

CAPM & FF3 for Grocery stores: Evidence from Kroger, Walmart and Target

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Abstract. The impact of COVID-19 on the global economy is significant to most of the industry, especially hotel industry or restaurant industry. In order to fight for the negative effect from COVID-19, the government applied a lot of conventional tools and made an increase on the amount of money supply. However, these activities lead to an uncontrol consequence, which is inflation. The purpose of this research is to adopt the CAPM and Fama & French models to evaluate the inflation effect on grocery stores. The data used to compute the result, is the historical stock price collected from Yahoo Finance. When comparing the results from CAPM and Fama & French models, Fama & French model display the effect from inflation more specifically than that in CAPM model. Nevertheless, both models conclude the inflation plays an important role on the market value of the business. These results indicate the degree of influence from Inflation on particular industry, along with supporting evidence from CAPM and Fama & French Models.

Keywords: Grocery stores, Kroger, Walmart, Target, CAPM, Fama and French.

1. Introduction

The spiking cases of COVID-19 globally caused most of the countries decided to impose full lockdowns of their population, which resulted in a huge economic damage to the global economic entity. The U.S Federal Reserve applied a combination of monetary and fiscal policies in order to offset the damage from the pandemic. From the Finance and Economics Discussion Series called the COVID-19 Crisis and the Federal Reserve's Policy Response, it concluded the conventional tools that Federal Reserve utilized to support the U.S. economy and economic recovery [1], including near-zero interest rates, and large-scale asset loan program [2]. Likewise, a \$2.2 trillion Coronavirus Aid, Relief, and Economic Security (CARES) Act has been released by the Federal Reserve to against the negative effects of COVID-19 [3]. As a result, the combination of monetary and fiscal policies provides a large increase of money supply. From the quantity theory of money [4], the increase of money supply led to a decrease on the quality of money. It means the purchasing power from customer also decreased, resulting in a root of inflation. The inflation is not healthy for the economic environment and causing many families to suffer.

The COVID-19 heavily stricken by the inflation and reflected significantly from certain key indicators, including the customer price index (CPI). From full report at CPI-September 2022, the price increased by 0.4% in September compared with an increase of 0.1% in August [5]. The rate is below 2% before the pandemic exaggerate and it becomes uncontrollable to the economic affect with a rate of 8%. The increase on the inflation rises the purchase cost and decrease the consumer surplus. For instance, raising on price of good in Grocery store is one of the obvious ways that the consumers can realize the inflation. The most dominant Grocery market in the United States have affected tremendously and consumers can observe the impact through Walmart, Kroger, and Target.

Capital asset pricing model, also known as CAPM, is a popular model that was established over 70 years. It continues to be the most favored model when the financial analysis decides to quantify the overall value of the project or the investment. A paper written by Bjorn Hansson and Peter Hordahl, used a multivariate GARCH-M to test the reliability of CAPM. By utilizing hypotheses test, the researchers noticed the traditional CAPM is often fall under the favor of rejected. However, the result of the hypothesis test also testifies the accuracy of the Sharpe-Lintner-Mossin version of the conditional CAPM [6]. Scholars proof that the empirical evidence opposed to the CAPM cannot

discard the outcome from CAPM. And the results verify most of the companies continue to use CAPM as the measuring tool for project evaluation [7].

Although the CAPM is the dominant model after several times of revolution, the empirical test from Fama and French revealed that the backwards of CAPM [8]. Meanwhile, some researchers examine the Fama and French Model to testify its reliability. Gregory and Sehgal found various evidence explained that the cross-sectional mean return not only bearing the risk from the market factor, as well as other factors including the parallel market, size and book to market factors in earnings. The conclusion of the paper is consistence with the Fama and French three-factor model [9]. Further, another research paper published on International Journal of Managerial Finance [10], intent to justify the reliability of the model. The researchers draw the conclusion after the examination of Fama and French model by using the evidence from New Zealand, which can also be explained by three factors including the excess market returns, a size factor, and a book-to-market equity factor.

The purpose of this research is to discover the inflation impact on Grocery Stores between Walmart, Kroger, and Target by using the CAPM and Fama and French Models. The research is divided into several sections, which further develop the investigation and research in the industry. The research begins with the basic concept and data analysis over the use of CAPM and Fama and French Model. It is supported by other scientists and the potential risk associated with it. It further introduced the metrics of R^2 , MSE, and MAE in assisting with the analyzation over CAPM and FF3 for these companies. After such scrutiny analysis and comparison, the paper indicated several investment recommendations, limitations, and the future anticipation to investors.

2. Data & Method

2.1. Data

To discover the detail of the influence by inflation, three companies from the Grocery industry and these industries are directly related to inflation and consumer purchasing power. Three companies from the industry are Walmart, Kroger, and Target, which have taken dominant position in the market. To form CAPM, and Fama and French model for each company, the data of the research is the historical data of daily stock price collected from 2018 to 2021 through Yahoo Finance. The time phase included the COVID-19 pandemic in which can reflect and illuminate the affection from inflation.

2.2. Models

Capital asset pricing model (CAPM) has been created for 30 years ago by Sharpe and Lintner. The model presents the risk of cash flow from the project or the investment, as well as estimates the cost of capital. In the CAPM model, the risk is evaluated by the beta of cash flow from the project. With the respect to the return from the project, beta can reflect the systemic risk from the market as well as how sensitive the investment will react to the change in the economy. Moreover, there is a linear relationship between beta and expected rate of return. Although the CAPM had experience a lot of criticisms from the professional, such as Fama and French, it is hard to overturn the theory of CAPM by employing other models. Until now, the CAPM is the model most often been used by the financial analysts over the decades [11].

The limitations and weakness encouraged the existence of Fama & French Model. In 1992, Fama and French tested their model by predicting the cross-section rate of return of a sample of no financial firm. After the examination, the result illustrated there is no relationship between market beta factor and rate of return [12]. Rather than the variable from the entire financial market, Fama & French model added more factors, including firm size and book-to-market equity. Compared with CAPM, Fama & French model considers more various aspects. Especially, the innovation increases the accuracy of the ending results when different firms evaluate an investment of a same project. If the financial analysts use the traditional CAPM to do the measurement, they might potentially fail to consider or balance one of the factors, resulting in a significant difference between the results [13].

2.3. Metrics

R^2 is a key indicator introduced by Wright [14], which is also known as coefficient of determination. It can quantify the relation between dependent variable and independent variables. To explain it in another way, R^2 expresses how much the dependent variable is determined by the independent variables [15]. Mean squared error (MSE) is the natural way to clarify the error signal; as well as it can represent a measure of signal quality [16]. Mean average error (MAE) usually been defined as the average of all the error. The “error” does not mean incorrection of such data, but the uncertainty in a measurement. MSE is more sensitive to the outliers compared to MAE.

3. Result & Discussion

Table 1 and Table. 2 are the CAPM regression models built for the 3 companies. In the CAPM model, it only takes one variable into the consideration which is RMRF. RMRF presents a difference between the market return and risk-free rate.

Table. 1. The statistical summary of the CAPM for three companies.

	WMT	KR	TGT
Multiple R	0.49	0.21	0.49
R Square	0.24	0.04	0.24
Adjusted R Square	0.24	0.04	0.24
Standard Error	1.24	1.93	1.24

Table. 2. The statistical summary of the regression models for three companies.

	Intercept-WMT	RMRF-WMT	Intercept-KR	RMRF-KR	Intercept-TGT	RMRF-TGT
Coefficients	0.015	0.518	0.050	0.300	0.015	0.518
Standard Error	0.039	0.029	0.061	0.045	0.039	0.029
t Stat	0.387	17.952	0.812	6.674	0.387	17.952
P-value	0.699	0.000	0.417	0.000	0.699	0
Lower 95%	-0.062	0.462	-0.070	0.211	-0.062	0.462
Upper 95%	0.092	0.575	0.169	0.388	0.092	0.575

According to the results, Walmart’s RMRF beta is at 0.518 which is a positive beta that allows the stock to move to the same direction with that in the market. If the market return curves down in the next few month due to a gloomy economic situation, Walmart's stock price will also decrease at a certain degree.

The regression model in Table. 2 presents the beta of RMRF at 0.300, and 0.716, respectively Kroger and Target. As a result, the positive RMRF beta value of all three companies from CAPM regression model indicate that these three companies have a positive relationship with the change in the market.

Compared with other 2 companies, Target has the highest beta which means the company is more sensitive to the change in the market. It also illustrates Target may bear higher risk from the systematic risk in the market than that in Walmart and Kroger, because the systematic risk is hard to eliminate by diversifying the portfolio.

Fama & French Model includes more factors than CAPM does, including firm size and book-to-market equity. In the Fama & French regression model for these 3 companies, there are 3 factors including in the model, which are RMRF, SMB, and HML. Small minus big (SMB) represents the effect from firm size. High minus low (HML) illustrates the influence from book-to-market equity. The statistical summary of the FF3 models for the three companies are listed in Table. 3.

Table. 3. The statistical summary of the FF3 for three companies.

	WMT	KR	TGT
Multiple R	0.53	0.21	0.50
R Square	0.28	0.04	0.25
Adjusted R Square	0.27	0.04	0.24
Standard Error	1.22	1.93	1.70

Table. 4. The statistical summary of the FF3 regression models for three companies

	Coefficients	Std	t Stat	P-value	Lower 95%	Upper 95%
Intercept-WMT	0.010	0.038	0.269	0.788	-0.065	0.086
RMRF-WMT	0.549	0.029	19.176	0.000	0.492	0.605
SMB-WMT	-0.315	0.055	-5.745	0.000	-0.422	-0.207
HML-WMT	-0.107	0.036	-2.971	0.003	-0.178	-0.036
Intercept-KR	0.052	0.061	0.847	0.397	-0.068	0.171
RMRF-KR	0.296	0.045	6.520	0.000	0.207	0.386
SMB-KR	-0.022	0.087	-0.025	0.803	-0.192	0.149
HML-KR	0.061	0.057	1.068	0.286	-0.051	0.174
Intercept-TGT	0.097	0.054	1.800	0.072	-0.009	0.202
RMRF-TGT	0.721	0.040	18.026	0.000	0.643	0.800
SMB-TGT	-0.042	0.077	-0.546	0.585	-0.192	0.108
HML-TGT	-0.036	0.050	-0.704	0.482	-0.135	0.063

Seen from Table. 4, SMB beta for all three companies are negative, which exhibit the company will takes less effect from the makret or the economy. Since the larger the company is, more diversify it is. The Walmart and Target has a negative HMB beta after the analysis through Fama & French model. A negative HML beta illustrates that contains higher growth opportunity. Moreover, all three companies have a positive RMRF beta, reflecting that the the stock will move to the same direction as the change in market. However, the negative SMB and HML beta will offset the influence from the RMRF beta. As a result, the rate of return can been affected by 3 factors, not only taking the risk from the economy.

4. Limitations & Prospects

The analysis is delineated and proficient in terms of CAMP and Fama and French Model between individual companies. However, this brings qualification in mainly five ways. First, this paper only analyzed over the past four years of stock price, instead of long-term historical stock price. The short-period variation is a snapshot of the change with the pandemic of COVID. The CAPM and FF3 is thus not sufficient in providing long-term analysis over these firms. Secondly, the model itself did not reflect all the risk associated with the firms, it only reflects the market risk. This will cause inaccurate perspectives toward individual firms and potentially cause these firms to lose outside investment. Third, these firms and their business strategies are different and cause variation among firms.

In fact, it is unfair to compare the CAPM and FF3 for firms with drastic differentiation. For example, Target does not have a gas station, whereas the other two does. People have more tendency to look at the gas price in determining the inflation of the market and economy. This put Target at a disadvantage in competing with other competitors in the industry. Moreover, firms often do not release private information, and this will cause the stock price to not reflect reality. Investors cannot make accurate decisions based on public information and current stock prices. Lastly, the paper did not reflect all the grocery stores in the United States. It only has analyzation of several dominant companies in the market. Thus, the data is not considering the industry comprehensively. In suspect to the future, once COVID wanes down, the stock price in the industry and the economy will recover.

Inflation will decrease back to normal, and the risk can be reduced for investors. For further expectation for 2023, the stock price will decrease since the market risk premium and interest rates are high. The return is higher since the rates are higher. Inflation decreases will affect the industry in the short term and recover over time.

5. Conclusion

In summary, this study discovered the CAPM and FF3 for grocery stores of Walmart, Kroger, and Target. Although CAPM and FF3 have different focuses, the analytical results are the similar for individual companies. It indicated several limitations of the investigation and the future expectation in both the short-term and long-term. Although it did not analyze all the grocery stores in the United States, it analyzed a basic component of several firms in the industry. Nevertheless, the three corporations in this research can not represent overall industry owing to the limitation of this study, including difference on revenue structure. Especially, the different time range selection in study might leads to a complete different result with that in this study. In the future, inflation rate will decrease in the future once the COVID wanes down and economy expected to recover. Overall, these results offer a guideline for the effectiveness of inflation on grocery stores industry.

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