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

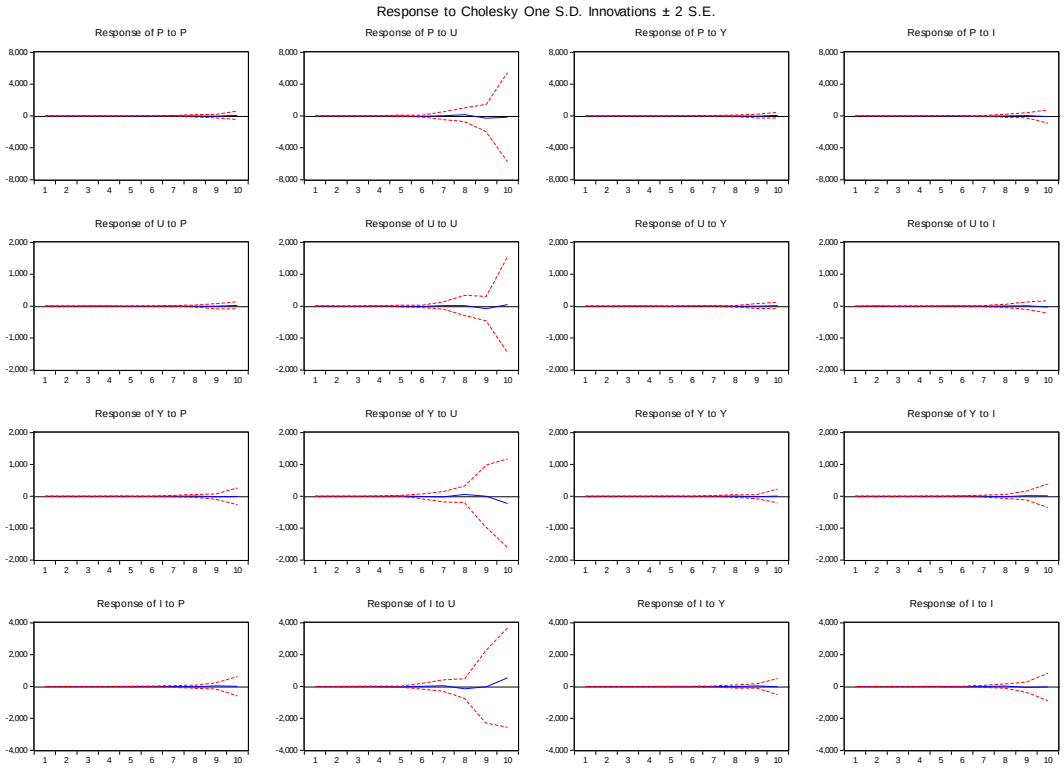

Figure row 1 column 2 (from left) indicates the response to poverty as a result of the unemployment shock. The existence of a shock from unemployment was responded to by poverty at first it tended to be flat or there was no response. However, after the 7th period, poverty showed its reaction as a result 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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