FIVE CRUCIAL ECONOMIC FACTORS THAT AFFECT GDP PER CAPITA: A STUDY ON BANGLADESH ECONOMY

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ABSTRACT

In this paper, we aim to remark on the nine crucial economic factors that affect GDP (Gross Domestic Product) per capita as assess the importance, effect, or value of economic development for a sample of 31 years of economic data from Bangladesh for the period of 1992 to 2022. The research question is "What are the effects of these variables on GDP per capita?" To inquire into that business in detail we use multiple regression analysis in this paper as GDP (Gross Domestic Product) per capita is the regressand or dependent variable and the rest of the factors or variables are the regressors or independent variables.

In this regard, we use nine independent variables in the regression analysis: Gross Domestic Product (GDP) in current billions of USD, GDP growth rate (latest) per annum, Inflation (on consumer price index), Gross Savings (%GDP), Literacy rate, Unemployment rate, Investment rate, Population growth rate, Poverty Rate. After the data analysis we found that among the nine independent variables, five have a significant impact on GDP per capita. For instance, Inflation (% of GDP), GDP (current USD), GDP growth rate, Gross Savings rate, and Poverty rate play a vital role in determining GDP per capita.

Since we use time series data, to identify an accurate estimation as being present we test the stationarity of data, to conduct the time series has no unit root problem we use first difference and log difference such that the data and the estimation will become acceptable. An assortment of statistical tests, such as Normality Test, Multicollinearity, Heteroskedasticity, Autocorrelation, Goodness-of-Fit (GoF) Test, ANOVA (Analysis of Variance) Test, and Multiple Regression Analysis, were performed using GRETL (Gnu Regression, Econometrics and Time-series Library). We use CUSUM (cumulative sum) test and CUSUM (cumulative sum) square test to find out the stability of the coefficient or parameters.

The research question is "What are the effects of these variables on GDP per capita?"

Keywords: GDP, Inflation, GDP per capita, Savings, Gretl.

INTRODUCTION

Bangladesh is a developing economic nation. It is expected to become a developed economic nation by 2041 and it has to be done with a great challenge. The nation has been doing a great job for the last 10 years which is already noticeable on the international stage. Over the last two decades, the growth of Bangladesh's economy has been constant. Starting from 2004, Bangladesh has maintained a growth rate of over five percent or more.

To analyze a country's wealth, development, and prosperity one has a few ways. GDP (Gross Domestic Product) per capita is the most widely used factor because it is regularly tracked on a global scale, which provides easy calculation and usage. The concept of per capita GDP (Gross Domestic Product) plays a close and vital role in the Economy. An increase or decrease in the Per Capita GDP will make the economy or break the economy and that introduces it as a crucial concept that needs to be studied closely. In general, we can visualize an economy through this factor. Thus, we take a look at how GDP Per Capita is influenced by the economy. There are so many factors in the economy which is responsible for fluctuation in GDP per capita.

Gross domestic product (GDP) per capita is a financial way that considers a country's economic output per person and it can be found by dividing the GDP of a nation by its population. Per capita GDP (gross domestic product) measures a nation's per-head economic production output and service. In a broad sense, the basic interpretation of GDP per capita is to provide the value by which an individual can observe how much economic production value is distributed to each citizen. Alternatively, it shows a measure of national wealth. GDP market value per person also gives a scale of prosperity measure. GDP per capita is also used to understand how the economy is growing with its population and whether that growth is sufficient or not. Potential technological progression is possible when a country's GDP per capita is growing with a constant population level that is producing more with the same population level. A country that has a high GDP per capita but a small population usually means the country built up a self-sufficient economy. GDP per capita growth will be negative if the nation's economic growth is lower than its population growth.

In contrast, per capita GDP is one of the economic factors that policymakers must consider. In this paper, we want to contribute to the policy-making system by analyzing regression analysis to determine economic factors that can significantly impact the GDP per capita.

LITERATURE REVIEW

There are so many publications on GDP per capita and its relationships with population, GDP, GDP growth rate, inflation, population below the poverty line poverty rate, education, and many others. Among those factors here we use nine essential factors to determine the effects on GDP per capita. From Bangladesh's economic perspective, there are a lot of papers on GDP. GDP per capita is the dependent variable in the equation and its relationship with the independent variables is analyzed below:

Generally, one can expect that the higher the population means the lower the GDP per capita. A higher population reduces economic growth (Kim, Hewings, Nam 2014). The UK can develop a growth model in the future that functions without strong population growth. If a future Conservative government were more successful in controlling immigration, and therefore population growth. In that situation, an alternative economic strategy that supports capital-intensive industries may be required to sustain economic growth (Barry 2014). As we don't have year-to-year basis data on the population size of Bangladesh, we don't include the variable which is Population size in our regression model but we are able to collect population growth rate data and we use it in our model. Higher populations lead to lower GDP per capita which is showed in our regression analysis.

GDP per capita and total GDP**,** these two variables that are positively related. The formula for calculating GDP per capita is, GDP per capita = GDP/population. Therefore, as one expected the higher the value of GDP is the higher the value of GDP per capita will be. The variable GDP per person is a significant indicator of welfare across a broad range of countries: the two measures have a positive correlation. There are economically important differences between GDP per person and consumption-equivalent welfare (Jones and Klenow, 2015). Without GDP and population, GDP per capita can`t be measured. Therefore, in this study to show the correlation between GDP per capita and GDP, GDP has been included, the population growth is negatively and the GDP is positively related.

One might say that the higher the economic growth rate equivalent to the higher the GDP per capita since growth is an economic criterion for higher GDP. The GDP per capita itself is self-explanatory. However, we used both GDP per capita and GDP growth in our models to estimate the GDP per capita. The reason behind this, two variables GDP growth and GDP per capita can tell the country's economy from different perspectives (Luan and Zhou 2017). The relation between the average growth rate per capita real GDP from 1960 to 1985 and the value of real per capita GDP is not significant; the correlation is 0.09 (Barro, 1991). According to this study, the two variables GDP per capita and GDP are positively related however their relationship is not significant.

When the money supply is higher than the goods and services produced in an economy introduces as inflation. Inflation means a high price rate of goods and services. Inflation influences producers to production as there are higher prices for goods and services. In this regard, various studies did not find a direct relationship between GDP per capita and inflation. The estimated relationship between inflation and growth does not provide an accurate explanation through which inflation affects the growth of GDP per capita (Gokal and Hanif 2004). There we notice evidence that Brazil has experienced permanent inflation shocks. Thus, permanent inflation shocks do not have significant permanent effects on output growth rates (Faria and Carneiro, 2001). This paper suggests that GDP per capita is negatively related to inflation and the relationship is significant.

This study suggests that there is a positive correlation between GDP per capita and gross savings rate. The positive correlation suggests that GDP per capita is higher if the saving rate is higher.

Savings as an economic term is a preference to give up some current consumption to increase future consumption. As savings increase it will reduce current consumption for a short time which gives the incentive to produce less as a result of reduced GDP per capita however in the long run, it will increase investment and consequently increase the national production.

This paper suggests that GDP per capita and literacy rate both two variables are both positively related. Similarly, many studies on education and growth also showed this positive correlation. A survey in Europe shows on an average 50% of the economic growth is dependent on labor income growth at the post-secondary education level (Tertiary level of education). In some European nations that have a leading economies France, Norway, Switzerland, and the United Kingdom, the gross domestic product (GDP) is 60% or more growth is generated by those who have attained post-secondary education and technical training (Education at a Glance 2012). There is available huge and significant evidence that supports the significant effect of education on wages (authors note: wages are one part of the GDP calculation) (for more details see Card 1999) (Roser and Ortiz-Ospina 2017).

For the last 200 years in the world economic growth progress has been achieved which caused higher incomes for more which is responsible for more people in the world. The correlation between them suggests that absolute poverty is abolished from a society if it has an average income of around 10,000 International Dollars, (http://ourworldindata.org/data/growth-anddistribution-of-prosperity/world-poverty/).

We find similar conclusions from other studies. Empirical evidence significantly supports the way that countries that control population growth in their overall economic development strategies and have population control policies and strictly regulate family planning programs, they have achieved high, strong, and sustained rates of economic growth and they can also control poverty with significant reductions rate (Sinding 2009).

DATA

In this paper, all data, for the sample of 31 years of the economy of Bangladesh have been obtained from BBS (Bangladesh Bureau of Statistics), World Bank, tradingeconomics.com, UNESCO, the Bangladesh Bureau of Educational Information and Statistics (BANBEIS), World Bank's World Development Indicators (WDI), and other economic surveys.

The dataset used in this analysis extends over multiple decades and the dataset provides an interdisciplinary overview of the GDP per capita for Bangladesh. This fact is crucial for comprehend the long-term trends and patterns in GDP per capita. To provide a longitudinal view of the variables which are used in the analysis, the data covers 31 years, the period from 1992 to 2022. The data is collected annually, making a total of 31 observations.

The dataset is complete, there are no missing data points for the entire period from 1992 to 2022. The completeness of the dataset ensures that our analysis is based on a persistent and successive series of observations which enhance the reliability of the results. It also significantly contributes to the robustness of the analysis. This type of data integrity enhances the credibility of the findings of the data analysis and allows for more precise and confident conclusions.

METHODOLOGY

At first, before regressing data, we conduct the Augmented Dickey-Fuller Test to dig out the unit root problem of the time series data. We appraise the first difference and the log difference for those variables that are nonstationary at level zero. Then, the data of the sample 31 years of Bangladesh economy were loaded onto GRETL (Gnu Regression, Econometrics, and Time-series Library) data sheet, used OLS (Ordinary Least Squares), and the program was run to measure the effects of the independent variables on GDP per capita as being the dependent variable and the rest of the following nine criteria being the independent variables:

- Gross Domestic Product (GDP) in current billions of USD
- GDP growth rate (latest) per annum
- Inflation (on consumer price index)

- Gross Savings (%GDP)
- Literacy rate
- Unemployment rate
- Investment rate
- Population growth rate
- Poverty Rate

Data Stationary Test:

Our concerning variables are GDP per capita, Inflation, GDP, GDP growth rate (annual %), Gross savings (% of GDP), Literacy rate (%), Unemployment rate, Investment rate, Population growth rate, and Poverty Rate. We used the Augmented Dickey-Fuller Test for the Unit Root Test, which is gradually given below:

GDP per capita has a unit root problem means it is a nonstationary time series. Moreover, to avoid the fake regression problem that will come from regressing a nonstationary time series on one or more nonstationary time series data, we have to transform the nonstationary time series to make them stationary. For this circumstance, we take log differences which makes GDP per capita into a stationary time series, which is shown on the Table: 01. In the table "ld GDP Per Capita" for the log difference of GDP Per Capita. The null hypothesis is "data is nonstationary (a=1)" and the less than 5% P-value implies null hypothesis should be rejected. That means our time series data is stationary at log differences.

Table: 01

Augmented Dickey-Fuller test for ld GDP per capita testing down from 9 lags, criterion AIC sample size 31 unit-root null hypothesis: a = 1	test with constant including 0 lags of (1-L) ld GDP per capita model: (1-L)y = b0 + (a-1)*y(-1) + e estimated value of (a - 1): -0.666059 test statistic: tau_c(1) = -3.81808 asymptotic p-value 0.00274 1st-order autocorrelation coeff. for e: -0.028	with constant and trend including 0 lags of (1-L)ld GDP per capita model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e estimated value of (a - 1): -0.803493 test statistic: tau_ct(1) = -4.24873 asymptotic p-value 0.003708 1st-order autocorrelation coeff. for e: 0.014

The inflation rate is stationary time series at level zero, which is given in Table: 02. We are concerned with P-value, which is less than 5%, exposing the data does not have a unit root problem, explicitly time series is stationary.

Table: 02

Augmented Dickey-Fuller test for Inflation testing down from 9 lags, criterion AIC sample size 31 unit-root null hypothesis: a = 1	test with constant including 0 lags of (1-L) Inflation model: (1-L)y = b0 + (a-1)*y(-1) + e estimated value of (a - 1): -0.933964 test statistic: tau_c(1) = -5.07683 asymptotic p-value 1.418e-05 1st-order autocorrelation coeff. for e: -0.016	with constant and trend including 0 lags of (1-L) Inflation model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e estimated value of (a - 1): -0.96665 test statistic: tau_ct(1) = -5.1029 asymptotic p-value 0.0001 1st-order autocorrelation coeff. for e: -0.005

The tested P-value of the GDP time series is greater than 5%, almost 100% that is we have a unit root issue, specifically the time series under consideration is nonstationary. But the log difference (ld) of GDP shows stationarity which is given in Table: 03 where both P value is less than 5%.

Table: 03

Augmented Dickey-Fuller test for ld GDP testing down from 9 lags, criterion AIC sample size 31 unit-root null hypothesis: a = 1	test with constant including 0 lags of (1-L) ld GDP model: (1-L)y = b0 + (a-1)*y(-1) + e estimated value of (a - 1): -0.699679 test statistic: tau_c(1) = -3.958 asymptotic p-value 0.001652 1st-order autocorrelation coeff. for e: -0.020	with constant and trend including 0 lags of (1-L) ld GDP model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e estimated value of (a - 1): -0.8164 test statistic: tau_ct(1) = -4.30886 asymptotic p-value 0.002986 1st-order autocorrelation coeff. for e: 0.014

GDP growth rate is a stationary time series, the Augmented Dickey-Fuller test for GDP growth rate is given in Table: 04. Both P values are less than 5% means data does not have a unit root problem, and explicitly time series is stationary.

Table: 04

Augmented Dickey-Fuller test for GDP growth rate testing down from 9 lags, criterion AIC sample size 31 unit-root null hypothesis: a = 1	test with constant including 0 lags of (1-L) GDP growth rate model: (1-L)y = b0 + (a-1)*y(-1) + e estimated value of (a - 1): -0.620762 test statistic: tau_c(1) = -3.75343 asymptotic p-value 0.003438 1st-order autocorrelation coeff. for e: -0.042	with constant and trend including 0 lags of (1-L) GDP growth rate model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e estimated value of (a - 1): -1.02707 test statistic: tau_ct(1) = -5.52765 asymptotic p-value 1.451e-05 1st-order autocorrelation coeff. for e: 0.032

Augmented Dickey-Fuller test for d Gross savings (% of GDP) shown in Table: 05 where both P value is less than 5%, implies first difference (d) of Gross Savings has a stationarity.

Table: 05

Augmented Dickey-Fuller test for d Gross savings (% of GDP) testing down from 9 lags, criterion AIC sample size 31 unit-root null hypothesis: a = 1	test with constant including 0 lags of (1-L) d Gross savings (% of GDP) model: (1-L)y = b0 + (a-1)*y(-1) + e estimated value of (a - 1): -0.84821 test statistic: tau_c(1) = -4.29449 asymptotic p-value 0.0004491 1st-order autocorrelation coeff. for e: -0.043	with constant and trend including 0 lags of (1-L) d Gross savings of GDP model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e estimated value of (a - 1): -0.946454 test statistic: tau_ct(1) = -4.9035 asymptotic p-value 0.000277 1st-order autocorrelation coeff. for e: -0.103

Table: 06 shows the Augmented Dickey-Fuller test for d Literacy rate where both P value is less than 5%, implies the first difference (d) of Literacy rate has a stationarity.

Table: 06

Augmented Dickey-Fuller test for d Literacy rate testing down from 9 lags, criterion AIC sample size 31 unit-root null hypothesis: a = 1	test with constant including 0 lags of (1-L) d Literacy rate model: (1-L)y = b0 + (a-1)*y(-1) + e estimated value of (a - 1): -0.911117 test statistic: tau_c(1) = -4.83858 asymptotic p-value 4.316e-05 1st-order autocorrelation coeff. for e: 0.008	with constant and trend including 0 lags of (1-L) d Literacy rate model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e estimated value of (a - 1): -0.921044 test statistic: tau_ct(1) = -4.78005 asymptotic p-value 0.0004699 1st-order autocorrelation coeff. for e: 0.009

Similarly, first difference of unemployment rate, first difference investment rate, first difference of population growth rate, first difference of poverty rate are data stationary that is represented by Table: 07, Table: 08, Table: 09, and Table: 10 respectively.

Table: 07

Augmented Dickey-Fuller test for d unemployment rate testing down from 8 lags, criterion AIC sample size 31 unit-root null hypothesis: a = 1	test with constant including 2 lags of (1-L) d unemployment rate model: (1-L)y = b0 + (a-1)*y(-1) + ... + e estimated value of (a - 1): -2.13981 test statistic: tau_c(1) = -5.2981 asymptotic p-value 4.818e-06 1st-order autocorrelation coeff. for e: -0.015 lagged differences: F(2, 24) = 4.088 [0.0297]	with constant and trend including 2 lags of (1-L) d unemployment rate model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e estimated value of (a - 1): -2.13394 test statistic: tau_ct(1) = -5.24897 asymptotic p-value 5.724e-05 1st-order autocorrelation coeff. for e: -0.041 lagged differences: F(2, 23) = 3.965 [0.0332]

Table: 08

Augmented Dickey-Fuller test for d investment rate testing down from 8 lags, criterion AIC sample size 31 unit-root null hypothesis: a = 1	test with constant including 0 lags of (1-L) d investment rate model: (1-L)y = b0 + (a-1)*y(-1) + e estimated value of (a - 1): -0.98351 test statistic: tau_c(1) = -5.30709 asymptotic p-value 4.607e-06 1st-order autocorrelation coeff. for e: -0.062	with constant and trend including 0 lags of (1-L) d investment rate model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e estimated value of (a - 1): -0.984442 test statistic: tau_ct(1) = -5.21121 asymptotic p-value 6.847e-05 1st-order autocorrelation coeff. for e: -0.059

Table: 09

Augmented Dickey-Fuller test for d Population growth rate testing down from 8 lags, criterion AIC sample size 31 unit-root null hypothesis: a = 1	test with constant including one lag of (1-L) d Population growth rate model: (1-L)y = b0 + (a-1)*y(-1) + ... + e estimated value of (a - 1): -1.77531 test statistic: tau_c(1) = -7.77625 asymptotic p-value 2.236e-12 1st-order autocorrelation coeff. for e: -0.216	with constant and trend including one lag of (1-L) d Population growth rate model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e estimated value of (a - 1): -1.80101 test statistic: tau_ct(1) = -7.659 asymptotic p-value 2.486e-11 1st-order autocorrelation coeff. for e: -0.211

Table:10

Augmented Dickey-Fuller test for d Poverty Rate testing down from 8 lags, criterion AIC sample size 31 unit-root null hypothesis: a = 1	test with constant including 0 lags of (1-L) d Poverty Rate model: (1-L)y = b0 + (a-1)*y(-1) + e estimated value of (a - 1): -0.912821 test statistic: tau_c(1) = -25.7689 asymptotic p-value 3.128e-52 1st-order autocorrelation coeff. for e: -0.250	with constant and trend including 0 lags of (1-L) d Poverty Rate model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e estimated value of (a - 1): -0.943414 test statistic: tau_ct(1) = -25.8843 asymptotic p-value 3.755e-99 1st-order autocorrelation coeff. for e: -0.336

DATA ANALYSIS

Outcome:

Model 1: OLS, using observations 1992-2022 (T = 31)

Dependent variable: log difference of GDP per capita

Heteroskedasticity-robust standard errors, variant HC1

Table: 11

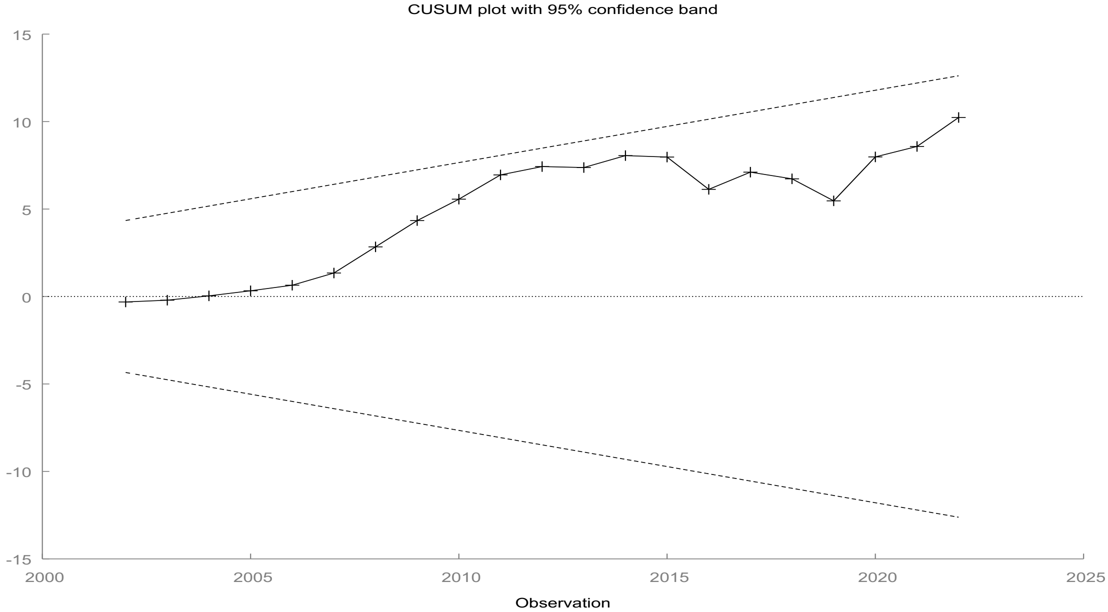
	Coefficient	Std. Error	z	p-value	
const	−0.0298437	0.00457244	−6.527	<0.0001	***
Inflation (% of GDP)	−0.000681450	0.000293374	−2.323	0.0202	**
log difference of GDP (current USD)	1.06489	0.0269451	39.52	<0.0001	***
GDP growth rate	0.00170953	0.000543640	3.145	0.0017	***
First difference of Gross savings of GDP	0.00109017	0.000570508	1.911	0.0560	*
First difference of Literacy rate	0.000163159	0.000337851	0.4829	0.6291	
First difference of unemployment rate	0.0163977	0.153525	0.1068	0.9149	
First difference of investment rate	0.000181227	0.00180001	0.1007	0.9198	
First difference of Population growth rate	−0.00869077	0.0123492	−0.7038	0.4816	
First difference of Poverty Rate	−0.00256145	0.00281370	−0.9103	0.3626	

Table: 12

Mean dependent var	0.072576	S.D. dependent var	0.063136
Sum squared resid	0.000147	S.E. of regression	0.002647
R-squared	0.998769	Adjusted R-squared	0.998242
F(9, 21)	4780.965	P-value(F)	1.06e-32
Log-likelihood	146.0124	Akaike criterion	−272.0248
Schwarz criterion	−257.6850	Hannan-Quinn	−267.3504
rho	0.190560	Durbin-Watson	1.583797

CUSUM test for stability of parameters:

Figure: 01



In Figure: 01, the line is in between the two parameters, which implies at a 95-degree confidence interval CUSUM test shows the constant of the regression term is stable.

CUSUMSQ test for stability of parameters:

Figure: 02

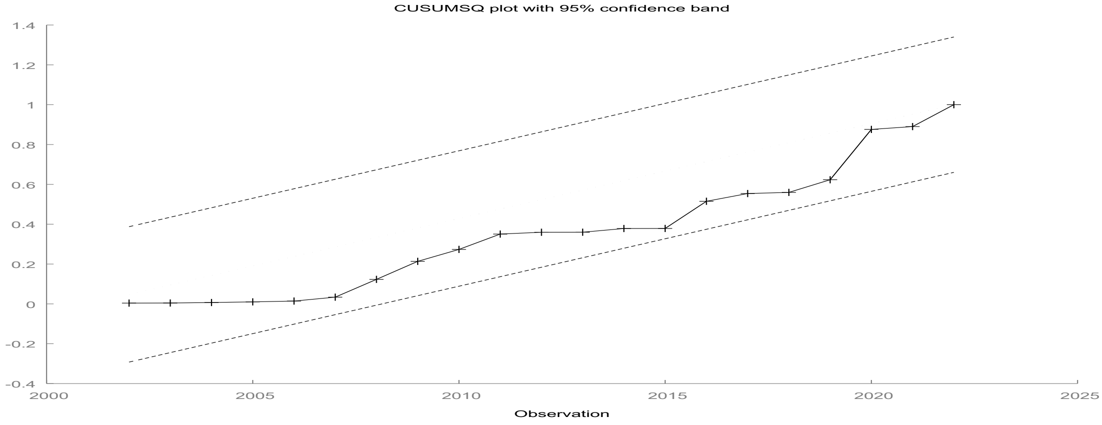


Figure: 02 also shows the slope coefficient is stable.

Analysis of Variance:

Table: 13

Analysis of Variance:

	Sum of squares	df	Mean square
Regression	0.119437	9	0.0132708
Residual	0.000147152	21	7.00723e-006
Total	0.119584	30	0.00398613

R^2 = 0.119437 / 0.119584 = 0.998769

F(9, 21) = 0.0132708 / 7.00723e-006 = 1893.87 [p-value 1.75e-028]

FINDINGS

In the model-1 summary above the value of R square is closer to 1 (Table:11) means that 99% of the variations on the dependent variable are explained by the variability of the independent variables. On the other hand, R which is the square root of R square shows the correlation between the dependent variable and independent variables. 99% of R square means dependent and independent variables are highly correlated. In Table:12 the value of F being positive means that explained variance is greater than unexplained variance.

In regression analysis, the sign of the coefficient determines the relationship between two variables whether they are positively related or negatively related. If the sign of a coefficient is positive, the relationship between two variables is positive and vice versa.

The slope coefficient for the variable GDP is approximately 1.06489. The positive value of the coefficient of GDP implies GDP is positively correlated with GDP per capita. Similarly, except the three variables, inflation rate, poverty rate, and population growth rate, the value of the other six slope coefficients of the rest six variables is positive which implies they are positively correlated with GDP per capita. The negative slope coefficient values of the inflation rate, poverty rate, and population growth rate imply GDP per capita will decrease if those variables increase. Theoretically, If the inflation rate is higher disposable income will lower, and investment capability will decrease hence net output should decrease. Moreover, a higher poverty rate indicates a lower income in a nation which infers disability of investment. On the other hand, higher population size reduces per capita gain.

Consequently, conducting with the sign of the coefficient of Table: 11 we can conclude that among the nine regressors – Inflation, GDP, GDP growth rate, Gross Savings of GDP, Literacy rate, Unemployment rate, Investment rate, Population growth rate, Poverty Rate - only inflation rate, poverty rate, and population growth rate are negatively related to the regressand GDP per capita and the rest of the six are positively related to the GDP per capita.

However, in regression analysis, the p-value also has a significant scientific explanation to make a decision. Lower the value of the p-value increases the significance of that variable to the dependent variable. We are extremely concerned about the P-value in Table:11. The Significance P-value being lower than 0.05 means that there is a statistically highly significant relationship between the dependent and independent variables. In Model-1 Table:11 above, P-value for the coefficient of GDP is less than 0.0001 and the P-value of the GDP growth rate is 0.0017 means there is a statistically highly significant relationship between the dependent variable GDP per capita and the two independent variables GDP and GDP growth rate. On the other hand, for the three variables: literacy rate, unemployment rate, and investment rate, there is a higher rate of p-value. This more than 60% p-value implies that the effect of literacy rate, unemployment rate, and investment rate on GDP per capita is not significant. Moreover, considering the p-value we can get a conclusion that inflation rate, GDP, GDP growth rate, and Gross savings of GDP have a highly significant correlation with GDP per capita since their p-value is lower than 5%. And also added that, among the rest variables poverty rate has a significant correlation with GDP per capita, as its p-value is about 35% which is a lower amount compared to the others. To conclude, Among the nine dependent variables GDP per capita has a significant relationship with five variables: inflation rate, GDP, GDP growth rate, Gross savings of GDP, and poverty rate.

Analysis of variance (ANOVA) in Table:13 above, shows F value is positive which implies that explained variance is greater than unexplained variance and df (degree of freedom-residual) is 21 which means there are 30 observations in the dataset and 9 variables in the equation (30-21 = 09). To specify the position of the system completely 21 is the number of independent coordinates that exist there.

LIMITATIONS AND CONCLUSION

GDP per capita is one of the most significant factors to realize the economic situation of a nation and it is the most widely used measure of living standards. It is also a crucial indicator for policymakers and analysts. However, there is a limitation of this indicator, GDP per capita is unable to accurately measure an individual in a broad sense social well-being due to the existence of income inequalities among people in the economy. However, GDP per capita analysis is still an interesting and attractive field to many researchers. There are a huge number of research papers in this field. The limitation of this paper is that it does not cover all the social and economic factors that affect GDP per capita, here, we only use the nine factors to explain GDP per capita and this paper is only for Bangladesh, no other countries are included here. Since Bangladesh is a developing nation therefore the behavior of the independent variables could be different in developed and poor nations. So, it is not an easy task to predict those nations based on this paper and it would not be a rational approach. To see the behavior of the independent variables whose are used here and whose correlation was significant became insignificant and vice versa, this type of study can be repeated over and over every year.

Consider the research question "What are the effects of these variables on GDP per capita?" the answer is given below:

According to the value of coefficient, t, and P-value on Model-1 (coefficients part), it is observed that: GDP has a positive correlation with GDP per capita. The higher GDP the higher the GDP per capita. The p-value says this correlation has strong significance. GDP Growth Rate is positively correlated with GDP per capita and it is also as strong as GDP since the p-value is lower than 5%.

The relationship between the three independent variables- inflation rate, population growth rate, poverty rate- and the dependent variable GDP per capita is negative. However, among the three variables only the inflation rate affects GDP per capita strongly. Moreover, the effect of the poverty rate is not ignoble, it has also significance.

The literacy rate has a positive correlation with GDP per capita but it is not significant as the p-value is more than 60% which is an insignificant amount. Similarly, unemployment rate and investment rate have an insignificant positive relation with GDP per capita. The gross saving rate is positively correlated as the coefficient value is positive. And it is significant which is shown by the p-values. The value of R square is 99% which shows the variability of the dependent variable is explained by the variability of the independent variables.

Since among the independent variables inflation rate, GDP, GDP growth rate, Gross savings of GDP, and poverty rate play a vital role in GDP per capita, policy maker should give extra concentration on them and the factors that influence those five variables, especially GDP (because of the lowest p-value) to find a good figure for GDP per capita.

The main source of GDP is production; to produce we have to use land, labor, and capital. GDP = C + I + G + (X-M) where, C = consumption expenditure, I = investment expenditure, G = govt. expenditure, X-M = net export. The four components - C, I, G, (X-M) are positively related to the GDP. That means if total employment increases and the other hand decrease in unemployment there will be more production and more GDP per capita. So, governments should take the initiative to solve the unemployment problem. Govt. should not only be concerned about the quantity of the workforce but also the quality of them. A more skilled workforce means more productivity which will increase the production level. Though the literature review's findings and our data analysis say there is a negative relation between Population size and GDP per capita but a skilled educated large population size means a larger labor supply which goes down the wage rate as well as reduces production cost which attracts foreign investment that creates a large GDP. The real-world example is China which has 800 million of the labor supply market and they are highly skillful, which makes China one of the biggest economic nations in the world. It will be a great example for us. Increasing govt. expenditure to increase human skills and knowledge by arranging educational and training programs will increase the performance of the workforce and enable them to take on new challenges and consequently increase the GDP per capita. Capital return also known as interest and profit is another main source of GDP. So as long as the absorbable inflation effect, and a reasonable level of taxes will give incentive people to save more and make investments more consequently the GDP per capita will grow higher. The third source of the GDP is the rent received by the landowner. So, countries take measures that would affect positively all these three factors. Governments should influence people to invest more and find out new probable effective sectors of economics. In this respect, the government should keep the interest rates low so people can borrow more to implement their ideas and expand their businesses, and will be able to increase their expenditures which lead to a higher GDP per capita. Lower level and stable inflation are required in the economy so that people can earn a higher level of real income so Governments should keep the inflation low and at a stable level.

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APPENDIX

TEST OF OLS ASSUMPTION

In this part, we show only answers, and the respective analysis data found from Gretl.

6.1: Normality:

Residuals are normally distributed which is shown in figure-03. As the p-value is more than 5%, then null is accepted.

Shortly:

Test for normality of residual -

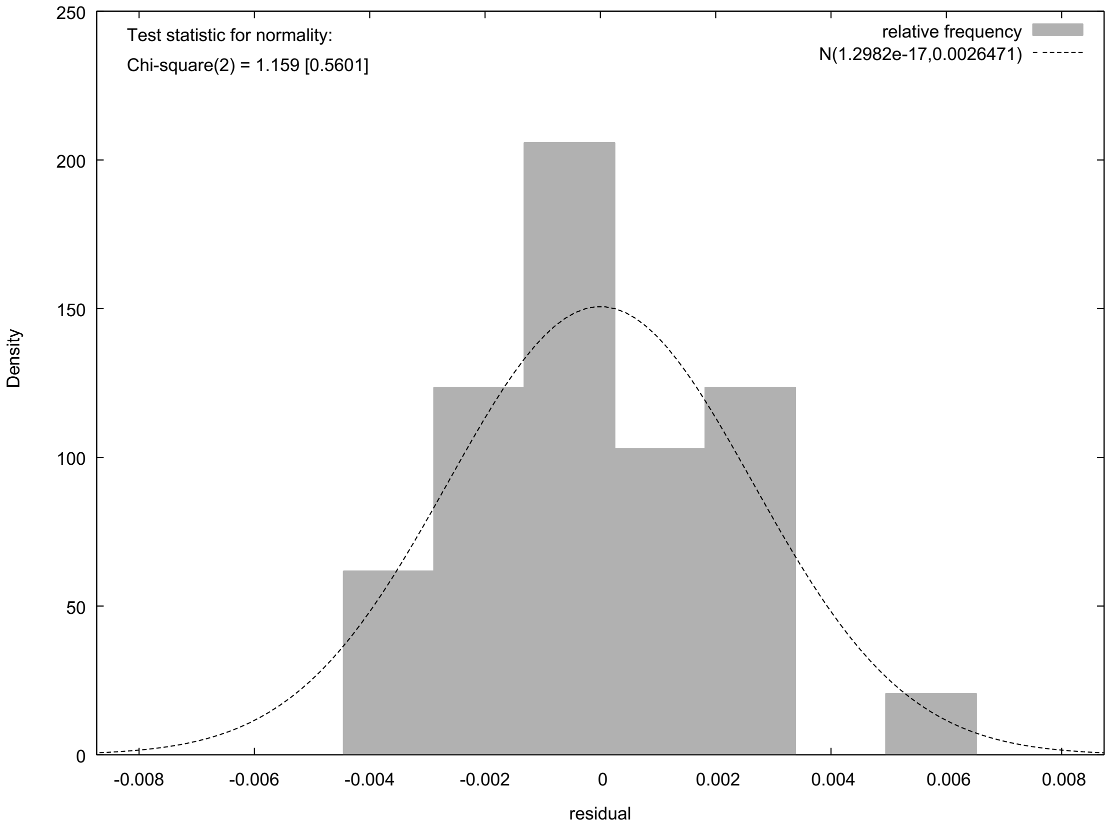
Null hypothesis: error is normally distributed

Test statistic: Chi-square (2) = 1.15937

with p-value = 0.560075

The graph is given below:

Figure-03: Test for Normality



6.2: Heteroskedasticity

White's test for heteroskedasticity –

Null hypothesis: heteroskedasticity not present

Test statistic: LM = 22.4921

with p-value = P(Chi-square(17) > 22.4921) = 0.166527

According to the P-value, null is accepted.

6.3: Autocorrelation:

LM test for autocorrelation up to order 1 -

Null hypothesis: no autocorrelation

Test statistic: LMF = 1.15946

with p-value = P(F(1, 20) > 1.15946) = 0.294395

No autocorrelation exists here.

6.4: Multicollinearity:

This test indicates some collinearity problem but that is not major because the values of Variance Inflation Factors are less than 10.

Variance Inflation Factors

Minimum possible value = 1.0

Values > 10.0 may indicate a collinearity problem

- Inflationrate 7.730
- ld GDP 10.437
- GDP growth rate 1.687
- d Gross savings of GDP 2.530
- d Literacy rate 1.570
- d unemployment rate 1.899
- d investment rate 1.497
- d Population growth rate 2.142
- d Poverty Rate 2.277

6.5: Mean of the residual:

The error term has a population mean which is almost zero. (See Table:14)

Table: 14

Mean	1.2087e-017
Median	-1.1252e-005
Minimum	-0.0040065
Maximum	0.0061058
Standard deviation	0.0022486
C.V.	NA
Skewness	0.46026
Ex. kurtosis	0.26122
5% percentile	-0.0037711
95% percentile	0.0044814
Interquartile range	0.0029009
Missing obs.	1