

Effects of macroeconomic variables on poverty in Iran (Application of bootstrap technique)

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Abstract. *It is believed that the level of poverty is significantly determined by macroeconomics variables such as inflation, government expenditure and unemployment rate. In this paper attempt has been made to investigate how macroeconomics variables affect the level of poverty in Iranian society. Our findings indicate that economic growth has significant effects on poverty in Iran. In addition, there is a negative relation between poverty and growth, namely increasing the growth rate leads to poverty reduction. The results of this study have also shown that unemployment and inflation have positive effects on poverty, while social security expenditure relating to government expenditure has no meaningful effects on poverty. In this study bootstrap technique is used to check the validity of the results.*

Keywords: poverty, unemployment, growth, government expenditure, bootstrap.

JEL Classification: E61, I32.

REL Classification: 7G, 8M.

1. Introduction

One of the most widely used measure is headcount ratio, which simply measures the proportion of the population that is counted as poor, often denoted by H .

Formally, $H = \frac{q}{n}$ Where q is the number of the poor and N is the total population.

Another moderately popular measure of poverty is the poverty gap index, which adds up the extent to which individuals on average fall below the poverty line, and expresses it as a percentage of the poverty line.

More specifically, the poverty gap (I) is defined as the poverty line (Z) less than the actual income (s_i) for the poor individuals. The gap is considered to be zero. Otherwise using the index function, we have:

$$g_i = (z - \mu^*) \cdot I(Y_i < z)$$

Then the poverty gap index (I) may be written as

$$I = \frac{\sum_{i=1}^q (z - s_i) / q}{z} = \frac{z - \mu^*}{z} = \frac{\sum_{i=1}^q g_i}{qz}$$

In addition to previous indices, Sen (1976) index is also used in this paper. Sen (1976) proposed an index that sought to combine the effects of the number of the poor, the depth of their poverty and the distribution of poverty within the group. The index is given by

$$P = Q(Z) = H[I + (1 - I)G^*]$$

Where H is the headcount ratio, G^* is the Gini coefficient of inequality among the poor and I is the poverty gap index .

In analyzing the poverty one of the basic questions is that how we can distinguish the poor from the non-poor? To answer this question, first we have to define poverty. With a literature review of poverty we can observe that various definitions are given for poverty. Each of these definitions has led to different criteria for assessment of poverty. There are various methods for calculating the poverty threshold. Depending on which concept of poverty to be concerned, there will be different methods of calculating poverty line. Table 1 summarizes the most important methods for evaluating the poverty threshold:

Table 1. *Different Methods for Assessing Poverty Line*

Method	Remarks
Measuring poverty line based on calorie needs	The poverty line is measured based on the calorie need and the concept of absolute poverty and the basic needs. In these studies, the poverty line is measured based on 2179, 2300 and 2000 calories.
Measuring poverty line based on 50 or 66% of the average household expenditure	This method indicates a relative definition of poverty line, in which poverty line is determined according to the average cost of the households and based on a related rate.
Measuring poverty line based on 50% to 66% of median of household expenditure	A percent of mean of costs is considered as the poverty line.
Measuring poverty line based on the reciprocal Engel coefficient	Average households expenditure multiplies the estimated Engle coefficient.

As you see in Table 1, there are various methods for calculating poverty line. If we assume that each person needs only 2000 calories of energy per day, the estimated poverty line is shown in Table 2 for the years 2001 to 2007. These results indicate that the poverty line in urban area has shown an upward trend in the years under study. The study carried out by Khodadad Kashi and his colleagues (2008) revealed that the income gap during the years 2001 to 2007 in rural regions, has had lots of fluctuations, so that in the year 2001, the income gap in rural regions was 0.234 and in the year 2005 it declined to 0.226 and in the year 2007 once again it increased to 0.243.

In urban regions, the income gap during the years 2001 to 2004 has had an upward trend so that this index was 0.214 in 2001, and increased to 0.243 in 2004. In 2005, the index declined to 0.199 and maintained an upward trend thereafter.

During 2001 to 2007, the poverty line maintained an upward trend both for rural and urban regions, so that the poverty line in rural regions increased from Rls819763 per month in 2001 to Rls2640222 in 2007. In urban area the poverty line increased from Rls1393267 to Rls4235601 during the same period.

Upon evaluation to attain minimum calories during the years 2001 to 2007, it was observed that the cost of calorie intake has increased for poor families during the period of study, so that each person in urban household needed Rls297602 per month for providing 2000 calorie per day in 2001 and Rls980118 in 2007. Regarding to Head-Count Ratio, we can observe that the number of poor people in 2007 increased compared to 2001, so that the rate of poverty increased from 4% of the total population in 2001 to 4.9% in 2007. Based on Sen Index, income gap, the changes in poverty have been shown in Table 3.

Table 2. Poverty indices in Iran, based on 2000 calories intake poverty line

year	region	Income gap	Poverty line	Head-Count Ratio
2001	rural	0.234	819763	4.5
	urban	0.214	1393267	4.0
2002	rural	0.235	1040327	4.1
	urban	0.228	1749769	4.4
2003	rural	0.233	1280090	4.2
	urban	0.231	2235705	4.1
2004	rural	0.235	1715157	4.2
	urban	0.243	2815233	4.6
2005	rural	0.226	1921691	4.2
	urban	0.199	3191748	4.3
2006	rural	0.224	2248901	4.6
	urban	0.212	3558943	4.7
2007	rural	0.243	2640222	4.4
	urban	0.231	4235601	4.9

Source: Khodadad Kashi et al., 2010.

Table 3. Poverty indicators based on 2179 calories intake poverty line

year	SEN poverty index		Income gap index		Head-Count Ratio	
	Rural regions	Urban regions	Rural regions	Urban regions	Rural regions	Urban regions
2001	0.024	0.019	0.248	0.234	6.913	5.727
2002	0.021	0.02	0.247	0.245	6.129	6.01
2003	0.02	0.019	0.247	0.242	5.811	5.65
2004	0.019	0.022	0.242	0.252	5.503	6.084
2005	0.019	0.018	0.235	0.223	5.659	5.767
2006	0.022	0.021	0.233	0.233	6.627	6.474
2007	0.021	0.022	0.248	0.25	6.197	6.375

Source: Khodadad Kashi et al., 2010.

2. Effects of macro variables on poverty

Macroeconomic variables such as inflation, unemployment, government's expenditure and economic growth affect the extent of poverty indices. In macroeconomic issues, the economic stabilization is one of the most important goals of economy, always persuade by governments through economic policies. Government and monetary officials apply macroeconomics policy including fiscal and monetary policies to stabilize the economy.

Not only Business cycle leads to the deviation of macroeconomics variable from their long run path but also badly affect the poor people. Two major business cycles include recession and inflation cycles. In the first case the economic activities will face a remarkable decline and the level of production and employment will decrease. It is obvious that the effects resulted from business

cycles that mainly include unemployment and inflation, will have the most important influence on low income and the poor stratum of the society. The reduction of employment through reduction of job opportunities will deprive all individuals of the society, especially poor people who are not the owners of the production, from gaining of income and the inflation will reduce their purchasing power over time. In such circumstances, the government and Central Bank implement stabilization policies in order to reduce the length of recession and inflation cycles. So, in continuation of the discussion, we will try to have a more precise analysis in order to study the effects of macro variables on poverty in Iran.

It also should be noted that some studies like Khodadad Kashi (2010); Baye (2006); Baye and Fambong (2001); Bigsten et al. (2003); Canagarajan et al. (1997); Datt and Gunewarden (1997); Datt and Ravallion (1992); Foster et al. (1984); Kakwani (1997); McKay (1997); Ravallion (2001); Zelealem (2006) have reviewed the literature.

3. Introducing the model

In this section, we try to investigate the relation between macro variables and poverty level through an econometric model. In line with achieving this goal, we will first introduce the model and stationary testing of the variables, and we will then analyze the number of Co-integration vectors in poverty equations and finally we will estimate the optimal model and consider the tests for goodness of fit of the model and analysis of the estimated model.

In this research, the variables of inflation rate, unemployment rate, Gini coefficient, the share of Social Security and Health expenditures to the government's budget and the economic growth during the years 1985-2007 are considered as determinants of poverty level. The statistical information related to the price index, Gini coefficient, the Social Security and Health expenditure and the government's expenditure have been obtained from Central Bank of Iran and the information related to unemployment rate from the Statistical Center of Iran (SCI).

In order to study the effect of macro variables on poverty in Iran the following regression has been considered:

$$Pov = \alpha + \beta_1 Gini + \beta_2 SSG + \beta_3 U + \beta_4 Inf + \beta_5 Y + \varepsilon$$

$$Pov = [H, I, Q(Z)]$$

in which Gini is the inequality measure, SSG is the share of Social Security and Health expenditures to the government's budget, U is the unemployment rate, *Inf* is the inflation rate and y indicates the economic growth.

$$\frac{q}{n} = \alpha + \beta_1 Gini + \beta_2 SSG + \beta_3 U + \beta_4 Inf + \beta_5 Y + \varepsilon \quad (1)$$

$$\frac{\sum_{i=1}^q (z - s_i) / q}{z} = \alpha + \beta_1 Gini + \beta_2 SSG + \beta_3 U + \beta_4 Inf + \beta_5 Y + \varepsilon \quad (2)$$

$$H[I + (1 - I)G^*] = \alpha + \beta_1 Gini + \beta_2 SSG + \beta_3 U + \beta_4 Inf + \beta_5 Y + \varepsilon \quad (3)$$

3.1. Stationary test

The use of usual methods of econometrics in experimental studies is based on the assumption that the time series variables existing in the model are stationary. On the other hand, most macroeconomic time series are non-stationary. So, before using time series it is necessary to get assured whether they are stationary or non-stationary. To find out whether the time series variables used in the model are stationary or non-stationary, Augmented Dickey Fuller (ADF) test, Phillips-Perron (PP) test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test have been used.

As you can see in Table 4, most of the variables in this study (excluding the unemployment rate and SSG) are stationary.

Table 4. ADF, PP and KPSS test at 95 percent of confidence level

Variables	ADF			pp		KPSS			
	ADF	*N(lag,c,t)	0.05	Z(t _α)	B(h,c,t)	0.05	LM	***KPSS (h,c,t)	0.05
Stationary tests									
GINI	-3.72	N(0,c)	-3.0	-3.70	B(1,c)	-3.0	0.34	B(1,c)	0.46
h	-3.78	N(0,c,t)	-3.63	-3.78	B(0,c,t)	-3.63	0.10	B(2,c,t)	0.14
SSG	-2.45	N(0,c,t)	-3.57	-2.45	B(0,c,t)	-3.58	0.6538	B(0,c)	0.46
Inf	-2.97	N(0,c)	-3.0	-3.04	B(1,c)	-3.0	0.21	B(2,c)	0.46
Y	-4.77	**** N(0,n)	-1.95	-4.79	B(2,n)	-1.95	0.20	B(0,n)	0.46
U	-0.77	N(0,n)	-1.95	-0.77	B(0,n)	-1.95	0.12	B(3,n)	0.46
Sen	-3.88	N(0,c,t)	-3.63	-3.88	B(2,c,t)	-3.63	0.10	B(2,c,t)	0.14
Z	-3.97	N(0,c,t)	-3.63	-3.97	B(0,c,t)	-3.63	0.16	B(0,c,t)	0.14

In this research in order to determine the number of co-integration vectors, the test statistic quantities of λ_{trace} and λ_{max} have been used. As you can see in Table 5, based on the two statistics (λ_{trace} and λ_{max}) the existence of one co-integration vector in Sen regression equation is approved, but the equations in which the dependent variable is the number of poor people (h) and the income gap (Z), do not have co-integration vector.

Table 5. Determining the number of co-integration vectors with λ_{trace} and λ_{max}

Equations	hypothesis	λ_{max}	λ_{trace}	Critical value	p-value	result
SEN Equation(SEN)	$H_0 : r = 1$ $H_1 : r \geq 1$	0.22	5.05	3.84	0.024	One co-integration vector
number of poor equation (h)	$H_0 : r = 1$ $H_1 : r \geq 1$	0.000154	0.003	3.84	0.95	Without co- integration vector
Income gap equation(z)	$H_0 : r = 1$ $H_1 : r \geq 1$	0.153	3.32	3.84	0.068	Without co- integration vector

Source: current research.

So, taking the above issue into consideration, in this research in order to avoid encountering spurious regression, the regression model in which the dependent variable for poverty index is Sen, has been used in order to measure the effect of macro variables on poverty in Iran.

3.2. Estimation of the model

The results of a survey on the effect of macro variables on poverty in Iran reveal that the Gini Coefficient, unemployment rate, inflation rate, economic growth rate and the wartime have had significant effect on poverty in Iran.

As shown in Table 6, the Gini coefficient has a negative impact on the poverty in Iran. Perhaps it is assumed that there is a positive relation between inequality of income and poverty, but the case is that we have to determine what would be the reason for change of Gini coefficient and what is the reason for its increase and decrease?

The Sen poverty index is the result of poverty gap, Head count ratio and inequality in income distribution and specially income distribution amongst poor families. Actually the extent of poverty index mainly pertain to the poor people of the society. But on the other hand, the Gini coefficient is an index that addresses the distribution of income throughout the whole society and is influenced by income information of all people of the society. So, we cannot expect that there is always a pre-defined relation between the Gini coefficient and poverty index. This

means under specific circumstances the Gini coefficient may change in one direction and the poverty index may change in the opposite direction.

In the current study, the poverty index has been calculated based on the poverty line according to the minimum energy intake. During the study, the supporting policies (payment of subsidies for necessity goods) have caused the households to have access to their minimum energy requirements and this issue has a declining effect on the poverty calculated based on calorie.

On the other hand some studies confirm that the currency and monetary policies implemented during the period of study have increased inequality. So, it is natural that the direction of changes of poverty index and Gini coefficient during the period under survey to be reversed.

As we expected from theoretical point of view, the increase of unemployment rate leads to intensified poverty. As it is shown in Table 6, the unemployment rate in Iran has a significant effect on increasing the poverty. Also the inflation rate, as another macro parameter, has a significant effect on increase of poverty in Iran.

There is an important question whether or not the economic growth has led to reduction of poverty in Iran. The issue that how growth impacts poverty, depends on how the additional income resulted from growth is distributed within the country. In principal, if the economic growth happens with the increase of income for the poorest people, poor people's income will grow faster than people with an average level of living. Accordingly, if the economic growth is associated with the reduction of share of income of the poorest families, the growth of poor people's income will be less than the average income growth of the country. In other words, from the theoretical point of view, whenever the distribution of income is more balanced, with a specified rate of economic growth, poverty will be less than the average income growth of the country.

The results of this survey reveal that first the economic growth has a significant influence on intensity of poverty in Iran; secondly the relation between economic growth and poverty is negative which means the economic growth has leads to the reduction of poverty. In the estimated model, it is observed that the SSG has not had a significant effect on reduction of poverty.

Table 6. Effects of macro variables on the poverty index (based on Sen index)

$pov = \alpha + \beta_1 Gini + \beta_2 SSG + \beta_3 U + \beta_4 Inf + \beta_5 Y + \beta_6 Dum$				
variables	coefficient*	Standard error of coefficient	statistics t	p-value
intercepte	-7.838639	309.0166	-0.025366	0.9802
Gini coefficient	-2.057618	1.022801	-2.011747	0.0673
Share of social security expenditure in government budgets	847.1132	589.5236	1.436945	0.1763
Unemployment rate	0.836433	0.403429	2.073307	0.0603
Inflation rate	0.158920	0.074551	2.131713	0.0544
Economic growth	-0.119071	0.055098	-2.161074	0.0516
Dummy variable	-9.485832	1.956840	-4.847527	0.0004
Other measures				
$R^2 = 0.91$		$\bar{R}^2 = 0.85$		Durbin-Watson= 2.2
Ramsey RESET Test: F-statistic=-0.856613		Jarque-Bera= 1.16 Prob(0.55)		Prob(F-statistic)= 0.000025
Heteroskedasticity Test: ARCH: $nR^2 = 3.33$ <i>prob</i> : 0.06				

Source: current research.

3.3. Statistical test of the model estimators using bootstrap method

One of the important issues in studying the income distribution, poverty and social welfare is that it may be possible that the value calculated for an estimator or the value of its changes in statistical point of view is not significant. So, it is necessary to measure the statistical validity of the coefficient through calculating the confidence interval. Since the identification of distribution and estimation of diversion of the criteria of poverty indices is analytically problematic because of complexity, so the researchers use the resampling method. There are three traditional methods and one modern method in resampling. The traditional methods include: cross-validation, Jackknife method and Delta method. The modern method of resampling is called bootstrap. Bootstrap is used to calculate the confidence intervals for the estimated parameters. In other words, this method is used for bias correction of statistical inference.

In this survey, 200 of the existing samples were resampled and the confidence interval has been calculated for each coefficient at 95% significance. The findings are mentioned to include dispersion of criterion and confidence level for the estimators of regression model, specified based on the bootstrapping method in Table 7. Table 7 shows the confidence interval for the coefficient of the regressors.

Table 7. Calculating standard deviation and confidence interval (with bootstrapping technique)

variables	coefficient*	Standard error of coefficient(with bootstrap)	t statistics	Confidence interval (95)
intercepte	-7.84	20.88	-0.38	[- 28.72 13.04]
Gini coefficient	-2.06	0.68	-3.01	[- 2.47 -1.37]
Share of social security expenditure in government budgets	847.11	1938.72	0.44	[-1091.61 2785.3]
Unemployment rate	0.84	0.21	4.07	[0.63 1.04]
Inflation rate	0.16	0.08	1.98	[0.08 0.24]
Economic growth	-0.12	0.04	-2.88	[- 0.16 - 0.08]
Dummy variable	-9.49	1.22	-7.80	[-10.7 - 8.27]

Source: current research.

4. Conclusions

This study aimed to examine the poverty trend in Iran firstly by posing the relevant theoretical basis and then evaluating the impact of macroeconomic indicators on the Poverty so that based on these topics some policy recommendations is offered as follows:

1. The findings demonstrate that the unemployment has had a significant effect on the poverty increase in Iranian society. It is stated theoretically (in the macroeconomic domain) that Favorable performance of the labor market performs a crucial role in an economy while Iranian economy indicates disequilibrium in both supply and demand sides so as not use its potential capacities and causes more poverty. Hence it is offered that the government and central bank pursuit coordinated financial and monetary policies in line with job creation. Meanwhile, the vulnerable groups specially women and youth as the target groups must be regarded through the labor market and supportive priorities.
2. The results show that the inflation has a positive impact on the poverty increase in Iran. Rate of liquidity growth under the literature has been the most important paradigm among various effective factors so that the covariance of liquidity growth and inflation was positive and high correlated. So, adopting contractionary monetary policy by the officials in order to reduce the absolute poverty is the main solution for hinder the inflation rate.
3. As mentioned before that there is a negative relationship between the economic growth and poverty, therefore the relevant officials should have more attention on

this variable in order to reduce the absolute and relative poverty by following the growth-oriented strategies, besides designing more efficient institutions which give more proceeds and profits to the poor. In other words, the government in line with serving its necessary classic task which is fairly income, opportunities and facilities distribution should prepare a pattern for optimal allocation of resources as far as by implementing income redistribution policies make a proper pave for efficient transition of growth spillovers on the fragile groups and less developed regions.

4. The results indicate that the Expenditure share of Social Security and Welfare has not had a significant role in the government budget in order to reduce the volume of poverty. The empirical evidence states that the government expenditures lead to more inequality and poverty in the society. This is while that combination of government expenditures is the important issue in the path of making opportunities and facilities such that decreases the poverty in mid-term and long run, if it happens. That is, some measures like providing an appropriate basis in order to expand the growth of infrastructures such as roads, hospitals, schools, railways and generally the public goods in addition to preparing Latest minimum requirements livelihood of deprived regions including fresh water availability, electricity and sanitation services, presenting a good framework for the transfer and subsidies payments to the poor groups and so on could reduce the absolute poverty of the society. Hence it is suggested that the Iranian government applies a right combination for allocation of credits as well as resources distribution at the aim of enhancing the economic growth and poverty reduction.

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