

# Earnings Impact Across Industries

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# Purpose of Project

## Guiding Question:

Do patterns exist across industries for earnings announcements, does Q4 impact industries differently?



Understand the relationship between earnings announcements and the stock's price across different industries: real estate, tech, pharmaceuticals, retail and energy



Calculate key statistics and visualize data.

Build a scalable and customizable program to analyze market sectors' earnings and their impact.



# Program Overview

## Input

Find compelling industries that might be susceptible to earnings announcements. Choose three companies in that industry to gather data.



## Gather Data

Use Python to gather Q4 earnings announcements. Get daily returns one week before the announcement and a week after. Consolidate data for the three companies chosen.



## Calculate statistics

T test  
Correlation Test  
Regression Test



## Conclusion

Explain data/statistics gathered



# Test Hypothesis

- $H_0 = \text{Earnings surprise} - \text{Price Difference Before \& After Announcement} = 0$   
(Earning Announcement has no effect on stock price)
- $H_a = \text{Earnings surprise} - \text{Price Difference Before \& After Announcement} \neq 0$   
(Earning Announcement has an effect on stock price)
- $\text{Alpha} = 0.05$

# Energy Industry

1. NextEra Energy (NEE)
  - Renewable Energy Company which is world's largest producer of wind & solar energy
2. Exxon Mobil Corporation (XOM)
  - large international integrated oil companies
3. Chevron Corporation (CVX)
  - large international integrated oil companies



	Expected EPS	Actual EPS	Actual - Expected EPS	Price Diff Before & After Ann
2014-01-28	0.97	0.95	-0.02	-6.984777
2014-01-30	1.92	1.91	-0.01	-1.463542
2014-01-31	2.57	2.57	0	-4.533355
2015-01-27	1.07	1.03	-0.04	-9.157146
2015-01-30	1.63	1.85	0.22	1.771695
2015-02-02	1.34	1.32	-0.02	7.849044
2016-01-28	1.09	1.17	0.08	-0.682244
2016-01-29	0.47	0.26	-0.21	-2.800474
2016-02-02	0.63	0.67	0.04	7.218986
2017-01-27	1.3	1.21	-0.09	3.445412
2017-01-27	0.64	0.21	-0.43	-2.718285
2017-01-31	0.7	0.9	0.2	-5.292496
2018-01-26	1.31	1.25	-0.06	-1.358110
2018-02-02	1.04	0.88	-0.16	4.507830
2018-02-02	1.22	0.72	-0.5	5.278992
2019-01-25	0.38	0.37	-0.01	3.486846
2019-02-01	1.87	1.95	0.08	-9.413050
2019-02-01	1.08	1.41	0.33	-10.121324
2020-01-24	0.37	0.36	-0.01	3.195326
2020-01-31	1.45	1.49	0.04	-3.610085
2020-01-31	0.43	0.41	-0.02	-2.174017
2021-01-26	0.37	0.4	0.03	5.702448
2021-01-29	0.07	-0.01	-0.08	1.113069
2021-02-02	0.01	0.03	0.02	2.876383
2022-01-25	0.4	0.41	0.01	0.823601
2022-01-28	3.12	2.56	-0.56	0.957226
2022-02-01	1.94	2.05	0.11	2.732731
2023-01-25	0.49	0.51	0.02	2.496242
2023-01-27	4.38	4.09	-0.29	-4.745628
2023-01-31	3.3	3.4	0.1	-4.544488

# Energy Industry

## T-Test:

- Alpha = 0.05
- T-statistic = -0.5534
- P-value = 0.5820
- P-value > Alpha
- We fail to reject the null hypothesis

## Correlation Test:

- Correlation coefficient: -0.2130
- P-value: 0.2584

# Energy Industry Regression



Dep. Variable:	Price Diff Before & After Ann	R-squared:	0.045			
Model:	OLS	Adj. R-squared:	0.011			
Method:	Least Squares	F-statistic:	1.331			
Date:	Thu, 16 Mar 2023	Prob (F-statistic):	0.258			
Time:	18:01:17	Log-Likelihood:	-89.137			
No. Observations:	30	AIC:	182.3			
Df Residuals:	28	BIC:	185.1			
Df Model:	1					
Covariance Type:	nonrobust					
	coef	std err	t	P> t	[0.025	0.975]
const	-0.7575	0.912	-0.830	0.413	-2.627	1.112
Actual - Expected EPS	-5.3518	4.639	-1.154	0.258	-14.854	4.151
Omnibus:	2.053	Durbin-Watson:	1.677			
Prob(Omnibus):	0.358	Jarque-Bera (JB):	1.185			
Skew:	-0.109	Prob(JB):	0.553			
Kurtosis:	2.051	Cond. No.	5.21			

# Pharmaceutical Industry

## Abbvie Inc

ABBV is engaged in the research and development, manufacturing, commercialization and sale of medicines and therapies.

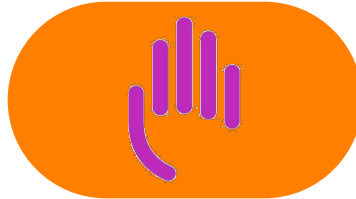
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## Bristol-Myers Squibb Co

BMJ is engaged in the discovery, development, licensing, manufacturing, marketing, distribution, and sale of biopharmaceutical products.



## Johnson & Johnson

JNJ is engaged in the research and development, manufacture and sale of a range of products in the healthcare field.

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	Expected EPS	Actual EPS	Actual - Expected EPS	Price Diff Before & After Ann
2014-01-21	1.2	1.24	0.04	-0.013856
2014-01-24	0.43	0.51	0.08	0.023717
2014-01-31	0.82	0.82	0	0.045971
2015-01-20	1.25	1.27	0.02	0.028920
2015-01-27	0.41	0.46	0.05	0.021182
2015-01-30	0.86	0.89	0.03	0.035234
2016-01-26	1.42	1.44	0.02	0.020749
2016-01-28	0.28	0.38	0.1	-0.027115
2016-01-29	1.12	1.13	0.01	0.035905
2017-01-24	1.56	1.58	0.02	0.001735
2017-01-26	0.67	0.63	-0.04	0.043814
2017-01-27	1.2	1.2	0	0.129754
2018-01-23	1.72	1.74	0.02	-0.007154
2018-01-26	1.44	1.48	0.04	-0.104655
2018-02-05	0.67	0.68	0.01	-0.023270
2019-01-22	1.95	1.97	0.02	-0.025738
2019-01-24	0.85	0.94	0.09	-0.023292
2019-01-25	1.94	1.9	-0.04	0.112460
2020-01-22	1.87	1.88	0.01	-0.015599
2020-02-06	0.88	1.22	0.34	-0.045532
2020-02-07	2.19	2.21	0.02	-0.006616
2021-01-26	1.82	1.86	0.04	0.066509
2021-02-03	2.85	2.92	0.07	-0.041081
2021-02-04	1.42	1.46	0.04	-0.037224
2022-01-25	2.12	2.13	0.01	-0.014838
2022-02-02	3.29	3.31	0.02	-0.050203
2022-02-04	1.8	1.83	0.03	-0.019484
2023-01-24	2.23	2.35	0.12	-0.026127
2023-02-02	1.72	1.82	0.1	-0.072381
2023-02-09	3.56	3.6	0.04	0.008227

T-test:

Alpha: .05

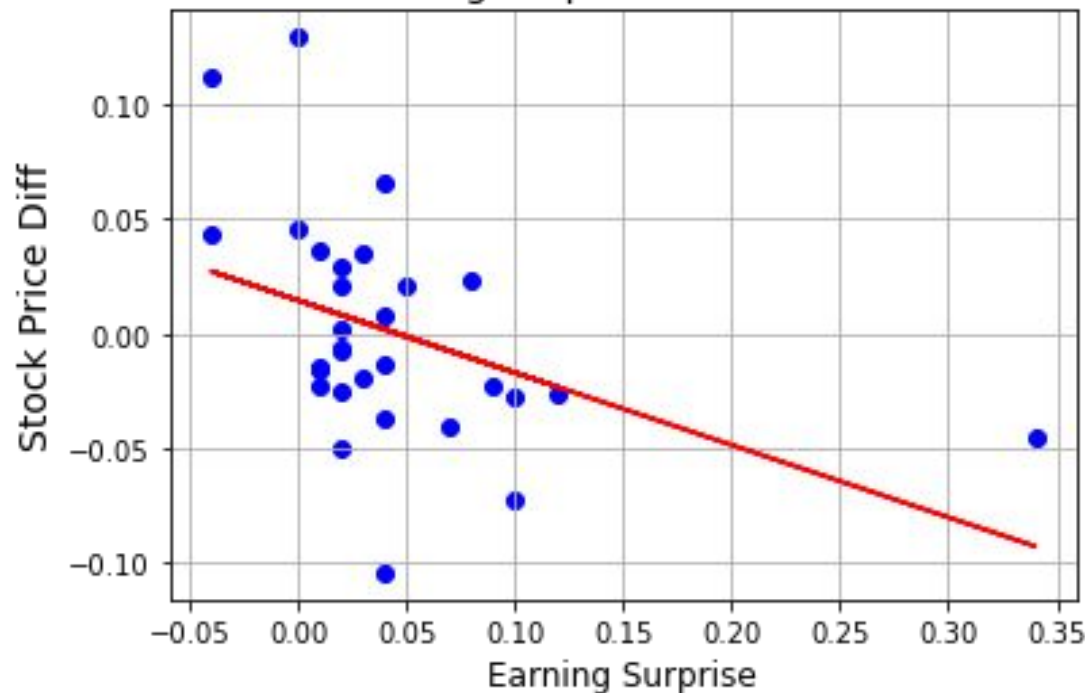
P-value: .01778

Since p-value < alpha we reject the null hypothesis

Correlation Test: -0.429

# Pharmaceutical Industry

Earning Surprise Vs Price Diff



OLS Regression Results

Dep. Variable:	Price Diff Before & After Ann			R-squared:		0.185
Model:	OLS			Adj. R-squared:		0.156
Method:	Least Squares			F-statistic:		6.343
Date:	Thu, 16 Mar 2023			Prob (F-statistic):		0.0178
Time:	18:37:19			Log-Likelihood:		51.197
No. Observations:	30			AIC:		-98.39
Df Residuals:	28			BIC:		-95.59
Df Model:	1					
Covariance Type:	nonrobust					
	coef	std err	t	P> t	[0.025	0.975]
const	0.0145	0.010	1.456	0.157	-0.006	0.035
Actual - Expected EPS	-0.3164	0.126	-2.518	0.018	-0.574	-0.059
Omnibus:	2.458	Durbin-Watson:	1.788			
Prob(Omnibus):	0.293	Jarque-Bera (JB):	1.194			
Skew:	0.337	Prob(JB):	0.550			
Kurtosis:	3.708	Cond. No.	15.2			

Notes:

[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

# Technology Industry

**Google LLC (GOOGL)**



Google specializes in internet-related services and products.

**Apple Inc. (AAPL)**



Apple designs, develops, and sells consumer electronics, computer software, and online services.

**Meta Platforms (META)**



Meta is a social media company that operates a range of social media platforms

# Technology results

	Expected EPS	Actual EPS	Actual - Expected EPS	Price Diff Before & After Ann	STD Diff Before & After Ann
2014-01-27	0.5025	0.5175	0.015	0.055726	0.335458
2014-01-30	0.305	0.3005	-0.0045	0.246697	0.130243
2014-01-30	0.305	0.3005	-0.0045	0.056535	1.402596
2015-01-27	0.65	0.765	0.115	0.057883	2.436463
2015-01-29	0.3555	0.344	-0.0115	0.050217	2.049265
2015-01-29	0.3555	0.344	-0.0115	0.018638	0.417251
2016-01-26	0.8075	0.82	0.0125	-0.019898	-0.171961
2016-02-01	0.4055	0.4335	0.028	-0.036621	-0.048651
2016-02-01	0.4055	0.4335	0.028	-0.015575	2.983893
2017-01-26	0.4825	0.468	-0.0145	-0.027165	2.412010
2017-01-26	0.4825	0.468	-0.0145	-0.014414	-0.520418
2017-01-31	0.8025	0.84	0.0375	0.008542	0.672869
2018-02-01	0.499	0.485	-0.014	0.084557	5.187058
2018-02-01	0.499	0.485	-0.014	0.023132	2.001424
2018-02-01	0.965	0.9725	0.0075	0.064808	1.850348
2019-01-29	1.04	1.05	0.01	-0.044545	0.973188
2019-02-04	0.541	0.6385	0.0975	-0.069771	11.730566
2019-02-04	0.541	0.6385	0.0975	-0.007840	2.716841
2020-01-28	1.14	1.25	0.11	0.050430	3.183948
2020-02-03	0.6265	0.7675	0.141	0.000974	-0.109049
2020-02-03	0.6265	0.7675	0.141	-0.032684	-0.823568
2021-01-27	1.41	1.68	0.27	-0.021481	0.014482

- No discernable pattern in the measured EPS and Prices before and after announcements
- Volatility was very high leading up to and after the announcements.

# Technology Industry Earning surprise graph



- Points are scattered across the linear regression line which implies high variance
- Points collect around 0.0 in the X axis "Earning Surprise"
- No strong correlation
- Fail to reject null hypothesis

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Correlation coefficient: 0.0947537210507246  
P-value: 0.6184431642962163

# Technology regression results

Dep. Variable:	Price Diff Before & After Ann	R-squared:	0.009
Model:	OLS	Adj. R-squared:	-0.026
Method:	Least Squares	F-statistic:	0.2537
Date:	Thu, 16 Mar 2023	Prob (F-statistic):	0.618
Time:	19:46:46	Log-Likelihood:	41.040
No. Observations:	30	AIC:	-78.08
Df Residuals:	28	BIC:	-75.28
Df Model:	1		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
const	0.0140	0.013	1.056	0.300	-0.013	0.041
Actual - Expected EPS	0.0519	0.103	0.504	0.618	-0.159	0.263

Omnibus:	23.075	Durbin-Watson:	1.365
Prob(Omnibus):	0.000	Jarque-Bera (JB):	39.789
Skew:	1.730	Prob(JB):	2.29e-09
Kurtosis:	7.457	Cond. No.	8.89

- Very weak relationship between "Actual - Expected EPS" and "Price Diff Before & After Ann"
- Extremely low R-squared value (0.009), indicating a poor model fit
- No significant linear relationship at the 95% confidence level
- Durbin-Watson statistic (1.365) suggests some positive autocorrelation in residuals Omnibus test
- Jarque-Bera test indicate non-normality in the residuals High kurtosis value (7.457) shows the presence of outliers or heavy tails in the data
- Overall, the model has very limited explanatory power and may not be suitable for predicting the relationship between the variables

Notes:

[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

# Real Estate Industry



## American Tower Corporation (AMT)

REIT: leading independent owner, operator, and developer of wireless and broadcast communications real estate



## Zillow (Z)

Online real estate marketplace. \$2 billion in revenue in the last year.



## Prologis (PLD)

Real estate investment trust (REIT) with nearly \$200 billion in assets under management.

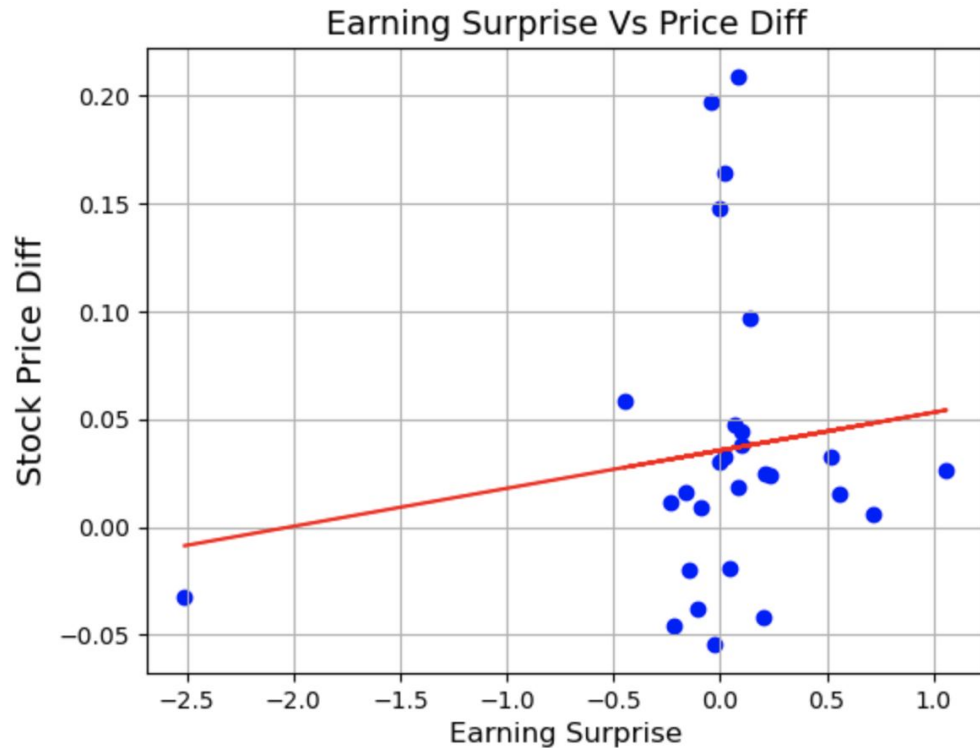
# Real Estate Earnings Results Table

	Expected EPS	Actual EPS	Actual - Expected EPS	Price Diff Before & After Ann
2014-01-30	0.04	0.12	0.08	0.018491
2014-02-12	0.09	0.19	0.1	0.044615
2014-02-25	0.47	0.25	-0.22	-0.045575
2015-01-27	0.09	0.81	0.72	0.006177
2015-02-13	0.28	0.24	-0.04	0.197371
2015-02-23	0.51	0.42	-0.09	0.009348
2016-01-26	0.13	0.23	0.1	0.038074
2016-02-11	-0.09	-0.01	0.08	0.208863
2016-02-26	0.51	0.48	-0.03	-0.054343
2017-01-24	0.26	0.82	0.56	0.015109
2017-02-07	0.12	0.14	0.02	0.164379
2017-02-27	0.58	0.47	-0.11	-0.038210
2018-01-23	0.34	0.55	0.21	0.024814
2018-02-08	0.19	0.19	0	0.147382
2018-02-27	0.74	0.51	-0.23	0.011320
2019-01-22	0.42	0.94	0.52	0.032539
2019-02-21	0.01	0.01	0	0.029839
2019-02-27	0.77	0.62	-0.15	-0.020078
2020-01-22	0.39	0.59	0.2	-0.041701
2020-02-19	-0.3	-0.26	0.04	-0.019442
2020-02-25	1.03	1.26	0.23	0.023855
2021-01-26	0.36	0.38	0.02	0.032201
2021-02-10	0.27	0.41	0.14	0.096603
2021-02-25	1.27	0.82	-0.45	0.058563
2022-01-19	0.61	1.67	1.06	0.026455
2022-02-10	-1.15	-0.42	0.73	NaN
2022-02-24	1.15	0.99	-0.16	0.015799
2023-01-18	0.56	0.63	0.07	0.047050
2023-02-15	0.07	0.21	0.14	NaN
2023-02-23	1.04	-1.47	-2.51	-0.032090

- T-statistic = -0.275
- P-value = 0.78
- Alpha = 0.05
  - As p-value is greater than alpha: we fail to reject the null hypothesis.



# Real Estate Earnings Surprise Graph



# Real Estate Earnings Surprise Graph

<b>Dep. Variable:</b>	Price Diff Before & After Ann	<b>R-squared:</b>	0.022
<b>Model:</b>	OLS	<b>Adj. R-squared:</b>	-0.016
<b>Method:</b>	Least Squares	<b>F-statistic:</b>	0.5756
<b>Date:</b>	Thu, 16 Mar 2023	<b>Prob (F-statistic):</b>	0.455
<b>Time:</b>	19:25:41	<b>Log-Likelihood:</b>	35.770
<b>No. Observations:</b>	28	<b>AIC:</b>	-67.54
<b>Df Residuals:</b>	26	<b>BIC:</b>	-64.87
<b>Df Model:</b>	1		
<b>Covariance Type:</b>	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
<b>const</b>	0.0355	0.013	2.685	0.012	0.008	0.063
<b>Actual - Expected EPS</b>	0.0176	0.023	0.759	0.455	-0.030	0.065

<b>Omnibus:</b>	9.335	<b>Durbin-Watson:</b>	2.396
<b>Prob(Omnibus):</b>	0.009	<b>Jarque-Bera (JB):</b>	7.813
<b>Skew:</b>	1.229	<b>Prob(JB):</b>	0.0201
<b>Kurtosis:</b>	3.807	<b>Cond. No.</b>	1.75

## Sector Regression Analysis:

- Weak relationship between "Actual - Expected EPS" and "Price Diff Before & After Ann"
- Low R-squared value (0.022), indicating limited model fit
- No significant linear relationship at 95% confidence level
- Durbin-Watson statistic implies no significant autocorrelation in residuals
- Limited explanatory power of the model overall

# Retail Industry



One of the largest multinational retail corporations, and the world's largest private-sector employer. Currently, Walmart has a market cap of \$372.91 B which makes it the second largest retail company.



The online retail giant and also the leader in cloud services. The company mainly focused on e-commerce, but it's also operating Amazon Fresh now. It's the considered the largest retail company with a market cap of \$1.025 T.



An American general merchandise retailer with stores in each state. It is the eighth largest retailer in the United States with the market cap of \$75.06 B.

	Expected EPS	Actual EPS	Actual - Expected EPS	Price Diff Before & After Ann
2014-01-30	0.66	0.51	-0.15	0.020283
2014-02-20	1.59	1.6	0.01	-0.014953
2014-02-26	0.79	0.9	0.11	-0.003814
2015-01-29	0.17	0.45	0.28	0.057182
2015-02-19	1.54	1.61	0.07	0.018124
2015-02-25	1.46	1.5	0.04	0.129526
2016-01-28	1.56	1	-0.56	0.021609
2016-02-18	1.46	1.49	0.03	-0.060986
2016-02-24	1.54	1.52	-0.02	-0.066430
2017-02-02	1.35	1.54	0.19	0.074019
2017-02-21	1.29	1.3	0.01	0.011445
2017-02-28	1.51	1.45	-0.06	-0.019350
2018-02-01	1.84	2.16	0.32	0.006033
2018-02-20	1.37	1.33	-0.04	0.017010
2018-03-06	1.38	1.37	-0.01	0.048383
2019-01-31	5.68	6.04	0.36	-0.002374
2019-02-19	1.33	1.41	0.08	-0.095357
2019-03-05	1.52	1.53	0.01	-0.056660
2020-01-30	4.03	6.47	2.44	-0.017094
2020-02-18	1.44	1.38	-0.06	0.040967
2020-03-03	1.66	1.69	0.03	-0.128725
2021-02-02	0.36	0.71	0.35	-0.024454
2021-02-18	1.51	1.39	-0.12	-0.004182
2021-03-02	2.54	2.67	0.13	0.082661
2022-02-03	0.18	1.39	1.21	0.140017
2022-02-17	1.5	1.53	0.03	-0.021811
2022-03-01	2.86	3.19	0.33	0.005253
2023-02-02	0.18	0.03	-0.15	-0.076896
2023-02-21	1.51	1.71	0.2	-0.022679
2023-02-28	1.4	1.89	0.49	0.085425

# Retail Earning Surprise and Stock Price



Correlation coefficient: 0.17544225471581953

P-value: 0.35375750559389807

Two-sample t test statistic = 1.905  
P-value = 0.066  
From the test result, when  $\alpha=0.05$ , it's not statistically significant, so we cannot reject the null hypothesis.

There is not a strong correlation between the two variables.

# Retail Regression Results

<b>Dep. Variable:</b>	Price Diff Before & After Ann	<b>R-squared:</b>	0.031
<b>Model:</b>	OLS	<b>Adj. R-squared:</b>	-0.004
<b>Method:</b>	Least Squares	<b>F-statistic:</b>	0.8892
<b>Date:</b>	Thu, 16 Mar 2023	<b>Prob (F-statistic):</b>	0.354
<b>Time:</b>	17:16:01	<b>Log-Likelihood:</b>	42.065
<b>No. Observations:</b>	30	<b>AIC:</b>	-80.13
<b>Df Residuals:</b>	28	<b>BIC:</b>	-77.33
<b>Df Model:</b>	1		
<b>Covariance Type:</b>	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
<b>const</b>	0.0009	0.012	0.072	0.943	-0.024	0.025
<b>Actual - Expected EPS</b>	0.0210	0.022	0.943	0.354	-0.025	0.067

<b>Omnibus:</b>	0.043	<b>Durbin-Watson:</b>	1.607
<b>Prob(Omnibus):</b>	0.979	<b>Jarque-Bera (JB):</b>	0.125
<b>Skew:</b>	0.071	<b>Prob(JB):</b>	0.940
<b>Kurtosis:</b>	2.718	<b>Cond. No.</b>	2.07

- The regression test showed similar results to the previous tests which there is a weak relationship between the two variables
- R-squared indicates that only 3.1% of the risk is systematic
- The p-value of 0.354 shows that it's not statistically significant
- Overall, there is not a significant relationship between the two variables

# Conclusion

## Findings

- Out of the five industries, only Pharmaceutical industry shows that there is a negative correlation between earnings surprise and stock price changes
- The results for the rest of the industries show no patterns of price change based on earning announcements
- High volatility
- Q4 impacts Pharmaceutical industry differently

## Limitation

- Our results did not include factors such as macroeconomic events and influences
- Small sample sizes (3 stocks in each industry and Q4 in the last 10 years)
- There are many other factors that can lead to stock price changes