

## Relationship between Global Peace Index and Economic Growth of SAARC Countries: An Empirical Analysis

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### ABSTRACT

**Purpose-** The objective of the research is to study the Trends of Gross Domestic Product (GDP) of SAARC Countries and their position in Global Peace Index (GPI) over the years and also to observe the impact of GPI on the GDP of SAARC Countries.

**Design/ Methodology/Approach-** The data for GPI and GDP of SAARC Countries has been collected for time period of 2008-2017. To evaluate the data and to establish the connexion, Augmented Dickey Fuller (ADF) Test and Philip Perron test, Johanson's cointegration approach, and Granger causality has been employed. Further, Panel data cross sectional fixed effect has been applied.

**Findings-** The result suggests a Uni- variate causality between GPI scores and GDP of Afghanistan, Bangladesh, India and Srilanka, where as in Nepal and Bhutan, there is no Co-integration and Causality between the two parameters. Pakistan is the only SAARC Nation which depicts a Bi-Variate causality between GPI and GDP scores. Maldives have been omitted from the analyses as it is not part of Global Peace Index.

**Practical Implications-** The results of the research would help the nations to develop the strategies to maintain peace and harmony resulting in the growth and development.

**Keywords--** Global; Growth; Peace; Political; Stability

This paper endeavours to disclose how peace in SAARC nations influences the overall growth within the nations.

**South Asian Association for Regional Cooperation (SAARC)**

SAARCH was founded on 8<sup>th</sup> December, 1985 in Dhaka. SAARC is a regional organisation and geo-political union of countries of South Asia. At present, It has 8 members namely, Bangladesh, Afghanistan, India, Bhutan, Nepal, Maldives, Pakistan, Srilanka, comprising, 3% of World's area; 21% of world's population and 4% of Global Economy. It promotes Economic Development and regional integration among member countries. On 17<sup>th</sup> January, 1987, its Secretariat was recognised at Kathmandu, Nepal. Its Secretariat is sustained by Regional Centres situated in member nations to stimulate regional cooperation. Till date, 18 SAARC Countries have been held at various locations of member countries. SAARC has 6 apex bodies namely, SCCI (SAARC Chamber of Commerce and Industry), SAARCLAW (South Asian Association for Regional Cooperation), SAFA (South Asian Federation of Accountants), SAIEVAC (South Asia Initiative to end Violence against Children), FOSWAL (Foundation of SAARC writer and Literature).

**Global Peace Index (GPI)**

GPI was developed by Institute for Economics and Peace in consultation with an international panel of peace experts with data collected by the Economic Intelligence Unit (EIU). This index was launched in 2007 which ranked almost 121 countries, now the number has increased to approx. 164 countries. This index gauges three themes:

- Safety and Security
- Domestic and International Conflict
- Degree of militarization

The updated index is released every year in London, Washington D.C and at UN Secretariat in New York. The peaceful of countries is measured with the help of 22 indicators to gauge harmony or discord within the nation.

The 22 indicators used to develop GPI are: Number of External and Internal Conflicts, Number of

### I. INTRODUCTION

There are several factors which strengthens the peace and harmony in any nation which impacts the Economic Growth of the country. Peace and harmony of any nation is measured by the various parameters and indicators like safety, security, military expenditure, Inner conflicts. Conflicts with neighbouring countries, political stability etc. which influences the Growth and Development of any nation. Hence, it is imperative for any nation to cultivate a peaceful environment within the nation to stimulate the progress of the country.

deaths from Organised Conflict (Internal & External), Level of Organised Conflict within the nation, Relations with border countries, Level of observed criminality, Number of refugees & displaced persons as percentage of population, Refugee population by country or territory of origin and the number of a country's internally displaced people as a percentage of the total population of the country, Political instability, Terrorist activity, Political terror scale, Number of Homicides Per 100,000 Persons, Intentional Homicides comprising Infanticide but exclusive of minor road traffic & petty offences, Level of violent crime, Violent Demonstrations, Number of prisoned persons per 100,000 people, Rate of incarcerated persons as compared to the total population of the country, Number of Security Officers and police per 100,000 persons, Military expenditure in proportion to GDP, Cash outlays of central or federal government to meet costs of national armed forces, as a percentage of GDP, Number of armed-services personnel, Volume of transfers of major conventional weapons imports per 100,000 people, Imports of conventional weapons per 100,000 people, Volume of transfers of major conventional weapons exports per 100,000 people, Exports of conventional weapons per 100,000 people, Financial aid to UN Peacekeeping Missions, Total number, Nuclear and heavyweight weapons capability, The Military Balance and Easiness in accessing small arms and lightweight weapons. The 11<sup>th</sup> edition of GPI 2017 indicates that New Zealand, Iceland, Portugal, Austria and Denmark are most

peaceful countries and Syria, Africa, South Sudan, Iraq, and Yemen are least peaceful.

The present paper challenges to find a relationship between GPI scores and the Economic Growth of SAARC countries.

The main objectives of the paper are as follows:

1. To understand and highlight the trend of GDP of SAARC nations and their position in GPI over last few years.
2. To scrutinize the impact of GPI on the GDP of SAARC Countries.
3. To suggest some vital policy implications.

In the light of above objectives, this study intends to test following research hypothesis:

**H01:** There is no Co-integration and Causality between GPI scores and GDP of SAARC countries.

**HA1:** There is Co-integration and Causality between GPI scores and GDP of SAARC countries.

In order to achieve objectives and to test hypotheses, the paper is divided into following sections. Section I i.e. the present section gives the insights of SAARC nations with their economic conditions. This section also highlights the GPI followed by Section II which gives an exhaustive Review of Existing Literature. Section III defines the nature of data and methodology used for analysis. Section IV involves the Analysis and Interpretations of the results, followed by Conclusion and Policy Implications which will be part of Section V. References will be part of the last Section.

## II. REVIEW OF LITERATURE

SCHOLAR & YEAR	OBJECTIVE	DATA & METHODOLOGY	KEY FINDINGS
Kwasi Fosu (1992)	To find relationship between growth and in politics instability in Sub-African nations.	Cross sectional data in sub – Sahara African nations during 1960s and 1970s	Authors discovered that instability in politics negatively effects the growth of Africa due to migration of skilled humans and reduction of investment.
Edgardo.E. (Zablotsky) (1996)	To inspect the relationship among growth and stability	Cross- section data by using military coups as indicators of political instability. 63 countries during 1951-1983	The researchers found no association between Political Instability and Growth but there exists a two way relationship between two.
Alesina and Perotti (1996)	To observe a link between socio-political instability and Income inequality.	Cross - section data analysis using aggregate index of Socio-Political Instability obtained from principal components as	It was observed that Income inequality causes socio-political instability and has negative relationship with investment.

		indicators of Political Instability of 71 countries during 1960-1985	
Alesina et al (1996)	To discover a link between growth and political analysis.	Cross - section data analysis by using aggregate estimated probability to government termination as indicator of Political Instability	It was found that Political Instability has negative effect on growth
Jokob De Haan & Sierman.L.S (1996)	To discover that Political Instability hampers investment in Asia	Cross country regression analysis using data of 97 nations for period of 1963-1988 and 1990 - 1999	It was noticed that Political Instability hamper to investment and growth in Asia.
Benhabib Speiegel (1996)	To determine how Economic Growth and Political Instability are interrelated	Panel data analysis by dummy variable for major government transfers as indicator of Political Instability	Author exposed that Political Instability does not have a significant effect on growth but it has significant negative effect on physical capital accumulation.
Harold j. Brumm(1997)	To find correlation among Economic Growth & military expenditure.	Cross country study	It was discovered that Military Expenditure is positively correlated with Economic Growth by improving Property Rights & law and orders
George K Davis and Bryce E Kanaco (1998)	To ascertain how growth is impacted by Political Instability in different countries.	Cross Sectional Analysis of 44 countries during 1969-1988 using responses of business intelligences analysts with other measures.	Researchers determined that Political Instability positively effects inflation hence there is an adverse relationship between growth and political instability.
Francois Outreville J.(1999)	To highlight the relationship between financial growth and political of developing countries	Cross Sectional Analysis of 57 emerging nations using index of political instability.	A Negative correlation was found between financial development and political instability which has indirect effect on growth.
Dimitrios Asteriou & Simon Price (2001)	To scrutinize the link between peace and growth.	Time series analysis UK during 1961-1997 by using GARCH-M models.	It was established that instability in politics has negative effect on growth.
Fabrizo Carmignani (2004)	To find the relationship	Cross section, panel and time series	Author found a positive relationship

	between Political Instability and Growth, Fiscal Policy and Monetary Policy.	analysis with summary of broad literature	between all parameters.
Selvarathinam Santhirasegaram (2008)	To investigate the influence of Peace on Economic Growth in emerging nations.	Pooled data Analysis of 70 underdeveloped nations from 2000-2004 using OLS Econometric Methods.	Author emphasized that peace as determinant of growth should be incorporated within growth theories in future.
Deyshappriya(2015)	To model the effect of Corruption and Peace on Economic Growth.	Cross-country analysis which focuses of countries. Corruption and Peace were represented by corruption perception index and GPI. OLS estimates was applied to analyse the data.	Result established that Corruption adversely affects the per capita economic growth, while peace stimulates the economic growth.
Balami & et. al (2016)	To inspect the association between peace, security and inclusive growth in Nigeria.	Existing literature	Result suggested that Peace and Security are very vital and instrumental in the Economic development of any nation.

### III. DATA AND METHODOLOGY

The data have been collected from various sources like, the handbook of statistics of Reserve Bank of India, International Financial Statistics, and IMF and from the GPI. The data for the study has been collected from 2008 to 2017.

Owing to the nature of data, it becomes very important to test whether data is stationary or not before applying test like Cointegration, Granger Causality and OLS technique as the data is time series. We use different unit root tests, namely Augmented- Dicky Fuller (ADF) to add robustness in the results. We first study the data properties from an econometric perspective starting with the Stationarity of Data. We employ cointegration technique to understand the causality in GPI and GDP of SAARC Countries. The Stationarity of data has been tested using ADF test. The ADF test uses the presence of Unit Root as the null

hypothesis. The next logical step for our purpose is to study the Granger-causal relationship between the variables.

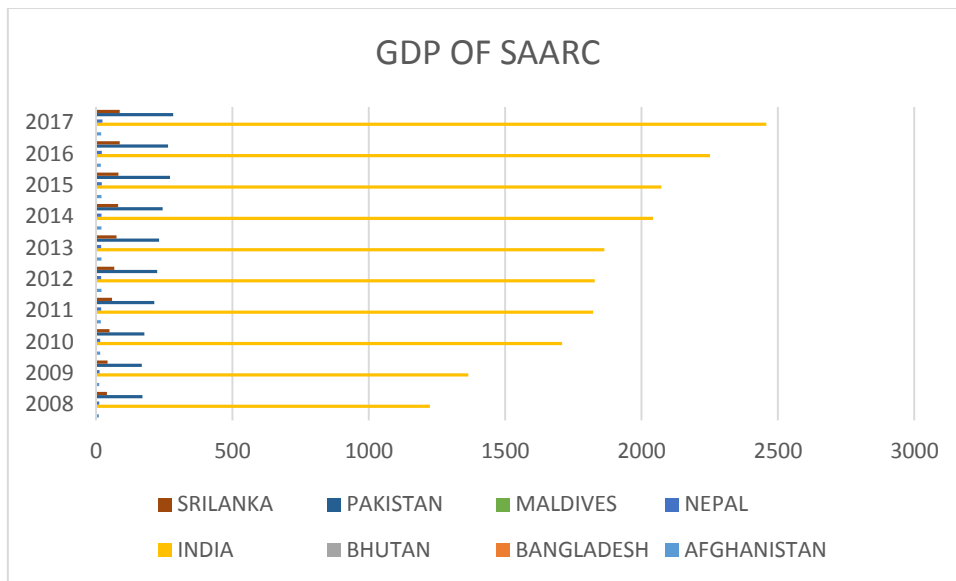
The Time Series data has been analyzed Country-wise as well as Panel Data Cross Sectional Fixed Effect Analyses has been done.

### IV. RESULTS AND ANALYSIS

#### 4.1 Trends and composition of GDP of SAARC Countries

To understand the effect of GPI on GDP of SAARC Countries, it is important to examine the trends of GDP of SAARC Countries over the past years, which will give an inclusive picture of how the landscape of SAARC countries have changed over the years. Figure 1 given below gives the overview of trend of GDP of SAARC Countries from 2008-2017.

**Figure 1: GDP OF SAARC Countries over the past Years**



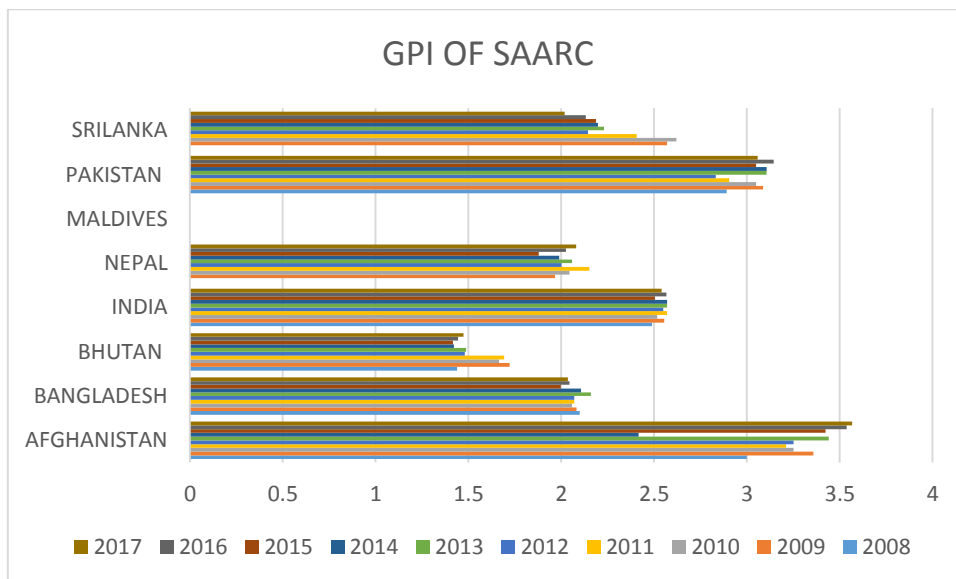
Source: [www.saarcstat.org](http://www.saarcstat.org)

**4.2 Trends of Global Peace Index for SAARC Countries**

GPI scores of SAARC countries has been highlighted below in Figure 2 from 2008-2017 which

depicts the ranking of various countries on the basis of select indicators.

**Figure 2: GPI Scores of SAARC countries over the years**



Source: Wikipedia

**4.3 Country wise Analysis**

This section gives the Country-wise analysis of GDP and GPI data of SAARC countries using ADF test, Johanson's cointegration approach, and Granger causality test.

**H01:** There is no Co-integration and Causality between the GPI scores and GDP of SAARC countries.

**HA1:** There is Co-integration and Causality between the GPI scores and GDP of SAARC countries.

**1. AFGHANISTAN**

**Table 1: Unit Root Result of GDP of Afghanistan**

Null Hypothesis: GDP has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.448345	0.0423
Test critical values:		
1% level	-4.582648	
5% level	-3.320969	
10% level	-2.801384	

\*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 8

**Table 2: Unit Root Result of GPI of Afghanistan**

Null Hypothesis: GPI has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.152577	0.0582
Test critical values:		
1% level	-4.420595	
5% level	-3.259808	
10% level	-2.771129	

\*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 9

The sample return series exhibit Stationarity thus conforming that sample series are integrated to the

first order. Table 1 and Table 2 exhibits the Unit root result using Augmented Dicker Fulley Test (ADF).

**Table 3: Johanson Co-Integration Result of Afghanistan**

Date: 06/26/17 Time: 18:44

Sample (adjusted): 2010 2017

Included observations: 8 after adjustments

Trend assumption: Linear deterministic trend

Series: GDP GPI

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.890980	21.84032	15.49471	0.0048
At most 1 *	0.401789	4.110494	3.841466	0.0426

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

To employ cointegration technique it is a pre-condition that the series have to non-stationary which is met. Hence we employ Johanson co-integration techniques to conclude the presence of a stable long-run

relationship between the GDP and GPI. The result of Co-Integration is displayed in Table 3, which shows that there is Co-integration between two parameters at 5% significant level.

**Table 4: Granger Causality Result of Afghanistan**

Pairwise Granger Causality Tests

Date: 06/26/17 Time: 18:46

Sample: 2008 2017

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
GPI does not Granger Cause GDP	8	2.64001	0.2181
GDP does not Granger Cause GPI		0.03089	0.9699

After analysing that there is a significant cointegration in the sample series, we employ Granger Causality Test to test the Causality between the two variables and the

results are proven in Table 4 which verifies a uni variate causality between the two variables.

## 2. BANGLADESH

**Table 5: Unit Root Result of GDP of Bangladesh**

Null Hypothesis: D(GDP,2) has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.043056	0.0844
Test critical values:		
1% level	-5.119808	
5% level	-3.519595	
10% level	-2.898418	

\*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 6

**Table 6: Unit Root Result of GPI of Bangladesh**

Null Hypothesis: GPI has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.053937	0.2630
Test critical values:		
1% level	-4.420595	
5% level	-3.259808	
10% level	-2.771129	

\*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 9

Table 5 and Table 6 displays the stationarity on 2<sup>nd</sup> level difference, hence, co-integration test can be employed.

**Table 7: Johanson Co-Integration Result of Bangladesh**

Date: 06/26/17 Time: 18:54

Sample (adjusted): 2010 2017

Included observations: 8 after adjustments

Trend assumption: Linear deterministic trend

Series: GDP GPI

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.867584	18.55498	15.49471	0.0167
At most 1	0.257378	2.380542	3.841466	0.1229

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Table 7 reveals the result of Co-Integration test showing the co-integration between both the variables at 5% significant level at 1<sup>st</sup> difference.

**Table 8: Granger Causality Result of Bangladesh**

Pairwise Granger Causality Tests  
Date: 06/26/17 Time: 18:55  
Sample: 2008 2017  
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
GPI does not Granger Cause GDP	8	1.79414	0.3073
GDP does not Granger Cause GPI		0.62387	0.5935

Table 8 exhibits Granger Causality results presenting the Uni-variate Causality between GPI scores and GDP.

### 3. BHUTAN

**Table 9: Unit Root Result of GDP of Bhutan**

Null Hypothesis: GDP has a unit root  
Exogenous: Constant  
Lag Length: 0 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-1.680385</b>	<b>0.4075</b>
Test critical values:		
1% level	-4.420595	
5% level	-3.259808	
10% level	-2.771129	

\*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 9

**Table 10: Unit Root Result of GPI of Bhutan (2<sup>ND</sup> DIFFERENCE)**

Null Hypothesis: D(GPI,2) has a unit root  
Exogenous: Constant  
Lag Length: 0 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-2.845213</b>	<b>0.0996</b>
Test critical values:		
1% level	-4.803492	
5% level	-3.403313	
10% level	-2.841819	

\*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 7

Table 9 and table 10 displays the stationarity of the data at 2<sup>nd</sup> level difference.

**Table 11: Johanson Co-Integration Result of Bhutan**

Date: 06/28/17 Time: 19:42  
Sample (adjusted): 2010 2017  
Included observations: 8 after adjustments  
Trend assumption: Linear deterministic trend (restricted)  
Series: GDP GPI  
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.971913	33.23588	25.87211	0.0050
At most 1	0.441246	4.656366	12.51798	0.6462

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Table 11 shows the Co-Integration results displaying the co-integration between two variables at 5% significant level.



**Table 12: Granger Causality Result of Bhutan**

Pairwise Granger Causality Tests

Date: 06/28/17 Time: 19:43

Sample: 2008 2017

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
GPI does not Granger Cause GDP	8	0.83009	0.5165
GDP does not Granger Cause GPI		0.29620	0.7631

Table 12 exhibits that there is non-existence of Causality between two variables, hence unveils a negative relationship between the two variables.

**4. INDIA****Table 13: Unit Root Result of GDP of India**

Null Hypothesis: GDP has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.932776	0.0052
Test critical values:		
1% level	-4.420595	
5% level	-3.259808	
10% level	-2.771129	

\*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 9

**Table 14: Unit Root Result of GPI of India**

Null Hypothesis: D(GPI) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.312888	0.1894
Test critical values:		
1% level	-4.582648	
5% level	-3.320969	
10% level	-2.801384	

\*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 8

Table 13 and Table 14 confirms that the data is stationary as p value is less than 0.05.

**Table 15: Johanson Co-Integration Result of India**

Date: 06/28/17 Time: 19:46

Sample (adjusted): 2010 2017

Included observations: 8 after adjustments

Trend assumption: Linear deterministic trend (restricted)

Series: GDP GPI

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.999826	77.46435	25.87211	0.0000
At most 1	0.641295	8.202040	12.51798	0.2356

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Table 15 unveils the Co-integration between GPI scores and GDP at 5 percent significant level.

**Table 16: Granger Causality Result of India**

Pairwise Granger Causality Tests

Date: 06/28/17 Time: 19:47

Sample: 2008 2017

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
GPI does not Granger Cause GDP	8	0.16840	0.8525
GDP does not Granger Cause GPI		1.31740	0.3885

Table 16 discloses Uni- variate causality between GDP and GPI scores of India.

**5. NEPAL****Table 17: Unit Root Result of GDP of Nepal**

Null Hypothesis: D(GDP) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-15.49320	0.0000
Test critical values:		
1% level	-4.582648	
5% level	-3.320969	
10% level	-2.801384	

\*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 8

**Table 18: Unit Root Result of GPI of Nepal**

Null Hypothesis: D(GPI) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.508265	0.1472
Test critical values:		
1% level	-4.582648	
5% level	-3.320969	
10% level	-2.801384	

\*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 8

Table 17 and table 18 approves the stationarity of data as p value is less than 0.05, henceforth, Co-integration test can be performed.

**Table 19: Johanson Cointegration Result of Nepal**

Date: 06/28/17 Time: 19:17

Sample (adjusted): 2010 2017

Included observations: 8 after adjustments

Trend assumption: Linear deterministic trend (restricted)

Series: GDP GPI

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.944145	30.19275	25.87211	0.0136
At most 1	0.588973	7.112764	12.51798	0.3329

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Table 19 supports the cointegration between GPI scores and GDP at 5 % significant level.

**Table 20: Granger Causality Result of Nepal**

Pairwise Granger Causality Tests  
Date: 06/28/17 Time: 19:19  
Sample: 2008 2017  
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
GPI does not Granger Cause GDP	8	0.31260	0.7528
GDP does not Granger Cause GPI		0.00736	0.9927

Table 20 exhibits the results of Granger Causality test which confirms non-existence of causality

in GDP and GPI of Nepal, hence, approves an adverse relationship between the two variables.

## 6. PAKISTAN

**Table 21: Unit Root Result of GDP of Pakistan**

Null Hypothesis: GDP has a unit root  
Exogenous: Constant  
Lag Length: 0 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.554155	0.1354
Test critical values:		
1% level	-4.420595	
5% level	-3.259808	
10% level	-2.771129	

\*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 9

**Table 22: Unit Root Result of GPI of Pakistan**

Null Hypothesis: D(GPI) has a unit root  
Exogenous: Constant  
Lag Length: 1 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.470954	0.0144
Test critical values:		
1% level	-4.803492	
5% level	-3.403313	
10% level	-2.841819	

\*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 7

Table 21 and table 22 displays the result of Unit root confirming that the data is stationary.

**Table 23: Johanson Co-Integration Result of Pakistan**

Date: 06/28/17 Time: 19:27  
Sample (adjusted): 2010 2017  
Included observations: 8 after adjustments  
Trend assumption: No deterministic trend (restricted constant)  
Series: GDP GPI  
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.764753	21.91404	20.26184	0.0294
At most 1 *	0.725316	10.33707	9.164546	0.0298

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Table 23 exhibits that there exists co-integration between the two variables at 5% significant level.

**Table 24: Granger Causality Result of Pakistan**

Pairwise Granger Causality Tests  
Date: 06/28/17 Time: 19:28  
Sample: 2008 2017  
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
GPI does not Granger Cause GDP	8	1.72682	0.3169
GDP does not Granger Cause GPI		0.88632	0.4984

Table 24 reveals the result of granger causality test, confirming a Bi-variate causality, hence, showing a positive relationship between GDP and GPI of Pakistan.

## 7. SRILANKA

**Table 25: Unit Root Result of GDP of Srilanka**

Null Hypothesis: GDP has a unit root  
Exogenous: Constant  
Lag Length: 1 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.591386	0.1322
Test critical values:		
1% level	-4.582648	
5% level	-3.320969	
10% level	-2.801384	

\*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 8

**Table 26: Unit Root Result of GPI of Srilanka**

Null Hypothesis: D(GPI) has a unit root  
Exogenous: Constant  
Lag Length: 0 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.762658	0.3693
Test critical values:		
1% level	-4.582648	
5% level	-3.320969	
10% level	-2.801384	

\*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 8

Table 25 and Table 26 shows the result of Unit root depicting that the data is stationary and co-integration test can be performed on data.

**Table 27: Johanson Co-Integration Result of Srilanka**

Date: 06/28/17 Time: 19:32  
Sample (adjusted): 2010 2017  
Included observations: 8 after adjustments  
Trend assumption: Linear deterministic trend  
Series: GDP GPI  
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.822732	22.61000	15.49471	0.0036
At most 1 *	0.665848	8.769266	3.841466	0.0031

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Table 27 gives the result of co-integration showing co-integration between two variables at 5% significant level.

**Table 28: Granger Causality Result of Srilanka**

Pairwise Granger Causality Tests

Date: 06/28/17 Time: 19:33

Sample: 2008 2017

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
GPI does not Granger Cause GDP	8	0.77684	0.5347
GDP does not Granger Cause GPI		1.70778	0.3198

Table 28 depicts the result of Granger Causality test confirming a Uni-variate causality between the two variables.

#### 4.4 PANEL DATA CROSS SECTIONAL ANALYSIS USING FIXED EFFECT

**Table 29: Unit Root Result of GDP of SAARC Countries**

Null Hypothesis: GDP has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=11)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.307853	0.1721
Test critical values:		
1% level	-3.515536	
5% level	-2.898623	
10% level	-2.586605	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(GDP)

Method: Least Squares

Date: 06/19/17 Time: 19:10

Sample (adjusted): 2 80

Included observations: 79 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP(-1)	-0.128810	0.055814	-2.307853	0.0237
C	36.67603	37.97292	0.965847	0.3371
R-squared	0.064696	Mean dependent var		0.978481
Adjusted R-squared	0.052549	S.D. dependent var		316.6735
S.E. of regression	308.2407	Akaike info criterion		14.32463
Sum squared resid	7315949.	Schwarz criterion		14.38462
Log likelihood	-563.8229	Hannan-Quinn criter.		14.34866
F-statistic	5.326186	Durbin-Watson stat		1.927156
Prob(F-statistic)	0.023694			

**Table 30: Unit Root Result of GPI of SAARC Countries**

Null Hypothesis: GPI has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=11)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.610749	0.0076
Test critical values:		
1% level	-3.515536	
5% level	-2.898623	
10% level	-2.586605	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(GPI)

Method: Least Squares

Date: 06/19/17 Time: 19:10

Sample (adjusted): 2 80

Included observations: 79 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GPI(-1)	-0.283699	0.078571	-3.610749	0.0005
C	0.564945	0.178715	3.161147	0.0022
R-squared	0.144801	Mean dependent var		-0.012418
Adjusted R-squared	0.133694	S.D. dependent var		0.762208
S.E. of regression	0.709429	Akaike info criterion		2.176277
Sum squared resid	38.75327	Schwarz criterion		2.236263
Log likelihood	-83.96295	Hannan-Quinn criter.		2.200310
F-statistic	13.03751	Durbin-Watson stat		2.249462
Prob(F-statistic)	0.000541			

Table 29 and Table 30 depicts the result of Unit root confirming the stationarity of data.

**Table 31: Johanson Cointegration Result of SAARC Countries**

Date: 06/19/17 Time: 19:11  
 Sample (adjusted): 4 80  
 Included observations: 77 after adjustments  
 Trend assumption: Linear deterministic trend  
 Series: GDP GPI  
 Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.084454	12.54800	15.49471	0.1325
At most 1 *	0.072003	5.753951	3.841466	0.0164

Trace test indicates no cointegration at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Table 31 confirms the Co-Integration between the GDP and GPI of SAARC countries at 5 % significant level.

**Table 32: Panel Data Fixed Analysis of SAARC Countries**

Redundant Fixed Effects Tests  
 Equation: Untitled  
 Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	67.728896	(7,71)	0.0000
Cross-section Chi-square	163.063485	7	0.0000

Cross-section fixed effects test equation:

Dependent Variable: GPI  
 Method: Panel Least Squares  
 Date: 06/19/17 Time: 20:37  
 Sample: 2008 2017  
 Periods included: 10  
 Cross-sections included: 8  
 Total panel (balanced) observations: 80

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.927778	0.121483	15.86876	0.0000
GDP	0.000390	0.000180	2.170469	0.0330
R-squared	0.056957	Mean dependent var		2.034925
Adjusted R-squared	0.044866	S.D. dependent var		1.015865
S.E. of regression	0.992815	Akaike info criterion		2.848137
Sum squared resid	76.88311	Schwarz criterion		2.907687
Log likelihood	-111.9255	Hannan-Quinn criter.		2.872012
F-statistic	4.710935	Durbin-Watson stat		0.190200
Prob(F-statistic)	0.033014			

Table 32 shows Fixed Effect cross sectional result, hereby depicting a significant result as p value is less than 0.05.

**Table 33: Granger Causality Result of SAARC Countries**

Pairwise Granger Causality Tests  
 Date: 06/19/17 Time: 20:39  
 Sample: 2008 2017  
 Lags: 6

Null Hypothesis:	Obs	F-Statistic	Prob.
GPI does not Granger Cause GDP	32	5.09870	0.0028
GDP does not Granger Cause GPI		0.03777	0.9997

Table 33 shows results of granger causality confirming a Uni- variate causality between the GDP and GPI of SAARC Countries.

## V. CONCLUSION AND IMPLICATIONS

The main purpose of the study is to comprehend the effect of peace on the growth of SAARC countries. Out of 8 member nations of SAARC countries, Maldives is not been part of GPI, hence, our study excludes the Maldives from the analyses. The result of OLS and pooled cross-sectional analyses proposes that in Afghanistan, Bangladesh, India and Srilanka, a Uni-Variate causality between GPI scores and GDP, hence, rejecting the null hypotheses, whereas, in Pakistan there is a Bi-Variate causality between the two variables depicting that peace and economic growth both of Pakistan are inter-related. On the other hand, result for Nepal and Bhutan depicts a negative relationship between two variables, hence, accepting the null Hypotheses. The results would help the nations to develop the strategies to maintain peace and harmony resulting in the growth and development.

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