

INVESTIGATING OKUN'S LAW IN SAARC COUNTRIES: AN ARDL APPROACH

SAARC ÜLKELERİNDE OKUN YASASININ İNCELENMESİ: ARDL YAKLAŞIMI

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Abstract: *The aim of this paper is to test the applicability of Okun's law in SAARC (South Asian Association for Regional Cooperation) countries. It also intends to find the long-run association between unemployment rate and growth rate and investigate the impact of growth rate on unemployment in the South Asian Region. The study uses annual time series data for eight SAARC countries, from 1991 to 2017. To meet the objectives of the research, the graphical illustration of trend with descriptive statistics are followed by econometric analysis. Based on the stationarity of the variables, an autoregressive distributive lag (ARDL) model has been estimated to test the long-run relationship between unemployment and growth. The results indicate that per capita GDP negatively influences the unemployment rate in the long run only in three member countries of SAARC, namely- Afghanistan, India and Sri Lanka and in the South Asian Region in aggregate. This paper also finds a negative relationship between the growth rate and unemployment rate in Bangladesh, but this association is not statistically significant. The study doesn't find any negative relationship between the two variables in Bhutan, Maldives, Nepal and Pakistan. The study discovers the validity of Okun's law, but the attained Okun coefficient is less than that of the actual Okun coefficient, documented by Arthur Okun. Another substantial evidence is that the significance of the connection between the growth rate and unemployment rate varies among the SAARC countries. The main limitation of this paper is the unavailability of data for Afghanistan compared to other SAARC countries. This paper is unique as it tests the validity of Okun's law in every member country of SAARC and as a region of South Asia. To date, no such study like this has been found in the body of literature which finds long-run relationship in all SAARC countries.*

Keywords: *ARDL, economic growth, Okun's law, SAARC, South Asia, unemployment rate*

Öz: *Bu makalenin amacı Okun yasasının SAARC (Güney Asya Bölgesel İşbirliği Birliği) ülkelerinde uygulanabilirliğini test etmektir. Ayrıca Güney Asya Bölgesi'ndeki işsizlik oranı ile büyüme oranı arasındaki uzun vadeli ilişkiyi bulmayı ve büyüme oranının işsizlik üzerindeki etkisini araştırmayı amaçlamaktadır. Çalışma, 1991'den 2015'e kadar sekiz SAARC ülkesi için yıllık zaman serisi verilerini kullanmaktadır. Araştırmanın amaçlarını karşılamak için, açıklayıcı istatistiklerle trendin grafiksel gösterimini ekonometrik analiz takip etmektedir. Değişkenlerin durağanlığına bağlı olarak, bir otoregresif dağıtım gecikmesi (ARDL) modelinin işsizlik ve büyüme arasındaki uzun vadeli ilişkiyi test ettiği tahmin edilmektedir. Sonuçlar, kişi başına düşen*

GSYİH'nın uzun vadede işsizlik oranını sadece SAARC'ın üç üye ülkesinde, yani Afganistan, Hindistan ve Sri Lanka'da ve toplamda Güney Asya Bölgesi'nde olumsuz etkilediğini göstermektedir. Bu makale aynı zamanda Bangladeş'teki büyüme oranı ile işsizlik oranı arasında negatif bir ilişki bulmaktadır, ancak bu ilişki istatistiksel olarak anlamlı değildir. Çalışma, Butan, Maldivler, Nepal ve Pakistan'daki iki değişken arasında herhangi bir negatif ilişki bulamadı. Çalışma, Okun yasasının geçerliliğini keşfediyor, ancak elde edilen Okun katsayısı, Arthur Okun tarafından belgelenen gerçek Okun katsayısından daha az. Bir başka önemli kanıt da, büyüme oranı ile işsizlik oranı arasındaki bağlantının öneminin SAARC ülkeleri arasında farklılık göstermesidir. Bu makalenin ana sınırlaması, diğer SAARC ülkelerine kıyasla Afganistan için veri bulunmamasıdır. Bu makale, Okun yasasının SAARC'ın her üye ülkesinde ve Güney Asya'nın bir bölgesi olarak geçerliliğini test ettiği için benzersizdir. Bugüne kadar, tüm SAARC ülkelerinde uzun vadeli ilişkiler bulan literatürde buna benzer bir çalışma bulunamamıştır.

Anahtar Kelimeler: ARDL, ekonomik büyüme, Okun yasası, SAARC, Güney Asya, işsizlik oranı

INTRODUCTION

GDP is a commonly used parameter to measure the economic growth of a country. Some other factors like inflation, unemployment and literacy rate affect GDP growth rate (Anyanwu, 2014). The South Asian Association for Regional Cooperation (SAARC) is the regional geopolitical organization and intergovernmental union of the countries in South Asia. Its member countries include Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. SAARC countries cover 3% of the total world's area, while the population of the SAARC countries is 21% of the world's total population. SAARC was established on December 8, 1985 in Dhaka, the capital of Bangladesh. Political and economic problems are similar in SAARC countries (Chauhan, 2008). The population density of these countries is high, which lead to serious threat of creating job opportunities. As a result, it creates unemployment problem. Although the growth rates of the countries are positive on average in recent decades, the effect of such growth on the level of employment requires scientific investigation.

Unemployment is a situation in which people who are actively seeking jobs, but there are no vacancies. In labour economics, unemployment includes frictional unemployment, cyclical unemployment, structural unemployment and classical unemployment (Junankar & Price, 2016). Because of the globalization and advancement of technology (Mincer & Danninger, 2000), the SAARC countries can't cope with those changing circumstances on account of social and economic problems. Such a condition of the economy obstructs the economic growth of the SAARC countries, causing a high unemployment rate (Upreti, 2015).

Economic policymakers consider unemployment as a vital factor in both developing and developed countries. As the full employment level maximizes output, it is one of the significant macroeconomic goals for every government (Arnold, 2011). Nevertheless, South Asian countries are facing structural changes for the last few decades and the consequences of these structural changes reduced the employment ratio of the agriculture sector in GDP (Sawhney, 2010). The intersectoral output gap ensures a couple of things: rapid economic growth and unemployment changes (McMillan & Rodrik, 2011).

In macroeconomics, Okun's law is a well-known concept that describes the negative relationship between economic growth and unemployment (Martin, 1993). In 1962, Arthur Okun, an American economist, states that if the real GDP increases rapidly, the rate of unemployment will decline. Conversely, unemployment will rise if the growth will lower or negative (Higgins, 2011). A reduction in the unemployment rate in any economy is supposed as a positive development (Arnold, 2011). It is considered as a favourable sign since most of the people in a society require employment for their livelihood. Therefore, the Okun's law is the best technique to investigate and explain the negative association between economic growth and unemployment.

Most of the previous studies (Ciprian-Ionel, 2007; Villaverde & Maza, 2009; Watts & Mitchell, 1991) investigated the relationship between unemployment rate and growth for a single economy or state within the country. Some papers (Ahmed, Aziz, & Zaman, 2013; Moosa, 1997; Sawhney, 2010) tried to find the existence of Okun's law in some selected SAARC countries (not more than five countries). Majority of the papers (Christopoulos, 2004; Owyang & Sekhposyan, 2012; Villaverde & Maza, 2009) tested Okun's law for developed countries. This paper tries to check the validity of Okun's law in all member countries of SAARC individually and also in South Asia.

The objective of the paper is to examine the effectiveness of Okun's law in SAARC countries in the long-run. It also tries to find out whether any inverse relationship between growth rate and unemployment rate exist or not in South Asia. The study uses annual time series data for eight SAARC countries from 1991 to 2017. To meet the objectives of the research, the graphical illustration of trend with descriptive statistics are followed by econometric analysis. Based on the stationarity of the variables, an autoregressive distributive lag (ARDL) model has been estimated to test the long-run relationship between unemployment and growth.

1. REVIEW OF THE THEORY AND LITERATURE

1.1 Review of the Theory

Okun's Law is termed afterward Arthur Melvin Okun (Nov. 28, 1928 - March 23, 1980) who at first described it in the early 1960s. Okun originally described, the economy experiences 1% increase in the unemployment rate for every 3% decrease in real GDP. Similarly, a 3% increase in GDP from its long-run level decreases a 1% in unemployment (Knotek II, 2007). According to his empirical result, a slowdown of economic growth causes the unemployment rate to rise. This connection is more numerical rather than organizationaleconomic framework. But during the stormy 1970s, when stagflation (condition of both stagnation and inflation) troubled the country, the rule no longer held.

Furthermore, no economic theory can explain this association between unemployment rate and economic growth. Therefore, the Okun's theory becomes a benchmark to measure the connection between these two variables. It is a widely used technique of finding any negative association between growth rate and unemployment rate for its simplicity.

Many versions of the Okun's law are available: gap version, difference version, dynamic version and production function approach. Based on the assumptions formulated by the researchers, every method has its own characteristics for calculation. Among the different approaches, only the difference version carries decently simple statistical calculations. By this method, without making any assumptions, values can be calculated from the accessible empirical data. Different techniques are applied in the dynamic version, gap version and the production function version to regress GDP growth over fluctuations in the unemployment rate to the data with different interpretations and assumptions. However, the difference version merely regresses GDP growth rate on the unemployment rate.

To acquire a positive growth, more production of goods and services is a prerequisite. With the help of inputs (capital, labor), the output can be produced if more workers are employed at the given capital stock by utilizing economic resources at their optimum level, then we can obtain real GDP growth. From this theoretical background, it is clear that there is a positive relationship between real GDP growth and reduction in unemployment level, as high employment level leads to a high price level in the economy, according to Phillips (1962).

That is, having a higher employment level, the economy must face inflation. Thus, we observe that a higher price level is associated with a low unemployment rate. If we consider the unemployment rate and real GDP growth, the two economic variables from the above discussions, at that time we can conclude the effect of the unemployment rate over GDP growth. As employment and GDP growth are positively related to each other, unemployment rate and GDP growth must be negatively associated with each other i.e., a positive economic growth weakens the unemployment rate in the economy.

1.2. Literature Review on Unemployment and Growth Nexus

Different studies (Ahmed *et al.*, 2013; Lal, Muhammad, Jalil, & Hussain, 2010; Moosa, 1997) have been done to detect the negative influences of growth rate on the unemployment rate of developing countries by employing time series data and panel data for individual SAARC countries over time to time. It requires to find the validity of Okun's law in all SAARC countries and also in the South Asia region. There are few studies (Chauhan, 2008; Tariq Hussain, Siddiqi, & Iqbal, 2010; Islam & Nasrin, 2015) have been worked to show the negative relationship between unemployment rate and economic growth in Bangladesh, India, Sri Lanka and Pakistan individually or some selected SAARC countries. Some studies (Aranki, Friberg, & Sjödin, 2010a; Ciprian-Ionel, 2007; Knotek II, 2007) find the validity of Okun's law in the short-run. Long-run relationship is absent in their studies and they recommend further research on the impact of economic growth on unemployment in the long-run. There are few gaps in the existing literature and this study tries to fulfil the underlining gap of existing literature. Ahmed *et al.* (2013) recommend to find out a significantly long-run connection between GDP growth and unemployment for all SAARC countries in future research.

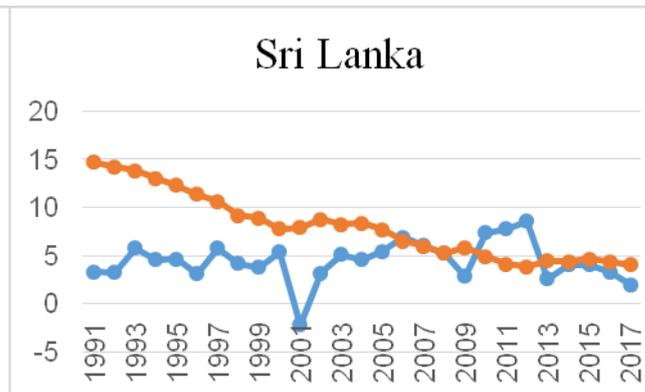
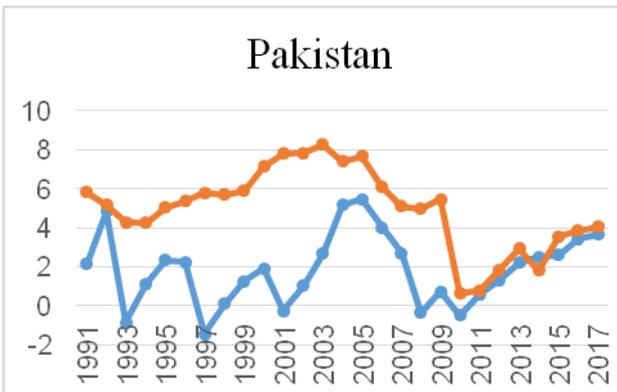
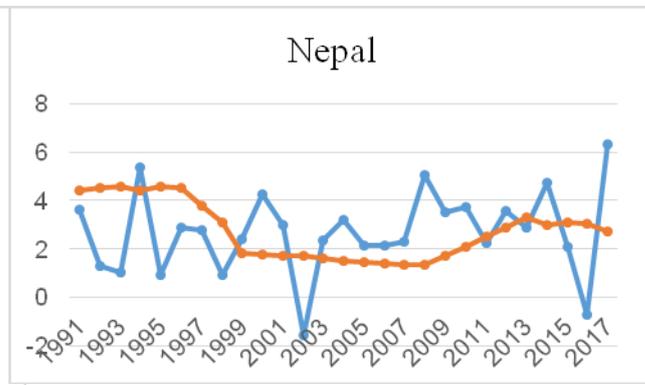
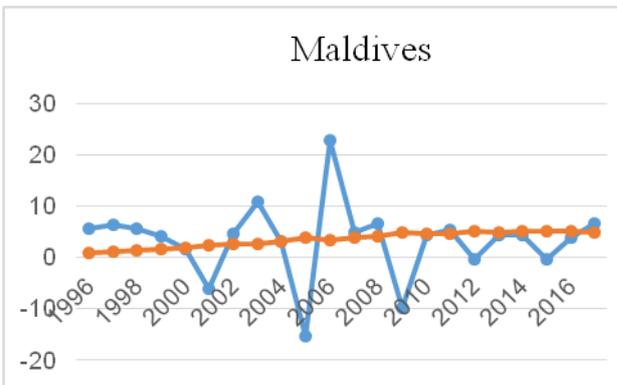
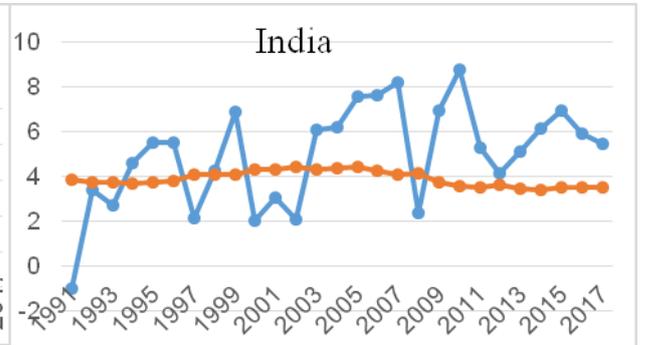
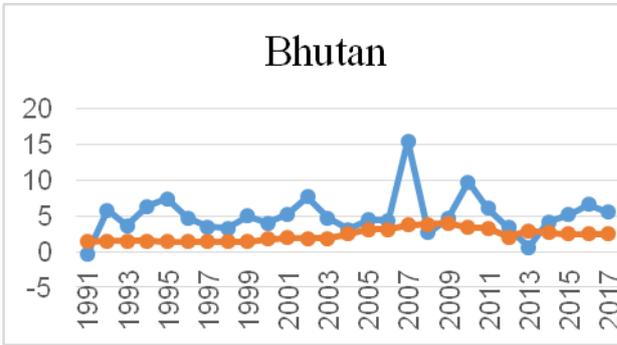
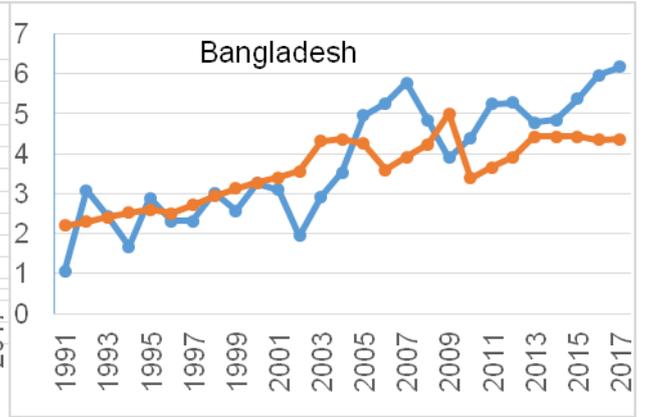
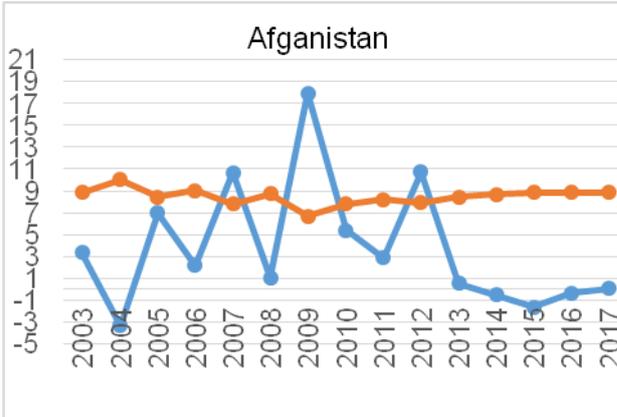
In the case of the US economy, Levin, Lin, and Chu (2002) analysed the unemployment and economic growth nexus and found a significance inverse relationship that indicates the validity of Okun's law. Walterskirchen (1999) examined and found a negative relationship between unemployment and economic

growth by time series annual data from 1968 to 1998 for EU countries. Tatoğlu (2011) finds the validity of Okun's law for European countries and the result shows that the nexus between growth rate and unemployment rate varies among the countries. Marinkov and Geldenhuys (2007) studied in the case of South Africa using annual data from 1970-2005. Also, they found that unemployment and GDP growth move in the opposite direction. Still, changes in the unemployment rate causes less inflation in the GDP growth rate as compared to Okun's coefficient. Among the EU countries, depending on Swedish data, Aranki, Friberg, and Sjödin (2010b) investigated the relationship between unemployment and economic growth. In the case of Australia, Watts and Mitchell (1991) also supported Okun's law. Their study found the long-run relationship between unemployment and economic growth is unstable. Villaverde and Maza (2009) analysed the Okun's law for the Spanish region throughout 1980-2004. Ciprian-Ionel (2007) tested Okun's law and found an inverse and two-way relationship between GDP growth variable and unemployment rate for Romania during 1993-2004. Knotek II (2007) also studied the usefulness of Okun's law in which he calculated the effects of current output, past output level, past unemployment rate on unemployment rate by using its difference, gap and dynamic versions and analysed that increasing unemployment rate slowdown the economic growth in the short-run and long-run. Christopoulos (2004) also estimated Okun's law by applying unit root tests and co-integration approach on panel data at regional level in Greece and found that results are valid in six out of thirteen regions. Moosa (1997) tested Okun's law for G7 countries namely Canada, Italy, UK, US, France, Germany, Japan. The empirical studies showed that Okun's coefficient is higher in North America whereas lower in Japan.

Moreover, Al-Habees and Rumman (2012) directed a similar study for Arab countries, highlighting their economic strategies. The study found that less economic growth rate hinders new job creation, which increases the rate of unemployment. Empirical results identify the validity of Okun's law and indicate that programmes should be taken in such a way so that economic growth will rise, reducing the unemployment rate.

Similarly, Lal, Muhammad, Jalil, and Hussain (2010) checked the validity of Okun's law in some Asian countries, specifically Bangladesh, China, India, Pakistan and Sri Lanka. For this persistence, they took annual time series data during the period 1980 to 2006. Using Engle-Granger (1987) co-integration technique, they examined the long-run relationship between GDP growth and unemployment. Their results found that there is no existence of Okun's law in some Asian countries. By using time series data for Pakistan from 1972 to 2006, Tahir Hussain, MW Siddiqi, and Asim Iqbal (2010) investigated the fundamental relationship between economic growth and unemployment rate. Considering some explanatory variables like capital, labor and human capital; their results also indicate a short-run and significant long-run relation between growth and unemployment.

Now the question may arise how this study is unique from others. This study tries to find the validity of Okun's law in all SAARC countries in the long-run and the impact of growth on unemployment in the South Asia Region. ARDL model is used to test the validity of Okun's law. This study has tried to fulfil the research gap. Moreover, this study also includes an update data from 1991 to 2017.



Economic Growth

Unemployment Rate

Figure-1: Unemployment rate and growth trends in SAARC Countries

Bangladesh

The GDP in Bangladesh extended 7.11% in 2016 from the previous year. GDP Growth Rate in Bangladesh averaged 3.56% from 1991 until 2017, reaching a high of 6.16% in 2017 and a record low of 1.07 percent in 1991 (World Bank, 2018).

Bangladesh's Unemployment Rate increased to 4.37 % in Dec 2017. The average rate of unemployment is 3.56 %. The data reached a high of 5.00 % in Dec 2009 and a record low of 2.20 % in Dec 1991 (World Bank, 2018).

Bhutan

The main sectors of the Bhutanese economy are hydroelectricity, tourism and agriculture. GDP Annual Growth Rate in Bhutan averaged 5.05 percent from 1991 until 2017, reaching a high of 15.38 percent in 2007 and a record low of -0.41 percent in 1991. (World Bank, 2018).

The unemployment rate in Bhutan remained unchanged at 2.50 percent in 2017 from 2.50 percent in 2016. The unemployment rate in Bhutan averaged 2.28 percent from 1991 until 2017, reaching a high of 3.96 percent in 2009 and a record low of 1.38 percent in 1995. (World Bank, 2018).

India

The unemployment rate in India increased to 3.52 percent in 2017 from 3.51 percent in 2016. The unemployment Rate in India averaged 3.89 percent from 1991 until 2017, reaching a high of 4.43 percent in 2002 and a record low of 3.41 percent in 2014. (World Bank, 2018)

GDP Annual Growth Rate in India averaged 4.94 percent from 1991 until 2017, reaching a high of 8.76 percent in 2010 and a record low of -0.98 percent in 1991 (World Bank, 2018).

Maldives

The unemployment rate in Maldives remained unchanged at 5 percent in 2017 from 5 percent in 2016. The unemployment rate in Maldives averaged 3.35 percent from 1991 until 2017, reaching a high of 5.21 percent in 2014 and a record low of 1.001 percent in 1996. (World Bank, 2018).

Tourism, fishing and shipping are the most critical sectors of the economy. Tourism accounts for more than 30 percent of GDP and over 60 percent of foreign currency earnings. GDP Annual Growth Rate in Maldives averaged 3.34 percent from 1996 until 2017, reaching a high of 22.82 percent in 2006 and a record low of -15.42 percent in 2005 (World Bank, 2018).

Nepal

Nepal is one of the least developed countries in the world and relies extensively on foreign aid. The primary sector of the economy is agriculture, which employs over 70 percent of the population and accounts for 33 percent of GDP. As Nepal is home to the highest mountains in the world, tourism has been steadily growing in importance and is an essential source of revenue. The Gross Domestic Product

(GDP) in Nepal expanded 6.30 percent in 2017 from the previous year. GDP Annual Growth Rate in Nepal averaged 2.69 percent from 1991 until 2017, reaching a high of 6.31 percent in 2017 and a record low of -1.53 percent in 2002 (World Bank, 2018).

The unemployment rate in Nepal decreased to 2.73 percent in 2017 from 3.06 percent in 2016. The unemployment rate in Nepal averaged 2.74 percent from 1991 until 2017, reaching a high of 4.60 percent in 1995 and a record low of 1.34 percent in 2008 (World Bank, 2018).

Pakistan

The unemployment rate in Pakistan averaged 4.99 percent from 1991 until 2017, reaching a high of 8.27 percent in 2003 and a record low of 0.65 percent in 2010 (World Bank, 2018).

GDP Annual Growth Rate in Pakistan averaged 1.89 percent from 1991 until 2017, reaching a high of 5.48 percent in 2005 and a record low of -1.45 percent in 1997 (World Bank, 2018).

Sri Lanka

Sri Lanka is a developing economy of the southern coast of India. Despite years of civil war, the country has recorded strong growth rates in recent years. The main sectors of Sri Lanka's economy are tourism, tea export, apparel and textile, and rice production. GDP Growth Rate in Sri Lanka averaged 4.46 percent from 1991 until 2017, reaching a high of 8.56 percent in 2012 and a record low of -2.23 percent in 2013 (World Bank, 2018).

The unemployment rate in Sri Lanka averaged 7.97 percent from 1991 until 2017, reaching an all-time high of 14.67 percent in 1992 and a record low of 3.88 percent in 2013 (World Bank, 2018).

2. RESEARCH METHODOLOGY

2.1. Data and Variables

All data for this study are collected from various sources. The primary sources are the World Development Indicators (World Bank, 2018) and Bangladesh Bank. The data consists of the yearly time series over the period from 1991 to 2017. The time frame of data depended mainly on the available data. The dependent variable is GDP per capita growth and the independent variable is the unemployment rate.

A detailed description of the raw data set is provided in the form of descriptive statistics in Table 1 and Table 2. The time-series data sample include 1991 to 2017 for all the countries.

Table 1: Descriptive Statistics of Regression Variables [SAARC Countries]

	Variables	Obs.	Mean	Std. Dev.	Min.	Max.	Jarque-Bera	Prob.
AFG	Unemp	15	8.488	0.742	6.705	10.001	1.236	0.538
	Growth	15	3.727	5.735	-3.361	17.951	3.263	0.195
BGD	Unemp	27	3.562	0.815	2.200	5.000	1.853	0.395
	Growth	27	3.808	1.449	1.068	6.164	1.624	0.443
BHU	Unemp	27	2.280	0.850	1.381	3.960	2.405	0.300
	Growth	27	5.050	2.908	-0.408	15.397	32.951	0.000
IND	Unemp	27	3.891	0.337	3.414	4.432	2.412	0.299
	Growth	27	4.949	2.283	-0.982	8.763	1.367	0.504
MALD	Unemp	22	3.354	1.522	0.790	5.210	2.028	0.362
	Growth	22	3.341	7.340	-15.421	22.823	5.074	0.079
NEP	Unemp	27	2.747	1.175	1.340	4.595	2.537	0.281
	Growth	27	2.688	1.732	-1.528	6.317	0.522	0.770
PAK	Unemp	27	4.988	2.100	0.650	8.270	1.092	0.579
	Growth	27	1.883	1.883	-1.449	5.478	0.566	0.753
SRI	Unemp	27	7.966	3.436	3.880	14.660	2.327	0.312
	Growth	27	4.459	2.116	-2.227	8.556	7.747	0.060

Source: Authors' calculation and data are collected from the World Bank database. Note: All data are in percentage form.

Table 2: Descriptive Statistics of Regression Variables [South Asia]

	Obs.	Mean	Std. Dev.	Min.	Max.	Jarque-Bera	Prob.
Unemployment	27	4.048	0.424	3.301	4.686	1.091	0.579
Growth	27	4.470	1.967	-0.279	7.507	1.150	0.562

Source: Authors' calculation and data are collected from World Bank database. Note: All data are in percentage form.

The above tables consists of observation, mean value, standard deviation, maximum value, minimum value and corresponding probability value of Jarque-Bera along with the value Jarque-Bera of all variables.

2.2. Modelling & Methodology

When a study is being conducted with time-series data, it needs to check whether the data is stationary or not. Because there is a possibility to be the spurious regression if time-series data is used. A time series Y is said to be stationary if its mean and variance are constant over time and the value of covariance between two time periods depends only on the distance between the two time periods and not on the actual time at which the variance is computed (Gujarati, 2009). There are many ways to check the data stationarity. The standard approach to check the stationarity of a time series data is unit root test. Among the various tests, the Augmented Dickey-Fuller (ADF) test is used widely (Adenutsi, 2010; Islam & Nasrin, 2015). Augmented Dickey-Fuller (ADF) unit root test has been used to check whether the variables are stationary or not.

The purpose of this paper is to test the relationship between the unemployment rate and growth rate by using annual time series data of SAARC countries from 1991

to 2017. To conduct the study an autoregressive distributive lag (ARDL) model, proposed by Pesaran and others (Pesaran and Pesaran, 1997; Pesaran and Shin, 1999; Pesaran *et al.*, 2001). The following autoregressive distributed lag (ARDL) model will be estimated in order to test the long-run relationship between the unemployment rate and economic growth. The model is as follows:

$$\Delta UN_t = \alpha + \beta_1 UN_{t-1} + \beta_2 Y_{t-1} + \sum_{i=1}^n \gamma_1 \Delta Y_{t-i} + \sum_{i=1}^n \gamma_2 UN_{t-i} + \varepsilon_t \dots \dots (1)$$

Where,

ΔUN_t = Change in unemployment rate in period t

ΔUN_{t-1} = First lag of unemployment rate

Y_{t-1} = First lag of GDP growth

ε_t = Error term in time period t

3. EMPIRICAL RESULTS

3.1. The Results of Augmented Dickey-Fuller (ADF) Unit Root Test.

Table 3: The Results of Unit root Test of Variables [SAARC Countries]

		Level		First Difference		Decision
		Intercept	Inter. + Trend	Intercept	Inter. + Trend	
AFG	<i>Unemp</i>	-1.532	-3.891*	-8.251***	-8.096***	I(1)
	<i>Growth</i>	-3.608**	-3.724*	-3.845**	-4.217**	I(1)
BGD	<i>Unemp</i>	-1778	-2.978	-.5766***	-5.860***	I(1)
	<i>Growth</i>	-1.657	-3.486**	-6.115***	-6.013***	I(1)
BHU	<i>Unemp</i>	-1.384	-1.302	-5.588***	-5.587***	I(1)
	<i>Growth</i>	-5.697***	-5.547***	-5.869***	-5.738***	I(0)
IND	<i>Unemp</i>	-2.888**	-1.152	-4.215***	-4.468***	I(1)
	<i>Growth</i>	-4.461***	-4.773***	-5.315***	-5.275***	I(0)
MALD	<i>Unemp</i>	-3.921***	0.1534	-6.126***	-3.397*	I(1)
	<i>Growth</i>	-5.299***	-5.096***	-6.315***	-6.171***	I(0)
NEP	<i>Unemp</i>	-2.117	-.7731	-3.568**	-3.745**	I(1)
	<i>Growth</i>	-5.924***	-5.618***	-5.595***	-5.376***	I(0)
PAK	<i>Unemp</i>	-1.489	-1.695	-5.054***	-4.950***	I(1)
	<i>Growth</i>	-2.989**	-3.027	-6.342***	-6.391***	I(1)
SRI	<i>Unemp</i>	-2.114	-1.306	-4.247***	-4.730***	I(1)
	<i>Growth</i>	-3.962***	-3.841**	-7.540***	-7.279***	I(0)

Note: (*), (**) and (***) denotes 1%, 5% and 10% respectively.

Table 4: The Results of Unit Root Test of variables [South Asia]

		Level		First Difference		Decision
		Intercept	Inter. + Trend	Intercept	Inter. + Trend	
SA	<i>Unemp</i>	-1.080890	-1.381725	-4.092137***	-4.080203**	I(1)
	<i>Growth</i>	-4.065264***	-4.520553***	-5.236510***	-5.182008***	I(0)

Note: (*), (**) and (***) denotes 1%, 5% and 10% respectively.

The results of the ADF unit root test for the variables of SAARC countries and South Asia in their levels and first differences are presented in Table 3 and Table 4. The output of ADF unit root test indicates that the growth rate variable of Bhutan, India, Maldives, Nepal and Sri Lanka are stationary in level and the variables of other member countries of SAARC. On the other hand, South Asia are stationary in the first difference, which is statistically significant. None of the variables of SAARC countries and South Asia are stationary in the second difference.

3.2. The Results of ARDL Estimation

The results of the ARDL model are the long-run output because all variables used by the ARDL model are stationary at I(0) and I(1).

Table 5: Results of ARDL Model [SAARC Countries]

Method: Autoregressive Distributed Lag								
Independent variable	Dependent variable: Unemployment Rate, Sample Range: 1991 - 2017							
	Coefficient							
	AFG	BGD	BHU	IND	MALD	NEP	PAK	SRI
Constant	2.712	0.651	0.312	0.926	0.417	-0.012	0.687	1.065
UNEMR(-1)	0.590	0.510	0.874	0.891	0.943	1.4404	0.090	0.921
UNEMR(-2)	0.323	0.066		0.112		-0.537		
UNEMR(-3)	-0.289	-0.149		0.113				
UNEMR(-4)	0.134	0.571		-0.270				
GDPGR	-0.108*	-0.104	0.002	-0.044***	-0.002	0.007	0.090	-0.121**
GDPGR(-1)	0.032			0.0217	-0.021	0.083		-0.063
GDPGR(-2)	0.038			-0.005	0.015			
GDPGR(-3)	-0.008			-0.012				
GDPGR(-4)				-0.022				
R-squared	0.962	0.746	0.800	0.9842	0.987	0.945	0.694	0.982
Adjusted R ²	0.861	0.672	0.782	0.973	0.9839	0.934	0.667	0.979
Durbin-Watson Stat.	1.102	2.059	2.195	2.450	2.4218	2.305	1.883	2.029
F-statistic	9.567	10.033	46.039	90.101	292.225	86.821	26.10	400.846
Prob(F-statistic)	0.044	0.0001	0.000	0.0000	0.000	0.000	0.000	0.000

Note: (*), (**) and (***) denotes 1%, 5% and 10% respectively.

Table 6: Results of ARDL Model [South Asia]

	Independent Variables				
	Coefficient				
Constant	UNEMR(-1)	GDPGR	GDPGR(-1)	GDPGR(-2)	GDPGR(-3)
0.806345	0.900047	-0.069560***	-2.72E-05	0.020122	-0.038522
R-squared	0.901285		F-statistic		32.86851
Adjusted R ²	0.873864		Prob(F-statistic)		0.000000
Durbin-Watson stat	1.729192		Dependent Variable		Unemployment Rate

Note: (*), (**) and (***) denotes 1%, 5% and 10% respectively.

The Table 5 and Table 6 show the long-run relationship between GDP growth and unemployment rate. The results indicate that per capita GDP negatively influences the unemployment rate in the long run in some SAARC countries, namely

India, Sri Lanka and Afghanistan and the coefficient of growth rate is also found statistically significant at 1%, 5%, 10% significant level respectively. Also, the study observes the negative relation between the variables in South Asia.

One percent point increase in per capita GDP will lead to a 0.11 percent point decrease in the unemployment rate in Afghanistan, 0.04 percent point in India, 0.12 percent point in Sri Lanka and 0.07 percent point in South Asia in the long run. This paper also finds a negative relation between the growth rate and unemployment rate in Bangladesh, but this association is not statistically significant. The study doesn't find any negative relationship between the two variables in Bhutan, Maldives, Nepal and Pakistan. This implies that GDP growth rate does not have any positive influence in creating employment in those countries in the long-run. Several studies (Ahmed et al., 2013) also support these findings. This model is the best fit as the adjusted R² value is high as well as the explanatory variables can be explained dependent variable by near or above 90% for most of the countries. F-statistic value is also high and the corresponding probability value is much low. It is found that F-statistic value is statistically significant. Durbin-Watson value confirms that the model is not spurious. Durbin-Watson value indicates the serial correlation of residuals. The results of this regression will be spurious if Durbin-Watson value is not close to 2. The results of various test which are related with this model will be disclosed in the following section.

3.3. Diagnostic Tests for ARDL Model

Serial correlation or autocorrelation refers to the correlation of a time series with its previous and future values. Autocorrelation is also sometimes called “lagged correlation,” which refers to the correlation between members of a series of numbers arranged in time. Here, this study uses the Breusch-Godfrey Serial Correlation Lagrange Multiplier (LM) test for serial correlation.

Results for the serial correlation test have been presented in Table 7 and Table 8 below.

Table 7: Results for Autocorrelation of ARDL Model: [SAARC Countries]

C	AFG	BGD	BHU	IND	MALD	NEP	PAK	SRI
F-statistic	7.802	0.044	1.284	1.655	0.871	0.683	0.056	0.150
Prob. F	0.245	0.956	0.297	0.235	0.441	0.517	0.945	0.861

Table 8: Results for Autocorrelation of ARDL Model: [South Asia]

Breusch-Godfrey Serial Correlation Lagrange Multiplier (LM) Test:			
F-statistic	0.043873	Obs*R-squared	0.130902
Prob. F(2,16)	0.9572	Prob. Chi-Square(2)	0.9366

The above result implies that there is no serial correlation in the ARDL Model. It indicates that the results obtained from ARDL with stationary data is not spurious or non-sense.

Heteroskedasticity test is inserted in following Table 9 and Table 10
 Result for Heteroskedasticity has been presented in Table 9 and Table 10 below.

Table 9: Results of Heteroskedasticity Test: [SAARC Countries]

Heteroskedasticity Test: Breusch-Pagan-Godfrey								
	AFG	BGD	BHU	IND	MALD	NEP	PAK	SRI
F-statistic	0.748	2.057	1.493	1.984	1.135	2.901	0.931	0.223
Prob. F	0.6709	0.121	0.245	0.126	0.377	0.048	0.408	0.878

Table 10: Results of Heteroskedasticity Test: [South Asia]

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.551892	Prob. F(5,18)	0.2238
Obs*R-squared	7.229461	Prob. Chi-Square(2)	0.2041

From the results of above table, it can be concluded that the ARDL model is free from the Heteroskedasticity problem at the 5% level of significance. The normality test for the ARDL model is shown in the next Table 11 and Table 12.

The results of the normality test for the residuals of the ARDL model are presented below.

Here, the appropriate test statistic of normality test is Jarque-Bera (JB) test statistic

Table 11: Results of Normality Test: [SAARC Countries]

	AFG	BGD	BHU	IND	MALD	NEP	PAK	SRI
Jarque-Bera	0.942	13.562	2.716	0.507	0.208	1.981	55.496	1.178
Probability	0.624	0.001	0.257	0.775	0.902	0.371	0.000	0.554

Table 12: Results of Normality Test: [South Asia]

Normality Test: Jarque-Bera	
Jarque-Bera	5.637081
Probability	0.059693

The residuals of the ARDL model are normally distributed over the study period and the above decision made the ARDL model valid. The figures of the Normality test for each country are presented in the Appendixes section. Model specification error tests are performed in the following section.

Results for Ramsey RESET test is presented in Table 13 and Table 14 below.

Table 13: The results of the Ramsey RESET Test: [SAARC Countries]

	AFG	BGD	BHU	IND	MALD	NEP	PAK	SRI
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F-statistic	1.863	9.350	1.236	0.255	5.224	1.894	0.127	3.520
Prob. F	0.305	0.007	0.278	0.622	0.038	0.184	0.724	0.074
t-statistic	1.365	3.057	1.112	0.505	2.288	1.376	0.357	1.876

Table 14: The results of the Ramsey RESET Test: [SAARC Countries]

Ramsey RESET Test			
F-statistic	1.4172	t-statistic	1.1904
Prob. F	0.2502	Prob. (t-statistic)	0.2502

From the above result, the null hypothesis cannot be rejected indicates that the ARDL model is correctly specified.

4. FINDINGS AND DISCUSSION

The results indicate that per capita GDP negatively influences the unemployment rate in the long run in some SAARC countries, namely India, Sri Lanka and Afghanistan and the coefficient of growth rate is also found statistically significant at 1% , 5%, 10% level respectively. Also, the negative relation between the variables in South Asia has been found in this paper. One percent point increase in per capita GDP will lead to a 0.11 percent point decrease in the unemployment rate in Afghanistan, 0.04 percent point in India, 0.12 percent point in Sri Lanka and 0.07 percent point in South Asia in the long run. This paper also finds a negative relation between the growth rate and unemployment rate in Bangladesh, but this association is not statistically significant. The study doesn't find any negative relationship between the two variables in Bhutan, Maldives, Nepal and Pakistan. This implies that the GDP growth rate does not have any positive influence in creating employment in those countries in the long-run. These findings are also supported by previous studies (Ahmed et al., 2013).

Findings-01: Only in three member countries of SAARC, namely Afghanistan, India and Sri Lanka among eight and also in the South Asia Region; this study finds the validity of Okun's law. But the attained Okun coefficient is less than that of the actual Okun coefficient, which was documented by Arthur Okun (Okun, 1962).

Findings-02: This study suggests that there is a long-run negative relationship between growth and unemployment rate in Afghanistan, India and Sri Lanka. No long-run association between the variables in Bhutan, Maldives, Nepal and Pakistan. For Bangladesh, this paper observed expected negative sign, but the result is insignificant.

CONCLUSION & RECOMMENDATIONS

In this study, we examined the validity of Okun's law the long run term relationships between unemployment rate and economic growth in SAARC countries and the South Asia Region from 1991 to 2017. Estimation results support the unemployment jeopardize in most of SAARC countries.

The need for improvement in governance is essential for all SAARC countries by strengthening institutions that will help in promoting economic growth and stability. The government should help in having sound political, financial and social reforms to achieve structural changes smoothly because SAARC countries have the potential to grow and that will help in increasing the productivity of the economy and economic welfare (Sawhney, 2010). SAARC countries should develop their human resources and physical infrastructure development by spreading regional cooperation to each other by reducing restrictions on intra-regional investment and technology flows.

This study concludes with the recommendation that Okun's law are not valid in most of the developing countries because of asymmetric problems. This study again recommends that it is needed further research on the relationship between economic growth and the unemployment rate in short-run by different models with updated quarterly data. The implications of Okun's law for economic policy is that economists need to anticipate the further development of the unemployment rate for a given projected growth level, which is additionally essential to forecast unemployment costs. But our results do not support the implications of Okun's Law in some developing countries. It can be said that Okun's law interpretation may not be applicable in developing countries. Pakistani, Bangladeshi, Sri Lankan, and Indian governments and political leaders should adopt this role model and follow from those Asian countries.

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