SSA) countries using panel data method during the period 1991-2012. The empirical results show that, total male and female youth unemployment is influenced negatively by GDP growth, trade openness, foreign direct investment, education and corruption, while natural resources affect positively of youth unemployment both the aggregate and gendered levels.

In the end, after discussing the various literature related to the problem of our research. We can say that the factors that affect the youth unemployment rate are different and multiple between countries. However, most of studies did not disregard the effect of the economic environment on the youth unemployment rate, which is the subject of our interest in this research paper.

3. Methodology

3.1. Model Specification and Data

To analyze the relationship between youth unemployment and some macroeconomic variables in North Africa countries (Algeria, Egypt, morocco and Tunisia) .This paper uses a simple model. The specification of this model are consistent with economic theory, previous empirical studies about youth unemployment such(Anyanwu, 2013), (Bayrak & Tatli, 2018) and(Sam & G.P. Pokhariyal, 2016) and the nature of the economic structure of these countries. This model can be presented in the following concise form:

$$YU_{it} = \beta_0 + \beta_1 X_{it} + \mu_{it}\ldots\ldots\ldots\ldots\ (01)$$

Where the subscripts i and t represent the country and time period. (YU) represent youth unemployment, it is the dependent variable in our study. While M_i represent the vector of the independent variables that hypothesized to influence youth unemployment. It consists of GDP per capita, Government Expenditure, inflation and oil price. To make our variables homogenous, all the variables introduced in the in the equation (01) is taken in the natural logarithm form.

Thus, we can rewrite equation (01) as:

$$LYU_{it} = \beta_0 + \beta_1 LGDP_{it} + \beta_2 LGE_{it} + \beta_3 LINF_{it} + \beta_4 LOP_{it} + \mu_{it}\ldots\ (02)$$

Where (LYU) represent natural logarithm of youth unemployment, (LGDP) represent natural logarithm of Gross Domestic Product, (LGE) represent natural logarithm of Government Expenditure (LINF) represent natural logarithm of Inflation and (OP) represent natural logarithm of Oil Price. These variables were collected from several sources and it covers the period from 2004 to 2021. Table 01 includes a summary of the dependent and independent variables.

Table 1. Description of Variables

Variable type	Variable code	Description of Variables	Source
Dependent Variable	YU	Unemployment, youth total (% of total labor force ages 15-24)	World Bank database*
Independent Variables	INF	Inflation, Consumer Price Index (2010 =100)	
	GE	Government Expenditure (at constant prices)	
	GDP	GDP per capita (at constant prices)	SESRIC Database**
	OP	Oil price (dollars per barrel)	OAPEC Data base***

Source: Prepared by researchers.

* **Available at:** https://data.albankaldawli.org.

** **Available at:** http://www.sesric.org.

*** **Available at:** http://oapecorg.org.

3.2.Estimation Procedures:

To estimate the model shown in equation (02) the present study employs an empirical analysis using panel data cointegration and PMG-ARDL model to estimate both long and short run relationship between youth unemployment and some macroeconomic variables in North Africa countries.

(Pesaran & Y., & Smith, R, 1999), suggest Pool Mean Group (PMG) model in dynamic panels. This model assumes the long run coefficients to be homogeneous across countries. While short run coefficients different from country to country, including the intercepts, the speed of adjustment to the long run equilibrium values, and error variances (Rafindadi & Zarinah , 2013, p. 122).

According to (Pesaran & Y., & Smith, R, 1999), this may be due to many factors such as arbitration condition, common technologies, or the institutional development, which was covered by all groups. In our study, we expect that there will be a homogeneity between the coefficients in the long run due to the convergence of the four countries in the in policies, especially in the domain of employment and facing the phenomenon of unemployment.

Another important point that guarantees validity, consistency and efficiency of this methodology is the existence of a long run relationship between the variables under study. For that, the study methodology requires us to apply the following tests:Panel unit root tests, Kao residual cointegration test, Pedroni residual cointegration test, Panel PMG estimates and normality test.

4. Empirical Results

4.1.Unit root tests

To determine whether the time series of the variables under study possesses the unit root, we used a variety of panel unit root test: Levin, Lin Chu (2002), Lm Pesaran and Chin(2003), ADF Fisher (1979) and PP-Fisher test. The results of panel unit root test for each variable appear in Tables 02 and 03.

Table 2. Results of panel unit root test at level

Tests		Variables				
		LYU	LGDP	LDEP	LINF	LOP
Levin, Lin, Chu	Statistic	-1.35	-0.52	2.56	1.09	1.20
	Prob	**0.08**	**0.30**	**0.99**	**0.86**	**0.88**
Lm, Pesaran and chin W-stat	Statistic	0.13	0.59	2.93	2.75	2.90
	Prob	**0.55**	**0.72**	**0.99**	**0.99**	**0.99**
ADF Fisher Chisquare	Statistic	7.68	6.47	5.18	0.68	0.50
	Prob	**0.46**	**0.59**	**0.73**	**0.99**	**0.99**
PPFisher Chisquare	Statistic	7.51	2.37	2.68	0.70	0.65
	Prob	**0.48**	**0.96**	**0.95**	**0.99**	**0.99**

Source: Prepared by researchers based on Eviews outputs.

Table 3. Results of panel unit root test at first difference

Tests		Variables				
		LYU	**LGDP**	**LDEP**	**LINF**	**LOP**
Levin, Lin, Chu	Statistic	-8.81	-4.89	-5.00	-2.65	-4.56
	Prob	**0.00***	**0.00***	**0.00***	**0.00***	**0.00***
Lm, Pesaran and chin W-stat	Statistic	-6.99	-3.85	-3.32	-4.60	-2.64
	Prob	**0.00***	**0.00***	**0.00***	**0.00***	**0.00***
ADF Fisher **Chi**square	Statistic	46.06	28.57	23.73	32.67	20.31
	Prob	**0.00***	**0.00***	**0.00***	**0.00***	**0.00***
PPFisher **C**hisquare	Statistic	48.26	27.34	25.19	37.15	47.17
	Prob	**0.00***	**0.00***	**0.00***	**0.00**	**0.00***

Source: Prepared by researchers based on Eviews outputs.

Note: (*, **) represents significance level at 1% and 5% level respectively.

According to panel unit root analyses shown in table (02), we can conclude that all variables are not stationary in level, but after taking the first difference all variables become stationaryunder the 1% significance level.Therefore, we can analyse the relationship between youth unemployment and other independent variables in our study using panel cointegration tests.

4.2.Co-integration Test

After confirmed that the series have the same degree of co integration I(1), We would like to find a long run and stable relationship among variables. Therefore, we applied two tests of Co-integration: Kao Residual Co-integration test (1999) and Pedroni Residual Co-integration test (2004).Tables 04 and 05 reports the results of Kao Residual Co-integration test and Pedroni Residual Co-integration test respectively.

Table 4. Results of Kao Residual Cointegration Test

Null Hypothesis: No cointegration		
ADF	**t-Statistic**	**Prob.**
	-2.240515	0.0125*

Source: Prepared by researchers based on Eviews outputs.

Note: (*, **) represents significance level at 1% and 5% level respectively

Table 5. Results of Pedronicointegration test

Null Hypothesis: No cointegration				
Alternative hypothesis: common AR coefs. (within-dimension)				
	Statistic	Prob	Statistic	Prob
Panel v-Statistic	-0.254269	0.6004	-0.649064	0.7419
Panel rho-Statistic	0.336395	0.6317	0.458931	0.6769
Panel PP-Statistic	-2.252094	0.0122	-3.408078	0.0003*
Panel ADF-Statistic	-2.125243	0.0168	-2.707807	0.0034*
Alternative hypothesis: individual AR coefs. (between-dimension)				
	Statistic		Prob	
Group rho-Statistic	1.248364		0.8941	
Group PP-Statistic	-5.061587		0.0000*	
Group ADF-Statistic	-2.795784		0.0026*	

Source: Prepared by researchers based on Eviews outputs.

Note: (*, **) represents significance level at 1% and 5% level respectively

According to the results of Kao cointegration test the null hypothesis of no cointegration is rejected in this case, and we can easily conclude that the existence of a long run relationship among the variables of our study. Where T-statistic is equals to (-2.24) and the probability value is less than 0.05 (equals 0.0125).

On the other hand, the results of Pedroni cointegration test confirm our findings through Kao cointegration test. Where among the seven statistics composing the test, the results show that there is four statistics indicating the rejection of the no cointegration null

hypothesis. This statistics is Panel PP-Statistic, Panel ADF-Statistic, Group PP-Statistic and Group ADF-Statistic. Therefore, it can be stated that there is a long run relationship between among variables under study, and all the variables will be moving in the same direction in the long run.

4.3.Panel PMG-ARDL modelresults

Table 06 reports the estimation results of long run PMG model. The results indicate that most of the estimated coefficients bear the expected sings except Government Expenditure coefficient.

Table 6. PMG longrun estimates

Dependent Variable: EMP			
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LGDP	-0.248185	0.199605	-1.243380	0.2257
LGE	1.168584	0.251640	4.643870	0.0001*
LINF	-1.091300	0.284543	-3.835277	0.0008*
LOP	-0.073782	0.024179	-3.051543	0.0055*

Source: Prepared by researchers based on Eviews outputs.

Note: (*, **) represents significance level at 1% and 5% level respectively.

We find that gross domestic product affects negatively the youth unemployment rate. As the increase in GDP per capita by 1% leads to a decrease in the youth unemployment rate of 0.24% in the long run, but this effect is not statistically significant. This means that Okun's law is not valid in the case of North African countries. The result is consistent with the studies carried out in this area such (Imad, 2008) and (Belabbas, Bellatreche, & Zaghba, 2018). Where as Imad (2008) explains, Okun's law is not valid in the countries studied because of the rigidity of the labour market institutions in this countries and the mismatch between supply and demand of labor.

The results of the analysis also show that inflation negatively affects the youth unemployment rate at a significance level of 1%. As the increase in Inflation by 1% leads to a decrease in the youth unemployment rate by 1.09% in the long run.

These results indicate that Philips Curveanalysis is valid to explain youth unemployment Change in North African countries. This result is consistent with studies conducted in the field such(Ebaidalla, 2016)and (Maqbool, Tahir, & M. N. Bhalli, 2013)

Conversely, Government Expenditure has positive and significant longrun relation with youth unemployment rate. If Government Expenditure increase by 1%, youth unemployment will increase by 1.16 % in long. This is not consistent with economic theory, but can be explained, according to (Dimova, Elder, & Stephan, 2016)by the impact of the 2008 financial crisis and the lack of it political instability, as well as various financial and structural adjustment programmes in these countries.

Finally, the effect of oil price on youth unemployment in North African countries is negative at a 1% significance level. Should oil price rose by 1%, youth unemployment rate will decrease by 0.07% in the long term.

As for the dynamics of PMG short run estimate, the result is presented in table 07. According to this results the equilibrium correction coefficient estimated by (-0.49) is significant at 5% level and has the correct sign. It shows that the speed of adjustment to restore equilibrium in the dynamic model by estimated by 49% a year. About 49% of disequilibria from the previous year's shock converge back to the long-run equilibrium in the current year. In addition, the results show that most of the short run coefficients were not significant at 5% level. As for the equilibrium correction coefficient estimated for country specific, the results show that they are all significant at 1% level and has the correct sign.

Table 7. PMG short run estimate

Dependent Variable: DLYU						
Variable	Coefficient	Std. Error	t-Statistic		Prob.*	
C	-8.279822	3.358148	-2.465592		0.0212	
DLYU$_{-1}$	-0.390066	0.063405	-6.151951		0.0000*	
DLGDP	-0.203939	2.707105	-0.075335		0.9406	
DLGDP$_{-1}$	-2.864636	0.798879	-3.585817		0.0015*	
DLGE	-0.647564	0.459797	-1.408370		0.1718	
DLGE$_{-1}$	0.959083	1.547814	0.619638		0.5413	
DLINF	2.693114	1.541504	1.747070		0.0934	
DLINF$_{-1}$	-0.975230	2.002595	-0.486983		0.6307	
DLOP	-0.008809	0.033001	-0.266928		0.7918	
DLOP$_{-1}$	0.074129	0.073362	1.010453		0.3224	
	PMG	**ALG**	**EGY**	**MARO**		**TUN**
ECT$_{t-1}$	-0.49 (0.02)**	-0.21 (0.00)*	-0.08 (0.00)*	-0.91 (0.00)*		-0.76 (0.00)*

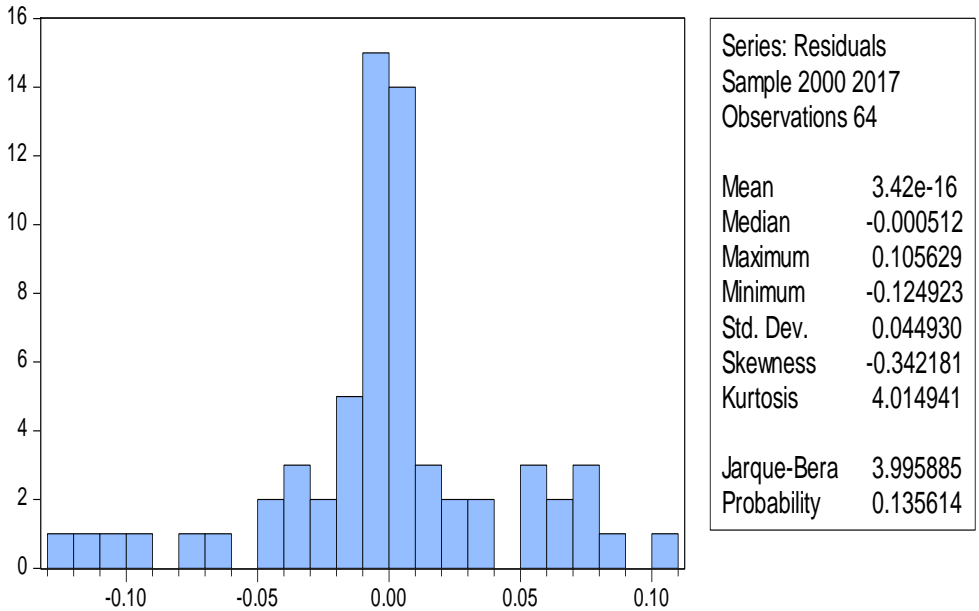**Source:** Prepared by researchers based on Eviews outputs.

Notes: Figures in parentheses are the probability value.
(*, **) represents significance level at 1% and 5% level respectively.

At the last, in order to ensure that the model used in the study is reliable and to verify that results are robust.(Pesaran & Y., & Smith, R, 1999), suggests that for the obtained PMG estimators to be symmetrical, they must be distributed normally.

The following figure shows the results of the normality test and it is indicate that the residues are distributed normally (Probability of Jarque-Bera test it is larger than critical value at a 5% level).

Fig 1. Normality test

Series: Residuals	
Sample 2000 2017	
Observations 64	
Mean	3.42e-16
Median	-0.000512
Maximum	0.105629
Minimum	-0.124923
Std. Dev.	0.044930
Skewness	-0.342181
Kurtosis	4.014941
Jarque-Bera	3.995885
Probability	0.135614

Source: Eviews outputs.

5. Conclusion

This research attempts to understanding the relationship between youth unemployment rates and some macroeconomic variables, by taking annual data about four North African countries during the period 2004 to 2021. The study includes five variables: youth unemployment rate, gross domestic product, inflation, government expenditure and oil price. The panel data cointegration and PMG-ARDL model was used to test the relationship both in the short and in the long run between above mentioned variables.

The results of Kao and Pedroni cointegration tests suggest that there is a long run relationship between among variables under study. It also the estimation results of long run PMG model indicat that that youth unemployment rate is negatively influenced by GDP per capita, inflation and oil price, while the effect of government expenditure on youth unemployment rate is positive in North Africa countries.

Based on these results, our recommendations indicate that policy makers in these countries should pay more attention to factors of the economic environment, via adopting sound and effective economic policies to promote growth and attain economic stability, to aim addressing the rigidity of the labour market institutions and improving employability of youth people.

6. Bibliography List:

Anyanwu, J. C. (2013). *Characteristics and Macroeconomic Determinants of Youth Employment in Africa. African Development Review, 25(02), 107-129.*

Bayrak, R., & Tatli, H. (2018). *The Determinants of Youth Unemployment: A Panel Data Analysis of OECD Countries. The European Journal of Comparative Economics, 15(02), 231-248.*

Belabbas, R., Bellatreche, R., & Zaghba, T. (2018). *Analysis of detrrminants in nourth africa countries, a panel data co-integration approach. 36th International Academic Conference. London: 15-25.*

Choudhry, M. T., Enrico , M., & Marcello, S. (2012). *Youth Unemployment rate and Impact of Financial Crises. International Journal of Manpower, 33(01), 76-95.*

Dimova, R., Elder, S., & Stephan, K. (2016). *Labour market transitions of young women and men in the Middle East and North Africa. OIL.*

Ebaidalla, E. M. (2016). *Analysis of youth unemployment in Sub-Saharan Africa: determinants and possible ways forward. African J. Economic and Sustainable Development, 05(04), 302-317.*

Ebaidalla, E. M. (2016). *Determinants of Youth Unemployment in OIC Member States: A Dynamic Panel Data Analysis. Journal of Economic Cooperation and Development, 37(02), 81-102.*

GÖÇER, İ., & ERDAL, L. (2015). *The Relationship between Youth Unemployment and Economic Growth in Central and Eastern European Countries: An Empirical Analysis. Journal of The Faculty of Economics and Administrative Sciences, 05(01), 173-188.*

ILO. (2016). *World Employment Social Outlook. Geneva: International Labour Office.*

ILO. (2017). *Youth and Employment in North Africa: A Regional Overview. Geneva: International Labour Office.*

Imad, M. (2008). Economic Growth and Unemployment in Arab Countries: Is Okun's Law Valid? Journal of Development and Economic Policies, 10(02), 7-24.

Kakwagh, V& Ikwuba, A. (2010). Youth Unemployment in Nigeria: Causes and Related Issues. CANADIAN SOCIAL SCIENCE, 06(04), 231-237.

Maqbool, M. S., Maqbool, M., & M. N. Bhalli. (2013). DETERMINANTS OF UNEMPLOYMENT: Empirical Evidences from Pakistan. Pakistan Economic and Social Review, 51(02), 91-207.

Msigwa, R., & Erasmus, F. (2013). Determinants of Youth unemployment in Developing Countries: Evidences from Tanzania. Journal of Economics and Sustainable Development, 4(14), 67-76.

Pesaran, H. S., & Y., & Smith, R. (1999). Pooled Mean Group Estimation of Dynamic Heterogeneous Panels. Journal of the American Statistical Association, 621-634.

Rafindadi, A. A., & Zarinah , Y. (2013). AN APPLICATION OF PANEL ARDL IN ANALYSING THE DYNAMICS OF FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN 38 SUB-SAHARAN AFRICAN CONTINENTS. Proceeding - Kuala Lumpur International Business, Economics and Law Conference, 2, pp. 118-135. Kuala Lumpur, Malaysia.

Sam, S. O., & G.P. Pokhariyal. (2016). Modelling Economic Determinants of Youth Unemployment in Kenya. Journal of Emerging Trends in Economics and Management Sciences, 7(1), 31-38.