Cryptocurrency Exchange Selection Decision Support System Using Preference Selection Index

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Abstract. Cryptocurrency trading is a very popular business of buying and selling digital money today. Many investors trade cryptocurrency assets through cryptocurrency exchange platforms in the hope of getting a large profit difference. However, the cryptocurrency trading business is not always favourable for investors as choosing the wrong cryptocurrency exchange can result in huge losses from the trades made. Based on these problems, it is necessary to have a decision support system for selecting the most relevant cryptocurrency exchange to be used as a cryptocurrency trading platform that can increase the chances of investors making profits. The decision support system method used in this research is Preference Selection Index (PSI). The results of the selection of cryptocurrency exchanges using the Preference Selection Index (PSI) method in this study recommend Indodax as the most relevant cryptocurrency exchange used by investors to gain profits in running a cryptocurrency trading business because it gets the highest value (0.893662729) compared to 4 other alternatives.

Keywords: Cryptocurrency Exchange, Decision Support System, Preference Selection Index (PSI)

1 Introduction

Cryptocurrency is a digital currency based on blockchain technology that can be used in the transaction process between users without going through a third party. Basically, cryptocurrency has almost the same function as traditional currency [1]. But cryptocurrencies are not available in the form of real currency, like cash, but hash-bound blocks of data that are useful as validation [2].

In the current technological era, the cryptocurrency trading business is increasingly in demand by various circles of modern society. Many modern people have made the choice to become cryptocurrency investors in order to get big profits [3]. The cryptocurrency trading business itself can be done through cryptocurrency exchange platforms [4]. However, investors are required to choose their cryptocurrency trading venue carefully to avoid any fatal impact. One of the losses that investors can experience in cryptocurrency trading if they choose the wrong cryptocurrency exchange is that the assets that have been invested are simply lost because the platform used turns out to be a scam, or the assets owned by investors are drained because the platform used is hacked by irresponsible parties [5,6]. Many novice investors have suffered cryptocurrency asset losses after choosing the wrong cryptocurrency exchange [7]. So to overcome these problems, a decision support system is needed to select the most appropriate cryptocurrency exchange.

A decision support system is an information system that presents information, with modelling, and data manipulation that can help and facilitate decision makers to get information and understand data related to a problem in a fast time [8–10]. To get accurate results on the support system in this study, it is necessary to use a decision-making method. The decision support system method used to solve the problem of selecting a cryptocurrency exchange in research is the Preference Selection Index (PSI) method.

The reason researchers choose the Preference Selection Index (PSI) method is because it has been proven to be used to solve problems with the multi-criteria decision making (MCDM) category [11–13]. Then, the decision-making process using the Preference Selection Index (PSI) method is very simple and easy to understand because there is no need to calculate the value of the attribute weights before use [14–16]. So that

the Preference Selection Index (PSI) is considered feasible to be used by researchers to solve the problem of selecting a cryptocurrency exchange in this study.

2 Research Method

2.1 Cryptocurrency Exchange

Cryptocurrency Exchange is a platform that investors can use to buy and sell cryptocurrency assets in search of huge profits [17].

2.2 Metode Preference Selection Index (PSI)

Preference Selection Index (PSI) is a method that can be used to address multi-criteria decision making [18]. The Preference Selection Index (PSI) method does not require the process of determining the relative importance between attributes. The process of determining the weight value in the Preference Selection Index (PSI) method is done by using a standard deviation based on information obtained from the decision matrix [19]. Some steps of the Preference Selection Index (PSI) method in the process of solving multi-criteria decision-making problems, namely [19]:

1. Determining the Decision Matrix

$$X_{ij} = \begin{bmatrix} X_{11} & X_{12} & \cdots & X_{1n} \\ X_{21} & X_{22} & \cdots & X_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ X_{m1} & X_{m2} & \cdots & X_{mn} \end{bmatrix} \tag{1}$$

2. Normalisation of the Decision Matrix

    Normalisation for benefit criteria:

    $$X_{ij} = \frac{X_{ij}}{X_{ij}^{max}}, i = 1, \dots, m \tag{2}$$

    Normalisation for cost criteria:

    $$X_{ij} = \frac{X_{ij}^{max}}{X_{ij}}, i = 1, \dots, m \tag{3}$$

3. Determining the Average Value of the Normalised Matrix

    $$N = \frac{1}{n} \sum_{1=1}^{m} \bar{X}_{ij} \tag{4}$$

4. Determining the Preference Variation Value

    $$\emptyset_j = \sum_{1=1}^{n} (\bar{X}_{ij} - N)^2 \tag{5}$$

5. Determining the Deviation of Preference Value

    $$\Omega_j = 1 - \phi_j \tag{6}$$

6. Determining Criteria Weights

    $$W_j = \frac{\Omega_j}{\sum_{i=1}^{n} \Omega_j} \tag{7}$$

7. Determining the Preference Selection Index

    $$\Theta_i = \sum_{j=1}^{n} \bar{x}_{ij} w_j \tag{8}$$

2.3 Research Stages

In this study, researchers used several stages to solve the problem of choosing a cryptocurrency exchange, namely:

a. Identification of Problems

    In the initial stage, researchers carried out the process of identifying problems that occurred in the process of selecting a cryptocurrency exchange.

b. Literature Study

    In the second stage, researchers conducted a literature study process to define each variable used in solving the problem of selecting a cryptocurrency exchange.

c. Collection of Data

    In the third stage, researchers collect data to obtain sample data which is then analysed and used to determine the results of the selection of cryptocurrency exchanges.

d. Application of Preference Selection Index (PSI) Method

    In the fourth stage, researchers solve problems in selecting cryptocurrency exchanges using the Preference Selection Index (PSI) method.

e. Preparation of Research Report
In the final stage, the researcher makes a research report to present conclusions from the results of research that has been carried out in solving the problem of selecting a cryptocurrency exchange using the Preference Selection Index (PSI) method.
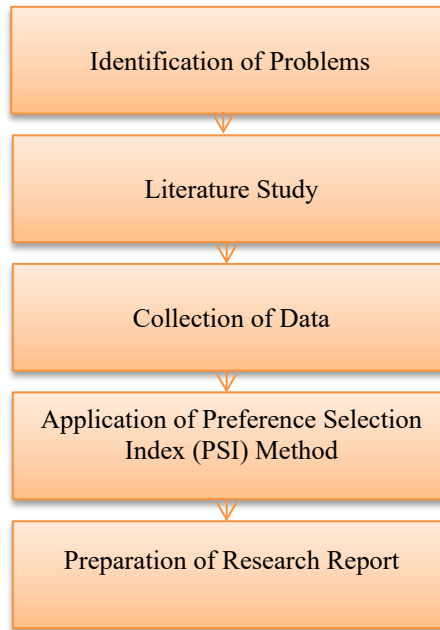

Figure 1. Research Stages

3 Result and Discussion
3.1 Research Data Results

Based on the results of data collection conducted to solve problems in the selection of cryptocurrency exchanges, it can be seen that the research data sample is as follows:
a. Data on Criteria and Subcriteria for Cryptocurrency Exchange Selection

Table 1. Cryptocurrency Exchange Selection Criteria

Code	Criteria
C01	Security
C02	Liquidity
C03	Reputation
C04	Customer Service

Table 2. Cryptocurrency Exchange Selection Subcriteria

Code	Criteria	Subcriteria	Weight
		Good	7
C01	Security	Enough	6
		Bad	5
		Good	7
C02	Liquidity	Enough	6
		Bad	5
		Good	7
C03	Reputation	Enough	6
		Bad	5
		Good	7
C04	Customer Service	Enough	6
		Bad	5

b. Sample Cryptocurrency Exchange Selection Data

Table 3. Sample Cryptocurrency Exchange Selection Data

No	Alternative	Criteria			
		C01	C02	C03	C04
1	Indodax	Good	Enough	Bad	Good
2	Luno	Enough	Good	Enough	Bad
3	Pintu	Bad	Enough	Good	Enough
4	Rekeningku	Good	Bad	Enough	Good
5	Triv	Enough	Good	Bad	Enough

Table 4. Weighted Alternative Values on Cryptocurrency Exchange Selection

No	Alternative	Criteria			
		C01	C02	C03	C04
1	Indodax	7	6	5	7
2	Luno	6	7	6	5
3	Pintu	5	6	7	6
4	Rekeningku	7	5	6	7
5	Triv	6	7	5	6
MAX		7	7	7	7
MIN		5	5	5	5

3.2 Preference Selection Index (PSI) Method

The results of calculating the value of all alternatives using the Preference Selection Index (PSI) method in solving the problem of selecting a cryptocurrency exchange can be seen in the explanation below.

a. Determining the Decision Matrix

$$X_{ij} = \begin{bmatrix} 7 & 6 & 5 & 7 \\ 6 & 7 & 6 & 5 \\ 5 & 6 & 7 & 6 \\ 7 & 5 & 6 & 7 \\ 6 & 7 & 5 & 6 \end{bmatrix}$$

b. Normalisation of the Decision Matrix

Nomalisation of criteria C01

$$R_{11} = \frac{x_{11}}{x_j max} = \frac{7}{7} = 1$$

$$R_{21} = \frac{x_{21}}{x_j max} = \frac{6}{7} = 0,857142857$$

$$R_{31} = \frac{x_{31}}{x_j max} = \frac{5}{7} = 0,714285714$$

$$R_{41} = \frac{x_{41}}{x_j max} = \frac{7}{7} = 1$$

$$R_{51} = \frac{x_{51}}{x_j max} = \frac{6}{7} = 0,857142857$$

To obtain the normalisation value of criteria C02 to criteria C04, the same calculation process is carried out with the calculation of the normalisation value of criterion C01 so that the normalisation results of the overall decision matrix are obtained as shown in the table below.

Table 5. Decision Matrix Normalization

No	Alternative	Criteria			
		C01	C02	C03	C04
1	Indodax	1	0,857142857	0,714285714	1
2	Luno	0,857142857	1	0,857142857	0,714285714
3	Pintu	0,714285714	0,857142857	1	0,857142857
4	Rekeningku	1	0,714285714	0,857142857	1

5	Triv	0,857142857	1	0,714285714	0,857142857
	Total Nilai	4,428571428	4,428571428	4,142857142	4,428571428

c. Determining the Normalized Average Value of the Matrix

$N_1 = \frac{1}{5} * 4,428571428 = 0,885714286$

$N_2 = \frac{1}{5} * 4,428571428 = 0,885714286$

$N_3 = \frac{1}{5} * 4,142857142 = 0,828571428$

$N_4 = \frac{1}{5} * 4,428571428 = 0,885714286$

d. Determining the Preference Variation Value

$\emptyset_{j1}$

$\emptyset_{j11} = \sum_i^n (1 - 0,885714286)^2 = 0,013061224$

$\emptyset_{j21} = \sum_i^n (0,857142857 - 0,885714286)^2 = 0,000816327$

$\emptyset_{j31} = \sum_i^n (0,714285714 - 0,885714286)^2 = 0,029387755$

$\emptyset_{j41} = \sum_i^n (1 - 0,885714286)^2 = 0,013061224$

$\emptyset_{j51} = \sum_i^n (0,857142857 - 0,885714286)^2 = 0,000816327$

$\emptyset_{j1}$ = 0,013061224 + 0,000816327 + 0,029387755 + 0,013061224 + 0,000816327
= 0,057142857

Next, the calculation is done to get the value of $\emptyset_{j2}$ up to $\emptyset_{j4}$ using the formula that has been used to calculate the value of $\emptyset_{j1}$. After finishing calculating the value of $\emptyset_{j1}$ up to $\emptyset_{j4}$, the final value of $\emptyset_j$ is obtained below:

$\emptyset_j = [0,057142857 \quad 0,057142857 \quad 0,057142857 \quad 0,028571429]$

e. Determining the Deviation of Preference Value

$\Omega_1 = 1 - 0,057142857 = 0,942857143$
$\Omega_2 = 1 - 0,057142857 = 0,942857143$
$\Omega_3 = 1 - 0,057142857 = 0,942857143$
$\Omega_4 = 1 - 0,028571429 = 0,971428571$
$\Omega_j = 0,942857143 + 0,942857143 + 0,942857143 + 0,971428571 = 3,8$

f. Determining Criteria Weights

$W_1 = \frac{0,942857143}{3,8} = 0,248120301$

$W_2 = \frac{0,942857143}{3,8} = 0,248120301$

$W_3 = \frac{0,942857143}{3,8} = 0,248120301$

$W_4 = \frac{0,971428571}{3,8} = 0,255639098$

g. Determining the Preference Selection Index

θ_{i1}

$\theta_{11} = 1 * 0,248120301 = 0,248120301$
$\theta_{21} = 0,857142857 * 0,248120301 = 0,212674544$
$\theta_{31} = 0,714285714 * 0,248120301 = 0,177228786$
$\theta_{41} = 1 * 0,248120301 = 0,248120301$
$\theta_{51} = 0,857142857 * 0,248120301 = 0,212674544$

Next, the calculation is done to get the value of $\emptyset_{i2}$ up to $\emptyset_{i5}$, using the formula that has been used to calculate the value of $\emptyset_{i1}$. After finishing calculating the value of $\emptyset_{i1}$ up to $\emptyset_{i5}$, the final value of $\emptyset_i$ is obtained below:

Table 6. Preference Selection Index (PSI)

No	Alternative	Criteria				
		C01	C02	C03	C04	Total PSI
1	Indodax	0,248120301	0,212674544	0,177228786	0,255639098	0,893662729
2	Luno	0,212674544	0,248120301	0,212674544	0,182599356	0,856068745
3	Pintu	0,177228786	0,212674544	0,248120301	0,219119227	0,857142858
4	Rekeningku	0,248120301	0,177228786	0,212674544	0,255639098	0,893662729
5	Triv	0,212674544	0,248120301	0,177228786	0,219119227	0,857142858

Based on the Preference Selection Index (PSI) table above, the following alternative rankings can be generated:

Table 7. Alternative Ranking

Alternative	Value	Ranking
Indodax	0,893662729	1
Rekeningku	0,893662729	2
Pintu	0,857142858	3
Triv	0,857142858	4
Luno	0,856068745	5

Based on the results of calculations that have been carried out using the Preference Selection Index (PSI) method, of the 5 alternatives taken into account, the priority choice to be used as a cryptocurrency exchange is Indodax with a value of 0.893662729..

4 Conclusion

a. The Preference Selection Index (PSI) method can be used to support decision making in determining the selection of cryptocurrency exchanges.
b. The alternative with the highest value of the 5 alternatives considered in the selection of cryptocurrency exchanges in this study is Indodax with a value of 0.893662729.

References

[1]   Luxmana DB, Oktafiyani M. Analisis Fundamental Cryptocurrency Terhadap Fluktuasi Harga Pada Masa Pandemi. Dinamika Akuntansi Keuangan Dan Perbankan 2022;11(1):41–52. https://doi.org/10.35315/dakp.v11i1.8952.
[2]   Ariatmanto D, Sari R, Mahdika YR. SLR Metode Paling Populer Prediksi Harga Cryptocurrency dengan Mechine Learning dan Deep Learning n.d.:543–548.
[3]   Muhammad Ramdhan Sampurna, Firdaus Yuni Dharta DK. Komunikasi Persuasif Cuantomonologi Dalam Meningkatkan Pengetahuan Masyarakat Terhadap Cryptocurrency Di Kabupaten Karawang. Jurnal Ilmiah Wahana Pendidikan 2023;9(9):639–648. https://doi.org/https://doi.org/10.5281/zenodo.7969711.
[4]   Caliskan K. The Elephant in the Dark: A New Framework for Cryptocurrency Taxation and Exchange Platform Regulation in the US. Journal of Risk and Financial Management 2022;15(3). https://doi.org/10.3390/jrfm15030118.
[5]   Huda N, Lake Y, Ray D, Sitorus H. Strategi Investasi pada Aset Cryptocurrency Strategi Investasi pada Aset Cryptocurrency 2023(April). https://doi.org/10.31294/moneter.v10i1.14365.
[6]   Safitri E. Kebijakan Melegalisasi Cryptocurrency Sebagai Upaya Pemerintah Jepang Mengamankan Keamanan Nasional Jepang. Journal of International Relations 2019;5(2):271–280.
[7]   Made N, Ujianti P, Hukum F, Warmadewa U. PERLINDUNGAN HUKUM TERHADAP INVESTASI PADA KOMODITAS 2022;4(1):97–102.
[8]   Fransiska D, Informasi S, Informasi T, Mandiri UN, Keputusan SP, Product W, et al. SISTEM PENDUKUNG KEPUTUSAN MENENTUKAN E-COMMERCE 2023;10(1).
[9]   Yusupa A, Manullang J, Marbun N, Bill S, Ginting F. Decision Support System for Determining the Best PAUD Teacher Using the MOORA Method 2023;1(2):50–55. https://doi.org/10.58905/SAGA.vol1i2.101.
[10]   Zalmi WF, Sitompul BJD, Nduru SW, Kayan S. Welder Recruitment Decision Support System Using the SMARTER Method 2023;1(2):44–49. https://doi.org/10.58905/SAGA.vol1i2.98.
[11]   Supitri D, Yulianti L, Elfianty L, Info A. Penerapan Metode Preference Selection Index (PSI) Dalam Sistem Pendukung Keputusan Penilaian Kinerja Perawat 2023;06(02):123–132.
[12]   Phan NH, Vu NN, Shirguppikar S, Ly NT, Tam NC, Tai BT, et al. Multi-criteria decision making in electrical discharge machining with nickel coated aluminium electrode for titanium alloy using preferential selection index. Manufacturing Review 2022;9. https://doi.org/10.1051/mfreview/2022010.
[13]   Arifin N, Saputro PH. Selection Index (PSI) Method in Developing a Student Scholarship Decision Support System. International Journal of Computer and Information System (IJCIS) 2022;3(1):12–16. https://doi.org/10.29040/ijcis.v3i1.55.
[14]   Siahaan MK, Mesran M, Hutabarat SA, Afriany J. Sistem Pendukung Keputusan Penentuan Prioritas

Pembangunan Daerah Menerapkan Metode Preference Selection Index (Psi). KOMIK (Konferensi Nasional Teknologi Informasi Dan Komputer) 2018;2(1):370–375. https://doi.org/10.30865/komik.v2i1.961.

[15] Asiedu-Ayeh LO, Zheng X, Agbodah K, Dogbe BS, Darko AP. Promoting the Adoption of Agricultural Green Production Technologies for Sustainable Farming: A Multi-Attribute Decision Analysis. Sustainability (Switzerland) 2022;14(16). https://doi.org/10.3390/su14169977.

[16] Agung Sutrisno VK. Supply Chain Sustainability Risk Decision Support Model Using Integrated Preference Selection Index (PSI) Method and Prospect Theory. Journal of Advances in Management Research (In Print) 2022;33(1):1–12.

[17] Jorgy Qori Qurani AI. Rancang Bangun Aplikasi Penjualan Cryptocurrency Berbasis Website Dengan Metode Prototype. Jurnal Pendidikan, Sains Dan Teknologi 2022;9(2):627–639.

[18] Hutagalung J, Boy AF, Jaya H, Zulkarnain I. Pemberian Beasiswa Kepada Mahasiswa dengan Metode Preference Selection Index (PSI) 2022;6(September):648–660.

[19] S U. Implementasi Metode Preference Selection Index (PSI) dalam Seleksi Penerimaan Content Creator Media Sosial 2023;7(April):632–640. https://doi.org/10.30865/mib.v7i2.5936.