NASDAQ Sector Returns and Market Conditions
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Abstract
This study compares stock returns for NASDAQ sector indices over varying market conditions. The results reveal that, during relatively shorter periods of time, some sectors have generated statistically significantly greater mean monthly returns than those of other sectors. However, for the overall recent ten-year period 1998 through 2007, there were no statistically significant differences between any two NASDAQ sectors. These results therefore indicate that individual long-term investors should not re-allocate funds among sectors based on varying short-term market conditions.

I. Introduction:

Since investors have numerous alternatives available to them in many sectors of the stock market, it is important to examine and understand equity return performance, not only for broad composite indices, but also for various sector indices. An understanding of the performance of various sectors in recent years may be an important component of equity analysis for many individual investors. In particular, the performance of individual sectors over varying market conditions can be important to investors in several ways. First, it will inform investors about relative sector performance during up-markets and down-markets. Investors can then determine which sector returns are more (or less) sensitive to market downturns. Second, this analysis provides insight for investors so that they can re-allocate resources to those sectors that are least sensitive to economic downturns. Finally, this analysis allows us to more thoroughly compare sectors in order to determine whether any particular sector consistently outperforms others over varying market conditions.

This study first examines and compares the performance of the sectors of the NASDAQ Composite index during a recent ten-year period. Second, the performance of each sector during two different market scenarios, up-markets and down-markets, is determined during this period. Then, the study investigates whether any particular sectors are relatively less integrated with the remaining sectors under the two market conditions. For the short-term, investors may obtain diversification benefits by re-allocating funds to sectors that are less correlated with the remaining sectors. Finally, the re-allocation issue from a long-term investment perspective is investigated; that is, it is examined whether any sector outperforms others over a longer holding period.

This paper is organized as follows. The literature relevant to this study is discussed in the next section. The following section presents the data used in the study, and the subsequent section discusses empirical findings. The final section provides conclusions and summarizes the major findings.

II. Literature Review:

Eakins and Stansell (2007) examine various rebalancing strategies based on investments in sector funds. They studied nineteen sector funds over the period December 1995 through

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December 2002, and concluded that investors should rebalance frequently so that their portfolios are not over-weighted in a particular sector fund. They indicate that even investors who maintain well-diversified portfolios improve their risk protection with rebalancing. Since relative fund performance can vary substantially from one year to the next, investors are well-served by rebalancing portfolios among the various sectors.

Sassetti and Tani (2006) note the equity markets' negative returns during the recent three year period (2000 through 2002), and conclude that it is critical for investors to develop strategies to outperform the market during extended periods of poor performance. Since returns for various sectors follow differing patterns over time, they conclude that investors should pay attention to sector rotation, which can result in outperforming the benchmark in the long run.

Ewing and Malik (2000) investigate the performance of various sectors, relative to that of the overall market, because it is important for investors to determine whether this relationship changes over time. The authors examine risk-return relationships among S&P sector indices for time periods before and after the 1987 market crash. They observe that, because relative volatility of some sectors compared to the market may change after major events, investors should revisit their investment allocations after major economic events.

In a later study, Ewing, Forbes and James (2003) explain that the popularity of index investing in sector specific funds prompted their investigation of the impact of macroeconomic shocks on sector returns. They examined five S&P sector specific indices during the post-crash period 1988 through 1997.

Ratner, Meric and Meric (2006) observe that, because investors do not invest equally in various equity sectors, a disparity of information may exist among these sectors. It is therefore possible that economic expansions and recessions have differential effects on sector returns.

Taing and Worthington (2005) examined relationships among five equity sectors in six European countries during the period 1999 through 2002, and found that few sectors exhibited significant interrelationships with other sectors. The authors conclude that these results indicate opportunities for diversification by sector in the European Union markets.

Chan, Lakonishok and Swaminathan (2007) state that industry classifications are commonly used to create homogenous stock groups for comparison purposes. They add that industry effects are relatively stronger for larger firms than for smaller firms.

Prior research indicates that larger firms appear to have more pronounced sector effects than do smaller firms. Therefore, this study hypothesizes that NASDAQ sectors may be relatively less integrated with each other, so that investors may have the opportunity to diversify. Further, in recent years, investors face increased offerings among investment alternatives representing various equity sectors. Recognizing the importance of these opportunities, NASDAQ sectors are examined in this paper over a recent ten-year period. The description of the data for this study is in the following section.

III. Data:

In this study, the NASDAQ Composite index is used to represent a broad-based market index. The NASDAQ Composite index measures returns for a portfolio of over 3,000 publicly traded stocks, and is therefore widely followed and quoted in the media. The *Wall Street Journal* (WSJ) reports performance of the NASDAQ Composite, along with some of its component indices, as a major U.S. stock market index. The NASDAQ website provides data for the seven sub-indices examined in this study:

- The NASDAQ bank index.
- The NASDAQ computer index.
- The NASDAQ industrial index.
- The NASDAQ insurance index.
- The NASDAQ other finance index.
- The NASDAQ telecommunications index.
- The NASDAQ transportation index.

This study emphasizes relatively recent data; specifically, the sample period is the ten-year period from January 1998 through December 2007. The data is comprised of NASDAQ index values, resulting in 120 monthly observations for each index. A summary of empirical results is reported in the next section.

IV. Empirical Results:

Table 1 reports return characteristics for the seven NASDAQ sector indices and the NASDAQ composite index for the period January 1998 through December 2007. For the overall period, the following four sector indices generated monthly returns greater than the returns for the composite (0.77 percent): the computer (1.12 percent), transportation (0.95 percent), other finance (0.92 percent) and industrial (0.78 percent) indices. The insurance index returns (0.77 percent) were identical to those of the composite, while the telecommunications (0.35 percent) and bank (0.29 percent) index returns were substantially less than those of the composite.

Total risk, measured by the standard deviation of returns, for the computer (10.10 percent) and telecommunications (9.84 percent) indices was greater than the total risk of the composite index (8.15 percent). Standard deviations for the remaining sector indices were lower than the standard deviation of the composite index. It should be noted that the bank, insurance and transportation sector indices exhibited substantially lower standard deviations compared to those for the other four sector indices. Also, the transportation sector index has higher risk and return than the bank and insurance sector indices. In addition, the coefficient of variation (i.e. risk divided by return) for each sector, other than the bank and telecommunication sectors, is lower than that of the composite index.

In Table 2, mean monthly returns for the NASDAQ composite index and for each of the seven sector indices are reported by calendar year for each year of the sample period 1998 through 2007. As expected, the NASDAQ composite index results indicate negative returns for the three consecutive years 2000, 2001 and 2002, and positive returns for the remaining years, 1998, 1999, and 2003 through 2007. In contrast to the composite index, however, the insurance,

transportation and bank sector indices do not generate negative returns from 2000 to 2002. The four remaining sector indices do generate negative returns during the period 2000 to 2002 when the composite index produced negative returns as well.

The primary objective of this study is to compare performance of the NASDAQ sector indices based on market conditions. Accordingly, two sub-periods were created: the first sub-period represents down years for the composite (the years 2000, 2001 and 2002) and the second sub-period is comprised of the seven up years of the sample period. Thus, these sub-periods contain thirty-six and eighty-four monthly observations, respectively.

Table 3 displays performance for each of the seven sector indices during up years and down years, respectively. For up years, mean return for each of the seven sectors is positive, indicating that, when the overall market (i.e., the composite index) generates positive returns, the sector indices move in the same direction. In contrast, as revealed in Table 2, mean return during down years is negative for only four of the seven sectors, so that not all sector indices move with the composite index during down years.

Also in Table 3, the results of significance tests for the difference in mean monthly return between up years and down years are presented. These tests reveal that, for three sectors (the telecommunications, computer and industrial indices), the difference between mean returns during up years is statistically significantly greater than mean returns during down years, at the 0.05 level of significance. Additionally, the other finance index generated statistically significantly greater returns during up years than during down years, at the 0.10 level of significance. Differences for the remaining three sectors (the transportation, bank and insurance indices) were not statistically significant, and differences for the transportation and bank indices were actually negative. Further, two of the three sectors with no statistically significant difference in mean return (i.e., the bank and insurance indices) play an important role in the next phase of this analysis, where correlations among the sectors are investigated. It appears that, during down years, correlations among some sectors are relatively high while other correlations between sectors are substantially lower.

Examination of Table 1 indicate the possibility that the bank, insurance and transportation sectors do not move along with the other four sector indices because standard deviations for these three sectors are substantially lower than the standard deviations for the remaining indices. When returns are separated by calendar year in Table 2, these three sector indices exhibit lower variability, compared to the other four sector indices. Further, the results in Table 3 reveal that these three sectors have positive returns over both sub-periods, up years and down years. Next, principal component analysis is performed over each market condition (i.e., up years and down years) to further detail this relationship.

The principal component analysis examines the extent to which the seven sector indices are integrated. Results are reported in Table 4. During the up-market phase, there is only one component, so that the seven sectors are integrated and highly positively correlated with each other. The implication for investors is that diversification benefits among the sectors may be relatively limited during the years of positive returns in this sample period. However, the more interesting outcome from this analysis derives from the examination of sector integration during

the years of negative returns. These results indicate that, during the down-market phase, sectors are substantially less integrated.

More specifically, the results in Table 4 indicate that, during the down-market phase, there were two components. The first component consisted of the following sectors: the telecommunications, computer, industrial, other finance and transportation indices. The second component consisted of the banking and insurance sectors. Therefore, these findings indicate that the banking and insurance sectors are clearly distinct from the other five sectors during the down-phase of market conditions, so that perhaps investors can derive diversification benefits by investing in the banking and insurance sectors during the down years.

Next, mean monthly returns are compared among the seven sectors in order to determine whether any particular sector generates significantly greater returns than others. In order to analyze these differences, pair-wise t-tests (as well as Wilcoxon signed ranks test) are utilized to identify specific differences among the seven sectors. Therefore, the mean monthly return for each sector is compared with those of the remaining six sectors in order to determine whether any pairs of sectors exhibit statistically significant differences, producing a total of twenty-one pair-wise comparisons among the seven sectors. These differences in sector returns are identified for three data groups from the sample period: (1) down years, (2) up years, and (3) the overall period. Therefore, a total of sixty-three comparisons are identified. Non-parametric Wilcoxon rank test statistics for significance in these comparisons were also performed. However, the results of these latter tests are not reported here as they are qualitatively similar to the results from the parametric t-tests, reported below.

The tests of significance indicate that, during down years, the telecommunications index has statistically significantly lower mean returns than the other six sectors. All other sector differences during down years were not statistically significant. For up-years, mean returns for the computer and telecommunications sectors were statistically significantly greater than the bank, insurance and transportation sector returns. Additionally, bank sector returns were statistically significantly less than returns for the other finance, industrial and insurance sectors. Furthermore, it is important to detect sector differences for the overall period because many investors regard their stock market investments as long-term, regardless of market conditions. For the overall sample period January 1998 through December 2007, the findings reveal that there were no specific statistically significant differences between sectors.

Finally, comparisons of mean returns for each sector index with mean returns for the composite index were performed over both short-term and long-term holding periods. During shorter time periods, some sectors exhibited mean returns statistically significantly different from mean returns for the composite. For example, during down years, composite mean returns are statistically significantly greater than telecommunications sector returns, and statistically significantly less than transportation sector returns. Additionally, during up years, composite returns are statistically significantly greater than bank, insurance and transportation index returns, and statistically significantly less than computer sector returns. More importantly, results indicate that none of the NASDAQ sector indices generated returns that are statistically significantly different from returns for the NASDAQ Composite index for the overall period 1998 through 2007.

V. Summary and Conclusion:

This study examines stock returns for NASDAQ sectors over the recent ten-year period January 1998 through December 2007. Specifically, this study is particularly focused on investigating whether any specific NASDAQ sector generated consistently greater returns than other sectors. The results revealed some specific differences in sector returns during shorter time periods. However, for individual long-term individual investors, the more critical issue is whether any sectors generate significantly greater (or lower) returns than do other sectors, or the composite index, over longer-time periods.

The results indicate that none of the NASDAQ sector indices outperformed (or under performed) other NASDAQ sector indices for the overall time period. Additionally, none of the NASDAQ sectors generated statistically significantly greater returns than did the NASDAQ Composite index over the long-run. These findings could be interpreted to indicate that long-term individual investors should not invest in any specific NASDAQ sector based on short-term market conditions.

Table 1

NASDAQ Sector Index Mean Monthly Percentage Returns

January 1998 to December 2007

Index	Mean	SD	CV	N
Insurance Index	0.77	4.20	5.45	120
Transportation Index	0.95	5.90	6.21	120
Other Finance Index	0.92	7.93	8.62	120
Computer Index	1.12	10.10	9.02	120
Industrial Index	0.78	7.69	9.86	120
Composite Index	*0.77*	*8.15*	*10.58*	*120*
Bank Index	0.29	4.03	13.90	120
Telecommunications Index	0.35	9.84	28.11	120
Note: SD is Standard Deviation, CV is Coefficient of Variation				

Table 2

NASDAQ Sector Index Mean Monthly Percentage Returns

By Calendar Years

Index	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Insurance	0.21	0.62	1.41	0.63	-0.07	1.67	1.55	0.77	0.96	-0.02
Transportation	-0.34	0.25	1.38	1.23	0.34	2.65	2.11	0.87	0.60	0.39
Other Finance	0.59	3.18	-2.18	0.12	-1.48	4.73	1.64	1.03	1.41	0.15
Computer	5.70	6.71	-3.78	-0.93	-3.06	3.52	0.40	0.31	0.59	1.76
Industrial	0.96	4.84	-2.62	0.11	-2.18	3.86	1.33	0.11	1.04	0.39
Bank	-0.78	-0.62	1.30	0.85	0.42	2.25	0.91	-0.33	0.88	-2.01
Telecommunications	4.72	6.40	-5.53	-4.49	-5.47	4.54	0.75	-0.53	2.31	0.83
Composite	*3.22*	*5.59*	*-3.30*	*-1.13*	*-2.76*	*3.50*	*0.77*	*0.19*	*0.82*	*0.84*

Table 3

NASDAQ Index Monthly Returns By Market Conditions

Index	Up Years		Down Years			
	Mean	N	Mean	N	T-Value	*p-value*
Composite Index	*2.13*	*84*	*-2.40*	*36*	*2.87*	*0.005*
Telecommunications Index	2.72	84	-5.16	36	4.30	0.000
Computer Index	2.71	84	-2.59	36	2.70	0.008
Industrial Index	1.79	84	-1.56	36	2.23	0.028
Other Finance Index	1.82	84	-1.18	36	1.92	0.057
Transportation Index	0.93	84	0.98	36	-0.04	0.967
Bank Index	0.04	84	0.86	36	-1.02	0.311
Insurance Index	0.82	84	0.66	36	0.20	0.844

Note: Down Years are 2000 to 2002. Up Years are 1998, 1999, and 2003 through 2007. Mann-Whitney significance results were essentially similar to T-test results.

Table 4

Principal Component Analysis of NASDAQ Indices Over Market Conditions

January 1998 to December 2007

Index	Up Years	Down Years	
	P.C. 1	P.C. 1	P.C. 2
Telecommunications Index	**0.819**	**0.879**	-0.360
Computer Index	**0.742**	**0.913**	-0.308
Industrial Index	**0.929**	**0.938**	-0.239
Other Finance Index	**0.793**	**0.912**	0.136
Transportation Index	**0.787**	**0.695**	0.267
Bank Index	**0.792**	0.348	**0.846**
Insurance Index	**0.755**	0.244	**0.890**
Percentage of Variance	64.71%	56.91%	26.86%
Cumulative Percentage	64.71%	56.91%	83.77%

Table 5
Paired T-Test Comparisons of NASDAQ Sectors at 0.05 level Significance

Panel A: Down Years

Telecommunication < all other sector indices

Panel B: Up Years

Computer > Bank, Insurance, Transportation

Telecommunication > Bank, Insurance, Transportation

Bank < Other Finance, Industrial, Insurance

Panel C: Overall Period

None

Note: Wilcoxon Signed Ranks Test significance results were essentially similar to T-Test results.

Table 6
Paired T-Test Comparisons of NASDAQ Sector Index With Composite Index
0.05 level of Significance

Panel A: Down Years

Composite > Telecommunication

Composite < Transportation

Panel B: Up Years

Composite > Bank, Insurance, Transportation

Composite < Computer

Panel C: Overall Period

None

Note: Wilcoxon Signed Ranks Test significance results were essentially similar to T-test results.

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