



Original Research

The Impact of Financial Development on the Poverty of Fishermen in the Northern Provinces in Iran (Gilan, Mazandaran and Golestan) With A Threshold Vector Auto Regression (TVAR)

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ABSTRACT

Financial development has been the main factor for economic development in different countries, and the causal relationship between financial development and economic development is part of the macroeconomic relations that have been examined many times. Yet studies on fishermen's poverty have rarely been done. Many residents of coastal villages are engaged in fishing activities. Small-scale fishing on various coasts in the north of Iran is an important source of employment, income and nutrition for coastal villages. This characteristics and effects have not been well examined. This study has investigated the poverty of Iranian fishermen in Gilan, Mazandaran and Golestan provinces due to changes in financial development. The study was based on the Threshold Vector AutoRegression (TVAR), between 2000 to 2020. The research results confirm the existence of a nonlinear relationship between financial development and poverty. A significant relationship between financial development and income distribution was also confirmed on the poverty of northern Iranian fishermen.

1 Introduction

Townsend believed that individuals, households, and cumulative groups could be considered poor when faced with a lack of resources to acquire a variety of regime, participate in activities, conditions, and routine life possibilities [1]. Sen considers poverty to be a deprivation of basic functionality [2]. Poverty is a destructive consequence that affects the economic and social standard of living of different segments of society. the poverty reduction is always one of the important goals of economists and policymakers [3]. The financial sector plays an important role in this area and can change poverty in ways such as facilitating exchanges, granting credits, reducing risk and providing other financial services [4]. Financial development is a major factor for economic development in different countries. The causal relationship between financial development and economic development is part of the macroeconomic

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relations that have been examined many times [5]. Studies show that food consumption has decreased in recent years due to the increase in living costs and the decrease in people's purchasing power [6, 7]. According to the statistics center of Iran (2020) fish and shrimp consumption is considered one of the most valuable and nutritious foods, during the twelfth government period, from 294,520 tons in 2012 to 206,514 tons in 2020, which indicates a 30 percent decrease in fish and shrimp consumption in the country. Also, according to the annual per capita consumption of fish in the world, it is 21 kilograms, which unfortunately is 11 kilograms in our country. That is why it is likely that the poverty of groups working in this area, including fishermen, has increased. Understanding the various strategies to increase fishermen's income, poverty alleviation in this sector, planning in the organization of fishermen's cooperatives, importing advanced fishing Equipment and finally examining sustainable strategies to increase fisheries from the seas, along with understanding the factors affecting fishermen's income in the North, can be strategies to flourish as many fishing businesses and by-industries as possible. Based on this, the basic question that arises is whether financial development can reduce the poverty of fishermen? For this purpose, in the period of 2000-2020, for the provinces of Gilan, Mazandaran and Golestan of Iran as the fishing pole in the north of Iran, in the form of Threshold Vector AutoRegression (TVAR), the impact of financial development on the fishermen poverty is investigated. For this purpose, the structure of the article is organized in several sections, in the second part it examines the theoretical foundations and background of studies, and in the third part it introduces the data and variables of the research, and in the fourth part it presents the research method and modeling, and in the fifth part the research results are examined and presented, and finally in the sixth part it is presented with a conclusion and policy recommendation.

2 Theoretical Foundations

King and Levine were among the first to argue that financial development was associated with economic development [8]. Most studies show that financial development estimate economic growth and then alleviates poverty. Another indirect channel is that financial development may have an impact through its impact on income distribution on the poor. Some studies showing a nonlinear relationship between financial and economic development. Therefore, If financial development reduces income inequality, this effect could have significant impacts on poverty reduction [9]. Fig 1 briefly illustrates how financial development may affect poverty. Accordingly, financial development may affect poverty through four channels. First, directly affect poverty. Second, affect poverty by affecting income distribution. Third, by stimulating economic growth, it causes a change in poverty, and fourth, it affects poverty by affecting economic instability [9]. In other way, Economists have long debated the relationship between economic growth and poverty. It is unclear exactly how economic growth will affect the conditions of the poverty. In the 1970s many economists believed that economic growth was not enough to reduce poverty. Adelman and Cynthia (1973), held the belief that economic growth had not helped people in extreme poverty. With the dramatic increase in regional and intra-regional economic and social inequality from the 80s onwards, it became clear that the study of growth was not possible regardless of the poverty [2]. However, Perhaps the most explicit link between poverty and economic growth can be sought from Kuznets' theory. According to this theory, there is an inverse U-shaped relationship between economic growth and income inequality. In this theory, it is stated that in the early stages of economic growth, income inequality increases and then aligns, and finally, as economic growth increases further, income inequality decreases [10].

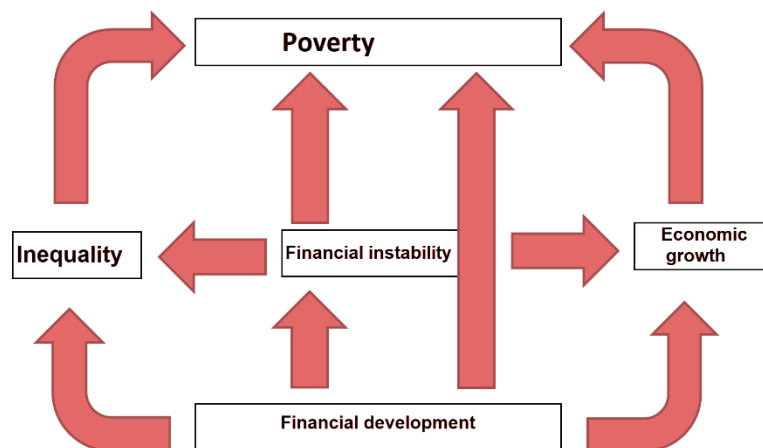


Fig 1. The impact of financial development on poverty [9]

Other experts, including Banerjee and Newman show a negative and linear relationship between financial development and inequality of income distribution [5]. Galor and Zeira model an income distribution pattern in which investment is indivisible. According to this Pattern, people live in two periods, and wealth is transmitted through inheritance between generations. People in both periods either work as simple workers or invest in their investments in the first period and then in the second period they work like a skilled worker. It is assumed that those who benefit from sufficient inheritance will be able to invest humanly in the first period. The results show that the initial long-term distribution of wealth affects income levels, and the inequality of income distribution through inheritance transfer among individuals will last. Wealth is divided in the long term between high-income people (skilled workers) and low-income people (simple workers). Therefore, developing financial markets can make it easier for poor families to access financial resources. In other words, if credit constraints faced by low-income households are removed, income distribution inequality will be reduced [11]. It is generally discussed that financial development through credit services contributes to reducing income inequality and poverty [12, 13]. Financial development can also indirectly reduce poverty and income inequality through increased economic growth, and the proceeds from growth are directed towards the poor. One way in which financial development increases economic growth is by equipping funds from inefficient to efficient use [13]. There is an extensive literature on the impact of financial development on income inequality. Liang showed that financial development contributes significantly to reducing urban income inequality in China [14]. Geda et al. show that access to financial resources significantly reduces absolute poverty in Ethiopia [15]. Canavire and Rioja have studied the effect of financial development on income distribution in Latin America. The results of this study, in which all income villages are considered, show that financial development not only improves economic growth but also improves income distribution [16]. Kapel showed that inequality and poverty decrease through increased lending and further development of equity markets. Evidence shows that government spending leads to a decrease in income inequality in high-income countries. No significant effects were found in low-income countries [17]. Ang examines the impact of financial development on income inequality in India. The results of this study show that financial development helps reduce income inequality, but intensifies financial liberalization [18]. Guillaumont-Jeanneney & Tapsoba showed in the article that financial development contributes directly and indirectly to poverty reduction. They also proved that financial development is associated with financial instability, which is harmful to the poor. Nevertheless, the benefits of financial development for the poor outweigh the cost [19]. Imran and Khalil show in their study that poverty can

be reduced by developing a manufacturing industry that creates more job opportunities [20]. De Haan et al. (2017), show that financial development has no direct impact on the poverty gap. However, since financial development leads to greater inequality which in turn leads to greater poverty, financial development through this transmission channel has an indirect effect on poverty [12]. Habibollahi et al (2023), show that financial development has a significant on economic growth, while tax revenues do not significantly impact economic growth [21]. Nazarpour et al (2023), show that the financial Pygmalion has a positive and significant impact on the three dimensions of auditors financial ethics confidence [22]. Sarhangi et al (2023), show that the regulatory quality, government deficit, government effectiveness, devaluation of the national currency, nuclear sanctions and financial crises have a negative effect on growth [23]. The results of Mansouri et al research show that the variables of the private credit to production ratio, the facilities granted to the private sector and the number of private industrial workshops have a positive impact on the Gini coefficient and increase income inequality [24]. According to the Mansouri et al (2024) research results, the presence of large companies in the province has neither generated local benefits nor reduced income inequality in the urban sector [25]. Currently, only a small number of researchers have noted the impact of financial development on fishermen's income, although much research has been done on financial development and poverty reduction as noted above. Pretes & Petersen (2004), studied the role of offshore investment in increasing fishing revenues [26]. Rangeley & Davies (2012), proposed the creation of new financial institutions to fund the implementation of large-scale fishing reforms [27]. Zheng et al. (2021) examined the performance of financial development on poverty reduction in Chinese companies. The results have confirmed an indirect relationship between financial development, economic growth and poverty reduction of fishermen [28]. This means that economic growth has had a significant impact on the poverty of Chinese fishermen. Also, the U-shaped inverse relationship associated with GJ theory (GJ) [29] has been confirmed. Pata et al. (2024), examined the impact of financial development on the consumption of fishing products. The research results showed that consumption of fishing products and economic growth increased fishing footprints, while population and financial development reduced pollution in fishing areas [30]. Other findings suggest that cost stickiness has a positive impact on the relationship between institutional investors and passive institutional investors with conservatism [32].

3 Data and Research Model

The data used in this study, collected from the central bank of Iran, Statistics Center of Iran and the annuals of Statistical Yearbook of the fisheries of Iran, are presented as follows:

- **POR:** per capita aquaculture consumption per kilogram as an indicator of fisherman poverty (dependent variable)
- **FD:** Facility to GDP ratio to percentage as an indicator of financial development
- **GDP:** GDP growth without oil to % as a variable of economic growth
- **Power:** number of fishing boats as an indicator of fishermen's power
- **Labour :** number of employees in the fisheries sector as an indicator of the human capital of the fishing industry
- **Str:** number of fishing cooperatives as an indicator of the infrastructure of the fishing industry
- **Resource:** area of fish and shrimp farms per hectare as an indicator of fishing resources
- **Disaster:** the rate of harvesting from natural and semi-natural water resources as an indicator of the risks of natural catastrophes of fishing

Given that the relationship between financial development and poverty is shown in studies and theoretical foundations as a mostly U-shaped nonlinear relationship, the study have been used the threshold vector AutoRegression method (TVAR).

AutoRegression The experimental model is as follows:

$$Y_{it} = \alpha + \theta X_{it} + \beta_1 b_{it}(q_{it} \leq \gamma) + \beta_2 b_{it}(q_{it} > \gamma) + E_{it} \tag{1}$$

In the above equation, q_{it} is the threshold variable, γ is the unique threshold value, α and E_{it} is the constant and error term, b_{it} is an independent variable, Y_{it} is a dependent variable, X_{it} is a control variable, θ is the corresponding coefficient variable, and β_i is the threshold effect coefficient.

Depending on the type of threshold model the research model will be as follows:

$$POR_{it} = \alpha + \beta_{11}FD_{it}(PGDP \leq \gamma_1) + \beta_{12}FD_{it}(\gamma_1 < PGDP \leq \gamma_2) + \beta_{13}FD_{it}(PGDP > \gamma_2) + \theta_1 Power_{it} + \theta_2 Labor_{it} + \theta_3 Str_{it} + \theta_4 Resource_{it} + \theta_5 Disaster_{it} + E_{it} \tag{2}$$

To determine the number of regimens, first the assumption without threshold is considered as:

$$H_0 = \beta(1) = \beta(2) = \beta(3) \tag{3}$$

Under this assumption there is only one regime. The Likelihood ratio are as follows:

$$JT = \max_{\gamma \in \Omega} \frac{\sigma^2 - \hat{\sigma}^2}{\hat{\sigma}^2(\gamma)} \tag{4}$$

If H_0 is not rejected, the model is linear AutoRegression, the rejection of the zero assumption indicates the presence of more than one regime in the model. The threshold estimator is defined as:

$$\hat{\gamma} = \operatorname{argmin} \hat{\sigma}^2(\gamma) = \operatorname{argmax} JT(\gamma) \tag{5}$$

In experimental studies, the regression order of threshold values and model coefficients are estimated by a simple algorithm. In the first step, the first order TAR model is estimated, and then the initial estimate is used to estimate the threshold values. Secondly, according to the threshold values through model selection criteria such as Akaike, Schweitzer, Hannan-Quinn, etc., the order of lag is selected in each regime [13]. Asymmetric effects are also evaluated through a combination of approaches to a momentum threshold autoregressive and threshold error correction (MTAR-TEC) [30].

To determine the number of regimes, a total-to-component approach is used. First, the model has three regimes versus the model has four test regimes. Each of the following assumptions is tested against the assumption that there are four regimes:

- 1) $H_0: \beta_1 = \beta_2$
- 2) $H_0: \beta_1 = \beta_3$ 3) $H_0: \beta_2 = \beta_3$

To perform the test of the above double assumptions, a test of the same proportion of correction as equation (5) and the bootstrap method is used.

4 Model Estimation

4.1 Stationary Test

The first test that needs to be done for each variable is the stationary test. After examining the model of unit root test, the relationship with no constant with trend was confirmed. The results of the stationary tests are presented in Table 1.

Table 1: Philips-Peron Stationary Test Result

Variable	Statistics (I0) (prob)	Statistics (I1) (prob)	Result
POR	-0.5 (0.87)	-5.5 (0.00)	Integrated to a degree of differentiation I(1)
FD	-1.64 (0.44)	-6.0 (0.00)	Integrated to a degree of differentiation I(1)
POWER	-2.01 (0.27)	-9.3 (0.00)	Integrated to a degree of differentiation I(1)
LABOR	1.2 (0.9)	-16.4 (0.00)	Integrated to a degree of differentiation I(1)
STR	-1.2 (0.67)	-3.7 (0.00)	Integrated to a degree of differentiation I(1)
RESOURCE	-1.6 (0.46)	-5.5 (0.00)	Integrated to a degree of differentiation I(1)
DISASTER	-0.9 (0.75)	-8.9 (0.00)	Integrated to a degree of differentiation I(1)

Source: Research Results

Johansen's cointegration test was used to confirm the trace vector. The results of the study show that the Johansen trace statistic is 219.01, in which case the error level of 5% rejected the absence of cointegration in the null hypothesis and the cointegration is confirmed.

4.2 Estimated Threshold Model

Linearity is evaluated in northern data and 4 states are expressed for the equality of coefficients and the presence of linear correlation.

$$H01: \beta_1 = \beta_2 = \beta_3 = 0$$

$$H02: \beta_1 = \beta_2 = 0$$

$$H03: \beta_1 = 0$$

Due to the significant level of linearity, the coefficients are rejected and the nonlinear model is confirmed. According to the nonlinear relationship confirmation, the nonlinear model selection test was conducted for $H1: \beta_1 = 0 \mid \beta_2 = \beta_3 = 0$ and the first-order logistics model was approved. Also, the existence of a threshold cointegration with a statistic F equal to 4.45 was also confirmed. Meaning that the nonlinear relationship between financial development and poverty in northern Iranian fishermen has been confirmed. The estimate for the north of the country is shown in the Table 2. According to Table 2 in the threshold model, the coefficients can be checked both linear and nonlinear. In the linear model, the effect of the variable poverty of a previous period (S_TRENDS (-1)) and the last two periods (S_TRENDS (-2)) on poverty was examined. The significant level of poverty with one lag and two lag is 0.70 and 0.64 respectively. Both are above 0.05 and are not significant, meaning that poverty in the past and the past two periods has no effect on poverty in the current period. In the nonlinear model, the poverty of the past one period and the past two periods are 0.19 and 0.18 respectively, which are not

significant and do not affect the poverty of the current period. Economic growth with a significant level of 0.81 is also not significant. In general, the significant level of the threshold model for the north of the country is 0.99, which shows that this model is not effective for the north of the country. That is, in the north of the country, the model variables are not affected by poverty one period lag and two periods lag.

The number of fishing boats and the labor employed in the fishing sector have had a positive and small effect on poverty. The number of fishing cooperatives has had a negative effect on poverty and has reduced poverty in northern Iranian fishermen.

The area of Fish and shrimp farms and the amount of harvest from natural and semi-natural resources have been identified as a significant and large effect on poverty. In other words these two factors have greatly increased fisherman poverty and show that the powerful domestic production sector and the lack of attention to natural resources have a great impact on Fisherman poverty.

Table 2: Threshold Model

Threshold variables (linear section)				
Variable	Coefficient	Standard Error	t-statistics	probability
S_TRENDS (-1)	-0.02	0.05	-0.4	0.7
S_TRENDS (-2)	0.01	0.02	-0.5	0.64
Threshold variables (non-linear section)				
Variable	Coefficient	Standard Error	t-statistics	probability
S_TRENDS (-1)	0.18	0.12	1.5	0.19
S_TRENDS (-2)	-0.17	0.11	-1.55	0.18
Non-Threshold variables				
Variable	Coefficient	Standard Error	t-statistics	probability
C	13.96	1.2	11.5	0.00
FD	0.00	0.00	2.4	0.06
FD*GDP	-7.8	3.1	-0.25	0.8
POWER	0.00	0.00	11.6	0.00
Labour	0.00	8.1	2.1	0.09
Str	-0.004	0.001	-3.2	0.02
Resource	8.5	3.7	22.8	0.00
Disaster	8.8	5.6	15.6	0.00
Domain	Coefficient	Standard Error	t-statistics	probability
	44.3	25029543	1.77E-06	1
Threshold	Coefficient	Standard Error	t-statistics	probability
	33	6018	0.005	0.99

Source: Research Results

The effectiveness path of each of the coefficients in the northern estimate is presented in Fig 2. The positive or negative of the coefficients is evident. The nonlinearity of estimation in the scattering of points is clear in many cases with a large distance from the line of the estimated.

The threshold effect survey shows that at first with a one percent increase in economic growth and financial development, poverty increases by about 0.05 percent. This is despite the continued economic growth and financial development showing a negative impact on fishermen's poverty. So that, decline by one percentage in economic growth, poverty decrease about 0.06 percent.

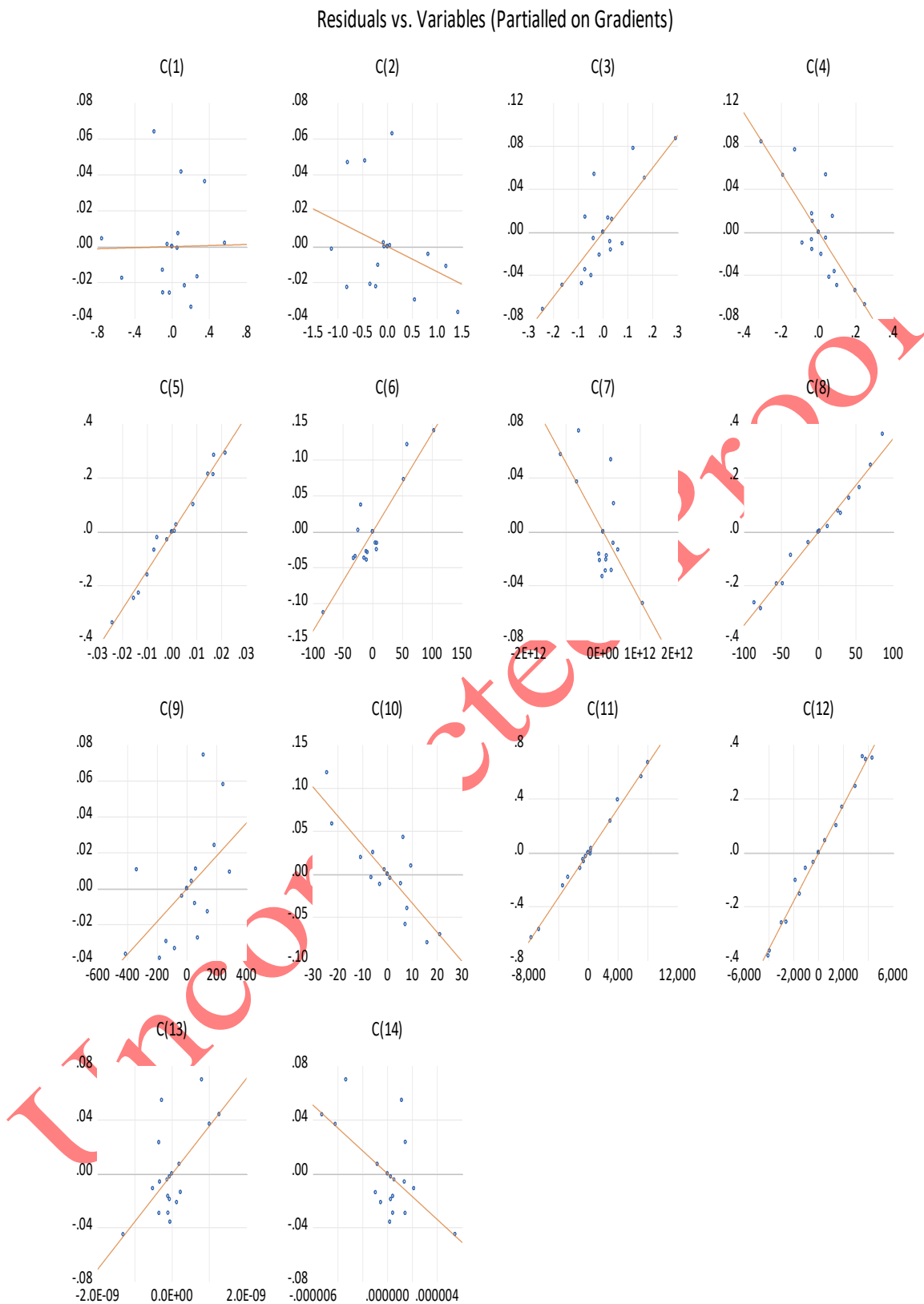


Fig 2. The impact of coefficients on poverty in the North

Source: Results Research

5 Conclusion and Suggestions

Many residents of coastal villages are engaged in fishing activities. Small scale fishing on various coasts of northern Iran is an important source of employment income and nutrition for coastal villages whose characteristics and effects have not been well examined [31]. Given the main hypothesis, it is necessary to look at fishing as an important occupation in northern areas and banks provide appropriate financial facilities to fishermen. Currently, fishing can only be done on calm sea days, and with a few atmospheric problems, the possibility of fishing is eliminated. Through the financial development of fishermen and the availability of facilities, the stability of fish prices in coastal areas can be helped and the job stability of fishermen and thus the reduction of their poverty. Fishermen can also be organized into companies such as Cooperatives Company. So, in this research, the main goal is to evaluate the impact of financial development on the poverty of fishermen in the northern provinces of Iran, including Gilan, Mazandaran and Golestan. For this purpose, it has been investigated using the TVAR method in the period from 2000 to 2020. To this, initially introduced variables and models, and used the Philips-Peron stationary test for examine the unit root. According to the research results:

- The proposed model for the northern part of the country is First-Order logistics with zero threshold.
- Financial development has reduced the poverty of fishermen in the northern provinces of Iran. The positivity of this effect shows that the higher the ratio of bank and institution grant facilities, the more fishermen will benefit and these facilities can provide a platform for more people to create and develop fishing jobs, thereby reducing the poverty of fishermen (with confidence of more than 90 percent).
- The coefficient of impact of financial development \times GDP is not significant.
- The power variable affects the poverty of fishermen (confidence more than 99 percent).
- The Labor (Human investment) affects the fishermen's poverty (confidence over 90%).
- The Str (structure of the fishing industry) affects the poverty of fishermen (confidence of more than 95 percent).
- Fishing resources affect the fishermen's poverty (confidence over 99 percent).
- Disasters affect the fishermen's poverty (confidence over 99 percent).
- So the only hypothesis about GDP will be rejected, and the rest of the coefficients will be significant.

The formation of a union in the north to organize the activities of fishermen and provide advanced fishing facilities for them will also be effective in the financial development of the fisheries sector and by-industries. Since economic growth has not had a significant impact on fishermen's poverty, economic instability will not affect fishermen's poverty, and in this case, fishermen's poverty can be reduced in a recession by improving financial development.

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