

Interaction of Health Variables with Economic Variables (Case Study in West Sumatera)

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ABSTRACT

This study was conducted to examine the interaction of health variables like (the expectancy of life, nutrition and morbidity) with economic variables (the economic growth). This study using the analytical method with Granger causality test, the function of impulse response and prediction of error variance decomposition in 19 locale/urban areas in West Sumatra from 2016 – 2019. Result of this study conclude that in general there is no causality between health variables, namely expectancy of life, nutrition, morbidity and the economic variable the economic growth. However, the findings found that there was a one-way relationship between health variables and economic variables. Means that in general health variables can affect economic variables. In addition, from the IRF results it was found that the health variable gave a shock to economic growth which responds permanently or not permanently. Response of the economic growth due to shock from life expectancy and nutrition not permanent while shock morbidity responded by the economic growth permanent because it moves away from the balance line. From the results of FEVD, could be seen that the changeability of the monetary development generally the largest is explained by morbidity in the short term and the long term.

Keywords: *Life expectancy, Nutrition, Morbidity, Economic Growth*

1. INTRODUCTION

Health and the economy are inseparable.[1]–[5] Good quality of health will be able to encourage the economic activity of the people in an area. In the other hand, poor health quality can reduce the rate of economic activity in the community. The same is true of the economy and health. Good community of economic activity will certainly increase the income they receive so that it has an impact on improving the welfare of the community's life itself. This welfare will certainly encourage the good quality of public health. The opposite will apply if the community's economic activity decreases, the quality of public health itself will also decrease.[6]–[11]

This can be seen from several examples of life in this world.[2], [6], [7] For instance in developed countries, good quality of health encourages good economic activity. Good economic of activity encourages the quality of public health in the country. On the other hand, in developing countries, poor health quality makes

In the RPJMD Sumatera Barat 2016-2021 the mission 4 states is development in the economic

their economy unable to do much. Their low economic activity also has an impact on the poor quality of health received by the community so far (Anggraeni, 2017; Anwar, 2017; Falck, 2011).[12]–[15] These two things are old issues that have not been well resolved, especially in developing countries.

West Sumatra as one of the regions that continues to strive to improve the quality of health and regional economic activities (Amar, 2019).[16] Various efforts, policies and development programs have been taken and implemented of health and economic quality in the future. In the Regional Medium-Term Development Plan (RPJMD) of West Sumatra Province for 2016-2021, it has been emphasized that Health Development in West Sumatra it's the third point of Governor's mission, namely "Improving human resources who are intelligent, healthy, faithful, character and with high quality". Increasing of life expectancy by increasing clean and healthy living behavior in the community has been done as effort to achieve that mission,

sector, beside the programs in the health sector, that is "Increacement a strong, productive, and

regionally and globally competitive community-based economy, by optimizing the utilization development resources of regional". Efforts that have been made include increasing the development of people-based economic and businesses, developing product downstream businesses (processing industry), increasing the competitiveness of products for people-based economic businesses and others.

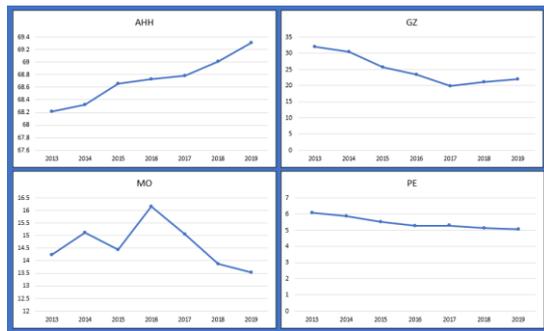


Figure 1: Trends of AHH, GZ, MO and PE in West Sumatra from 2013 - 2019

It viewed carefully through the data on the health and economic variables of West Sumatra, showed that there is an indication of a strong interaction between health and economic variables. In picture 1, indicators of life expectancy (AHH), nutrition (GZ) and morbidity (MO) as the health variable shown a strong trend with the economic variable, that is the economic growth (PE). The figure shows that the trend of AHH data from 2013 – 2019 has increased while the PE trend has decreased. There is a phenomenon that shows that when the community's AHH increases, this condition will strengthen and increase PE. However, in West Sumatra, the opposite is true. Besides that, the GZ variable shows a decreasing trend but in the last 2 years it has shown an increase. Meanwhile, the PE trend has decreased. This also shows the phenomenon of the relationship between GZ and PE. The MO variable also shows the same thing, where MO experienced a fluctuating trend at the beginning of the observation, but the last 4 years showed a declining trend. This condition should be accompanied by an

- AHH = Life Expectancy
- GZ = Nutrition
- MO = Morbidity
- PE = Economic Growth

Before doing estimate the model of PVAR/VECM, there is several tests, including test of stationary, optimal lag, PVAR/VECM stability, causality, cointegration, (IRF)/ drive reaction

increase in PE, but PE shows a decreasing condition. Once again, this trend shows a phenomenon. This condition should be accompanied by an increase in PE, but PE shows a decreasing condition. Once again, this trend shows a phenomenon. This condition should be accompanied by an increase in PE, but PE shows a decreasing condition. Once again, this trend shows a phenomenon.

From the analysis of the trend data, it shows that there is an interesting phenomenon to study that health variables and economic variables in West Sumatra allegedly do not show a positive relationship and even tend to be negative. Supposedly when the health variable improves, the economic variable will increase. On the other hand, when the economic variable increases, this condition will be followed by an improvement in the health variable. However, in West Sumatra, things are different. Therefore, this study aims to analyze the problem of the interaction in health variables with these economic variables so that it is known which health variable gives the greatest shock to economic variables.

2. RESEARCH METHODS

In this review the information sourced from the Central Bureau of Statistics of the Province of West Sumatra. or this investigation variable comprise of board information comprising by information on future, nourishment, horribleness, and monetary development in 19 areas or urban communities start from 2013-2019.

The information examination strategy in this review utilizes the (PVAR/VECM). The type of the PVAR/VECM model for this review is as per the following:

$$\begin{aligned}
 AHH_t &= \alpha_{11} + \sum_{i=1}^n \beta_{11} AHH_{t-i} + \sum_{i=1}^n \theta_{11} GZ_{t-i} + \sum_{i=1}^n \lambda_{11} MO_{t-i} + \sum_{i=1}^n \phi_{11} PE_{t-i} + \varepsilon_{1t} \\
 GZ_t &= \alpha_{21} + \sum_{i=1}^n \beta_{21} AHH_{t-i} + \sum_{i=1}^n \theta_{21} GZ_{t-i} + \sum_{i=1}^n \lambda_{21} MO_{t-i} + \sum_{i=1}^n \phi_{21} PE_{t-i} + \varepsilon_{2t} \\
 MO_t &= \alpha_{31} + \sum_{i=1}^n \beta_{31} AHH_{t-i} + \sum_{i=1}^n \theta_{31} GZ_{t-i} + \sum_{i=1}^n \lambda_{31} MO_{t-i} + \sum_{i=1}^n \phi_{31} PE_{t-i} + \varepsilon_{3t} \\
 PE_t &= \alpha_{41} + \sum_{i=1}^n \beta_{41} AHH_{t-i} + \sum_{i=1}^n \theta_{41} GZ_{t-i} + \sum_{i=1}^n \lambda_{41} MO_{t-i} + \sum_{i=1}^n \phi_{41} PE_{t-i} + \varepsilon_{4t}
 \end{aligned}$$

capacity and (FEVD)/estimate mistake change deterioration.

To analyze causality of life expectancy, nutrition, morbidity, the economic growth in West Sumatra were analyzed using Granger causality and followed by IRF and FEVD approaches. IRF analysis seen that the response shock of the health variable given by regional economic variables. Analysis from the FEVD showed that how much

impact the health variable has on regional economic variables as seen from the shock contribution given by each variable.

3. RESULT

3.1 Stationary Test

This review utilizing the Dickey-Fuller (DF) unit root test, to decide if the factors in this review demonstrated fixed or not in the review was. This test was named by David Dickey and Wayne Fuller. In the event that the measurable test esteem is more modest than the basic worth or simultaneously the likelihood worth of the variable is not exactly = 0.05 it implies variable information is supposed to be fixed (H0 is dismissed or Ha is acknowledged). However, on the off chance that a variable information the factual test esteem is more prominent than the basic worth or simultaneously the likelihood worth of the variable is more noteworthy than = 0.05 it implies non-fixed (H0 is acknowledged or Ha is dismissed). Nonetheless, assuming a variable information is arranged as non-fixed information, the arrangement that should be possible is preparing non-fixed contrasts.

Table 1. Stationary Test Results for AHH, GZ, MO and PE Variables in Stage

Variable Name	Levin, Lin & Chu t	Conclusion
	Probability	
Life Expectancy (AHH)	0,0000	unchanged
Nutrition (GZ)	0,0023	unchanged
Morbidity (MO)	0,0000	unchanged
Economic Growth (PE)	0,0000	unchanged

Table 1 it can show that the aftereffects of the fixed test AHH, GZ, MO and PE factors at the level. Table it very well may be seen that the likelihood worth of Levin, Lin and Chu at all factors specifically AHH, GZ, MO and PE at a level under 0.05. All factors in this review normal, difference and autocovariance are steady after some time (for various slacks the qualities are something very similar, regardless of where you start to measure).

3.2 OL Test.

Decision of the ideal leeway length is basic in the VAR/VECM is valuable for defeating the effect of the autocorrelation in the VAR/VECM framework, and furthermore that showing how long the reaction of a variable to different factors.[17]

To choose the ideal measure of (slack length standards) utilizing a few rules, counting: LR, FPE, AIC, SIC, and HQIC. From the few measures for deciding the ideal slack, the standards picked in this review is the AIC strategy. All things considered, everything models can be utilized as

long as they are reliable in their utilization. In any case, AIC strategy can be utilized on the grounds that overall many examinations utilize this technique. Littlest AIC esteem set apart with an indicator.

Table 2 seen that outcomes slack test for AHH, GZ, MO, and PE factors were ideal. That the littlest AIC esteem set apart with an indicator is at slack 2. Thusly, in this review the ideal slack picked is slack 2 since it gives the littlest AIC esteem.

Table 2. Optimal Lag Test Results for AHH, GZ, MO and PE Variables

lag	LogL	LR	FPE	AIC	SC	HQ
0	-524.8187	NA	30503065	28.58479	28.75895	28.64619
1	-304.2105	381.5925	483.0103	17.52489	18.39566*	17.83188
2	-275.6077	43,29071*	252.6371*	16.84366*	18.41104	17.39624*

3.3 Stability Test

The solidness test has been finished by working out the foundations of the polynomial capacity or known as the underlying foundations of trademark polynomial. The VAR/VECM framework is arranged as steady if the whole worth of the AR-roots modulus is under 1. In the mean time, the VAR/VECM framework is arranged as shaky when the whole worth of the AR-roots modulus is under 1. A steady VAR/VECM framework will result in a substantial IRF and FEVD investigation. Then again, invalid IRF and FEVD investigation a shaky found in unsteady VAR/VECM framework.

From the table 3 the outcomes of VAR/VECM robustness test on this model, that all modulus regards are under 1. It could be said that VAR/VECM system in this model is a steady VAR/VECM which will shown result in a genuine or definite IRF and FEVD assessment.

Table 3. VAR/VECM Stability Test Results AHH, GZ, MO and PE Variables

Root	Modulus
0.993309	0.993309
0.854416	0.854416
0.792694 - 0.086208i	0.797368
0.792694 + 0.086208i	0.797368
-0.563379	0.563379
-0.370806 - 0.341915i	0.504384
-0.370806 + 0.341915i	0.504384
0.175565	0.175565

3.4 Causality Test

This review utilized the Granger causality test. This test for the most part can show regardless of whether a variable has a two-way relationship, or just a single way. Ho is dismissed or Ha is acknowledged whether the likelihood esteem is little than = 0.05 (t-measurement is more noteworthy than t-table), it implies that endogenous variable 1 influences endogenous variable 2. Also, if the likelihood esteem is little than = 0.05 (t-measurement is more noteworthy than t-table) then, at that point, Ho is dismissed or Ha is acknowledged, mean the outcome that endogenous variable 2 influences endogenous variable 1. So endogenous factors 1 and 2 have a bidirectional relation or causality.

Table 4 it shows the delayed consequences of the causality test on this model, seen that there are variables that have a two-way relationship and some of it does not show a two-way relationship. The variables AHH and PE show a two-way relationship because the probability of each of these variables is smaller than 0.05. While the PE variable on GZ and MO also has a small probability of 0.05. This means that these variables have a one-way relationship. However, if you pay close attention to the health variable and the economic variable, there is a relationship even though there is a two-way or one-way relationship. In any case, testing of this model can in any case be proceeded.

Table 4. Causality Test Results for AHH, GZ, MO and PE Variables

Dependent variable: AHH

excluded	Chi-sq	df	Prob.
GZ	8.952030	2	0.2285
MO	2.516192	2	0.2842
PE	9.663760	2	0.0080
All	15.15439	6	0.0191

Dependent variable: GZ

excluded	Chi-sq	df	Prob.
AHH	1.414930	2	0.4929
MO	0.162983	2	0.9217
PE	9.747933	2	0.0073

All	2.651726	6	0.0511
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Dependent variable: MO

excluded	Chi-sq	df	Prob.
AHH	0.238525	2	0.8876
GZ	3.886804	2	0.1432
PE	9.464084	2	0.0093
All	9.187881	6	0.0633

Dependent variable: PE

excluded	Chi-sq	df	Prob.
AHH	45.97281	2	0.0000
GZ	3.418954	2	0.1810
MO	2.254727	2	0.3239
All	48.02070	6	0.0000

3.5 Cointegration Test

This review utilizing the Kao cointegration test. In the event that the likelihood worth of ADF Kao cointegration is more noteworthy than nothing, the model should be a non-cointegrated model. In the meantime, the model should become a non-cointegrated model if it is cointegrated ADF Kao likelihood esteem is under nothing. In the event that the model is cointegrated, the examination utilized is the VECM Panel, yet the investigation utilizing VAR Panel assuming the model isn't cointegrated.

Table 5 can see the consequences of the Kao cointegration test on the model of the impact of web use on money related action in the West Sumatra locale. From the table, the ADF probability regard is more conspicuous than 0.05. Since the ADF probability regard is more unmistakable than 0.05, it will in general be communicated that this model isn't cointegrated. Consequently, the model of the impact of web takes on monetary actions in the West Sumatra area can be evaluated using the model of VAR Panel.

Table 5. AHH, GZ, MO and PE Cointegration Test Results

	t-Statistic	Prob.
ADF	1.268605	0.7235
Residual variance	24,47869	
HAC variance	28.57776	

3.6 Impulse Response Function

Impulse Response Functionserved to see the impact of jerk from a single variable to different factors, more than that, IRF provides the guidance of the connection between the greatness of the impact of the endogenous variable. A jerk to the endogenous variable will impact the real factor and will distribution to other endogenous elements. IRF makes evaluation with focused in on the understanding of a variable to a change of one SD of the real factor or of various elements loaded in the VAR model. **Figure 2:** Results of IRF PE Response Due to AHH Shock

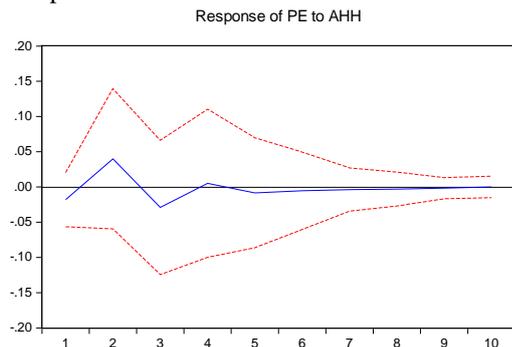


Figure 2 shows the PE response to AHH shock. The presence of shock from AHH in response to PE initially increases. Then from period 2 to period 3, the PE response decreased and increased again in period 4. However, after the 5th period, PE showed a response due to AHH shock which tended to level off. In period 6, the PE response will in general move along the balance line. Consequently, the PE reaction because of AHH shock will in general be non-long-lasting in the long haul in light of the fact that the PE reaction line draws nearer to the balance line.

Figure 3 shows the PE response as a result of the GZ shock. The presence of shock from GZ in response to PE initially increased. Then from period 2 to period 3, the PE response decreased and increased again until period 5. In the 7th period onwards the PE response was on the equilibrium line. In period 6, the PE response will in general move along the balance line. Accordingly, the PE reaction because of GZ shock isn't extremely

durable in the long haul in light of the fact that the PE reaction line is on the equilibrium line.

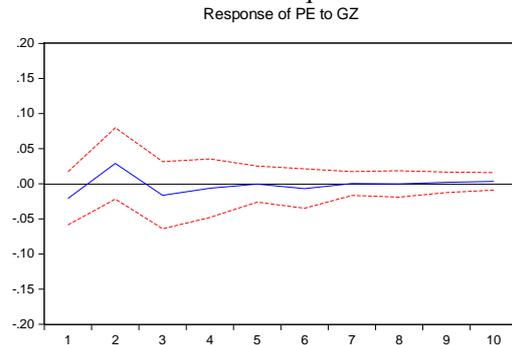
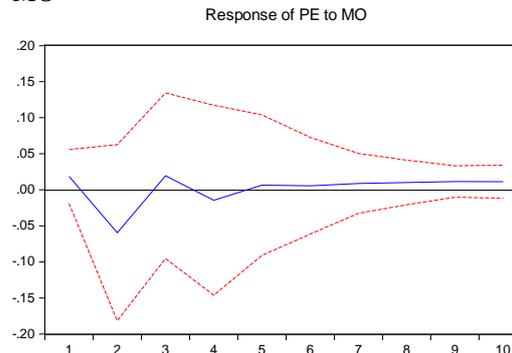


Figure 3: IRF PE Response Result Due to GZ Shock

Figure 4 shows the PE response as a result of the MO shock. The MO shock had an impact on the response to a decrease in PE from period 1 to period 2. In period 2 to period 3, the PE response increased but fell again in the next period. In the 5th period onwards, the PE response is above the equilibrium line and tends to move away from the equilibrium line. Thus, it can be interpreted that the MO shock causes the PE response to move away from the equilibrium line and is permanent.

Figure 4: IRF Results of PE Response for Shock MO



3.7 Forecast Error Variance Decomposition (FEVD)

Gauge mistake change disintegration (FEVD) is an investigation that gives data with respect to the powerful connection among endogenous variables and endogenous components in the VAR/VECM enthusiastic system. FEVD is a shock from factors that influence the inconstancy (vacillation) of specific factors against different factors which is completed symmetrically. This FEVD is directed to perceive which level of the job of each shock on the changeability of specific factors or to look at the wellsprings of vacillations in specific factors. Along these lines, it tends to be known with conviction the components that impact the vacillation of one variable against different factors. These components are strategy suggestions

that assume a significant part in the security of these factors.

Table 6. FEVD AHH, GZ, MO and PE Results

Variance Decomposition of PE:					
Period	SE	AHH	GZ	MO	PE
1	0.117598	2.349999	3.127199	2.455884	92.06692
2	0.150780	8.458708	5.600624	17.05532	68.88534
3	0.159930	10.82498	6.027179	16.63402	66.51383
4	0.168157	9.887793	5.592852	15.79189	68.72747
5	0.169792	9.940124	5.486469	15.63699	68.93641
6	0.171656	9.825735	5.527066	15.40557	69.24163
7	0.172370	9.792297	5.481756	15.53883	69.18712
8	0.172869	9.766611	5.450370	15.79421	68.98880
9	0.173302	9.727924	5.437467	16.15297	68.68164
10	0.173695	9.683951	5.451286	16.49357	68.37120

Cholesky Ordering: AHH
GZ MO PE

Table 6 shows the aftereffects of FEVD on the effect of AHH, GZ and MO on PE. The table shows that PE fluctuation in the present moment can be clarified by the shock from the AHH of 2.34% and 9.68% in the long haul. PE changeability in the present moment is clarified by the GZ shock of 3.12% and in the drawn out it diminishes to 5.45%. In the meantime, the MO shock to PE changeability in the present moment was 2.45% and expanded in the long haul to 16.49%.

From the aftereffects of the FEVD, it tends to be presumed that notwithstanding the PE variable itself, overall MO has the best effect both in the short and long haul on PE. This can be seen from the worth of PE changeability because of shock from MO the biggest among different factors like AHH and GZ. This is on the grounds that temporarily, particularly in the long haul, when individuals experience an increment in objections about wellbeing, this will upset their efficiency at work. This decline in productivity will certainly have an impact on the decline in the ability of the community to produce goods and services. In the end, this condition will certainly have an impact on economic growth.

4. CONCLUSION

The results of this study conclude that in general there is no causality between the health variables, namely AHH, GZ, MO and the economic variable, namely PE. However, the findings found

that there was a one-way relationship between health variables and economic variables. This means that in general health variables can affect economic variables.

In addition, from the IRF results it was found that the health variable gave a shock to PE which was responded to permanently or not permanently. PE response due to shock from AHH and GZ is not permanent while MO shock is responded by permanent PE because it moves away from the equilibrium line. From the FEVD results, it can be seen that the greatest variability of PE is generally explained by MO both for the time being and in the long haul.

From the consequences of the review, the idea set forward in this review is that the public authority ought to consistently focus on and have the option to support the nature of general wellbeing. Since it is obvious from the consequences of the review that the wellbeing variable affects the monetary factors of West Sumatra. The government needs to provide health services that are affordable by the community so that people can get the certainty of good health services. The government needs to provide and add adequate health facilities. With more and more quality health facilities for the community, it will certainly be able to improve the health condition of the community itself. The government needs to increase the public health budget of West Sumatra so that public health conditions are more guaranteed. Good health will increase people's productivity so that it has an impact on increasing the production of goods and services. This will ultimately be able to encourage increased economic growth.

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