THE JOURNAL OF ECONOMIC SCIENCES: THEORY AND PRACTICE

Scientific, Refereed, Biannual

Year: 24, Volume 75, #2/ 2018 ISSN 2220-8739

Contents

www.ecosciences.edu.az

THE JOURNAL OF ECONOMIC SCIENCES: THEORY AND PRACTICE	
Scientific, Refereed, Biannual	
Azerbaijan State University of Economics (UNEC)	
Year: 24, Volume 75, July – December 2018	
www.ecosciences.edu.az	ISSN 2220-8739
Publisher:	Azerbaijan State University of Economics (UNEC)
Honorary Editor	prof. Dr. Rawi E. Abdelal, Harvard University, USA
Editor-in-chief:	prof., Dr. A.J.Muradov, UNEC, Azerbaijan
Managing Editor:	associate prof., Dr., N.O. Hajiyev n.hajiyev@unec.edu.az; nazimxx@yahoo.com
Title of Journal:	The Journal of Economic Sciences: theory and practice
Type of Journal:	Periodical
Time Period and Language:	Biannual, English
Directorial Address:	AZ 1001, Baku, Azerbaijan Republic, Istiglaliyyat st. 6, room 414, Tel: (+994 12) 4926817; 4926411 Fax: (+994) 4 92 59 40
Printing House:	AZ 1001, Baku, Azerbaijan Republic, Istiglaliyyat st. 6, room 30, Tel: (+994 12) 4925337; Fax: (+994 12) 4926509
Place and Date of Print:	Baku, Azerbaijan, 25.06.2018
Abstracting-Indexing:	EBSCO, EconLit, Google Scholar, Index Copernicus International, Turkish Education Index, Research Bib, Scholar Steer, Academic Keys, European Reference Index for the Humanities (ERIH), J-Gate, Cite Factor, Open Academic Journals Index, International Institute of Organized Research (O2OR), Root Indexing

THE JOURNAL OF ECONOMIC SCIENCES: THEORY AND PRACTICE, V.75, # 2, 2018, pp. 4-16

Anamolous Behavior of the Volatility of Nasdaq Composite Index: 1971 To 2017

Shaikh A. Hamid[1], Tej S. Dhakar[2]

[1] Ph.D., School of Business, Southern New Hampshire University, 2500 North River Road, Manchester, NH 03106-1045, phone 603-644-3198, Email:s.hamid@snhu.edu
[2] Ph.D., School of Business, Southern New Hampshire University, 2500 North River Road, Manchester, NH 03106-1045,phone 603-644-3106, Email: t.dhakar@snhu.edu

Received 20 September 2018; accepted 20 December 2018; published online 28 December 2018

ABSTRACT

This study explores the seasonality in the volatility of the Nasdaq Composite index. The study seeks to uncover the anomalies in the behavior of Nasdaq Composite Index in terms of volatility. We define volatility as the mean of absolute daily percentage changes in Nasdaq Composite Index over each month. The Mean Absolute Percentage Change (MAPC) is preferred over the standard deviation of daily percentage changes during the month as a measure of volatility. The study spans the entire period that Nasdaq Composite Index has been in existence until the end of last year - from the inception in February 1971 to December 2017. The study identifies the months when the volatility is high and the months when Nasdaq Composite is the least volatile. The period of study is further split into three parts: 1971-1992, 1993-2002 and 2003-2017 to study how the volatility has changed over those three seminal periods since the inception of Nasdaq Composite Index. It appears that the NASDAQ market has not become more volatile in recent times. The market appears to be fairly efficient – though not highly. Also, seasonality changes over time which is the characteristic of stock markets that are nonstationary. Seasonality is not so pronounced in terms of mean of absolute changes but more so in terms of volatility of the absolute changes, as a market consisting of tech-stocks and smaller stocks should be. The findings and conclusions of the study will be of interest to those who invest in the stock markets, those who study the behavior of the stock markets, and to economics and finance professionals in general.

Keywords*:* Nasdaq Composite Index, NASDAQ Market, Anamolous Behavior, Volatility, Stock Markets.

JEL Classification: G15

I. INTRODUCTION AND LITERA TURE SURVEY

Existence of market anomalies have been explored for various assets based on their returns. Understanding of volatility is crucial for traders, analysts, and policy-makers.

At least two studies have looked at the day-of the-week effect in the volatility of stock markets (Berument and Klymaz [2001] and Klymaz and Berument [2003]). Cochran, Heck, and Shaffer (2003) explore volatility of world equity markets. Gerlach (2005) analyze effect of imperfect information on stock market volatility. Jones, Walker and Wilson (2004) look at extreme day measures to analyze stock market volatility. Kim, Morley and Nelson (2004) explore relationship between volatility and equity premium. Du and Shang-Jin (2004) analyze if insider trading raises volatility. Possibly no study has looked at the existence of month effect in terms of volatilities – specially in the NASDAQ Composite Index. If the markets are highly efficient, we would not expect to see significant month-to-month differences in volatilities. We intend to contribute to the formidable literature on market anomalies by exploring month-to-month differences in volatilities in the Nasdaq Composite Index – one of the most popular stock indexes in the world. We also want to explore if volatilities have increased in recent decades as is the popular perception.

We define volatility in terms of mean absolute percent change (MAPC) rather than standard deviation. We use the percent change as it is not affected by the scale given that the NASDAQ Composite Index has increased manifold since inception. Secondly, MAPC is preferable since the standard deviation tends to give more weight to larger % changes than the smaller percentage changes. Lastly, the investors are concerned by the percentage changes as the returns from the stock market correlate more directly with the percentage changes.

We explore volatility of the NASDAQ Composite Index from the inception in February 1971 to December 2017 principally from two perspectives: (a) if the MAPC of the *monthly percentage changes* for a month was different from the MAPC of the remaining months of the year, and (b) if the MAPC based on *daily percentage changes* for a month was different from the MAPC of the remaining months of the year. The findings of the study will guide practicing analysts to achieve better timing for investing in NASDAQ stocks.

The next section describes the methodology used, description of data and descriptive statistics, analysis of results, and finally we summarize and conclude.

II. RESEARCH METHODOLOGY

We define the absolute percent change in NASDAQ Composite Index as

$$d_t = \left|\frac{x_t - x_{t-1}}{x_{t-1}} \times 100\right| \quad (1)$$

where *t* can be either month or day depending on whether we are looking at the daily monthly percentage change or the daily percentage change. The mean absolute percentage change (MAPC) then is simply the mean of the absolute percentage changes, which we can denote as $\bar{d}$.

For the first study, our data consists of the percentage changes in the monthly closing values of the Nasdaq Composite Index from February 1971 until December 2017. The NASDAQ Composite Index is market value weighted. It may seem that analysis of month effect will be affected by the omission of dividends. Lakonishok and Smidt (1988) find that this omission does not seem to affect their results with respect to month effect. Hence, we do not include the dividends. For the second study we find the MAPC for a month by averaging the on daily percentage changes.

In addition to analyzing the data for the entire period (February 1971 to December 2017), we divide the entire period into the following sub-periods to gain deeper insight into the performance of NASDAQ Composite Index:

- 1971 to 1992: a rather stable period;
- 1993 to 2002: period characterized by run-up in stock prices created by dot.com bubble, and subsequent bust;
- 2003 to 2017: the post Sep 11, 2001 world, the Great Recession, and the longest period of economic expansion following that.

We hope to show that the month effect is sensitive to the time period under study.

We first look at the statistical descriptives for the period February 1971 to December 2017. We present distribution of the absolute monthly percentage changes and test the distribution for normality through the Jarque-Bera statistic. This widely used statistics is based on the values of skewness and kurtosis of sample data. For large n, with

skewness S and kurtosis K under the normality condition, the Jarque-Bera statistic $= \frac{n}{6}\left(S^2 + \frac{(K-3)^2}{4} \right)$ follows a Chi-square distribution with 2 degrees of freedom.

Many studies have used the dummy variable methodology to detect market seasonality. Chien, Lee and Wang (2002) provide statistical analysis and empirical evidence that the methodology may provide misleading results. We avoid this methodology.

We test the following hypotheses:

1. If the variability of the daily absolute percentage changes for a given month is significantly different from the remaining eleven months. The hypothesis test for a given month *i* is: H_o: $\mu_i = \mu_j$ vs. H_o: $\mu_i \neq \mu_j$ where j = {1, 2, …, i-1, i+1, ,,,, , 11, 12}. μ_i is the mean of MAPC values for month i.

2. If the means of the monthly absolute percent changes for a given month is different from the means of the monthly absolute percent changes for the other eleven months. The hypothesis test for a given month *i* is: H_o: $\mu_i = \mu_j$ vs. H_o: $\mu_i \neq \mu_j$, where j = {1, 2, …, i-1, i+1, …, 11, 12}.

Since we found the variances for the periods i and j to be unequal in many cases, we decided to use the more conservative t-test assuming unequal variances.

III. THE DATA AND DESCRIPTIVE STATISTICS

The data consists of 11,817 values of daily percentage changes and 562 values of mean of absolute daily percentages changes for a month from March 1971 to December 2017. The data for the February 1971 was not included in the sample as it was a partial month, Nasdaq having originated on February 5, 1971.

Over this period, the value of NASDAQ Composite Index increased from 101.34 at the end of February 1971 to 6903.39 at the end of December 2017, 6713% – with an average percentage increase of 0.956% per month or 11.47% increase per year. The mean of absolute percent changes during a month (MAPC) averaged 0.81% over this period. The MAPC in the NASDAQ Composite Index for the total period is highly significant (p = 0.00). The standard deviation of MAPC during this period was 0.56%.

Thus, the coefficient of variation, which is the ratio of standard deviation to the mean was 69%, which is quite a large amount of variability in the Nasdaq Composite Index.

Table 1: Mean of Absolute Percentage Changes in NASDAQ Composite Index: 1971-2016

Count	562
Mean	0.81
Median	0.63
Minimum	0.23
Maximum	4.30
Range	4.07
Standard Deviation	0.56
Coeff of Variation	69%
Skewness	2.51
p-value (□□□)	0.000

The median of MAPC from Feb 1971 to December 2017 was 0.63%. Since the mean of MAPC is larger than the median value, it indicates a right-skewed distribution as we can also see in the histogram. The skewness equals 2.51. The skewness has been caused by a few months of high volatility. Most of the observations otherwise are quite normally distributed.

Figure 1: Mean of Absolute Percentage Changes of NASDAQ Composite Index: 1971-2016

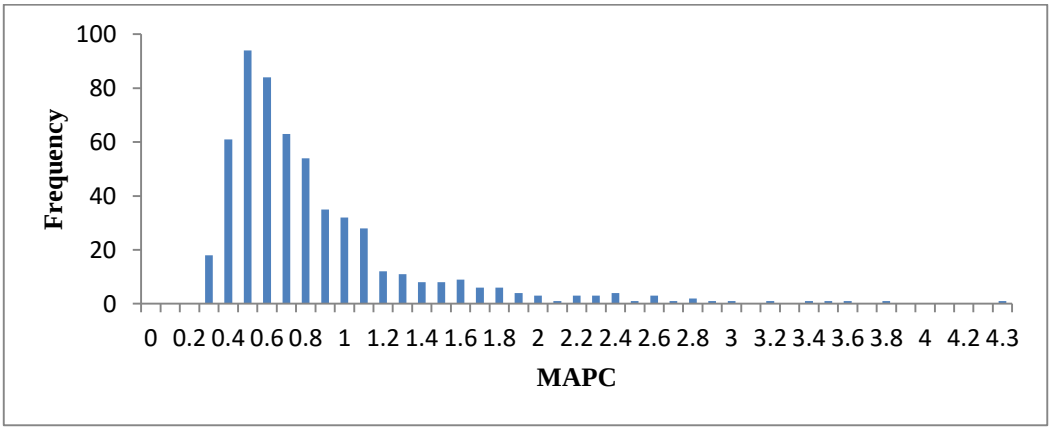


Table 2 shows the months with extremely high volatility (MAPC for the month larger than 2%). There were too many instances of MAPC under 2%. Hence, MAPC of 2% was used as the cut-off value. Table 3 shows the months with extremely low volatility (MAPC for the month smaller than 0.3%). There were too many months with MAPC larger than 0.3%. Hence, the 0.3% was used as the cut-off point.

Table 2: Months with Extremely High Volatility (MAPC larger than 2%)

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1987										1			1
1998										1			1
2000	1		1	1	1	1	1			1	1	1	9
2001	1	1	1	1					1				5
2002							1	1		1			3
2008									1	1	1	1	4
2009	1		1										2
2011								1					1
Total	3	1	3	2	1	1	2	2	2	5	2	2	26

Table 3: Months with Extremely Low Volatility (MAPC Smaller than 0.2%)

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1971-1980		1	2			1	1	3	2		1		11
1981-1990						1	2		1	2		1	7
Total		1	2			2	3	3	3	2	1	1	18

There were a total of 26 months between 1971 to 2017, when the MAPC was larger than 2%. Those instances occurred only during eight out of the 47 years of the life of Nasdaq. Hence, the instances are listed by those eight years. It is very interesting to observe that October had the most instances at five followed by January and March with three each. There were basically two periods, when the most volatile periods occurred. The first was between January 2000 (Y2K) and April 2001 with 13 out of 16 months with extremely high volatility. This was the Internet boom and bust period with sky-high valuations followed by a nose-dive. The second period occurred from September 2008 to March 2009 with six out of those seven months with extremely high volatility. This period has been described as the great recession.

Over the entire life of Nasdaq, all 18 instances of extremely low volatility (MAPC smaller than 0.3%), occurred during the first twenty years from 1971 to 1990. So, it is obvious that Nasdaq has become much more volatile since 1991. In other words, those investing in Nasdaq and the Nasdaq stocks post-1990 must learn to live with high volatility.

Looking at individual values of the monthly percentage changes, the most volatility was experienced during April 2000 with MAPC equal to 4.3%, followed by October 2008 with 3.76%, November 2008 with 3.54%, April 2001 with 3.44%, December 2000 with 3.37% and October 1987 with 3.19% (month with the "Black Monday").

IV. ANALYSIS OF RESULTS

Month effect: Comparison of MAPC for Each Month

All the means of absolute percent changes are highly significantly higher than zero (p=0.000) as we can see in Table 4. For the entire data set, mean of absolute percent changes has ranged from 0.74% (June) to 0.97% (October). The mean of absolute percent changes have been the highest in October, falling until December, and then rising in January. It was lowest in June (0.74%). The standard deviation of the absolute percent changes was also the lowest in June (0.41%). It was highest in October (0.76%). The mean of absolute percent changes of none of the months was significantly different from the mean of the changes of the other eleven months stacked.

Table 4: Mean of Absolute % Changes Each Month from 1971-2017

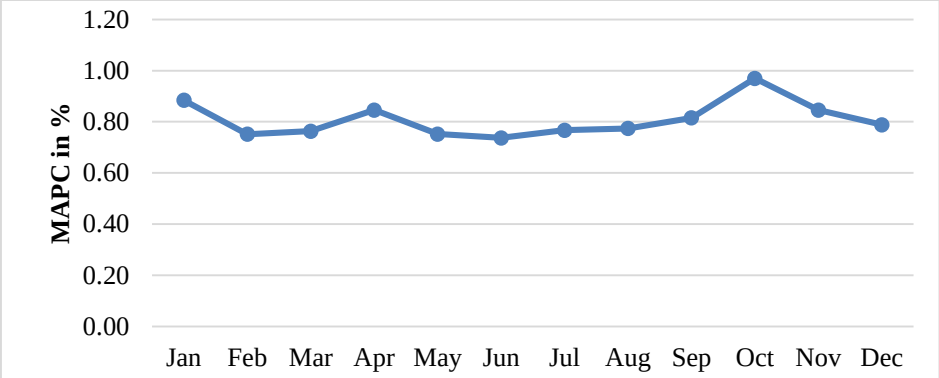
Period 1971-2017	All	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	562	46	46	47	47	47	47	47	47	47	47	47	47
Mean	0.81	0.88	0.75	0.76	0.85	0.75	0.74	0.77	0.77	0.81	0.97	0.85	0.79
Median	0.63	0.74	0.62	0.55	0.62	0.59	0.62	0.60	0.60	0.64	0.73	0.69	0.65
Minimum	0.23	0.36	0.30	0.25	0.32	0.30	0.25	0.27	0.23	0.25	0.24	0.29	0.27
Maximum	4.30	2.84	2.33	2.80	4.30	2.90	2.06	2.59	2.43	2.38	3.76	3.54	3.37
Range	4.07	2.47	2.03	2.54	3.98	2.60	1.81	2.32	2.20	2.13	3.52	3.25	3.10
Standard Deviation	0.56	0.54	0.43	0.57	0.73	0.50	0.41	0.48	0.50	0.53	0.76	0.60	0.56
Sample Variance	0.31	0.30	0.18	0.32	0.53	0.25	0.17	0.23	0.25	0.28	0.57	0.36	0.31
p-value (μ=0)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
p-value (t test)		0.325	0.369	0.575	0.705	0.436	0.239	0.551	0.636	0.924	0.123	0.646	0.801
p-value (F test)		0.427	0.010	0.452	0.007	0.172	0.003	0.078	0.167	0.329	0.002	0.269	0.516
Mean Sigma	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive
Month Effect (Mean)													
Month Effect (Var)			Lower		Higher		Lower				Higher		

Note: "Positive" implies the mean of monthly changes was significantly greater than zero "Higher" implies the mean of absolute percent changes or the variance of absolute percent changes for a month was significantly higher than those of the other eleven months stacked; "Lower" implies the mean or the variance of absolute percent changes for a month was significantly lower than those of the other eleven months stacked. Numbers are rounded in all tables to two decimal places.

The standard deviation of absolute percent changes of October and April are separately highly significantly higher than the standard deviations of the absolute percent changes of the other eleven months stacked (p=0.00). The standard deviation of absolute percent changes of February and June are separately highly significantly lower than the standard deviations of the absolute percent changes of the other eleven months stacked (p=0.01 and 0.00 respectively based on F-test). So we do not find seasonality in terms of mean of absolute percent changes, but we find seasonality in terms of variance of the absolute percent changes.

Figure 2 shows the mean of absolute percent changes exhibit a rising trend from June to October.

Figure 2: Mean of Absolute % Changes Each Month from 1971-2017



The first sub-period – 1971-1992 (Table 5) – shows the mean of absolute percent changes is lower compared to the mean of the entire data set (0.57% versus 0.81%) The standard deviation of absolute percent changes is also lower for the first sub-period (0.28% versus 0.56% for the entire data set). All the means of absolute percent changes of the first sub-period are significantly greater than zero (p=0.000). October has the highest mean (0.73%) followed by January (0.66%). The mean of June (0.48%)

is significantly lower than the mean of absolute percent changes of the other eleven months stacked. The standard deviation of absolute percent changes of October (0.37%) is highly significantly higher than the standard deviation of absolute percent changes of other eleven months stacked. A number of months independently exhibit lower variance compared to the mean absolute percent changes other eleven months stacked (January, February, and April through July). So for the first sub-period, we have seasonality in terms of mean of absolute percent changes, as well as, variance of the percent changes.

Table 5: Mean of Absolute % Changes Each Month from 1971-1992

Period 1971-1992	All	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	262	21	21	22	22	22	22	22	22	22	22	22	22
Mean	0.57	0.66	0.54	0.51	0.55	0.51	0.48	0.50	0.56	0.57	0.73	0.63	0.59
Median	0.50	0.64	0.51	0.43	0.49	0.47	0.45	0.47	0.49	0.52	0.57	0.59	0.51
Minimum	0.23	0.36	0.30	0.25	0.32	0.30	0.25	0.27	0.23	0.25	0.24	0.29	0.27
Maximum	3.19	1.05	0.85	1.55	1.13	0.88	0.80	1.02	1.54	1.41	3.19	1.13	1.09
Range	2.96	0.68	0.55	1.29	0.81	0.58	0.55	0.75	1.31	1.16	2.94	0.83	0.82
Standard Deviation	0.28	0.21	0.17	0.26	0.21	0.14	0.15	0.18	0.31	0.27	0.61	0.25	0.26
Sample Variance	0.08	0.04	0.03	0.07	0.04	0.02	0.02	0.03	0.09	0.07	0.37	0.06	0.07
p-value (μ=0)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
p-value (t test)		0.055	0.463	0.283	0.656	0.061	0.011	0.094	0.921	0.998	0.180	0.224	0.697
p-value (F test)		0.041	0.002	0.360	0.034	0.000	0.001	0.008	0.325	0.443	0.000	0.240	0.330
Mean MAPC	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive
Month Effect (Mean)							Lower						
Month Effect (Var)		Lower	Lower		Lower	Lower	Lower	Lower			Higher		

The mean of absolute percent changes of the second sub-period (1993 to 2002—Table 5) goes up from 0.57% in first sub-period to 1.23% -- more than twice. Markets are now much more volatile. All the means are significantly greater than zero (p=0.00). There is no month effect in terms of means of absolute percent changes – none of the mean of a given month is significantly greater than the mean of other eleven months stacked. And only April has significantly higher standard deviation (1.54%) compared to the standard deviation of absolute percent changes of the other eleven months stacked. So we have seasonality in the second sub-period only in terms of variance – and not in terms of mean of absolute percent changes.

Table 6: Mean of Absolute % Changes Each Month from 1993-2002

Period 1971-2017	All	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	120	10	10	10	10	10	10	10	10	10	10	10	10
Mean	1.23	1.23	1.13	1.14	1.54	1.20	1.11	1.28	1.07	1.23	1.40	1.16	1.23
Median	0.98	0.94	0.79	0.82	0.96	0.79	0.93	1.13	0.90	0.98	1.28	1.02	1.12
Minimum	0.35	0.37	0.51	0.36	0.46	0.50	0.47	0.41	0.35	0.49	0.49	0.52	0.44
Maximum	4.30	2.84	2.33	2.80	4.30	2.90	2.06	2.59	2.23	2.34	2.75	2.67	3.37
Range	3.96	2.46	1.82	2.44	3.84	2.40	1.59	2.18	1.88	1.85	2.26	2.15	2.94
Standard Deviation	0.77	0.84	0.65	0.79	1.30	0.82	0.57	0.72	0.65	0.70	0.80	0.66	0.83
Sample Variance	0.59	0.71	0.42	0.62	1.69	0.68	0.32	0.51	0.42	0.49	0.64	0.44	0.69
p-value (μ=0)	0.000	0.001	0.000	0.001	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001
p-value (t test)		0.981	0.631	0.739	0.436	0.915	0.519	0.823	0.462	0.994	0.482	0.738	0.987
p-value (F test)		0.412	0.286	0.524	0.025	0.447	0.141	0.426	0.286	0.391	0.494	0.308	0.435
Mean MAPC	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive
Month Effect (Mean)													
Month Effect (Var)					Higher								

As Table 6 shows, the third period – 2003-2017 – was characterized by lower mean of absolute percent changes and lower standard deviation of the absolute percent changes compared to the second sub-period. All the means are significantly greater than zero.

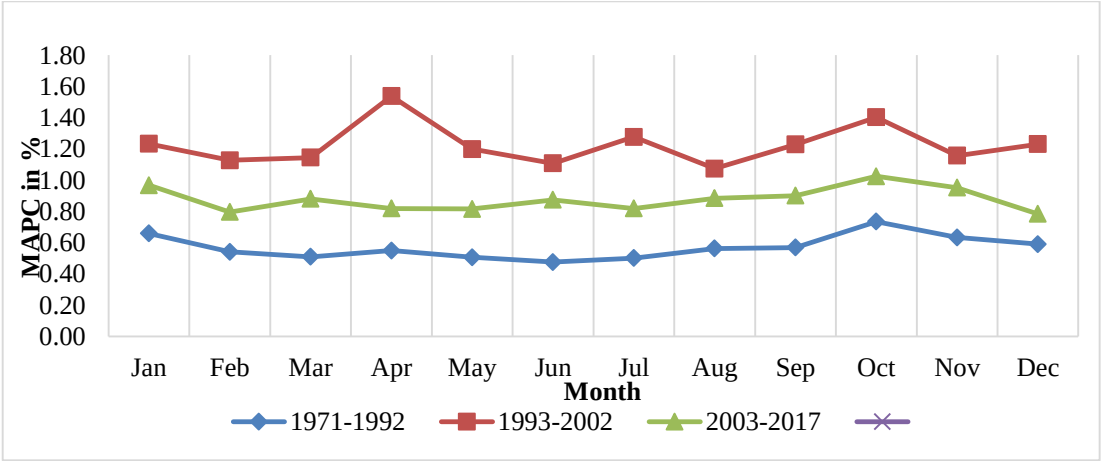
Table 7: Mean of Absolute % Changes Each Month from 2003-2017

Period 1971-2017	All	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	180	15	15	15	15	15	15	15	15	15	15	15	15
Mean	0.88	0.97	0.80	0.88	0.82	0.82	0.87	0.82	0.88	0.90	1.02	0.95	0.78
Median	0.76	0.85	0.69	0.68	0.87	0.75	0.93	0.83	0.79	0.75	0.84	0.69	0.65
Minimum	0.33	0.41	0.34	0.38	0.38	0.42	0.34	0.44	0.34	0.40	0.34	0.33	0.39
Maximum	3.76	2.30	1.68	2.58	1.57	1.77	1.29	1.24	2.43	2.38	3.76	3.54	2.52
Range	3.43	1.89	1.33	2.20	1.20	1.35	0.95	0.81	2.09	1.98	3.42	3.21	2.13
Standard Deviation	0.51	0.51	0.33	0.58	0.32	0.34	0.28	0.26	0.51	0.52	0.83	0.80	0.53
Sample Variance	0.26	0.26	0.11	0.34	0.10	0.12	0.08	0.07	0.26	0.27	0.68	0.64	0.28
p-value (□□□)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
p-value (t test)		0.482	0.356	0.977	0.504	0.505	0.978	0.427	0.949	0.853	0.466	0.703	0.486
p-value (F test)		0.522	0.024	0.275	0.020	0.040	0.006	0.002	0.520	0.497	0.009	0.014	0.454
Mean Sigma	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive
Month Effect (Mean)													
Month Effect (Var)			Lower		Lower	Lower	Lower	Lower			Higher	Higher	

The mean of percent changes of October is the highest (1.02%) followed by November (0.95%) and the standard deviations of the two months are also among the highest (0.83% and 0.80% respectively). The third sub-period does not present seasonality in terms of mean; the mean of absolute percent changes of none of the months is significantly greater than that of the other eleven months stacked. But there is seasonality in terms of variance. The standard deviations of the percent changes of October and November are separately significantly higher than the standard deviations of the percent changes of other eleven months stacked. The standard deviations of February, and April through July, are significantly lower. This sub-period includes the Great Recession (spanning months of 2008-2009) and the longest period of steady economic growth thereafter, hence a lower variance compared to the previous sub-period.

Figure 3 shows graphically the monthly trends of means of absolute percent changes for the three sub-periods. The first sub-period exhibits lowest overall means for various months, and lowest volatility. The last sub-period exhibits higher overall means of various months, and higher volatility compared to the first sub-period. The second sub-period exhibits the highest overall means for various months, and highest volatility. This period was characterized by the dot.com bubble and the bust in mid-2000 which severely affected tech-stocks which are the hallmark of the NASDAQ Composite Index. The differences in the means of the three sub-periods based on pairwise t-tests show significant differences in the means of absolute percent changes of the sub-periods paired. F-test for differences in the variances of the mean absolute percent changes also show highly significant differences in pairwise tests (p values in each case are 0.0000).

Table 8: Mean of Absolute % Changes Each Month: Comparison of the Three Periods



V. SUMMARY AND CONCLUSION

We have explored if for the NASDAQ Composite Index the mean of absolute percent changes of a month is significantly different from the mean percent changes of other eleven months stacked, and if the variance of the monthly absolute percent changes for a month was significantly different from the variance of the other eleven months stacked. In other words, we explore if there was seasonality in terms of mean and variance. If the NASDAQ stocks are fairly efficiently priced there should not be seasonality in terms of mean or volatility. The mean of absolute percent changes of every month for the entire data set and for each of the three sub-periods is significantly greater than zero. For the entire data set there is no seasonality in terms of mean of absolute percent changes: the mean of absolute changes was not different from the mean of absolute changes of the other eleven months stacked. We find seasonality with respect to volatility for four months. Seasonality in terms of mean is exhibited only in the case of one month (June) in the first sub-period. Seasonality in terms of volatility is exhibited in all three sub-periods, most pronounced in the first and third sub-periods (seven months in each case) and exhibited by one month in the second sub-period.

So it appears that the NASDAQ market has not become more volatile in recent times. The market appears to be fairly efficient – though not highly. Also, seasonality changes over time which is the characteristic of stock markets that are nonstationary. Seasonality is not so pronounced in terms of mean of absolute changes but more so in terms of volatility of the absolute changes, as a market consisting of tech-stocks and smaller stocks should be. The findings and conclusions of the study will be of interest to those who invest in the stock markets, those who study the behavior of the stock markets, and to economics and finance professionals in general.

REFERENCES

Berument, Hakan and Halil Klymaz. (2001). The day of the week effect on s*tock* m*arket volatility. Journal of Economics and Finance*, Summer, Vol. 25 Issue 2, 181-192.

Chien, Chin-Chen, Cheng-few Lee and Andrew M. L. Wang, 2002, A note on stock market seasonality: The impact of stock price volatility on the application of dummy variable regression model. *The Quarterly Review of Economics and Finance*, 42, 155-162.

Cochran, Steven, Jean L. Heck and David R. Shaffer, (2003). Volatility in world equity markets. *Review of Pacific Basin Financial Markets and Policies*, September, Vol. 6 Issue 3, 273-290.

Gerlach, Jeffrey R, (2005). Imperfect information and *stock market volatility*. *Financial Review*, May, Vol. 40(2), 173-194.

Jones, Charles P., Mark D. Walker, and Jack W. Wilson, (2004). Analyzing stock market volatility using extreme-day measures. *Journal of Financial Research*, Winter, Vol. 27(4), 585-601.

Kim, Chang-Jin, James Morley and Charles R. Nelson, (2004). Is There a Positive Relationship between *Stock Market Volatility* and the Equity Premium? *Journal of Money, Credit & Banking*. June, Vol. 36(3), 339-360.

Klymaz, Halil and Hakan Berument, (2003). The day of the week effect on *stock market volatility* and volume: International evidence. *Review of Financial Economics*, Vol. 12 Issue 4, 363-381.

Lakonishok, J. and S. Smidt (1988). Are Seasonal Anomalies Real? A Ninety Year Perspective. *Journal of Financial Studies*, 1(4): 403-425.

Du, Juan and Shang-Jin, 2004. Does Insider Trading Raise *Market Volatility*? *Economic Journal*, October, Vol. 114(489), 916-942.

THE JOURNAL OF ECONOMIC SCIENCES: THEORY AND PRACTICE
(Scientific, Refereed, Biannual)

NOTES FOR CONTRIBUTORS

1.Articles not published or submitted for publication elsewhere are accepted in English.

2.Manuscripts should be typed on one side of a A4 sized paper and should not exceed 25, 1,5-spaced pages with the Times New Roman 12-font character size. Only e-mail posts are welcomed for article submissions. Manuscripts should be sent official e-mail address of the journal (n.hajiyev@unec.edu.az; nazimxx@yahoo.com).

3.The first page should include (i) the title of the article; (ii) the name(s) of the author(s); (iii) institutional affiliation(s) of the author(s); (iv) an abstract of not more than 250 words in English (text of abstracts must be consist of sections of "purpose", "design /methodology/ approach", "findings", "research limitations/implications", "practical implications" and "originality/value"); (v) keywords must not be more than 5 words; (vi) JEL codes. The name, address, e-mail address, phone and fax numbers and academically sphere of interest of the author(s) should be indicated on a separate page.

4.Tables, figures and graphs should be numbered consecutively and contain full references. The titles of the tables, figures and graphs should be placed at the heading of them; the references of tables, figures and graphs should be placed at the bottom of them. Decimals should be separated by a comma. Equations should be numbered consecutively. Equation numbers should appear in parentheses at the right margin. The full derivation of the formulae (if abridged in the text) should be provided on a separate sheet for referee use.

5. Footnotes should be placed at the bottom of the page.

6.All references should be cited in the text (not in footnotes), and conform to the following examples:

It has been argued (Hajiyev, 2000 – 504-45)....
Griffin (1970a: 15-20) states....
(Gupta et.al., 1982: 286-7).
(Hajiyev and Bayramov, 2011: 461-26).

7. References should appear at the end of the text as follows:

Books: Kenen, P.B. (1989), The International Economy, Englewood Cliffs, N.J.: Prentice-Hall, Inc.

Periodicals: Bayramov A. (2011)," The phenomenon of economic reality", The Journal of Economic Sciences: theory and practice, 12 (2), 152-15.

Articles in edited books: Krugman, P. (1995), "The Move Toward Free Trade Zones", in P. King (ed.), International Economics and International Economic Policy : A Reader, New York: McGraw-Hill, Inc., 163-82.

Other sources: Central Bank of the Republic of Baku (2012), Statistical Bulletin 4/2012 <http://www.cbar.az/assets/2246/BULLETEN_04-2012__eng.pdf>

Chang, R. (1998), "The Asian Crisis", NBER Discussion Paper, 4470, National Bureau of Economic Research, Cambridge, Mass.

8. Cited web pages should exist at the References with their full address and certain cited date as follows:

……., < http://www.unec.edu.az >.