Clustering Home Bias Behaviour of Surakarta Traditional Food Lovers in Financial Transaction During Covid-19 Pandemic

Utami Tri Sulistyorini, Sri Rahayu Zees, Sri Widiyati, and Nurseto Adhi(✉)

Accounting Department, Semarang State Polytechnic, Semarang, Indonesia
nurseto.adhi@polines.ac.id

Abstract. This research is based on two previous research's result that there was an image changing of Surakarta City from Batik's City toward City of traditional Food. Surakarta's traditional foods are culture in heritage's foods, functional foods, favorite foods have economic potential to rise Surakarta's economy growth, so analysis of clusterinhope of g was needed. Since Covid-19 pandemic, the hope of Surakarta City Government to make traditional food as an investment driver had been constrained. Financial transaction on traditional food is pushed by psychological behavior which is home bias (irrational behavior). While Covid-19 pandemic rational behavior will change to irrational behavior. The question is these changing also happened to traditional food lovers. If the answer is yes, so what should the Surakarta City government do to make their traditional food as an investment driver. The research's result is hoped to give an input for the Surakarta City government, which is home bias profile Surakarta's traditional food in doing financial transaction especially investment during Covid-19 pandemic. Based on this reason, this research is objected to do clustering the home bias profile Surakarta's traditional food in doing financial transaction especially investment during Covid-19 pandemic. In order to obtain the research's objective, the survey has been done by using 100 Surakarta's traditional food lovers as sample of this research. Purposive sampling is used as technique sampling, the all data is analysis using two step clustering method. Interesting finding of this research is there are three clusters of home bias behavior Surakarta's traditional food lovers, when they invest their money on business. Cluster 1 has financial behaviour in business investment, cluster 2 there is changing from financial behavior toward home bias behavior in business investment, and cluster 3 has home bias behavior in business investment. These result can be a policy input for Surakarta City government when they want build city branding based on Surakarta traditional food. It can be started from develop a culture protection by evaluation of effectivity and analyzing networking of development traditional food program for SME. The research's constraint is there having no data about effectivity and networking development program for SME's traditional food. The further research will be based on this research's constraint.

Keywords: Clustering · Surakarta's Traditional Food · Home Bias Behaviour

A. Rahman et al. (Eds.): ICAS 2022, ASSEHR 776, pp. 610–621, 2024.
https://doi.org/10.2991/978-2-38476-104-3_57

1 Introduction

9 March 2020, WHO had been determined that Corona virus as global pandemic, while Indonesian Government through BNSP had been determined that Corona virus as national pandemic at 14 March 2020. In order to stop Corona virus deployment, Indonesian government applied the big scale social distancing, which it was followed by Surakarta City government through Surakarta Major Letter number 067/036 at 8 January. This policy had a direct impact toward Surakarta food sector especially Surakarta traditional food sector. It can be seen from the decreasing of Regional GDP of Surakarta City, which it was from 5,41% at 2019, became 4,58% at 2020, and the growth rate of Surakarta City's Regional GDP decreased 6,49% from 2019 to 2020 [1].

The decreasing of growth rate in Surakarta food sector will be impacted on the Surakarta City's Government Policy to build Surakarta traditional food as an icon or City Branding of Surakarta City. The research result's Sulistyorini et al. [2], showed that traditional food such as sate kere, tengkleng, selat Solo, soto rempah, pecel ndeso, nasi liwet, gudeg ceker dan timlo Solo had been popular in Surakarta City, and contributed to the Regional GDP of Surakarta City (72,96%). These 8 Surakarta traditional food could be made as investment driver in Surakarta City.

Actually, it is not difficult for the local government of Surakarta City to make traditional food as a driving force of investment in Surakarta City. This is because the people of Surakarta City are very proud of their traditional food and are lovers of their traditional food. They behave irrationally when spending their money on traditional food, because it is driven by pride. This irrational behavior of Surakarta traditional food lovers is known as home bias behavior.

Home bias behavior is happened when people do financial transaction in a well kown product without calculating profit return [3]. The home bias behavior can be seen when people spend their money on product which has high correlation with their city birth or hometown. It is because of the proud as the son of the region. This home bias behavior is shown when individuals carry out their financial transactions, preferring products (both assets and goods) that have a high correlation with the city of birth, so that they get recognition as cultural heirs or regional fanaticism [4]. This home bias behavior is stronger when there are no transaction barriers such as difficult local regulations, inadequate information and unpopular product [5].

Home bias behavior is a strong basis for the development of cultural protection for traditional foods, so it is very beneficial for the local government of Surakarta City who wants to make their traditional food as a driving force for investment or City Branding. The problem is during Covid-19, financial transaction has been changed from irrational (psychological) behavior to rational (financial) behavior [6].

Behavior in financial transactions is actually an intersection between psychological (including home bias) behavior and financial behavior. Therefore, clustering analysis is urgently needed to see in financial transactions what kind of psychological behavior dominates over financial behavior or vice versa [7].

The results of this study are expected to be able to contribute to the local government's policy of Surakarta City to make traditional food as cultural protection, which is the initial basis for Surakarta City Branding. This is because the results of this study are a cluster profile of Surakarta traditional food lovers. This cluster profile is mapped based

on the home bias behavior of Surakarta traditional food lovers, when they invest in venture capital. Based on this cluster profile, the local government of Surakarta City can determine priority clusters in the development of Surakarta traditional foods.

2 Literature Review

2.1 Behavioral Finance

Manurung 2012 explains the definition of financial behavior based on the definition of Nofsinger [8] and Shefrin [9]. According to Nofsinger [8] financial behavior is actual human behavior when making investments, especially psychological behavior. While Shefrin defines financial behavior as psychological behavior that affects people when making investments. Furthermore, Manurung stated that according to Shefrin [9] there were three themes discussed in Financial Behavior, where the themes were made in the form of questions, namely:

- Whether the financial practitioner admits a mistake because it always adheres to the rules of thumb. For adherents of Behavior Finance admit it while traditional finance does not. The use of these rules of thumb is called Heuristics to Process data. Adherents of traditional finance always use statistical tools correctly and correctly to process data. While Behavioral Finance adherents practice rules of thumb such as "back-of-the-envelope calculations" which are generally imperfect. As a result, practitioners hold "biased beliefs" that influence the fulfillment of promises against those wrongdoings. This theme is known as Heuristic-driven bias.
- Does the form including the substance affect the practitioner? Adherents of Behavioral Finance state that practitioners' perceptions of risk and rate of return are strongly influenced by how the "decision problem" is framed. Meanwhile, adherents of Traditional Finance view all decisions as being transparent and objective. This theme is known as frame dependence.
- Do mistakes and decision-making frameworks affect the prices built on the market? Adherents of Behavioral Finance claim a "heuristic-driven bias" and the effect of framing causes prices to be far from their fundamental values so that the market is inefficient. While adherents of Traditional Finance assume an efficient market. This theme is known as an inefficient market.

2.2 Home Bias Behavior

Home bias behavior is the behavior of investors who tend to invest their funds in domestic products, where they are domiciled based on irrational reasons. These reasons are psychological such as geographical distance or sensitivity, familiarity, trust in information, trust in low costs and culture.

Gómez et al. [4] stated that home behavior can occur when the available products have a high correlation with domestic wealth, which in general are local products. This is because they feel "keeps them up with the Joneses." It can be said that the expected return can be higher, because local factors are very important in determining the expected return.

According to Bekaert and Wang [10] home behavior can grow when investors know the product well and have reliable information, because this creates a sense of optimism for investors to invest their funds. This optimism in turn encourages them to invest more in companies that are familiar to them. Naturally, investors prefer products that they know well, so there is a feeling of comfort when investing in these products.

Jeske [11] further underlines the growing home bias behavior based on investor confidence in the information available in the area of origin. Investors believe that they will get lower information costs if they invest in their home country than outside their home country. In addition, they will also get better and more reliable information if they invest in their area of origin compared to those outside their area of origin.

Home bias behavior also grows when investors have patriarchal behavior. According to Morse and Shive [5], investors' home bias behavior is not triggered by low transaction barriers, low risk, reliable information or familiarity, but rather by patriotism. This patriotism encourages investors to over-invest in local products of origin. This is due to the patriotic behavior of investors, there is loyalty to their hometown. This patriotic feeling and loyalty to the city of birth is what influences investors' choices in investing their funds.

3 Research Method

The type of data that will be used in this research is primary data taken by survey method from traditional food lovers in Surakarta. The two secondary data were taken from BPS and Disperindag or Kadin Surakarta City. The existing data consists of categorical data or nominal data and continuous data or interval data.

The population of this research is all residents of Surakarta City who work or have income. This population is 227,479 people [1].

The sampling technique used is purposive sampling where all populations do not have the same opportunity to be taken as samples or respondents. Purposive sampling is often referred to as a purposeful sampling technique, so that the population is mapped into certain criteria to be taken as a sample. The criteria specified in this sample are:

- Residents of Surakarta City are lovers of traditional food in Surakarta City.
- Residents of Surakarta City are lovers of traditional food in Surakarta City who carry out financial transactions both in the form of consumption and investment.

  One of the sample requirements is representative, which can be seen from the number of samples taken. For this reason, the Taro Yamane formula is used as follows:

  $n = N/(Nd^2 + 1)$, where n = number of samples; N = total population; d = 10% (research precision).

  $n = 227.249/(227.249 \text{ x } 0{,}1^2) + 1 = 99{,}96$ d rounded off by 100 respondents.

  The data analysis method used is Two Step Clustering. Two Step Clustering analysis is carried out using the following steps:
- Determining the Number and Significance of the Variables. The number of variables used depends on the purpose of the study. The variables here are significant predictors for the evaluation field in determining the optimum cluster. To determine the

significance of variables, two analytical methods can be used, namely the Ch-Square method for variables whose data is categorical, with the formula:

$$t = \frac{\hat{\mu}_k - \hat{\mu}_{jk}}{\hat{\sigma}_{jk}/\sqrt{N_k}}$$

and the t-Student method for variables whose data is continuous, with the formula:

$$\chi^2 = \sum_{l=1}^{l_k} \left(\frac{N_{jkl} - N_{kl}}{N_{kl}} \right)^2$$

- Define the Evaluation field. The evaluation field is determined as the basis for clustering, to explain the characteristics of each cluster formed.
- Determine the Optimal Cluster Number. According to Bacher et al. [12] the Two Step Clustering method is a clustering method that can be used to overcome the problem of unequal measurements, in other words, this method can be used for both categorical and continuous data. Determination of the number of clusters using 2 measures of distance, namely Euclidean and Log-Likelihood. When the data is of mixed type, the Log-Likelihood measure is more appropriate, which can be measured as follows [13]:

$$\mathrm{d(i, s)} = \xi_{\mathrm{i}} + \xi_{\mathrm{s}} - \xi_{\mathrm{hi,si}}$$

$$\xi_j = -N \left(\sum_{k=1}^{K^A} \frac{1}{2} log\left(\hat{\sigma}_k^2 + \hat{\sigma}_{jk}^2 \right) - \sum_{k=1}^{k^B} \sum_{l=1}^{L_k} \frac{N_{jkl}}{N_j} log\left(\frac{N_{jkl}}{N_j} \right) \right)$$

$$\xi_s = -N \left(\sum_{k=1}^{K^A} \frac{1}{2} log\left(\hat{\sigma}_k^2 + \hat{\sigma}_{sk}^2 \right) - \sum_{k=1}^{k^B} \sum_{l=1}^{L_k} \frac{N_{skl}}{N_j} log\left(\frac{N_{skl}}{N_j} \right) \right)$$

$$\xi_{(js)} = -N \left(\sum_{k=1}^{K^A} \frac{1}{2} log\left(\hat{\sigma}_k^2 + \hat{\sigma}_{(js)k}^2 \right) - \sum_{k=1}^{k^B} \sum_{l=1}^{L_k} \frac{N_{(js)kl}}{N_j} log\left(\frac{N_{(js)kl}}{N_j} \right) \right)$$

Cluster determination starts from determining the initial cluster using a sequential approach, where observations are made one by one based on the size of the distance. The distance measure is used to detect the presence of outliers, with a log-likelihood distance measure. If there is a distance that exceeds the critical point, namely:

$$C = log(V) \; compares$$

$$V = \prod_k R_k \prod_m L_m$$

Next is the determination of the optimal cluster, which is done by calculating the BIC (Schwarz's Bayesian Criterion) value with the formula:

$$BIC(J) = -2 \sum_{j=1}^{J} \xi_j + m_j \log(N)$$

where:

$$m_j = J\left\{2K^A + \sum_{k=1}^{K^B}(L_k - 1)\right\}$$

$$\xi_j = -N\left(\sum_{k=1}^{K^A}\frac{1}{2}log\left(\hat{\sigma}_k^2 + \hat{\sigma}_{jk}^2\right) - \sum_{k=1}^{k^B}\sum_{l=1}^{L_k}\frac{N_{jkl}}{N_j}log\left(\frac{N_{jkl}}{N_j}\right)\right)$$

The optimal number of clusters can be seen from the smallest BIC value, or the largest BIC changes ratio or the largest ratio of distance measure changes. The number of clusters can be known based on the comparison between distances with the following formula:

$$R(k) = d_{k-1}/d_k$$

$$d_k = l_{k-1} - l_k$$

where:

$$l_v = (r_v \log n - BIC_v)/2$$

$$l_v = (2r_v - AIC_v)/2$$

$$v = k,\ k - 1$$

4 Findings and Discussion

4.1 Profile of Respondents

The age range of the respondents is from 22 years to 60 years. The age range of these respondents is classified into 4 age groups, namely: 22 to 30 years, totaling 18 people; 31 – 40 years totaling 17 people; 41–50 years are 28 people and 51–60 are 37 people.

Respondents who are male as many as 30 people, while the female sex is more than 2x as many as 70 people.

The majority of respondents have a bachelor's level of education (75 people), while the number of respondents who have a junior high and high school education level is the same, namely 11 respondents.

Most respondents have 2 children (39 respondents), while 17 respondents do not have children.

The income profile of the respondents is divided into two groups, the first group is respondents who have income less than Rp 5,000,000 per month as many as 96 respondents, while the remaining 4 respondents have income greater than Rp 5,000,000.

The profile of the respondents is divided into 4 types of work, namely civil servants, entrepreneurs or entrepreneurs, traders and private companies. Most respondents (61

people) have the type of work as civil servants, while the least number of respondents (6 people) have the type of work as Entrepreneurs and Private.

Respondents are divided into two groups of respondents, namely respondents who choose to invest with high returns but have a high risk, and respondents who choose to invest in types of investments that have low returns but also low risk. A total of 78 respondents chose the type of investment that even though has a low rate of return or return, the risk is low, while the remaining 22 respondents choose the type of investment that has a high rate of return even though the risk is high.

There are 5 types of investment that respondents can choose from, namely gold, land, deposits, venture capital and securities. There are 45 respondents who choose the type of land investment, and 33 respondents choose gold, only 2 respondents who choose to invest in securities.

4.2 Result of Two Step Clustering Analysis

There are 8 variables used in the Two Step Clustering analysis, where these variables are taken from the respondent's profile, namely: Age (USIA), number of children (ANAK), income level (INCOME), gender (SEX), education level (EDU), investment options (Profit vs Risk), and investment types (JENISINV). The results of the Chi-Square test for categorical data variables, namely gender, education level, type of work, type of investment and investment choice are the 8 significant variables as predictors of home bias with a significance value < 0.05. The results of the t-Student test for variables with continuous data, namely the number of children, income level and age, also showed that the three variables were significant as predictors in the two-step clustering analysis. The significance of each predictor is shown in the Fig. 1:

The evaluation field used in this study consists of 5 indicators, namely: pride as a son of the region, trust in reliable investment in information from the region of origin, the belief that investment in the region of origin is more profitable, the belief that investment costs in the region of origin are lower, and the belief that investment risk in the region

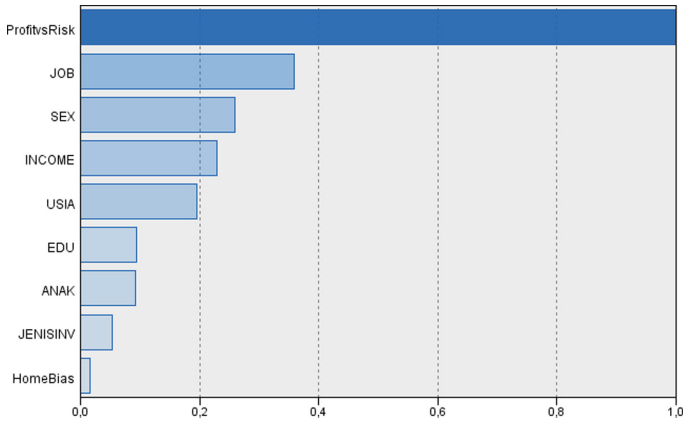

Fig. 1. Predictor's importance.

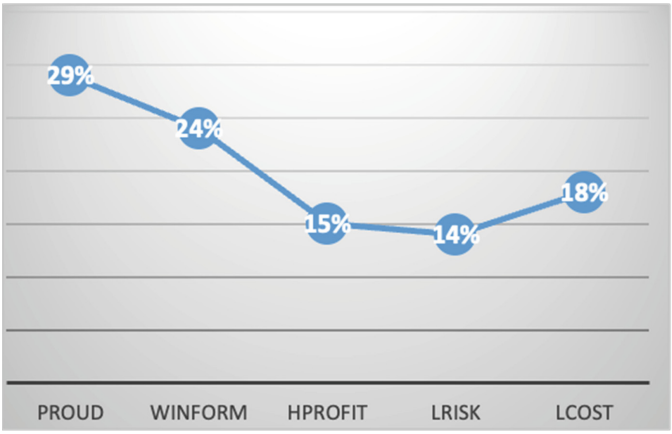

Fig. 2. Home bias.

of origin is higher low. These five indicators have a proportion of building a home bias as shown in the Fig. 2.

By using SPSS ver 22 software, the results of Two Step Clustering are obtained that the optimal number of clusters is 3 clusters. Thus, it can be said that traditional food lovers in Surakarta City who carry out financial transactions for transactions, and who base these transactions on home bias behavior can be grouped into 3 groups. This is indicated by the Ratio of Distance Measures value of 1.188, which is the largest value compared to the number of clusters below or above 3 clusters.

Cluster 1 consists of 36 people who love traditional food from the city of Surakarta, while cluster 2 consists of 42 people and cluster 3 consists of 22 people. Where the ratio of the largest and smallest cluster distance is 1.91. This ratio is higher than the constant of 1.15, so the number of cluster 3 is the optimal number of clusters.

4.3 Profile of Cluster 1

Cluster 1 consists of lovers of traditional food from the City of Surakarta during the Covid-19 pandemic, who base their investment on pride as a native of the region (27.8%) and the belief that investing in the area of origin is more profitable than outside the area of origin (25%), for low risk investment. Cluster 1 members, 100% female, and civil servants. 97.2% of the cluster members have an undergraduate education level, with an average income level of IDR 4,237,305.56, with an average number of children 2 or more. Members of this cluster are 50 years old or older, with the type of investment chosen is land (63.9%). In Cluster 1, there has not been a shift in transaction behavior, namely from financial transactions to psychological transaction behavior during the Covid-19 Pandemic, or it can be said that traditional food lovers in the City of Surakarta still hope for security for their investment, namely getting big profits even in the long term, with low risk, this is indicated by the low willingness of cluster members to invest in venture capital (8%), and the low behavior of home bias in the form of pride as sons of the region (10%) when they are faced with investment in venture capital.

4.4 Profile of Cluster 2

Cluster 2 consists of lovers of traditional food from the city of Surakarta during the Covid-19 pandemic, who chose low-risk investments in their home areas which were mostly based on pride as sons of the region (27.8%) and the belief that investing in their home areas was more profitable than abroad. Area of origin (25%). Cluster 2 members, more men (52.4%) than women, and dominated by non-civil servant types of work by 74%, where the type of private work is the most, which is 52.4%. 57.1% of the cluster members have a bachelor's level of education, with an average income level of almost half of those in Cluster 1, which is IDR 2,582,261.90, with an average number of children less than 2 people. Members of this cluster are at least 40 years old, with the most chosen type of investment being gold (42.9%). In Cluster 2, there is a tendency for a shift in investment transaction behavior, namely from financial behavior to home bias behavior during the Covid-19 Pandemic. This is indicated by the type of investment chosen, namely gold, where the price is more volatile than land, as well as in the form of a commodity that can be immediately traded even though it carries a risk of loss. In addition, it can also be seen from the willingness of cluster members to invest in business capital in their area of origin by 21%, citing pride as sons of the region (33%) and the belief that investment costs in the area of origin are lower than outside their area of origin.

4.5 Profile of Cluster 3

Cluster 3 consists of lovers of traditional food from the city of Surakarta during the Covid-19 pandemic, who choose high-risk investments in their home areas which are mostly based on pride as sons of the region (31.8%) and reliable information with the same percentage. Cluster 3, there are more women (63.6%) than men, where the types of work are non-civil servants and civil servants with the same percentage, namely 50%. Cluster members with a bachelor's level of education have the largest percentage of 72.7%, with an average income level similar to that of cluster 1, which is IDR 4,420,909.09, with an average number of children less than 2 people. Members of this cluster average at least 41 years of age or more, with the type of investment chosen between land that has low risk and other than land that has high risk, has the same percentage of 50%. In cluster 3 there has been a shift in transaction behavior, namely from financial behavior to home bias behavior. This is indicated by the willingness of cluster members to invest their funds in venture capital (23%), which is higher than in cluster 1 and cluster 2. When cluster members invest in venture capital, all indicators of their home bias behavior are used as the basis, except for low trust. Investment risk in the area of origin. Proud of being a son of the region (14%), trust in higher returns on investment from the region of origin (50%), trust in more reliable investment information in the region of origin (29%) and trust in lower investment costs in the region of origin (20%).

5 Conclusion and Recommendation

There are 8 variables used in this study, namely; age, income level, number of children, gender, education level, type of work, investment choice and type of investment. Meanwhile, the evaluation field used is home bias indicators, namely; reliable information,

pride as the son of the region, low investment costs, high returns or profits, and low investment risks.

The results of the Two Step Clustering analysis show that financial transactions for traditional food lovers in Surakarta City during the Covid-19 Pandemic for investment can be grouped into 3 clusters.

Cluster 1 consists of lovers of traditional food from the City of Surakarta during the Covid-19 Pandemic who still have financial behavior when investing their funds in business capital. This is indicated by the willingness of cluster members to invest in venture capital, which has low risk with adequate and reliable investment information.

Cluster 2 shows a tendency to shift the behavior of traditional food lovers in Surakarta City during the Covid-19 Pandemic in investment, namely from financial behavior to home bias behavior. This is indicated by the willingness of cluster members to invest in venture capital, who are more likely to base their investments on pride as sons of the region and the belief that investments from their region of origin have higher returns.

Cluster 3 consists of lovers of traditional food from the City of Surakarta during the Covid-19 Pandemic, who carry out financial transactions for high-risk investments. In Cluster 3, there has been a behavioral shift in financial transactions from financial behavior to home bias behavior. This is indicated by the willingness of cluster members to invest their funds in venture capital (23%), which is higher than in cluster 1 and cluster 2. When cluster members invest in venture capital, all indicators of their home bias behavior are used as the basis, except for low investment risk in the area of origin. Pride as a son of the region, confidence in the higher returns on investment from the region of origin, trust in investment information from the region of origin that is more reliable and trust in lower investment costs in the region of origin.

A very interesting finding from the results of this study is that financial transactions for traditional food lovers during the Covid-19 pandemic can be grouped into three groups, each cluster having different characteristics in investing its funds. Cluster 1 has financial behavior in investing their funds, while cluster 2 has a tendency to shift financial behavior to home bias behavior, and cluster 3 has home bias behavior in investing their funds. Apart from that, members of both clusters 1, 2 and 3 during the Covid-19 pandemic are willing to invest in business capital, and have led to home bias behavior. This can be an input for the Surakarta City Government, when they want to make their traditional food as City Branding, it can be started from the home bias behavior of the Surakarta City traditional food lover, as culture protection. To grow this culture protection, the Surakarta City Government can take the following Fig. 3 steps.

Fig. 3. The development of culture protection through the development of traditional food SMEs.

6 Limitation and Further Research

The limitation of this research is the absence of data related to the effectiveness of the traditional food MSME funding and networking program of the Surakarta City Government. This is because the effectiveness of the program has never been tested, which involves two groups of traditional food SMEs, namely traditional food SMEs that are free from the program and traditional food SMEs that are included in the program.

Therefore, for future research, it is better to conduct research related to the analysis of the effectiveness of the traditional food SMEs funding program or traditional food SMEs networking. This is the next step after the clustering test to determine traditional food as a city branding for Surakarta City.

References

1. BPS Kota Surakarta (2021).
2. Sulistyorini, U.T., Amid, J., Widiyati, S., Adhi, N.: Perceptual Mapping Potensi Ekonomi Makanan Tradisional Sebagai Pangan Fungsional Berbasis Pangan Lokal Kota Surakarta. JOBS (Jurnal Of Business Studies) 5(1), 1-16 (2019).
3. Chen, Y., Huang, J., Xiao, S., Zhao, Z.: The “home bias” of corporate subsidiary locations. Journal of Corporate Finance 62, 101591 (2020).
4. Gómez, J.P., Priestly, R., Zapatero, F.: Keeping up with the Joneses: An international asset pricing model. Universitat Pompeu Fabra (2003).
5. Morse, A., Shive, S.: Patriotism in your portfolio. Journal of financial markets 14(2), 411-440 (2011).
6. Gurbaxani, A., Gupte, R.: A study on the impact of COVID-19 on investor behaviour of in-dividuals in a small town in the state of Madhya Pradesh, India. Australasian Accounting, Business and Finance Journal 15(1), 70-92 (2021).
7. Thompson, J.R., Feng, L., Reesor, R.M., Grace, C.: Know Your Clients’ behaviours: a cluster analysis of financial transactions. Journal of Risk and Financial Management 14(2), 50 (2021).

8. Nofsinger, J.R.: Investment Madness: How Psychology Affects Your Investing and What to Do About It. Prentice Hall (2001).
9. Shefrin, H.: Beyond Greed and Fear: Understanding Behavioral Finance and Psychology of Investing. Harvard Business School Press (2000).
10. Bekaert, G., Wang, X.: Home bias revisited. Draft Columbia Business School (2009).
11. Jeske, K.: Equity home bias: Can information cost explain the puzzle?. Economic Review-Federal Reserve Bank of Atlanta 86(3), 31 (2001).
12. Bacher, J., Wenzig, K., Vogler, M.: SPSS TwoStep Cluster-a first evaluation. (2004).
13. Mongi, C.E.: Penggunaan analisis two step clustering untuk data campuran. d'Cartesian: Jurnal Matematika dan Aplikasi 4(1), 9–19 (2015).