

The plant-based milk market in the context of CAPM and three-factor model – the case of Oatly

Kainan Yin*

Business School, China University of Political Science and Law, Beijing, China

Abstract. The article examines the performance of Oatly, a plant-based food company, and the factors that influence its re-turns. Considering the CAPM and Fama-French three-factor models, tracking market volatility is a key factor for investors. The findings reveal that market risk significantly affects Oatly's performance, as shown by the positive relationship between the intercept and Mkt-RF. Investors must monitor market trends closely to make informed investment decisions. The analysis of Oatly's beta value indicates that it is a low-risk investment option, making it an attractive option for investors seeking stable returns. The study highlights the importance of investing in low-risk options, especially in the plant-based food industry. In conclusion, this study provides valuable insights into the determinants of Oatly's returns and offers a comprehensive understanding for investors seeking low-risk investments. Monitoring market trends and risks is essential for investors in the plant-based food sector, and this study serves as a useful guide for making informed investment decisions. Oatly's low-risk profile makes it an attractive investment option, and investors must stay vigilant and keep track of market changes to make the most of this opportunity. This study offers important insights that can help investors navigate the complex and dynamic world of plant-based food investments.

1 Introduction

With the global ecological environment in a state of deterioration and the climate crisis worsening, carbon dioxide emissions are contributing to an increase in disasters caused by global warming. It is imperative to reduce global emissions since carbon dioxide can remain in the atmosphere for hundreds of years. To address the climate crisis, the international community has proposed "carbon neutrality." The agricultural sector is the second-largest sector of carbon dioxide emissions, with animal agriculture being a major contributor. The expansion of the livestock industry, driven by an increasing global population, has resulted in animal agriculture being responsible for nearly 15% of total global emissions. To tackle the environmental problem, controlling negative externalities is the main solution, and the international community advocates for individuals to bear the cost of carbon emissions instead of direct intervention in business emissions. This approach ensures true "carbon neutrality" economically.

According to the 2021 China Youth Green Behavior Report, over 70% of consumers prioritize green consumption. The younger generation has the strongest awareness of environmental protection, and plant-based milk is becoming increasingly popular due to its quality and eco-friendliness. Consumer Insights data shows that 35-40% of adults in several countries have purchased plant-based milk, with many making repeat purchases within two years.

The article gives investors a thorough understanding of the factors influencing Oatly's returns. The study provides valuable insights for investors looking for low-risk investments by emphasizing the importance of monitoring market changes. Investors can make informed decisions and achieve their investment goals while minimizing risk by carefully considering these factors.

2 Literature review

Since Sharpen Lintner proposed the theory of Capital Asset Pricing Model (CAPM), international research scholars have conducted a lot of empirical studies on CAPM model in conjunction with different capital markets [1]. CAPM theory is considered to be an equilibrium model. It is based on a one-off functional relationship between investors' expected returns and exposure to systemic risk. It is generally used to measure systemic risk [2]. The CAPM model proposes an inverse relationship between expected return and asset value. Specifically, as the value of an asset increases, the expected rate of return rises and vice versa [3]. If the beta of a stock is greater than 1, it is considered to be unstable because its risk exceeds that of the overall market, and vice versa [4]. The CAPM equation is generally computed in two ways, either by expressing the covariance or by estimating it using a genetic algorithm [5]. The CAPM is considered an important tool for analyzing a company's financial

* Corresponding author: 2201365003@cupl.edu.cn

ratios, and the use of the CAPM can better represent the investment value of that company's stock [6]. CAPM is considered simple and intuitive, but it is conditional because beta and risk premium are time-varying [7]. Both models measure systemic risk by using short-, medium- and long-term data. [8]. FF three-factor models are widely used to evaluate the performance of portfolios with respect to market returns [9]. Models that include SMB and HML better and more accurately reflect the expected returns of investment portfolios and the relationship between the two [10]. It is possible that the model is a more effective representation of stock returns. The CAPM is not perfect [11]. The FF three-factor model has the drawback of not accounting for substantial market anomalies [12].

3 Model

3.1 CAPM

The CAPM is a financial model used to calculate an asset's expected return based on risk. This model assumes that all investable assets in the market form an overall market investment portfolio, and the covariance of the portfolio represents the investor's asset risk.

The CAPM computes an asset's expected return by adding the premium for systematic risk, which is the ineliminable risk, to risk-free rate. This price is the market risk price, which is the ratio to assets with zero variance. Investors expect their holdings of risky assets to receive additional returns.

The CAPM is the common tool used by investors, portfolio managers, and academics for evaluating and pricing investments. However, it has faced criticisms and empirical challenges, particularly regarding its assumptions and its ability to accurately predict returns.

The expression for the CAPM is:

$$R_i = R_f + \beta_i(R_m - R_f) \tag{1}$$

3.2 Fama-French three-factor model

The Fama-French three-factor model is a framework proposed by Eugene Fama and Kenneth French in the 1990s [13]. It was proposed to explain the returns of a market portfolio or individual stocks through the three factors of market risk, size and value.

The expression for the model is:

$$R_i - R_f = \alpha_i + \beta_i (R_m - R_f) + s_i(\text{SMB}) + h_i(\text{HML}) + \varepsilon_i \tag{2}$$

Three factors are:

Market Risk: This factor measures the return ratio of a portfolio to the overall market. It is generally represented by the excess return between the Treasury rate and the market.

Size: The size factor is another criterion in the model. It compares the return on investment portfolios with the return on stock investment portfolios. This factor is used to capture the effect of company size on returns. Typically, small cap stocks are considered riskier and have higher expected returns than large-cap stocks.

Value: This factor measures the ratio of returns to

value-based stock portfolios and investment portfolios. The value factor is generally expressed through the difference in returns between stocks with different market capitalisation ratios.

The model is used in the investment field to explain the relationship between portfolios and individual stocks. It completes the CAPM by considering only the impact of market risk as a return. By taking into account these factors, the model offers a more complete understanding of the risk-return tradeoff and can better explain the returns of portfolios with varying characteristics. As a result, it has become a valuable tool for investors and analysts in making informed investment decisions.

3.3 Result

This article utilizes both these two models to examine the transaction data of Oatly Company. Oatly Company, which went public on May 20,2021, is analyzed using historical trading data spanning from May 2021 to January 2023 [14].

Based on the analysis of transaction data from May 2021 to January 2023, it was found that the intercept and Mkt-RF are positively related, with a stronger positive relationship observed as the beta value increases and the intercept becomes larger. This indicates that Oatly's market risk premium also increases as its beta value and intercept increase. The results also suggest that market risk is a significant factor that affects the performance of Oatly, highlighting the importance for investors to closely monitor market changes if order to make informed investment decisions.

By incorporating both these two models into Oatly's transaction data, a more comprehensive understanding of the factors influencing the company's returns can be achieved. The analysis highlights the importance of market risk, as evidenced by the strong positive relationship between the intercept and Mkt-RF. The larger the beta and intercept, the higher the market risk premium for Oatly. This finding emphasizes the need for investors to closely monitor market changes to make informed investment decisions.

Table 1. Oatly's Regression Stations

Regression Station	Results
Multiple R	0.2725
R Square	0.0743
Adjusted R Square	0.0228
Starndard Err	0.1709
Obervation	20.0000

Table 2. Anova 1

Index	Regression	Residual	Total
df	1.0000	18.0000	19.0000
SS	0.0422	0.5260	0.5682
MS	0.0422	0.0292	
F	1.4441		
Significance F	0.2450		

Table 3. Anova 2

Index	Intercept	Mkt-RF
Coefficients	- 0.0941	0.7951
Standard	0.0382	0.6617
t Start	2.4600	1.2017
P-value	0.0242	0.2450
Lower 95%	0.1744	0.5949
Upper 95%	0.0137	2.1852
Lower 95.0%	- 0.1744	- 0.5949
Upper 95.0%	- 0.0137	- 2.1852

The beta value of Oatly Company is 0.7951, indicating that the company is less sensitive compared to the market portfolio. Specifically, a 1.0000% increase in the market portfolio is expected to result in a 0.7951% increase in the Company's stock, and vice versa.

As per the CAPM, assets with a higher beta tend to have a higher risk premium and a higher expected return. Conversely, assets with lower beta values have a lower risk premium and correspondingly lower expected returns. Therefore, while the expected return of Oatly's stock may be lower relative to the market portfolio, its risk level is also lower, making it a relatively less risky investment option suitable for investors seeking low-risk investments.

Table 4. Regression Stations

Regression Station	Results
Multiple R	0.5731
R Square	0.3286
Adjusted R Square	0.2027
Standard Err	0.1544
Observation	20.0000

Table 5. Anova 3

Index	Regression	Residual	Total
df	3.0000	16.0000	19.0000
SS	0.1867	0.3815	0.5682
MS	0.0622	0.0238	
F	2.6102		
Significance F	0.0873		

Table 6. Anova 4

Index	Intercept	Mkt-RF	SMB	HML
Coefficients	- 0.0862	0.6948	4.0262	0.9275
Standard	0.0355	0.6182	1.6408	0.8384
t Start	- 2.4253	1.2340	2.4538	1.1062
P-value	0.0275	0.2776	0.0260	0.2850
Lower 95%	- 0.1616	-	0.5479	-
Upper 95%	- 0.0109	2.0052	7.5045	2.7049
Lower 95.0%	- 0.1616	- 0.6156	0.5479	-
Upper 95.0%	- 0.0109	2.0052	7.5045	2.7049

SMB is a factor-based investment strategy that involves

constructing a portfolio of stocks with different market capitalizations, specifically by investing in smaller capitalization stocks and larger capitalization stocks. Oatly is a company that falls into the category of smaller capitalization stocks and has been performing relatively well in the market. A positive SMB value indicates that Oatly has outperformed the broader market, and the larger the value, the higher the potential return.

HML, on the other hand, is a factor-based investment strategy that involves creating a portfolio of stocks with varying degrees of quality, specifically by investing in high quality and low-quality stocks. A positive HML value indicates that a company has exhibited strong market performance and is likely to be a high-quality stock. Additionally, when a stock's value is higher, it tends to offer higher returns.

3.4 Other financial metrics

The company's operating income in 2022 increased by 12.29% compared to the previous year. However, this growth rate is slower than the 52.65% increase in 2021 and the 106.5% increase in 2020. The company's net loss for the full year widened to \$397 million, up from \$215 million the previous year, as multiple costs put pressure on profits. The company is facing significant operating pressure to achieve year-on-year revenue growth. Despite investing in building category awareness and brand building, and adhering to the B-side and C-side dual raceway model, the company's e-commerce channels are the main highlight of growth.

Compared to the same period last year, the company's operating gross profit margin has dropped significantly by -48.37%. The company is continuing to expand its business and boost sales to achieve future growth, but this has resulted in increased operating expenses and higher production costs, leading to lower gross margins. Basic earnings per share and diluted earnings per share are decreasing year by year, which means that investors are receiving fewer dividends, and the company's operating capacity and profitability are decreasing as well. The company's cyclical nature may also be in question.

Despite the challenges posed by the new crown epidemic, the company has rapidly expanded its production capacity, adding three new production lines, and continuing to expand its market. However, the lower gross margin value is due to the construction of new plants, inflationary pressures and rising transcontinental logistics costs.

Table 7. Other financial metrics

Index	2022/12/ 31	2021/12/ 31	2020/12/ 31	2019/12/ 31
Net profit	- 3.92 million	- 2.21 million	- 60,972,400	- 35,603,800
Turnover	7.22 million	6.41 million	4.62 million	2.04 million
Basic earnings per share	- 0.6625	- 0.3855	- 0.1030	- 0.0602
Gross margin	9.86%	23.16%	29.80%	31.92%
Net profit margin	54.35%	33.02%	14.33%	17.46%
Asset liability ratio	35.43%	23.55%	51.87%	46.22%
Operating gross margin	11.08%	23.16%	29.80%	31.92%

9. Shaabani, J., Jafari, AA. A New Look to Three-Factor Fama-French Regression Model using Sample Innovations[J]. 2020.06.03, 2023.04.15, <https://doi.org/10.48550/arXiv.2006.02467>.
10. Taneja, YP. *Vision*, **14(4)**, 267-274 (2010)
11. Sehrawat, N., Kumar, A., Nigam, NK., et al. *Investment Management & Financial Innovations*, **17**, 113 (2020).
12. Tazi, O., Aguentaou, S., Abrache, J. *International Journal of Economics and Financial Issues*, **12**, 58 (2022)
13. Fama, EF., French, KR. *Journal of financial economics*, **33**, 3-56 (1993)
14. Bocken, N., Lisa SMorales., Matthias, Lehner. *Sustainability*, **12**, 824 (2020)

4 Conclusion

This study examines the factors affecting the performance of Oatly, a popular plant-based food company. The results show a positive correlation between the intercept and Mkt-RF, indicating that Oatly's market risk premium increases with increasing beta and intercept. The analysis shows a positive correlation between market risk and Oatly, highlighting the importance of monitoring market changes for investors. Using these two models, the study provides a comprehensive understanding of the factors affecting Oatly's returns. As the company has a small beta, it means it is less sensitive to market fluctuations. While expected return on Oatly Corporation stock may be low relative to a market portfolio, it also has a low level of risk, making it a relatively low-risk investment option for investors seeking a low-risk investment.

References

1. Sharpe, WF. *The journal of finance*, **19**, 425-442 (1964)
2. Reichling, P., Beinert, C., Henne, A. *Praxishandbuch Finanzierung*, 41-44 (2005)
3. Nugraha, NM., Susanti, N. *Global Business & Management Research*, **11**, 266-274 (2019)
4. Latunde, T., Akinola, LS., Dare, DD. *Green Finance*, **2**, 20-34 (2020)
5. Susanti, D., Najmia, M., Lesmana E., et al. *IOP Publishing*, **332**, 012046 (2018)
6. Wihartati, AP., Efendi, TF. *IJCIS*, **2**, 19-23 (2021)
7. Vendrame, V., Guermat, C., Tucker, JA. *International Review of Financial Analysis*, **5**, 1-11 (2018)
8. Cenesizoglu, T., Reeves, JJ. *Journal of Empirical Finance*, **49**, 223-246 (2018)