

# Comparing Company Stock Performance

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## 1 Introduction

This document outlines the process and results of analyzing a company's stock performance and creating an efficient frontier with Microsoft. The analysis uses **157 weekly price observations (resulting in 156 weekly return observations)** ending **10/7/24**. **For illustration in this report, the selected company is Netflix (NFLX)**. The same framework can be applied to any company by replacing the ticker and updating the data.

**Key Results (Example: Netflix):**

$\text{Corr}(\text{NFLX}, \text{MSFT}) = 0.476$

Metric	Netflix (NFLX)	Microsoft (MSFT)
Beta vs market (Wilshire 5000)	1.62	1.09
Alpha (weekly, %)	0.038	0.116
R-squared	0.36	0.54
Weekly volatility (std dev, %)	6.59	3.62
Annualized volatility (%, sqrt(52))	47.54	26.13
CAPM expected return (annual, %)	17.51	13.38

Figure 1: Summary results (as computed in the Excel model)

## 2 Data Collection and Preparation

I began by gathering weekly historical prices for my assigned company, covering 157 weeks and ending on October 7, 2024, using Yahoo Finance. I focused on the "Adj. Close" price, which accounts for splits and dividends, ensuring consistency with current prices.

**Since the data is weekly, I calculated weekly percentage returns using:**

$$r_t = \frac{P_t}{P_{t-1}} - 1$$

(and multiplied by 100 to express it as a percentage)

I repeated this process for the Wilshire 5000 index to use as a market benchmark.

## 3 Company Analysis

### 3.1 Scatterplot: Netflix vs Wilshire 5000

The scatterplot shows the weekly stock price returns of Netflix vs. Wilshire 5000 returns. The x-axis represents Wilshire 5000 returns, while the y-axis represents Netflix's returns.

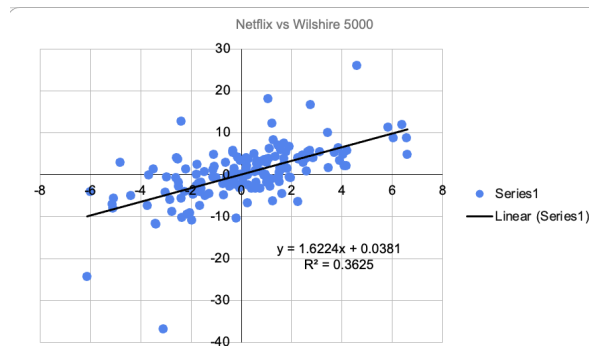


Figure 2: Scatterplot of Netflix and Wilshire 5000 (weekly returns)

### 3.1.1 Steps for plotting

1. I created a new column with returns using the formula  $r_t = \frac{P_t}{P_{t-1}} - 1$  for both Netflix and Wilshire 5000 and multiplied by 100 for percentage returns.
2. Using the returns column of Netflix as y-axis and Wilshire's as x-axis, I created a scatter plot.

## 3.2 Regression Analysis

### 3.2.1 Steps

1. Add linear trendline to the scatterplot.
2. Enable "Display equation on chart" and "Display R-squared value on chart."
3. Using the regression formula:  $y = [\text{slope}]x + [\text{intercept}]$ , find beta from this equation.

$$\text{Beta} = \text{slope}$$

**Result (from this dataset):**  $\beta_{\text{NFLX}} = 1.62$  and  $R^2 \approx 0.36$ .

## 3.3 Analysis of Microsoft vs Wilshire 5000

Repeat the same steps as above for Microsoft and Wilshire 5000.

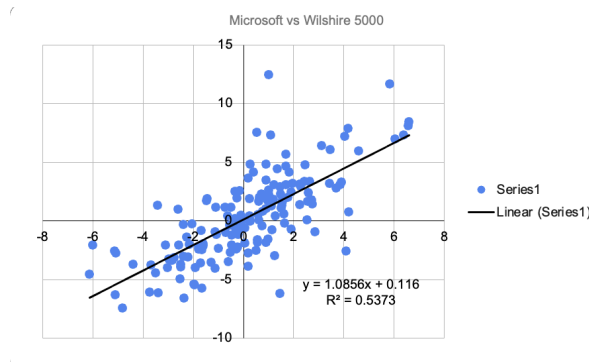


Figure 3: Microsoft vs Wilshire 5000 (weekly returns)

**Result (from this dataset):**  $\beta_{\text{MSFT}} = 1.09$  and  $R^2 \approx 0.54$ .

## 4 Efficient Frontier Analysis

### 4.1 Assumptions

I assumed Risk-free rate as 4.875% and Equity risk premium as 7.8%. I used CAPM:

$$E[R_i] = r_f + \beta_i \cdot ERP$$

### 4.2 Standard Deviation

Calculated standard deviation for all the values in column "Returns" for Netflix, Wilshire 5000 and Microsoft.

#### 4.2.1 Formulas

Netflix: =STDEV(H3:H159)

Wilshire 5000: =STDEV(Q3:Q159)

Microsoft: =STDEV(Z3:Z159)

Computed weekly volatility (from this dataset): NFLX = 6.59%, MSFT = 3.62%.

If annualizing volatility for an annual-efficient-frontier plot:  $\sigma_{annual} = \sigma_{weekly} \sqrt{52}$ .

### 4.3 Correlation

I calculated correlation between Netflix and Microsoft and stored in a cell.

#### 4.3.1 Formula

=CORREL(H3:H159,Z3:Z3:Z159)

Correlation between NFLX and MSFT returns (this dataset): 0.476 (moderate diversification benefit).

### 4.4 Betas

Beta values are the slopes in the regression formula. From the regression equations in the graphs,

Beta Netflix = 1.62

Beta Microsoft = 1.09

### 4.5 Returns

I found the returns using the formula: risk free rate + beta \* equity risk premium

Netflix's expected return = 17.511%

Microsoft's expected return = 13.377%

### 4.6 Portfolio Calculations

#### 4.6.1 Steps to calculate

1. For each of the 11 portfolio weightings (0%/100% to 100%/0%), I calculated the portfolio's standard deviation based on the weightings, correlation, and standard deviations of Netflix and Microsoft.

2. I calculated the expected return for each portfolio weighting.

$$\sigma_{portfolio} = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \rho_{1,2} \sigma_1 \sigma_2}$$

Figure 4: Formula for portfolio standard deviation

$$E[R_p] = wE[R_{NFLX}] + (1 - w)E[R_{MSFT}]$$

Figure 5: Formula for portfolio expected return

#### 4.6.2 Formulas

### 4.7 Efficient Frontier Graph

The shape of the efficient frontier graph can be explained by:

**Curvature:** The curvature in the graph is due to the diversification effect. As we combine two assets with less than perfect correlation, we can achieve better risk-return tradeoffs than simply interpolating between the two individual assets.

**Concavity:** The graph is concave (bowed outward) because of the risk reduction benefits of diversification. This shape indicates that investors can achieve a better return per unit of risk by combining the assets rather than investing in them individually.

**Endpoints:** The two endpoints of the curve represent 100% investment in either Netflix or Microsoft. All other points on the curve represent various combinations of the two assets.

**Optimal portfolios:** Points along the upper edge of the curve represent optimal portfolios that offer the highest expected return for a given level of risk.

The specific shape of your efficient frontier may vary depending on:

- The relative risk and return characteristics of Netflix and Microsoft
- The correlation between the two assets
- The difference in expected returns between the two assets

If the graph shows little curvature (largely linear), it could indicate:

- High correlation between the two assets
- Similar risk-return profiles of the two assets
- Limited diversification benefits from combining the two assets

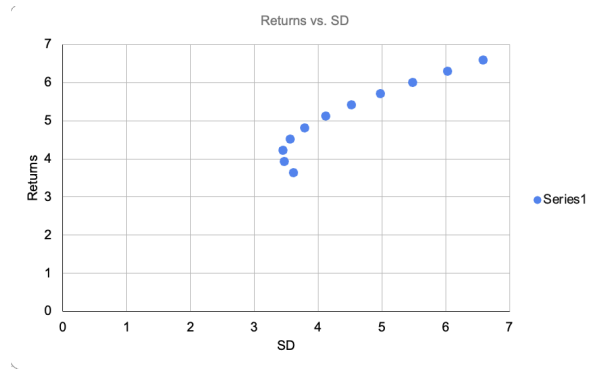


Figure 6: Efficient frontier (Netflix + Microsoft): Expected return vs volatility

## 4.8 Conclusion

This analysis provides insights into a company's stock performance relative to the market and its potential role in a diversified portfolio with Microsoft. In this report, Netflix (NFLX) is used as the example company, and the same method can be applied to any other stock. The efficient frontier demonstrates the risk-return tradeoffs available to investors when combining these two assets.