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Wilcoxon Rank-Sum Hypothesis Testing of Military Budgets as a Percentage of Gross Domestic Product and Government Spending

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Abstract
Military spending is a crucial factor in maintaining national sovereignty and security from internal and external threats. Increased state budget expenditures for military expenditures occur in countries at war. This study aims to describe the policy of determining military budget size as a percentage of Gross Domestic Product (GDP) and government spending in countries in Asia, Oceania, and Africa. The approach used in this study is descriptive quantitative. The data used are national defense allocations published by SIPRI. Data analysis used a hypothesis test with a Wilcoxon rank sum. This study concluded that for hypothesis testing with a Wilcoxon rank sum and using the same sample size and no more than 20 samples, the policy of determining military budget size as a percentage of Gross Domestic Product (GDP) in Asian and African countries differs. For testing with a different sample size and no more than 20 samples, the policy of determining military budget size as a percentage of Gross Domestic Product (GDP) in Asian and African countries is the same. Based on hypothesis testing with a Wilcoxon rank sum and using a sample size greater than 20 samples, the policy of determining military budget size as a percentage of government spending in Asian, Oceania, and African countries differs. There is a difference between the policy of determining the size of the military budget according to the percentage of government spending between Asian-Oceanic countries and African countries.

Keywords: *Defense budgets, Government spending, Gross Domestic Product, Military budget*

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1. INTRODUCTION

When an institution or researcher is conducting research related to a social problem, they often encounter a classic problem. A classic problem is that continuous data distributed normally is difficult or even impossible to obtain [1]. On other occasions, the only data obtained is data in specific categories whose frequencies can only be calculated. Sometimes, the data obtained can only be categorized or ranked [2].

If the data obtained or used in the research is categorical or ordinal, the researcher cannot treat it the same way as parametric statistical analysis methods [3]. If they insist on processing the data using parametric statistical methods, the conclusions they draw will undoubtedly be far from accurate. This occurs due to errors in the method chosen. Therefore, researchers must apply appropriate methods, namely non-parametric statistical methods [4]. Non-parametric statistical methods are appropriate when the

conditions encountered in the research have certain characteristics. Hypothesis testing using the Wilcoxon rank sum is an analysis used to determine the comparison between two sample groups where the members are assumed to be unpaired, or the two groups are not required to be paired [5]. The nature and distribution of the data, as well as the population parameters, are unknown.

Essentially, this hypothesis testing method is applied to test the validity of the null hypothesis, which states that the average value or sum of the values of the first and second sample groups are the same. Meanwhile, the alternative hypothesis states that the average value or sum of the values of the first and second sample groups are different. However, it must be remembered that the members of the two sample groups are not paired. The precise formulation of the null hypothesis and the alternative hypothesis depends on the context of the situation.

Military spending is a crucial factor in maintaining national sovereignty and security from internal and external threats [6]. Increased state budget expenditures for military expenditures occur in countries at war. Conflict or war situations in a country cause economic turmoil. A security level that is still in the minimum stage will cause the rate of economic growth to decline accompanied by additional unemployment as indicated by indicators of economic activity, manufacturing production, and the cessation of economic actors [7]. To provide security guarantees against internal and external threats, each country determines its military budget policy with costs charged to the state budget separated from national income [8]. Broadly speaking, defense expenditure includes the production of equipment and vehicles used as defense equipment, cost related to repairs and maintenance, costs related to R&D and financing of civilian staff employed in the defense sector [9]. Defense spending in a country will increase drastically when facing a threat, this increase will result in a reduction in budget allocations to improve the welfare of the country. So this issue is an interesting topic in looking at the rise and fall of defense spending compared to budget allocations for other sectors such as education, welfare, and infrastructure.

The country must be able to manage defense costs well with security objectives because this is very important in relation to the sustainability of the country [10]. The modern security system interprets and defines that a sovereign state functions as the best protection for its people [11]. The responsibility inherent in a sovereign state requires providing maximum security and capabilities in an effort to defend against various threats that may come [12]. So that in fulfilling the responsibilities in question, military strength becomes a necessity for the survival of a country [13]. This military force functions as a guardian of sovereignty, to support the implementation of state order, and to avoid and defend against various threats [14].

State savings and investments will be affected by military spending. This impact can be a positive or negative impact, depending on the appropriate policy in allocating a country's military expenditure. The savings trend will increase if there is an increase in military spending financed by taxes and if spending decreases in the future [15]. However,

conditions like this are rarely found in countries that are classified as developing due to difficulties in raising new income such as from tax increases, so that the opposite condition will occur where military spending is funded by conditions of increasing inflations and reducing savings.

Based on the description above, this study aims to provide a description related to the Wilcoxon rank sum hypothesis test for military budgets as a percentage of Gross Domestic Product and Government Spending in Asian, Oceanian, and African countries.

2. LITERATURE REVIEW

Considering that the hypothesis testing method using the Wilcoxon rank sum is a form of non-parametric statistical method, the requirements regarding the nature and form of the data distribution and its population parameters do not have to be met first [16]. The final conclusion can be formulated after several testing procedures have been carried out. Regarding several procedures that need to be carried out, they are:

a) Formulating the null hypothesis and alternative hypothesis
   Symbolically, the null hypothesis and alternative hypothesis formulas in this method are formulated as follows:
   $H_0 : \mu_1 = \mu_2$
   $H_1 : \mu_1 \neq \mu_2$
b) Determining a specific level of significance
   In the discussion of hypothesis testing using the Wilcoxon signed rank test, the levels of significance that can be determined are 5% and 1%.
c) Formulating test criteria
   The number of sample pairs can vary the test criteria applied. This difference lies in the values used as the basis for the determination. In this hypothesis testing method, there are two possible options. The application of one of the test criteria depends on the context of the situation. These are:
   1) If the number of samples in the first and second groups is no greater than 20 units, the null hypothesis is accepted if
      $$R \geq R_\alpha$$
      While the null hypothesis is rejected if
      $$R < R_\alpha$$
   2) If the number of members in one of the sample groups or even both is greater than 20 units, then the null hypothesis is declared accepted if
      $$Z \geq Z_{\alpha/2}$$
      The null hypothesis will be rejected if
      $$Z < Z_{\alpha/2}$$
d) Calculating the number of levels and the R or Z value
   When the hypothesis testing procedure has reached this stage, the number of marked levels must first be calculated. The procedure to do this is as follows:
   1) Record the observation results in a table

In this case, the observation results in question are the impacts of the treatment given to the first and second sample groups. To facilitate calculations, the first sample group is designated n1 and the second sample group is designated n2.

2) Enter both sample groups in a table and provide levels.
   The two sample groups that received treatment and their resulting impacts were then recorded and entered into a table. Afterward, each member of each sample group was assigned a level. The levels were assigned sequentially from the lowest to the highest value. If two or more values were identical, the level assigned to them was calculated as the average level.
3) Calculate the number of levels and the R value
   Once the levels for the members in each sample group have been assigned, the total number of levels must be calculated. The total number of levels in the first sample group is denoted R1, and in the second sample group, R2. The two are then compared, with the smaller total number of levels being used as the calculated R value.
   If the number of members in one or both sample groups is greater than 20 units, the desired Z value is determined. The Z value can be determined by applying the formula

$$Z = \frac{n' \; x \; (n_1 + \; n_2 + 1) - 2R')}{\sqrt{\frac{n_1 \; x \; n_2 \; x \; (n_1 + \; n_2 + 1)}{3}}}$$

   Where Z is the calculated Z value, n1 is the number of members of the first sample group, n2 is the number of members of the second sample group, R' is the number of levels that are smaller among R1, R2, R'1 and R'2 and n' is the number of samples with the number of levels R'.

e) Formulate final conclusions
   The final conclusion is formulated by comparing the R or Z values in the table with the calculated R or Z values. These values are then compared with the applicable testing criteria.

3. METHODS

The approach used in this study is descriptive quantitative. The data used are national defense allocations issued by SIPRI. The data samples used include military budgets, gross domestic product and government spending data from Asian, Oceanian and African countries. Data analysis used hypothesis testing with Wilcoxon rank sum. Hypothesis testing with rank sum is an analysis to determine the comparison between two sample groups where the members are assumed to be unpaired, or the two groups are not required to be paired. The nature and form of the data distribution, as well as the population parameters, are unknown.

4. RESULTS AND DISCUSSION

NATO defines defense expenditure as payments made by a national government specifically to meet the needs of its armed forces, that is, an Ally or Alliance. The primary component of defense expenditure is payments to the Armed Forces, which are funded from within the Ministry of Defense (MoD) budget. The Armed Forces include the Army, Navy, and Air Force, as well as Joint Forces such as Administration and Command, Special Operations Forces, Medical Services, Logistics Command, Space Command, Cyber Command, etc. It may also include "Other Forces" such as Ministry of Interior forces, national police, gendarmerie, carabinieri, coast guard, etc. In such cases, expenditure is included only in proportion to those forces that are trained in military tactics, equipped as a military force, can operate under direct military authority in deployed operations, and can, realistically, be deployed outside the national territory to support the military force. Also, expenditure on Other Forces financed through the budgets of ministries other than the Ministry of Defense is included in defense expenditure. [17]

The following is a sample of defense budgets of Asian and African countries by country as a percentage of Gross Domestic Product (GDP). The data were then simplified into tables for hypothesis testing using Wilcoxon rank sums for the same sample size and no more than 20. The data used were defense budget data published by SIPRI.

Table 1. Military expenditure by country as percentage of gross domestic product

Asian Countries			African Countries		
Number	Country	Military Expenditure	Number	Country	Military Expenditure
1	Taiwan	1.7%	1	Angola	1.6%
2	Afghanistan	1.2%	2	Benin	0.7%
3	Bangladesh	1.3%	3	Botswana	2.8%
4	India	2.4%	4	Burkina Faso	2.4%
5	Nepal	1.6%	5	Burundi	1.8%
6	Pakistan	4.0%	6	Cameroon	1.1%
7	Sri Lanka	1.9%	7	Cape Verde	0.5%
8	Brunei	3.3%	8	Central African Rep.	1.5%
9	Cambodia	2.3%	9	Chad	2.2%
10	Indonesia	0.7%	10	Congo, Republic of	2.7%
11	Malaysia	1.0%	11	Congo, Dem. Rep.	0.7%
12	Philippines	1.0%	12	Côte d'Ivoire	1.1%
13	Mongolia	3.2%	13	Ethiopia	0.6%
14	Thailand	1.3%	14	Gabon	1.6%
15	Timor-Leste	1.0%	15	Gambia	0.8%

Source: SIPRI 2023

In this case study, the null hypothesis formulated states that the policy for determining military budget size as a percentage of GDP in Asian and African countries is the same. Meanwhile, the alternative hypothesis states that the policy for determining military

budget size as a percentage of GDP in Asian and African countries is different. Therefore, in symbolic form, the null hypothesis and alternative hypothesis in this study are:

H_0 : $\mu_{\text{Military Budgets in Asian Countries}} = \mu_{\text{Military Budgets in African Countries}}$

H_1 : $\mu_{\text{Military Budgets in Asian Countries}} \neq \mu_{\text{Military Budgets in African Countries}}$

In this study, the significance level applied in hypothesis testing using the Wilcoxon rank sum was 1%. The sample size used included 15 countries from Asia and 15 countries from Africa. Given that the sample size in both groups was less than 20 units, an R value table was used to formulate the testing criteria. Thus, the R value in the table for a pair of 15 units in the first sample group and 15 units in the second sample group, with a significance level of 1, is 171. Therefore, the applicable testing criterion is that the null hypothesis is accepted if

$$R \geq 171$$

While the null hypothesis is rejected if

$$R < 171$$

In calculating the R value, the number of levels must first be calculated using the following steps.

Table 2. Calculation of the Number of Levels

Number	Asian Countries			Number	African Countries		
	Country	Military Expenditure	Level		Country	Military Expenditure	Level
1	Taiwan	1.7%	9		Angola	1.6%	9.5
2	Afghanistan	1.2%	5		Benin	0.7%	3.5
3	Bangladesh	1.3%	7		Botswana	2.8%	15
4	India	2.4%	12		Burkina Faso	2.4%	13
5	Nepal	1.6%	8		Burundi	1.8%	11
6	Pakistan	4.0%	15		Cameroon	1.1%	6.5
7	Sri Lanka	1.9%	10		Cape Verde	0.5%	1
8	Brunei	3.3%	14		Central African Rep.	1.5%	8
9	Cambodia	2.3%	11		Chad	2.2%	12
10	Indonesia	0.7%	1		Congo, Republic of	2.7%	14
11	Malaysia	1.0%	3		Congo, Dem. Rep.	0.7%	3.5
12	Philippines	1.0%	3		Côte d'Ivoire	1.1%	6.5
13	Mongolia	3.2%	13		Ethiopia	0.6%	2
14	Thailand	1.3%	7		Gabon	1.6%	9.5
15	Timor-Leste	1.0%	3		Gambia	0.8%	5
		R1	120			R2	120

From the calculation steps performed in the table above, the resulting number of levels is 120 (for the military budget size in Asian countries) and 120 (for the military budget size in African countries). Therefore, the calculated R value is 120.

Based on the calculation results, the R value is 120. This value is smaller than the R value in the table, which is 171. Therefore, based on the applied testing criteria, the null hypothesis stating that the policy for determining the military budget size as a percentage of GDP in Asian and African countries is the same is rejected. Meanwhile, the alternative hypothesis stating that the policy for determining the military budget size as a percentage of GDP in Asian and African countries is different is confirmed. Essentially, there are differences in determining the military budget size as a percentage of Gross Domestic Product in Asian and African countries.

In 2022, African countries have budgeted military spending in the range of $39,4 billion. There was a decline for the first time since 2018 in combined state spending in this region. And if you look more closely, this decline is lower compared to 2021, namely around 5,3% percent. And this decline even compared to 2013 is estimated to be lower at around 6,4 percent. The estimated combined size of these budgets in 2022 is $19,1 billion. Meanwhile, in North African countries, military spending compared to 2021 is around 3m2 percent lower. However, compared to 2013, this number was 11 percent higher. 74 percent or almost three-quarters of the military spending in the sub-region was contributed by Morocco and Algeria. This is caused by a territorial dispute related to Western Sahara involving two countries, namely Morocco and Algeria. This dispute resulted in a trend of ups an downs in military spending policies because it automatically had a very large influence, this trend will continue until approaching 2022. However, Algeria had reduced its military spending by 3,7 percent, namely 9,1 billion. However, the decrease in Algerian military spending did not change Morocco's military spending, which still maintained the size of its military spending.

Military spending remains around $5,0 billion. If analyzed in countries, which is part of Sub-Saharan Africa, combined military spending in 2022 will be approximately $20,3 billion. Compared to 2021, this is a decrease in military spending of 7,3 percent, while compared to 2013, this is a decrease in military spending of 18 percent. This decline occurred due to a downward trend in the largest military spenders involving two countries, namely South Africa and Nigeria. Nigeria reduced its military spending to around $3,1 billion, which is a decrease of around 38 percent in 2022. This decrease occurred when Nigeria had to face many security challenges during 2022. This decrease was caused by seasonal flooding which was so severe that it caused major changes in the state's budget allocation priorities. Even thought there is an additional budget in 2021 of around 73 percent for strengthening military capabilities, the additional budged in 2022 does not provide funding for military spending, instead the budget allocation is more focused on infrastructure damaged by floods with development focused on post-flood disaster recovery. Meanwhile, other countries, namely South Africa, are decreasing their military spending successively, which in 2022 will only reach $3,0 billion.

Compared to 2021, military spending is 8,4 percent lower and compared to 2013, it is 21 percent lower. This decline in military spending is more due to the sluggish economy, which has had an impact and pressure on government finances, requiring it to cut its military budget in 2022. In 2022, Ethiopia itself will record an increase in military spending, which is the largest increase compared to any county in Africa. This occurred with the government's increasing attacks on the Tigrary People's Liberation Front. This increase was around 88 percent to reach $1,0 billion [18].

The following is a sample of defense budgets in Asia and Africa by country, according to the percentage of government spending. The data were then simplified into a table for hypothesis testing using Wilcoxon rank sums for unequal sample sizes and no more than 20 samples. The data used are defense budget data published by SIPRI.

Table 3. Military Expenditure (ME) by country as percentage of government spending

Number	Country	ME	Number	Country	ME
1	Mongolia	2.3%	1	Algeria	15.5%
2	Taiwan	10.2%	2	Morocco	10.3%
3	Afghanistan	4.2%	3	Tunisia	7.9%
4	Bangladesh	9.7%	4	Angola	8.9%
5	India	8.8%	5	Benin	2.9%
6	Nepal	4.5%	6	Botswana	8.6%
7	Pakistan	18.4%	7	Burkina Faso	9.0%
8	Sri Lanka	10.4%	8	Burundi	7.8%
9	Brunei	9.5%	9	Cameroon	6.0%
10	Cambodia	9.1%	10	Cape Verde	1.4%
11	Indonesia	4.1%	11	Central African Rep.	8.0%
12	Malaysia	4.4%	12	Chad	14.0%
13	Philippines	4.5%	13	Congo, Republic of	11.3%
14	Thailand	6.3%	14	Congo, Dem. Rep.	6.4%
15	Timor-Leste	2.2%	15	Côte d'Ivoire	5.2%
			16	Ethiopia	3.9%
			17	Gabon	9.5%
			18	Gambia	3.5%
			19	Ghana	1.5%

Source: SIPRI 2023

The procedure involves sorting all data values, including military budgets, according to the percentage of government spending in Asian and African countries. After sorting the data values, a rank or ranking is assigned to each value. First, we assign a rank to each data value, starting from the smallest to the largest overall value. In this case, the military budget data values for Asian and African countries are combined and not separated. This ranking is referred to as the first group ranking. Second, we assign a rank to each data value, also sequentially, but now we sort from the largest to the smallest value. This ranking is referred to as the second group ranking.

Next, the first and second group rankings are summed. The smallest sum of the rankings is used as the calculated R value.

Table 4. Calculation of the Number of Rankings for Military Budgets in Asian and African Countries

No.	Country	ME	Group Level 1	Group Level 2	No.	Country	ME	Group Level 1	Group Level 2
1	Mongolia	2.3%	4	31	1	Algeria	15.5%	33	2
2	Taiwan	10.2%	28	7	2	Morocco	10.3%	29	6
3	Afghanistan	4.2%	9	26	3	Tunisia	7.9%	18	17
4	Bangladesh	9.7%	27	8	4	Angola	8.9%	22	13
5	India	8.8%	21	14	5	Benin	2.9%	5	30
6	Nepal	4.5%	11.5	23.5	6	Botswana	8.6%	20	15
7	Pakistan	18.4%	34	1	7	Burkina Faso	9.0%	23	12
8	Sri Lanka	10.4%	30	5	8	Burundi	7.8%	17	18
9	Brunei	9.5%	25.5	9.5	9	Cameroon	6.0%	14	21
10	Cambodia	9.1%	24	11	10	Cape Verde	1.4%	1	34
11	Indonesia	4.1%	8	27	11	Central African Rep.	8.0%	19	16
12	Malaysia	4.4%	10	25	12	Chad	14.0%	32	3
13	Philippines	4.5%	11.5	23.5	13	Congo, Republic of	11.3%	31	4
14	Thailand	6.3%	15	20	14	Congo, Dem. Rep.	6.4%	16	19
15	Timor-Leste	2.2%	3	32	15	Côte d'Ivoire	5.2%	13	22
					16	Ethiopia	3.9%	7	28
					17	Gabon	9.5%	25.5	9.5
					18	Gambia	3.5%	6	29
					19	Ghana	1.5%	2	33
		R1	**261.5**	**263.5**			**R2**	**333.5**	**331.5**

From the calculations in the table above, the total number of levels in the lowest group is 261.5. This 261.5 is the R value in this case. In the table, the R value for the pair of 15 units in the first sample group and 19 units in the second sample group, with a significance level of 1%, is 189. Because the calculated R value is greater than the R value in the table, the null hypothesis stating that the policy of determining the size of the military budget as a percentage of GDP in Asian and African countries is the same is accepted. This null hypothesis is accepted under these conditions.

Development economists have been slow to study the impact of defense spending on development, despite a significant increase in interest in this topic in recent years. The argument for high defense spending is quite clear. Without security, it is impossible for a country to develop. Therefore, defense spending and military capabilities are prerequisites for the initiation and implementation of the development process. The experience of Europe in the 19th century, as well as Japan in the pre-war years, demonstrates that strong armed forces and a strong economy can complement each other.

Combined military spending by countries in Asia and Oceania was $575 billion. This was a 2.7 percent increase compared to 2021 and 45 percent higher than in 2013, continuing an upward trend that had persisted since at least 1989. The growth in spending in 2022 was largely driven by increased spending in China, India, and Japan, which together accounted for nearly three-quarters (73 percent) of the region's spending. Total military spending in East Asia increased by 3.5 percent to $397 billion in 2022. The three largest military spenders in East Asia were China, which accounted for 74 percent of the subregion's total spending, South Korea (12 percent), and Japan (12 percent).

South Korea's military spending fell 2.5 percent to $46.4 billion in 2022, ending 22 consecutive years of real-term increases. This decline was largely due to inflation—in nominal terms, South Korea's military budget increased by 2.9 percent compared to 2021. Japan allocated $46.0 billion to its military in 2022, up 5.9 percent from 2021 and 18 percent from 2013. Japan is undertaking a significant policy shift, having previously capped military spending at 1.0 percent of GDP. Japan's 2022 National Security Strategy aims to increase security spending—including military funding—to 2.0 percent of GDP by 2027. This planned increase is largely a response to Japan's perception of growing threats from China, North Korea, and Russia. With GDP growth of 1.1 percent in 2022, Japan's military expenditure exceeded 1.0 percent for the third consecutive year and is at its highest level since 1960 [19].

The following is a sample of defense budgets for countries in Asia, Oceania, and Africa, by country, according to their percentage of government spending. The data was then simplified into a table for hypothesis testing using Wilcoxon rank sums for samples larger than 20. The data used are defense budget data published by SIPRI.

Table 5. Military expenditure by country as percentage of government spending

No.	Country	ME	No.	Country	ME
1	Kazakhstan	5.0%	1	Algeria	15.5%
2	Kyrgyzstan	4.1%	2	Morocco	10.3%
3	Fiji	5.0%	3	Tunisia	7.9%
4	New Zealand	3.9%	4	Angola	8.9%
5	Papua New Guinea	1.6%	5	Benin	2.9%
6	Mongolia	2.3%	6	Botswana	8.6%
7	Taiwan	10.2%	7	Burkina Faso	9.0%
8	Afghanistan	4.2%	8	Burundi	7.8%
9	Bangladesh	9.7%	9	Cameroon	6.0%
10	India	8.8%	10	Cape Verde	1.4%
11	Nepal	4.5%	11	Central African Rep.	8.0%
12	Pakistan	18.4%	12	Chad	14.0%
13	Sri Lanka	10.4%	13	Congo, Republic of	11.3%
14	Brunei	9.5%	14	Congo, Dem. Rep.	6.4%
15	Cambodia	9.1%	15	Côte d'Ivoire	5.2%
16	Indonesia	4.1%	16	Ethiopia	3.9%
17	Malaysia	4.4%	17	Gabon	9.5%

18	Philippines	4.5%	18	Gambia	3.5%
19	Australia	5.1%	19	Ghana	1.5%
20	Thailand	6.3%	20	Guinea	7.8%
21	Timor-Leste	2.2%	21	Kenya	4.6%

Source SIPRI 2023

In this case study, the formulated null hypothesis states that the policy for determining military budget size based on government spending percentage in Asia-Oceania and Africa is the same. The alternative hypothesis, however, states that the policy for determining military budget size based on government spending percentage in Asia-Oceania and Africa is different. Therefore, in symbolic form, the null hypothesis and alternative hypothesis in this study are:

H_0 : $\mu_{\text{Military Budgets in Asia-Oceania Countries}} = \mu_{\text{Military Budgets in African Countries}}$

H_1 : $\mu_{\text{Military Budgets in Asia-Oceania Countries}} \neq \mu_{\text{Military Budgets in African Countries}}$

In this study, the significance level applied in hypothesis testing using the Wilcoxon rank sum of 5% is 1.96. The Z value in the table of 1.96 is applied to the testing criteria, so the null hypothesis is accepted if

$$Z \leq 1{,}96$$

While the null hypothesis is rejected if

$$Z > 1{,}96$$

At this stage, the number of levels must first be calculated to determine the Z-score through the following steps.

Table 6. Calculation of the Number of Levels

Country	ME	Level	Country	ME	Level
Kazakhstan	5.0%	11.5	Algeria	15.5%	21
Kyrgyzstan	4.1%	5.5	Morocco	10.3%	18
Fiji	5.0%	11.5	Tunisia	7.9%	12
New Zealand	3.9%	4	Angola	8.9%	15
Papua New Guinea	1.6%	1	Benin	2.9%	3
Mongolia	2.3%	3	Botswana	8.6%	14
Taiwan	10.2%	19	Burkina Faso	9.0%	16
Afghanistan	4.2%	7	Burundi	7.8%	10.5
Bangladesh	9.7%	18	Cameroon	6.0%	8
India	8.8%	15	Cape Verde	1.4%	1
Nepal	4.5%	9.5	Central African Rep.	8.0%	13
Pakistan	18.4%	21	Chad	14.0%	20
Sri Lanka	10.4%	20	Congo, Republic of	11.3%	19
Brunei	9.5%	17	Congo, Dem. Rep.	6.4%	9
Cambodia	9.1%	16	Côte d'Ivoire	5.2%	7

Indonesia	4.1%	5.5	Ethiopia	3.9%	5
Malaysia	4.4%	8	Gabon	9.5%	17
Philippines	4.5%	9.5	Gambia	3.5%	4
Australia	5.1%	13	Ghana	1.5%	2
Thailand	6.3%	14	Guinea	7.8%	10.5
Timor-Leste	2.2%	2	Kenya	4.6%	6
	R1	231		R2	231

From the calculation steps that have been carried out, the number of levels obtained is 231 for both the size of the military budget in both Asia-Oceania countries and African countries. Therefore, the R' value calculated in this case study is 231. Meanwhile, the number of samples from the group whose number of levels is used as the R' value is 21. The value of 21 is the n' value. Both values, namely R' and n' are used as the basis for calculating the Z value of the calculation. Thus, the Z value of the calculation is

$$Z = \frac{n' \; x \; (n_1 + \; n_2 + 1) - 2R')}{\sqrt{\frac{n_1 \; x \; n_2 \; x \; (n_1 + \; n_2 + 1)}{3}}}$$

$$Z = \frac{21 \; x \; (21 + \; 21 + 1) - (2 \; x \; 231)}{\sqrt{\frac{21 \; x \; 21 \; x \; (21 + \; 21 + 1)}{3}}}$$

$$Z = \frac{441}{79{,}50} = 5{,}547$$

From the calculations performed in the fourth stage, the Z-value is 5.547. This value is significantly greater than the Z-value in the table, which is 1.96. Therefore, based on the applicable testing criteria, the null hypothesis stating that the policies for determining military budget size based on the percentage of government spending in Asian-Oceanian and African countries are the same is rejected. Meanwhile, the alternative hypothesis stating that the policies for determining military budget size based on the percentage of government spending in Asian-Oceanian and African countries are different is accepted.

The amount of military spending depends on the country's geographic, political, and strategic position on the map. Geopolitical hostility and domestic violence tend to influence defense spending. Other factors such as security, technology, political affinities and priorities, geography, and history determine defense spending [20]. Countries surrounded by threats cannot afford to neglect military spending, regardless of their stage of development. Collier and Hoeffler found that both external and internal threats influence the volume of military spending. Other factors they proposed were the increasing political power of the military in non-democratic regimes and the availability of financial resources to the government. Defense spending is generally considered a burden on the economy because it consumes resources that could otherwise be used for other development projects. Poverty-stricken developing countries, and large military expenditures raise serious concerns in these countries. One of the greatest challenges,

particularly for developing countries, is reallocating resources from military spending to social development to alleviate poverty, hunger, and preventable diseases.

The relationship between military spending and GDP growth remains a debate in the economic literature, and research findings vary from region to region and country to country. Research by Raju & Ahmed (2019) to identify the short- and long-run relationships between GDP growth and military spending in three developing South Asian countries: China, India, and Pakistan, using Ganger causality and cointegration tests, yielded some interesting results for these countries [21]. This study found a positive long-run relationship and a long-run causality between military spending and GDP growth at the 5% significance level, but no short-run relationship for the three countries, although the levels of relationships between the variables differed.

5. CONCLUSION

Based on the hypothesis testing procedures that have been carried out, this study concludes that for hypothesis testing with the number of Wilcoxon levels for the same number of samples and no more than 20 samples, it is concluded that the policy of determining the size of the military budget according to the percentage of Gross Domestic Product (GDP) in Asian and African countries is different. In essence, there is a difference in determining the size of the military budget according to the percentage of Gross Domestic Product in Asian and African countries. Meanwhile, for hypothesis testing with the number of Wilcoxon levels for an unequal number of samples and no more than 20 samples, it is concluded that the policy of determining the size of the military budget according to the percentage of Gross Domestic Product (GDP) in Asian and African countries is the same. Based on hypothesis testing with the number of Wilcoxon levels for a number of samples greater than 20 samples, it is concluded that the policy of determining the size of the military budget according to the percentage of government spending in Asian-Oceanic countries and African countries is different. In other words, it can be said that there is a difference between the policy of determining the size of the military budget according to the percentage of government spending between Asian-Oceanic countries and African countries.

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