Analysis of the Effect of Long-Term Debt, Short-Term Debt, And Net Working Capital on Profits And Their Impact On Company Value in the Cigarette Industry Listed on The Indonesia Stock Exchange (IDX)

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Abstract

And net working capital on profits and their impact on firm value in the cigarette industry listed on the Indonesia Stock Exchange (IDX). This research is a case study on the cigarette industry listed on the Indonesia Stock Exchange (IDX). The data of this research consist of balance sheets and profit/loss statements for 120 (one hundred and twenty) months, starting from the period 2006 to 2015. The independent variables of this research are long-term debt, short-term debt, and net working capital, while the dependent variable is profit and firm value. The research method used in this research is descriptive research with qualitative data analysis. The method of data collection is done by using a population and a sample. Calculation of data is done by analysis of the relationship with multiple regression. Long-term debt variable (X1) has a negative effect on earnings (Y) with a regression coefficient of -0.527374. Short-term debt variable (X2) has a positive effect on earnings (Y) with a regression coefficient of 0.148517. The net working capital variable (X3) has a positive effect on earnings (Y) with a regression coefficient of 0.302860. Long-term debt, short-term debt, and net working capital together have a positive and significant effect on profit with a significant F of 0.000156. Profit variable (Y) has a negative and insignificant effect on Firm Value (Z) with a significant value of 0.2850 (greater than 0.05).

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INTRODUCTION

In general it can be said that the purpose of the company is to be able to obtain maximum profit, dynamic company development and the company's survival in the future. For this reason, the management tries to optimally utilize its resources to maximize the profits to be obtained. In addition, the ability of the company's management to see the possibilities and opportunities in the future can encourage the company's success in achieving optimal profits. With this ability

management can plan for the future of the company and the possibilities that will be faced in the future. The finance of a company is a financial area that gets attention and has a considerable influence on the value of the company.

The company as a form of organization generally has certain goals to be achieved in an effort to fulfill the interests of its members. Company performance is a description of the financial condition of a company which is analyzed with financial analysis tools, so that it can be known whether the financial condition of a company is good or bad which reflects work performance in a certain period. This is very important so that resources are used optimally in dealing with environmental changes.

In principle, the company in meeting its funding needs can come from loans, then the company is said to be carrying out debt or debt financing (debt financing) where the debt can be said to be short-term debt and long-term debt. Short-term debt focuses on the company's ability to meet its short-term obligations, while long-term debt focuses on long-term financial conditions, current and future profits. To carry out the function of meeting the needs of funds, financial managers must always look for alternative sources of funds and make decisions about which alternative sources of funds to choose. In addition to utilizing funds, management must also be able to make maximum use of all the potential that exists within the company.

LITERATURE REVIEW
1. Definition of Management

According to experts, among them stated by Brantas (2010: 04) in his book "Basics of Management", management is a process or framework, which involves guiding or directing a group of people towards organizational goals or real intentions.

According to Albert Lepawsky in his book Administration: "The Art of Organization and Management", (2010: 20) defines "management is the energy or force that leads, gives instructions and guides an organization in achieving a predetermined goal. According to Jhon D. Millett in his book "Management The Public", defines "management is the process of guiding, directing and providing work facilities to people who are organized in groups of journals to achieve the goals set. Dalton E.MC Farland in his book "Management Farland Foundations And Practices", defines "management is a process in which managers create, direct, maintain, carry out organizational goals through coordination and cooperation of human effort.

Likewise, according to Appley and Oey Liang Lee (2010: 16), management is an art and a science, in the management of strategies to utilize the energy and thoughts of other people to carry out an activity directed at achieving predetermined goals. Meanwhile, according to GR Terry (2010: 16), explains that management is a distinctive process consisting of planning, organizing, actuating, and controlling actions to determine and achieve goals through the utilization of human resources and other resources.

According to Malayu Hasibuan (2014: 2), management is the science and art of managing the process of using human resources and other sources effectively and efficiently to achieve a certain goal.

So it can be interpreted that the notion of management is a process that has planning, organizing, influencing, and controlling carried out by human resources in order to achieve a desired goal.

2. **Financial management**
   a. **Definition of Financial Management**

   Financial management is a combination of science and art that discusses, examines and analyzes how a financial manager uses all company resources to raise funds, manage funds, and distribute funds with the aim of being able to provide profit or prosperity for shareholders and business continuity for company.

   b. **Scope of Financial Management**
      1) How to find funds.
      2) How to manage funds
      3) How to split the funds
      4) Financial Management Function
         a) Financial planning, making income and expenditure plans and other activities for a certain period.
         b) Financial budgeting, follow-up of financial planning by detailing expenses and income.
         c) Financial management, using company funds to maximize existing funds in various ways.
         d) Searching for finance, looking for and exploiting existing sources of funds for the operational activities of the company.
         e) Financial storage, collecting company funds and storing and securing these funds.
         f) Financial control, evaluating and improving finance and the financial system of the company.
         g) Financial audit, conduct an internal audit of the company's existing finances to prevent irregularities.
         h) Financial reporting, providing information about the company's financial condition as well as evaluation material.

   c. **Financial Management Objectives**
      1) Maximizing company value.
      2) Maintaining financial stability under controlled conditions.
      3) Minimizing the company's risks in the present and in the future.

3. **Financial statements**

Definition of financial statements

The company's financial condition and operating results are reflected in the company's financial statements, which are essentially the final results of the company's accounting activities. Information about the company's financial condition and operating results is very useful for several parties, for those within

the company and those outside the company. These parties are management, owners, creditors, investors, dealers, employees and government agencies.

a. Types of Financial reports

Financial statements are basically the result of a reflection of the many transactions that occur within a company. Transactions that are financial in nature are recorded, classified, and summarized in an appropriate manner in units of money, and then interpretation is made for various purposes. These various actions are none other than the accounting process which is essentially the art of recording, classifying and summarizing transactions and events which are at least partly financial in nature, in an appropriate manner and in the form of rupiah, and the interpretation of the results.

4. Long-term debt

a. Definition of long term debt

According to Umi Muamanah (2012: 28) long-term debt is an obligation whose repayment or maturity is more than one year or one accounting period.

According to Juminang (2012: 28) defines long-term debt as a company's obligations to other parties that must be fulfilled within a period of more than one year. The emergence of this loan is generally because the company needs large funds to finance factory expansion, additional equipment, working capital, or land, pay off short-term debt or other long-term debt.

Based on the above understanding, it can be concluded that long-term debt is a company's obligations to other parties that must be fulfilled within a period of more than one year

b. Types of long term debt

    1) Mortgage note payable
    2) Bonds payable
    3) Long term notes payable

5. Short term debt

a. Definition of short term debt

According to Juminang (2012: 34) short-term debt is a company's obligations to other parties that must be fulfilled within a normal period, generally one year or less, since they were prepared, or debts that are due in the current accounting cycle.

b. Types of short term debt

    1) Accounts payable
    2) Money order
    3) Deferred income
    4) Dividend payable
    5) Tax payable
    6) Obligations that still need to be fulfilled
    7) Past due long term debt.

RESEARCH METHOD

In a research required information and data to be processed to produce a study. According to Nasution (2010; 112) data is a statement about something that has happened, but is not yet known. The data is divided into two, namely as follows:

1.   Primary data

Primary data is data collected directly from data sources that directly provide data to data collectors (researchers) or data obtained directly from the field (object of research).

2.   Secondary data

Secondary data is data collected indirectly from data sources or through intermediaries.

The data source collected in the preparation of this thesis was obtained from secondary data taken through the Capital Market Reference Center or the Jakarta Stock Exchange, namely the financial reports of the cigarette industry which are listed on the Indonesia Stock Exchange. The data used consists of:

a.   Cigarette industry balance report listed on the IDX for 2006–2015.

b.   Profit and Loss Report of the cigarette industry listed on the IDX for 2006–2015.

Research design

1. Population

According to Prasetya Irawan (2010: 179), the population is the whole that the researcher wants to explain through his research.

The population used in this study is the financial statements of the cigarette industry listed on the IDX for 2006–2015. Where the population of the cigarette industry listed on the Indonesia Stock Exchange there are 3 companies namely PT Gudang Garam Tbk, PT HM Sampoerna Tbk and PT Bentoel Investana Internasional Tbk.

2. Sample

According to Prasetya Irawan (2010: 183), the sample is representative of the population. The sample is part of the number and characteristics possessed by the population.

The sample used in this study is in the form of balance sheets and income statements of the cigarette industry which are listed on the IDX for the year 2006–2015. Namely the balance sheet and income statement of PT. Gudang Garam Tbk and PT. HM Sampoerna Tbk 2006-2015 period.

RESEARCH RESULTS AND DISCUSSION

A. A general description of the company

    1. PT Gudang Garam Tbk

        PT Gudang Garam Tbk. Is a leading cigarette manufacturer company in Indonesia. This company was founded on June 26, 1958 by Surya Wonowidjojo. This company is a leader in the production of kretek cigarettes. To support its production, the company owns a 154 hectare tobacco plantation in Kediri, East Java.

    2. PT HM Sampoerna Tbk

PT HM Sampoerna is one of the leading clove cigarette manufacturers with the largest market share in Indonesia and is known as a producer of high quality kretek cigarettes. Judging from the assets owned, sales value, payment of excise bands and taxes to the Government of Indonesia, as well as the number of employees, PT HM Sampoerna is the largest company in the clove cigarette industry in Indonesia. PT HM Sampoerna has also listed some of its shares on the stock exchange. In 2013, PT HM Sampoerna won the Competitive Agricultural Products Award for the CSR category.

B. Research result
1. Descriptive Statistics Test

With descriptive statistics people can better understand the data presented. Descriptive statistics make comparisons for data, in this study cigarette industry companies will be presented systematically by performing calculations to obtain several results, namely Mean, Median, Mode, Maximum, Minimum.

Table 4.1. Descriptive analysis Independent Variable Long Term Debt (X1), Short Term Debt (X2), Net Working Capital (X3) and Profit Dependent Variable (Y) and Firm Value (Z) (in million rupiah)

	X1	X2
Means	968718.6	10237641
Median	1051857	8066052
Maximum	1455990	24045086
Minimum	441377	2683654
std. Dev.	352825.6	6408968
Skewness	-0.24732	0.952649
kurtosis	1.669795	2.941586
Jarque-Bera	1.67843	3.027976
probability	0.432049	0.220031
sum	19374372	2.055508
Sum Sq. Dev.	2.377712	7.800014
Observations	20	20

Source: processed data, 2015

The statistical test results found that the average for each variable of the two cigarette industry companies listed on the Indonesia Stock Exchange (IDX) in the 10-year period from 2006 to 2015 was at a positive number.

2. Panel Data Regression Model Determination

The model used in this research is panel data regression, to test the model specifications and the suitability of the theories with reality. Data processing was carried out electronically using Microsoft Exel 2010 and Eviews 9 software.

a. Chow test

The Chow test was carried out aiming to determine whether the processed data is better using ordinary linear regression analysis (common

or pooled) or using panel data analysis (fixed effect model). Through the probability obtained from the Chow test with the redundant fixed effect test, the selection of the appropriate data analysis can be carried out.

Table 4.2 Chow Test Results Redundant Fixed Effects Tests
Equation: MODELS Test cross-section fixed effects

Effect Test	Statistics	d
Cross-section F	38.13186	(
Chi-square cross-sections	25.29453	1

Cross-section fixed effects test equation:
Dependent Variable: Y
Method: Panel Least Squares
Date: 02/27/17 Time: 19:59
Samples: 2006 2015
Period included: 10
Cross-sections included: 2
Total panel (balanced) observations: 20

Variables	coefficient	std. Error	t-Statisti
C	2132279	2042511	1
X1	2.513596	2.344876	1
X2	0.056292	0.119644	0
X3	0.028246	0.139258	0
R-squared	0.158056	Mean dependent var	
Adjusted R-squared	0.000192	SD dependent var	
SE of regression	2975225	Akaike info criterion	
Sum squared residue	1.42E+14	Schwarz criterion	
Likelihood logs	-324.264	Hannan-Quinn criter.	
F-statistics	1.001215	Durbin-Watson stat	
Prob(F-statistic)	0.417723		

Source: Processed Research Results, 2015

Table 4.2 above shows the results with a probability cross section value of 0.0003 <0.05, meaning that H0 is rejected and H1 is accepted, so the data uses panel data regression analysis.

b. Haussman's test

The Haussman test is carried out to select the model to be used in panel data regression analysis whether it is more appropriate to use the fixed effect or random effect model.

Table 4.3 Haussman Test Results

Correlated Random Effects - Hausman TestCorrelated Random Effects -			
Test Summary	Chi-Sq. Statistics	Chi-Sq. df	Prob.
Random periods	22.327005	3	0.1579
Period random effects test comparisons:			
Variables	Fixed	Random	Var(Diff.)	Prob.
X1	0.01966	-0.527374	2.196545	0.7121
X2	-0.17866	0.148517	0.004993	0.0006
X3	-0.1654	0.30286	0.019258	0.0007
Period random effects test equation:			
Dependent Variable: Y			
Method: Panel Least Squares			
Date: 03/15/17 Time: 16:34			
Samples: 2006 2015			
Period included: 10			
Cross-sections included: 2			
Total panel (balanced) observations: 20			
Variables	coefficient	std. Error	t-Statistics	Prob.
C	9012181	2133963	4.223214	0.0045
X1	0.01966	1.745285	0.011264	0.9914
X2	-0.17866	0.083662	-2.13543	0.0766
X3	-0.1654	0.150868	-1.09632	0.315
Effects Specification			
Cross-section fixed (dummy variables)			
Period fixed (dummy variables)			
R-squared	0.959193	Mean dependent var	5443838
Adjusted R-squared	0.870777	SD dependent var	2975511
SE of regression	1069626	Akaike info criterion	30.7995
Sum squared residue	6.86E+12	Schwarz criterion	31.4966
Likelihood logs	-293.995	Hannan-Quinn criter.	30.9356
F-statistics	10.84864	Durbin-Watson stat	1.92948
Prob(F-statistic)	0.003959		

Source: Processed Research Results, 2015

The results of the Haussman test of long-term debt, short-term debt, and net working capital on profit in the table above, it can be seen that the cross-sectional profitability value is 0.1579 or ($p > 0.05$) then H0 is rejected and H1 is accepted, which means at a significance level of 5% then it is more effective to use the Random Effect model approach compared to the fixed effect model.

c. Classic assumption test

The classical assumption test is a statistical requirement for analyzing multiple regression based on ordinary least squares (OLS). This classic assumption test aims to make the regression results meet the Best, Linear, Unbiased, Estimator (BLUE) criteria. In fact, the Oannel regression analysis itself, according to Gujarati (2014: 67), generally violates the assumptions of heteroscedasticity and autocorrelation. This is because panel data analysis uses cross-sectional (heteroscedasticity) and time series (autocorrelation) data so that panel data are allowed to violate these assumptions. The classic assumption test consists of a normality test, multicollinearity test, heteroscedasticity test, and autocorrelation test.
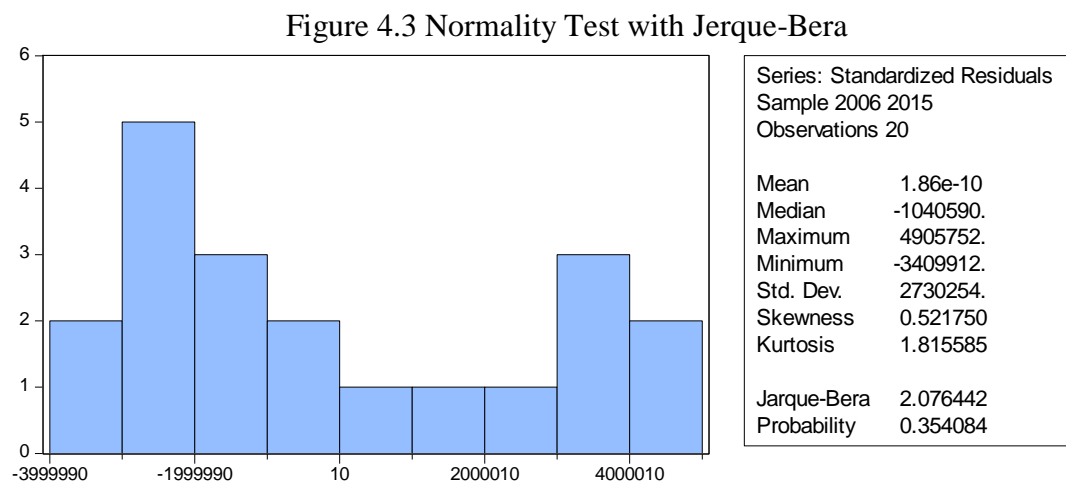
a. Normality test

The Normality Test was carried out to test whether the residual data or confounding variables in the study have a normal distribution, Ghozali (2013: 160). Testing the normality of this data will be carried out using Jarque-Bera. This test measures the difference in the skewness and kurtosis of the data and is compared to when the data is normal. With H0 in normally distributed data, Jarque-Bera is distributed by x2 with a degree of freedom of 2. The probability shows that the Jerque-Bera value exceeds the observed value under the null hypothesis. If the probability is greater than the significance value, the data is normally distributed.

Jarque-Bera $= \frac{n}{6}.\left(S^2 + \frac{(k-3)^2}{4}\right)$

Where: S = Skewneqq

K = Kurtosis

n = the number of coefficients in the equation

Figure 4.3 Normality Test with Jerque-Bera

| Series: Standardized Residuals |
| Sample 2006 2015 |
| Observations 20 |
| |
| Mean   1.86e-10 |
| Median   -1040590. |
| Maximum   4905752. |
| Minimum   -3409912. |
| Std. Dev.   2730254. |
| Skewness   0.521750 |
| Kurtosis   1.815585 |
| |
| Jarque-Bera 2.076442 |
| Probability 0.354084 |

Source: Processed Research Results, 2015

Based on Figure 4.3, it is found that the probability results from Jarque-Bera are 0.354084, which means it is greater than the significance level of 0.05 so that it can be said that the data is normally distributed.

b. Multicollinearity Test

The multicollinearity test is a test conducted to find out whether there is a strong linear correlation between the independent variables, namely long-term debt, short-term debt, and net working capital. A good model should not have autocorrelation between independent variables, if the variables are correlated they will not be orthogonal.

Orthogonal variables are independent variables with a correlation value between independent variables equal to zero. Multicollinearity occurs if the correlation between the two regressors is high, which is greater than 0.800, Gujarati (2010:55).

Table 4.4 Multicollinearity Test Results between Independent Variables

	X1	X2
X1	1	0.4277
X2	0.4277	1
X3	0.49521	0.34836

Source: Processed Research Results, 2015

In table 4.4 there is no correlation coefficient greater than 0.800 so this test finds no multicollinearity between the independent variables, long-term debt (X1), short-term debt (X2), and net working capital (X3).

c. Heteroscedasticity Test

Heteroscedasticity test was carried out to test whether in the regression model there is inequality of residual variance from one observation to another, Ghozali (2013: 139). If the residual variance from one observation to another is constant, it is called homoscedasticity and if the residual variance from one observation to another is different, it is called heteroscedasticity. The consequence of heteroscedasticity is that if there is a change in the dependent variable, the residual will change in line with the increase or decrease with the consequence that if the dependent variable increases, the error also increases.

d. Autocorrelation Test

The autocorrelation test aims to investigate the correlation between the disturbances in the current period (t) and the disturbances in the previous period (t-1). Autocorrelation arises because successive observations over time are related to one another and arise because residuals are not free from one observation to another. Most autocorrelation problems are experienced by time series data. The autocorrelation test was carried out using the Durbin Watson test. Determination of whether or not autocorrelation occurs by looking at the Durbin Watson numbers on the panel data regression analysis results obtained,

e. Hypothesis test

The hypothesis is a temporary answer to the research problem formulation, where the problem formulation has been stated in the form of a question sentence. Research that formulates hypotheses is research that uses a quantitative approach.

This research is based on the Chow Test and Haussman Test which have been carried out, the results show that panel data analysis using the Random Effects model is suitable. Then, the results of panel data regression with the Eviews 9 tool use a random effect model using a white cross section with the aim of improving df, thereby correcting heteroscedasticity.

Table 4.7 Panel Data Regression Test Results

Variables	coefficient	std. Error	t-Statistics	Prob.
C	1214510	757487	1.603341	0.1297
X1	-0.52737	0.92167	-0.57219	0.5757
X2	0.148517	0.04479	3.315864	0.0047
X3	0.30286	0.05919	5.116974	0.0001

Effects Specification	SD	Rho
Cross-section fixed (dummy variables)		
Random periods	183252.2	0.0285
Idiosyncratic random	1069626	0.9715

Weighted Statistics			
R-squared	0.758848	Mean dependent var	5443838
Adjusted R-squared	0.694541	SD dependent var	2927709
SE of regression	1618096	Sum squared residue	3.93E+13
F-statistics	11.80038	Durbin-Watson stat	0.674926
Prob(F-statistic)	0.000156		

Source: Processed Research Results, 2015

Through the panel data regression test with the random effect model in Table 4.7 above, the coefficient of the constant is 1,214,510 and the coefficient for each independent variable of long-term debt, short-term debt and net working capital is -0.527374, 0.148517, respectively. and 0.302860 with a significance level of 5%. The panel data analysis regression equation formed from this analysis is:

$$Y = 1.214.510 - 0.527374\ X1 + 0.148517\ X2 + 0.302860\ X3$$

After obtaining the results of the panel data regression test with the random effect model in Table 4.7 with the equation above, a hypothesis test is carried out which consists of the Coefficient of Determination Test (Adjusted R Square), F Test, and T test. From Table 4.7 the following results are obtained:

a. Determination Coefficient Value

In Table 4.7 is equal to 0.758848 which means 75.88% of the variation in the probability variable (profit) can be explained by the three independent variables that exist. 24.14% probability (profit) is explained by other variables not observed in this study,

b. F test

Done to test the independent variables that jointly affect the dependent variable. The hypothesis used for this test:

H0 : The independent variables of long-term debt, debt short term, and net working capital simultaneously and together have no effect on the dependent variable Earnings.

H1 : The independent variables are long-term debt, debt short term, and net working capital simultaneously and jointly affect the dependent variable Profit.

As for determining the magnitude of Ftable searched with the following conditions:　　α　　= 5% real rate

df　　= (nk-1), then we get (20-4-1) = 15

F_{table}　= 3.06

With decision making on the F-test:

- If Fcount < Ftable then H0 is accepted and H1 is rejected ($\alpha = 5\%$)
- If Fcount > Ftable then H0 is rejected and H1 is accepted ($\alpha = 5\%$)

Based on Table 4.7 the results of the regression test to test the effect of long-term debt, short-term debt, and net working capital on profit, the value of Fcount > Ftable (11.80 > 3.06) is obtained with a probability value (significance) 0.000156 <0.05. then H0 is rejected and H1 is accepted. This shows that long-term debt, short-term debt, and net working capital simultaneously have a significant effect on profit.

c. t-test

Conduct a t-test to determine the partial effect of the independent variables significantly affect the dependent variable.

Basis for decision making:

- If $t_{count} < t_{table}$ then H0 is accepted and H1 is rejected ($\alpha = 5\%$)
- If $t_{count} > t_{table}$ then H0 is rejected and H1 is accepted ($\alpha = 5\%$)

As for determining the size of the ttable, it is searched with the following conditions:　　α　　= 5% real rate

df　　= (n-4), then we get (20-4) = 16

t_{table}　= 1,746

Hypothesis Test 1: The Effect of Long-Term Debt on Profits

H0 : Long-term debt has no significant effect to Profit.

H1: Long-term debt has a significant effect on Profit.

The results of the regression analysis test show that the value t_{count} partially acquired long-term debt $t_{count} < t_{table}$(-0.572<1.746) then H0 is accepted and H1 is rejected. While the probability value is 0.5757 <0.05. These conditions indicate that the long-term debt variable has no significant effect on the earnings variable.

Hypothesis 2 Test: The Effect of Short-Term Debt on Profits

H0 : Short term debt has no significant effect to Profit.

H1: Short-term debt has a significant effect on Profit.

The results of the regression analysis test show that the value t_{count} partially acquired short-term debt $t_{count} > t_{table}$(3.316> 1.746) then H0 is rejected and H1 is accepted. While the probability value is

0.0047 <0.05. These conditions indicate that the short-term debt variable has a significant effect on the profit variable.

Hypothesis Test 3: Effect of Net Working Capital on Profit

H0: Net working capital has no significant effect to Profit.

H1: Net working capital has a significant effect on Profit.

The results of the regression analysis test show that the value t_{count} net working capital partially acquired $t_{count} > t_{table}$ (5.117> 1.746) then H0 is rejected and H1 is accepted. While the probability value is 0.0001<0.05. These conditions indicate that the net working capital variable has a significant effect on the profit variable.

d. Test the Effect of Profit on Firm Value

Lastly, a t-test was carried out to find out how the partial effect of Profit (Y) on Firm Value (Z) is carried out.

The hypothesis used for this test:

H0 : Profit Variable has no effect partially significant to the variable Firm Value.

H1: Profit Variable has a partial effect significant to the variable Firm Value Basis for decision making:

- If $t_{count} < t_{table}$ then H0 is accepted and H1 is rejected ($\alpha = 5\%$)
- If $t_{count} > t_{table}$ then H0 is rejected and H1 is accepted ($\alpha = 5\%$)

The results of the regression analysis test show that the value t_{count} profit is partially obtained $t_{count} < t_{table}$ (-1.146 <1.746) then H0 is accepted and H1 is rejected. These conditions indicate that the profit variable does not significantly influence the firm value variable.

CONCLUSION

The results of the research that has been done can be concluded that petung bamboo can be synthesized into activated carbon as a microwave absorbent material. Activated carbon material has an average particle size of 23.5 µm. At the micro-order, reflection loss of activated carbon occurs in samples with a thickness of 1 mm, which is equal to -21.2 dB at 10.8 GHz.

BIBLIOGRAPHY

Li, W., Lin, L., Li, C., Wang, Y., Zhang, J. (2018). Radar absorbing combinatorial metamaterial based on silicon carbide/carbon foam material embedded with metal split square ring, Results in Physics.

F Qin and C Brosseau. (2012). A Review and analysis of Microwave Absorption in Polymer Composites Filled with Carbonaceous Particles. Journal of Applied Physics, 111 (6) : 061301 – 061301 – 24.

LB Kong, ZW Li, L. Liiu, R. Huang, M. Abshinova, ZH Yang, CB Tang, PK Tan, CR Deng, and S. Matitsine. (2013). Recent Progress in some Composite materials and Structures for Specific Electromagnetic Applications. International Materials Reviews, 58 (4) : 203 – 259.

Chun Yu Chen, Nen Wen Pu, Yih Ming Liu, Sheng Yao Huang, Chia Hung Wu, Ming Der Ger, Yan Jhang Gong, and Yu Chieh Chou. (2017). Remarkable Microwave Absorption Performance of Graphene at a Very Low Loading Ratio. Composites Part B Engineering. 114 : 395-403.

Wang L, Song P, Lin CT, Kong J, Gu J. 3D shapeable, superior electrically

conductive cellulose nanofibers/Ti3C2Tx MXene aerogels/epoxy nanocomposites for promising EMI shielding. Research 2020;2020:4093732.

Liang C, Ruan K, Zhang Y, Gu J. Multifunctional flexible electromagnetic interference shielding silver nanowires/cellulose films with excellent thermal management and joule heating performances. ACS Appl Master Interfaces 2020; 12:18023–31.

L. Liu, S. Yang, H. Hu, T. Zhang, Y. Yuan, Y. Li, X. He, Lightweight and efficient microwave-absorbing materials based on loofah-sponge-derived hierarchically porous carbons, ACS Sustain . Chem. Eng. 7 (2019) 1228–1238.

JA King, MG Miller, RL Barton, JM Keith, RA Hauser, KR Peterson, LL Sutter, Thermal and electrical conductivity of carbon-filled liquid crystal polymer composites, J. Appl. Polym. sci. 99 (2006) 1552-1558.

RJK Wood, Tribo-corrosion of coatings: a review, J. Phys. D Appl. Phys. 40 (2007) 5502-5521.

AA Balandin, Thermal properties of graphene and nanostructured carbon materials, Nat. Mater. 10 (2011) 569-581.

Z. Min, H. Yang, F. Chen, T. Kuang, Scale-up production of lightweight high-strength polystyrene/carbonaceous filler composite foams with high-performance electromagnetic interference shielding, Mater. Lett. 230 (2018) 157-160.

S. Baseghi, H. Garmabi, JN Gavgani, H. Adelnia, Lightweight high-density polystyrene/carbonaceous nanosheets microcellular foams with improved electrical conductivity and mechanical properties, J. Mater. sci. 50 (2015) 4994-5004.

W. Liu, S. Tan, Z. Yang, G. Ji, Hollow graphite spheres embedded in porous amorphous carbon matrices as lightweight and low-frequency microwave absorbing material through modulating dielectric loss, Carbon 138 (2018) 143-153.

Huang, Y., Ding, X., Li, S., Zhang, N. and Wang, J. (2016). Magnetic reduced graphene oxide nanocomposite as an effective electromagnetic wave absorber and its absorbing mechanism. Ceramics International, Vol. 42. 15, pp. 17116-17122.

Wu, KH, Ting, TH, Wang, GP, Yang, CC, Tsai, CW (2008). Synthesis and microwave electromagnetic characteristics of bamboo charcoal/polyaniline composites in 2-40 GHz. Synth. met. 158, 688-694.

Fu, C., Zhao, G., Zhang, H. and Li, S. (2013). Evaluation and characterization of reduced graphene oxide nanosheets as anode materials for lithium-ion batteries. int. J. Electrochem. Sci., Vol. 8, p. 12.

Perez, F. Ruiz., Estrada, SM Lopez., Hernandez, RV Tolentino., Briones, F. Caballero. (2022). Carbon-Based Radar Absorbing Materials : A Critical Review. Journal of Science : Advanced Materials and Devices 7.

Skoog, DA, Holler, FJ and Crouch, SR (2007). Principles of instrumental analysis. 6th ed., Thomson Brooks/Cole, Belmont, CA.

Guan, H., Wang, Q., Wu, X., Pang, J., Jiang, Z., Chen, G., Dong, C., Wang, L., Gong, C. (2021). Biomass derived porous carbon (BPC) and their composites as lightweight and efficient microwave absorption materials. Composites Part B 207 108562.

Phang, SW, Tadokoro, M., Watanabe, J. and Kuramoto, N. (2008). Synthesis, characterization and microwave absorption property of doped polyaniline nanocomposites containing TiO2 nanoparticles and carbon nanotubes. Synthetic Metal, Vol. 158 No. 6, pp. 251-258.