Journal of Theoretical and Applied Information Technology
15th December 2022. Vol.100. No 23

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

ESTIMATION OF PATH ANALYSIS WITH JACKKNIFE AND BLINDFOLD RESAMPLING APPROACH

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ABSTRACT

Because it offers a variety of simple information that customers can obtain only online, websites are frequently used by criminal enterprises to conduct business. Marketplace is a sort of website that is currently widespread and used to transact business. between buyers and sellers. Increase the number of people that visit marketplace websites by promoting them on Instagram. For more information on these impacting elements, check out the Instagram marketplace and the websites that host online engagement feeds. An example of a marketplace was obtained from the website iPrice, which works with several marketplaces. This study's method analysis is a track of analysis used to determine how exogenous and endogenous variables interact. Because this research's testing of the hypothesis was done with a blindfold and a jackknife, the test findings demonstrate that the variable online engagement and visits marketplace have error that is not regularly distributed. Based on relative computation efficiency, the jackknife method yields better results than the tested blindfold method, which has more minor scoring alternatives. 96.7 percent of the diversity of data can be explained by a model study, while the remaining 3.3 percent is explained by other variables that are not included in models. A comparison of two resampling methods, namely jacknife and blindfold, was carried out to obtain an effective path coefficient value in researching Instagram marketplace uploads on marketplace website visits.

Keywords: *Path Analysis, Blindfold, Jackknife, Marketplace, Online Engagement, Uploads Instagram*

1. INTRODUCTION

Analysis utilized to determine the pattern link between variables is known as analysis correlation in statistics. Analysis of correlation is helpful in determining the degree of resemblance between the variables under study [1]. Analysis correlation uses a variety of methods, depending on the situation that needs to be solved. Analysis Path is a technique from analysis correlation [2]. Analysis tracks are frequently used in research to determine how exogenous and endogenous variables interact [3].

For research purposes, it is not possible to study an object with the entire population in place; therefore, a sample is necessary to address the issue. A good sample is also necessary to obtain a good representation of the population, and this sample can be obtained via the election technique. As for a current issue with sample collection, it is thought to be difficult or to need a lot of money, time, and effort. Regression analysis works under the presumption that model errors must be distributed according to a normal distribution [4]. Resampling is one way to overcome the second difficulty [5]. A parameter estimator's results could be influenced by an abnormality error if it is not corrected. Hipotesis by Uji When a parameter's evaluation fails to take into account a desirable set of input parameters, such as a small, neutral, and straight line, it ceases to be a legitimate parameter. Resampling can increase information from analysis results and solve abnormal problem [6]. Additionally, allow for the possibility of erroneous data distribution assumptions or the possibility that they are not necessary [7]. According to [8], there are three types of resampling methods: bootstrap, jackknifing, and penutup mata. Bootstrap is used when the sample size is greater than 100 and the data have a normal distribution. Jackknifing is used when the sample size is less than 100 and there are outliers.

Path analysis could be used in market research cases [9]. The pandemic's occurrence forced the public to adjust to the internet's advanced level of intelligence. One example is the habit community that began the transition from direct commerce to online transaction. That gadget is the reason Indonesian markets are seeing a lot of traffic. Even so, a lot of individuals come here to take advantage of the rising popularity of Indonesians' preferred social media. Instagram is among the most widely used social media platforms in Indonesia.

The impact of something uploaded might be observed in the likes and comments left by consumers. Social media responses to current events demonstrate that a market can build strong bonds with its customers. Good relationships can encourage customers to buy products from brands, hence it is possible to say that online involvement can boost brand loyalty [10].

Because it offers a variety of simple information that customers can obtain only online, websites are frequently used by criminal enterprises to conduct business. Marketplace websites serve as a common form of area for vendors and buyers to conduct business at the moment. If a large number of potential customers visit, a market is thought to be developing. In Marketing for Hospitality and Tourism, [11] make the assumption that interest in consumer purchases might be equated with interest in tourists' visits. The results of a study by [12] on The Influence of Social Media Instagram @wisatadakwahhokura on Interest Visit Followers show that social media Instagram @wisatadakwahhokura is influential to interest visit to the site travel.

Theoretically, Instagram uploads can affect how many people visit websites. Instagram uploads have an impact on online interaction, which in turn affects website visits that are prompted by online interaction. Analysis tracks can be used to examine connections between variables in order to understand how different elements interact with one another. Therefore, this study formulated to compare the blindfold and jackknife resampling methods in path analysis, based on the value of variance of the estimators each method. The purpose is to determine a more efficient resampling method in research of Instagram marketplace uploads on marketplace website visits.

2. LITERATURE REVIEW

2.1. Path Analysis

The alignment of the correlation matrix with two or more causal link models is tested by researchers using path analysis as a regression expansion model [13]. The model is presented as a circle, and the cause is denoted by a single arrow.

The path coefficient can also be referred to as a standard regression coefficient since, according to [14], it is actually a regression coefficient in standard form. The model for multiple regression used for path analysis is as follows:

$$Y_{1j} = \beta_{Y_1X}X_j + \varepsilon_{ij} \quad (1)$$

$$Y_{2j} = \beta_{Y_2X}X_j + \beta_{Y_2Y_1}Y_j + \varepsilon_{ij} \quad (2)$$

with:

Y_{ij} : endogenous variable, where i = 1,2 and j = 1,2, …, n
X_j : exogenous variable j observation
n : the number of observations
β_{Y_1X} : path coefficient between X and Y_1 (coefficient of path 1)
β_{Y_2X} : path coefficient between X and Y_2 (coefficient of path 2)
$\beta_{Y_2Y_1}$: path coefficient between Y_1 and Y2 _ (coefficient of path 3)
ε_{ij} i - th equation and the j -th observation

2.2. Resampling

Re-sampling is the act of taking samples from an existing sample in order to create a new sample, according to [15]. The original sample size, either with or without replenishment, is used to create the new sample. Resampling was employed in this study to evaluate the hypotheses. The assumption of normality is not necessary because the resampling approach is used to remove distributional constraints from the data that must be processed [16].

2.2.1. Blindfold

The blindfold technique employs a resampling algorithm that allows the researcher to select the minimum number of lines that must be included in each resampling, thereby forming the number of re-samples. The sample size divided by the number of samples results in the number of rows that are so adjusted in each sample.

Blindfold steps for estimating standard errors are as follows:

1. Determine the number of B times in the blindfold sample $(x_1^*, x_2^*, x_3^*, \dots, x_F^*)$obtained from random sampling by returning n elements from the initial sample $(x_1, x_2, x_3, \dots, x_n)$with $x_1$and $x_2$set to always be drawn
2. Estimating the standard error by using the standard deviation for the blindfold replicated B times with the following formula:

$$Se_B = \sqrt{\frac{\sum_{b=1}^{B}[\hat{\beta}^*(b) - \hat{\beta}^*(.)]^2}{(B-1)}} \quad (3)$$

With $\hat{\beta}^*(.) = \sum_{b=1}^{B} \frac{\hat{\beta}^*(b)}{B}$

Suppose there are five samples in the variable X, namely $X = \{x_1, x_2, x_3, x_4, x_5, x_6, x_7\}$. The following is the sampling process in the blindfold resampling method:

a. First re-sampling $x_1^* = \{x_1, x_2, x_4, x_3, x_2\}$.
b. Second re-sampling $x_2^* = \{x_1, x_2, x_3, x_5, x_5\}$.
c. Third re-sampling $x_3^* = \{x_1, x_2, x_3, x_5, x_7\}$.

Based on this process, it can be seen that for each blindfold sample, x_1 and x_2 will always be taken for every repeat sample taken.

2.2.2. Jackknife

[17] assert that Queno ille invented the jacknife method in 1949. By estimating Se from the estimator, this method seeks to reduce the bias of an estimator and offer an approximation of the confidence range for the parameters to be estimated.

Jackknife steps to predict standard errors are as follows:

1. Determine the number of N times in the jackknife sample $(x_1^*, x_2^*, x_3^*, \dots, x_F^*)$obtained from randomly taking n-1 elements from the initial sample $(x_1, x_2, x_3, \dots, x_n)$by eliminating one x_n.
2. Estimating the standard error by using the standard deviation for the jackknife replicated B times with the following formula:

$$Se_j = \sqrt{\frac{n-1}{n}\sum_{i=1}^{N}(\hat{\theta}_{(i)} - \hat{\theta}_{(.)})^2} \quad (4)$$

Suppose there are five samples in the variable X, namely $X = \{x_1, x_2, x_3, x_4, x_5, x_6, x_7\}$. The following is the sampling process for the jackkinife resampling method:

a. First re-sampling $x_1^* = \{x_2, x_3, x_4, x_5, x_6, x_7\}$.
b. Second re-sampling $x_2^* = \{x_1, x_3, x_4, x_5, x_6, x_7\}$.
c. Third re-sampling $x_3^* = \{x_1, x_2, x_4, x_5, x_6, x_7\}$.

Remove one sample by one from n observations and in the next step, the deleted sample is returned and one sample and so on until all samples from the population have a chance to be deleted.

2.3. Hypothesis test

By testing the hypothesis and comparing the value of the t count with the value of the t table at a significance level of 5%, the significance of the path analysis model can be ascertained. The t test is used to evaluate the partial significance of an estimator parameter. In other words, the t test can be used to find out how exogenous factors affect endogenous factors and how endogenous factors affect other endogenous factors. Hypothesis testing with t-test statistics done with the following formula.

$$t_i = \frac{\hat{\beta}_i}{Se_j(\hat{\beta}_i)}; \begin{matrix} i = 1,2 \dots, k \\ j = BI, JK \end{matrix} \quad (5)$$

Information:

t_i : Test statistic on observation i

$\hat{\beta}_i$: Estimator of parameter i

$Se(\hat{\beta}_i)$: Standard error of the -i parameter estimator.

2.4. Relative Efficiency

In this study, a method is employed to compare the two methodologies in order to determine the efficacy of the resampling results. Relative efficiency can be used to compare the effectiveness of two estimators. The efficiency of the two estimators $\hat{\beta}_i$ relative to $\hat{\beta}_i^*$ can be defined as follows [18]:

$$\text{eff}\left(\hat{\beta}_{bi,}\hat{\beta}_{bo}\right) = \frac{V(\hat{\beta}_{bo})}{V(\hat{\beta}_{bi})} \quad (6)$$

Information:

$V(\hat{\beta}_{bo})$: variance of parameter estimator with blindfold resampling method

$V(\hat{\beta}_{bi})$: variance of parameter estimator with jackknife resampling method

If the result of the calculation is more than one, it can be stated that the estimator $\hat{\beta}_{bi}$is a better unbiased estimator than $\hat{\beta}_{bo}$.

2.5. Model Validity

According to [19] there are indicators that can be used for the validity of the model in path analysis, namely Coefficient of Determination

The total variance of data that can be explained by the model is calculated using the formula (7).

$$R_m^2 = 1 - P_{e1}^2 P_{e2}^2 \dots P_{eI}^2 \quad (7)$$

where,R_m^2 is the value of the coefficient of total determination andP_{ep}^2

3. METHODOLOGY

3.1. Data Source

Because the information may be obtained at iPrice.co.id, data gathering was done online during the third quarter of 2021. While the major method of data acquisition is through each marketplace's Instagram account. In this study, 38 marketplaces with Instagram accounts are included. Two endogenous variables and one exogenous variable were employed in this study.

3.2. Steps

Steps taken in study this is as following.

1. Establish the study's location and timing
2. Compute the populace and a representative market
3. Select the research variable that will be represented by visits to online shops, internet activity, and Instagram uploads.
4. Gather information from the iPrice Group and observe each Instagram marketplace account.
5. Modeling on path analysis

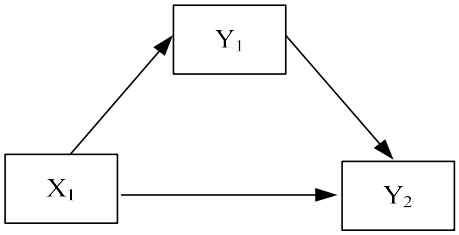

Figure 1. Research Model

6. there are two endogenous variables: visits to marketplaces and online involvement (Y1). (Y2). While marketplace visits (Y2) are impacted by uploading Instagram feeds and online engagement, uploading Instagram feeds have a variable impact on online engagement (X1).
7. Verify the assumption model's linearity, normality, the minimal interval endogenous variable, and the model's fit to theory.
8. To conduct resampling using the blindfold and jackknife method to test the normalcy assumption.
9. Obtain the data resampling coefficient path.

$$\hat{\boldsymbol{\beta}} = (\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'\mathbf{Y} \quad (8)$$

10. Test parameter hypothesis from the result data resampling.
11. Comparing findings using jackknife resampling, blindfolds, and count efficiency comparatively.
12. Use theory trimming and coefficient total determination to evaluate the model's validity.
13. Interpretation the result.

4. RESULTS AND DISCUSSION

4.1. Data Standard

Data gathered from the study has several units of measurement, including visits to the market place as a unit of person and variable uploads per day as a unit of variable engagement as a unit of likes or comments, therefore the original data must be standardized before being analyzed. Therefore, a transformation must be performed to create a z-score.

4.2. Assumption Test Path Analysis

1. Linear Assumption

Test assumption linearity with Ramsey RESET done with help software R

Table 1. Test Results Assumption Linearity

Variable	p- value	Decision	Results
X_1 with Y_1	0,7607	Accept H_0	Linear
X_1 with Y_2	0,7411	Accept H_0	Linear
Y_2 with Y_1	0,991	Accept H_0	Linear

Based on Table 4.1 it is clear that all relationships between exogenous and endogenous variables have more p-values from scores α (0.05), which means that H_0 is accepted and that the relationships between the variables are linear.

2. Assumption Normality

One assumptions on path analysis is error on every equality must spread normally. Test assumption normality using the Kolmogorov-Smirnov test with help R software.

Table 2. Test Results Assumption Normality

Equality	p- value	Results
Uploads feeds(Y_1)	0.0000	Not Normal
Visit Marketplace(Y_2)	0.0000	Not Normal

Table 4.2 shows that the results of the normality test for the equivalence of Y_1 and Y_2 were 0.00, and the result was even smaller at at α(0.05)., indicating that the data were not normally distributed. Using a jackknife and blindfold resampling technique, hypothesis testing is carried out in the event that the study's premise of normalcy is not met.

3. Recursive Model

It is clear from Figure 1 that the relationship between endogenous variables and causation is unidirectional. In order to fulfill the requirement that a recursive model's definition of the model used in the analysis track have system one direction

4. Measuring scale on endogenous variables at least interval

Interval data is distance-based information without zero absolute values. When conducting research, this variable's second endogenous variable, i.e., visiting a marketplace and uploading feeds, collects data in the form of scaled-down distance ratios. Validate the interval scale assumption for minimum endogenous variables.

5. The model used is in accordance with existing concepts and theories

The model developed during the research is based on the idea that claims that posting to Instagram affects online engagement and website visits, while website visits affect online engagement, proving the model's presumption.

4.3. Estimation Parameters of Original Data Sample

Estimation of parameters in analysis track from original data sample conducted with guess coefficient track use OLS method. Parameter estimation results using software R

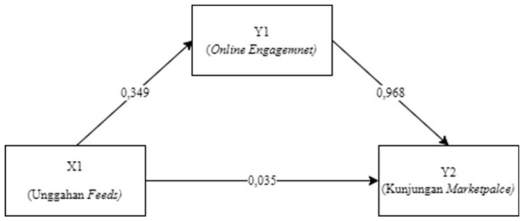

Figure 2. Diagram and Path Coefficient

The diagram in Figure 2 can be written in form equality like following:

$$Z_{Y1} = 0{,}349Z_{X_1}$$

$$Z_{Y2} = 0{,}035Z_{X_1} + 0{,}968Z_{Y1}$$

From the equation first, that is Z_{Y1} could interpreted that every increase one unit feeds upload will increase online engagement of 0.349.

On the equation two, namely Z_{Y2} show that every increase one unit upload feeds will increase visit marketplace of 0.035 and each increase one unit online engagement will increase visit marketplace of 0.968.

4.4. Estimating Parameters from Resampling Data

After conducted resampling obtained 1000 samples measuring 35 observations, that is 500 samples obtained from blindfold resampling with Tokopedia and Shopee samples always taken and 500 samples other obtained from resampling jackknife (delete-2). Following is a histogram of each parameter estimator from the data obtained from method blindfold and jackknife with OLS method

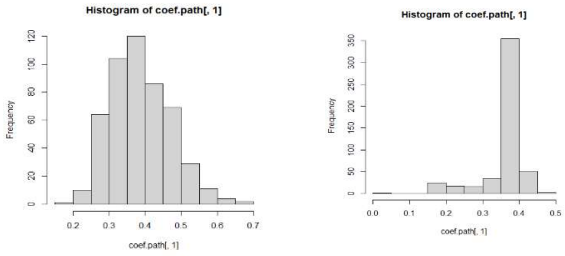

Figure 3 Histogram for Path 1 Coefficient Estimator from Data obtained with Blindfold (left) and Jackknife (right)

Journal of Theoretical and Applied Information Technology
15th December 2022. Vol.100. No 23

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

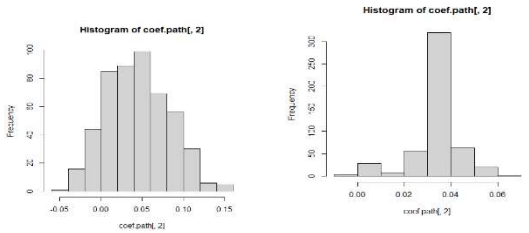

Figure 4 Histogram for Path 2 Coefficient Estimator from Data obtained with Blindfold (left) and Jackknife (right)

4.5. Testing Hypothesis

Test results hypothesis from the original data set and with approach blindfold and jackknife

Table 3. Test Results Hypothesis Influence Direct

Variable	Path Coefficient (Original Data)	t-count	p-value	t-count	p- value
		Blindfold		Jackknife	
$X_1 \rightarrow Y_1$	0.349	4,656	0.000 (Significant)	6,203	0.000 (Significant)
$X_1 \rightarrow Y_2$	0.035	1,167	0.201 (No significant)	3.182	0.002 (Significant)
$Y_1 \rightarrow Y_2$	0.968	68,357	0.000 (Significant)	209,871	0.000 (Significant)

Based on Table 3, it can be deduced that the value – $p < \alpha$ (0.05) leads to the denial of H_0 and that there is an influence on the upload feeds to online engagement, upload feeds to visit marketplace, and online engagement to visit marketplace, but upload no feeds take effect on method blindfold resampling.

Once the direct influence on each key variable of the models is understood, the direct and indirect influences may then be estimated. Influence is when something has no direct effect on it. Sobel Test is used in conjunction with varied upload feeds to visit marketplace through variable online interaction.

Table 4. Result Sobel Test

Intervening Variables	p-value Blindfold	p-value Jackknife
$X_1 \rightarrow Y_1 \rightarrow Y_2$	0.002 (Significant)	0.00 (Significant)

The results of the Sobel test in Table 4 show that with method blindfold and jackknife p-value < 0.05 indicates that Online Engagement (Y_1) mediates the effect of Uploaded feeds (X_1) on Marketplace Visits (Y_2).

Based on the formed model big the resulting total effect on the analysis track could be seen in Table 5.

Table 5. Effect on Path Analysis

Variable	Influence Direct	Influence Not Direct	Total Influence
$XtoY_1$	0.349	-	0.349
$XtoY_2$	0.035	0,349 × 0,968 = 0,337	0.372
Y_1toY_2	0.968	-	0.968

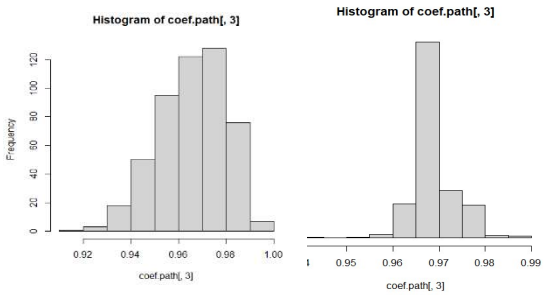

Figure 5. Histogram for Path 3 Coefficient Estimator from Data obtained with Blindfold (left) and Jackknife (right)

Based on Table 5 can is known that upload feeds have total effect of 0.349 on online engagement. Total effect of uploads feeds to visit marketplace of 0.372 while total online engagement effect to visit marketplace of 0.968. Influence false and not analyzed no calculated because no there is in models.

4.6. Efficiency Relatively

Calculation result efficiency relatively by concise could be seen in Table 6.

Table 6. Efficiency Results Relatively

Path Coefficient to -	Method Variants Blindfold	Method Variants Jackknife	Efficiency Relatively
β_1	0.0069	0.0031	2.17
β_2	0.0014	0.0001	13,081
β_3	0.0001	0.000002	9,368

Blindfold method variant is obtained with always set Tokopedia and Shopee taken in taking sample repeated 500 times. While the method variant jackknife conducted after get 500 samples with eliminate 2 samples in each taking repeat. Based on Table 4.6 can is known that score efficiency relative to all coefficient path > 1, so

that could is known that method jackknife have variant more small from method blindfold on all score estimator. This thing show that in research this method jackknife more efficient than method blindfold.

4.7. Model Validity

One of the two indicators of a model's validity is coefficient determination. In order to determine how much of a variety of data the model being used in the study can explain, the coefficient total determination is determined. Table 7 provides a simple breakdown of each equation's coefficient value determination (R2).`

Table 7 Coefficient Results Determination (R^2)

Endogenous Variables	Coefficient Value Determination
Y_1	0.121
Y_2	0.963

Based on score coefficient determination every the equation in Table 4.7, can be calculated score coefficient total determination as following:

- Equation 1

$$R^2 = 0{,}121$$

$$\varepsilon_1 = \sqrt{1 - 0{,}121} = 0{,}937$$

- Equation 2

$$R^2 = 0{,}963$$

$$\varepsilon_1 = \sqrt{1 - 963} = 0{,}191$$

- Coefficient total determination

$$R_m^2 = 1 - \varepsilon_1^2 \varepsilon_2^2$$

$$= 1 - (0{,}913)^2 (0{,}191)^2$$

$$= 0{,}967$$

The model can explain 96.7 percent of the information in the data, or a large diversity of data can be explained by it by 97.4 percent. The remaining 3.3 percent of the information in the data is explained by other variables that are not included in models. Information that can be explained by the model by 96.7% can said enough big so the model used in study this enough good or worth.

4.8. Interpretation

The research is in line with the topic of previous research which claims that Instagram social media affects interest visits to the website. However, this study also discusses the indirect effect of uploaded feeds on marketplace visits through online engagement.

The analysis results from the study's methodology suggest that 96.7 percent of the diversity of data can be explained by the model, with the remaining 3.3 percent being explained by additional variables that are not included in models. Based on the findings of this study, it is known that jackknife resampling of data produces coefficients more effectively than blindfold resampling. Value efficiency relative > 1, which signifies the variant estimator derived from the result data method jackknife is smaller than the variant obtained from the result data method blindfold, might be used to show this. Coefficient value obtained path from approach jackknife resampling more effective caused deletion reduced sample there are outliers so that produce coefficient path from approach resampling blindfold that has variant more small.

According to research findings, online engagement is a factor that must be updated because it has a significant enough impact to drive people to markets. Based on calculations that show that online engagement has a total effect of 0.968, variable upload feeds also influence online marketplace visits directly with a 0.035 influence, and indirectly with a 0.337 influence via variable online engagement. Improvements are made to the amount uploaded that influences feeds' variable online engagement of 0.349 in order to increase online engagement. Varied online involvement, on the other hand, mediates variable upload feeds to the marketplace, which is 0.372.

5. CONCLUSION

Application analysis is the method used to determine the coefficient by 96.7 percent. This indicates that online involvement and uploads have a 96.7 percent impact on market visits, with the remaining 3.3 percent being explained by variables outside the model. Calculation results for efficiency indicate that the jackknife resampling method is more effective than the blindfold resampling method since it has more minor variants.

Based on the results of this study, the researchers give suggestions to use other resampling methods or examine the consistency of the resampling method because in this study only 500 repetitions were used.

ACKNOWLEDGEMENT

Thank you to all parties for their support and input in the preparation of this research. All the support and input given is very useful for the perfection of this research. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The authors report there are no competing interests to declare.

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