A Cointegrated Multi-Factor Semi-Log Regression Approach to Quarantine the Impact of Microfinance on Poverty Regionally

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Abstract

This study aims to examine and segregate the impact of COVID-19, microfinance, and multiple macroeconomic variables on various poverty indicators in a single country at the macro level. Using a 35-year time series (1988-2022), the study applies unit root cointegration tests to address non-stationarity in the data. The semi-log regression method is employed to estimate poverty measures and disentangle the relative importance of different factors. The main research questions are: (1) What is the impact of COVID-19 on poverty indicators? (2) How does growth in microfinance borrowers, service availability and gross loan portfolio affect poverty levels? (3) What is the role of macroeconomic factors in poverty reduction? The findings reveal that the COVID-19 fixed effect is statistically significant across various poverty measures, while an increase in microfinance borrowers and service availability is associated with a reduction in poverty. The total loan portfolio has a significant effect on poverty levels despite its small size. Other macroeconomic variables have mixed effects on poverty indicators. The study concludes that governments should invest in expanding social policies such as education and training, support for entrepreneurs, and universal healthcare in addition to expanding microfinance services to reduce poverty effectively.

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1. Introduction

Pakistan's economy is also experiencing an unexpected decline during the outbreak of COVID-19[1]. Various factors contribute to this unexpected set of statistics that have hugely affected poor households and have broken Pakistan's declining trend of poverty [2]. There may be economic, social, political, or epidemical factors that affect the nature and direction of poverty [3]. However, the prevailing circumstances raise questions about the impact of microfinance on poverty

because people are still financially crippled and struggling for basic needs. In Pakistan, microfinance is flourishing; the number of microfinance institutes reached about 50, active borrowers reached more than 8.2 million, and the Gross loan portfolio (GLP) surpassed about Rupees (Rs. 365) billion, while 4.2 billion people are still poor. Microfinance expansion and a growing number of poor have become challenging for policy-makers to decide which preparations should be adopted to overcome poverty [4]. Microfinance institutions (MFIs) have increased in Pakistan over the past few years[5], and it is imperative to determine whether or not they have contributed to reducing poverty.

The researcher has long been trying to determine how microfinance affects people's lives by considering economic indicators such as income and consumption and social indicators such as health, education, and women's empowerment [6]. However, except for a few countries, microfinance failed to overcome poverty[7][8][9] in the least developed and developing countries. It has been investigated frequently at the microeconomic level; it has almost been repeated worldwide, but microfinance's convenient impact has not been found [9]. Moreover, it has become very complex to determine how financial development impacts poverty and distinguish the welfare of the correct population [10]. These issues stimulate most scholars to attempt case studies, making it challenging to compare the studies [4]. Due to much micro-level analysis, it is hard to understand what is going on at the macro-level.

Conversely, only a few studies have looked at the macro-level performance of microfinance across the country[4][11], but these efforts pronounce an ambiguous picture for a single country. Microfinance's perceived role as a savior has resulted in the proliferation of microfinance institutions (MFIs). Microfinance is referred to as a profit-making organization rather than an institution that assists the poor [12][13][14]. Along with these deliberations, it becomes obligatory to consider whether or not the MFIs have contributed to reducing poverty at the macroeconomic level. A macroeconomics approach is being used to distinguish the effects of microeconomic factors, COVID-19, and microfinance on poverty, representing a significant advancement over previous research. This approach also has significant advances because it enables us to use time-series data from a single country analysis for various regions, which helps policymakers improve microfinance designed to target strategies and increase their achievements in eradicating poverty.

The extent of poverty in any country depends on various factors, such as conflict or crises, inflation rate, unemployment rate, lack of financial resources, poor level of education, and population pressure. To alleviate poverty, governments have made every effort to address these issues, developing microfinance being at the forefront of their efforts. It has become challenging to quantify which factors contribute to escalating or de-escalating poverty. Our study is designed to quantify the impact of microfinance, COVID-19 and macroeconomics factors on poverty. The primary objective of this research is to determine the impact of factors that cause an increase or decrease in poverty, and the concern is to compare these factors. The study's secondary goal is to describe the regional disparities in the impact of factors that cause an increase or decrease in poverty. It is also needed to evaluate the overall impact of microfinance on poverty reduction because it is unclear where the overall impact of MFI has disappeared. Microfinance is growing faster, while poverty reduction is prolonged. Therefor the main research question of the study is: What is the impact of COVID-19 on poverty indicators? How does growth in microfinance borrowers, service availability and gross loan portfolio affect poverty levels? and What is the role of macroeconomic factors in poverty reduction? By answering these research questions, this study aims to provide valuable insights into poverty reduction strategies and inform policy decisions.

Logically, there is an inverse relationship between poverty and microfinance, but COVID-19 and microeconomic problems make it ambiguous, while regional structural discrimination makes it more multifaceted [10]. It is difficult to conclude the influence of microfinance without conducting an empirical study. The following section of the literature review discusses the researcher's findings and the relationship between the variables; the third section of this paper contains a detailed description of the secondary data and research methodology; the fourth section contains the results and discussion; the fifth section contains the conclusion and recommendation.

2. Literature

Poverty is not a phenomenon with a single side dimension[13], and poverty measurement is not a simple concept. Poverty has been measured in a variety of ways by different researchers. Usually, researchers adopt headcount ratio [15][16], per capita consumption [15], per capita GDP (gross domestic product)[16], Gini coefficient [17], or income inequality [18] to measure poverty. Several studies on poverty concerning linear modeling [19] have been conducted. Still, the results have raised concerns because most macroeconomic time-series factors are not stationary [20][21]. Nonlinear modeling for time-series data of determinants of poverty produces more empirical and significant estimates than linear modeling [22][23]. Much of this factual information brought significant support for developing a study to examine the relationship between health expenses, population, inflation, and unemployment in Pakistan. The research studies on the causes of poverty also found that the influence of health expenditure, population, inflation, and unemployment on poverty is still ambiguous due to the divergent results obtained. As a result, it is crucial to examine the factors that contribute to poverty from the perspective of Pakistan's economy. Time-series studies on poverty, in addition, have received little attention in Pakistan.

A unique cross-country panel data set from 106 countries was used for the study, covering 1998-2013[22]. He investigated the hypothesis that microfinance is a suitable tool for poverty alleviation at the macroeconomic level, which he found false. Results show that microlending is negatively associated with poverty. Regardless of the microfinance measures and poverty indicators used, the results remain consistent. They recommend that more microfinance institutions (MFIs) be established in developing and emerging countries. More funds should be directed to MFIs from development agencies and governments for poverty reduction.

Factors such as microfinance borrower, gross loan portfolio, unemployment rate, inflation rate, population growth, per capita GDP, health expenditure (HEs), and literacy rate all play a role in determining poverty. When the debate over the causes of rising poverty occurred, it was agreed that high unemployment was the most significant factor [24][25]. An unemployed person is out of work and has lost their source of income, making it impossible for them to provide for their family's basic needs and necessities. Poverty and unemployment have positive relations [24][25] but are not proportional [26]. Some researchers also studied unemployment's impact on poverty. Refs.[25][27] confirmed that poverty and unemployment are positively associated. Furthermore, while most of an economy's population lives below the poverty line, unemployment is a significant factor. The authors in [28][29] have observed a link between unemployment and poverty. On the other hand, other studies have found no explicit link between poverty and population [17].

Poverty is also affected by inflation because it will increase poverty when inflation increases. Since inflation increases the cost of consumer goods and decreases household purchasing power, poor households currently above the poverty line are forced to either fall below the poverty line or move closer to it due to rising prices [28]. Numerous empirical studies have looked into the relationship between inflation and poverty. Most of the studies found that inflation and poverty possess a positive relation [21][25][30]. Moreover, they have examined double impacts such as price increase and nominal wage effect on poverty. The negative impact of inflation on poverty is also being investigated by [31] in India. On the other hand, the authors in [30] reveal that poverty and inflation are unrelated in developing countries. Some researchers looked into the correlation between poverty and population growth. Despite numerous studies on the subject, no one can agree on the direction in which population growth and poverty go hand in hand. According to various theories, population growth can lead to poverty [32], while others argue it has no adverse effect on poverty[33]. The researcher claimed that population growth decreases per capita income, which in turn causes more people to fall into poverty. There is an interesting correlation between population growth and poverty as well. Population growth was a significant contributor to the slowing of many countries' economies. It is widely accepted that low-income families have lower levels of education and literacy. Poverty can also be caused indirectly or directly by a lack of education in the household. It has been examined that prolonged poverty is reduced due to an increased literacy rate [34]. When people become more literate, poverty decreases. In developing countries, poverty tends to be more concentrated among households where no one has ever learned to read or write. Another study found that poverty and education have an inverse relationship in India. A lack of literacy in developing countries is a hindrance to their development.

The study's findings also indicate that the rate of growth in real gross domestic product (GDP) per person substantially affects the incidence of eradicating poverty [35]. In most countries, income growth per capita is the most important factor contributing to poverty reduction. The studies have provided supporting evidence for this claim. Studies revealed data from many countries that supported the hypothesis that high growth rates in the actual gross domestic product (GDP) per capita are closely linked with a sharper decrease in poverty levels [36]. According to the World Bank, economic growth plays a significant role in poverty reduction but less or not in regional poverty [37]. However, according to [38], who conducted a study on economic growth in developing countries in Kazakhstan employing regional data, regions with higher growth rates experienced a faster reduction in poverty than those with lower growth rates. Growth, which resulted in increased jobs and better real wages, played a significant role in reducing poverty.

Researchers found that poverty has a negligible impact on healthcare expenditures. However, according to the most recent literature on the subject of current interest, the poor health of people is a contributing factor to poverty in the long term [39]. In a similar vein, some studies discovered that HEs have a negative impact on household income[40]. They argued that people work less, spend more on medicine, and save less. Increased expenditure on health, on the other hand, results in more healthy people, more work, more savings, and, ultimately, a reduction in poverty [41]. The argument presented above suggests a negative relationship between health expenditure and poverty.

Financial inclusion dominates the social investment sector, displacing more traditional interventions such as healthcare and education [42]. It all started with microcredit. Then, there was microfinance, after which came financial inclusion.

Despite new names, there are currently $100 billion (£62 billion) in outstanding loans 30 years later, and the idea of providing financial services to the poor, particularly loans, has a trendy following. It has been believed that there is a scarcity of credible academic evidence demonstrating the poverty-relieving effects of financial inclusion. "Based on current evidence, the best estimate of the average impact of microcredit on client poverty is zero". The entire world is in an economic crisis as a result of COVID-19. It has repercussions in every facet and field of daily life [43]. Economic activity is in a dismal state, which has resulted in an unexpected increase in the poverty rate [44]. Poverty has increased for various reasons since COVID-19 [45]. As a result of the running state of the epidemic [3], factories and transportation scheduled have been constrained, businesses have also decided to close, social activities have been expressly forbidden, and restrictions have been placed on religious activities. COVID-19 has a global impact, but it has an outsized impact on poor households. Aside from a few, most aspects of daily life are negatively impacted. The performance of microfinance institutions has also been negatively impacted due to COVID-19 [46][47], which has a direct impact on poverty.

Microfinance initiatives have been launched at the public and private levels to combat poverty; therefore, microfinance will play a promising role in overcoming poverty. There is no doubt that microfinance has a significant impact on poverty [12][48][49][50]. However, researchers have not concluded that microfinance has brought poverty up or down. According to several authors, microfinance can be an effective tool in the fight against poverty because it is an alternative to conventional finance that provides poor people with access to funds, allowing them to maintain their economic activities or start new ones. Microfinance, according to those who believe it has a positive impact on poverty, increases the income of households [48] and improves living standards and people's welfare [49], allowing them to meet social needs and reduce poverty [50]. Conversely, according to some other authors, microfinance is not a practical tool for poverty reduction. Because they believe that microfinance harms the poor, pushing them into the well of poverty, increasing indebtedness, did not increase income or consumption, and it did not achieve poverty reduction. A hypothesis is tested that microfinance reduces poverty at the macroeconomic level. The result demonstrates that a country with a higher gross loan portfolio per capita has lower poverty indices, but a higher number of borrowers has a higher poverty rate [51]. In contrast to recent micro evidence, our findings suggest that microfinance has a significant positive and negative impact on poverty at the macroeconomic level. Similarly, a panel data analysis with a sample of six countries was carried out using a regression model. One significant finding is that microfinance can assist in alleviating extreme poverty and that literacy can also assist in alleviating poverty in general [52].

There has been some research on the impact of COVID-19, microfinance, and macroeconomics on poverty, there is a lack of research that focuses specifically on the regional level. Similarly, there has been some research on the impact of individual factors on poverty levels, but there is a gap in research that examines the impact of multi factors on poverty then segregate the impact through unique modeling. This research gap could be addressed by developing a model that accounts for the unique contributions of each factor and how they interact to impact poverty levels.

Need for a comprehensive model: Poverty is a complex phenomenon that is influenced by a range of factors. However, most existing research on the impact of COVID-19, microfinance, and macroeconomics on poverty focuses on individual factors or relationships between two variables. This research gap could be addressed by developing a comprehensive model that accounts for multiple factors and their interactions. Moreover, microfinance has been shown to be effective in

reducing poverty, macroeconomic factors can also play a significant role in poverty reduction. However, there is a gap in research that examines the unique impact of macroeconomic factors on poverty levels and how they interact with COVID-19 and microfinance.

| Table 1.	Description of Variables Included in The Model
Variables	**Description**
POV	POV = Annual poverty rate of Pakistan. Poverty rate refers the ratio between number of individuals whose income is below the poverty line with total population of the country (Dependent Variable) Poverty is calculated in different method in a country to analyze. In this Paper Dependent variable poverty is taken into 4 different data set to estimate the impact of independent variable. These are: Over all Poverty of cost of basic Need (CBN), Urban Poverty of CBN, Rural Poverty of CBN and Poverty of $5.5.
UNR	UNR = Annual rate of unemployment, which refers the ratio between number of unemployed with the total labor force of the country (Independent Variable)
INF	INF = Inflation rate. It is actually the steady shift that occurs in the overall price level across the years (Independent Variable)
POP	POP = Population growth rate. It is the percentage by which a country's total population grows from one year to the next (Independent Variable)
LIT	LIT = Literacy rate. A population's literacy rate can be calculated by determining what percentage of that population's population, across all age groups, is able to read and write (Independent Variable)
MIB	MIB = Annual rate of microfinance borrower. A rate at which the number of borrowers is increasing annually (Independent Variable)
GLP	GLP = Annual rate gross loan portfolio. A rate at which microfinance loans are disbursed per borrower annually (Independent Variable)
PCI	PCI = Per capita GDP values of goods and services produced by per person in a country annually (Independent Variable)
HEG	HEG = Health expenses to GDP. The ratio between the amount of money spends for the health of the population with total income of a country annually (Independent Variable)
CVD	CVD = COVID-19 (Dummy Variable yes = 1 if no = 0). Year in which an epidemic exists

3. Theoretical Frame and Techniques

This section of the study clarifies the variables that contribute to poverty and the factors that have been specifically employed to alleviate poverty in the past. Two types of hypothetical independent variables are included in the thee suggested model. The first type consists of factors that determine poverty, and the second type consists of those factors whose effects need to be assessed. COVID-19 was also included in the model as a dummy variable to assess the epidemic's impact. So, the suggested model is described as:

$$POV = f \text{ (UNR, INF, POP, LIT, MIB, GLP, PCI, HEG, CVD)}$$

Poverty is calculated in different method in a country to analyze. In this Paper Dependent variable poverty is taken into 4 different data set to estimate the impact of independent variable. These are: Over all Poverty of cost of basic Need (CBN), Urban Poverty of CBN, Rural Poverty of CBN and Poverty of $5.5. CBN refers the cost of basic needs which includes food, Shelter and clothing, that are essential for a person to survive and maintaining a minimum standard of living. Overall poverty of CBN measures the percentage of the population that cannot afford to meet their basic needs, regardless of whether they live in urban or rural areas. Urban poverty of CBN refers to the percentage of the urban population that

cannot afford to meet their basic needs, while rural poverty of CBN refers to the percentage of the rural population that cannot afford to meet their basic needs. Lastly, poverty of $5.5 refers to the international poverty line of $5.5 per day per person, which is used to measure extreme poverty in developing countries. **Table** 1 presented the complete form of variables (col.1) and describes the further detail of the dependent and independent variables (col.2).
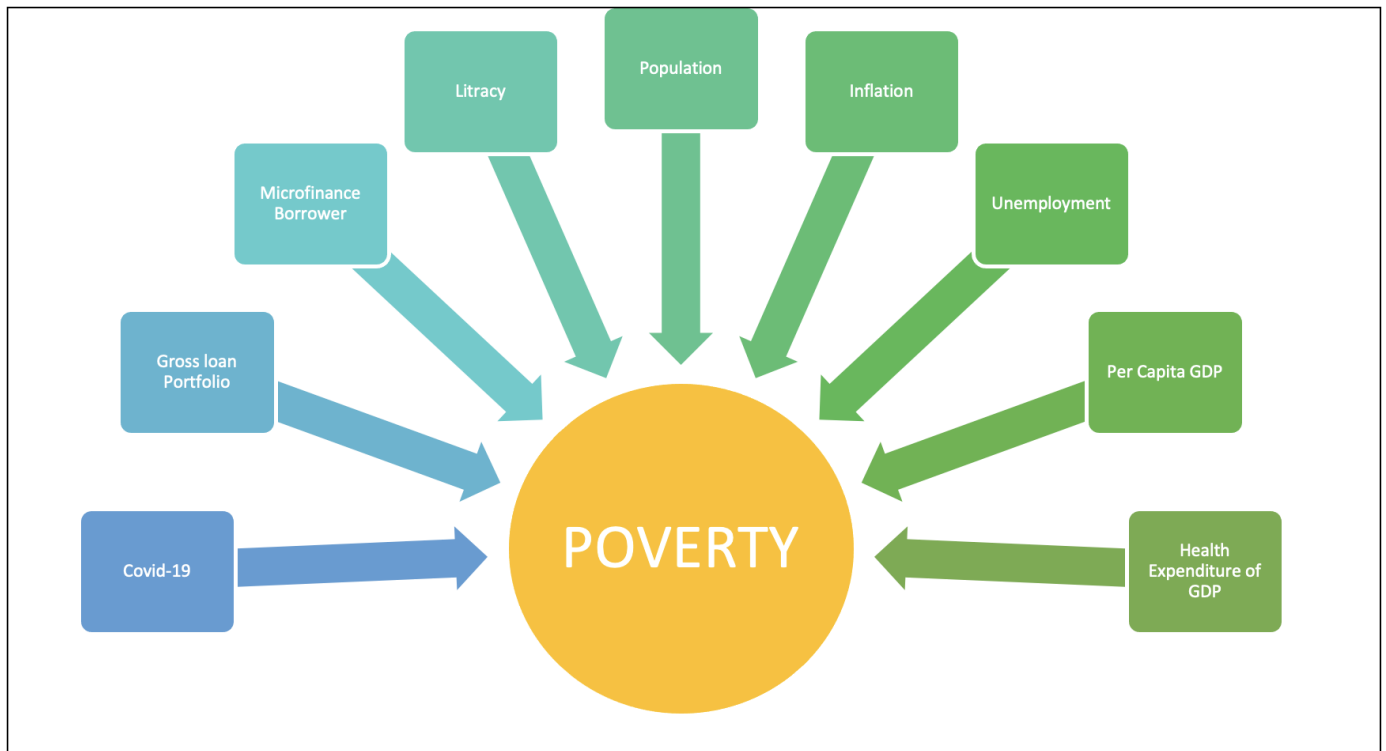
Fig. 1. Best describes the hypothetical relationship between poverty and independent variables

4. Methodology

Researchers assume that a linear relationship exists between poverty and the variable that impacts poverty. Therefore, straight-line modeling was adopted by the majority of the researchers in the existing literature. Time-series data of poverty and the determinants were tested by [21][53] in a non-stationary manner. In situations where the relationship is nonlinear in parameters, log transformation proves helpful and produces the desired linearity in parameters [53] or resolves the issue of stationarity. The log transformation of time-series data is an advantageous technique to stabilize the variance of the series [54] and estimate the responsiveness of the outcome. A log–log regression model is applied to differentiate the responsiveness of the impact of unemployment, inflation, population, literacy, GLP, borrowers, and COVID-19 on poverty.

4.1. Augmented Dickey–Fuller (ADF) Test

$$\Delta y_t = \mu + \lambda y_{t-1} + \sum \beta \Delta y_{t-j} + \varepsilon_t$$

where Δy_t is the first difference of y_t as $y_t - y_{t-1}$, μ represents the intercept and trend effect, $\lambda = \alpha - 1$. At the same time, α is the coefficient of y_{t-1}, and ε_t is the error term of the ADF model; if the null hypothesis is rejected, the means-tested

series is stationary.

4.2. Semi-Log Regression Technique

After clarifying all of the variables in the conceptual framework, applying the stationarity test ADF, and pointing to relevant literature in depth, the time has come to develop a model to quantify the hypothetical relation described in the theoretical framework. We have developed the following equation to examine the effects of literacy, population, inflation, unemployment, microfinance, and epidemic on poverty in Pakistan.

$$Y_t = \alpha_0 + \sum_{i=1}^{8} \alpha_i X_{it} + \mu_t$$

where Y_t is dependent variable (Poverty levels) need to be predicted and X_{it} (i=1, 2, 3….8) are the predictor variables. (t) represent time series data or numerical data observation are talking yearly basis. The coefficients αo is intercept and α_i (i=1, 2, 3….8) are the coefficient of each predictor whose marginal effects are thus measured by the coefficients while μt represent the error term for corresponding year.

First, a hypothesized relationship is developed to serve as the basis for the model's development. However, variable series need to be tested for stationarity in this form. Otherwise, the estimated parameter will not be blue. As long as the model is estimated in its current form, it will produce unreliable and spurious results. Usually, the time-series variable possesses a stationarity problem detected through the ADF test of stationarity. If time-series data persist in non-stationarity, which causes the issue of autocorrelation or heteroskedasticity, then to deal with such a situation first, the OLS model developed into the semi-log regression model. After applying the log, both sides of the Equation (3) model will look like:

$$\ln Y_t = \alpha_0 + \sum_{i=1}^{8} \alpha_i \ln X_{it} + \mu_t \ln Y_t = \alpha_0 + \sum_{i=1}^{8} \alpha_i \ln X_{it} + \mu_t$$

The semi-log regression model shown in Equation (4) which is the final form of the model. However, we still need to estimate the fixed effect of an exogenous variable such as the impact of epidemic on poverty, as shown in Equation (5).

$$\ln Y_t = \alpha_0 + \sum_{i=1}^{8} \alpha_i \ln X_{it} + \alpha_9 D_t + \mu_t$$

Where D_t represent the dummy variable (COVID-19) presence for a specific time period while α9 represent coefficient of that dummy variable which show yearly marginal impact of COVID-19 on poverty.

5. Data Collection and Estimation

Time-series data have been collected from published sources to differentiate and analyze the relationship between

poverty and independent variables. We acquired a comprehensive and authentic data set to accomplish our goal. The data were taken from annual observations of Pakistan and its provinces. The study utilizes yearly time-series data of Pakistan for the years 1988 to 2021. The primary sources of data for different variables in the current study are;

- Federal Bauru of Statistic (FBS);
- State Bank of Pakistan (SBP);
- Pakistan Microfinance Network (PMN);
- www.macrotrend.net

The time-series data collection in developing countries has limitations, primarily because macroeconomic surveys are not conducted every year. Therefore, significant missing observations in data on poverty and its determinants are present every day in macroeconomic data [4][55]. To deal with this problem and bridge the gaps, we chose a linear interpolation method based on the growth rate of the variables to fill in the missing values. We evaluate the sensitivity of our results to interpolation to ensure that they are as robust as possible. The linear interpolation method is adopted by many scholars [55][56] for poverty rate, Gini coefficient, and income data[57]. Data about the defined variable of microfinance, such as the number of active borrowers and the gross loan portfolio, also have some limitations.

Table 2. Summary Statistics of Variables

Item	Mean	Median	Std. Dev.	Skewness	Kurtosis
Number of Borrower	9.157033	13.45531	7.088007	–0.517096	1.331319
Gross Loan Portfolio	15.38156	22.64657	11.88109	–0.528745	1.331147
Health Expenditure	0.628788	0.560001	0.395368	–0.512004	4.023365
Inflation Rate	2.032266	2.202765	0.288376	0.668798	5.052684
No. Literate Person	18.17054	18.19683	0.447756	–0.073684	2.022236
Rural Poverty	17.08889	17.14198	0.16214	–0.606776	2.358844
Poverty of $5.5	18.73281	18.76928	0.167924	–0.548283	2.105100
Poverty of CBN	18.07403	18.10515	0.204819	–0.477789	2.264659
No. of Unemployed	13.41717	12.92235	1.02440	0.909344	2.111725
Urban Poverty	17.36111	17.47672	0.36738	–1.057387	3.118630
Per Capita GDP	6.617457	6.618636	0.471233	0.011178	1.417139
Rural Population	17.75885	17.77172	0.275551	–0.157282	1.890454
Total Population	18.87642	18.89258	0.231133	–0.171917	1.840893
Urban Population	18.47959	18.49806	0.209694	–0.192269	1.818799

The descriptive statistics result of the time-series data is listed in Table 2 which presents the summary statistics for various variables of interest. The mean, median, standard deviation, skewness, and kurtosis are reported for each variable. The mean represents the average value of the variable, while the median is the middle value of the distribution.

The standard deviation shows how spread out the data is from the mean. Skewness measures the symmetry of the distribution, with negative values indicating a left-skewed distribution and positive values indicating a right-skewed distribution. Kurtosis measures the degree of peaked Ness of the distribution, with positive values indicating a more peaked distribution and negative values indicating a flatter distribution.

From the table 2, it can be observed that the mean and median values are relatively close for most variables, indicating an approximate symmetrical distribution. The standard deviation varies across variables, with some having a larger spread than others. The skewness and kurtosis values suggest that some variables may have slightly skewed or peaked distributions. For example, the health expenditure variable has a negative skewness and a very high positive kurtosis, indicating a highly peaked distribution. In contrast, the inflation rate variable has a positive skewness and a positive but relatively low kurtosis, suggesting a slightly right-skewed and moderately peaked distribution. Overall, the summary statistics provide a useful way to quickly understand the distribution of variables and identify any potential outliers or unusual values.

Table 3. Results of Unit Root Test for Dependent and Independent Variables

Variables	At Level I (0)		First Difference I (1)	
	t-Value	p-Value	t-Value	p-Value
Poverty $5.5	−2.3107	0.4186	−0.8345	0.0097 ***
Poverty CBN	−2.4049	0.3715	−3.2995	0.0010 ***
Urban Poverty	−1.8952	0.6329	−11.240	0.0000 ***
Urban Poverty	−2.3911	0.3764	−4.8987	0.0023 ***
Unemployment	−0.5434	0.9769	−9.4457	0.0000 ***
Literacy	3.3942	0.9998	−12.758	0.0000 ***
Population	−0.4753	0.9988	−2.5604	0.0094 ***
Health Expenditure	−0.2085	0.9900	−6.0038	0.0001 ***
Inflation	−4.4808	0.0608	−63790	0.0001 ***
GLP	−2.6167	0.2782	−5.9843	0.0007 ***
Per Capita GDP	−1.9109	0.6242	−4.2760	0.0100 ***
Borrower	3.4572	0.9999	−4.5435	0.0016 ***
Urban Population	−2.6804	0.2507	−10.013	0.0000 ***
Rural Population	1.3577	0.9999	−12.024	0.0000 ***
Poverty $5.5	−2.3107	0.4186	−0.8345	0.0097 ***

* Significance at 10%

** Significance at 5%

*** Significance at 1%.

Before determining the dynamic relationship between the hypothetical relationship between dependent and independent variables, the unit root or stationarity test is needed to apply all the dependent and independent data of the time series. The result of the ADF test is listed in Table 3. According to the test's results, No. of Borrowers, the annual inflation and literacy rate are found to be stationary at only a 10% significance level. At the same time, the rest of the variable have a unit root at the level. Meanwhile, without log transformation, all the variables are non-stationary at the level. It means the dataset has a unit root, and it is not convenient to apply the OLS technique in this form. Furthermore, the ADF test is also used to check data stationarity at the first difference. The test results depicted that all the variables are stationary at the first difference. Furthermore, the ADF test is also applied to check the data stationarity at the first difference; the test result depicted that all the variables were stationary at the first difference. The stationarity of data at first difference was directed to test for cointegration. If the cointegration test is found significant, the linear combination of the series is stationary. Therefore, the OLS technique can be applied to non-stationary 1 (0) time-series data. Table 4 presented the result of the ADF cointegration test; it found that the residual estimates are highly significant. It means that a long-run association between variables exists, and a linear combination of the series is stationary. Residuals of poverty and poverty estimates have statistical significance.

Table 4. Unit Root Test Results of Residual the Estimates

		Poverty CBN	Poverty $5.5	Rural Poverty	Urban Poverty
ADF - test statistic		−6.213374 ***	−4.756098 ****	−5.000395 ***	−6.362335 ***
Critical values	1% level	−4.273277	−4.205004	−4.339330	−4.273277
	5% level	−3.557759	−3.526609	−3.587527	−3.557759
	10% level	−3.212361	−3.194611	−3.229230	−3.212361
Null Hypothesis: Residual Has a Unit Root		Exogenous: Constant, Linear Trend			

On the graph, different levels of poverty are represented by fitted lines, actual lines, and residual lines. The trend of values being almost the same can be clearly expressed when fitted values are compared to actual values. In other words, we can say that both have almost constant variances, while the residual plotted lines express that there is no trend in the data. This is what we mean when we say that there is no trend in the data. Therefore, it can be stated that OLS estimates are reliable, and that results are not inconsistent in any way (see Appendixes A–D).

6. Results

6.1. Multicollinearity Test Results

The variance inflation factor measures the amount of multicollinearity in a set of multiple regression variables. Multiple regression is used when a person wants to test the effect of various variables on a particular outcome. It is always greater than or equal to 1. There is no formal VIF value for determining the presence of multicollinearity. Values of the VIF that

exceed ten are often regarded as indicating multicollinearity. The results of the variance inflation factor for each poverty measure reveal that the explanatory variable is not collinear; the coefficient of VIF ranges from 1.96 to 8.96. By definition, variables are statistically non-collinear if the value of the VIF is less than 10, which means that there is no issue of multicollinearity between the explanatory variables, It can be observed in Table 5 below.

Table 5. Variance Inflation Factors Test for Multicollinearity

Variables	CBN Poverty	$5.5 Poverty	Urban Poverty	Rural Poverty
Borrower	6.464198	7.493266	7.913805	6.649714
COVID-19	4.695423	3.902215	4.753599	4.311759
Per Capita GDP	2.028805	7.913338	1.755557	1.964564
Gross Loan Portfolio	8.056439	3.331823	7.400495	5.939104
HE of GDP	3.541974	3.129071	3.723429	3.293142
Inflation Rate	3.130775	4.662177	3.338272	2.569352
Literate Person	6.681506	8.794274	6.154987	4.215855
Unemployment	6.503487	8.388897	7.249838	8.251006
Population	7.850058	6.493266	8.498014	5.890847

6.2. Result Summary of Semi-Log Regression Analysis

The findings presented in Table 6 demonstrate a statistically significant long-run relationship between poverty and the predictors of poverty. The explained variation R^2 confirms that the regressor is responsible for more than 94% of the variation in poverty of 5.5 USD/day, urban poverty, and rural poverty. However, only 87% of the variation in poverty-related costs of basic needs was explained by the predictors. Similarly, the F-statistic revealed that the results were found to be statistically significant. The logical relationship between the predictors and poverty is described by the positive and negative signs of the data. The negative sign of the estimator indicates that the poverty estimated decreases poverty by one additional unit of the regressor. In contrast, the positive sign indicates that poverty increases by one additional predictor unit.

Table 6. Semi-log Regression Results of Poverty

Variable	Coefficient of Poverty CBN	Coefficient of Poverty $5.5	Coefficient of Rural Poverty	Coefficient of Urban Poverty
Constant	13.09 **	13.96 **	12.14 **	14.03 **
COVID_19 (as dummy)	0.43 **	0.39 **	0.338 **	0.36 **
Gross Loan Portfolio	−0.28 ***	0.040 *	0.075 *	−0.20 ***
Health Expenditure	−0.11 **	−0.074 ***	−0.124 ***	−0.26 ***
Inflation Rate	0.01 *	0.006 *	0.014 *	0.014 *
No. Of Borrowers	−0.49 ***	−0.68 ***	−0.13 ***	−0.353 **
No. of Literate	−0.88 **	−0.487 **	−0.743 **	−0.498 **
No. of Unemployed	0.28 ***	0.044 ***	0.180 ***	0.44 ***
Per Capita GDP	−0.08 **	−0.042 **	−0.60 ***	−0.72 ***
Population	0.75 **	0.65 ***	0.64 **	0.68 **
R-squared	0.871116	0.996979	0.949635	0.947376
Adjusted R-squared	0.828155	0.995796	0.929927	0.929835
S.E. of regression	0.084906	0.010888	0.081256	0.139911
Sum Squared Residual	0.173017	0.002726	0.151859	0.469800
F-statistic	20.27677	843.2375	48.18521	54.00864
Prob (F-statistic)	0.000000	0.000000	0.000000	0.000000

[*] Significance at 10%

[**] Significance at 5%

[***] Significance at 1%.

6.3. Intercept

The constant or intercept shows the variable's average impact, which is not included in the models. The result related to the poverty of cost of basic needs depicted that 13.1% of poverty of CBN was caused by excluded variables not included in the model, 13.96% of poverty of 5.5 USD/day was caused by exogenous variables, as shown in Table 6. In contrast, urban and rural poverty were affected by 12.14% and 14.03%, respectively.

6.4. COVID-19

As shown in Table 6, the results of the COVID-19 estimated coefficient demonstrate that after every year of the epidemic, poverty increased. According to the Poverty CBN estimates, on average, poverty increased by 0.43% per year of the epidemic, but the poverty of 5.5 USD/day increased by 0.39% on average per year during the epidemic. Similarly, rural and urban poverty increased by 0.46% and 0.34%, respectively, in Pakistan. Many studies evaluated the impact of COVID-19 on poverty and found that COVID-19 worsens poverty [58][59].

6.5. Impact of Microfinance on Poverty

The steadily negative and statistically significant relationship we find between the number of microfinance borrowers and all four poverty measures advocates that expanding the reach of microfinance institutions can assist more people in moving out of poverty [4][60]. The result listed in Table 6 designated that 0.49% of CBN's poverty can be reduced if one more percent of the country's borrowers obtains access to microfinance. The coefficient of microfinance borrowers for poverty of 5.5 USD/day shows a 0.68% decrease due to an increase of 1% in the number of borrowers, as shown in Table 6. Still, rural poverty has a minor response because one more percent increase in microfinance borrowers in a rural area reduces poverty by 0.13%. In comparison, in an urban area, this reduction is 0.35%.

On the other hand, in our study, we discovered a statistically significant relationship between the second measure of microfinance intensity (gross loan portfolio) [61] and poverty measures, but in only two measures, Poverty of CBN and Urban poverty. The result reveals that a 1% increase in gross loan portfolio will lead to a decrease of poverty in CBN by 0.28%, while there is only a 0.2% decrease in urban poverty. The result of rural poverty and poverty of 5.5 USD/day is not statistically significant. A statistically insignificant relationship between poverty and gross loan portfolio intensity is also observed.

6.6. Impact of Microeconomics Factor on Poverty

Other predictors, particularly those belonging to microeconomics, have statistically significant positive and negative effects [56]. We find that health expenditure, literacy, and per capita GDP reduce poverty (Poverty of CBN, poverty of 5.5 USD/day, rural poverty and urban poverty) significantly [61]. The result shows that if the government increases health expenditure by 1%, CBN poverty tends to be reduced by about 0.11%, while urban poverty is reduced by 0.26%, rural poverty is reduced by 0.12%, and poverty of 5.5 USD/day is reduced by about 0.07%. Similarly, an increase in literacy will undoubtedly reduce poverty [60]. Among the poverty measures, the most significant decrease can be seen in the poverty measure of the cost of basic needs, which is about 0.88% due to an increase of 1% in literacy, which is followed by rural poverty, urban poverty, and poverty of 5.5 USD/day with percentage reductions of 0.743, 0.498, and 0.487, respectively.

Moreover, an annual increase in per capita GDP also confirms the reduction in poverty by all measures. There is a clear negative relationship between GDP per capita and poverty, as described by [62]. On the contrary, it can be seen in Table 5 that the predicted values of population and unemployment have a positive sign, indicating that an increase in population and unemployment will increase poverty levels. The result of population further explores that an increase in population is the most projecting factor that caused an increase in poverty. The coefficient of the population indicates that a 1% increase in population will lead to a 0.75% increase in the poverty of cost of basic needs measure, 0.67% increase in urban poverty, 0.65% increase in rural poverty, and 0.65% increase in poverty by 5.5 USD/day. Although increased unemployment is also a response to increased poverty, this increase is less severe than the response increase to an increase in population. In the end, the result of the insignificant coefficient of inflation should be described as well. As a result, the long-run impact of inflation is significant at a 10% level of significance only, and the value of the coefficient is relatively minimal.

7. Discussion

After describing the study's findings in greater depth, we can now discuss our research objectives. The first objective was to quantify the impact of COVID-19 (as a dummy) and microeconomic factors on poverty. In Table 5, we can observe a quantitative measure of the factor used in our study model. The second objective was to identify the factor responsible for increasing or decreasing poverty through different measures. Our research first discovered that the fixed impact of COVID-19 on the poverty of all measures is significant and positive [58][59]. Secondly, increases in health expenditures [61], literacy [20][63], no. of microfinance borrowers [64], gross loan portfolio [63], per capita GDP [65], staggered loan [66], etc. lead to a decrease in poverty headcount ratio for all measures[11][62]. On the other hand, there is no significant evidence found to decrease poverty using the inflation rate. In addition, the countries such as Pakistan with higher growth in populations tend to perform worse in the fight against poverty, as evidenced by the results in Table 5. Researchers also confirm that increases in population growth [32], unemployment rate [28][29] and inflation rate [21][25][30] tend to increase poverty. Third, we also consider whether the negative impact of microfinance is mitigated due to the significant positive impact that macroeconomic factors have on poverty. To calculate the net impact on poverty, we add up all of the positive and negative values of the coefficients separately for each poverty model, except the intercept value. The total negative impact on poverty of CBN is calculated as about –1.84. The positive impact is 1.47, so the net impact reached to reduce poverty is –0.37, which means that only 0.37% of poverty will reduce if there is a 1% increase in each interpreter of the poverty of CBN, 0.15% reduction in poverty of 5.5 USD/day, rural poverty decreases of 0.35% and urban poverty reduction of about 0.54%.

Finally, we must consider the differences in poverty levels between regions. It is possible to isolate regional differences by comparing the coefficients of poverty of CBN, rural poverty, and urban poverty. We found that the poverty estimates of each poverty measure are statistically significant, which allowed us to differentiate the impact of the described factors on regional segregation [27]. First and foremost, we examine the impact of COVID-19 on different regions. We discover that urban poverty is severely affected by COVID-19 compared to rural poverty, whereas poverty of CBN is not significantly affected by COVID-19 compared to urban poverty [67].

Similarly, the effects of population growth on the poverty of CBN are more severe than the effects of urban and rural poverty. In contrast, the coefficients of the population for urban and rural poverty are not significantly different from one another. The impact of unemployment on all poverty measures varies from region to region. The unemployment estimate for rural poverty is 0.10% less than the poverty of CBN and 0.26% less than urban poverty. In contrast, urban poverty increased by 0.16% more than the poverty of CBN due to unemployment. As far as the decreasing impact of factors on poverty is concerned, it is stated that estimates of literacy have the most significant impact on overall poverty, which is followed by rural and urban poverty reductions. In particular, an estimate of literacy for overall poverty is about 0.14 percentage points higher than estimates of rural poverty, and estimates of urban poverty are about 0.37 percentage points higher than estimates of rural poverty. In contrast, the difference between urban and rural poverty estimates is 0.245%. Further regional segregation between poverty estimates of different measures can be observed in Table 5.

The above paragraphs present the findings of a study that investigated the impact of various economic factors on poverty

reduction in a particular region. The study finds that health expenditure, literacy, and per capita GDP have a statistically significant negative effect on poverty. Specifically, an increase in health expenditure and literacy leads to a reduction in poverty across all poverty measures, with the greatest decrease observed in the poverty measure of the cost of basic needs.

Furthermore, the study finds that an increase in per capita GDP is also associated with a reduction in poverty across all measures. These findings are consistent with previous research that has established a negative relationship between economic growth and poverty. When an economy grows, people tend to earn more, leading to an increase in their standard of living and a reduction in poverty. On the other hand, the study also finds that an increase in population and unemployment has a positive effect on poverty levels. The coefficient of population indicates that a 1% increase in population leads to a significant increase in poverty across all measures. This finding suggests that population growth may be contributing to poverty in the region. Similarly, an increase in unemployment is also found to be associated with an increase in poverty, but its impact is less severe than that of population growth.

Moreover, the study finds that inflation has an insignificant impact on poverty levels. While inflation is often considered to be a significant factor affecting poverty, the study's findings suggest that it may not be a critical concern in this particular region.

Overall, the findings of this study highlight the importance of investing in health, education, and economic growth to reduce poverty. Governments can consider policies that promote these areas to help lift people out of poverty. Additionally, population growth and unemployment need to be managed effectively to avoid exacerbating poverty levels. While inflation may not be a significant concern, policymakers should still monitor its impact on the economy to ensure that it does not lead to an increase in poverty.

8. Conclusions and Recommendations

The study was carried out to quantify the impact of a global epidemic (COVID-19), microfinance, and macroeconomic factors on the poor inhabitants of Pakistan. Such types of relationship are evaluated using time-series data from various resources from 1988 to 2021. The cointegration tests were conducted to determine the degree of responsivity between two or more variables over a particular timeframe. Additionally, our findings support the cointegration testing hypothesis, indicating a relationship between the explanatory variable and the outcome for a particular country. A semi-log regression technique was adopted to account for skewness in time-series data and determine the responsiveness of the explanatory variable of poverty. We also discover that this relationship is also dependent on the government's targeting strategy. We developed a direct relationship between the outcome variable (poverty) and the explanatory variable (epidemic, microfinance, and macroeconomics) using this methodology. Our results explain that microfinance is significantly associated with poverty as negative and positive.

We found a significant negative relationship between the increase in microfinance borrowers and poverty. It is likely to reduce poverty if the government encourages microfinance institutions to increase the number of borrowers. On the other

hand, when the amount of money that MFIs lend out increases, it appears that they will have a positive impact on poverty. It may be possible that insignificant loans (poverty estimate for rural areas and poverty of USD 5.5) will trap the poor in a debt trap. In the context of this research, we can conclude that microfinance is a valuable tool for poverty reduction. Still, it cannot be presumed to be an adequate alternative in and of itself. Governments must also implement various social policies during increasing microfinance services, such as skill development, small industries, and healthcare expansion, which are critical in alleviating poverty.

Based on the results presented in the above paragraphs, it can be concluded that poverty in Pakistan is influenced by various factors, including excluded variables, exogenous variables, and microeconomic factors. The COVID-19 epidemic has had a negative impact on poverty, causing an increase in poverty rates over time. However, expanding the reach of microfinance institutions and increasing health expenditure, literacy, and per capita GDP can significantly reduce poverty rates.

Microfinance institutions play a significant role in poverty reduction, as evidenced by the negative and statistically significant relationship found between the number of microfinance borrowers and all four poverty measures. Expanding the reach of microfinance institutions can assist more people in moving out of poverty. Moreover, the gross loan portfolio of microfinance institutions has a statistically significant negative impact on Poverty of CBN and urban poverty.
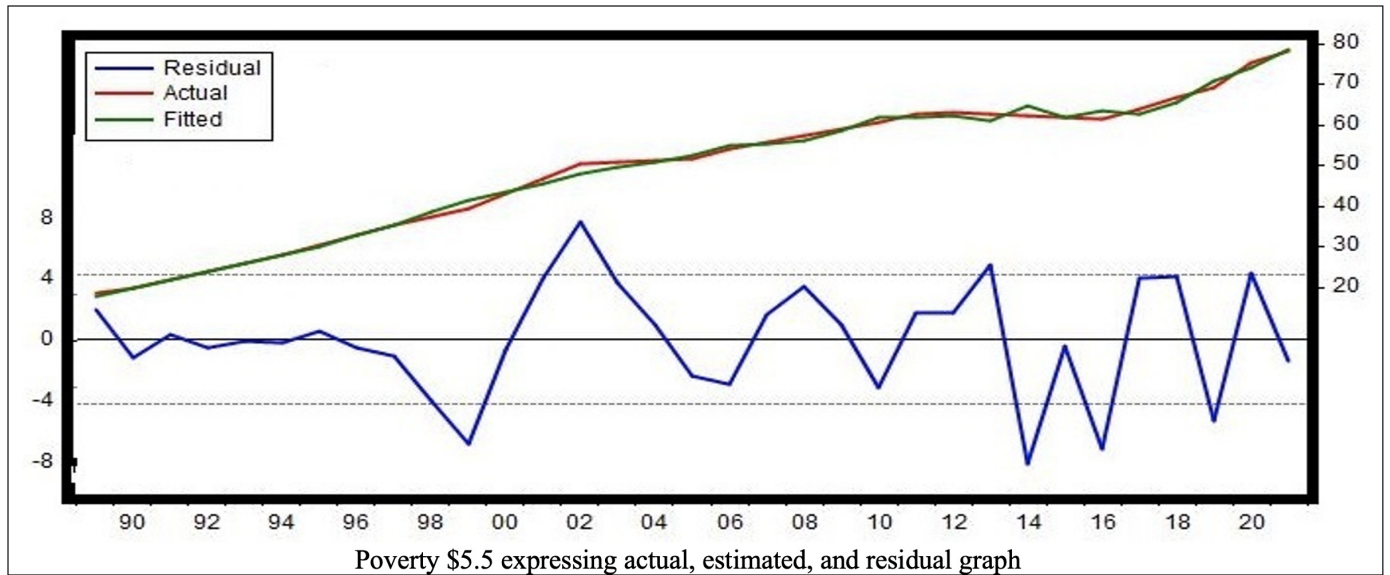
Other microeconomic factors such as health expenditure, literacy, and per capita GDP also have a significant negative impact on poverty rates and the result validates that poverty is critically associated with these factors. Increasing health expenditure and literacy can significantly reduce poverty rates in both rural and urban areas. Similarly, an annual increase in per capita GDP can also lead to a reduction in poverty rates in Pakistan. However, the population and unemployment have a positive impact on poverty rates. An increase in population has the most significant impact on poverty, while unemployment has a relatively minor impact on poverty rates. Moreover, the impact of inflation on poverty rates is insignificant.

Therefore, based on the above conclusion, it is recommended that the government should take measures to increase the reach of microfinance institutions, increase health expenditure and literacy, and focus on increasing per capita GDP to reduce poverty rates in Pakistan. Additionally, measures should be taken to control population growth and unemployment rates to prevent a rise in poverty rates in the long run. By taking these measures, the government can make significant progress in reducing poverty rates and improving the standard of living for the people of Pakistan. Moreover, we recommended that increasing the literacy rate in rural areas and controlling population growth is the best solution to overcome poverty. However, this paper has some limitations that will have to be given more attention for further research. For example, countries such as Pakistan could not collect samples due to a lack of data on poverty. Additionally, information on microfinance was lacking. The main challenge in future research extensions will be to ensure that the various data sources are compatible.
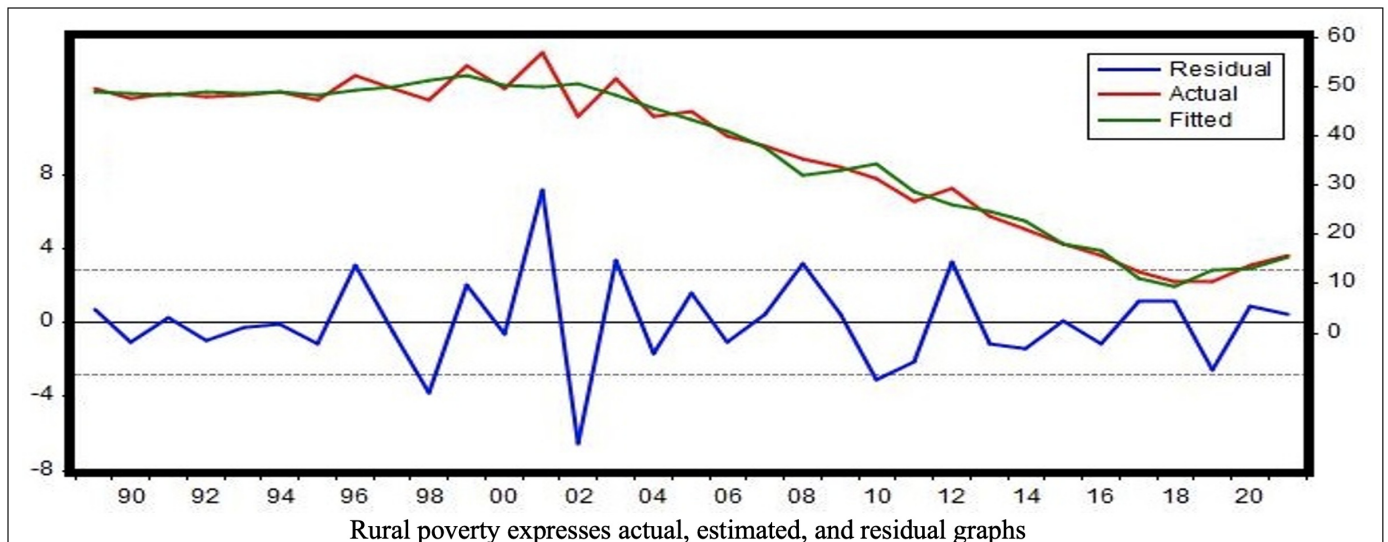
Appendices

CBN poverty expressing actual, estimated, and residual graph

Appendix A.

Poverty $5.5 expressing actual, estimated, and residual graph

Appendix B.

Rural poverty expresses actual, estimated, and residual graphs
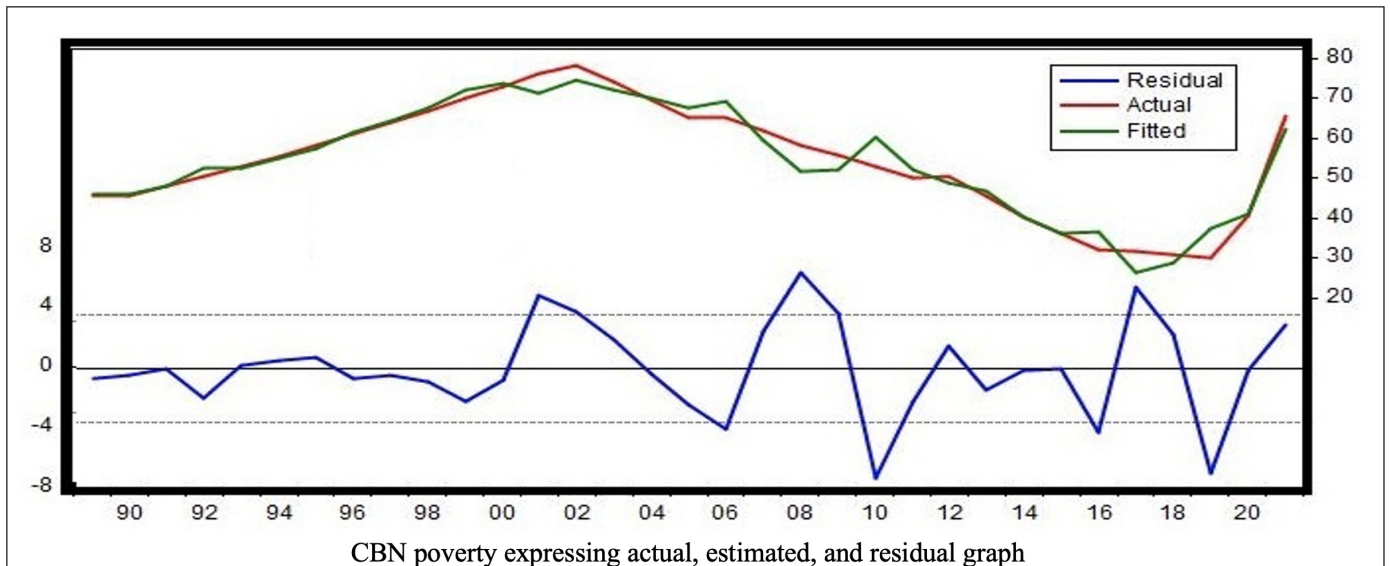
Appendix C.

Statements and Declarations

Other References

- Tambe, S.; Patnaik, S.; Bisaria, J.; Sarma, U.K. How Does Government Microfinance Impact the Rural Poor? Evidence from Madhya Pradesh. Econ. Polit. Wkly. 2017, 11, 81–87.
- Burchi, F.; Rippin, N.; Montenegro, C. From Income Poverty to Multidimensional Poverty: An International Comparison; Working Paper; 2018.
- Zhang, Q. Does microfinance reduce poverty? Some international evidence. B. E. J. Macroecon. 2017, 17.

https://doi.org/10.1515/bejm-2016-0011.

- Ishfaq, S.; Khan, I.; Shah, T.A.; Jamil, R.A. The Role of Microfinance in Poverty Reduction: Evidence from South Asia. Int. J. Manag. Account. Econ. Vol. 2016, 2, 1190–1199.

- Nikoukar, A. Investigating the Factors Affecting Rural Poverty in Provinces of Iran. Agric. Econ. 2021, 15, 89–111.

- Zhang, Q. Does microfinance reduce poverty? Some international evidence. J. Macroecon. 2017, 17. https://doi.org/10.1515/bejm-2016-0011.

- Wright, G.A.N. Examining the impact of microfinance services—Increasing income or reducing poverty? Small Enterp. Dev. 1999, 10, 38–47. https://doi.org/10.3362/0957-1329.1999.005.

- Allain-Dupré, D.; Chatry, I.; Michalun, V.; Moisio, A. The territorial impact of COVID-19: Managing the crisis across levels of government. OECD Policy Responses Coronavirus (COVID-19) 2020, 10, 1620846020–1909698535.

References

1. ^Ali, A.; Ahmed, M.; Hassan, N. Socio-economic impact of COVID-19 pandemic: Evidence from rural mountain community in Pakistan. J. Public Aff. 2021, 21, e2355.

2. ^Mamun, M.A.; Ullah, I. COVID-19 suicides in Pakistan, dying off not COVID-19 fear but poverty? The forthcoming economic challenges for a developing country. Brain. Behav. Immun. 2020, 87, 163.

3. a, bTsai, M.-C. Economic and non-economic determinants of poverty in developing countries: Competing theories and empirical evidence. Can. J. Dev. Stud. Can. D'études Du Dév. 2006, 27, 267–285.

4. a, b, c, d, eBangoura, L.; Mbow, M.K.; Lessoua, A.; Diaw, D. Impact of microfinance on poverty and inequality a heterogeneous panel causality analysis. Rev. Econ. Polit. 2016, 126, 789–818.

5. ^Riaz, M. Efficiency in Social Performance Management of Microfinance Institutions: A Case of Pakistan. Ph.D. Thesis, Universiti Sains Malaysia. 2016. Available online: http://eprints.usm.my (accessed on).

6. ^Sultana, H.Y.; Jamal, M.A.; Najaf, D.-E. Impact of microfinance on women empowerment through poverty alleviation: An assessment of socio-economic conditions in Chennai city of Tamil Nadu. Asian J. Poverty Stud. 2017, 3.

7. ^Terberger, E. The Microfinance Approach: Does It Deliver on Its Promise? In Microfinance 3.0; 2013; pp. 181–195.

8. ^Maitrot, M.; Nino-Zarazua, M. Poverty and Wellbeing Impacts of Microfinance: What Do We Know? United Nations Univ. World Inst. Dev. Econ. Res.: 2017.

9. a, bTambe, S.; Patnaik, S.; Bisaria, J.; Pandey, A.; Sarma, U.K.; Vadivelu, G.A. How does government microfinance impact the rural poor? Evidence from Madhya Pradesh. Econ. Polit. Wkly. 2017, 52, 81–87.

10. a, bAli, I.; Hatta, Z.A.; Azman, A.; Islam, S. Microfinance as a Development and Poverty Alleviation Tool in Rural Bangladesh: A Critical Assessment. Asian Soc. Work Policy Rev. 2017, 11, 4–15. https://doi.org/10.1111/aswp.12106.

11. a, bMiled, K.B.H.; Rejeb, J.-E.B. Microfinance and poverty reduction: A review and synthesis of empirical evidence. Procedia-Soc. Behav. Sci. 2015, 195, 705–712.

12. a, bUddin, A. Microfinance and Poverty Nexus: Leverage Spillover; University of Creative Technology Chittagong: Chattogram, Bengal, March 2018. https://doi.org/10.13140/RG.2.2.30272.43528.

13. a, bKhan, W.; Shaorong, S.; Ullah, I. Doing business with the poor: The rules and impact of the microfinance

institutions. *Econ. Res. Istraz. 2017, 30, 951–963. https://doi.org/10.1080/1331677X.2017.1314790.*

14. ^*Roberts, P.W. The Profit Orientation of Microfinance Institutions and Effective Interest Rates. World Dev. 2013, 41, 120–131. https://doi.org/10.1016/j.worlddev.2012.05.022.*

15. [a, b]*Pervez, S.; Rizvi, S.B. An empirical analysis on determinants of poverty: A co-integration analysis. J. Glob. Sci. 2014, 2, 1–5.*

16. [a, b]*Alkire, S.; Foster, J. Counting and multidimensional poverty measurement. J. Public Econ. 2011, 95, 476–487.*

17. [a, b]*Deaton, A. Household surveys, consumption, and the measurement of poverty. Econ. Syst. Res. 2003, 15, 135–159.*

18. ^*Lopez, J.H.; Servén, L. A Normal Relationship? Poverty, Growth, and Inequality; World Bank Publications: 2006; Volume 3814.*

19. ^*Mehrara, M.; Mohammadian, M. The determinants of Gini coefficient in Iran based on Bayesian Model Averaging. Hyperion Econ J 2015, 3, 20–28.*

20. [a, b]*Ahmad, N.; Batul, E.; Saleem, R. The Long Run and Short Run Relationship between Poverty and Literacy Rate in Pakistan. Pak. Bus. Rev. 2019, 20, 875–885.*

21. [a, b, c, d]*Meo, M.S.; Khan, V.J.; Ibrahim, T.O.; Khan, S.; Ali, S.; Noor, K. Asymmetric impact of inflation and unemployment on poverty in Pakistan: New evidence from asymmetric ARDL cointegration. Asia Pac. J. Soc. Work Dev. 2018, 28, 295–310.*

22. [a, b]*Enders, W.; Hoover, G.A. The effect of robust growth on poverty: A nonlinear analysis. Appl. Econ. 2003, 35, 1063–1071. https://doi.org/10.1080/0003684032000080871.*

23. ^*Bildirici, M.E.; Turkmen, C. Nonlinear causality between oil and precious metals. Resour. Policy 2015, 46, 202–211.*

24. [a, b]*Yusuf, L.A.; Dai, S.I. The Impact of Unemployment and Human Development Index on Poverty in Gorontalo Province 2008-2017. Jambura Equilib. J. 2020, 2.*

25. [a, b, c, d, e]*Powers, E.T. Inflation, unemployment, and poverty revisited. Econ. Rev. Reserv. Bank Clevel. 1995, 31, 2–13.*

26. ^*Molina, I.; Rao, J.N.K. Small area estimation of poverty indicators. Can. J. Stat. 2010, 38, 369–385.*

27. [a, b]*Quy, N.H. Relationship between economic growth, unemployment and poverty: Analysis at provincial level in Vietnam. Int. J. Econ. Financ. 2016, 8, 113–119.*

28. [a, b, c]*DeFina, R.H. The impacts of unemployment on alternative poverty rates. Rev. Income Wealth 2004, 50, 69–85.*

29. [a, b]*Chaudhry, I.; Malik, S.; Ashraf, M. Rural poverty in Pakistan: Some related concepts, issues and empirical analysis. Pak. Econ. Soc. Rev. 2006, 44, 259–276.*

30. [a, b, c]*Pervez, S.; Rizvi, S.B.-H. Determinants of poverty in case of Pakistan. Educ. Res. J. 2014, 5, 192–201. https://doi.org/10.14303/er.2013.222.*

31. ^*Naz, H.N.; Riaz, O.; Sirfraz, M. Determination of small farmers' poverty: Geographical prospective of selected areas in Faisalabad division. Int. J. Manag. Organ. Stud. 2015, 4.*

32. [a, b]*Ravallion, M.; Datt, G. Why has economic growth been more pro-poor in some states of India than others? J. Dev. Econ. 2002, 68, 381–400.*

33. ^*Talukdar, S.R. The Effect of Inflation on Poverty in Developing Countries: A Panel Data Analysis. Doctoral*

Dissertation, 2012.

34. ^*Sen, A. Poverty: An ordinal approach to measurement. Econom. J. Econom. Soc. 1976, 219–231.*

35. ^*Ahlburg, D.A. Population growth and poverty. In The Impact of Population Growth on Well-Being in Developing Countries; Springer: 1996; pp. 219–258.*

36. ^*Klasen, S.; Lawson, D. The impact of population growth on economic growth and poverty reduction in Uganda. Diskussionsbeiträge, 2007.*

37. ^*Mulok, D.; Kogid, M.; Asid, R.; Lily, J. Is economic growth sufficient for poverty alleviation? Empirical evidence from Malaysia. Cuad. Econ. 2012, 35, 26–32.*

38. ^*Morduch, J.; Graduate, R.F.W. Analysis of the Effects of Microfinance on Poverty Reduction Analysis of the Effects of Microfinance on Poverty Reduction; NYU Wagner Working Paper: New York, NY, USA, 2002.*

39. ^*Birdsall, N.; Londoño, J.L. Asset inequality matters: An assessment of the World Bank's approach to poverty reduction. Am. Econ. Rev. 1997, 87, 32–37.*

40. ^*Agrawal, P. Economic growth and poverty reduction: Evidence from Kazakhstan. Asian Dev. Rev. 2007, 24, 90.*

41. ^*Sirag, A.; Nor, N.M. Out-of-Pocket health expenditure and poverty: Evidence from a dynamic panel threshold analysis. Healthcare 2021, 9, 536.*

42. ^*Morrisson, C.B.D.M.; Cogneau, J.; Dumont, D.; Glick, J.; Razafindrakoto, P.; Razafindravonona, M.; Randretsa, J.; Berthélemy, I.; Lambert, J.; Hemmmer, D.; et al. Education and health expenditure and poverty reduction in East Africa: Madagascar and Tanzania. 2002.*

43. ^*Mayer, D.; Mora, H.; Cermeño, R.; Barona, A.B.; Duryeau, S. Health, Growth, and Income Distribution in Latin America and the Caribbean: A Study of Determinants and Regional and Local Behavior; Pan-American Health Organization: Washington, DC, USA, 2000; pp. 145–187.*

44. ^*Hugh Sinclair. Does Microfinance Really Help Poor People? The Guardian, 2014. Available online: https://www.theguardian.com/global-development-professionals-network/2014/oct/08/developing-countries-informal-economies-microfinance-financial-inclusion (accessed on).*

45. ^*Liu, Y.L.; Zhu, K.; Chen, Q.Y.; Li, J.; Cai, J.; He, T.; Liao, H. Impact of the COVID-19 pandemic on farm households' vulnerability to multidimensional poverty in rural China. Sustainability 2021, 13, 1842.*

46. ^*Zheng, C.; Zhang, J. The impact of COVID-19 on the efficiency of microfinance institutions. Int. Rev. Econ. Financ. 2021, 71, 407–423.*

47. ^*Dotsey, S. COVID-19 and Microcredit: Dissecting an NGO's Training, Financial Support, and Women Empowerment Programmes. Soc. Sci. 2022, 11, 402.*

48. [a, b]*Khan, T.A.; Khan, F.A.; Violinda, Q.; Aasir, I.; Jian, S. Microfinance Facility for Rural Women Entrepreneurs in Pakistan: An Empirical Analysis. Agriculture 2020, 10, 54. https://doi.org/10.3390/agriculture10030054.*

49. [a, b]*Ullah, I.; Khawaja, M.I.; Iqbal, N. Sustainability, market conditions and outreach: The vicious misconception of the win-win proposition in the microfinance industry. Econ. Res. Istraz. 2019, 32, 2122–2137. https://doi.org/10.1080/1331677X.2019.1642779.*

50. [a, b]*Wykstra, S. Microcredit, explained: How microcredit can help the world's poorest—Vox. vox.com, 2019. Available online: https://www.vox.com/future-perfect/2019/1/15/18182167/microcredit-microfinance-poverty-grameen-bank-*

yunus (accessed on).

51. ^Satti, R.A.; Ahmad, I. Addressing poverty through microfinance: Does it work. Pressacademia 2018, 7, 114–123. https://doi.org/10.17261/pressacademia.2018.800.

52. ^Sohn, W. The Impact of Microfinance on Poverty Alleviation: The Case of Pakistan. J. Asian Dev. 2019, 5, 16–36. https://doi.org/10.5296/jad.v5i3.15165.

53. a, bHussain, J.; Mahmood, S.; Scott, J. Gender, Microcredit and Poverty Alleviation In A Developing Country: The Case Of Women Entrepreneurs In Pakistan. J. Int. Dev. 2019, 31, 247–270. https://doi.org/10.1002/jid.3403.

54. ^Hosseinichimeh, N. Breaking the Vicious Cycle of Poverty: Micro-Lending. In Proceedings of the 2008 Syst. Dyn. Conf., 2008.

55. a, bAruoba, S.B.; Fernandez-Villaverde, J.; Rubio-Ramirez, J.F. Comparing solution methods for dynamic equilibrium economies. J. Econ. Dyn. Control 2006, 30, 2477–2508.

56. a, bGrüne, L.; Semmler, W. Using dynamic programming with adaptive grid scheme for optimal control problems in economics. J. Econ. Dyn. Control 2004, 28, 2427–2456.

57. ^Lütkepohl, H.; Xu, F. The role of the log transformation in forecasting economic variables. Empir. Econ. 2012, 42, 619–638.

58. a, bCuesta, J.; Pico, J. The gendered poverty effects of the COVID-19 pandemic in Colombia. Eur. J. Dev. Res. 2020, 32, 1558–1591.

59. a, bMartin, A.; Markhvida, M.; Hallegatte, S.; Walsh, B. Socio-Economic Impacts of COVID-19 on Household Consumption and Poverty. Econ. Disasters Clim. Chang. 2020, 4, 453–479. https://doi.org/10.1007/s41885-020-00070-3.

60. a, bRahman, S.; Junankar, P.N.; Mallik, G. Factors influencing women's empowerment on microcredit borrowers: A case study in Bangladesh. In Development Economics; Springer: 2009; pp. 205–224.

61. a, b, cMaliar, L.; Maliar, S.; Valli, F. Solving the incomplete markets model with aggregate uncertainty using the Krusell–Smith algorithm. J. Econ. Dyn. Control 2010, 34, 42–49.

62. a, bAmjad, R.; Kemal, A.R. Macroeconomic policies and their impact on poverty alleviation in Pakistan. Pak. Dev. Rev. 1997, 39–68.

63. a, bAbrar-Ul-Haq, M.; Shah, A.W.S.; Qamri, G.M. Poverty Profile and Correlates of Poverty in Pakistan: Evidence from District Vehari. Sci. Int. (Lahore) 2015, 28, 689–693.

64. ^Datta, G.; Meerman, J. Household income or household income per capita in welfare comparisons. Rev. Income Wealth 1980, 26, 401–418.

65. ^Ravallion, M. Global poverty and inequality: A review of the evidence. 2008.

66. ^Rambaud, S.C.; Pascual, J.L.; Santandreu, E.M. Staggered loans: A flexible modality of long-term financing for SMEs in global health emergencies. Quant Financ. Econ. 2022, 6, 553–569.

67. ^Weber, O. Impact measurement in microfinance: Is the measurement of the social return on investment an innovation in microfinance? J. Innov. Econ. 2013, 11, 149–171. https://doi.org/10.3917/jie.011.0149.