INTEREST RATE SENSITIVITIES OF THE NASDAQ AND DOW JONES

J. J. Arias
Department of Economics & Finance
Georgia College & State University
Campus Box 014
Milledgeville, GA 31061
Phone: 478-445-2085
Fax: 478-445-1535
Email: jarias@gcsu.edu

ABSTRACT

Conventional wisdom implies that the Nasdaq is *more* sensitive to interest rates than the Dow is due to the presence of larger firms in the Dow. However, the recent view of an old/new economy dichotomy implies that the Nasdaq is *less* sensitive to interest rates. To address these mutually exclusive implications, this study estimates the sensitivities of the Nasdaq composite index and the Dow Jones Industrial Average to changes in the federal funds rate. The paper uses seemingly unrelated regressions (SUR) analysis for the sample period covering January 1990 through May 2000. Both stock indices are equally sensitive for the entire 1990s as well as for the latter half of the 90s. The Nasdaq is more sensitive in the first half of the decade, possibly indicating the emergence of an old/new economy dichotomy in the mid-90s. However, the recent view that the Nasdaq is relatively immune to interest rate changes appears overstated.

I. INTRODUCTION

> Why are previously high-flying equities suddenly so out of favour? Rising short-term interest rates may be one culprit. With little or no debt, many analysts had assumed that tech stocks were immune to interest rates. Yet higher rates mean that investors face a higher cost of capital, and they also raise the discount rate on future earnings. (*The Economist*, April 8, 2000, p. 79)

The conventional wisdom in finance has been that changes in interest rates have a larger impact on small firms than on large firms, since large firms have greater access to liquidity, and they can purchase that liquidity at better rates. Since the Nasdaq composite index has historically consisted of smaller firms relative to the Dow Jones Industrial Average (Dow), a change in interest rates is usually thought to affect the Nasdaq to a greater degree. However, the recent emergence of "new economy" technology stocks has led to a different perspective. Now, the tech-heavy Nasdaq is increasingly viewed as being less sensitive to interest rates than the Dow is. This is because the "old economy" stocks that predominate the Dow are seen as more dependent on banks to raise money when compared to new tech-

nology companies. Because of this difference in the debt structure of old and new economy stocks, higher interest rates are perceived as more of a threat to the Dow. In particular, an increase in the targeted federal funds rate by the Federal Reserve would have a greater negative impact on the Dow than on the Nasdaq. But as the opening quote reflects, more recent volatility in the Nasdaq may indicate that the immunity of the Nasdaq to Fed rate hikes has been overstated.

A related question is "Can the Fed affect asset prices?" Ever since 1996 when Alan Greenspan uttered his (in)famous comment on "irrational exuberance," some have wondered if lower asset valuation has been a policy goal of the Fed. According to this new view, a rate increase by the Fed will lower share prices of the old economy, blue-chip firms, but leave the new economy, tech stocks relatively unaffected.

The purpose of this paper is to empirically test which of these two opposing views is more consistent with recent history. More specifically, this paper will examine the respective sensitivities of the Nasdaq and Dow to changes in the federal funds rate during the 1990s and the early part of the year 2000. To clarify, this paper is not an attempt to test the theories behind these opposing views. That is, the purpose is not to test if large companies or technology stock are relatively immune from interest rates. Rather, each theory presents a stylized fact about the relative sensitivities of the two stock indices, and these stylized facts are mutually exclusive. This paper attempts to ascertain which one is true. The reader should note that the composition of the Dow changed during this time period. In both March 1997 and November 1999 four companies were switched. The change in 1999 may bias the comparison, since new economy stocks were added to the average (e.g. Intel Corp., Microsoft Corp.).

This exercise is valuable for two reasons. The first is that the proposition of a Nasdaq that is unresponsive to changes in the fed funds rate was almost ubiquitous in the popular press and on financial news television programming. As such, it would be useful to examine the veracity of the proposition to see if this is simply a popular misconception or a valid statement of fact. Secondly, the truth or falsehood of the above proposition has policy implications for the Fed. If the wealth effect of rising asset prices is due mainly to increases in the Nasdaq, then the Fed may be unsuccessful in lowing asset prices through monetary policy. More recently, the Fed may also worry about the wealth effect of falling asset prices.

Earlier papers that have examined the effect of monetary policy on asset prices include Tarhan (1995) and Thorbecke (1997). Although Tarhan's main focus is the effect of open market operations (OMOs) on interest rates, he also considers the effect of OMOs on various asset prices using a vector autoregression (VAR) approach. He finds no evidence that the Fed influences stock prices and returns. Thorbecke examines the response of stock returns to monetary policy shocks. Using VAR estimation he finds that innovations in the funds rate have a large and statistically significant effect. He also conducts an event study by regressing the percentage change of the Fed's target fund rate on percentage changes of the Dow and the Dow Jones Composite Average. Both regressions reveal a statistically significant negative relationship between changes in the funds rate and changes in stock returns. Thus, both approaches indicate an inverse relationship between the fed funds rate and stock returns. These papers are part of the literature on the neutrality of money in financial markets, which also includes Bernanke and Blinder (1992), Boudoukh, Richardson, and Whitelaw (1994), Sims (1992) and Rozeff (1974). As such, they focus on what real effects, if any, monetary policy may have on the economy. In con-

trast, the focus of this inquiry is on the relative size of the interest rate effect between the stocks comprising the two different indices. In short, is one index more sensitive to changes in the federal funds rate than the other is?

The remainder of the paper is organized as follows. Section II discusses the data and the procedure used for estimation. Section III summarizes the empirical results for three different time periods and discusses some stability test results. Section IV summarizes the results and discusses some monetary policy implications.

II. DATA & METHODOLOGY

This paper uses monthly data for the Nasdaq, the Dow, the fed funds rate, the Consumer Price Index (CPI), and industrial production from January 1990 to May 2000. Data for the Nasdaq and the DOW are monthly averages of daily closing values. The fed funds rate data are also monthly averages of daily values. The CPI and industrial production data are non-seasonally adjusted.

It is hypothesized that participants in the stock market respond to current and expected funds rates, as well as to reports of inflation and productivity. Accordingly, the following system of equations is estimated:

$$\Delta N = \beta_0 + \beta_1 \Delta FF + \beta_2 \pi + \beta_3 \Delta IP + \varepsilon_n \quad (1)$$

$$\Delta D = \beta_0 + \beta_1 \Delta FF + \beta_2 \pi + \beta_3 \Delta IP + \varepsilon_d \,, (2)$$

where ΔN and ΔD represent percentage changes in the Dow and Nasdaq composite index respectively. Each of these variables is regressed on a constant (C), changes in the fed funds rate (ΔFF), the inflation rate (π), and percentage changes in industrial production (ΔIP). One could argue that the rate in the Fed funds futures markets should be used instead of the rate in the corresponding spot market. However, at the monthly frequency, the differences between these two rates become negligible.

Another potential problem with the above specification is the possibility of collinearity between inflation and changes in the federal funds rate. This may occur for two reasons. Firstly, since the federal funds rate is a nominal interest rate, changes in the funds rate may be highly correlated with the inflation rate. Secondly, Romer and Romer (2000) have found evidence that the Fed has an information advantage over private forecasters, and that changes in the targeted funds rate convey information about expected inflation to private agents. If this is the case and current and expected inflation tend to move together, this could also contribute to collinearity. However, the correlation coefficient between these two variables turns out to be 0.1045, so collinearity does not exist.

It is also possible that contemporaneous correlation exists between the error terms, ε_d and ε_n. Under the null hypothesis of no correlation, the test statistic Tr^2 has a χ^2 distribution with one degree of freedom, where T is the sample size and r^2 is the correlation coefficient between ε_d and ε_n (Griffiths, Hill and Judge 1993). That is, if there is no contemporaneous correlation between the two equations ($\sigma_{nd} = 0$) and the sample is large, then Tr^2 is a χ^2 random variable with a 5% critical value of 3.84. Since the test statistic turns out to be large (39.41), it is quite reasonable to assume the presence of contemporaneous correlation. Therefore, this study uses the seemingly unrelated regressions (SUR) method to estimate the above equations. Note that in this case, SUR will yield the same estimates of the βs as OLS since the values for the independent variables are identical between equations (1) and (2) (Greene 2000). However, even though SUR will give the same estimated betas and residuals as OLS, it will yield a different covariance matrix, and therefore a different coefficient covariance matrix. Consequently,

the relevant advantage of SUR over OLS for this analysis is more reliable hypothesis testing.

III. EMPIRICAL RESULTS

The estimated coefficients are presented in Table 1. In both the Nasdaq and the Dow estimations there is a statistically significant, negative coefficient for changes in the fed funds rate (ΔFF). This conforms to the general notion that (unexpected) increases in the funds rate adversely affect the stock market, at least in the near term. One possibly counter-intuitive result is that the coefficient for industrial production in the Dow equation is negative and significant. However, in the context of an expanding economy with low inflation, this result may not be unexpected. One could interpret increases in industrial productivity as a sign of an "overheating" economy, which in turn increases the probability of an increase in the funds rate by the Federal Open Market Committee.

TABLE 1. ESTIMATED COEFFICIENTS FOR 1990:1 – 2000:5

Stock Index	Nasdaq	Dow
C	0.0289*	0.0166*
	(3.3009)	(3.0290)
ΔFF	-0.0827*	-0.0485*
	(-2.7026)	(-2.5365)
π	-4.4876	-1.6621
	(-1.5390)	(-0.9117)
ΔIP	-0.1176	-0.3601*
	(-0.4636)	(-2.2698)

Note: Each coefficient's t-statistic appears in parentheses. The * indicates statistical significance at the 5% level.

Notice that the absolute value of the coefficient for ΔFF is greater in the Nasdaq equation than in the Dow equation. Since the issue to be resolved is if the Nasdaq is more or less sensitive to funds rate changes than the Dow, it is appropriate to now test the hypothesis that the two coefficients are equal to each other. Performing a Wald test on the restriction that the two coefficients are equal, results in a test statistic of 1.82. Since the critical value at the 5% level is 3.84, the equality restriction cannot be rejected. For the entire period, then, neither the Dow nor the Nasdaq appears to be more sensitive to interest rate changes.

However, to look at the entire decade of the 90s may be begging the question. If there was an emergence of a new and old economy dichotomy for stocks, then it probably occurred fairly recently. In other words, were there changes in the relationships expressed in equations (1) and (2) during this time period? To address this question, the stability of each equation is examined by way of the cumulative sum of residuals (CUSUM) and CUSUM-squared tests. These tests are based on recursive residuals, where the recursive residual in period *t* is the ex post prediction error for the dependent variable in the same period (Greene 2000). The null hypothesis of unchanging βs throughout the sample period is rejected if the sum of (squared) scaled residuals strays outside of the confidence bands. The CUSUM test indicates a stable relationship for both the Nasdaq and Dow equation. However, the CUSUM-squared test indicates that both equations become unstable during the mid-90s (see the Appendix). This indicates that a structural change may have occurred during the decade. To explore this possibility, the data is subdivided into two sections and SUR estimation is performed on each section separately.

1990:1 – 1994:12

The first data set covers the period January 1990 through December 1994, inclusive. The estimation results are summarized in Table 2, below. For this sample period, the coefficients for ΔFF and π are negative and significant in both equations. Once again, the absolute value of the coefficient for ΔFF is greater in the Nasdaq equation. A Wald test is again performed to test

the restriction that the coefficient for ΔFF is the same in both equations, where the critical value at the 5% level is 3.84. The value of the test statistic 6.4, resulting in a rejection of the hypothesis of equality. This suggests that in the early 90s, the Dow was *less* sensitive to changes in the fed funds rate than the Nasdaq. This result tends to confirm the conventional wisdom of a more interest rate sensitive Nasdaq.

TABLE 2. ESTIMATED COEFFICIENTS FOR 1990:1 – 1994:12

Stock Index	Nasdaq	Dow
C	0.0348*	0.0222*
	(3.5456)	3.1096
ΔFF	-0.0895*	-0.0439*
	(-3.3722)	(-2.2773)
π	-10.3544*	-6.1080*
	(-3.3749)	(-2.7381)
ΔIP	0.2595	-0.1169
	(0.8981)	(-0.5586)

1995:1 – 2000:5

The second data set covers the period January 1995 through May 2000, inclusive. The estimation results are reported in Table 3. In this case the coefficient for ΔFF in the Nasdaq regression just fails to be significant at the 5% level. However, it is negative and significant at the 10% level. The Wald test statistic is 0.209. Thus, the hypothesis of cross equation equality cannot be rejected, and the difference in the ΔFF coefficients is not statistically significant.

It appears then, that the Dow and the Nasdaq are equally sensitive to changes in the funds rate for this sample period. By itself these results support neither view. However in the context of the results in the first half of the decade, it indicates that something has happened to cause the differential in sensitivities to disappear.

TABLE 3. ESTIMATED COEFFICIENTS FOR 1995:1 – 2000:5

Stock Index	Nasdaq	Dow
C	0.0244	0.0124
	(1.8582)	(1.6378)
ΔFF	-0.1308	-0.1036*
	(-1.9748)	(-2.7279)
π	2.2442	3.6922
	(0.4636)	(1.3303)
ΔIP	-0.3229	-0.5053*
	(-0.8457)	(-2.3086)

IV. CONCLUSION

This study empirically tests two mutually exclusive hypotheses. Many believed that the Dow was less sensitive to interest rate changes than the Nasdaq because older and larger blue chip companies were concentrated in the Dow. More recently, some have appealed to the notion of new economy stocks, which are concentrated in the Nasdaq, to propose that the Dow is now more sensitive to interest rates than the Nasdaq.

Estimation for the entire period fails to support either view, since both indices appear equally sensitive to changes in the funds rate. But dividing the sample period into two sections, as suggested by the CUSUM-squared stability tests, reveals a possible change of conditions. Conventional wisdom prevails in the first half of the 90s according to estimation for that time period. The absolute value of the coefficient for changes in the funds rate is greater for the Nasdaq equation, and this difference is statistically significant. In the latter half of the 90s, there is no statistical difference in their sensitivities to changes in the fed funds rate. These results do not completely invalidate the old/new economy dichotomy. One interpretation is that the Nasdaq may be becoming more immune to interest rates. This would explain the disappearance of a significant difference between funds rate sensi-

tivities after the early 90s. However, so far, that immunity is not so great as to make the Nasdaq composite index *less* sensitive to interests rates than the Dow Jones Industrial Average. Accordingly, the insensitivity of the Nasdaq to interest rates that some have recently proposed appears to be overstated.

Concerning monetary policy, the evidence presented here indicates that open market operations can have an effect on stock prices and returns in the short run. Many find it unlikely that the Fed targets asset prices; Alan Greenspan certainly denies it. However, some have suggested it may be a consideration in setting federal fund rate targets. Debates on the existence or desirability of asset valuation as a policy goal for the Fed aside, it appears that the Nasdaq does not enjoy immunity from Fed actions at the present time as some may suppose.

Future research projects could involve different specifications or use daily data to test the robustness of these results. It would then be useful to test the underlying theories behind the opposing views presented here. That is, one could contrast indices or portfolios that separate stocks more accurately into large and small companies or into new economy and old economy companies.

APPENDIX

Figure 1. Nasdaq Composite Index: Cusum

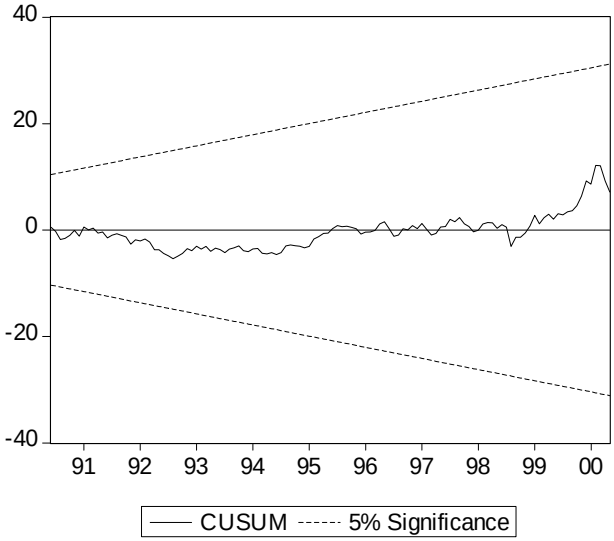


Figure 2. Nasdaq Composite Index: Cusumsq

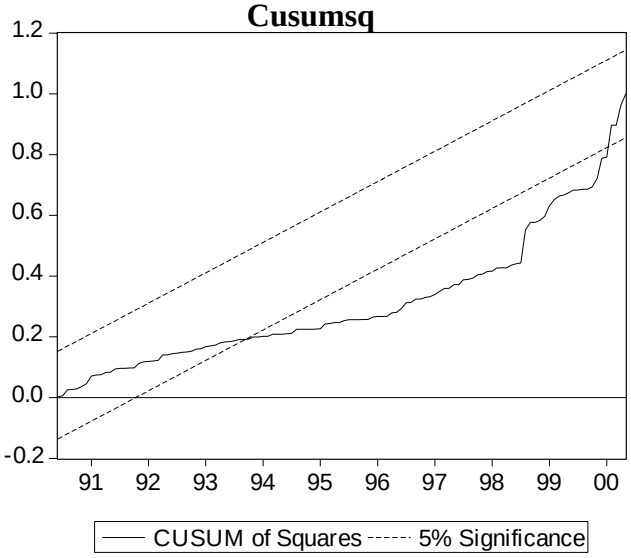


Figure3. Dow Jones Industrial Average: Cusum

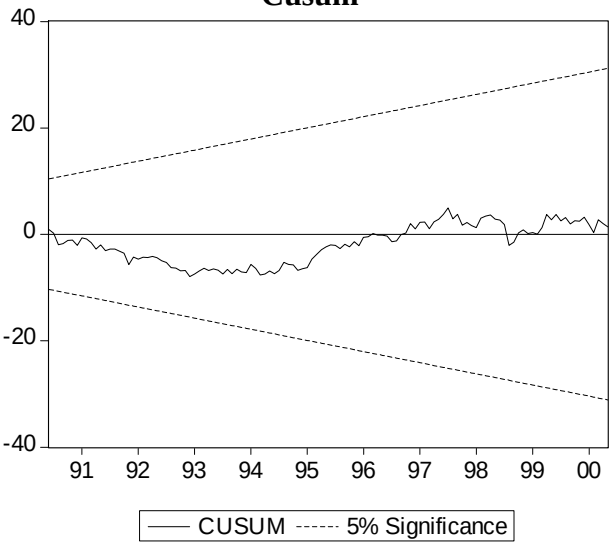
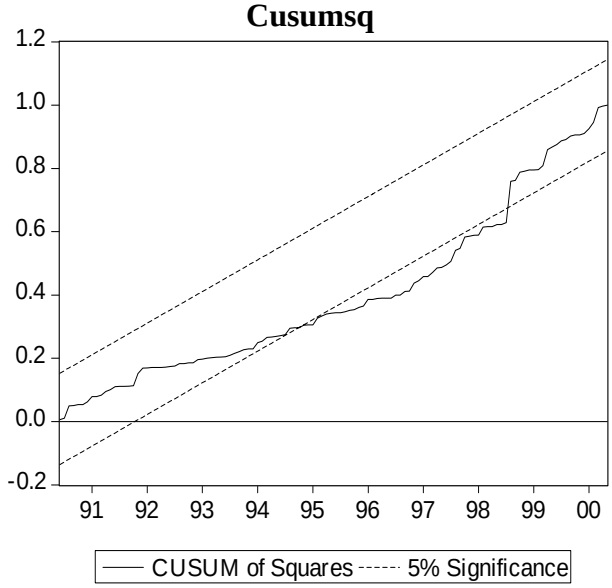


Figure 4. Dow Jones Industrial Average: Cusumsq



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