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# Determinants of Efficiency of Food and Beverage Companies: The Case of Vietnam in the Period of 2009 – 2018

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**Abstract**
Based on data from 36 listed Vietnamese food and beverage companies in the period of 2009-2018, the authors aim at studying determinants of the efficiency of Vietnamese food and beverage industry. By using regression results and Hausman testing result, the authors found that debt-to-total asset ratio and tangible fixed asset ratio are negatively correlated to return on asset (ROA), while, inventory turnover has a positive impact. Accordingly, the growth rate and receivable turnover's have no impacts on ROA. From the empirical research findings, recommendations were proposed to improve the efficiency of firms in the food and beverage industry in transitional countries such as Vietnam.

**Keywords**: Efficiency, Food and Beverage Companies, Debt-to-Total Asset, Tangible Fixed Asset, Inventory Turnover, Return on Asset, Vietnam

### 1. Introduction

Efficiency is an important factor when running businesses due to the scarcity of resources, and it is important to conserve those resources while maintaining an acceptable level of output (Banton 2019). This is not only the concern of top managers, but also the concern of managers of other departments such as human resources, finance, or production. The problem of business performance is crucial for Vietnamese food and beverage industry. Top managers concern that what are determinants of business efficiency and the levels those factors are affecting overall efficiency. Understanding those factors will help top managers answer the question of how to improve overall business efficiency. Food and beverage are a crucial industry in the Vietnamese economy. The level of consumption for food and beverage accounted for more than one-third of total consumption in Vietnam (VPBank Securities Company 2014). The report also stated key drivers for the growth of the whole industries, such as the high GDP growth rate, growing disposable income, and steadily increasing the population. From the period of 2014 to 2018, the Vietnamese economy achieved the GDP growth rate of 6% to 7%, the highest growth rate in the latest 10-year period. Along with the impressive growth rate, Vietnamese disposable income is forecasted to increase 8% per year, and the population is expected to increase at 1% per year. Therefore, the food and beverage

industry is expected to be a potential industry and can achieve the growth rate up to 10% in the coming years. Vietnamese food and beverage industry are a fragment, with the dominance of large domestic companies such as Vinamilk, Sabeco, Masan and Tan Hiep Phat, and foreign corporations such as Coca Cola, and Pepsi (VPBank Securities Company 2014). Although the industry is forecasted to be growing, firms in this industry must pay attention to their overall efficiency, otherwise, they will face the risk of bankruptcy. The year 2009 witnessed significant changes in the global food and beverage industry. After the crisis in 2008, there was a fall in the Down Jones F&B Index, but the index raised more than 20% from the beginning of 2009 (IMAP, Inc 2010). Despite the growth, the effect of crisis leads to tightening credit policy and reduction in the value of mergers and acquisition (IMAP, Inc 2010). IMAP report also stated that Asian countries were trying to improve the quality of these type of products by increasing their expenditure for agriculture in 2009 and also to stabilize the food price. The situation is not different in Vietnam. One year after the 2008 financial crisis, the Vietnamese stock market reached the lowest point in Feb 27th, 2009. Since then, the food and beverage industry has the strongest cash inflows, and achieved 47% in price growth rate in the period of 2009 - 2011 (FPT Securities Company 2015). FPT Securities Company (2015) also pointed out the significant growth rate of Vietnamese food and beverage industry and insignificant growth rates of other essential products industries, such as pharmaceutical or household goods in 2009. In the period 2009 – 2018, there are a lot of changes in Vietnamese food and beverage industry due to changes in the economy. Therefore, the authors tried to investigate the determinants of the efficiency of Vietnamese food and beverage companies in the period of 2009 – 2018.

## 2. Literature Review

### Capital structure

Capital structure plays an important role in business performance, and typically refers to the debt-to-total asset ratio or debt-to-equity ratio. Modigliani and Miller (1958) stated in researches about capital structure, as using debt will increase the value of enterprises, and increase business performance. However, according to the trade-off theories, using too much debt will result in the risk of bankruptcy, and will reduce the benefit of using debts. In general, many researches concluded that the debt ratio has a relationship with business performance. Velnampy and Niresh (2012) made a research about 241 listed companies in 20 business industries on Colombo Stock Exchange and pointed out that there is a significant negative relationship between debts to total funds and net profit (Velnampy. and Niresh 2012). Tung (2017) ran a research about Vietnamese Oil and Gas company and pointed out there is a significant relationship between debt-to-total asset ratio and return on asset. However, Batchimeg (2017) used short-term debt to total asset ratio and long-term debt to total asset ratio but did not mention the relationships between these debt ratios and returned on asset (Batchimeg 2017). According to agency theory, firms with lower efficiency tend to borrow more due to information asymmetry. Therefore, the capital structure is expected to have a negative relationship with firms efficiency.

The debt-to-total asset ratio is chosen as the measurement of capital structure. This variable is calculated by using total debt, including short-term debt and long-term debt, divided by total assets, then multiply by 100. The multiplication by 100 is for interpretation purpose.

$$D\_TA = Debt - to - total\ asset\ ratio = \frac{Total\ debts}{Total\ Asset} * 100$$

### Tangible fixed assets

Tangible fixed assets representing firms' long term investment and also represents for firms' technical production ability. Therefore, firms with a large investment on the tangible fixed asset are expected to have higher efficiency. In fact, researches have opposite ideas about this point. Siminica et al. (2012) researched 40 Romanian listed companies on Bucharest stock exchange during Romanian economic upturn period of 2007 – 2008 and economic downturn period of 2009 – 2010 and stated negative impact of fixed asset ratio on return on asset. Tiberti et al. (2016) studied 11 thousand farms in Italy and argue that in terms of efficiency, the tangible asset ratio is negatively correlated to business efficiency (Tiberti, Stefani and Lombardi 2016). However, Tung (2017) proposed that there is no significant connection between efficiency and tangible fixed asset ratio. In general, the researcher expected

there is a significant relationship between tangible fixed asset and firms' efficiency. The relationship can be positive or negative.

Tangible fixed asset ratio is chosen to measure fixed asset factor. This variable is measured by net tangible fixed assets over the total asset, then multiply by 100. The multiplication by 100 is for interpretation purpose.

$$TANG\_FA = Tangible\ fixed\ asset\ ratio = \frac{Net\ Tangible\ Fixed\ Asset}{Total\ Asset} * 100$$

**Working capital management**

Working capital management contains three components: receivables management, inventory management, and payables management. According to stewardship theory, management will act ethically to achieve firms performance. Therefore, in accordance with working capital management theories, to achieve the best performance, firms tend to increase the rate of receivable turnover, increase inventory turnover and decrease the payable turnover ratio.

The rate of receivable turnover is expected to have a significant positive relationship between firms efficiency. In some researches, instead of using the receivable turnover ratio, researchers use days of receivables instead, and an increase in receivable turnover ratio means a decrease in days of receivables. Tung (2017) included days of receivables in his research and pointed out the negative impact of days of receivables on ROA. Siminica, et al (2012) researched about Romanian companies showed positive changes in business efficiency when increasing turnovers of current assets, which contains receivables. Therefore, the researcher expects receivable turnover will have a positive impact on overall efficiency. The receivable turnover ratio is calculated by using net sales, divided by average net account receivables.

$$RT = Receivable\ turnover = \frac{Net\ Sales}{Average\ Account\ Receivables}$$

Inventory turnover representing firms ability on goods production and making sales orders. According to working capital management theories, higher inventory turnover will lead to better overall business efficiency. This claim agrees with the regression results of empirical researches. Siminica, et al (2012) claimed the positive relationship between business efficiency and current asset turnover, which contains both receivables turnover and inventory turnover. However, Demirhan and Anwar (2014) ran a research model on 140 non-financial firms in Turkey in the financial crisis in 2008, and found out that the relationship between business performance and inventory turnover ratio is insignificant. They also concluded that two factors affecting business performance in the financial distress period are liquidity and leverage. The researcher still believed that inventory turnover positively impacts business efficiency. The inventory turnover is calculated by using the cost of goods sold, divided by average inventory.

$$IT = Inventory\ turnover = \frac{Cost\ of\ Goods\ sold}{Average\ Inventory}$$

**Growth**

Growth rate measure firms' ability to develop in the competitive market. Firms with better growth rate will generate more income and can accumulate capital to make a future investment. Therefore, the researcher expected a positive relationship between growth rate and overall business efficiency. In the research about Vietnamese oil and gas enterprises, Tung (2017) pointed out that growth rate is positively correlated to business efficiency. This idea agrees with other researchers. Salim and Yadav (2012) studied 237 Malaysian listed companies during 1995 – 2011, and pointed outgrowth rate has a positive correlation with business performance (Salim and Yadav 2012). Growth variable is calculated by taking the difference between this year net revenue (t) and last year revenue (t-1), then multiply by 100. The multiplication by 100 is for interpretation purpose.

$$RG = GRO_t = \frac{Net\ Revenue\ in\ year\ (t) - Net\ Revenue\ in\ the\ year\ (t-1)}{Net\ Revenue\ in\ year\ (t-1)} * 100$$

**Tab 1.** Formulas and expected correlations of the regression model's variables

| No. | Variable | Meaning | Expected correlation with the dependent variable | Formula |
|---|---|---|---|---|
| 1. | ROA | Return on asset | | $$ROA = \frac{Net\ Income}{Average\ Total\ Asset} * 100$$ |
| 2. | TANG_FA | Tangible Fixed assets ratio | Both Positive and Negative | $$Tang\_FA = \frac{Net\ Tangible\ Fixed\ Asset}{Total\ Asset} * 100$$ |
| 3. | RG | Growth rate | Positive | $$RG = \frac{Net\ Revenue\ in\ year\ (t) - Net\ Revenue\ in\ year\ (t-1)}{Net\ Revenue\ in\ year\ (t-1)} * 100$$ |
| 4. | D_TA | Debt-to-total asset ratio | Negative | $$D\_TA = \frac{Total\ debts}{Total\ Asset} * 100$$ |
| 5. | RT | Receivables Turnover | Positive | $$RT = \frac{Net\ Sales}{Average\ Account\ Receivables}$$ |
| 6. | IT | Inventory turnover | Positive | $$IT = \frac{Cost\ of\ Goods\ sold}{Average\ Inventory}$$ |

## 3. Methodology and Analysis

### 3.1 Data collection

Secondary data extracted from year-end financial statements of companies in the Vietnamese food and beverage industry in the 10-year period of 2009 – 2018. In terms of scope, the research covered data from 36 Vietnamese food and beverage companies listed on the Ho Chi Minh Stock Exchange and Hanoi Stock Exchange. Hence,360 observations (36 companies * 10 years) used for regression.

### 3.2 Regression model

To examine the correlation between return on asset and its determinants, researchers run the following regression model. The input data is panel data.

$Y = \alpha + \beta_n X_n + \varepsilon$

In which:

Y: Dependent variable

$X_n$: Independent variable

$\alpha$: Intercept

$\beta_n$: Coefficient

$\varepsilon$: error terms.

First, the researcher will run a pooled model and random effect model using OLS method, then conduct Hausman test for fixed effect or random effect. The detailed regression equation is as follows:

$$ROA = \beta_1 + \beta_2 TANG\_FA + \beta_3 RG + \beta_4 D\_TA + \beta_5 LOG(RT) + \beta_6 LOG(IT) + \varepsilon$$

In which:

***Dependent variable:***
ROA: Net income over total assets

***Independent variable:***
TANG_FA (Tangible fixed assets): Net tangible fixed assets over total assets
RG (Growth): Net revenue growth rate, year over year
D_TA (Debt-to-total assets ratio): Total debts over total assets
RT (Receivable turnover): Net sales over average account receivables
IT (Inventory turnover): Cost of goods sold over average inventory

Because ROA and some independent variables are presented in percentage, for interpretation consistency, the researcher proposed LOG form for receivable turnover and inventory turnover. A table will be conducted to describe variables, and correlation matrix is conducted to predict multicollinearity between independent variables. After that, the researcher will run the regression model and perform Hausman test to choose the model's form. To determine multicollinearity, the researcher will run auxiliary regression models on suspected variables and will decide to drop the independent variable if R-square of the auxiliary regression model is larger than 70%. After that, the model will be tested for residual normality. The statistic significant level is 5%. Since the input data is panel data containing both cross-sectional effect and period effect, no testing on heteroscedasticity and serial correlation are required.

### 3.2.1    Descriptive Statistic

The following table shows the basic descriptive statistic in the regression model:

**Tab 2.** Descriptive statistics of regression variables

|              | ROA       | TANG_FA   | RG        |
|--------------|-----------|-----------|-----------|
| **Mean**     | 11.46746  | 26.61106  | 14.64482  |
| **Median**   | 10.06237  | 21.99269  | 9.022224  |
| **Maximum**  | 72.19110  | 87.11291  | 408.4701  |
| **Minimum**  | -31.72369 | 2.381784  | -62.36328 |
| **Std. Dev.**| 10.23076  | 17.93759  | 35.97471  |
| **Skewness** | 0.540725  | 1.326031  | 4.560028  |
| **Kurtosis** | 7.636341  | 4.445440  | 44.60904  |
|              |           |           |           |
| **Jarque-Bera** | 339.9779 | 136.8409 | 27217.31 |
| **Probability** | 0.000000 | 0.000000 | 0.000000 |
|              |           |           |           |
| **Sum**      | 4128.284  | 9579.982  | 5272.134  |
| **Sum Sq. Dev.** | 37576.01 | 115510.8 | 464610.7 |
|              |           |           |           |
| **Observations** | 360   | 360       | 360       |
|              | D_TA      | RT        | IT        |
| **Mean**     | 20.40073  | 202.3817  | 16.94434  |
| **Median**   | 14.69051  | 25.38729  | 6.845311  |
| **Maximum**  | 92.52794  | 14714.22  | 771.0786  |
| **Minimum**  | 0.000000  | 1.664528  | 0.461547  |
| **Std. Dev.**| 20.31702  | 1278.467  | 64.60249  |
| **Skewness** | 0.833962  | 9.283325  | 8.161990  |
| **Kurtosis** | 2.746787  | 92.17366  | 77.45805  |
|              |           |           |           |
| **Jarque-Bera** | 42.69132 | 124449.9 | 87157.11 |
| **Probability** | 0.000000 | 0.000000 | 0.000000 |
|              |           |           |           |
| **Sum**      | 7344.264  | 72857.42  | 6099.963  |
| **Sum Sq. Dev.** | 148188.5 | 5.87E+08 | 1498280. |

| | | | |
|---|---|---|---|
| **Observations** | 360 | 360 | 360 |

*Source: Researcher's calculation, extracted from EVIEWS software*

The data used for regression analysis is panel data, comprise of 360 observations. including the cross-sectional dimension of 36 companies and the period dimension of 10 years. Parameters calculated in the table, including mean, median, min value, max value, and standard deviation of each data variable. E-views software does not separate the period effect and the cross-sectional effect when calculating these parameters.

Descriptive statistics showed that the mean value of return on asset of Vietnamese food companies in the period of 2009 – 2018 is 11.47%, and this value is quite near the median of 10.06%. Return on asset ranges from -31.72% to 72.19%, with a standard deviation of 10.23%. Obviously, the range is very wide, and the fluctuation is large. This sign is reasonable as the time frame is long and covers different phases of the economy, as mentioned in previous chapters. The wide range of ROA can also be explained by differences between companies. The sample including very large, market dominant firms such as Vinamilk or Sabeco, and also smaller firms like Dabaco. In addition, in the period of 2009 – 2018, some companies suffered from a great loss, such as Hanoimilk, while some experience great income such as Vinamilk. Therefore, a large fluctuation is reasonable.

Tangible fixed assets parameter reflects firms' investment in tangible fixed assets over total assets to run the business in the long run. Fixed assets ratio has the mean of 26.61%, and the mean is far from the median value of 21.99%. The range of this indicator is also very wide, running from 2.38% to 87.11%, and large standard deviation of 17.93%. The wide range is caused by two factors. The first factor is the diversification of the core businesses of selected companies in the model. Selected data includes 36 companies in the food and beverage industry, and this sector can be divided into sub-sectors, such as beer, seafood and non-alcoholic beverage. Because each of these industries requires a different level of plant and machinery investment, the range of the fixed asset ratio is very wide, and the standard deviation is large. The second factor causing the wide range is differences in the business intention of companies. For example, Masan corporation is intending to get involved into new meat products market, so their level of fixed asset investment must be different from other companies, who do not intend to expand, such as Vinamilk, a very old corporation of dairy products in Vietnam.

The revenue growth indicator is the valuation of performance, whether the company is performing better or worse than last year business results. From the selected data, revenue growth has the mean value of 14.64%, very far from the median value of 9.02%. The range is extremely wide, ranging from – 62.36% to 408.47%. Although the period of 2009 – 2018 contains the recovery phase and the expansion phase of Vietnamese economy, there are companies marking profit and some lost. This also means that not every company experienced the same impact of economic changes, as well as changes in the sector.

The debt-to-total asset ratio has the mean value of 20.4%, ranging from 0% to 92.52%. The mean of the debt-to-asset ratio is quite far from the median of 14.69%. The wide range of debt-to-total asset ratios showed different choices of firms in financing activities. While some chose to used debt, interest-bearing sources, others rely on equity and short-term financing as payables and accruals. At some firms, the debt ratio is 0%. This does not mean they don't use any debt to finance their business, but because this rate is too small, the soft wares rounded and the figures became zero. Another noted point is that although the debt-to-total asset ratio has a quite same wide range as ROA, but its standard deviation is different. This data showed the diversified choices of firms when it comes to financing in the recovery and expansion phases of the economy.

The parameter receivables turnover is showing the negotiating power of the company in cash collection. This parameter mean is 202 times, and the mean is far from the median value of 25.38 times. The range of this parameter is very wide, from 1.66 times to 14714.22 times, which means that some companies make sales mainly on cash basis, while some are showing weaknesses in managing receivables, as the typical cash collection period for account receivables only ranges from 30 days to 90 days, equivalent to 4 times to 12 times of receivable turnover. The standard deviation is also large, at 1278.47 times. The large deviation between firms is slightly reduced as the

researchers used the average account receivables in the calculation to make it more conservative. The data could have varied more widely if the figures are calculated using ending account receivable only.

Similar to receivable turnover, inventory turnover indicator is showing firms power in terms of working capital management. Inventory turnover has ranged from 0.46 times to 771.07 times, with the mean value of 16.94 times and the median of 6.84 times. The variation of these indicators is caused by the time frame and difference in the core businesses of different firms. Some firms producing rice or agricultural products such as Binh Dinh Food Company may have low inventory turnover ratio, other firms such as Vinamilk, Sabeco or Halong Canned Foods produce products for final users and therefore have larger inventory turnover ratio.

To sum up, all variables, both the dependent variable and the independent variable have wide ranges. In addition, apart from return on asset, other indicators have a huge difference between the mean and the median value. Due to a large number of companies contained in the sample and long time frame, the huge fluctuation and the mean – median difference is acceptable. From the descriptive statistic result, the researcher expects regression results containing period effect and uniqueness of companies.

### 3.2.2    Correlation matrix

To see relationships between independent variables, the researchers conducted a correlation matrix. Below is the correlation matrix of the proposed independent variables of the mentioned model.

**Tab 3.** Regression variables correlation matrix

|          | ROA     | TANG_FA | RG      | D_TA    | LOG(RT) | LOG(IT) |
|----------|---------|---------|---------|---------|---------|---------|
| ROA      | 1       |         |         |         |         |         |
| TANG_FA  | -0.1782 | 1       |         |         |         |         |
| RG       | 0.1322  | -0.0181 | 1       |         |         |         |
| D_TA     | -0.4701 | 0.2055  | 0.1467  | 1       |         |         |
| LOG(RT)  | 0.2154  | 0.0274  | 0.0787  | -0.1524 | 1       |         |
| LOG(IT)  | 0.2624  | -0.0064 | 0.0303  | -0.3190 | 0.5874  | 1       |

*Source: Researcher's calculation, extracted from EVIEWS software*

From the above table, inventory turnover and debt-to-total asset ratio have the correlation of -0.31, a negative average relationship. Receivable turnover and inventory turnover have a correlation of 0.58, an average strong relationship. These levels of correlation proposed questions of multicollinearity. To answer the questions of multicollinearity, the researcher will run auxiliary regression models and will drop variables if R-square of those models is larger than 70%. However, the forms of the auxiliary regression models depend on the form of the main regression model

All independent variables showed an average relationship on the dependent variable, except for the revenue growth rate. In addition, no variables showed the opposite relationship to the researcher's expectations. However, all these signs can change when these variables are included in the model.

### 3.3  Regression results

### 3.3.1    Regression model determination.

There are 3 types of model to be applied: fixed effect model, random effect model, and pooled model. First, the researcher will run the pooled model and random effect model, then run the Hausman test to see if the random effect model is appropriate. The null hypothesis of the Hausman test is the random effect model is appropriate, the alternative is otherwise. If the testing result shows that the null hypothesis must be rejected, the fixed effect model

will be used. If the null hypothesis cannot be rejected, then the random effect model is the more appropriate model. The researcher first runs the pooled model. Below is the summary result of the pooled regression model.

**Tab 4.** Summary of pooled regression result

Dependent Variable: ROA
Method: Pooled Least Squares
Included observations: 360
Cross-sections included: 36

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 12.44202 | 0.278762 | 44.63321 | 0.0000 |
| TANG_FA | -0.048695 | 0.004344 | -11.21077 | 0.0000 |
| RG | 0.053048 | 0.002150 | 24.67543 | 0.0000 |
| D_TA | -0.225257 | 0.004101 | -54.92811 | 0.0000 |
| LOG(RT) | 0.851096 | 0.075233 | 11.31284 | 0.0000 |
| LOG(IT) | 0.627706 | 0.114941 | 5.461105 | 0.0000 |
| R-squared | | | 0.286338 | |
| Adjusted R-squared | | | 0.286063 | |

*Source: Researcher's calculation, extracted from EVIEWS software*

Ignoring period effect and the cross-sectional effect, the pooled model explains 28.83% of the variation of return on asset. However, because the data fluctuated very strongly, it is inappropriate to use the pooled model. Therefore, the random effect model or fixed effect model is prioritized. The researcher added random effect to both cross-section factor and period factor. Below is the summary regression result for the two-way random effect model.

**Tab 5. Summary of two-way random effect regression result**

Dependent Variable: ROA
Method: Panel EGLS (Two-way random effects)
Total panel (balanced) observations: 360
Swamy and Arora estimator of component variances

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 13.52031 | 2.562047 | 5.277153 | 0.0000 |
| TANG_FA | -0.086274 | 0.030920 | -2.790226 | 0.0056 |
| RG | 0.031724 | 0.011164 | 2.841625 | 0.0047 |
| D_TA | -0.224919 | 0.028965 | -7.765167 | 0.0000 |
| LOG(RT) | 0.265340 | 0.510652 | 0.519609 | 0.6037 |
| LOG(IT) | 1.751793 | 0.871681 | 2.009671 | 0.0452 |

| Effects Specification | | | | |
|---|---|---|---|---|
| | | | S.D. | Rho |
| Cross-section random | | | 5.109556 | 0.3672 |
| Period random | | | 0.514350 | 0.0037 |
| Idiosyncratic random | | | 6.687968 | 0.6291 |

| Weighted Statistics | | |
|---|---|---|
| R-squared | | 0.225167 |
| Adjusted R-squared | | 0.214223 |

| Unweighted Statistics | | |
|---|---|---|
| R-squared | | 0.269822 |

*Source: Researcher's calculation, extracted from EVIEWS software*

The R-square of the two ways random effect model is 26.98% lower than the R-squared of the pooled model. All coefficients of the two ways random effect model are statistically significant, except the coefficient of LOG(RT). The researcher still has the choice to use a fixed effect model. To make a decision on choosing the fixed effect model, random effect model, or hybrid model, the researcher will run the Hausman test, and make a decision as stated in the above section. Below is the summary Hausman testing results.

**Tab 6.** Summary of Hausman testing result for two-way random effect

| Correlated Random Effects - Hausman Test | | | |
|---|---|---|---|
| Test cross-section and period random effects | | | |
| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob. |
| Cross-section and period random | 55.391076 | 5 | 0.0000 |

*Source: Researcher's calculation, extracted from EVIEWS software*

It can be seen that the p-values calculated are smaller than 0.05, which means the null hypothesis is rejected. This means there is a significant difference between the fixed effect model and random effect model. Therefore, two-way random effect model is inappropriate. Too choose a fixed factor for a period or cross-sectional factor or both, Hausman test will be conducted for both hybrid models. The period effect is chosen fixed to see whether fixed effect or random effect for cross section is appropriate. Below is the summary Hausman testing result.

**Tab 7.** Summary of Hausman testing result for random cross-section effect

| Correlated Random Effects - Hausman Test | | | |
|---|---|---|---|
| Test cross-section random effects | | | |
| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob. |
| Cross-section random | 11.330238 | 5 | 0.0452 |

*Source: Researcher's calculation, extracted from EVIEWS software*

The calculated p-value is smaller than 0.05, meaning that under the condition of fixed period effect, fixed effect cross-sectional factor is appropriate. Radom effect of period factor will be tested again to see whether the random period effect or fixed period effect is appropriate. Below is the summary result of the Hausman test for a random period effect, under a fixed cross-sectional factor.

**Tab 8.** Summary of Hausman testing result for period random effect

| Correlated Random Effects - Hausman Test | | | |
|---|---|---|---|
| Test period random effects | | | |
| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob. |
| Period random | 25.805281 | 5 | 0.0001 |

*Source: Researcher's calculation, extracted from EVIEWS software*

The calculated p-value is smaller than 0.05, meaning the random period effect is appropriate. Under both testing results, the conclusion is two-way fixed effect model is appropriate. Therefore, two-way fixed effect model is chosen and the model is run again under the fixed cross-sectional effect and fixed period effect. Below is the summary regression result for the two-way fixed effect model.

**Tab 9.** Summary of two-way fixed effect regression result

| Dependent Variable: ROA Method: Panel Least Squares Total panel (balanced) observations: 360 | | | | |
|---|---|---|---|---|
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | 14.21831 | 3.233797 | 4.396785 | 0.0000 |
| TANG_FA | -0.104334 | 0.033725 | -3.093631 | 0.0022 |
| RG | 0.012820 | 0.011503 | 1.114543 | 0.2659 |
| D_TA | -0.231472 | 0.031729 | -7.295388 | 0.0000 |
| LOG(RT) | -0.130393 | 0.587246 | -0.222042 | 0.8244 |
| LOG(IT) | 2.531309 | 1.120369 | 2.259353 | 0.0246 |
| Effects Specification | | | | |
| Cross-section fixed (dummy variables) Period fixed (dummy variables) | | | | |
| R-squared | | 0.630989 | | |
| Adjusted R-squared | | 0.572661 | | |

*Source: Researcher's calculation, extracted from EVIEWS software*

The p-value of all coefficient in the two-way fixed effect model is smaller than 0.05, except for RG and LOG(RT), meaning that these two variables are not statistically significant. The value of all coefficients is different from zero. The p-value of the F-statistic is 0.000, meaning the model is statistically significant. Independent variables explained 63.09% of the variation of return on asset. The researcher first comes up with the first regression model:

$$\text{ROA} = (14.21831) + (-0.104334)*\text{TANG\_FA} + 0.012820*\text{RG}$$
$$+ (-0.231472)*\text{D\_TA} + (-0.130393)*\text{LOG(RT)} + 2.531309*\text{LOG(IT)}$$

### 3.3.2    Multicollinearity testing

The problem of multicollinearity happened when independent variables have a strong relationship with others. This violated the assumption of the regression model as those variables must be independent. In fact, there is almost no absolute zero multicollinearity. If the multicollinearity is not serious, the researcher will do nothing. If multicollinearity level is serious, then the solution is dropping one of the variables with multicollinearity, and run the model again. The decision to drop depends on R-square of an auxiliary regression model. If the R-square of the auxiliary regression model is higher than 70%, one variable will be dropped.

The researcher will run an auxiliary regression model on suspected variables stated in previous sections. They are D_TA – LOG(IT), LOG(IT) – LOG(RT).

➢ **Auxiliary regression model 1: D_TA – LOG(IT)**

The researcher found the correlation between D_TA and LOG(IT) variable is -0.31. The relationship, in this case, is average, but it does not include a panel effect. Since the main regression model is a two-way fixed effect model, the auxiliary regression model will also be two-way fixed effect model.

After running the auxiliary regression model, the result is the model is statistically significant, and the R-square level is 86.22%. However, the p-value of D_TA coefficient is larger than 0.05, meaning that the relationship between D_TA and LOG(IT) is insignificant. The high R-square value is caused by dummy variables for the fixed cross-sectional effect and fixed period effect. Therefore, multicollinearity is not serious in this case, neither D_TA nor LOG(IT) will be dropped. Below is the summary regression result of the auxiliary D_TA – LOG(IT) regression model.

**Tab 10**. Summary of auxiliary regression result of D_TA-LOG(IT) model

Dependent Variable: LOG(IT)
Method: Panel Least Squares
Total panel (balanced) observations: 360

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 1.975989 | 0.035359 | 55.88320 | 0.0000 |
| D_TA | 4.48E-05 | 0.001496 | 0.029964 | 0.9761 |
| Effects Specification | | | | |
| Cross-section fixed (dummy variables) Period fixed (dummy variables) | | | | |
| R-squared | | 0.862221 | | |
| Adjusted R-squared | | 0.842476 | | |

*Source: Researcher's calculation, extracted from EVIEWS software*

Theoretically, firms issued debts to finance short-term and long-term projects. In this research, the debt-to-total asset ratio covers both short term debt and long term debts. Firms can issue short-term debts or use short term financial instruments such as short term bonds to finance for working capital (Brigham and Daves 2010). Therefore, there will be a relationship between the debt ratio and inventory turnover ratio. The empirical results for Vietnamese food and beverage industry may be different because financed debt is mainly long term.

> ➤ **Auxiliary regression model 2: LOG(IT) – LOG(RT).**

The correlation between LOG(IT) and LOG(RT) variable is 0.58. The relationship is averagely strong, but it does not include the panel effect. Since the main regression model is a two-way fixed effect model, the auxiliary regression model form will be the same. The result is the model is statistically significant, coefficients are statistically significant and different from zero. and R-square level is 75.77%. However, the p-value of LOG(IT) coefficient is larger than 0.05, meaning the relationship between LOG(IT) or LOG(RT) is insignificant. The high R-square value is caused by dummy variables for the fixed cross-sectional effect and fixed period effect. Therefore, multicollinearity is not serious in this case, neither LOG(IT) nor LOG(RT) will be dropped. Below is the regression result of the auxiliary LOG(IT) – LOG(RT) regression model.

**Tab 11.** Summary of auxiliary regression result of LOG(RT)-LOG(IT) model

Dependent Variable: LOG(RT)
Method: Panel Least Squares
Total panel (balanced) observations: 360

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 3.454682 | 0.219913 | 15.70933 | 0.0000 |
| LOG(IT) | -0.024596 | 0.109845 | -0.223919 | 0.8230 |
| Effects Specification | | | | |
| Cross-section fixed (dummy variables) Period fixed (dummy variables) | | | | |
| R-squared | | 0.757715 | | |
| Adjusted R-squared | | 0.722993 | | |

In terms of working capital management, inventory turnover, and receivable turnover cause cash inflows, while payable turnover causes cash outflows (Brigham and Daves 2010). Inventory turnover and receivable turnover are not closely correlated (Brigham and Daves, 2010). The claim is applicable to Vietnamese food and beverage industry; as empirical research, result shows the same idea.

After running 2 auxiliary regression model, since no variable is dropped, the first main regression model is unchanged. The model is now tested for residual normality. The equation of the main regression model under the two-way fixed effect is presented as follows:

$$ROA = (14.21831) + (-0.104334)*TANG\_FA + 0.012820*RG$$
$$+ (-0.231472)*D\_TA + (-0.130393)*LOG(RT) + 2.531309*LOG(IT)$$

### 3.3.3    Residual Normality Testing

The ordinary least square method assumes that residual values are normally distributed. If this assumption is not held, the estimated coefficients ranges are not reliable. If this error is not serious, then this error can be accepted. Violation of this assumption does not cause bias or inefficiency of the model (Gujarati and Porter 2009). If the sample size is larger than 200 observations, the Central Limit Theorem will ensure a normal distribution of error terms. (Gujarati and Porter 2009). In this case, the sample size is 360 observations, which is considered as large sample size. However, the researcher still tested for residual normality for conservatism. The null hypothesis is the model's residual terms are normally distributed. The alternative hypothesis is model's residual terms are not normally distributed. Below is the normality testing result.
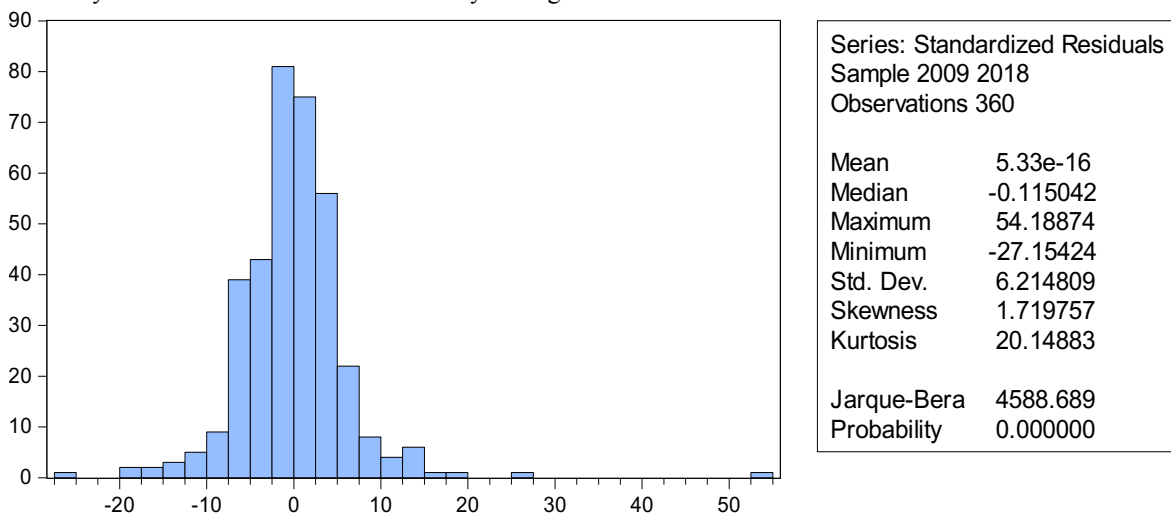


| Series: Standardized Residuals | |
| --- | --- |
| Sample 2009 2018 | |
| Observations 360 | |
| Mean | 5.33e-16 |
| Median | -0.115042 |
| Maximum | 54.18874 |
| Minimum | -27.15424 |
| Std. Dev. | 6.214809 |
| Skewness | 1.719757 |
| Kurtosis | 20.14883 |
| Jarque-Bera | 4588.689 |
| Probability | 0.000000 |

**Fig1.**  Residual normality testing result

The p-value is 0.00, smaller than 0.05, meaning the null hypothesis is rejected. The testing results interpreted that the model has the error of residual normality. According to the central limit theorem, as the sample number, in this case, is large, the disturbance terms are considered to be normally distributed. Therefore, the result is accepted, and no further working needs to be done.

### 3.3.4    Finalized regression model and interpretations

After testing for regression issues, the researchers came up with the finalized model:

$$ROA = (14.21831) + (-0.104334)*TANG\_FA + 0.012820*RG$$

**+ (-0.231472)\*D_TA + (-0.130393)\*LOG(RT) + 2.531309\*LOG(IT)**

Overall, independent variables have significant effects on ROA, except LOG(RT) and RG. Three variables having the strongest effect on return on the asset are inventory turnover, tangible fixed asset, and debt-to-total asset ratio.

First, the inventory turnover ratio has a positive relationship with ROA. The coefficient of inventory turnover is 2.5313, meaning that if the inventory turnover increase by 1%, ROA will increase by 0.025313%. This relationship follows the idea of working capital management. If the company can well manage its inventory, the overall performance will be improved significantly. This case is right to Vietnamese food and beverage industry.

Secondly, the tangible fixed asset ratio has a negative impact on ROA. To be specific, the coefficient is -0.104, meaning that if the tangible fixed asset ratio decreases by 1%, ROA will increase by 0.104%. This is opposed by the researcher's expectation as the more investment in the tangible fixed asset will be the will lead to better technological ability, and will increase overall efficiency. The case is not applicable to Vietnamese food and beverage industry. However, the result does not mean they should necessarily reduce tangible fixed asset investment, but should pay more attention to the current asset to prevent the case of insufficient working capital, or investing in intangible assets such as the accounting system or enterprise resource planning system.

Thirdly, the debt to total asset ratio has a negative relationship with return on asset. Respective coefficient of this variable is (-0.23), meaning that if the debt-to-total asset ratio decreased by 1%, ROA would increase by 0.23%. This relationship follows the trade-off theories that companies should pay attention to their capital structure if they don't want to face the risk of bankruptcy (Brigham and Daves 2010). This results also follows the idea of previous researches of other industry, as companies should use less debt if they want to increase the overall efficiency. Although using debt affect overall efficiency both positively and negatively, the negative sign of the coefficient of debt to asset ratio means the inefficiency of using debts (Tung 2017). The empirical data showed the same idea to Vietnamese food and beverage industry.

Lastly, the two remaining variables showed their effects on ROA, but the relationships are not statically significant. The weak effect of these variables is explainable. If the receivable turnover ratio decreases by 1%, ROA will increase by 0.0013%. The sign of the respective coefficient of receivable turnover ratio does not agree with the researcher's expectation stated in previous sections. The receivable turnover ratio is showing firms bargaining power on cash collection from sales (Brigham and Daves 2010). Cash collection affects cash flows and will also overall efficiency. Tung (2017) showed a significant correlation between ROA and days of receivables, but the impact is minor due to the small coefficient. However, in terms of accounting basis, when cash collection occurs, there is an increase in cash and a decrease in account receivables, which does not affect the total asset and the net income figures. In case firms have uncollectible receivables, there will be a recognition of receivable allowance into the balance sheet and income statement, affecting both total asset and net income. Therefore, the receivable turnover ratio may have a weak effect on ROA, but the relationship is insignificant. The idea is inapplicable to Vietnamese food and beverage industry because in general, they do not hold a large portion of uncollected account receivable.

If the growth rate increased by 1%, ROA will increase by 0.01%. The sign of the respective coefficient of the growth rate agrees with the researcher's expectation stated in previous sections. Tung (2017) claimed a significant relationship between revenue growth and returned on the asset, and believed enterprises with high revenue growth can reduce cost, expand, and up-scale production. However, the insignificance of this relationship is caused by accounting reasons. If firms achieved great sales growth, the growth, it means that sales and net income increased significantly. This increase is also reflected in the increase in total asset, and therefore, does not change the total asset ratio significantly. As a result, the insignificant relationship between sales growth and ROA is understandable.

Another noted point from the regression result is the form of this model. The model includes both dummy variables for cross-sectional effect and period effect. The regression result showed that estimators under a fixed effect model and random effect model differs significantly. When the number of cross-sectional data is large, and the period data is small, the fixed effect model can be the more appropriate model (Gujarati and Porter 2009). However, if the cross-sectional units are sampled and randomly chosen from a larger population, then the random effect model can be the more appropriate model (Gujarati and Porter 2009). After conducting Hausman tests, the conclusion is two-way fixed effect model is appropriate, following the first claim. The result of the two-way fixed effect model had taken into account the uniqueness of sampled firms by adding cross-sectional dummy variable and take into account year over year changes.

## 4. Conclusion

The research gathered theoretical framework about the business cycle, corporate governance, efficiency, its determinants, gave an assessment of about Vietnamese economy, Vietnamese food, and beverage industry and used empirical data to answer the research questions. The research result is the efficiency of Vietnamese food and beverage companies depends on five factors: capital structure, tangible fixed asset, growth rate, receivable turnover, and inventory turnover. To be specific, three factors affecting efficiency are capital structure, inventory turnover, and tangible fixed asset, while receivable turnover and growth rate do not show significant impacts on overall efficiency. Based on the regression results, the researcher suggested firms to enter an operating lease, choosing appropriate fixed asset management policy and pay attention to inventory management at both the corporate level and warehouse level. The research showed its limitations and suggested three improvements. The first improvement is gathering data from unlisted companies and includes dummy variables to see the difference between listed and unlisted firms. The second improvement is including variable measuring labor intensity. The third improvement is adding a macro factor into the model. These improvements will improve the academic properties of the research.

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