Assessing the Relationship between Poverty, Income Distribution and Economic Growth in Iran (FLSR Fuzzy approach)

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Abstract

Eliminating poverty and reducing income inequality is the most difficult task of economic policy making when considered with an economic growth. Therefore, the impacts of economic growth and development on income distribution largely depend on the growth model. Thus, determining an effect of economic growth on poverty is uncertain and relies on its country's growth pattern. The basic question of this paper which we are looking for is that have economic growth and income distribution had an impact on the poverty in Iran? To respond the question, we employed fuzzy regression for analyzing the variables relationship. The article also under the fuzzy logic presents an analytical framework at the aim of appraising the relationship between poverty, income distribution and economic growth. The results show that there is a positive relationship between the economic growth and poverty, in other words the economic growth has had negative impacts on the poverty reduction in Iran. Computational results based on fuzzy logic in Iran implies that the most ideal conditions come when the economic growth is 8 percent on overage and Gini coefficient is nearly 38.5 percent[1].

Keywords: Poverty, Income Distribution, Economic Growth, Fuzzy Logic, Fuzzy Regression.

JEL Classification: D33, P36, F43, C21

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1. Introduction

Based on the economic theories, High Economic growth can provide more opportunities for increasing society's incomes through extending the size of markets as well as generating necessary stimuli for promoting the income of all low-income groups of society. Under this circumstance the producers in response to the new emerging opportunities demand greater labor forces in the markets so that this issue can have a remarkable role in reducing poverty through absorbing the surplus of labor forces and even improve of the wages. For economic policy making, it always is important whether a level of income inequality should be accepted in order to accelerate an economic growth or a slower economic growth should be regarded for improving an income inequality. In a sense, the basic question of paper tackle this issue that have the economic growth and income distribution had an impact on the poverty in Iran? At first, in order to answer the question, we apply a fuzzy regression to analyze the relationship between the variables and then going to assess the relationship between the poverty, income equality and economic growth based on the analytical framework of fuzzy logic. It is noteworthy that there has been considerable research at the scope of Iran in this area like:[3,19,15,9,23,14,13,12].Moreover, some abroad literature include [26,25,8,38,18,17,22,31,4,39,40] so that Most studies have examined the poverty and its effective factors and rarely applied the Classical Regression. Now, this paper attempts to evaluate the relationship among the poverty, income distribution and economic growth by using the fuzzy logic and regression.

The paper is divided as follows: Section 2 describes the literature on the Relationship between Poverty, Income Distribution and Economic Growth. Section 3 describes the Methodology. Section 4 performs FLSR fuzzy regression estimation and section 5 performs analysis based on Fuzzy Logic. Finally, section 6 summing up.

2. Poverty, Income Distribution and Economic Growth

Many studies investigated the relationship between poverty, income distribution and economic growth. For example, examining the micro data Ravallion (2001) showed that the inequality, growth and poverty relationship is quite complicated in USA. The next year (2002), he showed that poverty has an adverse effect on consumption growth and leads to economic growth that reduces poverty less. Studies such as Lazear and Rosen (1979), Rosenzweig and Binswanger (1992), Foellmi and Zweimuler (2006), and Cinganno (2014), in different countries showed that inequality can affect economic growth in a number of complex ways and through channels.

Heshmati (2004) investigated the causal relationship between inequality and a number of macroeconomic variables (growth, openness, wages, and liberalization) frequently found in the inequality and growth literature. The data used in his paper are obtaines from 151 countries over the priod 1950 until 1998. The results showed that income inequality is declining over time. Inequality is

also declining in growth of income and there is a significant regional heterogeneity in the levels and development over time. The Kuznets hypothesis represents a global U-shape relationship between inequality and growth.

By using newly compiled data by solt (2009) for 33 countries, Berg et al. (2019), fined that lower net inequality is correlated with faster and more durable growth. They included initial income inequality and redistribution in their baseline regressions. Also, they found that redistribution becomes safe in terms of its impact on growth, except when it is extensive; and inequality seems to affect growth through human capital cumulation and productivity channels.

Halter et al. (2014) proposed a simple theoretical framework to highlight the biases associated with the different techniques. Their empirical finding were based on a comparatively large dataset that covers up to 106 countries over a period from 1965 to 2005. They concluded that higher inequality fosters performance and growth in the short run, nevertheless, inequality tends to have a negative effect on economic growth in the long run.

Grundler and Scheuermeyer (2018) use GMM estimation to examine the effect of income inequality on growth for countries at different levels of development. They split their sample into groups of countries at different levels of development. They found negative effects of inequality for poor and middle-income countries. They attribute this to poor public infrastructure and capital market imperfections and didn't find the effect of inequality on growth for richer countries. Also, the results of them showed that redistribution is generally positive for poor and middle-income countries but harmful for economic growth in wealthier countries.

McKnight (2019) examined the theoretical literature and empirical evidence on the relationship between poverty, inequality and economic growth. He found evidence that economic inequality for growth is good as well as new convincing evidence that inequality is bad for growth. He states that a recent hypothesis that the relationship between inequality and growth might be non-linear, with very low and very high levels of inequality being harmful to growth but a range in between where the relationship is not clearly defined might provide a means to unify some of the conflicting findings.

By focusing on both inequality and poverty and their interaction, Breunig and Majeed (2020) highlighted a negative impact of inequality on economic growth. Their basic economic data consists of 152 countries. The results of them showed that when they account for both inequality and poverty, the negative effect of inequality on growth appears to be concentrated amongst countries with high poverty.

Other studies were also conducted with focus in Iran. Mehregan et al (2008) estimated growth and distribution models in Iran by econometrics methods. They states that one of the most significant hypotheses about the impact of economic development on income distribution is Kuznets hypothesis. They suggested to reduce the level of economic inequality in Iran, economic policies must be directed to the agricultural growth, the sector that includes the less skilled and

low-income segments of the population. One the major factors of unequal income distribution in Iran is the presence of sectoral duality. Implementing policies to create an economic balance among existing sectors, not only could reduce the present income inequality, but also could create a sustainable economic growth. On this basis, in present conditions of Iran that income distribution is imbalanced and the level of national income is below average, the distribution model along with growth or pro poor growth is strongly suggested, because poverty reduction and income growth, not only are compatible, but also are related in practice.

Bakhtiari et al (2010) recognized the impact of income distribution on economic growth in Iran. By an endogenous growth model, they showed that rising income inequality would hinder economic growth in Iran and there is a positive relation between economic growth and the growth in employment, technological progress, human capital and investment spending.
Khodad Kashi and SHahiki Tash (2014) investigated how macroeconomics variables affect the level of poverty in Iranian society. They concluded that economic growth has significant effects on poverty in Iran. Also they showed that there is a negative relation between poverty and growth, namely increasing the growth rate leads to poverty reduction. In addition, they indicate that unemployment and inflation have positive effects on poverty, while social security expenditure relating to government expenditure has no meaningful effects on poverty.

Using smooth transition nonlinear regression model, Heidari and Hassanzadeh (2017) examined the effects of income inequality on Iran's GDP per capita. They showed that the link between income inequity and economic growth in Iran is nonlinear and includes a two-regime structure, that in the first regime the effect of income inequality on GDP per capita is negative and positive in the second regime. So they included that a net positive or negative impact of the inequality on growth that was achieved in most studies, cannot be accepted.

3. Methodology
There are different models of fuzzy regression that classified into two groups linear planning and fuzzy least squares. The fuzzy least regression given the inputs, outputs and parameters can be grouped into three classes including: 1-all inputs, outputs and parameters are fuzzy 2- outputs and parameters are fuzzy but inputs not 3-outputs and inputs are fuzzy while parameters not.
In most fuzzy regression models, Dependent variable and parameters are considered fuzzy while independent variables non-fuzzy. This study has applied inputs as fuzzy and outputs and parameters as non-fuzzy variables. Been fuzzy of output may be due to a Lack of precision in measure of phenomena, output ambiguity or been linguistic of output (E.g., very poor, relatively poor) as well may for arranging by order [34].
Let the inputs and outputs of regression are as follows:

$$(x_i, y_i) \qquad i=1, 2, \ldots, n$$

Where x and y terms are inputs matrix and dependent variable vector respectively. Additionally the non-fuzzy inputs and fuzzy output defined as(x_i, y_1). Hence, the fuzzy regression model is as:

$$y_i = \sum_{j=0}^{k} \hat{\beta}_j x_{ij} \qquad i=1, 2,\ldots, n$$

Where k is number of regression inputs, n implies number of observations, $\hat{\beta}_J$ is fuzzy parameter and term y_i indicates the fuzzy output. In fact, $\hat{\beta}_J = (c_j, l_j, w_j)$ and c_j, l_j, w_j Components is named the center, width of left side and width of right side of $\hat{\beta}_J$ respectively and $\hat{\beta}_J$ is a triangular fuzzy number.

If w=1, triangular fuzzy number $\hat{\beta}_J$ is asymmetric otherwise the number is non-asymmetric and the fuzzy output values is $y_J = (y_i, l_{y_i}, w_{y_i})$. The fuzzy coefficients $\hat{\beta}_J = (c_j, w_j)$ in the asymmetric triangular fuzzy number shown with the following membership function:

$$\mu_{\hat{\beta}_j}(a_j)= \begin{cases} 1-\dfrac{|c_j-a_j|}{w_j} , & c_j-w_j \leq c_j+w_j , \quad j=0, 1, \ldots, k \\ 0 & \text{otherwise.} \end{cases}$$
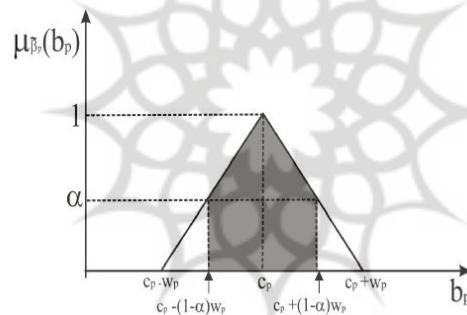

Fig. 1: Triangular Membership Function of Fuzzy Regression

Therefore, the fuzzy regression with the above membership function can be written as bellow:

$$y_i = (c_0, w_0) + (c_1, w_1)x_{1+\ldots+} (c_k, w_k)x_k$$

The parameters are estimated under the fuzzy linear planning in the Tanaka fuzzy regression model [21]. The linear planning model is as:

$$\min \sum_{i=1}^{n} \sum_{j=0}^{k} w_j x_{ij}$$

$$\text{S.t} : \sum_{j=0}^{k}(c_i + (1-\alpha)w_j)x_{ij} \geq y_i + (1-\alpha)e_i$$

$$\sum_{j=0}^{k}(c_i - (1-\alpha)w_j)x_{ij} \leq y_i - (1-\alpha)e_i$$

$$w_j \geq 0 \quad j=0,1,\ldots,k \quad i=1,2,\ldots,n , \; x_{i0} = 1$$

In fact, minimizing the band width is the goal of optimization at the Tanaka approach. In the above model j is number of independent variables, x_{ij} is independent variables, ei and yi are the width of band and center of dependent variable respectively. α Subscript refers to the membership function of fuzzy variables so that plays the control role of confidence intervals of observations. If α component rises caused to extend the width of right and left bands. Although a researcher should determine the quantity of α but optimal value of confidence level is an effective factor of fuzzy regression. Sum of squares error standard is one of the determinant criteria for determining α. It is noteworthy that the Fuzzy least squares regression (FLSR) which was presented by Diamond (1988) is one of the other approaches. This method is stand on measuring distance of the width of left band, right side and center of the two numbers. The target function of this model is as:

$$\min \sum_{i=1}^{n} d\left[y_i, \sum_{j=0}^{k} \hat{\beta}_J x_{ij}\right]^2$$

$$D = (c_0 + c_1 x_{n1} + \cdots + w_0{}^R + \cdots + w_k{}^R x_{nk} - y_n + W_{yn})^2$$
$$+ (c_0 + c_1 x_{n1} + \cdots + c_1 x_{nk} - y_n)^2$$
$$+ (c_0 + c_1 x_{n1} + \cdots - w_0{}^C - \cdots - w_k{}^C x_{nk} - y_n + L_{yn})^2$$

C is the center of fuzzy parameter; $w_0{}^R$ term indicates the width of right side of fuzzy parameter; $w_0{}^C$ is the width of left side of fuzzy parameter; Ly_n is the width of left side of independent fuzzy variable and Wy_n shows the width of right side of fuzzy independent variable. The independent and dependent variables are non-fuzzy and triangular fuzzy respectively in this method. it means they are as $y_j = (y_i, l_{y_i}, w_{y_i})$ where y_i , l_{y_i} and w_{y_i} are the center, width of left side band and width of right side band respectively. Moreover, the parameters also have three values for center, left side and right side.

4. FLSR Fuzzy Regression Estimation

The paper has applied such variables including inflation rate, unemployment rate, Gini Coefficient, share of collective security and welfare costs to the state budget, literacy rate and economic growth over the 1985-2017 so that the data concerned to the prices index, Gini Coefficient and share of collective security and welfare costs to the state budget were collected from Central Bank of Iran and the unemployment rate came from the databases of center of statistics of Iran. To examine the impact of economic growth and income distribution on poverty in Iran, the following functional form is considered:

$$pov = \hat{\beta}_0 + \hat{\beta}_1 Gini + \hat{\beta}_2 SSG + \hat{\beta}_3 U + \hat{\beta}_4 Inf + \hat{\beta}_5 Y + \hat{\beta}_6 Lit + \varepsilon$$

Where Gini is disparity coefficient; SSG is share of collective security and welfare costs to the state budget; U term implies the Unemployment rate; Inf shows the inflation rate; y represents the economic growth and Lit is the literacy rate. Here the dependent variable is the Amartyasen's Poverty index [6]. Hence, the bellow fuzzy regression is gained:

$$H[I + (1 − I)G^*] = α + \hat{β}_1 Gini + \hat{β}_2 SSG + \hat{β}_3 U + \hat{β}_4 Inf + \hat{β}_5 Y + \hat{β}_6 Lit + ε$$

The table 1 has cited the manner of account of model variables, data scale and the expected theoretical symptom among the variables.

Table 1: Theoretical Relationship between Macroeconomic Variables and Poverty

Variable	Definition	Indices	Expected Symptom Theoretically	Data Scale
POV	Amartyasen's Poverty index	$P = Q(Z) = H\left[I + (1 − I)G^*\right]$	---	Percent
INF	Inflation	$INF = \dfrac{CPI_t − CPI_{t−1}}{CPI_{t−1}}.100$	$COV(POV, INF) \succ 0$	Percent
SSCG	share of collective security and welfare costs to the state budget	$Sscg = \dfrac{SSC}{g}.100$	Ambiguous $COV(POV, SSG)$	Percent
Gini	Income Distribution	$GINI = \dfrac{1}{2μ}.\dfrac{1}{n^2}\sum_{i=1}^{n}\sum_{i=1}^{n}\left|X_i − X_j\right|$	$COV(POV, GINI)$ Ambiguous	Percent
G	Growth of Per capita Income	$YD = \dfrac{YYD − YYD(−1)}{YYD(−1)}.100$	$COV(POV, G)$ Ambiguous	Percent
UN	Unemployment Rate	$UN = \dfrac{PU_t − PU_{t−1}}{PU_{t−1}}.100$	$COV(POV, UN) \succ 0$	Percent
Lit	Literacy Rate	$UN = \dfrac{PU_t − PU_{t−1}}{PU_{t−1}}.100$	$COV(POV, Lit) \succ 0$	Percent

At table 2, the lower bound, center bound and upper bound of the Fuzzy Least Squares Regression (FLSR) model for the poverty variable according to the Sen's index has been estimated.

Table 2: The Results of Parameters Estimation in the FLSR.

Variable	Lower Bound (l_j)	Center (c_j)	Upper Bound (r_j)

Intercept	48.37 (0.082)	50.46 (0,020)	52.6 (0.003)
Unemployment	0.3559 (0.0000)	0.1361 (0.0017)	0.1363 (0.002)
Inflation	0.21602 (0.0190)	0.21606 (0.001)	0.21612 (0.0282)
Gini Coefficient	-0.8239 (0.001)	-0.8255 (0.051)	-0.8279 (0.020)
Growth of Gross Domestic Products	0.1711 (0.000)	0.17122 (0.0000)	0.17129 (0.000)
Literacy Rate	-0.3355 (0.000)	-0.3357 (0.0000)	-0.336 (0.000)
Share of Government Expenditures	0.746 (0.0051)	0.7476 (0.0000)	0.748 (0.000)
$IC = 1 - \dfrac{SSE}{SST} = 0.8930$			

Source: current research (2020)

Given the estimated results at table 2 can be concluded that the unemployment rate has had a significant effect on increasing the intensity of poverty in Iran. There is an important question whether economic growth leads to poverty reduction or not. The fact that how the growth affects poverty depends on this issue that how the additional revenue comes from the growth is distributed within the country. In principle, if economic growth is associated with the rise of income of the poorest people therefore their income growth will be faster than the income of average people. Similarly, if economic growth be accompanied by a reduction in the income share of the poorest households leads to be lesser the growth of poor people incomes from the average income growth of a country. In other words, if theoretically the income distribution is more balanced, the poverty will be lesser from the average income growth given the specific economic growth in the country. The results of this study confirm that there has been a positive relationship between economic growth and poverty, meaning that the flow of economic growth has had negative impacts on the poverty reduction in Iran. According to the investigated model considered that the share of collective security and welfare costs to the state budget no have a significant impact on the poverty reduction while the Gini coefficient has had a negative impact on the Sen's poverty index.

5. Analysis based on Fuzzy Logic

The base of fuzzy logic was founded through presenting a paper entitled "Fuzzy Sets" by Dr. Zade in 1965.The main objective of fuzzy logic Invention is a

description of ambiguous and non-precise phenomenon and forming a math modeling for their utilization and inferences. Linguistic variables are one of the basic concepts in fuzzy logic. For instance, the economic growth is a linguistic variable that can have low, medium and high quantities. In general, a fuzzy system consists of three components Fuzzy modeling, fuzzy rules and de-fuzzy fication. At the first stage, inputs is described as a linguistic variables and determined their membership functions, at second stage, the fuzzy rules are selected so that finally should be considered a method for converting the fuzzy quantities to the Numerical values. Fuzzy inference is core of fuzzy logic so as in fact comprises generating a fuzzy output given the input and fuzzy rules and embodied membership function and "if-then" rules. The three widely used fuzzy inference systems include Mamdani's Fuzzy Model, Takagi-Sugeno's Fuzzy Model and Relational Fuzzy model. There aresome approaches like maximum and mean (Center of the fuzzy aria) methods for defuzzification of output variable. This paper employed the Mamdani's Fuzzy Model. The inputs variables are consisting of growth of gross domestic products and Gini coefficient. According to table 3 nine fuzzy rules were determined.

Table 3. Poverty Status of the Society in Different Conditions of Economic Growth and Income Distribution Pattern [2].

Income Distribution ╲ Growth	High	Medium	Low
Low	Widespread poverty	Relatively widespread poverty	Uncertain (possibly a significant Poverty)
Medium	Relatively widespread poverty	Uncertain (possibly a significant Poverty)	Relatively limited poverty
High	Uncertain (possibly a significant Poverty)	Relatively limited poverty	Very limited poverty

Source: current research (2020)

For example, if economic growth and Gini coefficient are low and high respectively then the Poverty is widespread so that is seen at the following figure:
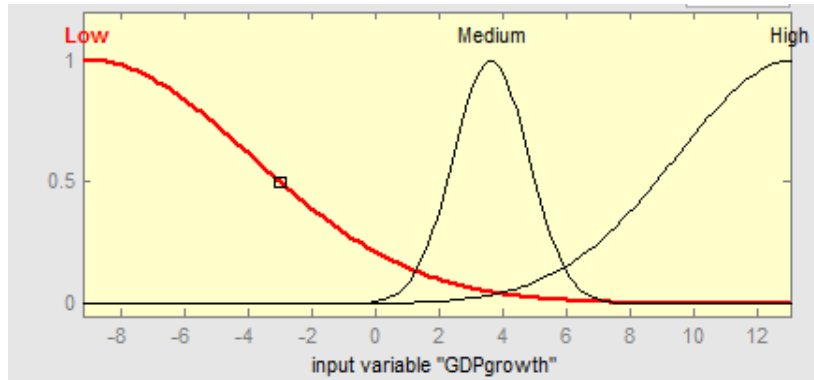
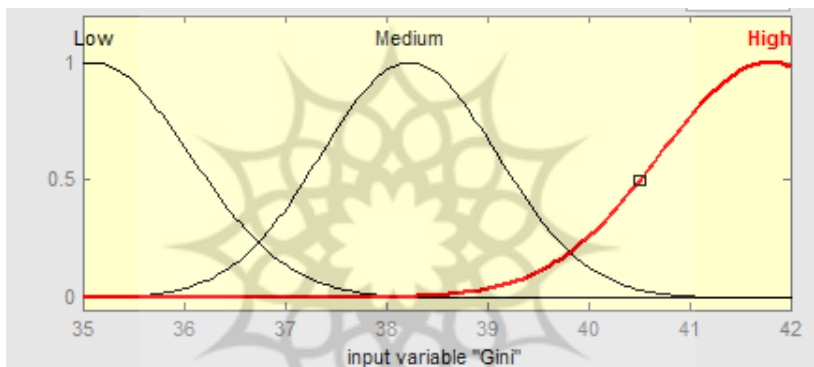**Fig. 2: Stating the Fuzzy Rules based on a Gaussian Membership Function for Economic Growth**

Fig. 3: Stating the Fuzzy Rules based on a Gaussian Membership Function for Gini Coefficient
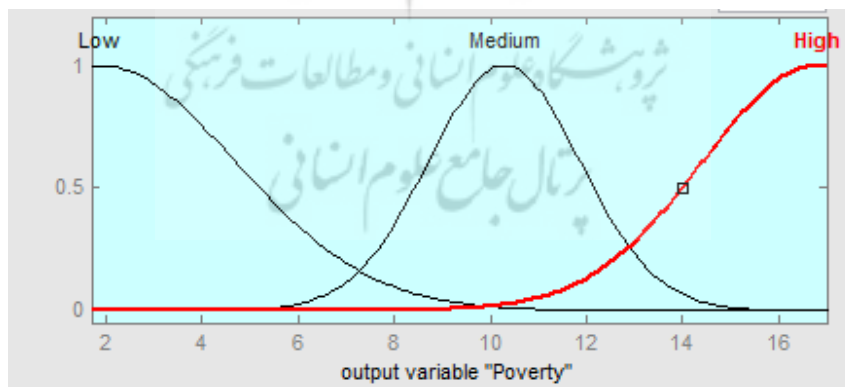

Fig. 4: Stating the Fuzzy Rules based on a Gaussian Membership Function for Poverty

It is noteworthy that the error rate based on fuzzy logic is 43.470 so that is lesser in compare with the liner Classical regression error under the sum of squares error (690). This finding confirms that the fuzzy approach has an appropriate result than the classical approach. At table 4 the estimated values based on the fuzzy logic is observed.
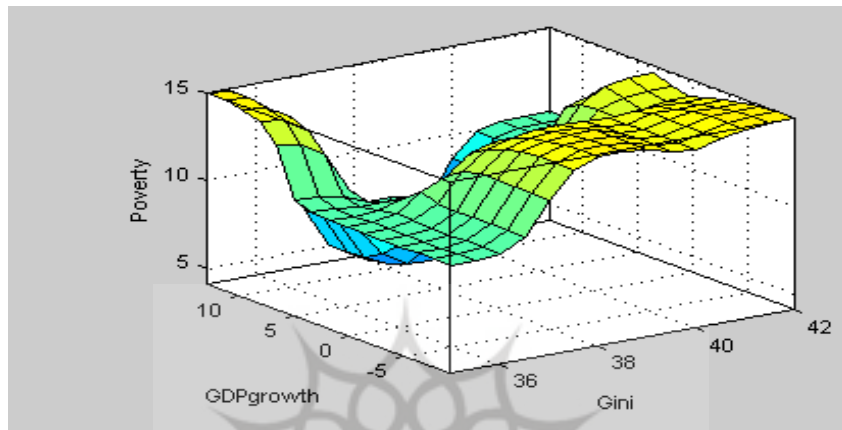

Fig 4. The Fitted Poverty under Fuzzy Logic in the 3D Spaces.

With respect to the released results inferred the following rules about the Gini Coefficient, Economic Growth and Poverty in Iran.

Table 4: The Results Obtained based on the Fuzzy Logic Output about the Gini Coefficient, Economic Growth and Poverty in Iran.

Poverty		GDP Growth		Gini Coefficient	
Result	Numerical Range (by percent)	Result	Numerical Range (by percent)	Result	Numerical Range (by percent)
Medium	4 to 14	Low	3 to -9	Low	0 to 38
Medium	4 to 14	Medium	0 to 9	Low	0 to 38
High	10 to 17	High	4 to 12	Low	0 to 38
High	10 to 17	Low	3 to -9	Medium	36 to 41
Medium	4 to 14	Medium	0 to 7	Medium	36 to 41
Low	1 to 9	High	4 to 12	Medium	36 to 41
High	10 to 17	Low	3 to -9	High	38 to 50
High	10 to 17	Medium	0 to 7	High	38 to 50
Medium	4 to 14	High	4 to 12	High	38 to 50

Source: current research (2020)

6. Summing Up

This paper discussed the relationship between income distribution, economic growth and poverty in Iran. According to the research findings, the following policy recommendations offered:

1. Economic growth has a positive relationship with the poverty in Iran. The point which should be considered by the country's economic policymakers is that in order to reduce the relative and absolute poverty tried to be regard this variable as well as the poverty reduction growth-oriented strategies so that through identifying the influential variables on the growth provided a proper platform for increasing the economic growth in Iran besides designing More Efficient institutions for the benefit of the poor to take advantage of the benefits and earnings arising from the growth. In other words, the government at the aim of implementing one of his classic works which is distributing a fair income, facilities and opportunities in the society must design an optimal allocation pattern of resources so as the redistribution policies of income paves the ways for transferring the growth spillovers efficiently on behalf of Vulnerable groups of society and less developed regions in the country.

2. The research findings show that inflation has had a positive impact on increasing poverty in Iran. Results of the literature indicate that there are several effective elements on the inflation rate. But the growth rate of liquidity is the most important component such that the covariance between the growth of liquidity and inflation rate has been positive with high correlation intensity. Thus, the inflation rate must decrease in order to reduce the intensity of absolute poverty and this fact not possible unless the monetary authorities pursued the Contractionary monetary policies for control the liquidity.

3. The results of our study imply that the share of collective security and welfare costs to the government budget has not had a significant role in reducing the volume of poverty in Iran. The empirical results demonstrate that the government expenditures can cause to more inequality and poverty or less volume of poverty. The important issue is the composition of government spending. If government spending in order to create opportunities and facilities to be spent in the community can leads to reduce absolute poverty in long and short terms. This means that the Government funds in different sectors of the economy can provide an appropriate base for extending the growth infrastructures like Roads, hospitals, schools, railways and generally public goods as well as creating a suitable situation for the areas with least subsistence facilities such as Safe drinking water, electricity, communication services, health services and so on besides drifting an efficient pattern for transfer payments and targeting the subsidies payment to the poor groups so that it can reduce the absolute poverty in the society. Hence, it is offered that the government designs a favorable combination for allocating credits and distribution of resources aimed augmenting economic growth and poverty reduction.

4. The research findings indicate that the unemployment has a significant effect in increasing poverty. As expressed in the macroeconomic theories that favorable performance of labor market plays an important role in an economy while the reality of Iranian economy confirms an imbalance in the supply and demand side such that the economy has failed to utilize potential capacities as far as the Undesirable performance of market has caused more poverty in the country.

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(مقاله پژوهشی)

بررسی ارتباط میان فقر، توزیع درآمد و رشد اقتصادی در ایران (با رویکرد فازی)

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چکیده

این مقاله تحت منطق فازی چارچوبی تحلیلی با هدف ارزیابی رابطه بین فقر، توزیع درآمد و رشد اقتصادی ارائه می‌دهد. نتایج نشان می‌دهد که ارتباط مثبتی میان رشد اقتصادی و فقر برقرار است. به‌عبارت دیگر رشد اقتصادی تأثیرات منفی بر کاهش فقر در ایران داشته است. نتایج محاسباتی مبتنی‌بر منطق فازی در ایران نشان می‌دهد که ایده‌آل‌ترین شرایط زمانی به‌وجود می‌آید که رشد اقتصادی به‌طور میانگین ۸ درصد باشد و ضریب جینی نزدیک به ۳۸.۵ درصد است. براساس نظریه‌های اقتصادی، رشد اقتصادی بالا می‌تواند ازطریق گسترش اندازۀ بازارها و همچنین ایجاد محرک‌های لازم برای ارتقاء درآمد همۀ گروه‌های کم‌درآمد جامعه فرصت‌های بیشتری برای افزایش درآمد جامعه فراهم کند. در این شرایط، تولیدکنندگان در پاسخ به فرصت‌های نوظهور خواستار نیروی کار بیشتر در بازارها هستند تا این مسأله از طریق جذب مازاد نیروی کار وحتی بهبود دستمزدها، نقش چشمگیری در کاهش فقر داشته باشد. به‌عبارتی، پرسش اساسی مقاله، مقابله با این مسأله است که آیا رشد اقتصادی و توزیع درآمد بر فقر در ایران تأثیر داشته است؟ در ابتدا، برای پاسخ به این پرسش، از یک رگرسیون فازی برای تحلیل ارتباط بین متغیرها استفاده می‌کنیم و سپس می‌خواهیم رابطۀ بین فقر، برابری درآمد و رشد اقتصادی را براساس چارچوب تحلیلی منطق فازی ارزیابی کنیم.

کلید واژه‌ها: فقر، توزیع درآمد، رشد اقتصادی، منطق فازی، رگرسیون فازی.

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