Pair-Samples T Test: Simulation Model of Financial Ratio's Measurement with Decision Support Sytems (DSS) Approach

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Abstract: *Modeling is everything that is constructed through specific parameters that are measured both in structure, form, content, amount and meaning with all the limitations. This research uses a factor test measuring mathematical models with a multivariate analysis approach with an independent or pair-samples approach (t test) to confirm whether the research object has a difference in the average value compared to the standard error score and continue testing the model using other approaches. This research uses mixed-methods method with descriptive analytic and t test. The object of this research involves a mathematical simulation model using the perspective of the data mining process through data preparation and exploration, prediction, classification, and affinity analysis and segmentation, evaluation and assessment models as long as deployment models. Model simulation based on decision support systems (DSS) which are derived into mathematical models (quantitative) can explain the complexity of the relationship between testing a model that is integrated with certain statistical approaches. Further, the model can be evaluated in advance to determine the assessment criteria with the approach chosen to produce the development of a model that is not mistakenly estimated (suitable model) for further testing, decision and answer the research objectives.*
Keywords*: Modeling, measurement factors, DSS.*

I. INTRODUCTION

The selection statistical tests is not easy, this model uses the concept of decision support systems (DSS) Generator software that facilitates the means of explaining data analysis, must first study the requirements of statistical analysis procedures by considering what approach or model will be used based on the title, problem, and type of data [1]. Modeling is everything that is constructed through specific parameters that are measured both in structure, form, content, amount, and meaning with all the limitations. This model is usually used by practitioners to describe real problems that become buildings in the decision making process [2,3]. DSS is developed by managers in the design of optimization models based on the critical success factors (CSFs) approach, which uses an approach between model and data orientation. This model uses linear programming techniques that can solve problems with a business environment approach that is not represented in the model. The development of this DSS aims at the capacity of its generator to identify problems that exist through representational, optimization and suggestions to end-users specifically.

Factor analysis is a double variable analysis technique used to find out the underlying factors and show the interrelationships between variables. The main purpose of factor analysis is to find a way to describe the information contained in the sum of the original variables into a new set of smaller [4]. Correlation analysis is one method that is quite familiar, easy to understand so it is quite often used by novice researchers who aim to find out whether or not there is a linear relationship between variables or constructs [5].
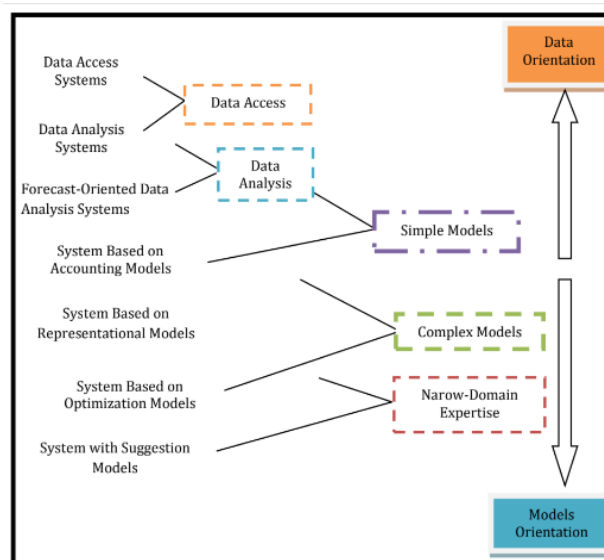

Fig. 1 Classification of DSS [1]

while covariance or ANCOVA analysis is part of the analysis of variance in which the metric independent variable aims to reduce error variance by eliminating the influence of non-categorical variables (metrics or intervals) that are believed to create analysis bias [6]. Therefore, model testing can be used in a multidisciplinary context of science to assess a measurement model whether or not it meets the criteria for a particular approach.

Several studies on interdependence analysis model tests

(canonical correlations) using 45 respondents of research samples analyzed with canonical correlation models and MANOVA statistical tests with the help of SPSS ver.21, research findings show that the influence of a variable group (based on the value of Eigen value) Members towards Non-members is greater than the influence of Non-members on Members in 2 Roots of the 3 Roots generated [7]. The difference between the customer satisfaction model of leasing company users and the discriminant model approach is to use 50 respondents of the research sample with the significance test of the discriminant function through Wilk's Lambda, Pilai, and F test with the help of SPSS ver.21, research findings based on three-factor discriminant analysis through prerequisite tests and variable feasibility tests, obtained two variables that are worth analyzing, namely the length of time of repayment of loans and the amount of down payment. The discriminant model that was formed was the z-score with the results of the validation which showed the accuracy rate of the model which was quite high at 54 percent [8]. Application of canonical correlation analysis on the association of service value to customer satisfaction with a factor analysis approach through three tests, namely Kaiser-Mayer-Olkin (KMO), Bartlett-test's and Measure of sampling Adequacy (MSA) test using 150 respondents, research findings produce a dominant factor in service quality is empathy and employee competence with a data variance of 46.156 percent while canonical correlation analysis yields a score of 0.869 [9]. Connectivity between Auditing courses with Information Systems Audit with Pearson's product-moment correlation approach using a helper table to find the KP value (determinant coefficient value) using 17 data, the research findings produce an r-count of 0.2150 with a determinant coefficient of 4.62 percent or produce a very low contribution value of both courses [5].

This research uses a factor test measuring mathematical models with a multivariate analysis approach with a independent or pair-sample approach (t test) to confirm whether the research object has a difference in the average value compared to the standard error score and continue testing the model using other approaches. The selection of research subjects is motivated by the release of CNBC Indonesia news that records a new history that since the privatization in 1992, during 2018 until early November 2018 there were fifty new issuer's which became the record listing on the Indonesian Stock Exchange (IDX) [10].

II. Methodology

The model is a derivative of the main characteristics of a decision support system (DSS) which is a simple representation or depiction of the reality of the phenomena of an object or an activity [11]. The essential of multivariate analysis can also be grouped into mathematical (quantitative) models that explain the twist of relationships in organizational systems that cannot be appear for by Iconic or Analog modeling. DSS analysis using numerical calculations aided by mathematical models or other quantitative models can be developed to assess two types of samples that are interconnected that have different average values, with standard errors of the average difference of the two samples formulated as follows:

$$t = \frac{average\ first\ sample - average\ second\ sample}{standar\ error\ difference\ two\ samples}\ [12]$$

Standard error differences in mean values are normally distributed. Factor analysis is an analysis to reduce many variables into a few new variables called "Factors". The number of factors is less than the number of original/original variables to be analyzed, but still contains enough information contained in the original variable to be analyzed [13]. The simulation of the factor model that became the object of this study was operating as follows:

TABLE I
MEASUREMENT OF FACTORS MODEL

Measurement	Definition
$CR = \dfrac{Current\ Assets}{Current\ Liabilities}$	Current Ratio's which shows a company's liquidity in paying short-term obligations or debt that is due immediately when billed as a whole.
$QR = \dfrac{Current\ Assets - Inventory}{Current\ Liabilities}$	Quick or Acid Test Ratio's that show a company's liquidity in meeting or paying liabilities or current debt with current assets regardless of inventory value.
$CashR = \dfrac{Cash\ or\ Cash\ Equivalent}{Current\ Liabilities}$	Cash Ratio's are used to measure how much cash is available to pay debts.
$NWC = \dfrac{Current\ Asset - Current\ Liabilites}{Total\ Assets}$	Net Working Capital Ratio's which is used to calculate the potential of the business working capital based on the overall assets owned by the company.

Sources: (Kasmir 2016:134-142)

This research uses mixed-methods method with descriptive analytic and t test. The object of this research involves a mathematical simulation model using the perspective of the data mining process.
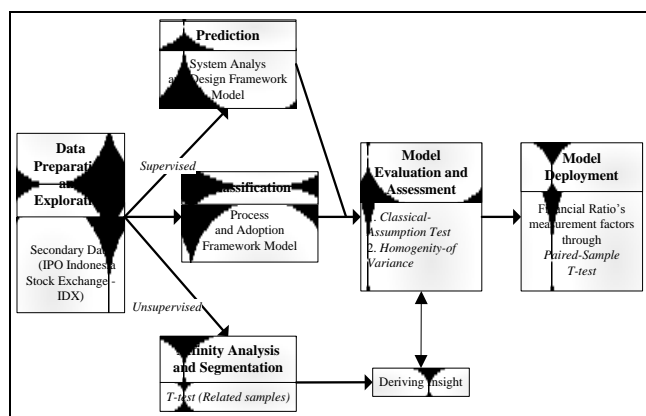

Fig. 2 *Developed by*: Data Mining a Process Prospective [15,3]

This research phase is conducted to test the whole multivariate based simulation model with steps of data preparation and exploration, prediction, classification, and affinity analysis and segmentation, evaluation and assessment models as long as deployment models.

III. RESULTS

A. Data Preparation and Exploration

The preparation phase begins by collecting secondary data

from the Annual Report and the official website of each subject of this research, namely companies that conduct Initial Public Offerings (IPO) in one year before and after 2018 on stock the Indonesian Stock Exchange (IDX). Data exploration is continued to analyze the characteristics of the data whether it can be carefully considered to determine the appropriate analysis model through compiling a new dataset, activating existing data, and importing data from other formats [16].
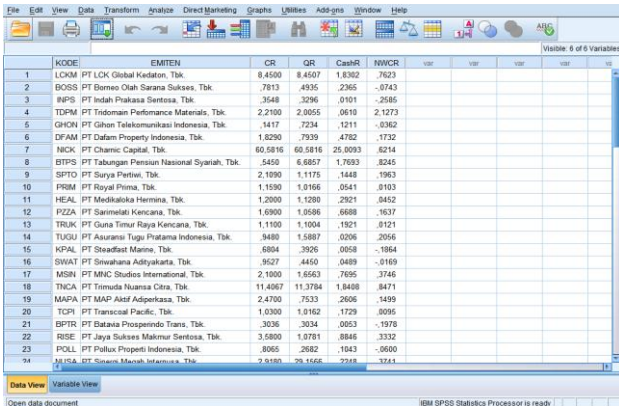

Fig. 3 Data View Menu: *SPSS Version 23.00*

Data exploration continues with the utilization of simulation data through certain parameters as needed.

B. Prediction, Classification and Affinity Analysis and Segmentation

Furthermore, it is processed into a model specification using the approach of the mathematical model of the different test (t test) which first sets the value of α and degree of freedom (dF) and compares the t-statistic with the t-table. Affinity analysis is carried out through normality using the Kolmogorov-Smirnov test (K-S test) and the Levene's test to identify samples of populations that have the same or homogeneous variance or vice versa.
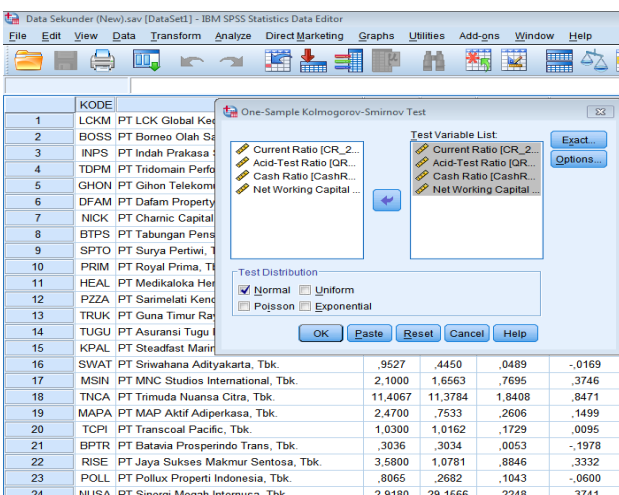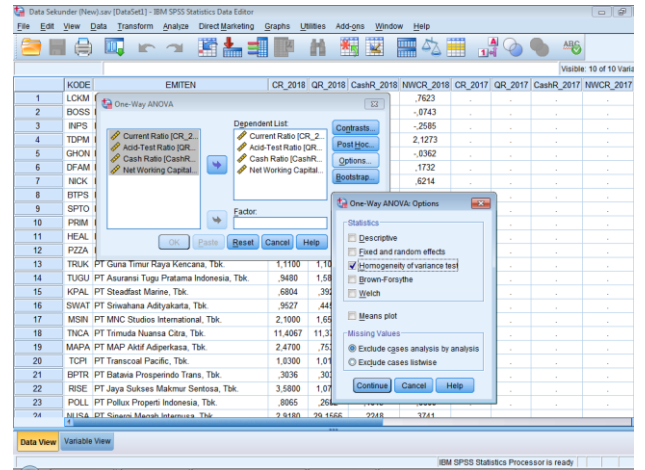

Fig. 4 One-Sample K-S Test: *SPSS Version 23.00*

Fig. 5 Homogeneity-of Variance Test: *SPSS Version 23.00*

C. Model Evaluation and Assessment

The evaluation phase is done through two sub-tests namely:

1) Classical-Assumption Test

Sent down to the evaluation and assessment test based on the K-S test results based on the normality test criteria of the previous stage of the sample. If the K-S test results make a significance of 0.000 (< 0.05), it means that the financial ratio factor between companies conducting an IPO does not produce normal data distribution.

2) Homogeneity-of Variance Test

Sent down to the evaluation and assessment test based on the results of the Levene's test based on the homogeneity test of the previous stage sample criteria. If Levene's test results make a significance of 0.000 (< 0.05), it means that the financial ratio factor between companies conducting an IPO has unequal variance or comes from a heterogeneous population.

TABLE 2
ABBREVIATED OF NORMALITY AND HOMOGENEITY TEST RESULTS

Variable or Construct	Normality Test Results	Levene's Test Results	Statistical Tools for Hypothesis Testing
CR			if sig > 0.05 for Normality Test, then Levene's Test sig. > 0.05, decided to use a *Pair-Samples T Test*
QR	. sig > 0.05	. sig > 0.05	
*Cash*R =			if sig < 0.05 for Normality Test, then Levene's Test sig. > 0.05, decided to use a *Mann-Whitney Test*
NWC=			

D. Model Deployment

The deployment phase derived from the results of evaluation and evaluation criteria to obtain information to decide to measure financial ratio factors with what approach is used whether using Pair-Samples T Test or Mann Whitney Test.
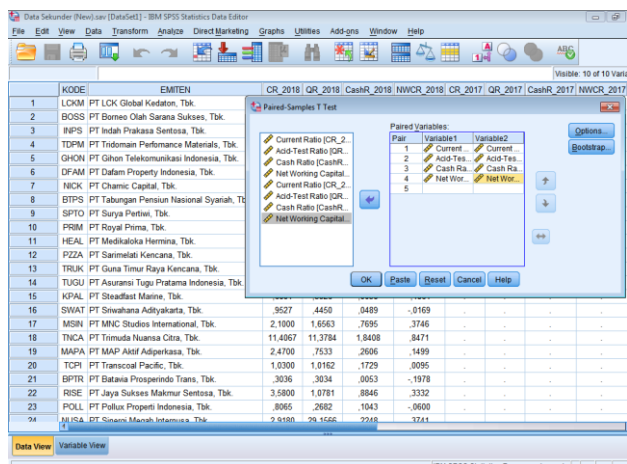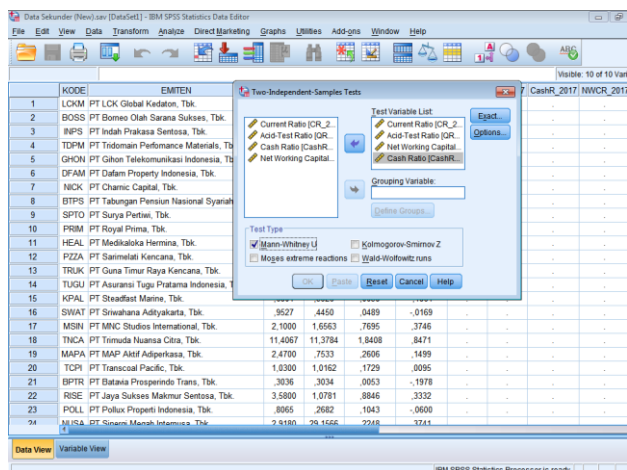
Fig. 6 Pair-Sample T Test: *SPSS Version 23.00*

Fig. 7 Mann-Whitney Test: *SPSS Version 23.00*

The two choices of statistical test equipment above are used as to produce measurement output for further testing or return to the input stage test through deriving insight.

IV. CONCLUSION

Model simulation based on decision support systems (DSS) which are derived into mathematical models (quantitative) can explain the complexity of the relationship between testing a model that is integrated with certain statistical approaches. Determination of the total of samples in the research target to be considered at the beginning of the data preparation and exploration stage as a prerequisite for predicting, classifying, and analyzing a model. The model can be evaluated in advance to determine the assessment criteria with the approach chosen to produce the development of a model that is not mistakenly estimated (suitable model) for further testing, decision and answer the research objectives.

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