May 2012

Long Run Relationship between Poverty and Macro-Economic Variables in Pakistan

Muhammad Naeem Akhtar[1], Ahmed Imran Hunjra[2], Nadeem Safwan[3], Abrar Ahmad[4]

LONG-RUN RELATIONSHIP BETWEEN POVERTY AND MACROECONOMIC VARIABLES IN PAKISTAN

This study examines the long-run relationship between poverty and economic indicators in Pakistan. Data from 1972 to 2010 were used to analyze the relationship between various economic variables and poverty. The economic indicators include consumer price index, literacy rate and population growth. Head count rate was used to measure poverty. The statistical techniques used include unit root Augmented Dickey-Fuller test (for checking the stationary data) & Johansen's cointegration test for the long-run relationship. The study found the correlation between all the economic factors and poverty, which means that the economic performance indicators are pertinent predictors of poverty. This can help in developing poverty alleviation strategies.

Keywords: *economic indicators; causality; literacy rate; population growth; Johansen's cointegration.*

Introduction. Poverty is the form of living conditions, characterized by the lack of satisfaction of essential human needs, such as fresh water, food, hospitals, education, clothing and homes to live. Relative poverty is the form of having scarce means or low sources of income compared to others within a society, or compared to worldwide averages. Even those who can get above poverty are always close to falling back into its clutches.

These days poverty is more than just a low volume of income. Living in poverty means one is more likely to die from a disease, a condition where there is a high rate of child mortality, lack of educational institutions and lack of living facilities. It also means more exposure to crime and carnage, insufficient or lack of justice and access to courts, as well as keeping out from political process and the life of society in general.

According to the report issued by the World Development Forum 2000/2001 poverty is a definite scarcity in well-being. The voices of poor people articulate proof to its meaning. To be poor is to be in a state of hunger, scarcity of sufficient living and clothing facilities, to be sick and not cared for, to be illiterate and not schooled. The report acknowledges a new conventional view on poverty as not only material deficiency (measured by income and consumption) but also less achievement in health and education facilities. The report also broadens the idea of poverty to take in susceptibility and experience to risk – and – voicelessness and powerlessness.

There is extraordinary high level of global inequality within and between countries. Rich countries are getting richer day by day and most of developing countries are trying to catch them but are falling behind. Even rich regions and countries try hard to get rid of the persistent problem of poverty. Moreover, the relationship between income sources and progress of the society is not mechanical. Most of the strongest performers in eliminating income differences are widely off-track on human development targets like maternal transience and child mortality, frequently as the

[1] corresponding author, PhD Scholar, Iqra University, Islamabad, Pakistan.
[2] Lecturer, UIMS PMAS-University of Arid Agriculture, Rawalpindi; PhD Scholar, Iqra University, Islamabad, Pakistan.
[3] Assistant Professor, Fuji Foundation University, Islamabad, Pakistan.
[4] Associate Professor, Iqra University, Islamabad, Pakistan.

result of well-established patterns of inequity. This underscores the desire to recognize poverty from the perspective of human rights as well as economic perspective.

This paper explores and investigates the relationship between poverty and some economic variables like the consumer price index, population growth rate and the literacy rate in Pakistan. The study uses time series data for the period 1972–2010. The validity of data is checked by using the augmented Dicky-Fuller (ADF) test. Johansen maximum likelihood cointegration technique is applied to find the long-run relationship between the variables.

Literature review. This section is mainly focused on the literature related to growth theories and poverty trap theories. The macroeconomic research in the past few years faced a revival in growth theories and pro-poor growth models. The summary of various contributions by many social writers towards the long-run economic growth models reveals the structure of neoclassic economy. According to Domar (1957) the huge contribution to the growth theory is made by Solow (1956), he is considered to be a father of the neoclassical growth model.

The results of the neoclassical growth model (Solow (1956), Tobin (1955), Pilvin (1953) and Harrod (1953)) could be analyzed on the short- and long-run basis. For the purpose of the short-term thinking, basic steps covering changes in tax rates may result in a change in the output level of production. But for the long-run rate of economic growth, this is not the case.

Ramsey (1928), Cass (1965) and Koopmans (1965) in their research pointed out some important issues through which changes can be made to the neoclassical growth model. They focused on the social problems and discussed the society's savings behavior which is taken as a constant function of income. They assumed that every member of a community is identical and their behavior shall live forever. This would maximize their satisfaction over their lifetime. In response to the criticism raised by researchers on the assumptions of the neoclassical theory, the growth theory emerged gaining popularity in the early 1980's. The assumptions of constant returns to scale are replaced with the increasing tendency in returns to scale and as a result growth with independent variables could be observed. Human resource capital and technology are regarded as independent variable, although the neoclassical model regards these variables as dependent. The main focus on the growth model is that it does not rely on dependent variables and they ultimately foster the policies that affect saving behaviors and investments (King and Rebelo, 1990). The assumption of increasing returns created a challenge to the growth model since it is not applicable to a perfectly competitive market because factors of production cannot be paid from the amount produced. However, by utilizing the increasing trend of returns that are external to a firm, this trouble can be circumvented, as was experimented by Romer (1986), Lucas (1988), and Barro (1990). Romer (1986) specified increasing returns as a major condition in achieving endogenous growth, while focusing on human resource accumulation as endogenous in growth models was explicit in Lucas (1988).

Reduction of poverty in developing countries is based on economic growth according to Richard and Adams (2004), but the question is how to define economic growth. While focusing to control a change in income disparity, the growth in economy is calculated by the variation in income analysis, the growth elasticity of poverty is 2.79; i.e., 10% increase in the analysis will decrease poverty ($1.00/person/day) by

27.9%. But when economic growth is measured by variation in GDP per capita, the growth elasticity of poverty is insignificant – 2.27, which is lower than in the previous estimations.

Due to the solutions provided by the new growth theory regarding the limitations of the neoclassical growth models, it gained marvelous popularity in the last few decades. It also included some socioeconomic factors that have propelled the economic growth in the long-run. Based on the neoclassical and endogenous growth theories, economic growth may not be sustainable or even may not change into enhanced economic development. Many of developing countries' economies have the characteristics of being structural, capacity barriers impeding thorough interventions focusing towards enhancing the growth (Focus, 2007). The forecast predicted that the citizens' welfare would increase when an economy grows. In other words, there is a significant impact on the level of poverty due to the economic growth of a country. But this is not the case as most of developing countries have a remarkable growth rate of the economy, but this has not truly been translated into the reduction of poverty. Here is the example of Nigerian economy, where significant economic performance in terms of GDP growth did not result in reduction of poverty in the country. However, this was caused by the lack of continuous or insufficient growth rate of various economies (World Bank, 2006).

It is therefore very necessary for a growing economy to cope with the poverty trap, and to implement that kind of policies that have positive long-term impact on the living standards of a society. It is also worth mentioning that it is very difficult to maintain growth in an economy unless and until it is translated into the reduction of poverty. As a pathway to the improved version of development, there are two points of views with regard to growth-poverty relationship. The traditional view on development is meant to describe a country's features, policies and institutions as a core cause of growth in the economy. The traditional view is that these constraints are exogenous, in other words they are not determined by a system (World Bank, 2006). Another perspective related to poverty trap sees poverty as a core setback to the growth in an economy.

On the other side, an economy facing vicious circle of poverty would have the characteristics like corruption, malpractices, inefficient institutions, policies etc. The better example of poverty trap is the growth models with enhancing returns to scale, since the countries will move towards the variable equilibrium, depending on their initial state. The poverty trap models clearly show the reasons for poor performance of poor economies (World Bank, 2006).

According to Adams (2003), Bruno et al. (1998) growth elasticity of poverty in the 1990s was predicted to be between 2.0 and 3.0. This reflects that a 10% increase in economic growth shall ultimately lead to a 20–30% decrease in poverty. The World Bank (1999) by using the lower, "traditional" growth elasticities of poverty, recently projected that there are 1.15 bln. people living under the international poverty standard of $1.00 per person per day, while by using the "new", higher growth elasticities of poverty, concluded that less than 1/3 of population (450 mln.) are living under that poverty standard.

The level of initial income inequality in a country is due to the growth elasticity of poverty in that particular country. Therefore, there is a need for broader explo-

ration and research to look for the relation between economic growth, poverty and income inequality (Richard and Adams, 2004).

According to recent studies inequality has nothing to do with economic growth, because division of income has not changed over the period of time. Deininger and Squire (1996, p. 587) pointed out that during 1985–95 in developing countries of the world the GDP per capita increased by 26%, whereas Gini coefficients in the world changed by only 0.28% per year over the same period. Ravallion and Chen (1997) and Chen and Ravallion (2000) also argued in their research that the included data related to income, growth and poverty.

Methodology & data collection. The objective of this research is to quantify the long-run relationship between poverty and its determinants, such as the consumer price index, population growth rate and the literacy rate in Pakistan. This research paper examines the relationship between the variables in the following way:

1. To check whether a time series have a unit root, this paper applies the augmented Dickey-Fuller (ADF) unit root test.

2. To establish the long-run relationship among the variables, this paper applies Johansen's cointegration technique.

There is a number of econometric techniques used to measure the relationship between different economic variables. It depends upon the nature of data (time series, cross sectional and panel data) and the kind of relationship of the variables. As the main objective of the study is to find the long-run relationship between poverty and economic variables, the appropriate econometric technique, i.e. Johansen's co-integration technique was chosen for estimation. As the study uses the time series data for the period 1972–2010, it is necessary to check whether time series is a stationary or a non-stationary item before testing for cointegration. Usually cointegration is used to estimate the relationship between non-stationary variables. If time series is a non-stationary variable, then usual statistical tools to analyze data are not appropriate and known as spurious regression. Unit root test is applied for checking the stationary variables properly. As the first step all the variables are examined for the stationary issues of the data. For this purpose the augumented Dicky Fuller (ADF) test has been used. Once it is proven that the data has a unit root and all the variables are integrated in the same order, we then proceed with the cointegration technique. In the next step the long-run relationship is estimated by regressing the dependent variable poverty head count ratio on the set of independent variables (which are all integrated in the same order as mentioned in the first step). Thus, the residual series of regression is obtained for checking the existence of the long-run relationship between the variables.

Results and discussion. In this section, the results derived from the descriptive statistics, augmented Dickey-Fuller test, Johansen's cointegration test, and Granger causality test are presented and discussed in detail.

1. Descriptive statistics. Table 1 provides the self-explanatory descriptive statistics analysis done through the E-Views statistical software. HCR has the mean of 27.99595 and the standard deviation of 6.910372. CPI has the mean of 46.56774 and the standard deviation of 35.67619. LR has the mean and the standard deviation of 36.09611 and 9.347406 respectively. PG has the mean and the standard deviation of 2.638946 and 0.313128 respectively. The values of median, skewness, kurtosis, Jarque-Bera and probability are also given for all 4 variables in Table 1.

Table 1. **Descriptive Statistics**

	HCR	CPI	LR	PG
Mean	27.99595	46.56774	36.09611	2.638946
Median	26.20000	32.26388	35.40000	2.537531
Maximum	45.75000	139.6783	56.00000	3.192435
Minimum	20.71000	5.758316	21.62500	2.052363
Std. Dev.	6.910372	35.67619	9.347406	0.313128
Skewness	0.960488	0.815755	0.406183	0.452892
Kurtosis	2.985273	2.646475	2.340096	2.309493
Jarque-Bera	5.689316	4.296326	2.688761	2.999917
Probability	0.058154	0.116698	0.429823	0.367895

2. Augmented Dickey-Fuller test. Augmented Dickey-Fuller test has been applied to test the stationary status of the data using the E-views software. Table 2 shows the head count ratio (HCR) is stationary at 1st difference, consumer price index (CPI) is stationary at 1st difference, literacy ratio (LR) was found stationary at 1st difference, and population growth (PG) was found stationary at 1st difference.

Table 2. **Results of Augmented Dickey-Fuller Test**

		1% critical value	-3.653730
ADF Test Statistic — HCR	8.787739	5% critical value	-2.957110
		10% critical value	-2.617434
		1% critical value	-3.670170
ADF Test Statistic — CPI	3.557202	5% critical value	-2.963972
		10% critical value	-2.621007
		1% critical value	-3.646342
ADF Test Statistic — LR	1.673786	5% critical value	-2.954021
		10% critical value	-2.615817
		1% critical value	-3.626784
ADF Test Statistic — PG	-0.920539	5% critical value	-2.945842
		10% critical value	-2.611531

Variable	Coefficient	Std. error	t-Statistics	Prob.
D(HCR(-1))	1.321068	0.150331	8.787739	0.0000
D(CPI(-1))	0.122931	0.034558	3.557202	0.0018
D(LR(-1))	-0.946334	0.122802	1.673786	0.0000
D(PG(-1))	-1.220788	0.169109	-7.218934	0.0000

Table 3. **Results of Johansen cointegration test**

	Eigen Value	Likelihood Ratio	5% Critical Value	1% Critical Value	Hypothesized No. of CE(s)
HCR	0.446326	54.22217	47.85613	54.68150	None
CPI	0.372674	33.53088	29.79707	35.45817	At Most 1
LR	0.285184	17.21076	15.49471	19.93711	At Most 2
PG	0.144446	5.460207	3.841466	6.634897	At Most 3

3. Johansen cointegration test. Johansen cointegration test explains whether there is any effect between dependent and independent variables in the long-term. The results of Johansen's cointegration test are shown in Table 3, which depicts that all the variables are having cointegration. The analysis of cointegration between economic indicators and poverty demonstrates that all the economic factors have a long-term

effect and have cointegration with poverty. CPI, LR and PG are having cointegration with poverty at the 5% significance level as well as the 1% significance level.

Conclusion & future research. The study has analyzed the long-term relationship between economic indicators and poverty in Pakistan. The macroeconomic indicators of consumer price index, literacy rate and population growth are used, whereas poverty is represented by a head count ratio. The study analyzes the long-term relationship between economic indicators and poverty in Pakistan.

The research shows that all the tested economic variables have a significant long-term relationship with poverty at the 5% significance level as well as the 1% significance level. So, to split the vicious circle of poverty, decision-makers should focus on activities for increasing the literacy rate, creating awareness among the masses of the benefits of education. Public-private partnership can be the best possible source for the increase in number of educational institutions, providing the facilities for the enhancement of quality of education. Government should take necessary steps for controlling the consumer price index. Population growth is the biggest challenge for Pakistan. Government as well as private sector including the NGOs and other social sector organizations can play a pivotal role in controlling the population growth rate in Pakistan. This will enable the government to eradicate poverty from Pakistan. Future research may focus on social and cultural factors that could eradicate poverty in the region.

References:

Adams, J.R. (2003). Economic growth, inequality and poverty: findings from a new data set. World Bank Policy Research Working Paper #2972. Washington, DC: World Bank, February.

Barro, R.J. (1990). Government spending in a simple model of endogenous growth. Journal of Political Economy, 98(5): 103–125.

Bruno, M., Ravallion, M., Squire, L. (1998). Equity and growth in developing countries: old and new perspectives on the policy issues. In: V. Tani & K.-Y. Chu (Eds.). Income distribution and high growth. Cambridge, MA: MIT Press.

Cass, D. (1965). Optimum growth in an aggregative model of capital accumulation. Review of Economic Studies, 32: 233–240.

Chen, S., Ravallion, M. (2000). How did the world's poorest fare in the 1990s? World Bank Policy Research Working Paper #2409. Washington, DC: World Bank, August.

Deininger, K., Squire, L. (1996). A new data set measuring income inequality. World Bank Economic Review, 10(3): 565–591.

Domar, E. (1957). Essays in the Theory of Economic Growth. Oxford University Press.

Focus, (2007). Integrated Social Development as the Accelerator of Shared Growth. Compiled by the Bureau for Economic Policy and Analysis (BEPA), Department of Economics, University of Pretoria. No. 55.

Harrod, R.F. (1953). Full Capacity vs. Full Employment Growth: Comment. Quarterly Journal of Economics, 67(4): 553–559.

King, R.G., Rebelo, S.T. (1990). Public policy and economic growth: developing neoclassical perspectives. Journal of Political Economy, 98: 126–150.

Koopmans, T.C. (1965). On the concept of optimal economic growth, in study week on the econometric approach to development planning. North-Holland Pub. Co. Amsterdam.

Lucas, R.E. (1988). On the mechanics of economic development. Journal of Monetary Economics, 22: 3–42.

Pilvin, H. (1953). Full capacity vs. Full employment growth. Quarterly Journal of Economics, 67(4): 545–552.

Ramsey, F.P. (1928). A mathematical theory of saving. Economic Journal, 38: 543–549.

Romer, P.M. (1986). Increasing returns and long-run growth. Journal of Political Economy, 94(5): 1002–1037.

Ravallion, M., Chen, S. (1997). What can new survey data tell us about recent changes in distribution and poverty? World Bank Economic Review, 11(2): 357–382.

Richard, H., Adams, J.R. (2004). Economic Growth, Inequality and Poverty: Estimating the Growth Elasticity of Poverty, World Development, 32(12): 1989–2014.

Solow, R.M. (1956). A contribution to the theory of economic growth. Quarterly Journal of Economics, 70(2): 65–94.

Tobin, J. (1955). A Dynamic aggregate model. Journal of Political Economy, 63 (2): 103–115.

World Bank (1999). Global economic prospects and the developing countries 2000. Washington, DC: The World Bank.

World Bank (2006). Poverty reduction and growth: virtuous and vicious circles. World Bank, Washington, D.C.