Causality Analysis of Economic Growth, Investment, Unemployment and Poverty in West Sumatra Province

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ABSTRACT
The study analyzes the causality of economic growth, investment, unemployment and poverty in West Sumatra Province. This study analyzes districts and cities in West Sumatra Province from 2015-2020 using the VAR method. The results of the analysis show that there is a causal relationship between poverty and unemployment, poverty and investment, unemployment and economic growth, unemployment and economic growth, and economic growth and investment. Meanwhile, there is a one-way relationship between poverty and economic growth, namely economic growth affects poverty but poverty does not affect economic growth. In the long term, the variability of poverty, economic growth and investment is largely determined by the shock of unemployment. The greater variability of unemployment is determined by the investment shock.

Keywords: Economic growth, Causality, investment, unemployment, poverty

1. INTRODUCTION

Economic development is closely related to growth of economic, the main goal of economic development in addition to improving the welfare of the community, economic development is to create the highest growth, economic development should also reduce poverty, inequality and unemployment. Job opportunities will provide income to meet the needs of life.

Increasing economic growth is very necessary in order to also improve the standard of living and welfare of society in general. High economic growth usually increases investment, reduces unemployment and poverty. Poverty and low unemployment are positive effects of increased investment and economic growth in a country. Therefore, the government seeks to increase investment and economic growth so that people become prosperous.

Figure 1. Economic Growth in West Sumatra Province From Year 2015-2020
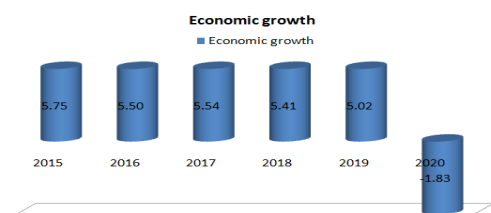

Figure 1 above shows that economic growth in West Sumatra has fluctuated from 5.75 in 2015 to 5.50 in 2016, the following year it increased slightly to 5.54. In

the last three years has decreased. A drastic decline occurred in 2020 to -1.83. This is due to a pandemic that has not yet come out of this problem. The decline in economic growth will have an impact on the number of unemployment that occurs in West Sumatra.

Problem of unemployment is a phenomenon of socio-economic because part of the workforce is productive but does not work or does not produce goods and services so that it becomes a burden for people who work. From the economic side, unemployment arises because of the excess supply of labor so that they are not absorbed in the labor market. Temporary unemployment in the Russian Federation is a problem posed by the developmental stage in the process of creating market connections [1]. The main economic causes of unemployment are (1) high prices for labor (salaries), which are required by sellers or trade unions; (2) the low salary or wages of workers, which are specified by the buyer (employer); (3). Low price value of labor. Labor market imbalances are the cause of unemployment where the supply of labor exceeds the demand for labor, this is caused by the economy experiencing a decline or recession, war, and natural disasters.

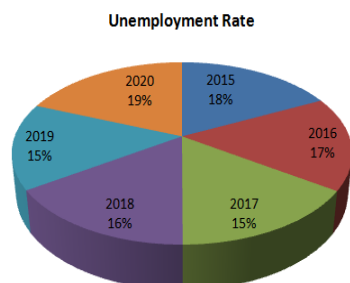**Figure 2.** Unemployment Rate in West Sumatra Province From Year 2015-2020

Figure 2 shows that the unemployment rate has fluctuated in the last 5 years in West Sumatra Province. In 2015 the unemployment rate was 18 percent, then two years later the figure fell to 17 percent and 15 percent, respectively. but rose again in 2018 to 16 percent. in 2019 the poverty rate decreased to 15 percent and in the year the pandemic began it increased drastically to 19 percent. The impact of unemployment will increase poverty.

Figure 3. Poverty Rate in West Sumatra Province From Year 2015-2020
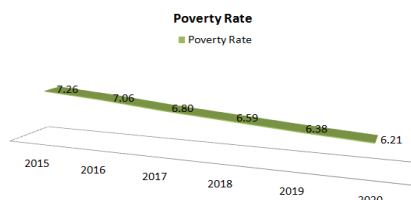

Figure 3 shows that the trend of the poverty rate from year to year has actually decreased in the last 5 years despite economic fluctuations and unemployment. The poverty rate has decreased from 7.26 percent in 2015 to 6.21 percent in 2020. The pandemic has not yet had a significant impact on the poverty rate in West Sumatra Province.

2. LITERATURE REVIEW

2.1. Causality of Economic Growth with Investment

Economic growth and investment are closely related to each other because the driver of economic development is investment. The research results [2] of show that investment and growth have an independent relationship with each other in Zimbabwe so that Zimbabweans must invest using modern technology to increase its economic growth. This study is in line with [3] contrary to [4]. Jakob B Madsen [5] growth is mainly due to investment in machinery and equipment, while investment in buildings and non-residential structures is mainly due to economic growth.

[6] found that ICT investment and GDP growth have a two-way effect in the long run except for the short-term case where only ICT investment affects growth of GDP using the VECM method so that ICT investment is an important part of growth. South Korea's economy in the long run; the size of investment in the ICT industry raises with growth of economic.

2.2. Causality of Economic Growth and Unemployment

Research by [7] using the VAR methodology and the Engel-Granger cointegration test, there is no causal relationship between the two variables, namely economic growth and unemployment in Mecedonia where changes in the real GDP growth rate do not cause changes in the unemployment rate and vice versa so that policy the country's economy is not yet suitable for promoting development and reducing unemployment, as the main source of employment is the public sector rather than the private sector.

[8] research, which became the basis for the study of this economic phenomenon. Okun's law (1962), states that if the rate of unemployment decrease to 1%, production will increase by 3%. Therefore, to avoid noxiousness due to unemployment, economic development continues. A prominent summary from Okun's law is that actual GDP must increase more than potential GDP. Okun's law shows an important relationship between the output market and the market of labor. Okun described the relationship between alterations in unemployment and short-run movements of real GDP.

[9] found that the relationship between unemployment and the rate of economic growth in Nigeria for the period 1981-2016 is a unidirectional causal VAR which implies that the level of Granger's economic activity does not cause the unemployment rate in Nigeria. This means that the government must create even more jobs, especially small and medium-sized enterprises so that unemployment can be reduced and economic growth will increase continuously. This research method uses the Granger Causality VAR approach.

[10] research on the relationship causality of equilibrium unemployment and economic growth for Europe - France, Germany, Italy and the UK as G7 countries. Using the Granger causality test method for G7 countries such as four European countries illustrates that France can be showed by the model of matching but Germany and Italy by the model of efficiency wage. The UK uses either the model of union or the

model of efficiency wage, rely on the amount of lag put in the estimate.

2.3. Causality of Economic Growth with Poverty

Socio-economic growth has a negative impact on poverty in western Indonesia using the PVAR Bivariate causality model [11]. By using the causality test of Granger and the Random Effects Model, there has been a causality between growth of economic and poverty in Thailand, meanwhile Indonesia and Malaysia have no causality between the two variables [12]. The population of Latin America and the Caribbean is currently more than a third living in poverty. Where high economic growth is accompanied by high inequality, it will not be effective in reducing poverty [13]. Poverty can hinder economic growth when markets are imperfect coupled with the inseparability of investment, fixed costs and strategic complements. Severability occurs when a minimum capital outlay must be made before the investment generates a return. Strategic complementarity occurs when the optimal strategy of one actor depends positively on the strategies of another actor [14].

There is a unidirectional causality that flows from the poverty rate and the prevalence of stunting to economic growth in the long term. The contribution of stunting cases is more dominant in slowing down economic growth in Indonesia in 2015-2017 [15]. Research using causality test of Granger, set up that there is a two-way reciprocal relationship between growth of economic and poverty reduction in Mexico and high growth of economic reduces poverty. The same study by [16] found that in the short term there is a reciprocal relation between poverty and growth of economic but not in the long term in Ethiopia. In Egypt, there is a reciprocal relationship between the two variables [17] and [18] for the case of Pakistan.

2.4. Causality of Unemployment and Poverty

Using a model of logistic regression to analyze cross-sectional data of 102 randomly collected from three geopolitical states of Nigeria, it shows that there is a proportional relationship between poverty and unemployment, therefore it is recommended that policy makers take action in creating skills programs. which are vocational in nature in helping to overcome the problem of unemployment in the country as well as increasing spending on education and minimum wages [19]. [20] found that unemployment causes poverty while poverty causes discomfort. A different study from [21] stated that there was a one-way relationship between poverty and unemployment in Nigeria from 1980 to 2010.

[22] investigated the relation between unemployment and poverty which is a strong positive correlation in Nigeria using 31 years of data from 1970 to 2000. The same study was also found by [23] stated that there is a long-term positive relationship between poverty and unemployment and a two-way Granger causality between poverty and unemployment which empirically studies the implications of unemployment on poverty rates in Nigeria from 1980 to 2014 using VEC for short-term analysis, Johansen cointegration techniques and causality of Granger.

2.5. Causality of Investment with Poverty

The results of this study show a different one-way causality of poverty reduction in both on two timeframes (short ruan and long run) to FDI when South Africa was decreased poverty in from 1980 to 2014 using an autoregressive distributed lag (ARDL) limit testing approach for cointegration and an ECM-based causality test [24].

The South African government has succeeded in reducing poverty by encouraging FDI inflows resulting in a gradual impovement in inflows of FDI leading to reduction of poverty [25]. [26] examined certain Sub-Saharans from 1990 to 2010 on poverty reduction in these countries as a result of the impact of foreign direct investment inflows. [27] explored the reciprocal between rates of poverty and FDI on regional economics, customs and monetary unions in five communities in Africa. By using the Granger Causality test, a causal relationship was found between FDI and poverty in Egypt, Morocco, Tunisia and Mauritania [28]. A different study from [29] found no causality between FDI and poverty rates in Nigeria in 1980-2102.

The same research was also conducted by [30] showing that there is a unidirectional relationship between FDI and poverty in the long term in Botswana in 1980-2017 using ARDL-bounds and ECM-based testing approaches on the Granger causality model.

2.6. Investment Causality and unemployment

[1] shows that there is a causal relationship between Foreign Direct Investment and unemployment in the Russian Federation. FDI has a very good impact on the host country of investment recipients, thereby reducing unemployment in the EU in 1991-2012 with the econometric methodology with the T-Y procedure [31]. Study shows that there is a positive relationship between FDI and employment in the long term. The same study was also found by [32] that there was a relationship between FDI and long-term employment in Poland in 1995-2009 using the VAR method.

A different study was found by [33] that foreign direct investment did not have a direct impact on

unemployment in countries such as China, India and Pakistan in 1985 - 2008. Investment of Physical and Development of technology had a significant and negative effect on unemployment in Indonesia in 2016-2018 [34] the same study shows that there is a causal relationship between FDI and the reduction in unemployment in Botswana from 1980-2017.

3. METHOD

This research is structured logically and systematically by using the methods used and the research strategies that are considered the most effective, namely Poverty, Unemployment, Economic Growth and Investment in West Sumatra. This research is a quantitative research, which is a method used to conclude and test hypotheses that depend on the results of statistical analysis. The discussion of the research results was conducted to explain the statistical figures and compare them with the results of the initial research and their suitability with the adopted theory. This study uses data on Poverty, Unemployment, Economic Growth and Investment in West Sumatra from 2015 to 2020. Poverty data is proxied from the poverty rate as a percentage, unemployment data is a proxy for the unemployment rate in percentage units, economic growth data and investment data is a proxy for gross fixed investment in million rupiah. Analisis statistik yang digunakan dalam penelitian ini adalah analisis regresi panel VAR. The following research model using the standard VAR model is as follows:

Poverty (P), Unemployment(U), Economic Growth (Y) and Investment (I)

$$Pt = \sum_{t-i}^{n} \alpha i\, P_{t-i} + \sum_{t-i}^{n} \beta i U_{t-i} + \sum_{t-i}^{n} \beta i Y_{t-i} + \sum_{t-i}^{n} \beta i I_{t-i} + U1_t \quad ....(1.1)$$

$$Ut = \sum_{t-i}^{n} \alpha i\, U_{t-i} + \sum_{t-i}^{n} \beta i P_{t-i} + \sum_{t-i}^{n} \beta i Y_{t-i} + \sum_{t-i}^{n} \beta i I_{t-i} + U2_t \quad ....(1.2)$$

$$Yt = \sum_{t-i}^{n} \alpha i\, Y_{t-i} + \sum_{t-i}^{n} \beta i P_{t-i} + \sum_{t-i}^{n} \beta i U_{t-i} + \sum_{t-i}^{n} \beta i I_{t-i} + U3_t \quad ......(1.3)$$

$$It = \sum_{t-i}^{n} \alpha i\, I_{t-i} + \sum_{t-i}^{n} \beta i U_{t-i} + \sum_{t-i}^{n} \beta i Y_{t-i} + \sum_{t-i}^{n} \beta i P_{t-i} + U4_t \quad ....(1.4)$$

Where;
P = Poverty
U = Unemplyment
Y = Economic growth
I = Investment

4. RESULT AND DISCUSSION

The steps taken in the estimation of the economic model with the VAR model are

1. Stationary Test

A data set is said to be stationary if the data stochastically shows a constant pattern from time to time. Testing stationarity of data on panel data is necessary because if the panel data is directly analyzed without being tested for stationarity it will produce spurious results because the variable often contains a unit root. Data that has a stationary nature, indicates that the data will move and fluctuate around the mean value and that value will be constant from time to time. The model condition estimated by VAR is that all variables must be stationary.

Table 1 illustrates the results of the stationary test of poverty, unemployment, growth of economic and investment variabels at the level. It can be showed that

the probability value of Levin, Lin & Chu for the variables of poverty, unemployment, economic growth and investment at levels small than 0.05. Therefore, it can be concluded that all variables in this study are stationary at the level. In other words, the variable data in this research can be showed to be average, variance and autocovariance are constant along time.

Table 1. Stationary Test Results for Poverty, Unemployment, Economic Growth and Investment At Level

Variable	Levin, Lin & Chu Prob.	Conclusion
Poverty (P)	0.0000	Stasionary
Unemployment (U)	0.0009	Stasionary
Economic Growth (Y)	0.0006	Stasionary
Investment (I)	0.0037	Stasionary

2. Optimal Lag Test

Selection of optimal lag length is very important in VAR/VECM systems because choosing optimal lag lengths is useful for dealing with the impact of autocorrelation on systems of VAR/VECM. The selection of the optimal lag length also aims to show

how long the response of the variable is to other variables.

Provisions for the optimal amount of lag can be conducted using several criteria, namely Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criteria (AIC), Schwarz Information Criterion (SIC), and Hannan Quinn Information Criteria (HQ). Based on several criteria to determine the optimal lag, the criteria used in this research is the AIC approach. The AIC approach is used because in general many research use this method. Basically all criteria can be used as long as they are always in their use. The smallest value of AIC will be marked with an asterisk.

Table 2. Results of Optimal Lag Test for Poverty, Unemployment, Variables Economic Growth and Investment

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1573.390	NA	2.58e+31	80.84052	80.96849*	80.88643
1	-1559.679	24.60935	2.03e+31	80.59894	81.11080	80.78259
2	-1543.429	26.66678	1.41e+31	80.22714*	81.12290	80.54853*

Lag Test Results Table 2 illustrates results of the optimal lag test for poverty, unemployment, economic growth and investment. It can be showed that the smallest value of AIC (an asterisk) is at lag 2. So, the optimal lag chosen in this study is lag 2 because it shows the smallest AIC value.

3. Stability Test

The stability of the VAR/VECM system can be shown from the characteristic value of the inverse AR polynomial root or the modulus value in the AR-nominal table. Stability test is conduct by calculating the roots of polynomial functions or in other words with the roots of characteristic polynomials. The system of VAR/VECM is categorized as stable if the overall value of the AR-roots modulus is below 1. If the entire value of the AR-roots modulus is below 1, then the system of VAR/VEMC is categorized as stable. A stable system of VAR/VECM will provide valid IRF and FEVD analysis. On the other hand, an unstable VAR/VECM system will produce invalid IRF and FEVD analysis.

Table 3 indicates the results of the VAR/VECM stability test on this model. The table dispalys all modulus values are below 1. In other words, the VAR/VECM system in this model is a stable VAR/VECM. A stable VAR/VECM will produce a valid or precise IRF and FEVD analysis.

Table 3. Results of VAR/VECM Stability Test for Variables Poverty, Unemployment, Economic Growth and Investment

Root	Modulus
-0.676256	0.676256
0.353625 - 0.561087i	0.663226
0.353625 + 0.561087i	0.663226

4. Causality Test

This research uses Granger causality test. This test can basically show whether a variable has a causality relationship, or only one-way direction (Nachrowi, 2006). If the probability value is less than = 0.05 (t-table is smaller than t-statistics) then Ho is rejected or Ha is accepted, which means that endogenous variable 1 affects endogenous variable 2. If the probability value is less than = 0.05 (t-table is smaller than t-statistics) then Ho is rejected or Ha is accepted which means that endogenous variable 2 affects endogenous variable 1. So, There is a two-way relationship between variables 1 and 2.

Table 4. Results of Causality Test for Poverty, Unemployment, Economic Growth and Investment

Null Hypothesis:	Obs	F-Statistic	Prob.
P does not Granger Cause U	190	3.41579	0.0176
U does not Granger Cause P		10.3120	0.0025
P does not Granger Cause Y	190	1.3E-05	0.9972
Y does not Granger Cause P		5.02782	0.0092
P does not Granger Cause I	190	6.83632	0.0057
I does not Granger Cause P		7.30443	0.0065
U does not Granger Cause Y	190	4.02427	0.0051
Y does not Granger Cause U		6.35705	0.0013
U does not Granger Cause I	190	1.23676	0.3167
I does not Granger Cause U		0.80886	0.5526
Y does not Granger Cause I	190	2.95783	0.0275
I does not Granger Cause Y		2.21165	0.0277

Table 4 indicates the results of the causality test on this model. This table it can be showed that poverty (P) and unemployment (U) have a two-way relationship or causality. This can be showed from the value of probability for P to U is less than 0.05, and the value of probability for U to P is also less than 0.05. Likewise with the variables of economic growth (Y) and investment (I), the probability value of P to I is less than 0.05, and the value of probability for I to P is also less than 0.05. While the connection between other variables does not display a two-direction relationship. Although the connection between these variables does not indicate a two-way relationship, the testing of this model can still be continued.

5. Test of Cointegration

To determine whether the variables and models used show long-term issues, one of the methods used is the cointegration test. Cointegration is a long-term relationship between variables which although individually are not stationary but the linear combination between these variables can be stationary. The existence of a cointegration relationship in a system of equations indicates that in the system there is an error correction model that describes the dynamics in the short term consistently with the long term relationship [36].

The test of cointegration in this research uses the Kao test of cointegration. If the value of probability for ADF Kao cointegration is bigger than zero, then the model is said to be a model of non-cointegrated. Meanwhile, if the value of probability for ADF Kao cointegration is less than zero, then the model is a model of cointegrated. If the model is cointegrated, the analysis used is the Panel of VECM, but if the model is not cointegrated, the analysis used is the Panel of VAR.

Table 5. Results of Cointegration Test for Determination of Poverty, Unemployment, Economic Growth and Investment in West Sumatra

	t-Statistic	Prob.
ADF	-1.268605	0.7235
Residual variance	24.47869	
HAC variance	28.57776	

Table 5 illustrates the results of the Kao cointegration test on the determination of poverty, unemployment, economic growth and investment in West Sumatra. The table displays that the value of ADF probability is bigger than 0.05. The result is the value of ADF probability is bigger than 0.05, this means that the model does not occur Cointegration. Thus, the model for determining poverty, unemployment, economic growth and investment can be estimated using the model of VAR.

6. *Impulse Response Function* (IRF)

The main VAR analysis is actually not reading the model coefficients by paying attention to the lag because the VAR model is indeed quite difficult to interpret. It will be easier for researchers to conduct analysis by looking at the Impulse Response Function (IRF) that is superior in the VAR analysis model.

To see the effect of shock from one variable to another, IRF is used. Shocks on the endogenous variable will affect the variable itself and will spread to other endogenous variables. IRF gives the direction of the connection between the magnitudes of the effect of endogenous variables. The estimation made for this IRF is focused on the response of a variable to changes in one of the standard deviations of the variable itself or from other variables contained in the model of VAR.

The vertical axis shows the standard deviation value which measures how much response a variable will give, in the event of a shock to other variables. Meanwhile, the horizontal axis shows the length of the period (years) of the response given to the shock. The response given above the horizontal axis indicates that the shock will have a positive effect. On the other hand, if the response is below the horizontal axis, it indicates that the shock will have a negative effect.

Figure 1. IRF Results for Determination of Poverty, Unemployment, Economic Growth and Investment in West Sumatra
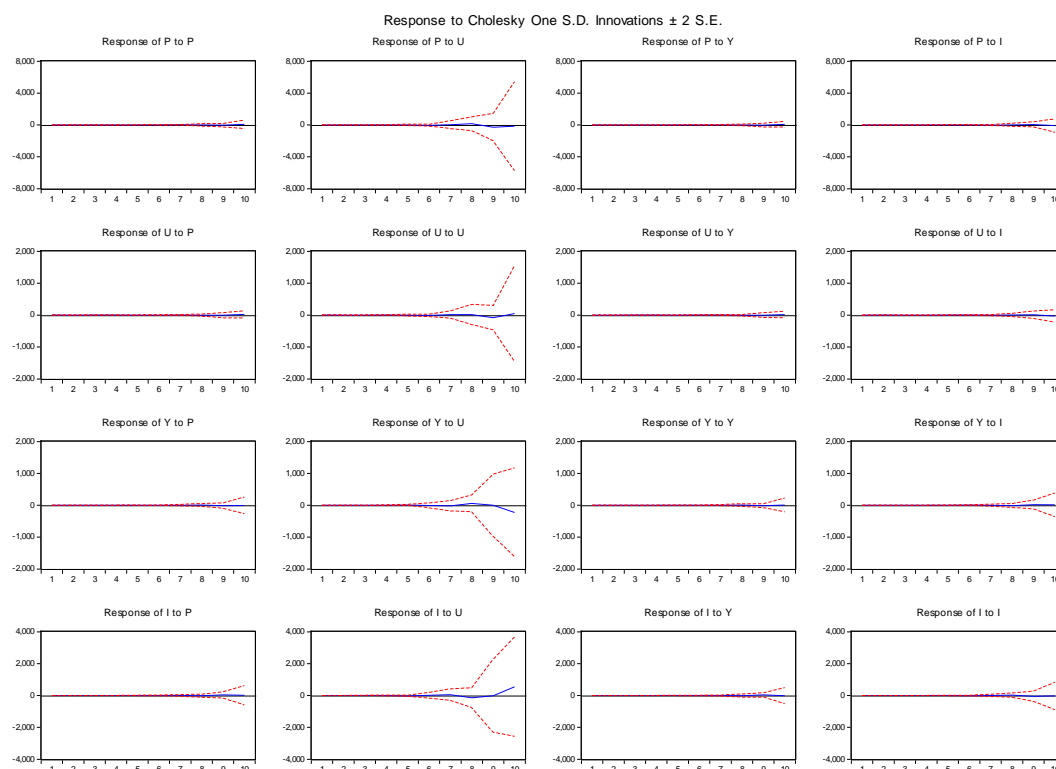

Figure row 1 column 2 (from left) indicates the response to poverty as a result of the unemployment shock. The existence of a shock from unemployment was responded to by poverty at first it tended to be flat or there was no response. However, after the 7th period, poverty showed its reaction as a result of the unemployment shock even though the response was very less responsive. In period 7, the response to period 10 tends to move around the equilibrium line. So, the poverty response due to the unemployment shock is permanent and not consistent in the long term because the poverty response line moves around the equilibrium line. Row 1 column 3 shows the response to poverty due to the shock of economic growth. The shock from economic growth was responded by poverty at first which tended to be flat or there was no response until the last period. Row 1 column 4 shows poverty due to investment shock. The existence of a shock from investment was responded to by poverty at first which tended to be flat or there was no response until the 8th period. After that period, poverty showed its response as a result of an investment shock even if the response was not very responsive. In period 9, the reaction to period 10 leans to move around the equilibrium line.

Row 2 column 1 indicates the unemployment reaction as a result of the shock of poverty. The existence of a poverty shock from being responded to by unemployment at first tends to level off or there is no reaction. However, after the period of 9th, unemployment showed a new response as a result of the poverty shock even though the response was not responsive. In period 10, the response tends to move around the equilibrium line. Therefore, the unemployment response due to the poverty shock is not consistent in the long term because the unemployment response line moves around the equilibrium line. Row 2 column 3 shows the unemployment response due to the shock of economic growth. The shock from growth of economic was responded by unemployment which at first tended to be flat or there was no response until the last period. Row 2 column 4 shows the unemployment response due to investment shock. The existence of a shock from investment was responded by unemployment which at first tended to be flat or there was no response until the 8th period. After the 8th period it tends to move around the equilibrium line.

Row 3 column 1 indicates the reaction of economic growth as a result of the poverty shock. The existence of a poverty shock from being responded to by economic growth at first tended to be flat or there was no response. However, after the period of 9th, unemployment only showed a slight response due to the poverty shock,

although it was not responsive. In period 10, the response leans to move slightly around the equilibrium line. So, the reaction to growth of economic due to the poverty shock is not permanent in the long run because the response of unemployment line moves around the equilibrium line. Row 3 column 2 shows the response of economic growth due to the unemployment shock. The shock from unemployment was responded by economic growth which initially tended to be flat until the 6th period. After that period, economic growth showed a response due to the shock of unemployment but was not very responsive, but after period 8 it tends to move around the balance. This means that the response to economic growth is not permanent in the long term. Row 3 column 4 shows the response of economic growth due to investment shock. The existence of a shock from investment was responded to by economic growth which at first tended to be flat or there was no response until the 8th period. After the 8th period it tends to move around the equilibrium line.

Row 4 column 1 indicates the response of investment as a result of the poverty shock. The existence of a poverty shock from being responded to by investment at first tends to be flat or there is no reactions. But, after the period of 9th, investment only showed a slight response due to the poverty shock although it was not responsive. In periods 9 and 10, the response leans to move slightly around the line of equilibrium. So, the investment response due to the poverty shock is not permanent in the long term because the investment reaction line moves around the level of equilibrium. Row 4 column 2 shows the reaction of investment due to the unemployment shock. The shock from unemployment was responded by investment which initially tended to be flat until the 7th period. After that period, investment showed a response due to the unemployment shock but was not very responsive, but after period 7 it tends to move around the balance. This means that the investment response is not permanent in the long term. Row 4 column 3 shows the

investment response due to the shock of economic growth. The shock of economic growth from being responded to by investment initially tended to be flat or there was no response until the 8th period. After the 8th period it tends to move around the equilibrium line.

7. *Decomposition of Forecast Error Variance*

Table 6 indicates the results of the FEVD for determining poverty, unemployment, economic growth and investment in West Sumatra. In the table for the Variance Decomposition of P, it can be showed that the variability of poverty in the short run can be clarified by shocks from unemployment, economic growth and investment of 0.00%, as well as unemployment of 0.52% and in the long term by 83%, 4.6% and 7.9%. So in the long term, the greatest variability of poverty is determined by the shock of unemployment.

In the table, the Variance Decomposition of P section shows that the variability of unemployment in the short run can be stated by shocks from economic growth and investment of 0.00% and in the long term by 3.19%, 9.05% and 4.21%. So in the long run, the greatest variability of unemployment is determined by the investment shock.

The Variance Decomposition of P shows that the variability of economic growth in the short run can be stated by shocks from investment, unemployment and poverty of 0.00%, 3.46%, 4.36% and in the long term 1.16%, 97.78% and 0 ,49%. So in the long term, the greatest variability of economic growth is determined by the unemployment shock.

Variance Decomposition of P shows that the variability of investment in the short term can be explained by shocks from poverty, unemployment and economic growth of 4.35%, 1.20%, 10.69% and in the long term 0.49%, 97.83% and 0.52%. So in the long term, the greatest investment variability is determined by the unemployment shock.

Table 6. Results of FEVD for Determination of Poverty, Unemployment, Economic Growth and Investment in West Sumatra

Variance Decomposition of P: Period	S.E.	P	U	Y	I
1	2.498311	100.0000	0.000000	0.000000	0.000000
2	3.413065	89.27349	7.86E-05	0.273510	10.45293
3	6.941779	28.12480	66.57923	0.888913	4.407063
4	11.54545	18.78420	74.49784	3.387364	3.330599
5	17.27726	8.397226	84.60159	2.104928	4.896258
6	48.97361	1.187318	95.68851	0.265870	2.858307

7	58.46473	6.142566	80.29481	4.642895	8.919732
8	158.8140	0.833037	96.99276	0.954027	1.220179
9	331.3496	1.552826	93.65427	0.695608	4.097293
10	391.3356	4.126838	83.34932	4.604550	7.919288

Variance Decomposition of U:

Period	S.E.	P	U	Y	I
1	0.421605	0.524855	99.47515	0.000000	0.000000
2	0.575537	2.092592	86.19461	1.631182	10.08162
3	1.106441	1.376866	93.43340	2.274204	2.915526
4	3.040640	1.278963	95.86026	0.571075	2.289699
5	3.325937	4.687003	80.36679	4.174992	10.77121
6	10.62338	0.465879	97.66968	0.638146	1.226299
7	19.12097	2.259955	91.48498	1.262821	4.992249
8	26.76493	2.657769	88.80945	3.314118	5.218663
9	85.85327	0.685129	97.19159	0.334842	1.788442
10	106.3466	4.213879	83.53951	3.194343	9.052265

Variance Decomposition of Y:

Period	S.E.	P	U	Y	I
1	0.343524	4.359263	3.463952	92.17678	0.000000
2	1.119697	2.123270	86.60064	10.76367	0.512429
3	2.127500	1.375235	89.83884	3.001307	5.784617
4	2.605955	4.643957	78.61998	9.502514	7.233553
5	9.097601	0.730582	97.25186	0.812275	1.205287
6	12.50078	3.313398	86.56891	2.131443	7.986254
7	25.49819	1.155890	94.71929	1.880404	2.244415
8	65.78541	1.156888	95.58010	0.535815	2.727193
9	71.85852	4.958459	80.11009	4.575144	10.35630
10	236.2898	0.486758	97.77765	0.577814	1.157774

Variance Decomposition of I:

Period	S.E.	P	U	Y	I
1	0.434732	1.192471	2.141480	10.68962	85.97643
2	2.248257	0.091037	95.94625	0.710754	3.251961
3	4.930065	1.500289	92.66870	1.412733	4.418283
4	6.313154	3.045212	86.02708	3.760304	7.167403
5	21.56111	0.557760	97.50639	0.324056	1.611792
6	28.85991	3.706573	85.51444	2.702091	8.076894
7	62.87566	0.993481	95.54877	1.527406	1.930340
8	154.9878	1.219135	95.25553	0.524296	3.001039
9	169.7263	4.914391	80.26518	4.762880	10.05755
10	572.5046	0.487893	**97.82683**	0.519523	1.165750

Cholesky Ordering:
P U Y I

The causality of poverty with unemployment
Based on the results of the test of Granger Causality, it is known that there is a causal connection between poverty and unemployment. This means that poverty affects unemployment and vice versa unemployment affects affects poverty. It is a fact that poverty is the result of unemployment and unemployment is the cause of poverty because it does not have income so that the ability to meet the needs of life is small. On the other hand, poor people generally find it difficult to work because of limited access to everything, including access to finding work, so that many poor people are unemployed. Those who are unemployed certainly cannot meet the needs of a decent life so they are included in the poor community group.

This study is in line with [22] and [23], [19] and [20] investigated the relationship between poverty, economic growth and unemployment, which has a strong positive correlation in Nigeria. This study differs from [21] which states that there is only a one-way relationship between poverty and unemployment in Nigeria from 1980 to 2010.

Causality of Poverty with Economic Growth
The results of the Granger Causality test state that there is a one-way relationship between poverty and economic growth, namely economic growth affects poverty but poverty does not affect economic growth. This means that the level of economic growth will determine the poor or not. If economic growth is high, poverty will decrease because it can absorb a lot of people working so that people have income so that the number of poor people decreases. On the other hand, if economic growth declines like today, there will be many poor people who are not able to meet the basic needs of life properly. The number of poor people increases because their income decreases and even loses income because production decreases and people's purchasing power decreases. Meanwhile, poverty does not affect economic growth because it depends on the size of the poverty rate. If the poverty rate is small, it is certainly not the impact of economic growth. It means that advanced economic growth is a modern sector, not a traditional sector where there are many poor people.

This study is in line [13] in Latin America and Caribbean [15] in Indonesia in 2015-2017, [11] in Thailand and research by [12]. In Indonesia and Thailand, it only shows a unidirectional relationship between poverty and economic growth. Meanwhile, the same study by [16] found that the causal relationship between poverty and economic growth in the short term but in the long term was not found in Ethiopia.

Poverty Causality with Investment

Based on the results of the test of Granger Causality, it was observed that there is a causal relationship between poverty and investment. This means that the size of poverty affects the size of investment in West Sumatra Province. This means that if people's incomes are low, of course the formation of savings is also low so that the formation of investment is also small. On the other hand, if people's incomes are high, the formation of savings will be high so that the formation of investment is also high in West Sumatra Province. The size of the investment determines the size of the poverty rate. If the investment is small in the Province of West Sumatra, then the opportunity for community income will be small so that the poverty rate will increase. On the other hand, if the investment is large in West Sumatra Province, the income opportunities for the community will be greater so that poverty will be small.

The same study was found by [28] in Egypt, Morocco, Tunisia and Mauritania, [26] examined a particular Sub-Saharan population from 1990 to 2010, [27], in five economic communities. regional and five customs and monetary unions in Africa. Different studies were found by [24] in South Africa from 1980 to 2014, [29] in Nigeria in 1980-2102, [30] in Botswana in 1980 -2017.

Causality of Unemployment with Economic Growth
Granger Causality test results found that there is a causal relationship between unemployment and economic growth. This means that high unemployment will have a negative impact on economic growth because unemployment causes many people to lose their jobs so that economic sectors do not work. This reduces economic output so that economic growth will decline in the Province of West Sumatra. Conversely, if unemployment is small, the economic sector will move and develop so that production increases and economic growth also increases in West Sumatra Province. Meanwhile, the size of the economic growth will determine the size of the unemployment that will occur. If the economic sectors develop, the unemployment rate will decrease in the Province of West Sumatra.

This causality study between unemployment and economic growth is in accordance with Okun's Law (1962), and research by [7] in Mecedonia. The same research was also found by [37] in Nigeria in 1981-2016 and [38] in 1980-2013 about the causality of these two variables. [39] also stated that the same thing happened in Pakistan in 1972-2006 with a negative relationship between the two variables.

Causality of Unemployment with Investment
Granger Causality test results found that there is no causal relationship between unemployment and investment. This means that the size of unemployment does not have an impact on investment in West Sumatra Province. On the other hand, the size of the investment does not affect unemployment in the Province of West

Sumatra. This means that the investment here used is gross investment which does not affect the income in this province.

This research is in accordance with research by [33], that foreign direct investment does not have a direct impact on unemployment in countries such as China, India and Pakistan in 1985 - 2008. Different research with [1] and [31].

Causality of Economic Growth with Investment

Granger Causality test results found that there is a causal relationship between economic growth and investment. This means that economic growth is determined by the size of the investment, otherwise investment is determined by the level of economic growth. Because investment and economic growth are variables that have a strong influence on each other. If there is a lot of investment, the economic sectors will move and run so that output or production will increase because investment is also called the engine of growth. If economic growth is high, people's income will be high so that people's savings will increase and will be used for investment. So economic growth and investment are variables that affect the economy of West Sumatra Province.

This research proved to be in accordance with the theory of Harrord Domard, Solow, and the classical theory. Empirically, this research is also in line with [40], [36] and [4]. What is different is [4] research that there is no causality between the two variables.

Based on the results of a deeper discussion analysis, it can be concluded that:

1. Based on the results of the test of Granger Causality, it is known that there is a causal connection between poverty and unemployment.
2. There is a one-way relationship between poverty and economic growth, namely economic growth affects poverty but poverty does not affect economic growth.
3. There is a causal relationship between poverty and investment.
4. There is a causal relationship between unemployment and economic growth.
5. There is no causal relationship between unemployment and economic growth
6. There is a causal relationship between economic growth and investment
7. In the long run, the greatest variability of poverty is determined by the shock of unemployment, the greatest variability of unemployment is determined by the investment shock, the greatest variability of economic growth is determined by the unemployment shock, and the greatest variability of investment is determined by the unemployment shock.

Variability Economic growth, poverty and greater investment are determined by the unemployment shock. Therefore, unemployment is very important to get the attention of the district and city governments. If the unemployment problem is resolved, the economy of West Sumatra Province will develop and progress rapidly so that the community becomes prosperous.

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