Apple (2)

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APPLE INC.

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1. Apple Inc.

1.1 Introduction

Apple Inc. was started by Steve Jobs, Steve Wozniak, and Ronald Wayne in 1976. Since then, it has grown into one of the largest technology companies in the world, and its products, like the iPhone, iPad, and MacBook, are known for being innovative. It was the first successful personal computer company and the one that made the graphical user interface widely used. Apple's success is mostly due to its creative marketing and design strategies, which have helped the company build a loyal customer base. Apple is one of the most valuable companies in the world right now with a market capitalization of over $2 trillion, Apple has stayed at the top of the tech industry because its products are known for their sleek designs and easy-to-use interfaces. Furthermore, Apple has a devoted customer base that eagerly awaits the introduction of new products and updates (Levy, S. 2023).

1.2 Share performance:

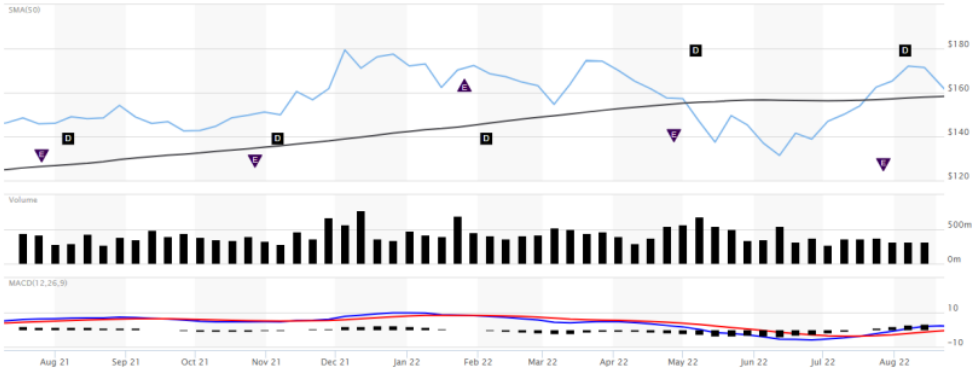

***Figure 1**: Share prices of Apple's stock*

The chart above shows how the price of Apple shares changed from 2021 to 2022, which is the required time period. It shows that the share price experienced fluctuations during this period, with some periods of growth and decline. From the chart, it can be observed that the share price experienced some fluctuations during this period, with a significant increase in the first quarter of 2022. The total number of Apple shares in circulation in 2022 was 16.326 billion, which was 3.2% less than the total in 2021.In 2021, there were 16.865 billion outstanding Apple shares, which is 3.78 percent less than the number of shares that were outstanding in 2020.

1.3 Key Statistics:

Key Statistics
Required Period (2022)

Dividends & Yields	
Dividend Per Share	$0.92
Dividend Yield	0.59%
Earnings Yield	3.88%
FCF Yield	3.98%
Dividend Growth (YoY)	4.55%
Payout Ratio	18.20%
Buyback Yield	3.41%
Shareholder Yield	4.01%

Share Statistics	
Shares Outstanding	**15.82B**
Shares Change (YoY)	**-3.41%**
Shares Change (QoQ)	**-1.01%**
Owned by Insiders (%)	**0.07%**
Owned by Institutions (%)	**61.32%**

Stock Price Statistics	
Beta (1Y)	1.3
52-Week Price Change	-2.70%
50-Day Moving Average	146.01
200-Day Moving Average	147.68
Average Volume (30 Days)	70,763,771

***Figure 2**: Key statistics of Apple's stock*

Apple has 15.82 billion shares currently available for purchase. In the past year, there has been a -3.41% drop in the total number of shares. In the past 52 weeks, the price of the stock has experienced a decline of -2.70%. Since Apple's beta is 1.30, the company's price volatility has been significantly higher than the average for the market. This particular stock distributes a dividend payment of $0.92 per year, which results in a dividend yield of 0.59%.

1.4 The biggest change in Apple stock:

The price of one share of Apple fell by 27% during 2022, making it a difficult year for the company's stock. Even though it has performed better than other major technology companies like Amazon, Meta, and Alphabet, Apple still faces a number of challenges in the market. The demand for consumer electronics products is already a concern. The COVID-19 work-from-home benefits are starting to wane, and high inflation and rising interest rates make the overall country's economy seem difficult. In addition, Apple has been experiencing problems with its supply chain because of COVID-19-related issues in China. Protests at the Foxconn factory in Zhengzhou, where most of the popular iPhone 14 Pro and Pro Max devices are made, are likely to have hurt Apple's sales. Apple's revenue from its services division is also decreasing. The division's growth in Q4 FY'22 was only 5%, which is significantly lower than the double-digit levels seen in previous quarters and falls below Apple's overall revenue growth, which was 8% in the prior quarter. When compared to Apple's overall gross margin of approximately 43%, which is significantly lower than the segment's gross margin of over 70%, investors are understandably concerned about the performance of this division. However, this raises questions about the sustainability of the division's growth and its ability to maintain a competitive advantage in the market. The company may need to reevaluate its strategy for this division to ensure long-term success.

2. CAPM Beta of Apple Inc.

Beta is a measure of how much the expected returns on an asset depend on the market's expected returns. Beta can be calculated by following formula:

Beta = Covariance (Ri, Rm) / Variance (Rm)

Table 1: Summary of the Beta Calculation

Share Correlation	Beta	Average Return %	Variance	Std. dev.	Covariance
Apple Inc.	1.37	0.03%	0.04%	1.93%	0.02%
DJIA Index (Market)	-	-0.04%	0.01%	1.10%	-

Apple Inc.'s stock beta is greater than 1, at 1.37, which indicates that the stock is more volatile than the overall market and tends to move in the same direction as the market but with greater magnitude. This means that investors can expect larger fluctuations in the stock's price compared to the market as a whole.

3. Testing the Validity of CAPM

3.1. 3-Month T-bill rate and Test the Validity of CAPM:

Although the beta is set at 1.37, the risk-free rate is assumed to be the 3-month Treasury bill rate, which is 0.80%. The market return for the DJIA index is -0.04%. The CAPM is used to determine whether or not these factors have an impact on the profits of Apple's stock. The CAPM model takes into account the risk-free rate, market risk premium, and beta of the stock to estimate the expected return. Based on this estimation, investors can decide whether or not to invest in Apple's stock.

Table 2: CAPM calculation

$CAPM(Eri)=Rf+\beta i(ERm-Rf)$	
E(Rm) daily	-0.04%
E(Rm) yearly	-13.36%
Rf	0.80%
Beta	1.37
CAPM	**-0.19%**

The market return is negative because the DJIA index fell dramatically during the required time period, resulting in a negative risk premium (rm - rf) and a negative expected return. Investors who had invested in the stocks represented by the DJIA index during that time period would have experienced losses due to the negative expected return, which highlights the importance of diversification and risk management in investment strategies.

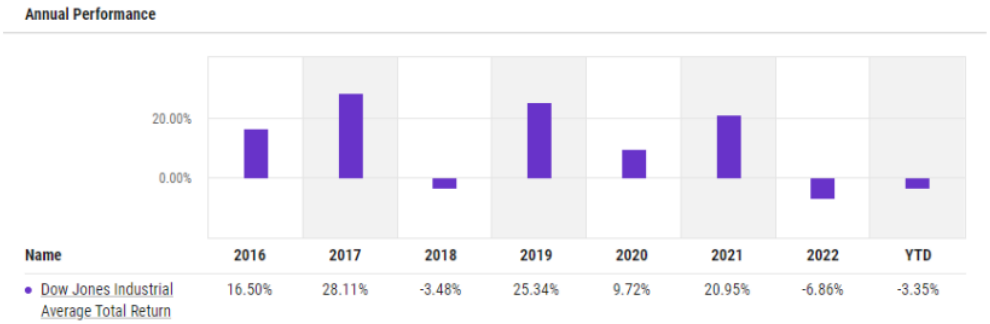

Figure 3: *Annual performance of DJIA Index*

This graph shows that the DJIA index fell 6.89% in 2022. This decline in the DJIA index is a significant drop and may indicate a bearish market trend. However, investors should closely monitor market conditions and adjust their investment strategies accordingly.

3.2 Regression Analysis for Apple:

Table 3: The Regression Analysis for Apple Inc.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.784925
R Square	0.616108
Adjusted R Square	0.614566
Standard Error	0.012022
Observations	251

ANOVA

	df	*SS*	*MS*	*F*	*gnificance*
Regression	1	0.057759794	0.05776	399.6193	1.1E-53
Residual	249	0.035989721	0.000145		
Total	250	0.093749515			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.000878	0.00075938	1.156815	0.248456
X Variable 1	1.374726	0.068769028	19.99048	1.1E-53

The study tested the CAPM by comparing the daily share prices of Apple Inc. and the Dow Jones Industrial Average (DJIA) index. This is an attempt to find out if there is enough evidence to show that X and Y are connected in a direct way. X is the excess market return, which is represented by E (Rm) - Rf, while Y is the excess stock return, which is represented by E (Ri) - Rf. This output suggests that the regression model is statistically insignificant since the p-value is greater than the standard alpha level of 0.05, indicating that the market risk premium and beta coefficients are not significantly related to the expected return of the asset. There is strong evidence against the idea

that the predictor and response variables have no relationship. Additionally, the F-statistic (399.6193) is much larger than 1, which further supports this conclusion.

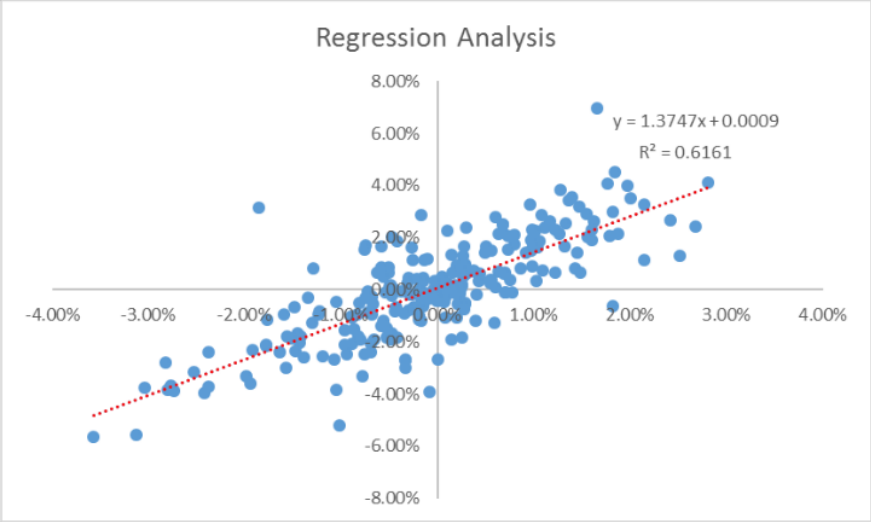

***Figure 4**: The output of the Linear Regression for Apple Inc.*

The R-squared value of 0.61suggests that only 61% of the stock's variability can be explained by the market's performance. However, the P-value for alpha is greater than 5% and alpha is not statistically different from zero, we can't reject the null hypothesis and must conclude that the asset's performance can be explained by its exposure to market risk. This means that the expected return of the asset is only based on its beta and the market risk premium, and that any deviation from this relationship is due to random chance or measurement error. But if alpha is found to be very different from zero, it suggests that the CAPM cannot explain the return on the asset and that other models or other factors may need to be looked at.

4. Assumption, Limitations and Criticism of CAPM Model

4.1 Assumptions:

- Investors are rational, risk-averse people who try to maximize their utility. It indicates that investors favor greater wealth over lesser risk when it comes to returns. All investors process information rationally, though that does not imply that they must all come to the same conclusion. Recent research calls the rationality premise into question.
- All transactions, like short-selling, lending, and borrowing, can happen at the risk-free rate in frictionless markets, and there are no fees or taxes to pay. The CAPM conclusions are unaffected by these assumptions. Short-selling restrictions may raise prices.
- Investors plan a one-year holding period. This presumption does not take into account investor education or the possibility that an investor might be willing to

accept a temporary loss in exchange for a longer-term gain, but CAPM is still applicable. Investors hold similar views: All investors reach the same inputs, judgements, and conclusions. CAPM functions if this presumption is relaxed.

- The model employs continuous functions and divides investments into smaller units. However, it doesn't affect the model's conclusions.
- It is assumed that because there are so many investors, none of them are large enough to have an effect on security prices.

4.2 Limitation:

- It is limited and inflexible since it solely prices systematic risk, also known as beta risk. This limitation can result in the mispricing of securities, especially those with idiosyncratic risk, and may not fully capture the complexity of the market.
- It does not take into consideration different time periods. As a result, it is impossible to account for time-varying variables that affect numerous time periods. This limitation can lead to inaccurate predictions or conclusions when analyzing complex systems that involve multiple variables and time periods. Incorporating a longitudinal approach can help overcome this limitation and provide a more comprehensive understanding of the system under study.
- A CAPM market portfolio includes financial and nonfinancial assets. CAPM-defined market portfolios cannot be created because many assets are not investable. However, since some assets are not investable, it is impossible to create a portfolio that fully represents the market, making it difficult to test the validity of the CAPM.
- Because there is no actual market portfolio, practitioners employ different proxies, resulting in varied return estimates for the same asset, breaching CAPM's assumption.
- Beta needs a long history of returns, but it may not be a good way to measure the systematic risk of an investment. Return frequency affects beta estimates (for example, weekly versus monthly). Thus, beta estimates affect return estimates. This limitation highlights the importance of using multiple beta estimates to improve the accuracy of return estimates and reduce the impact of any individual estimate's potential biases.

4.3 Criticism:

Some researchers argue that the CAPM has limitations in explaining the cross-sectional variation of stock returns and fails to capture other factors that affect asset pricing, such as liquidity risk and behavioral biases Black (1993). This criticism suggests that the CAPM model fails to consider the impact of macroeconomic factors on asset returns, and therefore cannot fully explain the behavior of stock prices in the market. This critique of the CAPM has led to the development of alternative models such as the, Arbitrage Pricing Theory, which attempt to better explain returns by incorporating additional factors beyond just market risk.

4.4 Alternative Model:

The alternative model for the CAPM is the Arbitrage Pricing Theory (APT), which indicates that the expected return of an asset is influenced not only by the market but also by other macroeconomic factors, making it a more comprehensive approach to asset pricing than the CAPM. While the CAPM is based on the assumption that investors are rational and markets are efficient, the APT takes into account multiple factors that can affect asset prices and considers the possibility of irrational behavior among investors. Additionally, the APT model can be used to identify mispricing in assets and potentially generate higher returns for investors.

5. Comparison with the Literature:

Ocampo (2004) used the monthly returns of stocks from 1992 to 2002 to test how well CAPM worked in the Philippine stock market. The study found that the CAPM model did not adequately explain the returns of stocks in the Philippine stock market during the period under investigation. Additionally, the study suggested that other factors beyond beta may be influencing stock returns in the Philippine market. Loukeris (2009) examined the reliability of the CAPM on the London Stock Exchange for the years 1980 to 1998. The results showed that beta and the cross-section of average excess security return were related in a positive way. This suggests that the CAPM can be a useful tool for investors in predicting returns on securities in the London Stock Exchange during this time period. However, it is important to note that the study only covers a specific time frame and may not be applicable to other markets or time periods. Our empirical results of CAPM for the US Company contradict these results in the literature, however the discrepancies may be due to differences in the data sets and time periods used in the studies, as well as variations in market conditions and investor behavior. The traditional CAPM model may be suitable for explaining the returns of US companies but may not be generalized to other countries or regions due to differences in market conditions and investor behavior. Therefore, further research is needed to determine the applicability of the CAPM model in other countries and regions. Additionally, it is important to consider other factors that may affect portfolio selection and returns.

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