

An Analysis of Determining the Most Valuable Company Based on Financial Analysis and Principal Component Analysis Methods

Zhe Ji^{1,*†} Andy Rui Chen Lu^{2,†} Jingyi Wang^{3,†} Yijin Sha^{4,†}

¹*School of Business, Nanjing University, Nanjing, Jiangsu 210046, China*

²*Stern School of Business, New York University, New York, New York 10012, The United States*

³*Questrom School of Business, Boston University, Boston, Massachusetts 02215, The United States*

⁴*UT College of Liberal Arts, The University of Texas at Austin, Austin, Texas, 78712, The United States*

*Corresponding author. Email: 181098107@smail.nju.edu.cn

†These authors contributed equally.

ABSTRACT

There are four profitable and valuable companies, Oshkosh Corporation, Intel Corporation, Arena Pharmaceutical Inc., and the Walt Disney Company, and we are choosing the most valuable one for investors to invest in. Among these four companies, the most valuable one should be determined carefully. This paper provides a comprehensive analysis and evaluation framework for investors to determine the best performing and valuable stock for investment. We study the financial performance and profitability of the four companies from two perspectives: core financial factors and the Principle Component Analysis measuring method. In this study, we calculate and analyze the cheapness, sales growth, profitability, and dividends of each company, and make a decision of the best performing company in each perspective. The result leads to our conclusion that the overall best performing company is Oshkosh Corporation. In addition, this paper further analyzes four companies' performance by the Principle Component Analysis method in order to examine and strengthen our previous finding that Oshkosh Corporation is the most valuable company for investors to invest in.

Keywords: *Principle Component Analysis methods, financial factors, profitability, stock price*

1. INTRODUCTION

Oshkosh Corporation, also called Oshkosh Truck, is an American industrial company, which is responsible for designing and building specialty trucks, truck bodies, access equipment, military vehicles, and airport fire apparatus. Oshkosh Corporation is an old corporation because it was founded in 1917. It is driven by the four-wheel drive system, which allows people to go where they never thought they would. In other words, its original goal is to design and build innovative products that power global progress. In addition to building machines, in Oshkosh, engineering vehicles and equipment are very crucial, which could move industries forward. Undoubtedly, electric vehicles are a vital tool for more sustainable development in the future. In this area, Oshkosh has been developing electric vehicles for more than 25 years. In a word, Oshkosh is a well-known corporation and all its products are extremely useful. After the general introduction to this corporation, now the most important thing is to figure out whether its stock

is worth to purchase now. As an investor, we need to be focus on which aspects can affect the value of the stock, so that we can have the most appropriate chance to purchase the most valuable stock.

There are lots of literature about analyzing how to pick up a good stock. In the first literature, Morgan et al., [1] were trying to figure out the stock reports under this condition. The conclusion was that when under the uncertainty about a sender's incentives to report information, they observed the environment as a natural setting where to explore strategic information transmission. Nonetheless, the model they analyzed was sufficiently general, which means the observations about amount of information transmission and the nature in this context can also be used in other conditions. The second one incorporated that Rizvi [2] tried to explore econophysics with Efficient Market Hypothesis to take on a comparative analysis of Islamic and developed countries' markets by extending the understanding of their multifractal nature. Finally, after

collecting the multifractal nature of stock market data, the result illustrates a relatively higher efficiency of the developed markets in the short term and a moderate efficiency ranking in the long term. Chordia [3] is trying to figure out the liquidity movements in stock and Treasury bond markets over a period of more than 1800 trading days. Finally, weekly regularities in bond and stock market liquidities nearly mimic. Besides, at both daily, bi-weekly, and monthly horizons, shocks to volatility or spreads in either market will have a persistent influence on spreads in both markets. In the fourth one, Cadrin [4] used an innovative method to explore stock. Traditional multivariate morphometrics have successfully differentiated many fish stocks. After the two examples that have been described, it illustrated that advanced morphometric techniques could be used to accurately distinguish stocks of lobster and salmon based on different history of life.

Recently, machine learning method also is used to investigate the stock price in literature. Schumaker [5] was trying to analyze a predictive machine learning approach for financial news articles analysis with several different textual representations: Bag of Words, Named Entities, and Noun Phrases. They investigated 9,211 financial news articles and 10,259,042 stock quotes covering the S&P 500 stocks during a five-week period. Dechow [6] document that short sellers position themselves in the stock of firms, and then cover their positions as the ratios mean return. Besides, it also illustrates that the short sellers refine their trading strategies to maximize their investment returns and minimize transactions costs. Cao [7] used different nonlinearity tests available to show that such volatility series are strongly nonlinear, and then explored the use of threshold autoregressive (TAR) models in describing monthly volatility series. Next, Chiang [8] were focusing on exploring the time-series behavior of stock returns for seven Asian stock markets. Generally, higher average returns will be associated with a higher level of volatility. Exploring the relationship between stock returns and unexpected volatility, the evidence illustrates that four out of seven Asian stock markets have significant results. Mizuno [9] showed a neural network model for technical analysis of stock market, and its application to a buying and selling timing prediction system for stock index. In this literature, a learning method was recommended for improving prediction accuracy of other categories, controlling the numbers of learning samples by using information about each important category. Experimental simulation which used actual price data was carried out to explain the usefulness of the method. In the last one, Paramati [10] were trying to explore whether the stock market performance leads to economic growth or vice versa. They used of monthly Index of Industrial Production (IIP) and quarterly Gross Domestic Production (GDP) data for the time span of April 1996 to March 2009,

which provided rich data for the empirical analysis. They undertake; Unit root (ADF, PP and KPSS) tests, Granger Causality test, Engle-Granger Cointegration test and Error Correction Model.

In this article, we analyse Oshkosh Corporation, Intel Corporation, Arena Pharmaceutical Inc., and Walt Disney Company, four companies with investment potential, using financial factor analysis. We evaluate these four companies from four perspectives: cheapness, sales growth, profitability, and the dividend paid, because the combination of these factors gives investors a comprehensive yet straightforward view of the companies. Secondly, we use the Principal Component Analysis (PCA) method to further confirm our conclusion from the same perspectives as financial factor analysis.

Finally, we introduce our article's structure. After introduction and literature review part, we will have a brief background introduction for the four company (section 2). Then, there will be a first contrast of the stocks among the four companies. In this section, we can approximately get a general idea of which company's stock is worth to purchase. Next, we will analyze the four companies to recommend from the value investing aspect. These four factors will be our determinants: their cheapness, their sales growth, their profitability, and their dividends. Specifically, we would choose the following different types of statistics: P/E ratio, EV/EBITA, growth rate of sales, GP/Assets, Sales/Assets, Gross Margin, and Dividend Yield. We found all the data of these four companies from 2015-2019 (section 3). The next section is Principal Component Analysis. There are two parts: the first one is Introduction of PCA. The second part is Standardization of Figures. In this section, we will use many tables to figure out the situation of stocks (section 4). The last section is the conclusion. In this part, we will show our finding after testing all above data (section 5).

2. ENTERPRISES BACKGROUND

In this paper, we are going to analyze and evaluate four valuable companies: Oshkosh Corporation, Intel Corporation, Arena Pharmaceutical Inc., and the Walt Disney Company. Before diving down into the analysis, in this section, four enterprises basic background information is provided, and their stock price trends are shown and analyzed.

2.1. Oshkosh Corporation background Information

Oshkosh Corporation is an American industrial company. It is a leading company in the market to design and construct specialty trucks, military vehicles, access equipment, fire & emergency, and so on.

Oshkosh Corporation expands and develops abundant trademarks including Oshkosh, JLG, Pierce, McNeilus, Jerr-Dan, Frontline, London, IMT, Command Zone, etc. And while its primary business is manufacturing and delivering machines, its business is so much more than machines: It's about "building, protecting and serving communities across the world". Its strong market position, diversified and high-quality products, strong innovation capability and customer services all strengthen its competitiveness and the leader position in the market.

2.2. Intel Corporation Background Information

Intel Corporation is a global leader company in the tech-hardware and semiconductor industry to design, manufacture and sell essential related products and technologies for computer. It offers platform products, such as system-on-chip and multichip packages; and non-platform products including accelerators, boards and systems, connectivity products, and memory and storage products. It has transformed from a PC-centric company to a company more strongly focusing on data. It expands its existing markets to the latest technology areas such as artificial intelligence, 5G network, data analysis, mapping, and driving policy technology. Its main businesses include: Data-centric Businesses (Data Center Group (DCG), Internet of Things (IOTG), Mobileye, Non-volatile Memory Solutions Group (NSG), and Programmable Solutions Group (PSG)) and PC-centric Business (Client Computing Group (CCG)).

2.3. Arena Pharmaceutical Inc. Background Information

Arena Pharmaceutical Inc. is a clinical-stage biopharmaceutical company with great potential which focusing on the discovery, development, and commercialization of novel drugs. It offers drugs in multiple therapeutic areas such as cardiovascular, central nervous system, inflammatory, and metabolic diseases. The company's most advanced clinical programs are ralinepag (formerly APD811) in testing for pulmonary arterial hypertension (PAH) and etrasimod (formerly APD334) in evaluation for inflammatory indications.

2.4. The Walt Disney Company Background Information

The Walt Disney Company is the world's premier international diversified entertainment enterprise. It includes five business segments: Disney Parks, Experiences and Products, Disney Media & Entertainment Distribution, and three content groups—Studios, General Entertainment, and Sports.

Disney Parks, Experiences and Products segment spreads Disney's stories and cultures to life through theme parks, cruise and vacation experiences, and consumer products.

Disney Media & Entertainment Distribution (DMED) aligns technology, media distribution and advertisements to promote and deliver personalized entertainment content to consumers.

The Studios segment operates by collecting world-class entertainment studios for streaming release. It also involves Disney Theatrical Productions, which produce popular stage shows on Broadway and around the world.

The General Entertainment group creates original entertainment and news content for the company's streaming platforms and broadcast networks.

The ESPN and Sports segment creates and produces ESPN's live sports programming, sports news and other sports-related content.

2.5. Stock Price Comparison

By using the data source from Yahoo Finance, we collected four companies' five-year stock price data from March 2016 to March 2020 and drew the four companies' five-year stock price trend diagram below.

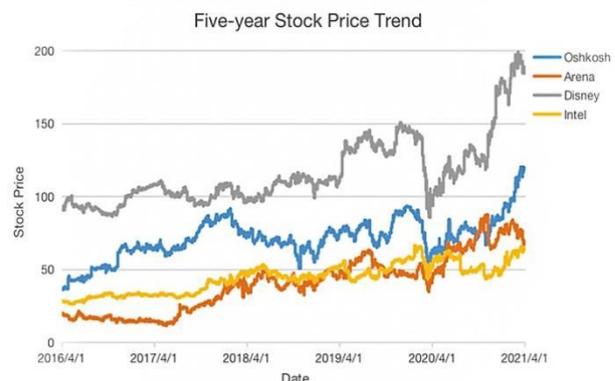


Figure 1 Five-year stock price trend of the four companies

From the figure 1, we can clearly see four companies' stock price trend in the recent 5 years. As shown in figure 1, Disney now has the highest stock price of \$186.91, and Oshkosh has the second highest stock price of \$120.20. Intel's stock price is \$61.96 and Arena's stock price is \$70.61. And for the increase trend, we can know from figure 1 that Arena has the highest increasing rate which is much higher than the other three companies, then are Oshkosh and Intel, and Disney has the lowest increasing rate.

Arena Pharmaceutical Inc.'s stock price was the lowest before Q3 2019. But after Q3 2019, its stock price exceeded that of Intel and continuously increased. Arena's stock price was very low with small increasing

trend in 2016 and 2017, but after Q2 2017, its price increased sharply for more than 100%. Its stock price is continuously increasing very fast with a good future increasing potential. However, we can know from the graph that it has huge fluctuations with uncertainty.

For the Walt Disney Company, as shown in figure 1, even though it has the highest stock price in the four companies, it doesn't have a clear increasing trend in price as the trend is almost keeping the same from 2016 to 2020, with a little increase after Q2 2020.

For Intel Corporation, by analyzing its trend in figure 1, we can know that its stock price is not high in the four companies, and its stock price overall stays the same with small fluctuations, which show that it doesn't have an obvious increasing trend in stock price. Therefore, it doesn't have a clear increasing trend for the future.

For Oshkosh Corporation, its price is the second highest in the four companies, and it has the steadiest growth rate in the four companies. Therefore, we can know that Oshkosh Corporation has constant and high growth rate with an excellent growth potential in the future.

3. ANALYSIS OF FINANCIAL FACTORS

In this section, we will analyze Disney Company (Disney), Intel Corporation (Intel), Oshkosh Corporation (Oshkosh), and Arena Pharmaceuticals Inc. (Arena) to give the investors some recommendations from the perspective of value investing . We will analyze the four companies from four factors: their cheapness, their sales growth, their profitability, and their dividends. These factors combined give investors a comprehensive yet simple view of the companies.

3.1. Cheapness

We can identify if a stock counts as a cheap stock by looking at its P/E ratio and EV/EBITDA ratio. Stocks with relatively lower P/E ratios and EV/EBITDA ratios are called value stocks. Data has shown that these stocks have a relatively higher growth rate. The 25-percentile value of P/E ratios of large US firms is 15.7; the 25-percentile value of EV/EBITDA ratios of large US firms is 8.8. All four stocks can be counted as value stocks because of their low P/E ratio and EV/EBITDA ratio.

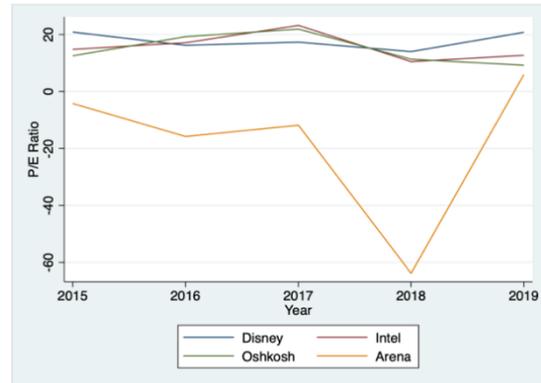


Figure 2 P/E ratio of the four stocks

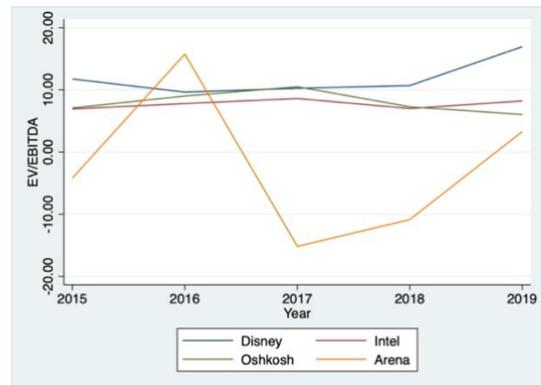


Figure 3 EV/EBITDA ratio of the four stock

3.2. Sales Growth

A company needs to have constant sales growth because it represents that the company can sustainably do its business. These companies are the companies that we would choose to invest in. By looking at the four companies' sales growth, we can easily identify that Arena had enormous sales growth in 2019. However, its sales growths are below 0% in 2017 and 2018. We do not want to invest in this kind of company because their sales fluctuate too much.

In the three remaining companies, we would recommend Oshkosh because its growth rate was positive for all the four years. While Intel's sale growth is similar to Oshkosh's, Intel's Sales is significantly higher than Oshkosh's. Keeping the sales growth positive when the sales are very high is not an easy task, so we reckon that Oshkosh has a better potential to keep its growth rate positive in the coming years. Moreover, Oshkosh's sales growth was 7.2% higher than Intel's in 2019.

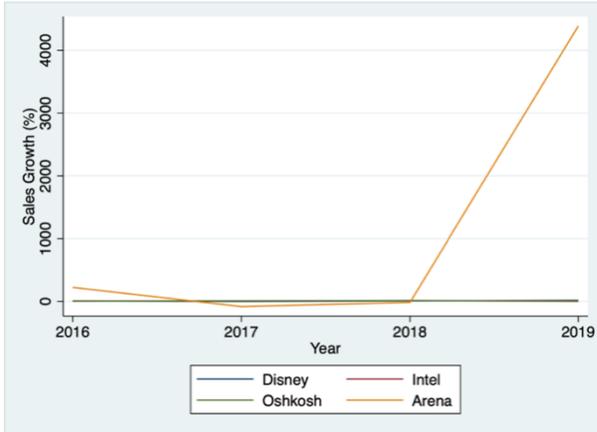


Figure 4 Sales growth of the four companies

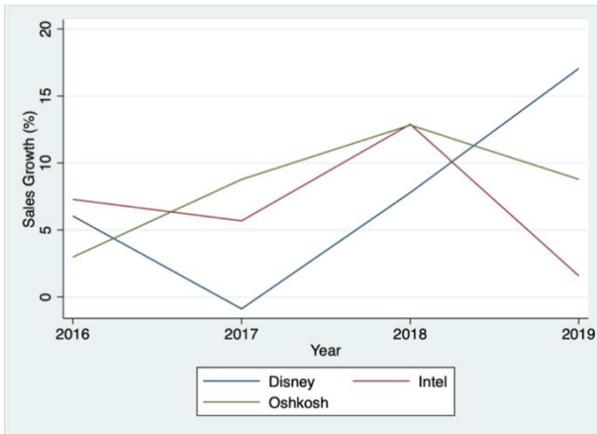


Figure 5 Sales growth of Oshkosh Corp., Intel Corp. and Disney Co.

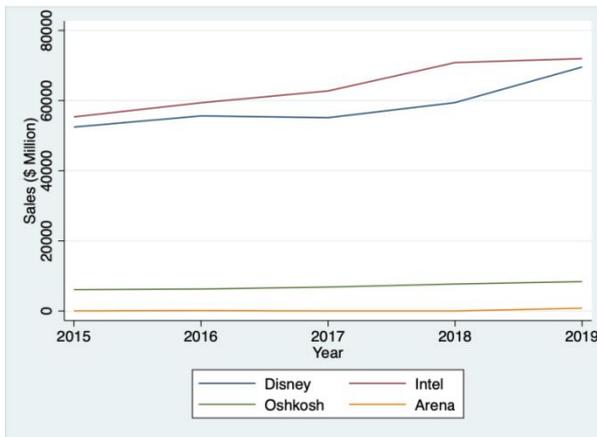


Figure 6 Sales of the four companies

3.3. Profitability

High profitability is one of the most important factors that we should consider when investing. The Gross profit to assets ratio (GP/Assets) is the best predictor of returns [11]. It incorporates asset turnover ratio (Sales/Assets) and gross margins (Gross profits/Sales).

The median number of the GP/Assets ratio of firms with higher than \$1 billion in market capitalization was

19.37% in 2019. Arena’s GP/Assets ratio was the highest of the four in 2019, but it fluctuated too much in the previous years. Thus, it is not a good choice in terms of profitability. Disney’s GP/Assets ratio was similar to Oshkosh’s from 2015 to 2018. However, there was a 12.89% decrease in 2019, and Disney’s 2019 GP/Assets ratio was lower than the median. As a result, we do not recommend Disney from the aspect of profitability.

Oshkosh and Intel’s GP/Assets ratio was above the median level and did not fluctuate much. However, Intel’s GP/Assets ratio was lower compared to its main competitor, AMD. In contrast, Oshkosh has an advantage in profitability compared to its competitors.

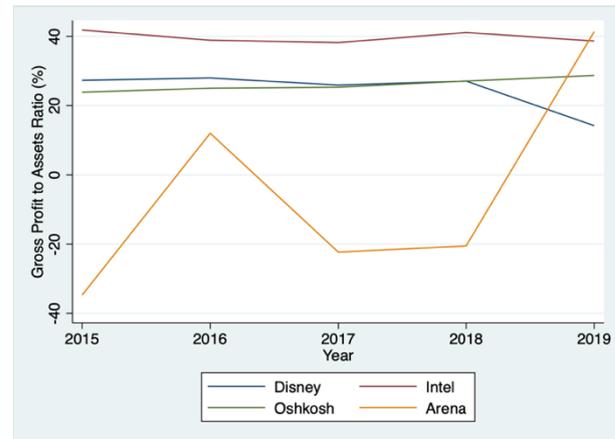


Figure 7 Gross profit to assets ratio of the four companies

3.4. Dividends

Dividends are a highly sought-after stock characteristic because they provide immediate investment income and allow investors to consume without selling and incurring capital gains tax. We use dividend yield here because it makes it easier to see how much return the shareholder can expect to receive per dollar they have invested.

The median dividend yield of firms with higher than \$1 billion in market capitalization is 1.10%. That means Intel, Oshkosh and Disney’s dividend yield is above the median. However, as shown in the graph, Intel pays a higher level of dividends than the other three companies, and paying a 2% to 3% dividend per year is sustainable. Thus, we recommend Intel from the aspect of dividend.

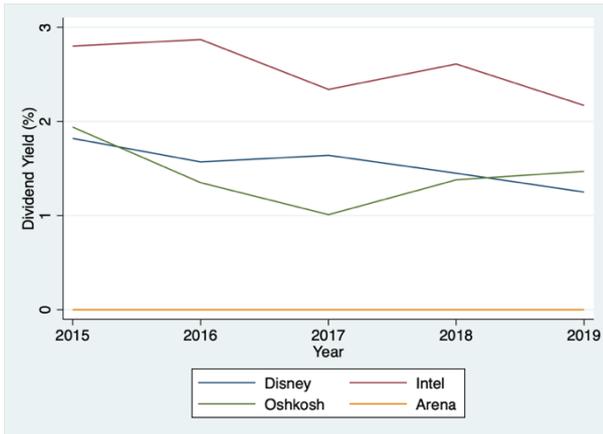


Figure 8 Dividend yield of the four companies

We recommended Oshkosh from the aspects of sales growth and profitability, and we recommended Intel from the aspect of dividends. In summary, we think sales growth and profitability are the more important aspects, so Oshkosh Corporation is the best choice to invest in.

It is essential to mention that our subjective opinions might influence how we analyzed the four stocks and how we came to our conclusion. Thus, we will use a more objective way to analyze the four stocks in the next section.

4. PRINCIPLE COMPONENT ANALYSIS

The origin of principal components analysis (PCA), as we now know it, is in a paper by Hotelling (1933) published in the Journal of Educational Psychology. The place of publication indicates the intended field of

Table 1: EV/EBITDA, P/E, Sales/Assets, Dividend Yield and Sales Growth Rate from 2016 to 2019

Year (2016-2019)	EV/EBITDA	P/E	Sales/Assets	Dividend Yield	Sales Growth Rate
Arena	X ₁₁	X ₁₂	X ₁₃	X ₁₄	X ₁₅
Disney	X ₂₁	X ₂₂	X ₂₃	X ₂₄	X ₂₅
Oshkosh	X ₃₁	X ₃₂	X ₃₃	X ₃₄	X ₃₅
Intel	X ₄₁	X ₄₂	X ₄₃	X ₄₄	X ₄₅

To avoid the influence of various dimensions and standardize the different indices, we segregated the positive and negative factors. Among the 5 factors, EV/EBITDA and P/E are negative factors, while Sales/Assets, Dividend Yield and Sales Growth Rate are positive factors.

For the positive factors:

application where it has been used for many years alongside factor analysis. Since then, it has been used in many other fields, including the biological, physical, and engineering sciences. Its prime purpose is as a means of reducing the dimensionality of a multivariate data set and, also, of illuminating its interpretation by identifying a smaller number of variables which, in a certain sense, summarize the larger set.

The starting point of PCA is the matrix of correlation coefficients derived from the original data set. Strictly speaking, the rationale behind the method requires that the correlations be obtained from variables measured on some continuous scale. In practice, these variables may be precisely continuous, as with something like length or weight, or they may be discrete as when the variable is something we have counted.

4.1. Selection of Variables

In the PCA analysis, in order to assess the cheapness, sales growth rate, profitability and dividend payment of each corporation, we chose 5 variables: EV/EBITDA, P/E, Sales/Assets, Dividend Yield and Sales Growth Rate from 2016 to 2019. Using PCA, the figures of these variables can be used to calculate the score of the 1st principle component from 2016 to 2019, and the corporation with the highest average annual score would be our pick.

The data of EV/EBITDA, P/E, Sales/Assets, Dividend Yield and Sales Growth Rate from 2016 to 2019 is shown in the table below.

$$Y_{ij} = \frac{X_{ij} - \text{Min}\{X_j\}}{\text{Max}\{X_j\} - \text{Min}\{X_j\}} \tag{1}$$

For the negative factors:

$$Y_{ij} = \frac{\text{Max}\{X_j\} - X_{ij}}{\text{Max}\{X_j\} - \text{Min}\{X_j\}} \tag{2}$$

j = 1, 2, 3, 4, 5, i = 1, 2, 3, 4.

After the standardization of data in Table 1, we get the new table below.

Table 2: Standardization of EV/EBITDA, P/E, Sales/Assets, Dividend Yield and Sales Growth Rate from 2016 to 2019

Year (2016-2019)	EV/EBITDA	P/E	Sales/Assets	Dividend Yield	Sales Growth Rate
Arena	Y ₁₁	Y ₁₂	Y ₁₃	Y ₁₄	Y ₁₅
Disney	Y ₂₁	Y ₂₂	Y ₂₃	Y ₂₄	Y ₂₅
Oshkosh	Y ₃₁	Y ₃₂	Y ₃₃	Y ₃₄	Y ₃₅
Intel	Y ₄₁	Y ₄₂	Y ₄₃	Y ₄₄	Y ₄₅

Data in Table 2 is suitable for the adaptation of Principal Component Analysis.

In the conduction of PCA, we calculated the principle components in each year for the 4 corporations. With the data of 2019, we determined the principle components and the weighting of the 5 variables in the 1st principle component.

4.2 Results

Table 3: Results of PCA of data in 2019

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp 1	3.106	1.627	0.6213	0.6213
Comp 2	1.480	1.066	0.2959	0.9172
Comp 3	0.414	0.414	0.0828	1.0000
Comp 4	0	0	0.0000	1.0000
Comp 5	0	.	0.0000	1.0000

Table 4: Top 3 Principle Components in PCA of data in 2019

Variable	Comp 1	Comp 2	Comp 3	Unexplained
EV/EBITDA	0.5177	0.2573	0.4100	0
P/E	0.5377	0.2197	0.2714	0
Sales/Assets	0.2401	0.6641	-0.6378	0
Dividend Yield	-0.4017	0.4900	0.5891	0
Sales Growth Rate	0.4732	-0.4521	0.0667	0

The two tables above show the results of PCA in 2019. Accordingly, the 1st principle component of 2019 is:

$$Z_i = 0.5177 \times Y_{i1} + 0.5377 \times Y_{i2} + 0.2401 \times Y_{i3} - 0.4017 \times Y_{i4} + 0.4732 \times Y_{i5}, i = 1, 2, 3, 4$$

Data in 2016, 2017 and 2018 was handled in the

same way. We imported the annual data to calculate the weighting of each variable in the 1st principle component, Z_i , and obtain the specific figure of Z_i . Then we calculated the annual average of the 1st principle component for each corporation in the 4 years, and obtained the final scores of them.

Scores of each corporation from 2016 to 2019

	Arena	Disney	Oshkosh	Intel
2016	- 1.006	0.604	0.691	0.942
2017	- 0.969	0.777	1.006	0.964
2018	- 0.952	0.781	0.983	0.938
2019	1.597	- 0.230	0.801	0.257
Average	- 0.333	0.483	0.870	0.775

As is shown above, Oshkosh Corporation gets the highest score of the 1st principle component, 0.870, and Arena gets the lowest score which is negative, -0.333. Accordingly, we believe that Oshkosh's stock is the most valuable one among the 4 corporations, while Arena's stock gave the worst performance.

Furthermore, we studied the net income, stock price

and gross margin of Oshkosh Corporation. Its net income increased continually, growing by 152.46% from 2015 to 2019. Stock price and gross margin were also on the rise overall, of which increasing rates were 108.64% and 5.60%. Thus, Oshkosh also had a satisfactory performance in net income, stock price and gross margin.

Table 5: The net income, stock price and gross margin of Oshkosh from 2016 to 2019

	Net Income	Stock Price	Gross Margin
2015	229.5	36.33	18.05%
2016	216.4	56	18.00%
2017	285.6	82.54	18.91%
2018	471.9	71.24	18.63%
2019	579.4	75.8	19.06%

5. CONCLUSION

In this study, our goal is to choose the most valuable and profitable company among four potential companies, Oshkosh Corporation, Intel Corporation, Arena Pharmaceutical Inc., and the Walt Disney Company, for investors to invest in. To find the best company, we conduct two aspects, financial factors analysis and the Principle Component Analysis method. Firstly, from the perspective of financial factors analysis, we investigate and analyze the four companies from four different perspectives (cheapness, sales growth, profitability, and dividends) in order to compare their performance and evaluate the best performance company. Then, we utilize the Principal Component Analysis method based on P/E, EBIT and other indexes to summarize and evaluate the four firms' performance. Finally, we identify the most valuable company for investors based on these two analysis methods.

We adapt the analysis of financial factors and PCA to determine which stock is the most worthy to investment, and come to several conclusions. Firstly,

while all 4 stocks can be counted as value stocks because of low P/E and EV/EBITDA ratio in 2019, only Disney, Oshkosh and Intel had stable and satisfactory growth rate throughout 2016 to 2019. Besides, Oshkosh and Intel's GP/Assets ratio and Sales/Assets ratio were above the market median level and did not fluctuate much. However, Intel's GP/Assets ratio was lower compared to its main competitor, AMD. In contrast, Oshkosh had an obvious advantage in profitability compared to its competitors, making its stock more preferable. And when it comes to dividend, both Oshkosh and Intel's dividend yields are higher than the market median level.

In the PCA analysis, we chose P/E, EV/EBITDA, Sales Growth Rate, Sales/Assets Ratio and Dividend Yield as the 5 variables. Their weighting in the 1st principle component are 0.5162, -0.5070, 0.0338, 0.4666, -0.5076 in 2016; -0.4826, -0.4863, 0.3633, 0.4014, 0.4873 in 2017; 0.5162, -0.5070, 0.0338, 0.4666, -0.5076 in 2018; -0.4694, -0.4827, 0.3677, 0.4187, 0.4859 in 2019. After calculating the weighted average of the 5 variables in each year and obtaining the

average annual score, Oshkosh gets the highest score, 0.870, while the others getting -0.333, 0.483 and 0.775. Accordingly, Oshkosh's stock owns the best comprehensive performance for value investment.

This study also has some limitations. We hold some subjective opinions in the study, which might influence the accuracy of our analysis logic and the conclusion. More objective and rigorous investigation method should further be utilized to analyze in the future research study. The data we used is also limited because we did not collect the data for 2020 and 2021, which are the most turbulent and shock period in the recent 5 years. 2020 and 2021 data might bring us with more useful information. In addition, because our analysis aspects and methods are limited to construct an impeccable conclusion, we have deficiency in conducting measuring methods. There might be other confounding factors which we did not consider about that will affect the result and companies' future growth path. During the study, we analyze four companies from the perspectives of financial factors and the Principle Component Analysis based on previous years' data. However, in the reality, past data and performance cannot perfectly illustrate a company's future performance as future is unpredictable and volatile. There are other factors we should consider about, such as predicting the future trend of each company, the growth potential of the industries, the competitiveness and development ability of companies' products and services, and the expansion and growth ability of the overall companies, so as to have a better view and prediction of the future potential trend.

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