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The Effect of Factors on Operational Efficiency and the Relationship between Operational Efficiency and Solvency of Logistics Joint-Stock Companies

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ABSTRACT: Operational Efficiency (OE) and solvency play an important role in the success of any enterprises. Therefore, studying the relationship between OE and solvency needs to be taken comprehensively and continuously in order to find out long –term solutions for increasing business effectiveness. This paper examines the determinants of OE and the relationship between OE and solvency of the logistics joint-stock companies (JSCs) listed on the Vietnam Stock market with answers for the above - mentioned issues. This study mainly investigates 30 listed logistics firms from 2014 to 2018. The findings of this study suggested that the relationship between OE and solvency of logistics JSCs is inversely correlation.

KEY WORDS: Operational Efficiency, Solvency, Logistics JSCs.

1. INTRODUCTION

In the world's current trend, logistics has become an economic industry - an essential service not only in Vietnam but also in the world. According to Council of Supply Chain Management Professionals (CSCMP), logistics which is an important sector in the overall structure of national economy, can bridge the gaps among other economic sectors, as well as promote the overall national economy. Therefore, this industry can solve the problem of optimizing unnecessary costs. Not falling out of this trend, top logistics enterprises in Vietnam have equipped themselves with sustainable resources in order to adapt to this change and serve full potential domestic market. In this context, managers need to understand the financial structure of their businesses to make appropriate adjustments and decisions to ensure operational efficiency and enhance development. However, Vietnamese researchers have put too much emphasis on capital structure (the relationship between debt and equity) and they have only paid little attention to solvency, which is also a very important issue in financial management. According to statistics of Hanoi Stock Exchange (HNX) and Ho Chi Minh City Stock Exchange (HOSE), the amount of capital listed on the trading floor of Vietnamese logistics enterprises is still moderate. There exist significant gaps in the amount of limited capital among internal enterprises in the same industry. According to the Vietnam Business Association, there are 1,200 logistics enterprises operating in the public sector. Apart from state-owned enterprises, most of them are small and medium-sized companies with limited resources. Therefore, these private companies cannot guarantee the ability to pay their own debts and ensure operational efficiency at the same time. This current situation generates deep challenges in management, investment, and production. All of these give rise to challenges for logistics JSCs in their business operation, in which, OE and solvency are not exceptional. The link between OE with the solvency of these companies is still controversial. Up to now, there is generally hardly any domestic concrete research to clarify the relationship between OE and solvency of enterprises and especially among logistics JSCs in Vietnam. As a result, this article will concentrate on identifying determinants of OE and the tie between OE and solvency of logistics JSCs so as to give a supported clue for this problem.

2. LITERATURE REVIEW AND HYPOTHESIS

There are many concepts of Operational Efficiency (OE) from different researchers both domestically and internationally and below are some typical ones. Operational efficiency can be formally defined as the ability of an enterprise to ensure the high quality of its products and services while delivering products or services to its customers in the most cost-effective manner possible (Beal, 2016). In addition, according to Matthew Burrows (2016), OE is not just about reducing costs; other business objectives including service quality, still have to be achieved in order to keep existing customers and maintain high revenue. Also, the study of Dennis Hartman (2016) pointed out a method of measuring OE by evaluating how well a business managed its resources and utilized them to generate profits. A theory which was developed by Neil Kokemuller (2016) focused on OE in terms of encompassing several strategies and techniques used to accomplish the basic goal of delivering quality goods to customers in the most cost- effective and timely manner; and on OE involving performing similar activities in more efficient ways than their competitors. Moreover, Subha Varadan (2016) proposed that "OE is a critical system that can keep a company in business or close it down". In terms of typical domestic researches, Nguyen Van Cong (2019) pointed out that the OE of a company reflected operation results that a company possibly got when it used its input for business operation. Basically, OE is an indicator of the efficiency of using the input elements of business operation and solvency.

In terms of measuring OE, the study of Bernstein (1988) identified that OE which presented firm performance can be evaluated by financial ratios such as solvency, capital structure, profitability, and turnover. In addition, Feng (2000) did also take financial ratios into consideration on carrying out firms' performance evaluation process for airlines by using grey relation analysis and TOPSIS method to overcome the problem of small samples and outranking of airlines. According to Hobarth (2006), he showed the correlation between financial indicators and OE of listed firms in the USA for a19- year period by using 17 financial indicators and 3 variables to measure firm's performance, namely market performance (measured by changes in stock market value), cash flow performance (solvency), and profitability (ROI). Sandstrom (2007) presented a historical review and some pragmatic solutions to Solvency. More specifically he discussed four fundamental issues needed for constructing solvency systems, i.e. valuation of assets and liabilities, risk margin for uncertainty in liabilities and assets and risk measures and modeling (risk categories, risk mitigation, diversification, etc.).

Regarding solvency, there is an array of different definitions. First of all, according to Pentikäinen, T. (1952), the definition of solvency was the difference between assets and liabilities. Benjamin (1977) refered to the Oxford Dictionary, which defined solvency as "having enough money to meet all liabilities". Developing the theory of Pentikäinen, T, Jackson et al. (2002) defined a firm's solvency as when its total assets were higher than current liabilities. Langiemer (2004), solvency measured the amount of debt and other cost obligations used in a company's business compared to the amount of equity invested in an enterprise. Ibenta (2005) argued that solvency was a firm's ability to meet capital needs.

Scale of company: Usually, large-scale businesses will have incessant and sustainable resources. With financial strength these businesses will easily minimize input costs and increase output efficiency. Research by Gleason, L. K Mathur and I.Mathur (2000), Onaolapo and Kajola (2010) showed that firms' size had a positive and significant impact on business performance, i.e.the bigger a business is, the efficiency it could generate. However, according to the results of other studies from such researchers as Mudambi and Nicosia (1998), Lauterbach and Vaninsky (1999), Durand and Coeuderoy (2001), Tzelepis and Skuras (2004), Zeitun and Tian (2007), the scale had positive impact but not significant on business performance of the enterprise.

H1: Scale of company has a positive impact on Operational Efficiency

Degree of financial independence: The degree of financial independence is presented by the proportion of owner equity out of total equity (abbreviated as ER). The more debts a company owed, the lower degree of financial independence of this company is. According to the theory of Modigliani and Miller, when a business starts to borrow, the business will have advantages of tax shield. The low cost of debt combined with the tax shield advantage will lead to a decrease in total cost. Therefore, business performance is enhanced. Specifically, if the companies kept the degree of financial independence at a low level, its OE would increase. In contrast, the empirical research results of Zeitun and Tian (2007), Neil Nagy (2009); Fozia Memon, Niaz Ahmed Bhutto, Ghulam Abbaas (2012) showed that debt ratio had a negative and significant effect on business performance of the enterprise.

H2: Degree of financial independence has a positive impact on Operational Efficiency

Total assets: Empirical research results of Rami Zeitun and Gary Gang Tian (2007); Onaolapo and Kajola (2010); Marian Siminica, Daniel Circiumaru, Dalia Simion (2011); Fozia Memon, Niaz Ahmed Bhutto and Ghulam Abbas (2012) showed that total assets were significantly negative impacts on business performance of the enterprise. According to the research of Marian Siminica, Daniel Circiumaru, Dalia Simion (2011), total assets also had a positive and significant effect on the OE of the company.

H3: Total assets has a positive impact on Operational Efficiency

Sales: The revenue will reflect the capacity of sales activities. An increase in goods sold, can positively affect business performance of a business. The study of Nguyen Quoc Nghi (2010) proved that there existed a direct correlation between total sales and OE.

H4: Total sales has a positive impact on Operational Efficiency

The relationship between OE and solvency

After considering different concepts of OE and solvency, one question has appeared: Is there any relationships between them? In fact, this topic has not attracted many studies from domestic researchers except for some foreign ones.

On the one hand, there exists a positive relationship between OE and solvency.Lambery and Valming (2009) evaluated and compared the solvency management of companies listed on the Stockholm Stock Exchange over two times to see how solvency's changes affecting firms' performance. The results showed that solvency maintenance strategies did not have any significant impact on operational efficiency.

A study of Victor Chukwunwieke (2014) determined the relationship between quick ratio and profitability ratios of listed companies on the Nigerian stock exchange NSE. The author concluded that there was a positive correlation between quick ratio and profitability ratios.

Rafid Hamad (2016) conducted an assessment of the relationship between solvency and performance of Standard Chartered Bank in Pakistan. This study showed that there was a positive relationship between solvency and OE of enterprises.

On the other hand, some researchers announced a negative correlation between OE and solvency. Jennifer Muthio Kyule (2015) conducted a research on the relationship of OE and solvency for financial activities of listed companies on Nairobi stock exchange, Kenya. The dependent variable presented for OE was ROA, while the independent variables were: solvency, liquidity, financial leverage, minimum capital adequacy ratio, and size of businesses (total assets). The author concluded that solvency was negatively correlated with ROA which presented for OE.

Evengi Raykov (2017) explored a trade-off between solvency and profitability in the event of financial crisis. Analysis data were collected by the authors from quarterly financial reports of 20 companies selected from different economies in the Bulgarian economy during 2007-2015. Through empirical testings of many hypotheses, the work came to a conclusion that during the 2007 crisis, financial managers successfully separated profits from payables when the correlation between them was negative.

H5: Operational efficiency has a significant and positive relationship on Solvency

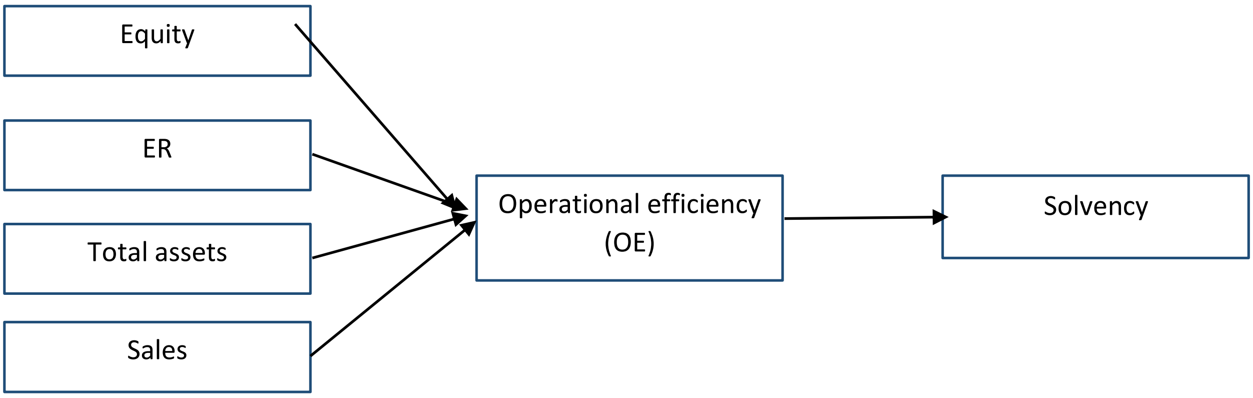

Fig 1. Conceptual Model

3. METHODOLOGY

Evaluation indicators

Operational Efficiency

In a study on the valuation of operating efficiency in Egypt firms, Armer, Mostafa and Eldomiaty (2011) found asset quality, capital adequacy, credit risk and liquidity as major determinants of OE in highly competitive companies. Based on the results found by Armer, Mustapha and Eldomiaty (2011) and a theory developed by Hobarth (2006) about using financial ratios to evaluate OE, Nguyen Van Cong (2019) measured OE via:

- Total asset turnover (TAT) presented for asset quality.
- Equity turnover (ET) presented for capital adequacy.
- Equity Ratio (ER) presented for liquidity.

Solvency

The dimensions' choice was influenced by the work of Nguyen Van Cong (2019).Based on this scale, Solvency can be measured via two ratios:

- Overall Ratios presented for the ability to repay all companies' debts in overall.
- Quick Ratios presented for the ability to secure short-term debts.

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Data

Data used in this study was collected from financial statements, annual reports of logistic firms listed in two major State Securities Commission of Vietnam: HNX and HOSE for the period from 2014 to 2018. These data were audited by the world famous auditing firms (e.g.: E&Y, KPMG, A&C…) and downloaded from the reliable websites of the HNX and the HOSE in this survey.

These logistic firms with their data lead to a research sample with 150 observations during this period. In this case, the above-mentioned data were transferred into Excel and encoded as variables. After that, they become inputs for running regression

Method

In order to examine the OE of researched enterprises, there are six variables used as follows. Two dependent variables which present for OE are Equity Turnover (ET) and Total Assets Turnover (TAT) and four other independent variables: Assets (presenting total assets of a company), Equity (presenting scale of a company), Equity Ratio (ER $=\frac{Owners\ equity}{Total\ assets}$, presenting liquidity of companies) and Sales (presenting the result of selling process). After that, in order to measure the solvency of listed logistics firms, there are two dependent variables: Quick ratio (QUICK $=\frac{Current\ assets - inventory}{Curent\ liabilities}$) and Overall ratio (OVERALL $=\frac{Total\ assets}{Total\ liabilities}$) three other controlling variables, including TAT, ER, and ET.

The study applies both qualitative and quantitative approaches. For a qualitative approach, the study takes a comparative and analytical method in order to assess the current situation of OE and solvency as well as detect the relationship between them. Theory frame is based on a fundamental base about a system of ratios which reflect the OE (ET and TAT) and Solvency (QUICK and OVERALL) of a company.

In addition, in order to strengthen the reliability of this study's result, this paper also uses a quantitative approach by running a regression model of Ordinary Least Square (OLS) with the above-mentioned variables. The OLS's first aim is to investigate how many factors impact OE and what they are. The second purpose is to forecast the link between OE and solvency. This paper uses the statistic software Stata 15 to run the regression to answer these questions.

The use of both qualitative and quantitative approaches aims to strengthen the reliability of the analyses and judgments because it collects evidence from different sources and creates a multi-directional vision of an issue. This combination also helps the result to satisfy planned purposes better and answer the research questions clearly as well as lead to conclusions which ensure a scientific base and feasibility.

4. RESULT

There are many listed firms providing logistic services in Vietnam and their stocks are listed on the two main securities exchanges of Vietnam, the HOSE and HNX. In order to have an overview of financial situation of all firms in this industry, this paper has selected listed firms on both HNX and HOSE.

There are thirty Logistics JSCs which were divided equally in both HNX and HOSE (14 firms listed on the HNX and 16 firms listed on the HOSE). Of these, Vietnam Airlines corporation (HVN) has the highest authorized-capital with nearly 82,000 billion Vietnam Dong (VND), which is nearly two times bigger than the second highest authorized-capital (VJC – 36,000 billion VND and three times bigger than the HNX highest authorized-capital (PHP), while the smallest authorized-capital is PRC with only 12 billion VND. Concretely, eight companies including CDN, DL1, PHP, VJC, GMD, HVN, PVT, and VOS have their scale of capital from over 1000 billion VND. In this paper, all surveyed firms shall be mentioned by their coded stocks instead of their names.

Operational efficiency

Firstly, a company's capital scale is not directly proportional to its OE. More clearly, despite its highest capital scale at nearly 82,000 billion VND, circulating turnover of total assets in HVN only ranks kin the eleventh place at 0.75times, which is lower than the lowest authorized-capital firm VNLas shown in Table 1.

This conclusion is also strengthened when VJC stands in the second place of capital scale (at 36,000 billion VND) but at the tenth place of OE in terms of total assets turnover (TAT). On the other hand, in this period, VNL and PRC have the lowest capital scale but express its graduation in circulating turnover of total assets among the first and can be seen clearly in Table 1.

Table 1. **Circulating turnover of total assets (TAT).**

JSCs	2014	2015	2016	2017	2018	Average
01.VNL	2.706	2.451	2.231	2.567	2.851	2.561
02.PRC	3.174	2.371	1.922	1.846	1.598	2.182

03.GSP	1.073	1.371	2.407	2.572	2.579	2.000
04.STG	3.959	2.144	0.602	0.499	0.554	1.552
05.SFI	1.748	1.363	1.277	1.493	1.680	1.512
06.CAG	0.627	0.571	4.995	0.431	0.435	1.412
07.VNS	1.676	1.604	1.487	0.945	0.705	1.283
08.VJC	1.305	1.117	1.037	0.950	1.029	1.088
09.MAC	1.002	0.858	0.851	0.832	0.748	0.858
10.TTZ	0.389	0.777	0.971	0.358	1.720	0.843
11.HVN	0.865	0.532	0.663	0.762	0.926	0.750
12.NAP	0.644	0.511	0.624	0.641	0.682	0.620
13.BSC	0.591	0.496	0.961	0.495	0.528	0.614
14.HHG	0.583	0.613	0.602	0.604	0.469	0.574
15.HTV	0.587	0.590	0.524	0.495	0.571	0.553
16.VGP	1.031	1.397	0.234	0.104	0.000	0.553
17.HAH	0.568	0.509	0.463	0.525	0.505	0.514
18.CDN	0.226	0.505	0.558	0.516	0.477	0.456
19.VSC	0.574	0.512	0.337	0.334	0.391	0.430
20.TMS	0.506	0.461	0.423	0.343	0.300	0.407
21.CLL	0.453	0.440	0.414	0.391	0.316	0.403
22.VOS	0.369	0.314	0.260	0.399	0.450	0.358
23.PVT	0.283	0.338	0.349	0.370	0.438	0.356
24.DL1	0.452	0.378	0.235	0.046	0.019	0.226
25.PHP	0.155	0.255	0.251	0.227	0.218	0.221
26.ACV	0.211	0.255	0.000	0.289	0.316	0.214
27.HMH	0.203	0.283	0.164	0.150	0.136	0.187
28.PGT	0.261	0.072	0.043	0.043	0.239	0.131
29.GMD	0.161	0.152	0.139	0.092	0.033	0.115
30.TCO	0.124	0.088	0.057	0.059	0.060	0.078

From the above analysis, it can be said that a big capital scale is a convenient condition for a company to increase its OE but whether a company is able to explore this advantage or not, it is quite a different case.

To strengthen the founded result, our research team uses statistical software STATA 15 to model a regression with the least squares regression method (OLS). After running model with the dependent variable of (TAT) as well as the three independent variables including Equity, ER and Sales (Independent variables are under logarithm),the results are expressed in Table 2.

Table 2. Regression TAT with Equity, ER and Sales

```
. reg tat er logequity logsales

      Source |       SS           df       MS      Number of obs   =       150
-------------+----------------------------------   F(3, 146)       =     97.49
       Model |  63.4640536         3  21.1546845   Prob > F        =    0.0000
    Residual |  31.6805086       146  .216989785   R-squared       =    0.6670
-------------+----------------------------------   Adj R-squared   =    0.6602
       Total |  95.1445622       149  .638554109   Root MSE        =    .46582

------------------------------------------------------------------------------
         tat |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          er |   1.569933   .1960385     8.01   0.000     1.182493    1.957372
   logequity |   -.696774   .0428851   -16.25   0.000    -.7815297   -.6120183
    logsales |   .6702494   .0404042    16.59   0.000     .5903968    .7501021
       _cons |   .1958264   .2684158     0.73   0.467    -.3346559    .7263087
------------------------------------------------------------------------------
```

⇨ **TAT= 0.20 + 1.57*ER - 0.70*log(Equity) + 0.67*log(Sales)**

From the above-mentioned results, it can be seen that independent variables of Sales and the ER maintain direct proportion with TAT and have at least 99% statistical meaning. This explains that enterprises with a larger proportion of equity accompanied with higher revenue from sales of goods and services will have significant increases in their OE. In other words, the bigger the companies are, the larger their OE is and vice versa. This result is consistent with the initial judgment of the group.

Secondly, logistics firms' degree of financial independence is not directly proportional to their OE. The percentage of owners' equity in total capital (ER) is the most important ratio to express a company's degree of financial independence. Again, PRC and VNL are still leading companies in circulating turnover of owners' equity at 4,827 and 4,578 times respectively while these firm's percentage of owners' equity is only with its arithmetical mean of 20% during five years.

DL1is an enterprise that has the lowest circulating turnover of owners' equity (ET) with its arithmetical mean for the surveyed period of 0.255 times only. This can be expressed in Table 3.

Table 3. Circulating turnover of total equity (ET).

JSCs	2014	2015	2016	2017	2018	Average
01.VJC	9.022	8.748	6.801	5.174	5.673	7.083
02.PRC	6.563	5.200	4.578	4.243	3.551	4.827
03.VNL	4.518	4.588	4.168	4.619	4.996	4.578
04.HVN	5.340	3.166	3.919	3.814	4.020	4.052
05.STG	6.040	6.232	1.345	0.847	0.779	3.048
06.GSP	1.302	1.654	3.060	3.380	3.918	2.663
07.VNS	2.991	3.032	2.945	1.745	1.152	2.373
08.SFI	2.383	1.749	1.628	1.938	2.160	1.972
09.VOS	1.522	1.337	1.428	2.581	2.648	1.903
10.CAG	0.668	0.615	5.374	0.456	0.725	1.568
11.MAC	1.434	1.157	1.094	1.093	0.987	1.153
12.TTZ	0.531	1.051	1.309	0.454	2.065	1.082
13.HHG	1.235	1.090	1.027	1.011	0.740	1.020
14.VGP	1.625	1.617	0.245	1.188	0.000	0.935
15.BSC	0.747	0.654	1.251	0.624	0.650	0.785
16.HAH	0.850	0.864	0.786	0.752	0.619	0.775
17.PVT	0.703	0.761	0.716	0.708	0.839	0.745
18.NAP	0.775	0.600	0.709	0.704	0.706	0.699
19.HTV	0.760	0.700	0.588	0.568	0.675	0.658
20.TMS	0.720	0.704	0.717	0.577	0.508	0.645
21.CDN	0.325	0.654	0.696	0.711	0.663	0.610
22.VSC	0.689	0.606	0.386	0.370	0.427	0.495
23.CLL	0.614	0.576	0.508	0.432	0.328	0.492
24.ACV	0.434	0.552	0.000	0.535	0.562	0.416
25.PHP	0.203	0.348	0.343	0.292	0.285	0.294
26.DL1	0.522	0.440	0.247	0.047	0.019	0.255
27.HMH	0.224	0.295	0.173	0.157	0.140	0.198
28.GMD	0.215	0.205	0.196	0.122	0.041	0.156
29.PGT	0.268	0.073	0.043	0.044	0.282	0.142
30.TCO	0.133	0.091	0.060	0.063	0.064	0.082

To strengthen the founded result, our research team uses statistical software STATA 15 to model regression with the least squares regression method (OLS). After running model with dependent variable of (ET) as well as three independent variables including Asset, ER, and Sales (Independent variables are under logarithm),the results are expressed in Table 4.

Table 4. **Regression ET with Asset, ER and Sales**

```
. reg et er logasset logsales

      Source |       SS           df       MS      Number of obs   =       149
-------------+----------------------------------   F(3, 145)       =     77.73
       Model |  304.476301         3  101.4921     Prob > F        =    0.0000
    Residual |  189.334743       145  1.30575685   R-squared       =    0.6166
-------------+----------------------------------   Adj R-squared   =    0.6087
       Total |  493.811043       148  3.3365611    Root MSE        =    1.1427

------------------------------------------------------------------------------
          et |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          er |  -2.856085   .4449646    -6.42   0.000     -3.73554   -1.976631
    logasset |  -.8936799   .0996536    -8.97   0.000    -1.090641   -.6967185
    logsales |   1.001941   .1021796     9.81   0.000     .7999873    1.203895
       _cons |   2.750587   .8168767     3.37   0.001     1.136063    4.365111
------------------------------------------------------------------------------
```

⇨ **ET = 2.75 – 2.86*ER – 0.89*log(Asset) + 1.00*log(Sales)**

With the above-mentioned results, it can be seen that two independent variables Asset (Asset) and ER maintain an inverse relationship with dependent variable ET and have at least 99% statistical meaning. This shows that OE of logistic JSCs will decrease when it keeps total assets and its financial independence at a high level. This result is not consistent with the initial judgment of the group.

Solvency

Regarding the solvency of joint - stock companies listed on Vietnam's stock market, our research group uses two common indicators namely Overall ratio and Quick ratio to measure, evaluate, and our team draws the following conclusions.

Firstly, through Table 5, we can see that the order of all surveyed enterprises has completely changed when compared to OE. In more detail, DL1 is a low-performing enterprise, and its asset and equity turnover ratios are significantly smaller than other firms in the same industry. However, this company has sufficient resources to maintain the overall ratio at 72.02 times, which is the highest among all surveyed firms. In contrast, HVN and VJC are two enterprises with a large capital scale and good operating efficiency, but the solvency of these businesses is limited when both ratios are ranked at the last level.

Table 5. Overall ratio

JSCs	2014	2015	2016	2017	2018	Average
01.DL1	5.842	9.060	34.112	169.439	141.661	72.023
02.PGT	61.533	68.433	43.347	32.582	4.025	41.984
03.HMH	21.033	26.170	16.623	32.103	36.246	26.435
04.TCO	38.102	24.741	18.057	14.192	21.755	23.369
05.CAG	16.710	12.195	17.009	20.076	24.507	18.099
06.CLL	3.985	4.458	6.896	25.520	30.494	14.271
07.VGP	4.510	24.747	18.660	1.051	0.000	9.794
08.NAP	6.403	7.149	10.092	12.917	10.324	9.377
09.VSC	5.913	7.062	8.818	12.457	11.546	9.159
10.HTV	4.906	8.872	9.520	6.659	6.355	7.262
11.BSC	4.507	3.830	5.081	4.671	6.262	4.870
12.TTZ	3.966	3.719	3.820	5.663	6.070	4.648
13.SFI	4.619	4.451	4.815	4.008	5.089	4.596
14.GSP	6.605	5.276	4.243	4.128	2.406	4.532
15.GMD	4.013	3.759	3.154	5.328	5.108	4.272
16.CDN	3.645	5.575	4.632	3.090	4.042	4.197
17.PHP	3.897	3.609	4.496	4.542	3.993	4.107
18.MAC	3.090	4.545	4.451	3.944	4.326	4.071
19.HAH	2.516	2.369	2.491	5.403	5.450	3.646
20.STG	2.530	1.327	2.110	2.843	4.490	2.660

21.TMS	3.293	2.648	2.303	2.650	2.286	2.636
22.HHG	2.020	2.563	2.340	2.651	2.827	2.481
23.VNS	2.171	2.083	1.967	2.497	2.661	2.276
24.VNL	2.186	2.112	2.193	2.311	2.347	2.230
25.PVT	1.753	1.846	2.074	2.119	2.072	1.973
26.PRC	1.868	1.811	1.695	1.863	1.775	1.802
27.ACV	1.902	1.839	0.000	2.241	2.330	1.663
28.VOS	1.344	1.275	1.172	1.195	1.215	1.240
29.HVN	1.185	1.177	1.230	1.272	1.330	1.239
30.VJC	1.138	1.152	1.199	1.242	1.206	1.187

In terms of quick ratios, the order is still unchanged. Enterprises have low operational efficiency will have high solvency and vice versa. Specifically, PGT holds the highest position for quick ratio (36.07 times), followed by DL1 with the second highest solvency at 15.91 times, but the performance of both these businesses is at a low level.

Table 6. Quick ratio

JSCs	2014	2015	2016	2017	2018	Average
01.PGT	61.386	68.433	27.680	20.599	2.243	36.068
02.DL1	5.378	9.151	9.423	30.266	25.315	15.907
03.BSC	3.392	6.087	13.228	11.270	14.157	9.627
04.TCO	7.554	7.366	11.247	6.418	9.738	8.465
05.HMH	5.728	7.320	4.440	8.441	13.070	7.800
06.CAG	7.068	4.711	5.925	7.422	9.392	6.904
07.CLL	0.693	2.721	4.767	10.468	13.255	6.381
08.HTV	3.454	7.012	7.846	3.632	3.950	5.179
09.VGP	1.761	13.535	8.838	1.036	0.000	5.034
10.GSP	5.821	4.000	3.618	3.790	2.445	3.935
11.VSC	2.455	3.113	3.184	3.185	3.319	3.051
12.VNL	1.835	3.060	3.294	3.244	2.691	2.825
13.CDN	1.618	4.920	3.465	1.253	2.331	2.717
14.PHP	1.559	1.857	3.410	3.204	2.239	2.454
15.SFI	2.176	2.302	2.904	2.252	2.376	2.402
16.ACV	1.758	2.694	0.000	3.519	4.032	2.401
17.NAP	1.641	2.233	3.814	1.818	2.150	2.331
18.HAH	1.863	1.772	1.590	1.786	3.137	2.030
19.MAC	1.429	2.214	2.171	1.876	2.033	1.945
20.PVT	1.935	1.625	1.979	1.949	1.665	1.831
21.GMD	3.870	2.161	0.537	1.261	1.010	1.768
22.TMS	1.981	2.305	1.203	1.083	1.469	1.608
23.STG	1.965	1.122	1.011	1.106	0.659	1.173
24.TTZ	1.209	0.765	0.913	1.116	1.165	1.034
25.HHG	0.314	1.206	0.757	1.407	1.258	0.988
26.VJC	0.973	0.876	0.806	0.914	0.800	0.874
27.VOS	1.161	1.059	0.758	0.619	0.665	0.852
28.PRC	0.884	0.924	0.688	0.828	0.793	0.823
29.VNS	0.767	0.633	0.385	0.511	0.566	0.572
30.HVN	0.577	0.584	0.617	0.476	0.486	0.548

Relationship between operational efficiency and solvency

After considering both OE and solvency of logistics JSCs listed on the Vietnamese Stocks market, this study draws some findings as follows.

Firstly, there is an inverse correlation between OE and solvency of enterprises. A business with good performance always has not enough resources to maintain a stable solvency. This is explained by the fact that VNL and PRC are always the two leading companies in terms of operating efficiency, however, they show solvency at a low level. Not only does it occur in small and medium-sized companies, but this relationship also exists in large companies. Through Table 6 and Table 6, despite their largest scale ad high financial independence, HVN and VJC only have enough resources to ensure the overall solvency and cannot guarantee the ability to pay short-term debts.

The results are similar to the results of the previous studies. According to (Kyule, 2015), the solvency of companies was negatively correlated with OE. This has been validated for all surveyed companies by our research team, especially VNL, PRC, HVN, VJC and DL1. In addition, (Raykov, 2017), companies that reduced their solvency and raise more debts would boost their efficiency of the companies' operations. This is a negative correlation.

To strengthen the founded result, our research team used statistical software STATA 15 to model regression with the least squares regression method (OLS). After running model with the dependent variable of (OVERALL) as well as the three independent variables including TAT, ER and ET, the results are expressed in Table 7.

Table 7. **Regression OVERALL with TAT, ER and ET**

```
. reg overall tat et er
```

Source	SS	df	MS
Model	14934.3589	3	4978.11962
Residual	45633.608	144	316.900055
Total	60567.9669	147	412.026985

Number of obs	148
F(3, 144)	15.71
Prob > F	0.0000
R-squared	0.2466
Adj R-squared	0.2309
Root MSE	17.802

overall	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
tat	-12.91052	3.461433	-3.73	0.000	-19.7523	-6.068733
et	5.44156	1.780232	3.06	0.003	1.922799	8.960322
er	51.77024	9.165592	5.65	0.000	33.65376	69.88672
_cons	-23.95817	7.311551	-3.28	0.001	-38.41	-9.506342

OVERALL = -23.96 – 12.91*TAT + 5.44*ET+51.77*ER

Moreover, our research team also used statistical software STATA 15 to run model with the dependent variable of (QUICK) as well as the three independent variables including TAT, ER and ET, the results are expressed in Table 8.

Table 8. **Regression QUICK with TAT, ER and ET**

```
. reg quick tat et er
```

Source	SS	df	MS
Model	2347.03012	3	782.343373
Residual	8503.0445	144	59.0489201
Total	10850.0746	147	73.8100314

Number of obs	148
F(3, 144)	13.25
Prob > F	0.0000
R-squared	0.2163
Adj R-squared	0.2000
Root MSE	7.6843

quick	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
tat	-4.530797	1.494173	-3.03	0.003	-7.484142	-1.577453
et	1.97917	.7684602	2.58	0.011	.460251	3.498089
er	20.7085	3.956447	5.23	0.000	12.88829	28.52872
_cons	-8.992905	3.156126	-2.85	0.005	-15.23123	-2.754585

⇨ **QUICK = -8.99 – 4.53*TAT + 1.98* ET + 20.71*ER**

Table 7 and Table 8 show that the independent variable TAT is inversely proportional to both solvency ratios: Overall ratio and Quick ratio and has at least 99% statistical meaning. This result is consistent with the previous research conclusion of (Raykov, 2017) and (Kyule, 2015). If a logistics company increased the turnover of its total assets to enhance its OE, this firm would have to bear the risk of reducing its solvency. In other words, the more efficient in the use of assets is, the more limited its ability to pay debts and vice versa.

Secondly, equity turnover (ET) and ER are necessary yet sufficient conditions to increase solvency. Generally, there is a direct proportion between ET, ER and solvency; or big scales of capital and highly independent JSCs are premises for the creation of a high solvency. This is proven when two independent variables ET and ER are directly proportional with both solvency ratios and have at least 99% statistical meaning. However as analyzed above, increasing turnover of the total assets reduced the solvency of the enterprises significantly. For logistics JSCs, despite having a large capital scale and high degree of financial independence, these enterprises allocated a large amount of companies' resources on enhancing OE by promoting total assets turnover. Although the efficiency of operations increases, the solvency decreases due to over-utilized resources. This gives rise to payment risk for these businesses. From the results of qualitative and quantitative approach in thirty logistics JSCs, it can be concluded that high performance can lead to low solvency and vice versa.

Table 9. Hypothesis test's results

Hypothesis	Contents	Results
H1	Scale of company has a positive impact on Operational efficiency	**Accepted**
H2	Degree of financial independence has a positive impact on Operational efficiency	**Rejected**
H3	Total assets has a positive impact on Operational efficiency	**Accepted**
H4	Total sales has a positive impact on Operational efficiency	**Accepted**
H5	Operational efficiency has a significant and positive relationship on Solvency	**Accepted**

5. CONCLUSION AND RECOMMENDATION

By analyzing the relationship between OE and solvency of logistics JSCs listed on the Vietnam Stock market in the 2014-2018 period, this study draws the conclusion that OE and solvency exist an inversely proportional relationship. In other words, a strong OE possibly causes low solvency and vice versa.

From the above-mentioned results, it is possible to come up with some policy implications for logistics JSCs. Firstly, these surveyed firms should restructure their total assets. This movement aims at controlling assets turnover and raising these companies' solvency. A suitable structure for assets shows a reasonable usage of capital and helps a company save its costs of mobilizing capital and guarantee their solvency. This also means a company should promote mobilized capital for its business operation or expands its scale of capital and assets as well. In other words, a reasonable structure of assets is a necessary condition.

Secondly, low OE firms should raise more debts to balance between their performance and solvency. Raising more debts helps these companies tighten their cost by tax shield and keep their business performance. This would help companies improve their operational activities considerably and stabilize their profitability.

By researching the relation between OE with solvency of logistics JSCs listed on the Vietnam Stock market, this paper contributes both certain theoretical (clarifying their links) and practical content (giving solutions to increase both OE and solvency). However, as the data of these logistics JSCs being are only take from a five-year period, it is not long enough to have a large research sample. A related study in the future may be undertaken including more industries rather than the logistics field only and a study over a longer period of time would give out a more precise prediction the relationship between OE and solvency, and more elements which affect them in companies.

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