MARKET BASKET ANALYSIS USING APRIORI ALGORITHM TO FIND EFFECTIVE FISCAL POLICY MIX WITH R PROGRAMMING

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Abstract

Fiscal policy drives a country's economy and is the most effectivepolicy to restore a country's economy. When a recession occurs, the fiscal policy helps a country increase aggregate demand in the market for goods and services. This study proposes a fiscal policy mix that can be implemented based on historical data. So this research focuses on using association rules to assist decision-makers (regulators in adopting appropriate fiscal policies in the global VUCA (Volatility, Uncertainty, Complexity, Ambiguity) era. Therefore, an experimental research approach was used in this study to produce the best association rules. The research was carried out in six stages to obtain conclusions, namely problem identification in the research sample and literature review related to apriori algorithms, data collection, data pre-processing, parameter determination, research findings building a priori algorithms, and knowledge extraction formed from a priori algorithms. Based on the experimental results using the a priori algorithm, 657 rules were obtained with a minimum variation of two to six itemsets. Rule 6 produces an average value of the budget performance of 90.65. Rule 6 also says that the performance value of the budget can be increased by spreading out funding sources and ensuring that operational spending is as efficient as possible.

Keywords*: apriori algorithm; association rules; fiscal policy; market basket analysis.*

MARKET BASKET ANALYSIS MENGGUNAKAN ALGORITMA APRIORI UNTUK MENEMUKAN BAURAN KEBIJAKAN FISKAL EFEKTIF DENGAN BAHASA R

Abstrak

Kebijakan fiskal tidak hanya menggerakkan perekonomian suatu negara tetapi menjadi kebijakan yang paling efektif untuk memulihkan perekonomian suatu negara. Ketika resesi terjadi, kebijakan fiskal membantu suatu negara meningkatkan permintaan agregat di pasar barang dan jasa. Studi ini mengusulkan bauran kebijakan fiskal yang dapat diimplementasikan berdasarkan data historis. Penelitian ini berfokus pada penggunaan aturan asosiasi untuk membantu pengambil keputusan (regulator) dalam mengadopsi kebijakan fiskal yang tepat di era VUCA (Volatility, Uncertainty, Complexity, Ambiguity) global. Oleh karena itu, pendekatan penelitian eksperimen digunakan untuk menghasilkan aturan asosiasi terbaik. Penelitian dilakukan enam tahap untuk memperoleh kesimpulan yaitu identifikasi masalah pada sampel penelitian dan kajian literatur terkait algoritma apriori, pengumpulan data, pra-pemrosesan data, penentuan parameter, temuan penelitian, membangun algoritma apriori, serta ekstraksi pengetahuan terbentuk dari algoritma apriori. Berdasarkan hasil eksperimen menggunakan algoritma apriori, diperoleh 657 aturan dengan variasi minimal dua sampai enam itemset. Aturan 6 menghasilkan nilai rata-rata kinerja anggaran sebesar 90,65. Aturan 6 juga mengatakan bahwa nilai kinerja anggaran dapat ditingkatkan dengan mendiversifikasi sumber pendanaan dan memastikan pengeluaran operasional seefisien mungkin.

Kata kunci: algoritma apriori; aturan asosiasi; kebijakan fiskal; market basket analysis.

INTRODUCTION

There are two poles of public policy in the economic field: fiscal and monetary from the government's point of view. Fiscal policy is a government policy that directs the country's economy to the desired state (Halim, Halim, & Felecia, 2019; Suhendra & Syathi, 2019). Fiscal policy drives a country's economy and is the most effective policy to restore a country's economy. When a recession occurs, the fiscal policy helps a country increase aggregate demand in the market for goods and services. Indonesia is included in the group of small open economies. This brings its uniqueness, which makes the economy not only influenced by domestic policies but also by policies originating from abroad. Fiscal policy is one of the policies that are often the main concern.

Fiscal policy aims to increase economic growth, while monetary policy aims to maintain currency value stability (Utama, 2020). Fiscal and monetary authorities must coordinate for economic stability and stable currency values. Good coordination can increase the effectiveness of fiscal and monetary policies simultaneously. The significance of fiscal policy is tested when the economy is in shock, for example, when the COVID-19 pandemic occurs. Policies that push the economy out of the pandemic crisis are achieved by increasing spending with high multipliers. This is because the value of the expenditure multiplier is higher than the income multiplier (Chenic, Ene, Hrebenciuc, Virjan, & Burlacu, 2022; Mirmozaffari, 2019).

In 2021, the government of Indonesia had 19,460 Work Units carrying out government tasks. The average national budget performance score for the Work Unit level reached 87.40 and was categorized as "Good." This result is slightly lower than the average budget performance score at the Ministry/Agency level, which reached 92.34 and is classified as "Excellent." The gap in performance measurement results between the two government groups is interesting. The results of measuring budget performance reflect that fiscal policy at this level has been running well. The results of measuring budget performance at the Work Unit level indicate a fiscal policy that may still need to cover the micro-scale (Ridzuan & Abd Rahman, 2021).

To support the policy by research paradigm, there is a method called the association rule in the scientific field of data mining. The analytical instrument that is generally used is market basket analysis. Apriori, apriori-TID, and Frequent Pattern-Growth (FP-Growth) algorithms are algorithms that are often used for market basket analysis (Idris et al., 2022; Nuraeni, Tresnawati, Handoko Agustin, & Fauzi, 2022). The apriori algorithm is popular for inspecting relationships between items/variables in large datasets. The apriori algorithm applies two basic principles: all subsets of the frequent itemset must be systematic, and for every rare item, all supersets must also be infrequent (Hermina, Balajishankar, & Gopalakrishnan, 2022; Nuraeni et al., 2022). Apriori algorithms are generally used in the retail sector to determine sales patterns (Chandra & Dewi, 2019; Fitriah, Riadi, & Herman, 2023; Kurnia, Isharianto, Giap, Hermawan, & Riki, 2019; Santoso, 2021), consumer patterns (Panjaitan et al., 2019; Qisman, Rosadi, & Abdullah, 2021), and consumer behavior (Sussolaikah, 2021). Apart from retail, the Apriori algorithm is also used to analyze crime data (Mangara Wainana, Njuguna Karomo, Kyalo, & Mutai, 2020), DNA sequence pattern mining (Kanakaris, Karacapilidis, & Lazanas, 2019; Yang et al., 2020), detect malicious network traffic (Gao et al., 2020), identify behavioral phenotypes of loneliness and social isolation (Dorya et al., 2019), and detect diabetes (Mahboob Alam et al., 2019).

This study focuses on the use of association rules to assist decision-makers (regulators) in implementing appropriate fiscal policies in the VUCA (volatility, uncertainty, complexity, ambiguity) world (Hikmawati, Maulidevi, & Surendro, 2021). This study proposes a fiscal policy mix that can be implemented based on historical data. Based on previous research, such as the research of Hakim & Akbar (2018), namely the analysis of market baskets using the Apriori algorithm based on the R language, then Rizaldi & Adnan (2021), namely the analysis

of market baskets using the Apriori algorithm as a transaction case at 212 Mart Soebrantas Pekanbaru. Also, research by Fathurrahman, Pratama, & Al-mudzakir (2023) compared the Apriori algorithm and FP growth to market basket analysis on bakery sales data. The third object discussed in this study is very different and has never been discussed in previous studies, namely the instruments used to formulate fiscal policy. So this study uses three variables to define fiscal policy: spending revision policies, financing policies, and budget-blocking policies. The spending revision policy variable, relating to changes in budget items throughout the year. The financing policy variable relates to funding sources to finance government activities. Meanwhile, the budget-blocking policy variable is related to delaying expenditure realization for cash management, regulatory compliance, or spending savings.

METHOD

The data used in this study is the 2021 dataset, which consists of 19,166 policy records in Work Units with three major policy groups: spending revision policies, financing policies, and budget-blocking policies. The spending revision policy includes adding and subtracting personnel, goods, or capital spending. Financing policies consist of procedures for allocating sources of financing such as counterpart funds, non-tax state revenue, grants, and loans. The budget-blocking policy blocks personnel spending, goods spending, or capital spending.

Table 1. The Attributes of The Policy Data

General Policy	*Subpolicy*	*Symbol*
Spending revision policy	Increase employee spending	P.B51
	Decrease employee spending	M.B51
	Increasegoods spending	P.B52
	Decrease goods spending	M.B52
	Increase capital spending	P.B53
	Decrease capital spending	M.B53
	Increase social assistance spending	P.B57
	Decrease social assistance spending	M.B57
Financing policy	Allocate counterpart fund	F_RM
	Allocate foreign loan	F_PLN
	Allocate Rupiah viability gap fund	F_RMP
	Allocate non-tax state revenue	F_PNBP
	Allocate domestic loan	F_PDN
	Allocate public service agency budget	F_BLU
	Allocate foreign grants	F_HLN
	Allocate domestic grants	F_HLD
	Allocate foreign direct grants	F_HLL
	Allocate Government Islamic Securities	F_SBSN
Budget-blocking Policy	Increase employee spending	P.Block51
	Decrease employee spending	M.Block51
	Increasegoods spending	P.Block52
	Decrease goods spending	M.Block52
	Increase capital spending	P.Block53
	Decrease capital spending	M.Block53
	Increase social assistance spending	P.Block57
	Decrease social assistance spending	M.Block57

This study uses an experimental study approach to generate the best association rule. Figure 1 describes the study steps we carried out. Based on Figure 1, the study carried out six stages to obtain conclusions: (1) identification of problems in the research sample and literature review related to apriori algorithms; (2) Data collection; (3) Data pre-processing; (4) Determination of parameters (support ratio and confident ratio); (5) Building apriori algorithms; and (6) Extraction of knowledge formed from apriori algorithm.
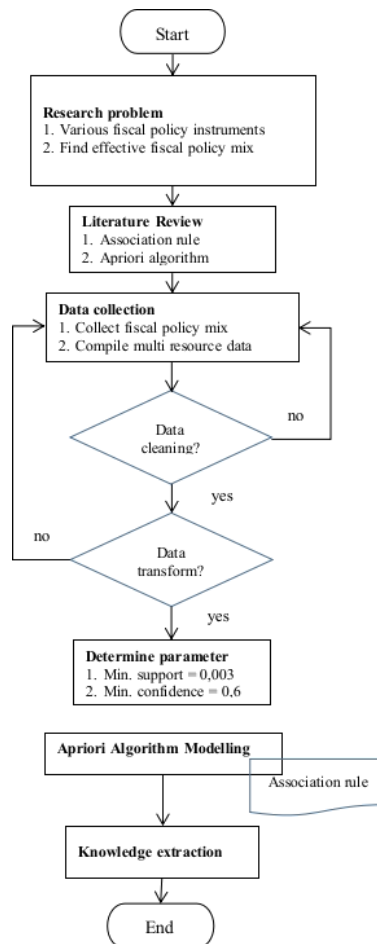

Figure 1. Research Framework

RESULTS AND DISCUSSION

Fiscal policy has many dimensions and instruments. In general, fiscal policy consists of macroeconomic and microeconomic dimensions. Each dimension has its instrument, such as macroeconomics using tax instruments, government spending, and government bonds. Regions can use subsidies, value-added taxes, and sector-specific budget allocations for the microeconomic dimension. In central government spending, fiscal policy is influenced by internal and external conditions. Environmental issues such as environmental degradation and climate change can influence the direction of fiscal policy (Muhafidin, 2020). Regions generally adopt expansionary fiscal policies during a recession but reduce bureaucratic spending allocations to be diverted to other sectors.

Conversely, when the economy is booming, regulators will adopt contractionary fiscal policies, reducing spending in general but increasing bureaucratic spending. Policies taken regarding bureaucratic spending include revision policies, funding policies, and budget-blocking policies. These things bring their complexity when the regulator makes a decision.

The number of fiscal policy instruments is one of the important concerns of regulators. Fiscal policy formulation must be based on data, not just regulatory intuition on environmental dynamics. The main goal of fiscal policy is, of course, to maintain sustainable growth and performance. The majority of policies adopted use the causality framework. For example, spending on social assistance is increased to support people's purchasing power during a recession. What still escapes the attention of regulators is the fiscal policy mix that maintains the performance of government work units. Current fiscal policy tends to focus on the ministries and agencies level, so at the Work Unit level, the effects of policies sometimes need to match regulators' expectations. This can be seen from the national performance score at the Work Unit level, which is lower than the ministry or agency level performance score. Fiscal policy formulation at the microscale still requires more attention.

Based on the SMART application data for 2021, 19,460 work units were obtained. The first stage will be data cleaning by selecting complete data fields so that fields containing N/A are not processed further. At this stage, 294 incomplete data fields were found, leaving 19,166 data fields. We compile this data with budget data in the OM SPAN application.

Data pre-processing is performed before using the data in the a priori algorithm. The first stage will be data cleaning by selecting complete data fields so that fields containing N/A are not processed further. At this stage, 294 incomplete data fields were found, leaving 19,166 data fields. In the second stage, data transformation is carried out from numeric data to string data according to the symbols in Table 1. Work unit information is also removed at this stage because it is confidential. The data is saved in.csv format for easy processing. The results of pre-processing the data are shown in Figure 2.
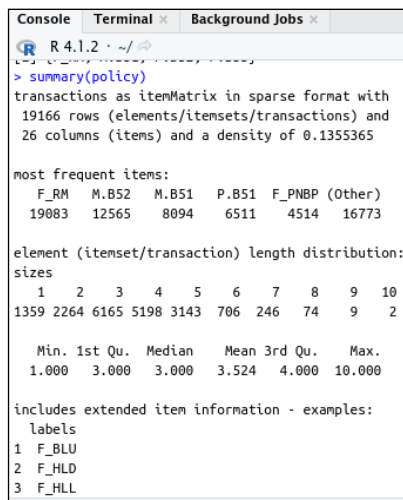

Figure 2. Dataset Summary

Two parameters are needed to build an a priori algorithm: support and confidence. The support value is formulated by:

$$\text{Supp}(A \rightarrow B) = \frac{|\{t \in D| A \cup B \subseteq t\}|}{|D|} \tag{1}$$

Supp is the value of support; A is the rule's antecedent in itemset form; B is the rule's consequence in itemset form; t is a transaction including A and B; and D is the overall transaction. Using the dataset, there is a minimum of one policy (in 1,359 records) and a maximum of 10 policies (in 2 records). The support value used is based on the number of records that have eight policies, namely 74 records. Calculation of the value of support:

$$\text{Supp}(A \rightarrow B) = \frac{74}{19166} \cong 0.0038$$

Based on these calculations, the support value is set at 0.0038.

Formula to calculate confidence:

$$\text{Conf}(A \rightarrow B) = \frac{|\{t \in D| A \cup B \subseteq t\}|}{|\{t \in D| A \subseteq t\}|} \tag{2}$$

Conf is confidence; A is the rule's antecedent in itemset form; B is consequent in itemset form; t is a transaction including A and B; and D is the overall transaction. Study (Kanakaris et al., 2019) applied Conf() $\geq$ 0.5 as the valid association rule, with a total of 685 transactions. The research dataset uses 19,166 records, so the confidence value must be higher. We set a confidence level of 0.60.

After determining the support and confidence parameters, the next step is to run the apriori algorithm to get the best association rules. Pseudocode is shown in Table 2.

Table 2. Apriori Algorithm (Santoso, 2021)

Apriori Algorithm
Variables
C_k is candidate itemet of size k
L_k is frequent itemet of size k
BEGIN
Find frequent set L_{k-1}
Generate Ck by using Cartesian product of L_{k-1} i.e. L_{k-1} x L_{k-1}
Perform pruning: emove any k-1 size itemset they are not frequent
Return frequent set L_k
END

The results obtained after running the apriori algorithm are as follows in Table 3.

Table 3. Result of Apriori Algorithm

Min Itemset	Association Rules	
	Initial	After Cleaning
minlen = 2	449	147
minlen = 3	421	181
minlen = 4	299	207
minlen = 5	113	99
minlen = 6	23	23
minlen = 7	0	0
minlen = 8	0	0
Total	**1305**	**657**

Based on the results of the a priori algorithm, association rules are formed in the minimum range of one to six itemsets. When the minimum itemset is more than 6, the a priori algorithm does not find association rules that pass the predetermined support and confidence thresholds. The total number of initial association rules discovered was 1305 in total. After that, the elimination of redundant regulations was carried out so that 657 rules were found. Association

rules with a minimum of 2 itemsets have limited policy dimensions so that they could be better for further study. Meanwhile, other association rules will be confirmed further with the average value of budget performance for each rule formed to obtain the golden fiscal policy rules at the Work Unit level.
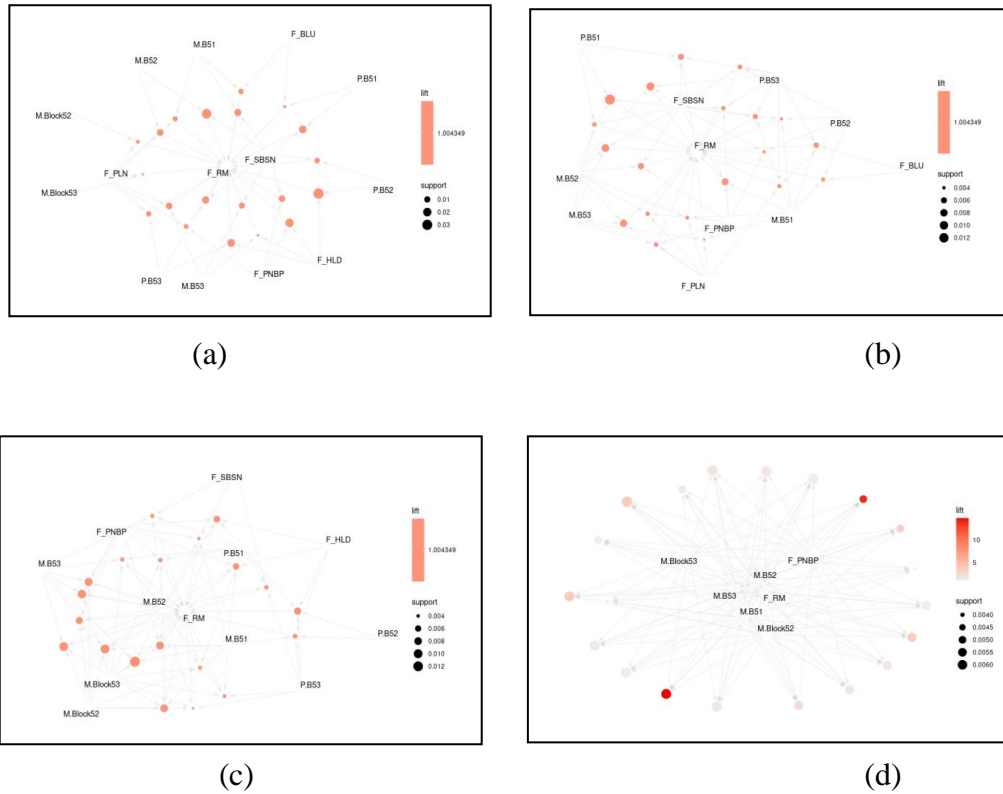

(a)

(b)

(c)

(d)

Figure 2. Association Rules Graph
(a) minlen = 3 (b) minlen = 4 (c) minlen = 5 (d) minlen = 6

Table 4. Top 5 Confidence for Each Minimum Itemset

No	Minlen	LHS	RHS	Support	Confi.	Coverage	Lift	Count	$\overline{nka}$	Accept.
1	2	F_HLL	F_RM	0.00500887	1	0.00500887	1.004349	96	86.99	No
2	2	F_HLN	F_RM	0.005582803	1	0.005582803	1.004349	107	91.68	Yes
3	2	F_SBSN	F_RM	0.036157779	1	0.036157779	1.004349	693	87.93	Yes
4	2	F_HLD	F_RM	0.048053845	1	0.048053845	1.004349	921	87.34	No
5	2	P.B51	F_RM	0.339716164	1	0.339716164	1.004349	6511	87.05	No
6	3	F_BLU, P.B51	F_RM	0.004017531	1	0.004017531	1.004349	77	89.66	Yes
7	3	F_BLU, M.B51	F_RM	0.007669832	1	0.007669832	1.004349	147	85.51	No
8	3	F_PLN, M.Block53	F_RM	0.00391318	1	0.00391318	1.004349	75	88.38	Yes
9	3	F_PLN, M.Block52	F_RM	0.004852343	1	0.004852343	1.004349	93	88.34	Yes
10	3	F_PLN, P.B53	F_RM	0.007565481	1	0.007565481	1.004349	145	88.12	Yes
11	4	F_BLU, M.B51, P.B52	F_RM	0.004382761	1	0.004382761	1.004349	84	86.11	No
12	4	F_BLU, M.B51, P.B53	F_RM	0.0053741	1	0.0053741	1.004349	103	85.98	No
13	4	F_PLN, P.B52, P.B53	F_RM	0.004382761	1	0.004382761	1.004349	84	89.59	Yes
14	4	F_PLN, F_PNBP, M.B53	F_RM	0.00464364	1	0.00464364	1.004349	89	73.54	No
15	4	F_PLN, M.B51, M.B53	F_RM	0.003861004	1	0.003861004	1.004349	74	85.09	No
16	5	F_SBSN, M.B52, P.B51, P.B53	F_RM	0.004434937	1	0.004434937	1.004349	85	85.10	No
17	5	F_SBSN, M.B52, M.B53, P.B51	F_RM	0.00427841	1	0.00427841	1.004349	82	86.08	No
18	5	F_PNBP, F_SBSN, M.B51, M.B52	F_RM	0.003965355	1	0.003965355	1.004349	76	90.65	Yes
19	5	F_HLD, P.B51, P.B52, P.B53	F_RM	0.007304602	1	0.007304602	1.004349	140	84.40	No
20	5	F_HLD, M.B51, P.B52, P.B53	F_RM	0.00464364	1	0.00464364	1.004349	89	86.35	No
21	6	F_PNBP, M.B52, M.B53, M.Block52, M.Block53	F_RM	0.00500887	1	0.00500887	1.004349	96	87.36	No
22	6	M.B51, M.B52, M.B53, M.Block52, M.Block53	F_RM	0.006208912	1	0.006208912	1.004349	119	87.32	No
23	6	F_PNBP, M.B51, M.B52, M.Block52, M.Block53	F_RM	0.003861004	1	0.003861004	1.004349	74	87.10	No
24	6	F_PNBP, M.B51, M.B52, M.B53, M.Block53	F_RM	0.00646979	1	0.00646979	1.004349	124	86.30	No
25	6	F_PNBP, M.B51, M.B52, M.B53, M.Block52	F_RM	0.00573933	1	0.00573933	1.004349	110	85.78	No

The final step in this study is to extract the knowledge obtained from the formed association rules. A large number of candidate items must be verified using the technique of pattern matching (Chee, Jaafar, Aziz, Hasan, & Yeoh, 2019). Therefore, of the 657 rules found using the a priori algorithm, we select the top five rules based on the highest confidence value for each minimum itemset so that there are 25 rules, as shown in Table 5. This selection is intended to obtain reliable rules that can be used in decision-making (Suryadi, Cattleya, & Anissa, 2022). All selected rules have a confidence value of 1 and a lift ratio of 1.004349. The average budget performance score for each rule (nka) is compared to the national average budget performance score of 87.40. Rules are considered reliable if they exceed this threshold. Based on the test, eight rules meet the criteria.

For rules with minlen = 2, even though they exceed the threshold, it is difficult to implement in decision making. This is because the dimensions of the fiscal policy only cover funding policies. This has the potential to result in biased fiscal policy because it only depends on one dimension. Therefore, there are six rules that can be studied further.

In general, the six rules support the budget deficit policy shown in Table 5. This is reasonable considering the dataset used is historical data for 2021, when economic policies will lead to economic recovery amid the COVID-19 pandemic. A year earlier, the economy was in a recession due to the pandemic. This budget deficit supports expansionary fiscal policy as a fiscal instrument to encourage economic growth (Syahrini, Masbar, Aliasuddin, Munzir, & Hazmi, 2021).

Table 5. Reliable Association Rules

No	Minlen	LHS	RHS	Rules
1	3	F_BLU, P.B51	F_RM	IF Allocate public service agency budget and Increase employee spending THEN Allocate counterpart fund
2	3	F_PLN, M.Block53	F_RM	IF Allocate foreign loan and Decrease capital spending THEN Allocate counterpart fund
3	3	F_PLN, M.Block52	F_RM	IF Allocate foreign loan and Decrease goods spending THEN Allocate counterpart fund
4	3	F_PLN, P.B53	F_RM	IF Allocate foreign loan and Increase capital spending THEN Allocate counterpart fund
5	4	F_PLN, P.B52, P.B53	F_RM	IF Allocate foreign loan, Increasegoods spending, and Increase capital spending THEN Allocate counterpart fund
6	5	F_PNBP, F_SBSN, M.B51, M.B52	F_RM	IF Allocate non-tax state revenue, Allocate Government Islamic Securities, Decrease employee spending, and Decrease goods spending THEN Allocate counterpart fund

For Rule 1, this can be applied to Work Units designated as public service agencies. The allocation of the public service agency budget, accompanied by an increase in the personnel expenditure budget, requires regulators to continue to allocate counterpart funds. This addition to the personnel expenditure budget is made possible by previously vacant positions or institutional reorganization. The implication is that the assignments can be completed better, and budget performance increases in the end.

Rule 2 suggests reducing the capital expenditure budget block and allocating foreign loans. When the capital expenditure budget block is reduced, more money can be spent, and the equipment purchased has a good multiplier effect on implementing assignments and the national economy. Rule 2 is a policy option that regulators can implement when the prerequisites for procuring capital expenditures have been completed and contracts can be executed further. Regarding the timing of policy making, this policy mix will be more effectively implemented during the second or third quarter so that contract realization does not pile up at the end of the year. Rule 3 is not much different from Rule 2. The difference is only in the type of shopping. Rule 3 requires that budget constraints on goods spending be reduced. In addition, shopping for blocked goods can be made possible by using funding sources other than foreign loans.

In Rule 4, regulators are advised to allocate funding from foreign loans and increase the capital expenditure budget allocation. Rule 4 indicates that the procurement of capital goods using fixed loans can achieve good performance. What must be considered is that the

application of Rule 4 must be accompanied by careful capital goods procurement selection. The government needs to ensure that buying capital goods is productive and has a high rate of return.

In carrying out a deficit budget policy, the regulator may consider Rule 5. Rule 5 suggests allocating foreign loans and additional budgets for goods and capital expenditures. When economic conditions are sluggish or in recession, regulators will choose an expansionary fiscal policy as a countercyclical form to restore economic growth. Expansionary fiscal policy is carried out by increasing government spending. In the context of Rule 4, this addition is made to goods spending and capital spending. Rule 4 is a representation of policies taken during the COVID-19 pandemic.

Rule 6 is the rule with the most policy dimensions. Rule 6 suggests allocating funding from non-tax state revenue and Government Islamic Securities and reducing personnel and material expenditures. Rule 6 suggests funding diversification accompanied by efficiency in bureaucratic operational spending. Rule 6 contrasts with other rules. If the other rules support expansionary fiscal policy, Rule 6 suggests personnel and goods spending efficiency. If examined further, the era of the COVID-19 pandemic forced the government to apply technology in various business lines. The advantage of this implementation is cost efficiency. Due to the uniqueness of Rule 6, it produces the highest average budget performance value compared to other rules. Rule 6 is a golden rule that regulators should consider when formulating future fiscal policies.

CONCLUSIONS AND SUGGESTION

Based on the experimental results using the a priori algorithm, 657 rules were obtained with a minimum variation of two to six itemsets. After that, the top 25 rules for each item set were selected. Screening of budget performance scores is carried out to obtain reliable association rules. This second screening resulted in six regulations and average performance scores above the national average. Rule of 6 is the best rule found via a priori algorithm. Rule 6 produces an average value of the budget performance of 90.65. Rule 6 also recommends funding diversification and operational spending efficiencies to increase the performance value of the budget. Based on knowledge extraction, four rules are related to funding from foreign loan sources. These rules are shown in Table 5, namely Rule 2, Rule 3, Rule 4, and Rule 5. These rules guide regulators in allocating capital expenditure and material expenditure budgets, namely rules 2 and 3 regarding reducing the capital expenditure budget and spending on goods using foreign loans. Rule 4 suggests an allocation of funding from foreign loans and an increase in the capital expenditure budget. Meanwhile, rule 5 directs the allocation of foreign loans and additional budgets for goods and capital expenditures as an expansionary fiscal policy. Applying these rules must consider the time of policymaking and economic conditions. These rules can be effective if implemented in the second or third quarter so that there is no backlog of contracts at the end of the year. In addition, regulators need to choose carefully the procurement of productive capital goods and have a high rate of return. However, regulators must consider other variables not mentioned in this study and examine economic conditions when implementing these rules. These rules only apply when the economy is in a recession. Although the a priori algorithm suggests increasing the goods and capital expenditure budget and reducing related budget blocks, regulators must consider other variables not mentioned in this research during the decision-making process. Regulators also need to re-check economic conditions when implementing these rules. The rule only applies when the economy is in a recession.

For further research, we suggest doing it during a booming economy. It defines the rules that can be applied when macroeconomic conditions change. Research can be expanded by adding policy dimensions, such as output targets, technology utilization, and mandatory

spending. The results of this study can also be used as comparison material to build association rules using other algorithms, such as the FP-Growth algorithm, the EClaT algorithm, the COFI algorithm, and the LP-Growth algorithm.

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