The Capital Asset Pricing Model: Analyzing Tesla’s Stock Performance

1. Introduction

The Capital Asset Pricing Model (CAPM) is a fundamental concept in finance that helps investors determine an asset's expected return based on its systematic risk relative to the overall market. It provides a theoretical foundation for pricing risky assets and is crucial in investment decision-making, portfolio management, and corporate finance.

The Capital Asset Pricing Model (CAPM) was developed in the 1960s by William F. Sharpe, John Lintner, and Jan Mossin as an extension of Harry Markowitz’s Modern Portfolio Theory (MPT). Before CAPM, investors lacked a systematic way to quantify the relationship between risk and return and determine an investment's required return based on its risk exposure. CAPM provided a standardized approach by establishing a relationship between an asset’s expected return and its exposure to market risk.

The model assumes that investors are rational and risk-averse, meaning they prefer portfolios that offer the highest return for a given level of risk. Under CAPM, an asset’s expected return is determined by the risk-free rate, risk exposure, and market risk premium, reflecting the additional return investors demand for taking on risk.

Despite its simplicity, CAPM remains one of the most widely used models in finance. It is applied in capital budgeting, cost of equity estimation, portfolio optimization, and risk assessment. However, the model also has limitations, as it relies on assumptions such as market efficiency, rational investor behavior, and a single risk factor (systematic risk). In this study, we explore CAPM’s effectiveness in evaluating Tesla’s stock, analyze its risk-return profile, and discuss alternative models that address its limitations.

1.1 Fundamentals of CAPM

The Capital Asset Pricing Model (CAPM) provides a systematic approach to evaluating risk and return in financial markets. It explains how investors can estimate the expected return of an asset based on its risk relative to the market.

A core component of CAPM is Beta (β), which measures an asset’s sensitivity to market movements. Beta quantifies how much an asset’s return is expected to change in response to movements in the overall market. A $\beta > 1$ indicates that the asset is more volatile than the market, while a $\beta < 1$ suggests lower volatility. This allows investors to assess how much additional risk they are taking when investing in a particular stock.

The model assumes that in an efficient market, all investors hold the market portfolio, and the only relevant risk is systematic risk, which cannot be diversified away. By using CAPM, investors can estimate whether an asset is fairly priced by comparing its expected return to its risk-adjusted return. The model remains a cornerstone of modern finance, widely applied in portfolio management, capital budgeting, and equity valuation.

1.2 Key Components of CAPM

Several key elements define CAPM:

- **Risk-Free Rate (Rf):** The return on a risk-free asset, typically a government bond.
- **Market Return (Rm):** The average return of the overall market, often represented by a stock index.
- **Market Risk Premium (Rm - Rf):** The difference between the expected market return and the risk-free rate, represents the excess return investors require for taking on additional risk.
- **Beta (β):** A measure of an asset's sensitivity to market movements, indicating how much its price is expected to fluctuate relative to the market.

1.3 Assumptions and Limitations

CAPM is based on several key assumptions, including:

- Investors make rational decisions and aim to maximize their utility.
- All investors have access to the same information and can borrow or lend at a risk-free rate.
- There are no transaction costs or taxes.
- Assets are infinitely divisible, and all investors hold diversified portfolios.

Despite its usefulness, CAPM has limitations:

- **Simplified Assumptions:** The real market does not always behave in a perfectly rational manner.
- **Beta Stability:** Beta values may change over time, affecting the accuracy of risk estimation.
- **Market Efficiency:** CAPM assumes that markets are fully efficient, which may not always hold in practice.

1.4 Applications of CAPM

CAPM is widely used in the financial industry for various purposes:

- **Investment Analysis:** Helps investors determine whether a stock is overvalued or undervalued.
- **Portfolio Management:** Assists in balancing risk and return to create efficient investment portfolios.

- **Corporate Finance:** Used to calculate the cost of equity, an important component of a company's capital structure.
- **Risk Assessment:** Evaluate an asset's risk profile relative to the market to support decision-making.

By applying CAPM to Tesla Inc. (TSLA), this project aims to estimate Tesla's risk profile, expected return, and investment attractiveness. The following sections will cover data collection, visualization, modeling, and application of CAPM to Tesla's stock.

2. Description of the problem

The primary challenge in investment decision-making is determining whether a stock offers sufficient returns to justify its risk. Investors need a reliable framework to compare different assets and evaluate their expected returns relative to market risks. CAPM provides a systematic approach to this problem by linking expected returns to an asset's risk level.

Tesla Inc. (TSLA) is an ideal candidate for this analysis due to its high volatility and rapid growth in recent years. As an industry leader in electric vehicles and clean energy, Tesla's stock has attracted significant attention from investors. However, its price fluctuations make it a risky investment.

This project seeks to address the following questions:

- How risky is Tesla's stock compared to the overall market?
- What is Tesla's expected return based on its market risk?
- How does Tesla's beta affect its attractiveness as an investment?
- Can CAPM effectively explain Tesla's stock performance?

By answering these questions, this project will provide insights into Tesla's risk-return profile and assess whether CAPM is a useful tool for evaluating high-growth stocks like Tesla.

3. Model description and simulation

This section introduces the Capital Asset Pricing Model (CAPM) and how it is applied to estimate Tesla's expected return based on market risk. CAPM is widely used for determining the appropriate required return on an investment given its systematic risk.

3.1 CAPM Model Overview

The CAPM framework explains the relationship between the expected return of an asset and its risk, measured by beta (β). It provides a structured way to determine whether an asset is priced relative to its risk exposure in the market.

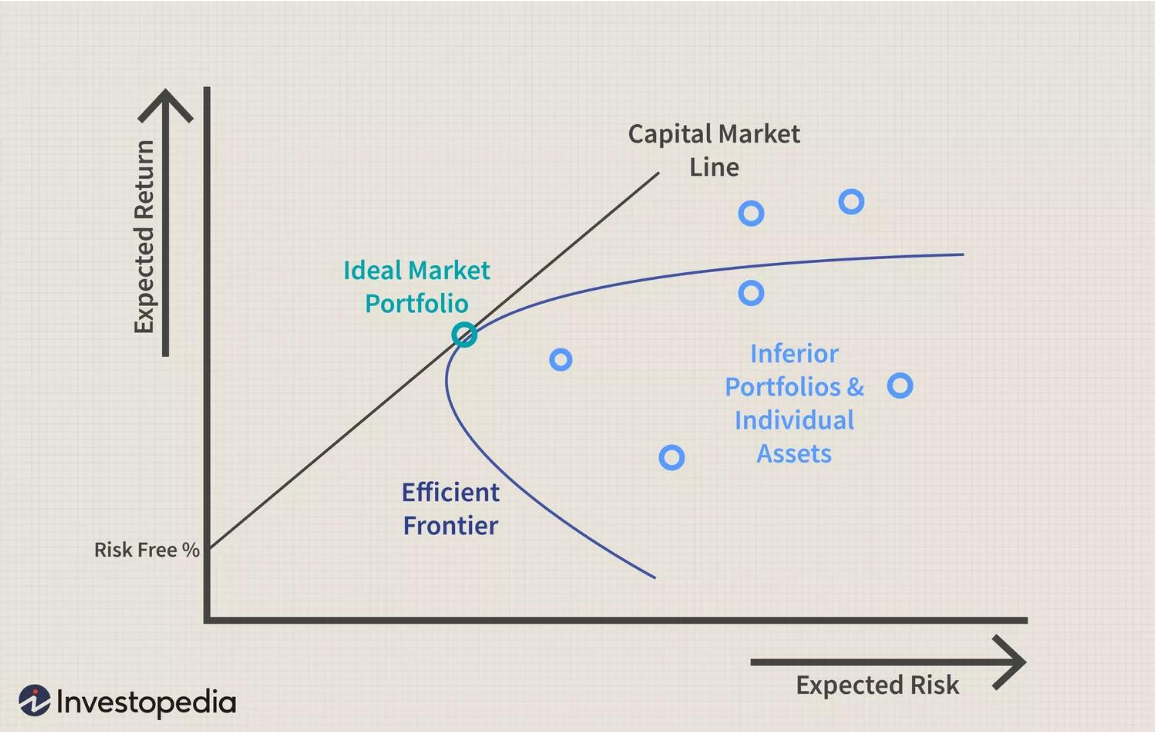
The CAPM formula is given by:

$$E\,(R_i) = R_f + \beta_i\,(E\,(R_m) - R_f)$$

where:

- $E(R_i)$ is the expected return of asset i
- R_f is the risk-free rate
- β_i is the beta of the asset (a measure of its volatility relative to the market)
- $E(R_m)$ is the expected return of the market
- $E(R_m) - R_f$ is the market risk premium.

Figure 1: Security Market Line (SML) Representation



Source: Image by Julie Bang © Investopedia 2022

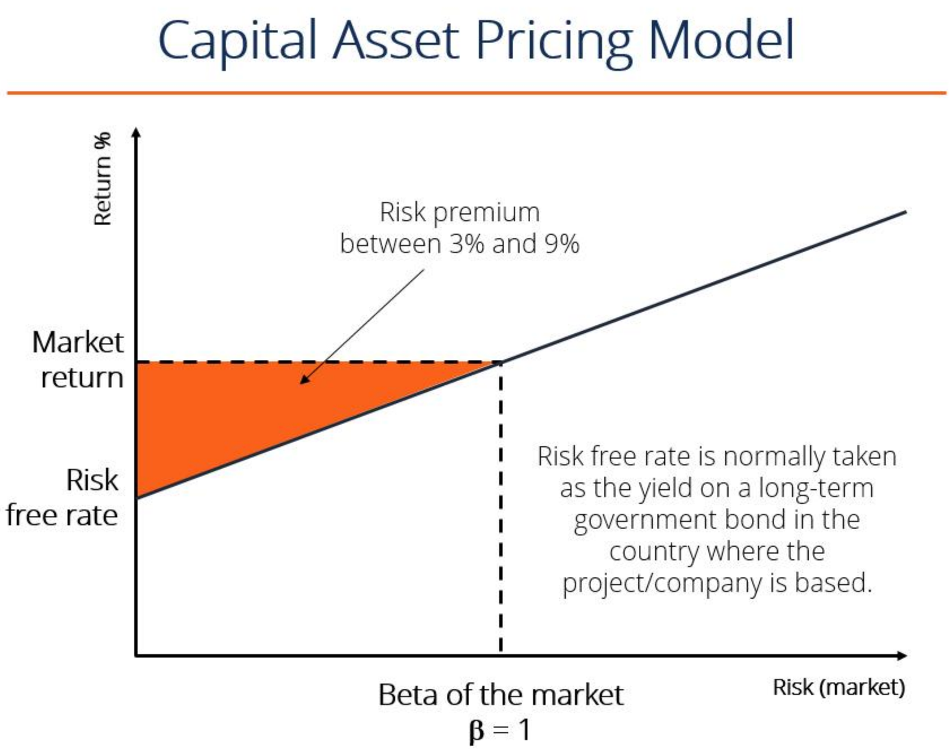
3.2 Estimating Beta for Tesla

Beta (β) measures the sensitivity of Tesla's stock returns to market movements. A beta greater than 1 implies that Tesla is more volatile than the market, while a beta less than 1 suggests lower volatility.

To estimate Tesla's beta, we will:

- Collect historical price data for Tesla (TSLA) and a market benchmark (e.g., S&P 500).
- Calculate daily returns for both Tesla and the market.
- Use **Ordinary Least Squares (OLS) Regression** to determine the relationship between Tesla's returns and the market returns.

Figure 2: CAPM Formula Breakdown



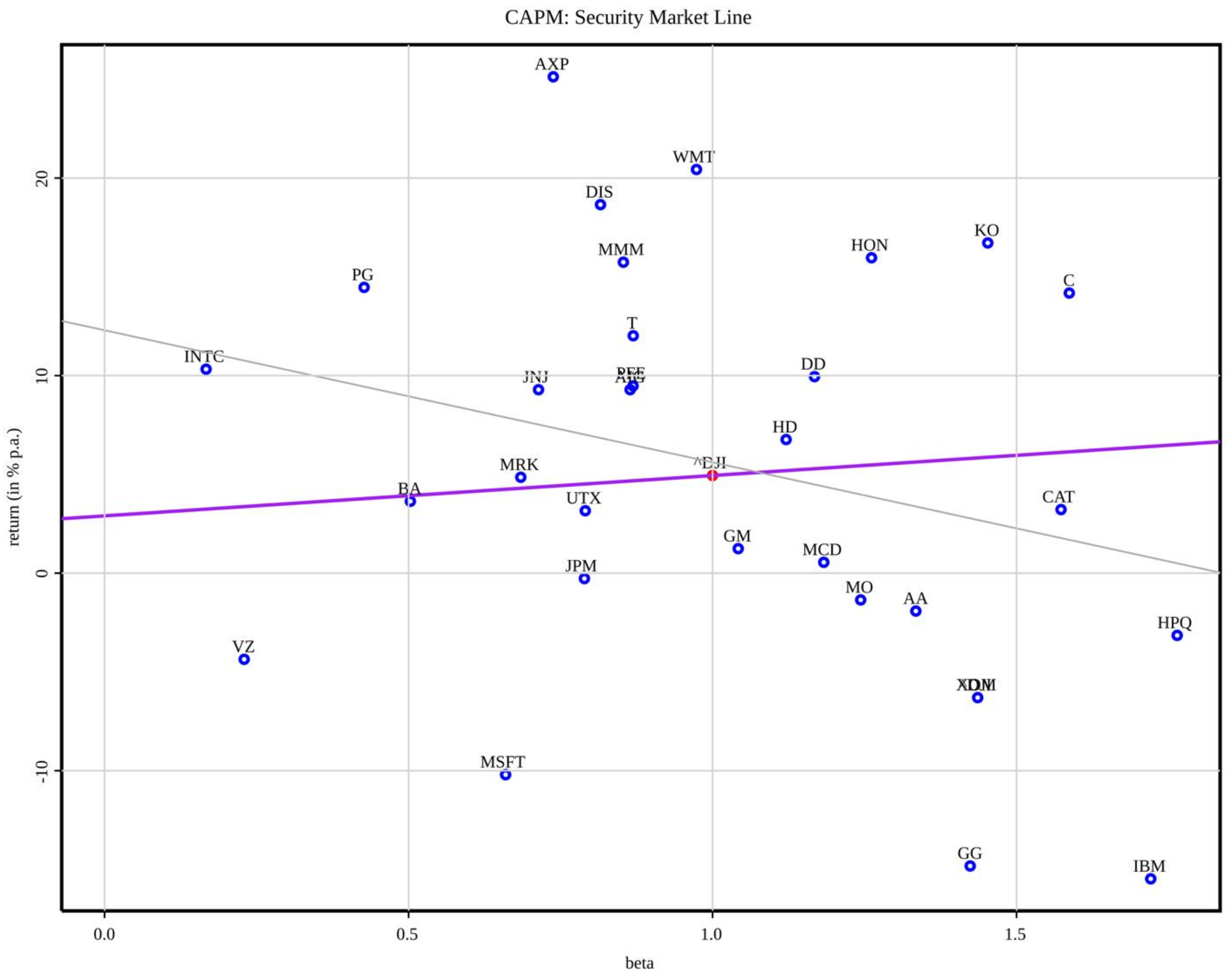
Source: CFI's [Math for Corporate Finance Course].

3.3 Simulation Using Python

To implement CAPM in Python, we will:

- Retrieve historical stock prices for Tesla and the market using yfinance.
- Compute daily and monthly returns.
- Perform **linear regression** to estimate Tesla's beta.
- Calculate the expected return for Tesla based on CAPM.
- Validate results using simulated data if necessary.

Figure 3: Regression Analysis for Beta Estimation



Source: By Thomas Steiner - data by quote.yahoo, atomatically retrieved with GNU R, https://commons.wikimedia.org/w/index.php?curid=1350810

If β≈1, Tesla moves in line with the market.

If β>1, Tesla is more volatile than the market.
If β<1, Tesla is less volatile than the market.
This analysis provides a quantitative measure of Tesla's risk exposure, forming the foundation for further financial modeling.

4. Data set description and visualization

To conduct our analysis, we retrieve Tesla Inc. (TSLA) stock prices and the S&P 500 Index (^GSPC) from Yahoo Finance using the yfinance library. The dataset spans January 1, 2020, to February 1, 2025, and includes daily stock prices, which serve as the foundation for estimating Tesla's beta (β) and expected return under the Capital Asset Pricing Model (CAPM).

4.1 Dataset Overview

The dataset consists of **daily stock prices**, with the following key attributes:

- **Close Price**: The stock's final price at the end of each trading day.
- **Daily Return**: The percentage change in the closing price compared to the previous day.

Before proceeding with the analysis, we fetch and validate the dataset to ensure correctness.

```python
import pandas as pd
import yfinance as yf
import matplotlib.pyplot as plt

# Define stock symbols and date range
start_date = "2020-01-01"
end_date = "2025-02-01"
tsla_symbol = "TSLA"
sp500_symbol = "^GSPC"

# Download Tesla and S&P 500 data
tsla = yf.download(tsla_symbol, start=start_date, end=end_date)
sp500 = yf.download(sp500_symbol, start=start_date, end=end_date)

# Print column names to verify structure
print("Tesla Data Columns:", tsla.columns)
print("S&P 500 Data Columns:", sp500.columns)

# Ensure data was fetched properly
if tsla.empty or sp500.empty:
    raise ValueError("Error: Failed to fetch data. Check stock symbols or date range.")
else:
    print("Data fetched successfully!")

# Handle MultiIndex DataFrame by extracting 'Close' prices correctly
if isinstance(tsla.columns, pd.MultiIndex):
    tsla_close = tsla["Close"]["TSLA"]  # Extract Close price for Tesla
else:
    tsla_close = tsla["Close"]

if isinstance(sp500.columns, pd.MultiIndex):
    sp500_close = sp500["Close"]["^GSPC"]  # Extract Close price for S&P 500
else:
    sp500_close = sp500["Close"]

# Compute daily returns
tsla_returns = tsla_close.pct_change().dropna()
sp500_returns = sp500_close.pct_change().dropna()

# Display first five rows
print("First 5 rows of Tesla Stock Data:")
print(tsla_close.head())

print("Tesla Stock Data Summary:")
print(tsla_close.describe())
```

```
[*********************100%***********************]  1 of 1 completed
[*********************100%***********************]  1 of 1 completedTesla Data Columns: MultiIndex([( 'Close', 'TSLA'),
            (  'High', 'TSLA'),
            (   'Low', 'TSLA'),
            (  'Open', 'TSLA'),
            ('Volume', 'TSLA')],
           names=['Price', 'Ticker'])
S&P 500 Data Columns: MultiIndex([( 'Close', '^GSPC'),
            (  'High', '^GSPC'),
            (   'Low', '^GSPC'),
            (  'Open', '^GSPC'),
            ('Volume', '^GSPC')],
           names=['Price', 'Ticker'])
Data fetched successfully!
First 5 rows of Tesla Stock Data:
Date
2020-01-02    28.684000
2020-01-03    29.534000
2020-01-06    30.102667
2020-01-07    31.270666
2020-01-08    32.809334
Name: TSLA, dtype: float64
Tesla Stock Data Summary:
count    1278.000000
mean      216.429170
std        86.168670
min        24.081333
25%       174.630005
50%       221.204994
75%       261.734993
max       479.859985
Name: TSLA, dtype: float64
```

The dataset, including 1278 trading days, contains daily closing prices for Tesla Inc. (TSLA) and the S&P 500 Index **(^GSPC)**, retrieved from Yahoo Finance. The first five rows confirm that the data is structured correctly, showing Tesla's closing prices from early January 2020.

Table1: Descriptive Statistics of Tesla's Closing Prices

Statistic	Values
Minimum	24.08
Maximum	479.86
Mean	216.43
Standard Deviation	86.17
Median	221.20

The data summary indicates that Tesla’s stock price fluctuated significantly during the period analyzed. The minimum closing price recorded was $24.08, while the maximum reached $479.86. The mean closing price is approximately $216.43, with a standard deviation of $86.17, suggesting a high level of volatility. The median closing price is $221.20, indicating that half of the observed closing prices were below this value. With 1,278 trading days included in the dataset, the data provides a comprehensive foundation for estimating Tesla's beta (β) under the CAPM model.

4.2 Tesla Stock Price Trend Visualization

To visualize Tesla's historical price trends, we plot its daily closing prices:

```
# Plot Tesla Stock Price Trend
plt.figure(figsize=(12, 6))
plt.plot(tsla_close, label="Tesla Stock Price", color="blue")
plt.xlabel("Date")
plt.ylabel("Stock Price (USD)")
plt.title("Tesla (TSLA) Stock Price Trend")
plt.legend()
plt.grid(True)
plt.show()
```

The following graph illustrates Tesla's stock price trend from 2020 to 2025:

Tesla's stock price increased significantly from 2020 to 2021, reflecting strong market optimism and rising demand for electric vehicles. However, the data also shows periods of high volatility, particularly in 2022 and early 2023, when the stock price experienced sharp declines. More recently, in 2024 and early 2025, Tesla's stock price exhibited a renewed upward trend, suggesting increased investor confidence.

This visualization provides insight into Tesla's historical performance, forming the basis for further analysis using the Capital Asset Pricing Model (CAPM).

5. Application

In this section, we apply the Capital Asset Pricing Model (CAPM) to estimate the expected return of Tesla Inc. (TSLA) based on its systematic risk (Beta, β).

5.1 Data Preprocessing for CAPM

We first convert Tesla (TSLA) and S&P 500 (^GSPC) daily prices into monthly returns, which are needed to estimate Beta (β).

```
import pandas as pd
import statsmodels.api as sm

# Resample daily stock prices to monthly (using Month-End)
tsla_monthly = tsla_close.resample("ME").last().pct_change().dropna()
sp500_monthly = sp500_close.resample("ME").last().pct_change().dropna()

# Rename columns for clarity
tsla_monthly.name = "TSLA"
sp500_monthly.name = "Market"

# Display first 5 rows
print("\nFirst 5 rows of Tesla Monthly Returns:")
print(tsla_monthly.head())

print("\nFirst 5 rows of S&P 500 Monthly Returns:")
print(sp500_monthly.head())
```

```
First 5 rows of Tesla Monthly Returns:
Date
2020-02-29    0.026776
2020-03-31   -0.215557
2020-04-30    0.492137
2020-05-31    0.067939
2020-06-30    0.293186
Freq: ME, Name: TSLA, dtype: float64

First 5 rows of S&P 500 Monthly Returns:
Date
2020-02-29   -0.084110
2020-03-31   -0.125119
2020-04-30    0.126844
2020-05-31    0.045282
2020-06-30    0.018388
Freq: ME, Name: Market, dtype: float64
```

Tesla's monthly returns show high volatility, ranging from -21.56% to +49.21%, while the S&P 500's returns are more stable. This confirms the data is ready for CAPM Beta estimation.

5.2 Risk-Free Rate and Market Risk Premium

The risk-free rate and market risk premium are required inputs for CAPM. The risk-free rate is assumed to be 2% annually (0.0017 per month), while the market risk premium is computed as the historical mean return of the S&P 500 minus the risk-free rate. To ensure correct data processing, we validate the excess returns before running the CAPM regression.

```python
# Assume a constant annual risk-free rate of 2% (~0.0017 per month)
risk_free_rate = 0.0017  # Monthly Rf

# Compute Market Risk Premium (MRP)
market_risk_premium = sp500_monthly.mean() - risk_free_rate

# Compute excess returns (subtract risk-free rate)
excess_tsla = tsla_monthly - risk_free_rate
excess_market = sp500_monthly - risk_free_rate

# Combine into a DataFrame for validation
ff_data = pd.DataFrame({
    "Mkt-RF": excess_market,
    "Asset": excess_tsla,
    "RF": risk_free_rate  # Constant risk-free rate for reference
})

# Display first 5 rows for verification
print("\nFirst 5 rows of dataset for CAPM estimation:")
print(ff_data.head())

# Print risk-free rate and market risk premium
print(f"\nRisk-Free Rate (Rf): {risk_free_rate:.4%}")
print(f"Market Risk Premium (MRP): {market_risk_premium:.4%}")
```

```
First 5 rows of dataset for CAPM estimation:
              Mkt-RF     Asset      RF
Date
2020-02-29 -0.085810  0.025076  0.0017
2020-03-31 -0.126819 -0.217257  0.0017
2020-04-30  0.125144  0.490437  0.0017
2020-05-31  0.043582  0.066239  0.0017
2020-06-30  0.016688  0.291486  0.0017

Risk-Free Rate (Rf): 0.1700%
Market Risk Premium (MRP): 1.0174%
```

The output confirms that excess returns for Tesla (Asset) and the Market (Mkt-RF) have been correctly computed by subtracting the risk-free rate (Rf). The Market Risk Premium (MRP) is 1.0174%, representing the historical average return of the market above the risk-free rate. Tesla's excess returns show high volatility, with values ranging from negative to large positive movements.

5.3 Beta Estimation and Expected Return Calculation

The risk-free rate and market risk premium are required for CAPM. Using the dataset, we estimate Tesla's beta using Ordinary Least Squares (OLS) regression and compute the expected return.

```
# Get the mean risk-free rate and market premium
rf = ff_data["RF"].mean()
market_premium = ff_data["Mkt-RF"].mean()

# Prepare independent variable (market excess return)
market_excess_return = sm.add_constant(ff_data["Mkt-RF"])

# Prepare dependent variable (Tesla excess return)
tesla_excess_return = ff_data["Asset"]

# Fit regression model to estimate beta
capm_model = sm.OLS(tesla_excess_return, market_excess_return).fit()
beta = capm_model.params[1]

# Compute expected return
expected_return_monthly = rf + beta * market_premium
expected_return_yearly = expected_return_monthly * 12

# Print results
print(f"The risk-free rate is {rf:.4f}; The Beta is {beta:.4f}; The market risk premium is {market_premium:.4f}.")
print(f"The expected monthly return of Tesla is {expected_return_monthly:.4f}.")
print(f"The expected yearly return of Tesla is {expected_return_yearly:.4f}.")
```

The risk-free rate is 0.0017; The Beta is 2.3364; The market risk premium is 0.0102.
The expected monthly return of Tesla is 0.0255.
The expected yearly return of Tesla is 0.3056.

The CAPM regression results indicate that Tesla has a risk-free rate of 0.17% per month and a Beta of 2.3364, showing that Tesla's stock is highly volatile and reacts more strongly to market fluctuations. The market risk premium is 1.02% per month, representing the additional return investors expect over a risk-free asset. Based on these values, the expected monthly return for Tesla is 2.55%, leading to an expected yearly return of 30.56%. This suggests that while Tesla offers high return potential, it also carries significant market risk.

6. Limitations

Through our analysis, we recognize several limitations of CAPM in evaluating Tesla's stock. CAPM assumes that market risk is the sole determinant of expected returns, but Tesla's stock is highly volatile due to firm-specific factors such as innovation cycles, regulatory changes, and competitive dynamics in the EV industry. These company-specific risks are not captured by CAPM, leading to a potentially incomplete risk assessment.

Our analysis estimated Tesla's Beta at 2.3364, indicating that Tesla's stock is more than twice as volatile as the overall market. However, Tesla's Beta is not constant over time, as its sensitivity to market movements fluctuates based on macroeconomic conditions and investor sentiment. Additionally, Beta does not capture non-market factors such as speculative trading activity, option market dynamics, and social media-driven sentiment, which have significantly impacted Tesla's stock price. These limitations suggest that relying solely on Beta may lead to an incomplete understanding of Tesla's true risk-return profile.

Another limitation is that CAPM assumes a constant risk-free rate and market risk premium, while in reality, economic conditions fluctuate over time. Interest rates, inflation, and macroeconomic shocks impact these variables, affecting the reliability of CAPM for long-term projections. Additionally, extreme market events, such as the COVID-19 crash and subsequent recovery, demonstrated that investor sentiment often deviates from CAPM's theoretical assumptions. As a result, CAPM may not be a reliable tool for long-term return projections under rapidly changing macroeconomic conditions.

To address these limitations, we consider alternative risk-adjusted return measures such as the Sharpe Ratio, which evaluates returns about total risk (standard deviation), providing a broader view of Tesla's investment attractiveness. Additionally, multi-factor models such as the Fama-French Three-Factor Model incorporate size and value effects, which may better capture Tesla's performance than a single-factor CAPM approach.

While CAPM provides a foundational framework for estimating expected returns, it should be used alongside additional risk-adjusted metrics to obtain a more comprehensive evaluation of Tesla's stock performance.

7. Alternative Metrics and Models

To address the limitations of CAPM and gain a more complete understanding of Tesla's stock performance, we incorporate additional models and financial metrics that account for risks beyond systematic market fluctuations. CAPM assumes that only systematic risk matters, but real-world financial markets are influenced by multiple factors, including firm-specific risks, macroeconomic conditions, and investor sentiment. Therefore, using alternative models and metrics provides a more comprehensive evaluation of Tesla's risk-return profile.

7.1 Key Financial Metrics

1. Sharpe Ratio

Measures risk-adjusted return by incorporating total volatility rather than just systematic risk.

$$S = \frac{E\,(R_i) - R_f}{\sigma_i}$$

where:

- S= Sharpe Ratio
- $E(R_i)$= Expected return of Tesla
- R_f= Risk-free rate
- σ_i= Standard deviation of Tesla's returns

A higher Sharpe Ratio indicates that Tesla offers better returns per unit of risk compared to the broader market. It helps investors compare assets with different levels of volatility and assess whether the excess returns justify the associated risks.

2. Jensen's Alpha and Security Market Line (SML)

Jensen's Alpha measures Tesla's excess return beyond what CAPM predicts, determining whether Tesla has overperformed or underperformed given its risk exposure.

$$\alpha = E(R_i) - [R_f + \beta_i(E(R_m) - R_f)]$$

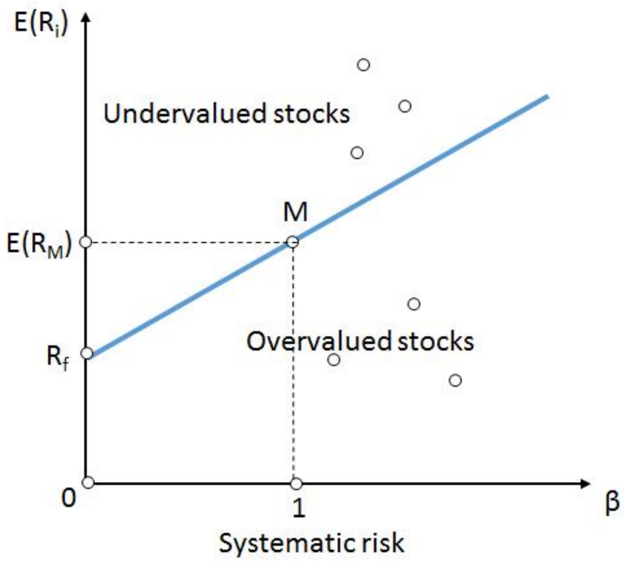
- If $\alpha > 0$, Tesla has outperformed its CAPM-predicted return, suggesting undervaluation or superior management.
- If $\alpha < 0$, Tesla has underperformed relative to CAPM predictions, indicating overvaluation.

Jensen's Alpha measures whether Tesla's actual return exceeds CAPM predictions, indicating potential overperformance or underperformance. A positive alpha suggests Tesla has outperformed, while a negative alpha signals underperformance.

The Security Market Line (SML) visually represents CAPM's expected return for different risk levels**.** Comparing Tesla's return to the SML helps determine if the stock is undervalued or overvalued under CAPM assumptions.

By combining Jensen's Alpha with the SML, we gain a more comprehensive evaluation of Tesla's risk-adjusted performance beyond CAPM alone.

Figure 4: Security Market Line and Stock Valuation



Source: By Lamro - I (Lamro) created this work entirely by myself., CC0, https://en.wikipedia.org/w/index.php?curid=40048738

7.2 Alternative Asset Pricing Models

1. Fama-French Three-Factor Model

Expands CAPM by adding size and value factors.

$$E\,(R_i) = R_f + \beta_m\,(E\,(R_m) - R_f) + s_i \times SMB + h_i \times HML$$

where:

- SMB (Small Minus Big) accounts for size-related return differences.
- HML(High Minus Low) captures value effects.

The Fama-French model is particularly relevant for evaluating Tesla, as its stock price is influenced by market capitalization effects and investor sentiment regarding growth versus value stocks. Since Tesla is historically classified as a high-growth stock, the HML factor could indicate whether it behaves more like a growth stock rather than a traditional value stock.

2. Monte Carlo Simulations

Monte Carlo simulations generate thousands of possible price trajectories based on Tesla's historical volatility and expected return. By modeling multiple scenarios, investors can better understand the range of possible outcomes for Tesla's stock price and make risk-aware investment decisions. This technique is particularly useful in forecasting Tesla's stock performance under different economic conditions, interest rate environments, or external shocks such as supply chain disruptions.

7.3 Summary

These models and metrics offer a broader perspective on Tesla’s stock performance beyond CAPM by incorporating additional factors that influence asset returns. The Sharpe Ratio provides a risk-adjusted measure of Tesla’s returns, helping investors evaluate whether the stock’s excess returns justify its volatility. Jensen’s Alpha, in conjunction with the Security Market Line (SML), assesses whether Tesla has outperformed or underperformed relative to CAPM expectations, identifying potential mispricing in the market.

The Fama-French Three-Factor Model refines return estimation by considering size and value effects, which are particularly relevant to Tesla given its growth-oriented nature. Meanwhile, Monte Carlo Simulations enhance risk assessment by generating thousands of potential price trajectories, accounting for uncertainties beyond CAPM’s assumptions. By integrating these approaches, we develop a more robust framework for analyzing Tesla’s stock performance, capturing both systematic and unsystematic risks more comprehensively.

8. Conclusion

In this project, we applied the Capital Asset Pricing Model (CAPM) to analyze Tesla’s stock performance, estimating its systematic risk (Beta) and expected return based on market conditions. Our findings highlight that while CAPM provides a foundational framework for evaluating risk-adjusted returns, it has notable limitations in capturing Tesla’s full risk profile.

To address these limitations, we incorporated alternative financial metrics and models, including the Sharpe Ratio, Jensen’s Alpha, the Fama-French Three-Factor Model, and Monte Carlo Simulations. These additional approaches helped account for total risk exposure, market mispricing, and non-systematic risk factors, providing a more comprehensive view of Tesla’s return dynamics.

By integrating these methods, we gained a broader understanding of Tesla’s stock valuation and investment potential. Future analysis could further enhance accuracy by incorporating additional risk factors, macroeconomic variables, and real-time data-driven models to refine predictive insights.

9. Explore Real-World Implications

Tesla's stock performance has been significantly influenced by recent market events, including interest rate hikes, evolving trends in the electric vehicle (EV) industry, and broader macroeconomic conditions.

9.1 Impact of Interest Rate Hikes

Interest rate hikes, particularly those implemented by the Federal Reserve in response to inflation concerns, have increased the cost of borrowing. For Tesla, this has translated into higher financing costs for production and expansion. Additionally, higher rates reduce the present value of future earnings, often resulting in downward pressure on Tesla's stock price.

9.2 EV Industry Trends

The EV market has experienced rapid growth, driven by global initiatives for carbon neutrality and advancements in battery technology. Tesla, as a market leader, has benefited from increased EV adoption. However, growing competition from established automakers and new entrants, such as NIO and Rivian, has intensified market dynamics. CAPM's beta metric captures Tesla's increased market sensitivity, reflecting investor sentiment toward the EV sector's growth potential.

9.3 Corporate Finance Implications

From a corporate finance perspective, Tesla's elevated beta indicates a high-risk, high-reward investment profile. The company's capital allocation strategies, including investments in manufacturing infrastructure and energy solutions, must account for this volatility. The CAPM model helps estimate Tesla's cost of equity, informing decisions related to capital structure optimization and shareholder return strategies.

By connecting these findings to broader market trends and strategic financial decisions, we gain a more comprehensive understanding of Tesla's stock performance within the contemporary investment landscape.

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