Factors affecting asset investment of public companies in plastic and packaging industry in Vietnam

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A R T I C L E   I N F O

A B S T R A C T

The purpose of this research is to identify and analyze the influence of internal factors on asset investment of public companies in the plastic and packaging industry in Vietnam. The research has built a regression model to determine the relationship of internal factors affecting asset investment of public companies in the plastic and packaging industry in Vietnam. The strength of this research is to use the E-view software in quantitative analysis to build a panel data regression model. At the same time, the researchers used the Hausman test to select the appropriate model compared to other research. The data of the research are collected and calculated from the financial statements of 27 companies in the plastic and packaging industry in Vietnam from 2013 to 2020. The research results show that such factors as sale, equity, and debt ratio have a positive impact on asset investment, the return on assets has a negative impact on asset investment, while the average loan interest rate does not affect the asset investment of enterprises. Therefore, the author has made recommendations to help public companies in the plastic and packaging industry in Vietnam to improve the efficiency of asset investment. The results of this research are very useful for corporate financial managers in helping them make appropriate financial decisions for their companies.

1. Introduction

In the market economy condition, assets are not only a prerequisite for the establishment of enterprises but also a decisive factor for the existence and development of enterprises. In each enterprise, assets are both a means of labor and the main labor object of the production and business process. Long-term assets are material and technical foundations that play an important role in the operation of enterprises and the main production means of great value and a condition for enterprises to increase labor productivity and promote the national economy. From a macro perspective, infrastructure and technical facilities will contribute to assessing the strength of a national economy, and from a micro perspective, machinery and equipment, and production lines are the determining factors of the production capacity of enterprises. In order to conduct production and business operations, in addition to long-term assets, enterprises also cannot lack short-term assets to ensure that the production process takes place on a regular and continuous basis. Consequently, asset investment is a particularly important issue for the economy in general and for businesses in particular. Only development investment can maintain and further expand the production potential of an enterprise or a country.

Public companies in the plastic and packaging industry in Vietnam over the past years have contributed significantly to the national economy, however, their operational efficiency has not yet been achieved as initially planned. One main reason is that the investment of enterprises has not been given proper attention. Therefore, it is urgent to study the factors affecting the asset investment of public companies in the plastic and packaging industry in Vietnam. From a financial perspective, the article will conduct an empirical analysis to test and evaluate the influence of factors on investment decisions of public companies in the plastic and packaging industry in Vietnam to provide more

information for investment decisions, helping these companies make the right investment decisions, gaining higher investment efficiency.

2. Literature review

In the world and in Vietnam, there are many studies on the factors affecting the investment in assets of enterprises. Baskin (1989) studied 378 enterprises in the period from 1960 to 1972 in the US and concluded that the profitability of assets has a positive relationship with the growth of invested capital. In this regard, Abel and Eberly (1994) had the same view.

Allen (1993) used the financial statements of 89 Australian industrial and commercial enterprises to regress the growth of investment capital in enterprises. The results show that there is a positive relationship between debt and business growth, which means that enterprises use debt financing to finance asset investment. Similarly, Chen and Steiner (1999) argued that ownership, risk management, debt policy, and dividend policy are an integral part of corporate decision-making. Besides, if the internal capital of enterprises is limited, enterprises tend to use debt to make good use of investment opportunities. However, contrary to the above view, Aivazian et al. (2005) showed that there is a negative relationship between the use of debt and asset investment.

Jong et al. (2000) through a study of 1003 enterprises from 1993 to 1995 in Bulgaria stated that enterprises prefer investments using internal capital or equity. Gelos and Werner (2002) used data from 1046 firms to conduct OLS and GMM regression models to examine the impact of cash flow and equity on the investment of firms. The results also show that the equity ratio decreases as the size of the enterprise increases.

Galan et al. (2007) conducted studies on businesses in Spain and proved that input costs (labor costs, transportation costs, loan costs, and raw materials costs) have a negative effect on asset investment.

Erkaningrum (2013) analyzed the interaction between insider ownership, dividend policy, debt policy, investment decisions, and business risk of 137 manufacturing companies listed on the Indonesian Stock Exchange from 2006 to 2010. The analysis results show that insider ownership and business risks have a negative influence on enterprise investment, while profit and sale growth has a positive influence.

In Vietnam, Pham et al. (2008) studied the factors affecting the investment decision of enterprises based on a sample of 294 non-state enterprises in Kien Giang. Research shows that the investment of enterprises depends on their own capital, the number of bank loans, and the growth of sales in the past. In addition, the larger the size of the enterprise, the slower the investment rate. Le and Le (2012), analyzed the factors affecting the investment decisions of enterprises in Tien Giang province

through 904 enterprises and concluded that: total labor, total assets, equity are proportional to enterprise investment decision, total sale and return on assets are inversely proportional to enterprise investment decision, profit before tax is significant in the model and private enterprises have more significance for investment decisions than other types of businesses.

Thus, empirical studies have shown that there are many different factors affecting the asset investment of enterprises, however, there has not been a specific study on the factors affecting the asset investment of public companies in the plastic and packaging industry in Vietnam in recent years. Therefore, on the basis of inheriting the advantages of previous studies, this study will add to the research gap on asset investment, analyze the factors affecting the asset investment of public companies in the plastic and packaging industry in Vietnam, thereby helping financial managers make the right decisions on asset investment of their enterprises.

Based on theoretical and empirical research on asset investment of enterprises, this study makes 5 hypotheses about the factors affecting asset investment of public companies in the plastic and packaging industry in Vietnam as follows:

H_1: Sale has a positive effect on asset investment.
H_2: Equity has a positive effect on asset investment.
H_3: Debt ratio has a positive effect on asset investment.
H_4: Return on assets has a positive effect on asset investment.
H_5: Interest rate has a negative effect on asset investment.

3. Research methods

3.1. Research data

The research sample includes data over a period of 8 years (from 2013 to 2020) of 27 public companies in the plastic and packaging industry in Vietnam. The source of data collected is from information on stock exchanges, securities companies, and data collected directly from companies. These are sources of information that, according to the author, are reliable. The data used in the study are built from the financial statements and financial information of enterprises in the plastic and packaging industry. The financial statements of these enterprises are prepared on the basis of compliance with the Vietnamese accounting standard system and have been audited.

The study uses table data regression with three methods: Pooled Ordinary Least Squares (POLS), Random Effects Model (REM), and Fixed Effects Model (FEM).

The article runs the model with E-view software and uses the least-squares method to determine the regression coefficient β_i. On the basis of the results obtained when running the program, we will write equations of the factors affecting the business

performance of the enterprise. Then test the fit of the model, that is, test β_i to know if the independent variable can explain the dependent variable or not. Evaluate the fit of the model through the adjusted coefficient of determination R^2 (Adjusted R Square) to determine the explanatory ability of the model in practice.

3.2. Research model

The econometric model selected to test the impact of internal factors on asset investment of public companies in the plastic and packaging industry in Vietnam is:

$$Y = \beta_1 + \beta_t X_t + u_i \qquad (1)$$

in which: Y is Dependent variable; X_n is The independent variable affects the dependent variable; β_1 is Free coefficient; β_t is Regression coefficient($t = 2 \div n$); u_i is a Random error.

Internal factors affecting asset investment are selected on the specific characteristics of public companies in the plastic and packaging industry in Vietnam, including Sale (SAL), equity (EQU), debt ratio (DR), return on assets (ROA), interest rates (INT). Although the interest rate on credit loans are regulated in the market, the average loan interest rate in this study is calculated on the entire debt of the enterprise (including misappropriated debts-with zero interest rate), so each firm has different borrowing costs, so the interest rate can be considered as an internal factor of the enterprise.

Overall regression model:

$$ASS_i = \beta_1 + \beta_2 SAL_i + \beta_3 EQU_i + \beta_4 DR_i + \beta_5 ROA_i + \beta_6 INT_i + u_i \qquad (2)$$

Overall regression function:

$$ASS_i = \beta_1 + \beta_2 SAL_i + \beta_3 EQU_i + \beta_4 DR_i + \beta_5 ROA_i + \beta_6 INT_i \qquad (3)$$

in which:

1. Dependent variable ASS_i: Asset investment of enterprise i, where i is each of the 27 public companies in the plastic and packaging industry in Vietnam in the period 2013-2020, this variable is measured in the decimal logarithm of the company's assets.
2. The group of independent variables reflecting the factors for which the statistics are taken from the financial statements of 27 public companies in the plastic and packaging industry in Vietnam from 2013 to 2020 includes:

- SAL_i: The sale variable of enterprise i, measured by the decimal logarithm of the sale value of the enterprise i.
- EQU_i: The equity variable of enterprise i, measured by the decimal logarithm of the equity value of the enterprise i.
- DR_i: The debt ratio variable of enterprise i, which is determined by the liabilities on the total assets.
- ROA_i: The return on assets of enterprise i, which is determined by the profit after tax on the average assets of the enterprise i.
- INT_i: The interest rate of enterprise i, which is determined by the interest expense on the average debt of the enterprise (including borrowed capital and appropriated capital, because appropriated capital may be considered as a loan with an interest rate of 0).
- β_i: The partial regression coefficient measures the change in the mean value of dependent variable FR when the independent variable changes one unit and the other independent variables remain unchanged.
- u_i: Random error of the model.

The statistics are presented in Table 1.

4. Research results and discussions

4.1. Research results

Running the model using E-view software under Panel data, we have:

-Regression with the Fixed Effect Model (Table 2).
-Regression with the Random Effect Model (Table 3).
-Use Hausman Test to select a model: The Hausman test is used to choose between two Random Effect Model and Fixed Effect Model. In essence, this is a test of whether unique errors correlate with the explanatory variables (Table 4). Test of hypothetical pairs:

H_0: There is no correlation between explanatory variables and random components (choose Random Effect).
H_1: There is a correlation between explanatory variables and random components (choose Fixed Effect).

In Table 4, Prob.=0.0000<0.05 so reject H_0, select the Fixed Effect model. Therefore, this article will use the Fixed Effect Model to regression to find out key factors affecting the asset investment of public companies in the plastic and packaging industry in Vietnam in the period of 2013-2020.

Table 1: Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASS	216	7.301513	9.988191	8.521169	0.594255
SAL	216	6.527865	9.967466	8.620302	0.631975
EQU	216	7.284777	9.604653	8.199294	0.545261
DR	216	0.030829	0.942246	0.475435	0.213267
ROA	216	-0.164229	0.220028	0.060165	0.050090
INT	216	0.000000	0.105487	0.033418	0.019883
Valid N (listwise)	216				

Table 2: Regression results with fixed effect model

Dependent Variable: ASS				
Method: Panel Least Squares				
Date: 08/29/21 Time: 10:19				
Sample: 2013 2020				
Periods included: 8				
Cross-sections included: 27				
Total panel (balanced) observations: 216				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.095179	0.161215	0.590385	0.5557
SAL	0.146126	0.021557	6.778594	0.0000
EQU	0.827407	0.019741	41.91321	0.0000
DR	0.897955	0.045055	19.93022	0.0000
ROA	-0.581257	0.086385	-6.728687	0.0000
INT	-0.291973	0.230780	-1.265158	0.2074
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.996628	Mean dependent var		8.521170
F-statistic	1754.357	Durbin-Watson stat		1.113765
Prob(F-statistic)	0.000000			

Table 3: Regression results with random effect model

Dependent Variable: ASS				
Method: Panel EGLS (Cross-section random effects)				
Date: 08/29/21 Time: 10:22				
Sample: 2013 2020				
Periods included: 8				
Cross-sections included: 27				
Total panel (balanced) observations: 216				
Swamy and Arora estimator of component variances				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.124165	0.107396	1.156140	0.2489
SAL	0.130411	0.018346	7.108289	0.0000
EQU	0.843424	0.017741	47.54037	0.0000
DR	0.850622	0.036674	23.19445	0.0000
ROA	-0.526115	0.081888	-6.424826	0.0000
INT	-0.461530	0.217902	-2.118067	0.0353
Weighted Statistics				
R-squared	0.969407	Mean dependent var		2.311670
F-statistic	1330.851	Durbin-Watson stat		0.807386
Prob(F-statistic)	0.000000			

Table 4: Hausman test results

Correlated Random Effects-Hausman Test			
Equation: Untitled			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	29.029543	5	0.0000

-Test to remove variables from the model: The purpose of removing variables from the model is to exclude variables that have no impact on dependent variables. Using the method of elimination and testing, remove each variable from the model and use E-view software to verify. After running the software, we see that at most one variable that can be removed is INT (Table 5). To conduct the test to remove variable INT from the initial regression model, we test the following hypothesis pair:

$$\begin{cases} H_0: \beta_6 = 0 \\ H_1: \beta_6 \neq 0 \end{cases}$$

In Table 5, Prob. F=0.2074>0.05. Not enough to reject H_0. So, it is possible to remove the variable INT from the model.

Prob (F-statistic)=0.0000<0.05 so the regression function is appropriate.

The model of factors affecting asset investment of public companies in the plastic and packaging industry in Vietnam is:

$$ASS_i = \alpha_1 + \alpha_2 SAL_i + \alpha_3 EQU_i + \alpha_4 DR_i + \alpha_5 ROA_i \qquad (4)$$

Sample regression function:

$$ASS_i = 0.096917 + 0.139793 SAL_i + 0.832410 EQU_i + 0.902986 DR_i - 0.585360 ROA_i \qquad (5)$$

4.2. Discussion

In Table 5, there is R^2=0.996599 indicating that in the regression model, 4 variables SAL, EQU, DR, ROA have a great influence on ASS, capable of explaining 99.6599% for fluctuations of ASS, which means that 99.6599% change in ASS of public companies in plastic and packaging industry in Vietnam is caused by the impact of 4 variables SAL, EQU, DR, ROA.

$+\alpha_2$=0.139793 reflects that sale has a positive effect on enterprise's asset investment, which means that the larger the sale, the larger the asset investment of public companies in the plastic and packaging industry listed in Vietnam. When other factors are held constant, if the decimal logarithm of the sale value increases by 1%, the decimal

logarithm of assets of the enterprise increases by 0.139793% and vice versa. This can be explained that when there is a growth trend, investors often consider expanding the scale of production and business in search of a larger source of sale, which means an increase in asset investment, when sale increases, it creates more opportunities for businesses to invest. This result is consistent with the study of Erkaningrum (2013).

Table 5: Test results of removing variable INT from the model

Redundant Variables: INT			
F-statistic	1.600624	Prob. F(1,184)	0.2074
Log likelihood ratio	1.870868	Prob. Chi-Square(1)	0.1714
Test Equation:			
Dependent Variable: ASS			
Method: Panel Least Squares			
Date: 08/29/21 Time: 10:28			
Sample: 2013 2020			
Periods included: 8			
Cross-sections included: 27			
Total panel (balanced) observations: 216			
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.096917	0.161471	0.600215	0.5491
SAL	0.139793	0.021002	6.656247	0.0000
EQU	0.832401	0.019374	42.96557	0.0000
DR	0.902986	0.044952	20.08782	0.0000
ROA	-0.585360	0.086464	-6.769982	0.0000
Effects Specification			
Cross-section fixed (dummy variables)			
R-squared	0.996599	Mean dependent var	8.521170
F-statistic	1806.916	Durbin-Watson stat	1.144678
Prob(F-statistic)	0.000000		

$+\alpha_3$=0.832401 means that equity has a positive effect on the asset investment of the enterprise. When other factors are held constant, if the decimal logarithm of the equity value increases by 1%, the decimal logarithm of assets of the public companies in the plastic and packaging industry in Vietnam increases by 0.832401% and vice versa. In theory, when equity increases, it means that the total assets or total capital of the enterprise increases, that is, the scale of asset investment increases. On the other hand, there is a strong negative relationship between the size of equity and the size of total assets on the balance sheet. Therefore, when the equity is larger, the enterprise tends to invest in assets and vice versa. This research result is supported by Jong et al. (2000), Gelos and Werner (2002), Pham et al. (2008), and Le and Le (2012).

$+\alpha_4$=0.902986 means that the debt coefficient has a positive effect on the asset investment of enterprises in the plastic and packaging industry. When other factors are held constant, if the debt ratio increases by 1%, the decimal logarithm of assets of the enterprise increases by 0.902986 % and vice versa. In fact, the size of equity capital of enterprises in Vietnam is often low, so enterprises need to mobilize capital from outside, especially loan capital to meet the needs of expansion. Therefore, when there is an opportunity to increase capital, enterprises will invest in assets to expand production, so the fear coefficient has a positive impact on the asset investment of enterprises. This result is similar to that of Allen (1993), Chen and Steiner (1999) but contrary to the research results of Aivazian et al. (2005).

$+\alpha_5$=-0.585360 means that the return on assets negatively affects the investment in assets of the enterprise. When other factors are held constant, if the return on assets increases by 1%, the decimal logarithm of assets of the enterprise decreases by 0.585360% and vice versa. This result is similar to the result of Le and Le (2012) but contrary to the proposed hypothesis and contrary to the views of Baskin (1989), and Abel and Eberly (1994). The reason is that when enterprises in the plastic and packaging industry in Vietnam expand their production and business scale, due to their limited capital management level, the return on assets will be reduced.

In addition, the model also clearly shows that the average loan interest rate factor has no relationship with asset investment. This result is not consistent with the results of Galan et al. (2007). The average loan interest rate in the model of this article is determined by the interest cost on total debt, including the capital occupied with zero cost of capital. In fact, in Vietnam, it is not easy for enterprises to mobilize loans from commercial banks, so the appropriated capital accounts for a very large proportion. Therefore, the average interest cost is very small and almost not the factor affecting the investment decision in assets of enterprises.

5. Conclusion

The article has studied the internal factors affecting the asset investment of public companies in the plastic and packaging industry in Vietnam through data collected from 27 companies in the period of 2013-2020. It is a better study than others because the factors chosen by the authors are very clear and closely related to the asset investment. In particular, the factors given by the author in the article have helped explain up to 99.6599% of the

research problem. Thereby shows the superior level of the outstanding reputation of the study compared to previous research.

The empirical model shows the correlation between intrinsic factors and asset investment, including the sale, equity, debt coefficient has a positive impact on asset investment; return on assets has a negative impact on asset investment; The average loan interest rate does not affect the asset investment of enterprises. From the results of the experimental study, the article makes some recommendations as follows:

- First, public companies in the plastics and packaging industries need to prioritize the profitability of their assets. According to the research results and the actual situation, it can be seen that asset investment companies have not really relied on the profitability of assets. Although investment in assets is necessary for businesses, it should be based on the real profitability of assets. If enterprises do not have good governance, the investment in assets will be spread and ineffective leading to many consequences in the future. To do this well, businesses need to improve their cost management capacity and the ability to exploit current assets. Accordingly, enterprises need to control input costs well, proactively seek out locally available raw materials; good control of inventory by applying inventory management models; at the same time, enterprises also need to control well selling and administrative expenses. In addition, businesses need to regularly maintain, repair, and upgrade fixed assets to better exploit assets.
- Secondly, companies need to improve their internal management capabilities to increase financial resources. The research results show that factors reflecting financial resources such as sales and liabilities have a positive impact on asset investment of companies in the plastic and packaging industries, helping these companies to have favorable conditions to expand the scale of asset investment. However, enterprises should aim to invest in assets in a sustainable way, should not increase asset investment when the profitability of assets is still low. Instead, companies need to focus on improving cost management in helping businesses both save costs and have the opportunity to increase financial resources, resulting in the sustainable development of businesses.

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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