Southern Methodist University



Introduction

For many years, a bitter rivalry - arguably the most bitter in all of business at the time - defined the relationship between tech

giants Apple (<u>NASDAQ:AAPL</u>) and Microsoft(<u>NASDAQ:MSFT</u>). Today, as their businesses have evolved, Apple and Microsoft still compete. Microsoft remains rooted in its PC-era profit machine while also positioning itself to serve a similar role as a leading software provider for the cloud-computing era. Meanwhile, Apple has had legendary success in mobile computing. Which of these mature companies is the more attractive to own? Let's run Apple and Microsoft through a statistical analysis to gauge which tech giant appears more deserving of investors' attention.

We will be using

- A 2 sample hypothesis test to test the difference of mean percentage growth.
- A 2 sample test of the difference of proportions of the days the
- companies have increased above 3 percent.
- Regression. Beta analysis to see if Apple has a correlation with the market (S&P 500)

Our data came from Yahoo Finance.

2 Sample Test of the difference of Proportions

Apple traded above 3% 20 times in the last three years. While Microsoft traded above 3% 14 times. Use a two-sample proportion z-test to test if the proportion of daily stock increases above 3% for Apple is greater than those of Microsoft. We are using the α = .1 level of confidence.

Apple traded above 3% 20 times or roughly $\frac{20}{753}$ = .02656 percent of the days in the last three years. Np > 5 nq > 5

Microsoft traded above 3% 14 times or roughly $\frac{14}{753}$ = .01859 percent of the days in the last three years. Np > 5 nq > 5

-4 -3 -2 -1 0 1 2 3

Step 1: H_o : p Apple = p Microsoft H_a : p Apple > p Microsoft

Step 2: Calculating the Critical Value CV= 1.281 InvNorm (.1,0,1)

Step 3: Calculating the test statistic .02656 – .01859 $r = \frac{p_{1-p_2}}{p_{1-p_2}}$ = 1.0408 $(P)(1-P)(\frac{1}{753}+\frac{1}{753})$ $\sqrt{(p)(1-p)(\frac{1}{n_1}+\frac{1}{n_2})}$



Step 5: We fail to reject the null hypothesis **Step 6:** There is not enough evidence to suggest at the α = .1 level to support the claim that the difference in proportions where Apple stock traded above 3% on a given day is significantly larger than the number of instances where Microsoft's stock traded above 3%.



APPLE VS. MICROSOFT

STATISTICAL STOCK ANALYSIS

2 Sample Hypothesis Test of Difference Of Means

We used a two sided two sample t-test to test if Apple's mean percent daily change in stock price is significantly different than Microsoft's. We are using a α =.1 level of significance.

Bin	Frequency	
-11%	0	
-10%	1	
-9%	0	
-8%	1	
-7%	0	
-6%	1	
-5%	0	
-4%	2	
-3%	8	
-2%	21	L
-1%	76	
0%	242	
1%	257	
2%	98	
3%	32	
4%	7	
5%	2	
6%	2	
7%	2	
8%	0	
9%	0	
10%	0	
11%	1	

Microsoft Daily Percent Change 300 250 200 150 100 50 Percent Change

Normal Distribution

Microsoft	
Mean	0.000831
Standard Error	0.000519
Median	0.000641
Mode	0
Standard Deviation	0.014231
Sample Variance	0.000203
Kurtosis	11.07969
Skewness	-0.27579
Range	0.207422
Minimum	-0.10706
Maximum	0.100358
Sum	0.625393
Count	753

Step 1:	$H_o: \mu \text{ Apple} = \mu \text{ Microsoft}$	H_o
	<i>H</i> _a : μ Apple ≠ μ Microsoft	H_{a}

Step 2: Calculating the Critical Value $t_{.05,(1506-2)} = \pm 1.6458$

Step 3: Calculating the Test Statistic t = -

SP: .015721382

Step 4: P-value 0.828977544 > .1

Step 5: Fail to Reject the Null Hypothesis **Step 6:** There is not sufficient evidence to support the claim that there is a difference between the mean percent daily change in Apple and Microsoft's respective stock prices

Confidence interval:

 $xbar - xbar_2 = .00115$

(-.0008332, .54906) We are 90% confident that the true difference in the proportion of days Apple and Microsoft's stock increased in value of 3% is between (-.0008332, .54906).

t-Test: Two-Sample Assuming Equal Variances								
			Date	Open	Close	Adj Close	Percent Change	F
	Microsoft	Apple	11/28/201	1 /7 95	5 /7 81	<i>11</i> 3105	Microsoft	
Mean	0.000830536	0.000655485	11/20/201	+ +7.50	J 47.01	44.5105		
Variance	0.000202526	0.000291798	12/1/201	47.88	8 48.62	45.06121	-0.159	6
Observations	753	753	12/2/2014	48.84	4 48.46	44.91292	2.019	%
Pooled Variance	0.000247162		12/3/2014	48.44	448.08	44.56074	-0.829	%
Hypothesized Mean Difference	0		12/4/201	4 48.39	9 48.84	45.2651	-0.109	%
df	1504		12/5/2014	48.82	2 48.42	44.87585	5 0.89%	%
t Stat	0.216050676		12/8/201	1 19 26	5 47 7	44 20855	_1 150	2/2
P(T<=t) one-tail	0.414488772		12/0/201	+ 40.20	5 47.7	44.20655	-1.137	0
t Critical one-tail	1.645867399		12/9/2014	4 47.11	1 47.59	44.1066	52.389	6
P(T<=t) two-tail	0.828977544		12/10/2014	47.58	8 46.9	43.46711	1.009	%
t Critical two-tail	1.961542541		12/11/201	47.08	8 47.17	43.71734	-1.05%	%
sp	0.015721382		12/12/2014	46.78	8 46.95	43.51344	-0.649	%





Apple	
Mean	0.000655
Standard Error	0.000623
Median	0.000987
Mode	0
Standard Deviation	0.017082
Sample Variance	0.000292
Kurtosis	20.9203
Skewness	0.392986
Range	0.312085
Minimum	-0.1409
Maximum	0.171182
Sum	0.49358
Count	753

Dee
Reg
S&P 50
-8.00%
Montl S&P 5
-3. 5. -1.
0. 1. -2.
-6. -2. 8.
0. -1. -5. -0.
6. 0. 1.
0. 3. -0. -0.
-1. 3. 1.
-0. 0.
1. 0. 1. 0.
1. 2. 2.
SUMMA
Multiple R Squar Adjuste Standar
Observa ANOVA
Regress Residua Total
Intercep S&P 500
Co T
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18

86

213

115

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hlyro	turne	Y = Apple X = S&P 500 β = 1.3072 = 30% more volatile than the market			
500 A	APL	Slope: For every increase of 1% in the S&P 500, there is a 130,2% increase in			
100/	C 1 40/	return for Apple.			
.10%	0.14%				
.49%	9.04%	Intercept: If the S&P 500 did not move for a month, percentage growth being			
.74%	-2.75%	zero. Apple would increase .64%			
.85%	0.58%	/ II			
.05%	4.10%	R^2 : Approximately 33.06% of the variation in Apple (Y) is explained by the			
.10%	-3.32%	variable S&P 500 (X)			
.97% 260/	-5.29%				
.20%		Step 1 : $H_o: \rho = 0$ A = .0064 $\beta = 1.302$			
.04%		$H_a: \rho \neq 0$ Y= 1.3022x + .0064			
.50%	0.54%				
.05%	-1.00%	r = .57 = linearly correlated			
.75%	-10.04%				
.07%	-0.67%	Step 2: Calculating the Critical Value			
.41%	13 33%	$CV = \pm 1.69$			
.00%	-13 99%				
53%	6 53%	Step 3: Test Statistic: 4.037			
.09%	-3.68%				
.56%	9.01%	Step 4 : P-value .0003 < .05			
.12%	1.81%				
.12%	7.13%	Step 5: We Reject the null hypothesis Step 6: There is sufficient suideness at the sum OF level (nuclus, 2002) to			
.94%	0.43%	Suggest that the data is linearly correlated. There is sufficient evidence to			
.42%	-2.66%	suggest that the slope is larger than 0			
.82%	5.33%	Suggest that the slope is larger than 0.			
.79%	4.77%				
.72%	12.89%	Confidence Interval:			
.04%	5.32%	Estimate $\pm t_2^u$, df × SE			
.91%	-0.01%	$1.3022 \pm 1.692 \times .32259$ 1.2022 + 54482228			
.16%	6.34%	$1.3022 \pm .04402220$			
.48%	-5.33%	(.75637 , 1.8480)			
.93%	3.27%	The interval does not contain 0 which agrees with our previous hypothesis test.			
.05%	10.27%	Slope: We are 90% confident that for every additional percentage point increase in the			
.93%	-5.66%	S&P 500, Apple will increase between .75637 and 1.8480 percentage points. Our best			
.22%	9.68%	estimate fails again at approximately a 1.3022 point percentage increase.			
.81%	1.66%	We are 90% confident that when the S&P500 is at 0% change then Apple will increase			
		between00992 and .022781 in percentage points.			

.00643 ± 1.692 × .009664 (-.00992, .022781)

ARY OUTPUT 0.33055201 0.31026571 Significance 0 322593673 4 0366254 0 000303196

onclusion

The winner is: Apple

Microsoft has plenty going for it, particularly given the ecent progress it's stock has made. The companies are very similar. However, with clearer near-term growth prospects working in its favor, Apple deserves a win as the better tech stock to own today.