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Does Human Capital Contribute to Achieving Economic Growth Path in Pakistan? An Empirical Investigation

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ABSTRACT

This paper tries to investigate the contribution of human capital to economic growth in Pakistan. For this purpose, the education enrollment index has been constructed, as a proxy for human capital. The study has collected secondary time series data and utilized the ARDL technique for the empirical results, during the year 1974-2020. The findings of the study concluded that the education enrollment index show a positive relationship with economic growth. The rate of inflation shows a negative relationship with the GDP growth rate. The results of the study suggested that the provision of education facilities is crucial especially at the higher and secondary levels to pursue the path of economic growth in Pakistan.

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1. Introduction

According to the United Nation's definition of human capital (1997), it is the productive wealth present in labor, knowledge and skills". Various theories have presented the contribution of human capital on economic growth (Fleisher & Chen, 1997; Levine & Renelt, 1992; Lucas Jr, 1988; Romer, 1986; Schultz, 1961; Yan & Yudong, 2003). Human Capital comprises many components like education, health and informal education like on-the-job training, skills, work experiences, etc. Mincer (1958) stated that education and experience from work represent the future earnings of an individual. Though human capital consists of various dimensions, education is one of an essential elements that play a vital role in promoting economic development and growth for developing economies (R. J. J. T. q. j. o. e. Barro, 1991; Mankiw, Romer, & Weil, 1992). Over time, different researchers have employed different proxies for human capital in their research. Average years of school, enrollment ratio at primary, secondary and tertiary level (R. J. Barro & Lee, 1997), as well as public expenditure on education, have been utilized as a proxy for education in different researches associated with human capital. According to some schools of thought, the empirical finding between average schooling and growth does not show much strong relationship with each other (Benhabib & Spiegel, 1994; Pritchett, 2001).

R. J. Barro and Lee (1997)contended that human capital can contribute to the transfer of technology from developed to developing countries, thus supporting the developing countries in achieving economic growth. Therefore, investment in human capital in the form of research and development will increase physical capital, which further yields

higher growth rates. Due to the tremendous increase in technological advancement and globalization, the lacking or absence of individual skills would be a barrier to achieving economic growth for less developed countries like Pakistan.

Table 1 presents the statistical data, from 2010 through 2020 of different variables related to education, health and income in Pakistan. The second column shows the annual GDP growth rates

Over ten years, the GDP growth rate for the year 2020 shows -0.935 percent. The gross domes product GDP, over the years, has increased amounting to 314.568 billion $ during the year 2018, and later started decreasing amounting to262.61 billion $. Government Expenditure on education for the year 2020 was 1.5 percent of GDP and current public health expenditures were 1.2 percent of GDP. The infant mortality rate was 58.46 (Per 1,000 live births) during the year 2020, in Pakistan.

Table 1
Trends of Different Macro-economic Variables in Pakistan

Year	GDP growth (annual %)	GDP(US$ billion)	Government Expenditure on Education (As a % of GDP)	Current Health Expenditure (% of GDP)	Infant Mortality Rate (Per 1,000 live births)
2010	1.067	177.166	1.77	2.59	70.1
2011	2.748	213.587	1.96	2.34	68.6
2012	3.507	224.384	2.14	2.35	67.1
2013	4.396	231.219	2.14	2.6	65.4
2014	4.675	244.336	2.2	2.72	63.8
2015	4.731	270.556	2.3	2.68	62.1
2016	5.527	278.655	2.2	2.85	60.5
2017	5.554	304.567	2.49	2.9	58.8
2018	5.836	314.568	2.9	3.02	57.2
2019	1.145	279.057	2.3	1.1	55.2
2020	-0.935	262.61	1.5	1.2	58.46

Source: World Bank Data Base, Economic Survey [Various Sources]

Pakistan is a developing country and lies in a low-middle-income country, according to the World Bank database. Poverty, unemployment, mal-nutrient, illiteracy, health issues, low infrastructure and overpopulation are the crucial issues that have become a hindrance to achieving the path of economic growth and development. Therefore, the need for time is to generate an efficient and productive labor force that will be a valuable resource i.e. human capital for the country. The problem statement for the present study is to analyze those factors that are crucial and essential elements of human capital and to analyze their role in generating economic growth in Pakistan. For this purpose, the impact of human capital on economic growth has presented substantial attention from the literature. The present study has attempted to examine the impact of human capital on Pakistan's economic growth and development, using secondary time series data from the world bank database. Moreover, the Educational Enrollment Index (EEI) has been constructed, by employing the latest data for the empirical investigation. This will further add novelty to the present piece of research.

2. Review of Literature

Asteriou and Agiomirgianakis (2001)studied the contribution of education to the prosperity of the Greece economy. The author collected data from 1960 to 1994, by employing two methods. i.e., the Johansen cointegration method and Granger causality test for the empirical analysis. The proxy for the education variable is the enrollment rates in primary, secondary and higher education. However, the proxy for economic development was the GDP per capita for the empirical results. The findings of the study have revealed that GDP and educational factors show a significant influential relationship, in the long run. The study concludes the significant contribution of education in promoting economic growth.

Park (2006)collected a time series pool data to investigate the role of human capital in productivity growth. The present study was focused on the period between 1960 to 1995, from 94 countries. The finding of the study has concluded that human capital promotes

productivity growth. Therefore, it is pertinent to formulate an education policy that helps to develop human capital to accelerate productivity growth.

Ljungberg and Nilsson (2009)collected data during the year1870–2000 from Sweden. The focus of the present study was to analyze the impact of human capital on economic growth, employing Granger-causality tests. For this purpose, education enrolment at different levels, since1812 of age group 15–65 years were considered for empirical findings. The results from empirical findings show that since industrialization human capital has played a vital role in economic growth in Sweden. However, after 1975, human capital's contribution has slightly been reduced as compared to the previous decades.

de la Escosura and Rosés (2010)collected secondary data from 1850-2000, to investigate the relationship between economic growth and human capital in Spain. The authors focused on two approaches i.e., income and education-based approach to pursue the present study. The authors examine the impact of human capital on total factor productivity and concluded from the results that are skilled-premium approach is suitable, while analyzing the Spanish economy. High education attainment leads to high earnings. However, human capital does but slightly contribute to the labor productivity growth in the economy.

Zhang and Zhuang (2011) collected secondary data to analyze the impact of human capital and economic growth in China. By utilizing the data during the period between 1997-2006, using the GMM technique for econometric analysis. The authors have collected the data from 31 provinces of China. Average years of schooling is employed as a proxy for education to pursue the empirical results. The findings of the study have revealed that human capital is essential for achieving the path of economic development. It was concluded from the study that attainment of tertiary education for economic growth, as compared to the attainment of education at the primary or secondary level. Due to lack of resources, developing countries confined themselves to primary education but developed countries are more inclined towards the attainment of tertiary education.

Qadri and Waheed (2014)examined the effects of an investment in human capital in Pakistan. The authors have collected data during the period between 2012 to 2016. The main focus of the present study is to investigate the effect of spending on human capital, by studying both the demand and supply-side variables related to Keynesian and neoclassical schools of thought. The results of the study concluded that investment in education results in raising the productivity and output in the economy.

Alataş and Çakir (2016) collected panel data from 65 countries to examine the impact of human capital on economic growth. The authors have collected data during the period between 1967 to 2011. Specifically, the countries were classified as clusters to pursue the empirical analysis. Human capital was denoted by education and health in the present study. The proxy of education returns to education and years of schooling, and the proxy for health was the infant mortality rate. The empirical findings of the study show that, for developing countries, the relationship between human capital and economic growth is positive and statistically significant.

While focusing on the role of human capital on economic growth, (Ogundari, Awokuse, & Policy, 2018)examine the secondary data of 35 countries belonging to S Sub-Saharan Africa. The author collected the data during the period between 1980-2008, by utilizing a system generalized method of moments (SGMM) technique for econometric analysis. The human capital was measured by focusing on two variables i.e., education and health. Further, variables related to education are school enrollment ratio, expenditure on education and average years of schooling by the adults and life expectancy represents the proxy of health. The finding of the study concludes that human capital does play an essential role in accelerating economic growth. However, the contribution of health is more as compared to the education in these economies.

Affandi, Anugrah, and Bary (2019) collected data to investigate the role of human capital on economic growth in Indonesia. Focusing on two approaches, the present study has used both the panel and cross-sectional data to analyze the production function and

convergence equation estimates. The results of the study concluded that human capital is an essential element for economic growth. The study also concluded that the relationship between human capital and economic growth varies across regions that are associated with the manufacturing sector. Years of school have used a proxy for human capital, significantly influencing economic growth. Developing cognitive skills will promote higher economic growth in Indonesia.

Matousek and Tzeremes (2021)studied the asymmetric impact of human capital on economic growth by using panel data of 100 countries from 1970 to 2014. For estimation, the authors have applied nonparametric and semiparametric analysis. The authors have used two nonlinear effects of human capital stock of perfect and imperfect substitutability between skilled and unskilled workers. The finding has shown that both have a positive effect on economic growth. The revealed asymmetric patterns of human capital have more emphatic in both assumptions substitutability of a skilled and unskilled worker. The findings of the study have concluded that human capital is significantly and positively related to the economic growth of these countries.

Ogbeifun and Shobande (2021)studied a reevaluation of human capital accumulation and economic growth in 24 OECD countries by using panel data from 1986 to 2018. The result has concluded that inflation will affect adverse growth rates. Human capital had a positive and significant relationship with economic growth. There was divergence growth exist in these countries. The authors had suggested that investment and research & development have improved the living standard of people and controlled inflation.

Widarni and Bawono (2021)collected the annual time series data of Indonesia from 1984 to 2019 to examine the role of human capital and technology on economic growth. The authors applied the autoregressive distributed lag model (ARDL) to estimate the relationship between human capital and technology on economic growth. The result has to reveal that human capital by using education as a proxy had positively affected economic growth. Technology had positively affected economic growth. The authors suggested that education was playing a vital role to increase human and technological development in Indonesia.

3. Data and Methodology

This study investigated the long-term effect of human capital on economic growth in Pakistan. Annual time series secondary data was collected from WDI indicators, during the year 1974-2020. The dependent variable in the present study is the GDP growth rate (GDP). The explanatory variables are Gross fixed capital formation (GFC), Headcount ratio (HCR), rate of inflation (INF), education enrollment index (EEI), infant mortality rate (IMR), and Health expenditure (HE).

The Education Enrollment Index was calculated by using the enrollment ratio at the school, college and university levels. It presents the number of students enrolled at a specific grade level. The enrollment ratio was used by Mankiw et al. (1992) and R. J. Barro and Lee (1997). The education enrollment index (EEI) was constructed as mentioned in the study of (Chaudhry, Rahman, & Sciences, 2009). In the present study, the Education Enrollment Index (EEI) has been employed as a proxy for Human capital.

EEI = (5PSE + 8MSE +10SSE +12HSSE + 14DCE +16HEE) / Population

Where,

PSE= Primary school enrolment
MSE= Middle school enrolment
SSE = Secondary school enrolment
HSSE= Higher secondary school enrolment
DCE= Degree class enrolment
HEE= Higher education enrolment

3.1 Model Specification:

The basic regression equation between economic growth and human capital is presented as follows:

$$GDP = \alpha + \beta 1\,(GFC) + \beta 2\,(INF) + \beta 3\,(HE) + \beta 4\,(IMR) + \beta 5\,(HCR) + \beta 6\,(EEI) + \mu t$$

Table 2
Description of the Variables

Variables	Description and concepts of the Variables	
	Dependent Variable	
GDP	Gross Domestic Product	GDP growth rate (%)
	Independent Variables	
GFC	Gross Fixed capital Formation	Gross fixed capital formation (GFC) as a % of GDP.
HE	Health Expenditure	The data of health expenditure is collected from WDI, as a percentage of government spending.
IMR	Infant Mortality Rate	Infant mortality rate data is collected from WDI.
INF	Inflation Rate	Inflation data is collected from WDI.
HCR	Headcount Ratio	The headcount ratio is used as a proxy of poverty.
EEI	Education Enrolment Index	It is an index constructed as a proxy of Human capital in the present study.

3.2 Empirical Findings and Interpretation

Here we will discuss and present the descriptive statistics and econometric technique for estimation. Descriptive statistics are used to describe the main quantitative features of the data used in this research paper.

Table 3
Descriptive Statistics

	GDP	GFC	HE	IMR	INF	HCR	EEI
Mean	4.793	3.903	0.782	61.709	9.692	25.562	-5.737
Median	4.725	4.343	0.770	62.039	8.778	23.933	-5.779
Maximum	8.958	15.825	1.250	67.273	38.51	35.963	-4.435
Minimum	-0.466	-12.524	0.440	54.613	0.400	17.320	-6.859
Std. Dev.	2.080	6.427	0.197	3.786	6.620	4.374	0.818
Skewness	-0.184	-0.212	0.511	-0.21	2.224	0.585	0.218
Kurtosis	2.840	2.875	2.811	1.883	9.521	2.582	1.554
Jarque-Bera	0.315	0.384	2.117	2.789	122.0	3.024	4.462
Probability	0.853	0.825	0.346	0.247	0.000	0.220	0.107

Source: Author's calculation, Eviews10

The mean value of GDP growth rate is 4.793055 and the standard deviation is 2.080747. Its skewness is negative (-0.184273) and the kurtosis value is 2.840428 which represents Mesokurtic. The normality of data is checked by the Jarque-Bera test so GDP is normally distributed. The Gross fixed capital formation mean value is 3.903248 and the standard deviation is 6.427072 and which is negatively skewed and Mesokurtic. GFC is normally distributed 0.384300.

The mean and standard deviation of health expenditure (HE) are 0.782340 and 0.197101. Health expenditure is normally distributed, positively skewed and Mesokurtic. Infant mortality rate (IMR) is normally distributed and Platykurtic because its value is greater than 1 but less than 2. IMR is negatively skewed. The mean and standard deviation value of inflation is 9.692266 and 6.620874. It is normally distributed, positively skewed and Leptokurtic because kurtosis value greater than 3.

The mean value of the headcount ratio is 25.56216 and the standard deviation is 4.3749. The kurtosis of headcount ratio is Mesokurtic and positively skewed. Education Enrollment index (EEI) is normally distributed and kurtosis is Platykurtic.

The table 4 shows the stationarity of the data. The result shows that gross domestic product (GDP), gross fixed capital formation (GFC), inflation and headcount ratio (used as a proxy of poverty) are stationary at level. Education enrollment index (EEI), health expenditure (HE) and infant mortality rate (IMR) is stationarity at first difference.

Table 4
Unit Root Test

Variables	Level	First Difference	Result
	Intercept/ Trend	Intercept/Trend	
GDP	-4.149 (0.0021)	…….	I(0)
GFC	-4.9931 (0.0002)	…….	I(0)
EEI	……..	-6.8332 (0.0000)	I(1)
HE	…….	-5.3145 (0.0001)	I(1)
HCR	-3.0136 (0.0412)	…….	I(0)
IMR	……	-3.5734 (0.003)	I(1)
INF	6.0872 0.0000)	……	I(0)

Source: Eviews10

Table 5
The F-test for ARDL Cointegration (5% Critical Value Bounds)

F- Statistic	10.37193	
Critical values bound		
Significance	**I0 bounds (Lower bounds)**	**I1 bounds (upper bounds)**
10%	2.188	3.254
5%	2.591	3.766
1%	3.54	4.931

Source: Eviews 10

3.3 Long Run ARDL Estimation:

$$\mathrm{GDP_t} = \beta_0 + \sum_{j=1}^{k} \partial_1 \mathrm{j\,GDP_{t-j}} + \sum_{j=1}^{k} \beta_1 \mathrm{jGFC_{t-j}} + \sum_{j=1}^{k} \beta_2 \mathrm{j\,HE_{t-j}} + \sum_{j=1}^{k} \beta_3 \mathrm{j\,INF_{t-j}} + \sum_{j=1}^{k} \beta_4 \mathrm{jIMR_{t-j}} + \sum_{j=1}^{k} \beta_5 \mathrm{\ j\,HCR_{t-j}} + \sum_{j=1}^{k} \beta_6 \mathrm{jEEI_{t-j}} + \in_t$$

Table 6
Long Run ARDL Estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GFC	0.040	0.031	1.296	0.2173
HE	0.870	0.689	1.262	0.0288
IMR	-0.651	0.162	-4.015	0.0015
INF	-0.286	0.028	-10.053	0.0000
HCR	-0.006	0.019	-0.317	0.7561
EEI	1.461	0.537	2.717	0.0176
C	57.931	13.921	4.161	0.0011
Diagnostic test				
R-squared				0.955
F-statistic				9.608
Prob(F-statistic)				0.000
Durbin-Watson stat				2.396
Serial Correlation F (2,11)				0.663[0.5346]
Heteroscedasticity F (28,14)				0.6626[0.8282]

Source: Eviews10

Table 6 shows the long-run relationship between variables. The coefficient value of health expenditure is 0.8706 and statistically significant. Health expenditure and economic growth are showing a positive relationship with each other. It is clear from the results that 1 percent increase in health expenditure will lead to a 0.87 % increase in economic growth. Similar findings have been found from the research work of (Esen & Çelik Keçili, 2021). Infant mortality and economic growth show a negative relationship with each other. The coefficient value of the infant mortality rate is -0.6513 and statistically significant. 1 percent increase in mortality rate will lead to a fall of 0.6513 percent in economic growth (Ali, Sharif Chaudhry, & Farooq, 2012). The coefficient value of inflation is -0.2863 and statistically significant. It means there is a negative relationship between inflation and economic growth. 1 percent increase in inflation will lead to a fall of .286% in economic growth. The variable Headcount ratio and economic growth are negatively related to each other. 1 percent increase in poverty will lead to a decline.0061 percent in economic growth and statistically insignificant. Ali et al. (2012) had found that inflation and headcount ratio negatively affected economic growth. The education enrollment index has a positive impact on economic growth and is statistically significant. 1 percent increase in education enrollment will lead to the increased economic growth of 1.4611%. Hafeez and Rahim (2019)The relationship between gross fixed capital formation and economic growth is positive.

In the diagnostic test, the R-squared value is 0.95, which means 95% variation occurs independent variable (economic growth) due to variation in independent variables. The Durbin Watson value is 2.39, which shows there is no autocorrelation between variables. The significant value of serial correlation and heteroscedasticity are greater than 5%. So there are no serial correlation and heteroscedasticity between variables.

3.3 Error Correction Term

Table 7
Error Correction Term

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	1.775467	0.241298	7.357987	0.0000
D(GDP(-2))	0.644280	0.121968	5.282359	0.0001
D(GFC)	0.162424	0.021816	7.445305	0.0000
D(GFC(-1))	0.196550	0.036806	5.340173	0.0001
D(GFC(-2))	0.295031	0.038849	7.594295	0.0000
D(GFC(-3))	0.178599	0.027099	6.590646	0.0000
D(HE)	-0.357334	1.499367	-0.238323	0.8153
D(HE(-1))	0.493867	1.696872	0.291045	0.7756
D(HE(-2))	-1.526523	1.551636	-0.983816	0.3432
D(HE(-3))	-9.807040	1.665514	-5.888295	0.0001
D(IMR)	10.77011	4.534827	2.374977	0.0336
D(IMR(-1))	69.29633	40.57548	1.707837	0.1114
D(IMR(-2))	89.13076	61.91266	1.439621	0.1736
D(IMR(-3))	-193.5791	33.41253	-5.793610	0.0001
D(INF)	-0.161040	0.023052	-6.985962	0.0000
D(INF(-1))	0.653069	0.071944	9.077509	0.0000
D(INF(-2))	0.381518	0.051719	7.376742	0.0000
D(INF(-3))	0.105377	0.027104	3.887930	0.0019
D(EEI)	0.946927	0.892053	1.061515	0.3078
D(EEI(-1))	-1.003656	0.790575	-1.269526	0.2265
D(EEI(-2))	-0.587437	0.775621	-0.757376	0.4623
D(EEI(-3))	1.249429	0.771403	1.619684	0.1293
CointEq(-1)*	-3.716217	0.328914	-11.29843	0.0000

Source: Eviews10

$$\Delta GDP_t = \beta_0 + \sum_{j=1}^{k} \partial_1 j\Delta GDP_{t-j} + \sum_{j=1}^{k} \beta_1 j\Delta GFC_{t-j} + \sum_{j=1}^{k} \beta_2 j\Delta HE_{t-j} + \sum_{j=1}^{k} \beta_3 j\Delta INF_{t-j} + \sum_{j=1}^{k} \beta_4 j\Delta IMR_{t-j} + \sum_{j=1}^{k} \beta_5 j\Delta HCR_{t-j} + \sum_{j=1}^{k} \beta_6 j\Delta EEI_{t-j} + \pi ECM_{t-1} + \mu_t$$

The table 7 shows the short-run result. In a short period, variation occurs in variables that's why some variables are significant and some are not. The error correction value is negative with an associated coefficient estimate of -3.7162 and statistically significant. This means that about 3.72% of any movement into disequilibrium is corrected for within one year. A 1% increase in gross fixed capital formation will lead to raising .64% increase in economic growth. This result is similar to the long-run gross fixed capital formation result. Inflation has negative -0.161 and significant impact on economic growth. 1% increase in inflation will lead to a decrease of .16% in economic growth. This result is similar to long-run results. The education enrollment index is positively 0.94 and statistically insignificant impact on economic growth. 1% increase in education enrollment will lead to an increase of .94% in GDP. Health expenditure has a negative and insignificant impact on GDP in the short run. Due to the short period, variation occurs in variables. Infant mortality is positive 10.777and statistically significant impact on economic growth and is not similar to long run results due to short-period changes.

3.4 Stability test

For the stability test, CUSUM and CUSUM square are used. If the blue line lies between two red lines it means our model is stable.

Figure 1:

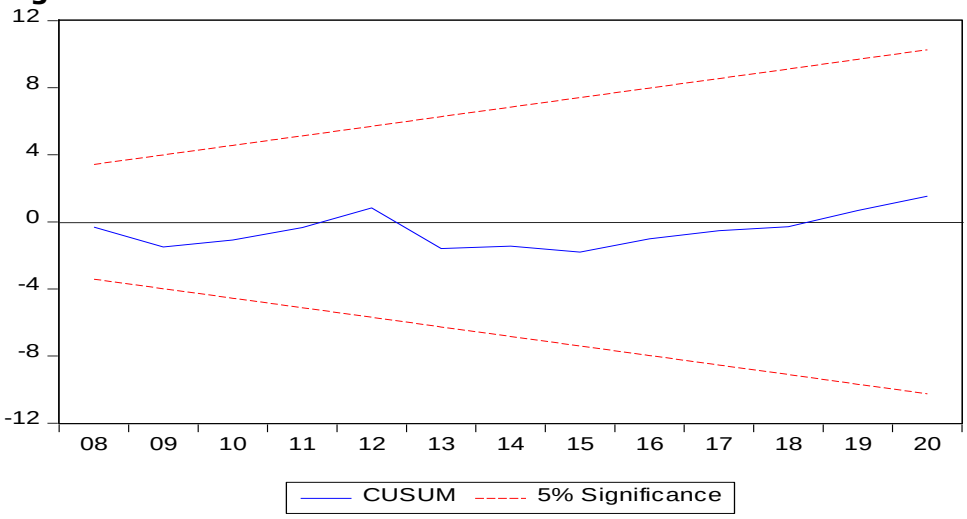

Figure 2: CUSUM Test

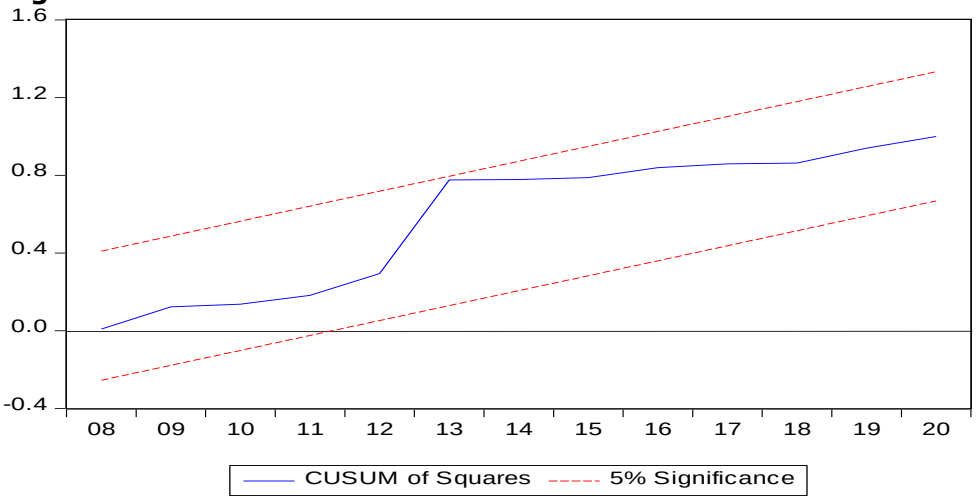

Figure 2: CUSUM of Square Test

4. Conclusion

This research paper has attempted to investigate the relationship between human capital and economic growth. We are taking time-series data from 1974 to 2020 and for estimation purposes, ARDL (Autoregressive distributed lag model) technique was used. The result shows that gross domestic product (GDP), gross fixed capital formation (GFC), inflation and headcount ratio (used as a proxy of poverty) are stationary at level. Education enrollment index (EEI), health expenditure (HE) and infant mortality rate (IMR) is stationarity at first difference. In a short period, variation occurs in variables that's why some variables are significant and some are not. The error correction value is negative with an associated coefficient estimate of -3.7162 and statistically significant. This means that about 3.72% of any movement into disequilibrium is corrected for within one year. Health expenditure and economic growth are positively related. The coefficient value of health expenditure is 0.8706 and statistically significant. The infant mortality rate coefficient value is -0.6513 and statistically significant. The coefficient value of inflation is -0.2863 and statistically significant. It means there is a negative relationship between inflation and economic growth. The headcount ratio is used as a proxy of poverty. Headcount ratio and economic growth are negatively related to each other. The education enrollment index is statistically significant. The stability test present that model is stable and there is no autocorrelation and heteroscedasticity in variables.

The economic performance of Pakistan's economy is responsible for inflation and poverty. Government should try to control poverty in the economy through increasing per capita income by increasing investment and employment opportunities. Government spending on the education and health sector will promote better health and employment opportunities in the short run. However, the government should develop vocational training institutes that will produce a multiplier effect on the economy in the long run, through producing educated and productive labor.

For future research prospects, the impact of various other variables like exchange rate, trade openness and foreign direct investment can be analyzed. Various government support programs like the EHSAS scholarship program can be analyzed to study its impact on economic growth in future studies.

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