LSE Team 3 Assignment 3

2025-02-20

AGENDA

- **Comparison between APPL, GOOGL, NVDA stock prices and**
  - Surprise factor
  - Macroeconomic factors
  - Sentiment from NY Times articles
- **Trading strategies**
- **Conclusions**

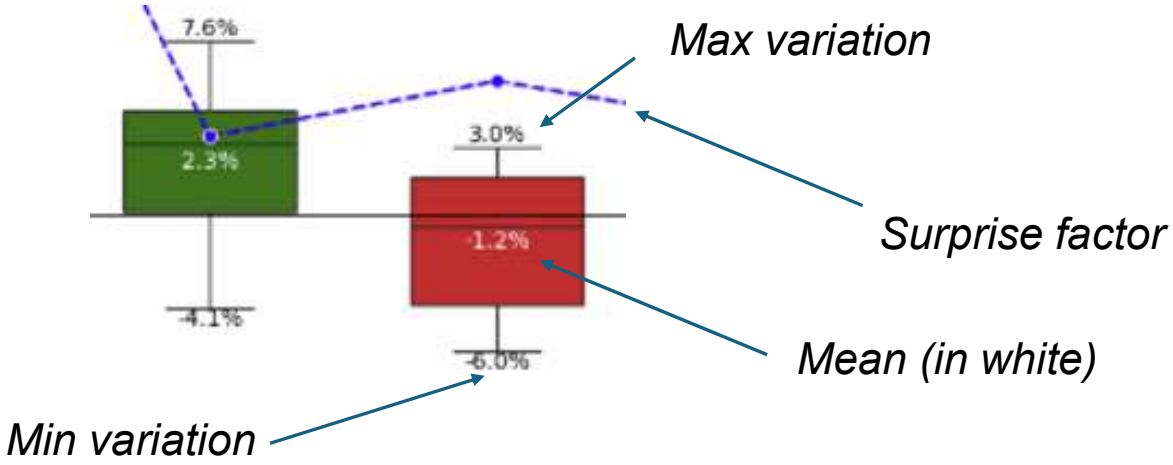
METHODOLOGICAL APPROACH

The comparison is made by retrieving the stock prices **before** and **after** each QERD through Box plots to compare the **closing price movements**, their own main statistical values and the **surprise factor** variation. Each box is calculated n days before and n days after each QERD (n = 1, 2, 3, 5, and 10 days)

Window timeline analyzed: **every quarter from 2017 to 2024**, excluding holidays and stock exchange closing days.

Green box → the stock increases value during that period

Red box → the stock loses value during the period

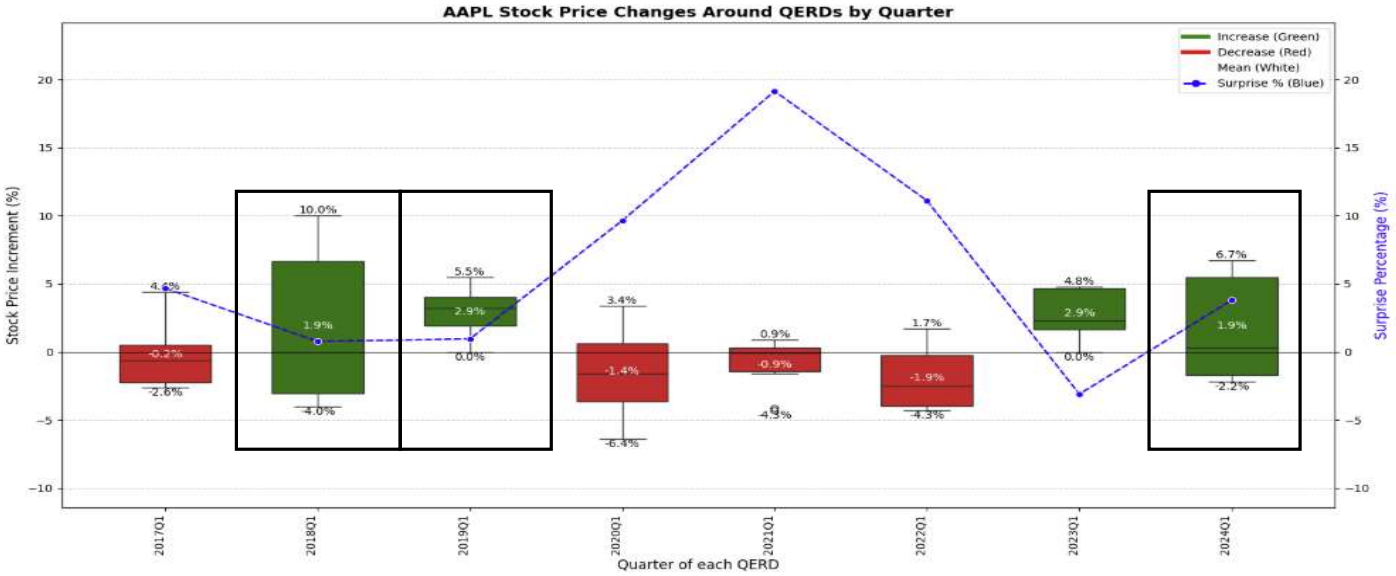


ANALYSIS ON QUARTERS BEHAVIOR

To grant robustness, the analysis has been conducted selecting the same quarter in the interval 2017 – 2024 (Q1 2017, Q1 2018, Q1 2019, etc.)

Every time the surprise factor follows the same trend of the closing prices variation, a correlation has been found

Example: 5 days, AAPL 2017 – 2024 Q1



Stock price and surprise factor correlate 3 times out of 8

WHICH STOCK PERFORMED THE MOST AND WHEN, IN TERMS OF CORRELATION?

1 day before and after QERDs			
2017 - 2024	AAPL	GOOGL	NVDA
Q1	4/8	5/8	5/8
Q2	**7/8**	5/8	5/8
Q3	**6/8**	3/8	4/8
Q4	4/8	6/8	4/8

2 days before and after QERDs			
2017 - 2024	AAPL	GOOGL	NVDA
Q1	3/8	3/8	4/8
Q2	**6/8**	5/8	**6/8**
Q3	4/8	5/8	4/8
Q4	2/8	4/8	3/8

3 days before and after QERDs			
2017 - 2024	AAPL	GOOGL	NVDA
Q1	2/8	2/8	4/8
Q2	2/8	4/8	**6/8**
Q3	4/8	5/8	4/8
Q4	3/8	4/8	4/8

5 days before and after QERDs			
2017 - 2024	AAPL	GOOGL	NVDA
Q1	3/8	3/8	4/8
Q2	4/8	**6/8**	4/8
Q3	4/8	**7/8**	4/8
Q4	2/8	3/8	4/8

AAPL shows the strongest short-term correlation in Q2 and Q3, GOOGL performs best long-term in Q3, and NVDA exhibits reliable medium-term correlation, especially in Q2.

TRADING STRATEGY: KEY INSIGHTS AROUND QERDs

One of the clear outcomes so far is the clear highlight of an «optimal set of Quarters for Trading»: Indeed, **Q2 and Q3** show the strongest correlation between stock prices and surprise factors.

Stock-Specific Strategies:

- **AAPL:**
  - ✓ **Best Timing:** Trade (buy or sell) **1 to 2 days before or after QERDs**.
  - ✓ **Focus on: Q2 and Q3**.

- **GOOGL:**
  - ✓ **Best Timing:** Trade (buy or sell) **5 days before or after QERDs**.
  - ✓ **Focus on: Q2 and Q3**.

- **NVDA:**
  - ✓ **Best Timing:** Trade (buy or sell) **2 to 3 days before or after QERDs**.
  - ✓ **Focus on: Q2**.

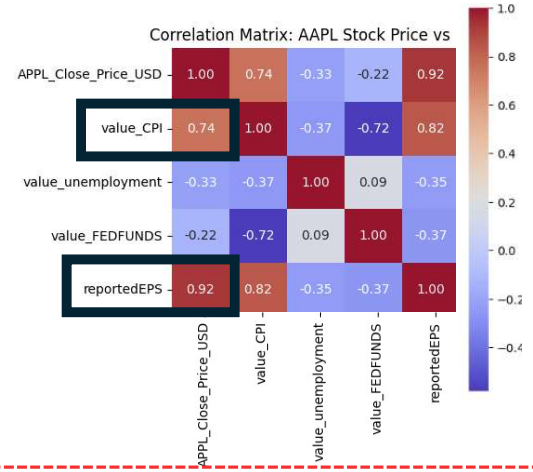
CORRELATION WITH MACROECONOMIC FACTORS

Closing prices have been correlated with key macroeconomic indicators that influence market sentiment and company performance:

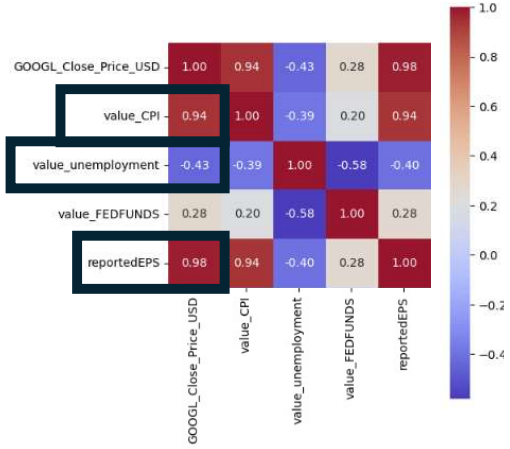
- **Consumer Price Index (CPI)**
  Measures inflation; rising inflation can reduce consumer purchasing power and increase costs, impacting corporate profitability and stock prices.
- **Unemployment Rate**
  Reflects labor market health; high unemployment can signal weaker consumer spending and lower earnings potential, while low unemployment can drive wage pressures.
- **FED Funds Interest Rate**
  Determines borrowing costs; higher rates typically slow economic growth and reduce future earnings potential, while lower rates can stimulate investment and spending.
- **Reported Earnings Per Share (EPS)**
  Direct indicator of company performance; a positive or negative earnings surprise relative to expectations often leads to stock price movements.
- **Surprise Factor (%)**
  Quantifies the deviation between expected and actual earnings; large surprises (positive or negative) can drive significant short-term volatility in stock prices.

STOCK PRICE CORRELATION WITH MACROECONOMIC FACTORS

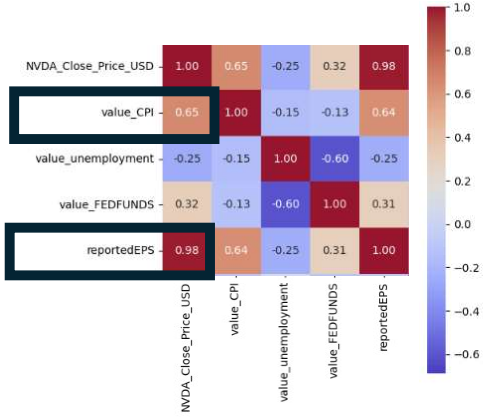
AAPL: Price performance is highly driven by earnings performance. Strongest correlation with **EPS (0.92)** and **CPI (0.74)**



GOOGL: Price is sensitive to both earnings and macro data. **Strongest** correlation with **EPS (0.98)** and **CPI (0.64). Notably, it has a negative correlation with Unemployment (-0.43)**



Price reflects both inflationary pressures and earnings performance. **Strongest correlation with EPS (0.98) and CPI (0.65)**



STRONG CORRELATION WITH EPS: STOCK PRICES AS INDEPENDENT VARIABLE TO BE COMPARED WITH CPI, UNEMPLOYMENT RATE, INTEREST RATES, EPS AND SUPRISE PERCENTAGE

AAPL

OLS Regression Results

Dep. Variable:	APPL_Close_Price_USD	R-squared:	0.877
Model:	OLS	Adj. R-squared:	0.877
Method:	Least Squares	F-statistic:	1.275e+04
Date:	Mon, 17 Feb 2025	Prob (F-statistic):	0.00
Time:	21:03:47	Log-Likelihood:	-38275.
No. Observations:	8926	AIC:	7.656e+04
Df Residuals:	8920	BIC:	7.661e+04
Df Model:	5		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	-82.6171	2.431	-33.988	0.000	-87.382	-77.852
value_CPI	0.3440	0.010	32.834	0.000	0.323	0.365
value_unemployment	1.0658	0.115	9.281	0.000	0.841	1.291
value_FEDFUNDS	3.7114	0.089	41.721	0.000	3.537	3.886
reportedEPS	75.4340	0.838	90.025	0.000	73.791	77.076
surprisePercentage	-0.1828	0.010	-18.660	0.000	-0.202	-0.164

Omnibus:	1340.022	Durbin-Watson:	1.998
Prob(Omnibus):	0.000	Jarque-Bera (JB):	6058.391
Skew:	0.667	Prob(JB):	0.00
Kurtosis:	6.810	Cond. No.	2.64e+03

GOOGL

OLS Regression Results

Dep. Variable:	GOOGL_Close_Price_USD	R-squared:	0.966
Model:	OLS	Adj. R-squared:	0.966
Method:	Least Squares	F-statistic:	2.340e+04
Date:	Mon, 17 Feb 2025	Prob (F-statistic):	0.00
Time:	21:15:22	Log-Likelihood:	-14827.
No. Observations:	4135	AIC:	2.967e+04
Df Residuals:	4129	BIC:	2.970e+04
Df Model:	5		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	-52.0637	3.454	-15.072	0.000	-58.836	-45.292
value_CPI	0.2872	0.015	18.728	0.000	0.257	0.317
value_unemployment	-0.9130	0.085	-10.736	0.000	-1.080	-0.746
value_FEDFUNDS	0.2177	0.092	2.364	0.018	0.037	0.398
reportedEPS	70.2913	1.017	69.134	0.000	68.298	72.285
surprisePercentage	0.0694	0.011	6.423	0.000	0.048	0.091

Omnibus:	909.707	Durbin-Watson:	2.046
Prob(Omnibus):	0.000	Jarque-Bera (JB):	2040.060
Skew:	1.247	Prob(JB):	0.00
Kurtosis:	5.372	Cond. No.	6.43e+03

NVDA

OLS Regression Results

Dep. Variable:	NVDA_Close_Price_USD	R-squared:	0.971
Model:	OLS	Adj. R-squared:	0.971
Method:	Least Squares	F-statistic:	3.551e+04
Date:	Mon, 17 Feb 2025	Prob (F-statistic):	0.00
Time:	21:20:06	Log-Likelihood:	-14840.
No. Observations:	5244	AIC:	2.969e+04
Df Residuals:	5238	BIC:	2.973e+04
Df Model:	5		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	-11.2324	0.658	-17.059	0.000	-12.523	-9.942
value_CPI	0.0404	0.002	18.191	0.000	0.036	0.045
value_unemployment	0.2331	0.039	6.015	0.000	0.157	0.309
value_FEDFUNDS	0.5538	0.042	13.233	0.000	0.472	0.636
reportedEPS	169.2972	0.659	256.944	0.000	168.005	170.589
surprisePercentage	-0.0013	0.001	-1.136	0.256	-0.004	0.001

Omnibus:	1708.321	Durbin-Watson:	2.053
Prob(Omnibus):	0.000	Jarque-Bera (JB):	65187.958
Skew:	0.866	Prob(JB):	0.00
Kurtosis:	20.186	Cond. No.	3.47e+03

EPS is the strongest driver of stock price movements for **AAPL, GOOGL, and NVDA**, as indicated by the **highly significant coefficients** in the OLS regression results.

REFINED TRADING STRATEGY – QERDs MACROECONOMIC SENSITIVITY

AAPL & NVDA:
Trade 2-3 days before/after Q2 & Q3 QERDs when CPI is stable or declining, and EPS beats expectations.
Increase position size in Q2 & Q3; reduce exposure in Q1 & Q4 due to weaker correlation.

GOOGL:
Trade 5 days after Q3 QERDs when unemployment is falling and EPS beats expectations.
Reduce exposure in Q1 & Q4 due to lower stock-price correlation with earnings.

Macro Overlay – for all Stocks:
Avoid increasing positions when CPI shows high volatility or large positive surprises.
Monitor unemployment trends closely for GOOGL; negative surprises may weaken stock performance.

Risk Management:
Reduce positions if macro data deviates sharply from expectations (e.g., CPI above forecasts)
Implement stop-losses around earnings releases and major macroeconomic announcements.

CONCLUSIONS

OPTIMAL TIMING DEFINITION

Q2 and Q3 are the optimal quarters for trading AAPL, NVDA, and GOOGL around QERDs due to the strongest price-surprise correlation.

MACROECONOMIC FACTORS

AAPL and NVDA: Strongest reactions to **EPS and CPI stability**.
GOOGL: Also **sensitive to unemployment data** alongside EPS and CPI.

INVESTING WINDOWS

Short-term windows (2-5 days) before and after QERDs present the **best trading opportunities**.
Macro data surprises (CPI, unemployment) can **amplify price movements**, requiring **active risk management**.

DATA-DRIVEN STRATEGIES COMBINING **EARNINGS SEASONALITY AND MACROECONOMIC SIGNALS** CAN **IMPROVE DECISION-MAKING AND RETURNS**

Thank you for your kind attention

Additional Slides

Sentiment analysis

- No correlation between AAPL and GOOGL stock prices and article mentioning them
- Weak negative correlation between NVDA stock price and articles mentioning “artificial” (intelligence?)

- No strategy can be adopted by investigating sentiment analysis and polarity

Granger causality test

- Useful to predict stock prices
- CPI index can predict AAPL and GOOGL stocks
- Reported EPS can predict all the stocks
- Sentiment analysis can predict the AAPL stock only

	AAPL	GOOGL	NVDA
CPI Index	Y	Y	N
Unemployment rate	N	N	N
FED funds interest rate	N	N	N
Reported EPS	Y	Y	Y
Surprise Percentage	N	N	N
Polarity articles	Y	N	N