

The Wealth Effects of Stock Returns on Consumption in the Pre- and Post-Nasdaq Periods

Ling T. He
University of Central Arkansas

This study finds that the wealth effects are significantly affected by the emergence of Nasdaq which not only greatly enhanced the efficiency level of the capital market, but also notably expanded the size of the capital market. The change in the wealth effects is verified by the Chow test. The test result suggests a structural change in the wealth effects in the first quarter of 1971 in which Nasdaq started trading. This study also provides empirical evidence that real stock returns have significant effects on consumption, particularly the consumption of durable goods, in the post-Nasdaq period. Furthermore, a strong causality running from stock returns to consumer confidence is found in the post-Nasdaq period. The result supports the consumer confidence argument that stock returns can indirectly affect consumption of households without stock holdings via consumer confidence.

INTRODUCTION

Relations between changes in real stock prices and real activity have been an important issue for long time. Supportive evidence is provided by many studies, such as Fama (1981, 1990), Geske and Roll (1983), Huang and Kracaw (1984), Kaul (1987), Barro (1989, 1990), Schwert (1990), and Lettau and Ludvigson (2001). Real stock returns are found to be highly correlated with not only future production growth rates (Fama, 1990 and Schwert, 1990) but also consumption (Mankiw and Zeldes, 1991; Parker, 1999; He and McGarrity, 2005). However, other studies suggest that the wealth effect of stock market on consumption may be overstated. One reason is that ownership of substantial shares of corporate stocks is limited to a small subset of wealthy households. According to Poterba (2000), the 1998 Survey of Consumer Finances suggests that the top 1 percent of stockholders account for almost half of household holdings of corporate stocks. However, on the other hand, the same survey suggests that the number of stockholders increases in a fast pace. There were 84 million direct and indirect stockholders in 1998, representing 43.6 percent of the U.S. adult population. It is a 61 percent increase from 1989's 52.3 million. Furthermore, less wealthy households start to own stocks. For instance, half of stockholders have annual household incomes of less than \$57,000, while 18 percent have household incomes of more than \$100,000 in 1998 (The New York Stock Exchange, 2000).

The second reason for the overstated wealth effect is derived from the fact that many stockholders have only indirect holdings through retirement accounts (Starr-McCluer, 1998). Finally, other factors, such as strong income growth and favorable labor market conditions, also promote consumer spending (Starr-McCluer, 1998 and Ludvigson and Steindel, 1999).

In order to examine if changes in stock market can affect spending by different types of households, it is necessary to distinguish two kinds of wealth effects. One is the direct effect. Higher stock returns simply mean greater purchasing power for consumers with direct or even indirect (through retirement accounts) stock holding, as a result, they spend more. Ludvigson and Steindel (1999) report a contemporaneous and short-lived relation between an unanticipated change in wealth and consumption growth. It means that movements in the stock market today appear to influence today's consumer spending, not tomorrow's. Lettau and Ludvigson (2004) further point out that only permanent changes in wealth affect consumer spending.

The other is the indirect wealth effect. Stock returns may cause changes in consumer confidence, that is, expectations about future stock and job markets and household income. In this sense, higher stock returns represent greater expected purchasing power for all kinds of consumers, including those without stock holdings. Therefore, higher stock returns may lead to higher consumer spending, via buoyed consumer confidence. Zandi (1999) provides empirical evidence to support this "consumer confidence" hypothesis. He reports that a rising stock market can boost consumer confidence, therefore, may raise spending even among households without stock ownerships.

Apparently, the consumer confidence hypothesis is the key for the indirect wealth effect and based on three assumptions. First, the stock market should be big enough to become an influential economic/financial component of the society; second, stock prices that are publicly available should be efficient enough to reflect significant political, economic, and financial news; and third, most households should pay attention on changes in the stock market and be knowledgeable enough to interpret stock volatility. Events that can significantly alter the structure of the stock market might be able to cause changes in relations between the stock market and consumption. The inception of Nasdaq in 1971 may be such an event.

Prior to the inauguration of Nasdaq, most well established and institutionally favored stocks were traded on national stock exchanges, small local companies and national companies that did not meet exchange listing requirements were traded in the over-the-counter (OTC) market. Quotes of OTC stocks were disseminated by means of paper copy, newspapers, and a number of private electronic systems. Further, the published quotes were representative only, not necessarily indicative of the price a retail trader would obtain (Smith, et.al., 1998). The new computer-based system, Nasdaq, came on-line for actual quote dissemination on Monday, February 8, 1971. The dissemination of accurate quotes not only narrows the spread between the bid and asked prices, but also results in a more marketable and liquid continuous OTC market. It means that the new system enhances market efficiency, whereby stock prices fully reflect all available information and new information is widely, quickly, and cheaply available to individual investors. It may represent a possible competition to Wall Street (New York Times Index, 1971). This is why the Nasdaq Index has become an important index of the price behavior of the equity market. The higher efficiency level of the equity market may boost consumer spending in two ways. First, the higher efficiency level strengthens the signaling function of stock prices. When consumers can learn more from stock prices, their uncertainty about future may decrease. It means that consumers need to save less for insurance of future uncertainty and have more cash for current consumption. Second, the higher efficiency level

enhances the market liquidity. Higher liquidity makes investors easier to get cash for consumption, thus, increases the direct wealth effect of stock returns on consumption of households with direct stock holdings. In addition to the enhanced market efficiency, the creation of this stock-trading computer network also reflected the growing corporate demands for equity funding and individual demands for stock investments. As a result, the emergence of Nasdaq fundamentally changed the structure of the overall capital market, and dramatically expanded the size of the overall capital market as well.

However, there are some misconceptions about the importance of Nasdaq, such as trading volume, dollar volume, and members of broker/dealer firms. According to Smith, Selway and McCormick (1998), the National Association of Securities Dealers, Inc. (NASD) had 1,500 members out of 6,700 broker/dealer firms registered with the SEC in 1939, and this number increased to 4,771, 83% of all registered firms by the end of 1961. The trading volumes for Nasdaq also verify its importance. In the Mid-August of 1971 Nasdaq's volume of over-the-counter securities traded exceeded trading on American Stock Exchange and was roughly one-half of them on NYSE (New York Times Index, 1971). After 27 years Nasdaq developed into "the second-most active equity market in the world" in terms of the dollar volume and represented a serious competitive alternative to NYSE (Smith, et.al., 1998). In the beginning of the twenty-first century, the trading volume of Nasdaq even surpassed that of NYSE. For example, in October of 2001 the trading volumes for the three U.S. equity markets were as follows: 44.30 billion shares for Nasdaq; 30.23 billion shares for NYSE; and 1.56 billion shares for AMEX. The dollar volumes were very close between Nasdaq and NYSE: \$830.15 billions vs. \$921.89 billions (Nasdaq, 2001).

All the facts about Nasdaq suggest that the establishment of the new stock-trading system may have a profound impact on the relation between real stock returns and consumer confidence. That is, changes in stock prices may be interpreted by consumers as an indicator of future economic conditions. Therefore, it is hypothesized that consumer spending is affected by changes in the stock market only in the post-Nasdaq period, not the pre-Nasdaq period, due to the impact of Nasdaq on the overall equity market.

The main purpose of this study is to accurately measure the overall (direct and indirect combined) effects of real stock returns on aggregate consumption of durable/nondurable goods and services in the pre- and post-Nasdaq periods. In order to accurately quantify these overall effects, it is necessary to control for the influence of changes in some economic factors other than real stock returns and unexpected changes in stock returns, such as unemployment and disposable income on consumption. In addition, this study also examines the direct wealth effects in the pre- and post-Nasdaq periods.

Results of this study provide useful information to economic policy makers at different levels. Personal financial planners and money managers of mutual funds can also benefit from understanding relationships between stock returns and consumption in the post-Nasdaq period.

DATA

In order to measure major types of consumption expenditures, this study uses quarterly personal consumption expenditures on durable goods, nondurable goods, and services from the Chain-Type Quantity Indexes for Gross Domestic Product compiled by the Bureau of Economic Analysis, U.S. Department of Commerce. The first differences in logarithms of consumption expenditures represent consumption changes in durable goods, nondurable goods, and services.

The S&P 500 Index is used as the proxy of the stock market. It is deflated by the Consumer Price Index calculated by the Bureau of Labor Statistics, U.S. Department of Labor. Real stock price changes or returns are measured by the first differences in logarithms of the deflated S&P 500 index. Based on the findings of Ludvigson and Steindel (1999), real stock returns are expected to have a positive and contemporaneous relation with consumption.

Volatility of real stock prices is measured by the standard deviation of real stock returns. Quarterly standard deviation is calculated from monthly real stock returns. Volatility of real stock returns represents uncertainty in future stock returns, therefore, should have a negative impact on future consumption, as the results reported by Romer (1990). The variable of volatility is one-quarter lagged.

Changes in unemployment are measured by the first differences in logarithms of the seasonally adjusted unemployment level for the civilian labor force reported by the Bureau of Labor Statistics. This monthly data goes back to 1948. The present study converts all monthly data into quarterly data which is consistent with consumption statistics provided by the Bureau of Economic Analysis. Changes in unemployment are used as the proxy for labor market conditions. Therefore, an inverse relationship between changes in unemployment and consumption is expected.

Disposable personal income is used as the proxy for labor income, therefore, is expected to have a significant positive impact on consumption. Changes in disposable personal income are measured by the first differences in logarithms of disposable personal income compiled by the Bureau of Economic Analysis. However, this monthly data dates back to 1959 only.

Consumer confidence is measured by the Michigan University Consumer Sentiment Index. The index was reported only three times a year before 1960 (Federal Reserve Bank in St. Louise). Therefore, the earliest quarter that can be used in this study is the fourth quarter of 1959.

Table 1 contains descriptive statistics for all variables. Among three consumption variables, the expenditure on durable goods displays the highest variability with a standard deviation of 4.17%; and the expenditure on services is the most stable one (a standard deviation of only 0.49%). The expenditure on nondurable goods has the highest coefficients of correlation with stock returns (28.48%), while the coefficient of correlation between the expenditure on durable goods and the stock market volatility is the highest (13.81%). Spending on nondurable goods and services is insignificantly correlated with the stock market volatility. However, all three consumption variables share similar significant negative correlations with unemployment changes. There are not many significant correlations among variables that are used to explain consumer behavior. The correlations between the stock volatility and real stock returns and unemployment changes are as low as -7.99% and -0.22%, respectively. The correlation between real stock returns and unemployment changes is higher, -11.22%, and significant at the 5 percent level.

The data of disposable personal income covers the period of quarter 2, 1959 through quarter 1, 2000. Changes in disposable personal income are very stable with a standard deviation as low as 0.37%. The variable has significant correlations with expenditures on nondurable goods (20.3%) and services (24.27%). The correlation between disposable personal income and unemployment is negative (-13.52%) and significant.

TABLE 1
DESCRIPTIVE STATISTICS (IN PERCENT) FOR THE PERIOD OF
QUARTER 2, 1948 THROUGH QUARTER 1, 2000

The variable $\ln(DU_t)$ is the natural log of consumption of durable goods in quarter t , $\ln(ND_t)$ is the natural log of consumption of nondurable goods in quarter t , $\ln(SV_t)$ is the natural log of consumption of services in quarter t , $\ln(SP_t)$ is the natural log of the S&P 500 index deflated by CPI in quarter t , $\ln(UM_t)$ is the natural log of unemployment level in quarter t , $\ln(IN_t)$ is the natural log of disposable personal income in quarter t , and STD_{t-1} is one-quarter lagged standard deviation of real stock returns.

The sample size is 208 quarters.

Variable	Correlations								
Mean	Std. Dev.	$\ln(DU_t)-\ln(DU_{t-1})$	$\ln(ND_t)-\ln(ND_{t-1})$	$\ln(SV_t)-\ln(SV_{t-1})$	$\ln(SP_t)-\ln(SP_{t-1})$	$\ln(UM_t)-\ln(UM_{t-1})$	STD_{t-1}		
$\ln(DU_t)-\ln(DU_{t-1})$	1.28	4.17							
$\ln(ND_t)-\ln(ND_{t-1})$	0.69	0.78	43.06 (6.85)						
$\ln(SV_t)-\ln(SV_{t-1})$	0.97	0.49	22.38 (3.30)	35.71 (5.49)					
$\ln(SP_t)-\ln(SP_{t-1})$	1.26	5.87	16.40 (2.39)	28.48 (4.26)	21.37 (3.14)				
$\ln(UM_t)-\ln(UM_{t-1})$	0.45	7.38	-36.84 (-5.69)	-32.34 (-4.91)	-35.19 (-5.40)	-11.22 (-1.62)			
STD_{t-1}	0.18	91.11	-13.81 (-2.00)	-8.85 (-1.26)	-8.24 (-1.19)	-7.99 (-1.15)	-0.22 (-0.03)		
$\ln(IN_t)-\ln(IN_{t-1})^1$	0.61	0.37	11.09 (1.42)	20.30 (2.65)	24.27 (3.19)	-9.00 (-1.15)	-13.52 (-1.74)	-2.02 (-0.26)	

t-values in parentheses.

¹ Based on the period of Quarter 2, 1959 through Quarter 1, 2000 (165 quarters).

RESULTS

Results on the Consumer Confidence Argument

Consumer confidence represents expectations of consumers on future economic conditions, such as changes in labor markets, personal income, etc. An increase in consumer confidence, therefore, may lead to more consumer spending. If real stock returns can Granger cause changes in consumer confidence, consumers with and without corporate stock holdings tend to spend more when the stock market is bullish, and vice versa. Apparently, a causal relation between real stock returns and consumer confidence is crucial to the consumer confidence argument.

TABLE 2
RESULTS OF GEWEKE CAUSALITY TESTS ON CONSUMER CONFIDENCE (X) and
STOCK RETURNS (Y): QUARTER 4, 1960 THROUGH QUARTER 1, 2000

The Consumer Sentiment Index (CSI) compiled by the University of Michigan is used as the proxy for consumer confidence, variable X. It is measured by the difference between the natural log of CSI in quarters t and t-1. Stock returns (Y) are measured by the difference between the natural log of the S&P 500 index deflated by CPI in quarters t and t-1. The following equations are estimated:

$$X_t = \alpha + \sum_{i=1}^r \beta_i X_{t-i} + \xi_{1t} \quad \text{Var}(\xi_{1t}) = \sigma_{\xi_1}^2 \quad (1)$$

$$X_t = \alpha + \sum_{i=1}^r \beta_i X_{t-i} + \sum_{j=1}^s \gamma_j Y_{t-j} + \xi_{2t} \quad \text{Var}(\xi_{2t}) = \sigma_{\xi_2}^2 \quad (2)$$

$$X_t = \alpha + \sum_{i=1}^r \beta_i X_{t-i} + \sum_{j=0}^s \gamma_j Y_{t-j} + \xi_{3t} \quad \text{Var}(\xi_{3t}) = \sigma_{\xi_3}^2 \quad (3)$$

$$X_t = \alpha + \sum_{i=1}^r \beta_i X_{t-i} + \sum_{j=-p}^s \gamma_j Y_{t-j} + \xi_{4t} \quad \text{Var}(\xi_{4t}) = \sigma_{\xi_4}^2 \quad (4)$$

Each of these canonical representations has an approximate asymptotic chi-square distribution. To determine the optimal lag/lead lengths for r, s, and p, the Shibata (1976) criterion and Hsiao's (1979) procedure are used. The maximum likelihood (ML) measures of linear causality from Y_t to X_t (denoted as $F_{y \rightarrow x}$), from X_t to Y_t (denoted as $F_{x \rightarrow y}$), and contemporaneous linear causality between Y_t and X_t (denoted as $F_{y \bullet x}$) are as follows:

$$F_{y \rightarrow x} = \ln(\sigma_{\xi_1}^2 / \sigma_{\xi_2}^2) * n \sim \chi^2(d); F_{x \rightarrow y} = \ln(\sigma_{\xi_3}^2 / \sigma_{\xi_4}^2) * n \sim \chi^2(d);$$

$$F_{y \bullet x} = \ln(\sigma_{\xi_2}^2 / \sigma_{\xi_3}^2) * n \sim \chi^2(d);$$

where n = the number of observations, χ^2 = the chi-square statistic, and d = the difference in the degree of freedom between the paired models.

Period	Geweke measure	χ^2 statistic	P-value		Shibata
Q4/60 - Q1/00	$F_{y \rightarrow x}$	8.90	0.003	r	2
	$F_{x \rightarrow y}$	3.13	0.540	s	1
	$F_{y \bullet x}$	21.04	0.000	p	4
Q4/60 - Q4/70	$F_{y \rightarrow x}$	7.78	0.100	r	3
	$F_{x \rightarrow y}$	1.28	0.257	s	4
	$F_{y \bullet x}$	2.78	0.095	p	1

Q1/71 - Q1/00	$F_{y \rightarrow x}$	4.32	0.038	r	2
	$F_{x \rightarrow y}$	3.64	0.056	s	1
	$F_{y \bullet x}$	18.69	0.000	p	1

r=number of dependent variable lags based on Shibata criterion in equation (1).

s=number of dependent variable lags based on Shibata criterion in equation (2).

p=number of dependent variable lags based on Shibata criterion in equation (4).

Table 2 contains results of the Geweke (1982) causality tests on real stock returns and consumer confidence proxied by the Consumer Sentiment Index compiled by the University of Michigan over the period of quarter 4, 1960 through quarter 1, 2000. A causal relation running from real stock returns to consumer confidence is strongly suggested by the causality test results. An increase or decrease in real stock returns is usually followed by an increase or decrease in consumer confidence one quarter later ($s=1$, Table 2). The result unambiguously supports the consumer confidence argument. In addition, a very strong contemporaneous causality between real stock returns and consumer confidence is reported in Table 2. This result indicates that both real stock returns and consumer confidence have similar responses to some fundamental economic changes, for example, changes in interest rates.

These two causal relations between real stock returns and consumer confidence are quite weak in the pre-Nasdaq period (quarter 4, 1960 - quarter 4, 1970). They are marginally significant at the 10 percent level (Table 2). The establishment of the electronic stock-trading system, Nasdaq, greatly enhances the efficiency of the capital market, therefore, more causal relations are detected in the post-Nasdaq period (quarter 1, 1971 - quarter 1, 2000). In addition to the strong contemporaneous causality and causality running from real stock returns to consumer confidence, the results in this later period also suggest an important causal relation running from consumer confidence to real stock returns, although at a lower significance level. The two-way causality between real stock returns and consumer confidence does not reduce the importance of the consumer confidence argument in any way. Instead, it clearly indicates that consumers with and without stock holdings are integrated into the stock market via consumer confidence, thanks to the more efficient stock price system in the post-Nasdaq period.

Results for the Entire Sample Period (quarter 2 of 1948 - quarter 1 of 2000)

The overall regression results over the entire sample period are contained in Table 3. Four different models are estimated for changes in expenditures on durable goods, nondurable goods, and services: (1) uses real stock returns and stock volatility to explain changes in consumption behavior; (2) uses labor market conditions represented by unemployment changes to explain consumption changes; in (3) the real stock returns, stock volatility, and the unemployment changes are used as independent variables; and in (4) a variable of disposable personal income which starts in the second quarter of 1959 is added to the third model.

Changes in the stock market have significant impacts on durable goods spending. The coefficient of real stock returns is 0.109 with a t-value of 2.25 (D1, Table 3). It is consistent with the wealth effect of stock prices on consumption reported in the literature (Mankiw and Zeldes, 1991; Zandi, 1999; and Parker, 1999). The result that higher current real stock returns tend to stimulate spending on durable goods is in line with the finding of Ludvigson and Steindel (1999).

On the other hand, uncertainty in stock returns tends to reduce the expenditure on durable goods. The coefficient of volatility is -0.006 with a t-value of -1.84. Nevertheless, the two variables explain only about 3 percent of variation on the consumption of durable goods. Results from the second model suggest that the spending on durable goods is more sensitive to unemployment changes. The coefficient of unemployment is -0.208 with a t-value of -5.69 (D2, Table 3). The adjusted R-square for this single-index model is 0.13. When the two stock market variables and the unemployment variable are used in a same model (D3, Table 3), the effects of real stock returns and uncertainty of stock returns for the consumption of durable goods can be more accurately estimated. Results of the three-factor model indicate that there is only a small reduction in the coefficient of unemployment compared with the second model, e. g., -0.201 with a t-value of -5.54 (D3, Table 2). The inclusion of the stock return and stock volatility variables into the second model drives the adjusted coefficient of determination from 0.13 only to 0.16.

These results raise two important issues. First, they unambiguously indicate that in fact, the variable of unemployment may capture much of the shared variation in spending on durable goods missed by the stock return variable. Second, the results also suggest that the highly significant effect of real stock returns on the consumption of durable goods in the first model may largely be due to covariation between the stock return factor and other factors, such as changes in unemployment. The inclusion of the unemployment variable into the first model not only increases the explanatory power from 0.03 to 0.16, but also reduces the coefficient of stock returns to 0.081. The results indicate that stock returns and unemployment changes play important roles on durable goods spending.

However, the consumption of durable goods is adversely affected by uncertainty of stock returns, due to its significant sensitivity to volatility for future stock returns. The result is consistent with Romer's (1990) finding that variability of stock prices has a significant negative effect on the consumption of durables, because spending on durable goods is irreversible, therefore, sensitive to uncertainty in future cash flow. The addition of the disposable personal income variable to the third model increases the explanatory power for the unemployment variable, its coefficient increases from -0.201 to -0.288, and t-value from -5.54 to -6.56 (D4, Table 3). The same effect is on the variable of real stock returns. On the other hand, the coefficient of stock volatility reduces by half and becomes insignificant in model four. The result suggests a trade-off relation between disposable personal income and stock market volatility, in terms of effects on consumption. That is, an increase in personal income may reduce the sensitivity of consumers to the stock market volatility. The variable of disposable personal income has a sizable coefficient (0.588), but it is statistically insignificant (Table 3). Nevertheless, the adjusted R-square for model four is the highest, 27%.

Unlike the consumption of durable goods, spending on nondurable goods is not irreversible (Bernanke, 1983 and Pindyck, 1991), therefore, has much lower sensitivities to real stock returns and stock volatility. The coefficients of these two variables are as small as 0.037 and -0.001, respectively. The coefficient of stock volatility is even not statistically significant (N1, Table 2). The coefficient of unemployment is small, too, -0.034 with a t-value of -4.91 (N2, Table 2). In addition, the two findings mentioned in the case of the consumption of durable goods do not hold true for nondurable goods. The coefficient of unemployment in the third model is -0.031, slightly smaller than that in the second model. The coefficients of real stock returns and stock volatility experience a similar decline when the unemployment variable is included: they are 0.033 and -0.001, respectively (N3, Table 2). However, like the consumption of durable goods, the inclusion of the income variable into the third model increases coefficients and t-values for

stock return and unemployment variables, and decreases the significance level for the stock volatility variable. The impact of disposable income on the consumption of nondurable goods is significant. The adjusted R-square increases from 16% (N3) to 25% (N4, Table 3).

The consumption of services is similar to consumption of nondurable goods. The sensitivities of services consumption to real stock returns, disposable income, and unemployment changes are more significant than sensitivities to uncertainty in real stock returns.

TABLE 3
THE ORDINARY LEAST SQUARES (OLS) REGRESSION ESTIMATES FOR THE PERIOD OF QUARTER 2, 1948 THROUGH QUARTER 1, 2000

The variable $\ln(DU_t)$ is the natural log of consumption of durable goods in quarter t, $\ln(ND_t)$ is the natural log of consumption of nondurable goods in quarter t, $\ln(SV_t)$ is the natural log of consumption of services in quarter t, $\ln(SP_t)$ is the natural log of the S&P 500 index deflated by CPI in quarter t, $\ln(UM_t)$ is the natural log of unemployment level in quarter t, $\ln(IN_t)$ is the natural log of disposable personal income in quarter t, and STD_{t-1} is one-quarter lagged standard deviation of real stock returns. The OLS estimates are based on the following basic regression model:

$$[\ln(DU_t) - \ln(DU_{t-1})] \text{ or } [\ln(ND_t) - \ln(ND_{t-1})] \text{ or } [\ln(SV_t) - \ln(SV_{t-1})] \\ = a + b_1[\ln(SP_t) - \ln(SP_{t-1})] + b_2STD_{t-1} + b_3[\ln(UM_t) - \ln(UM_{t-1})] + b_4[\ln(IN_t) - \ln(IN_{t-1})] + e_t.$$

The sample size is 208 quarters. R^2 is the adjusted coefficient of determination.

Dependent variable: $[\ln(DU_t) - \ln(DU_{t-1})]$												
Model	a	b_1	b_2	b_3	b_4	t(a)	t(b_1)	t(b_2)	t(b_3)	t(b_4)	R^2	
D1	0.011	0.109	-0.006			3.93	2.25	-1.84			0.03	
D2	0.014			-0.208		5.08			-5.69		0.13	
D3	0.013	0.081	-0.006	-0.201		4.65	1.76	-2.03	-5.54		0.16	
D4 ¹	0.010	0.108	-0.003	-0.288	0.588	2.20	2.85	-1.37	-6.56	0.97	0.27	

Dependent variable: $[\ln(ND_t) - \ln(ND_{t-1})]$												
Model	a	b_1	b_2	b_3	b_4	t(a)	t(b_1)	t(b_2)	t(b_3)	t(b_4)	R^2	
N1	0.006	0.037	-0.001			12.02	4.17	-0.99			0.08	
N2	0.007			-0.034		13.63			-4.91		0.10	
N3	0.007	0.033	-0.001	-0.031		2.94	3.83	-1.09	-4.62		0.16	
N4 ¹	0.005	0.035	0.000	-0.045	0.345	4.94	4.44	0.39	-4.92	2.70	0.25	

Dependent variable: $[\ln(SV_t) - \ln(SV_{t-1})]$												
Model	a	b_1	b_2	b_3	b_4	t(a)	t(b_1)	t(b_2)	t(b_3)	t(b_4)	R^2	
S1	0.009	0.017	-0.000			27.82	3.05	-0.96			0.04	
S2	0.010			-0.023		30.66			-5.40		0.12	
S3	0.010	0.014	-0.000	-0.022		29.83	2.64	-1.08	-5.15		0.15	
S4 ¹	0.008	0.016	-0.000	-0.027	0.264	12.57	2.98	-0.39	-4.44	3.08	0.20	

¹ Based on the period of Quarter 2, 1959 through Quarter 1, 2000.

The Structural Break in the Model for Consumption of Durable Goods

On February 8, 1971, the world's first electronic stock market, Nasdaq, started to trade stocks. This meant not only a new avenue of raising more equity funds for corporations, but also new opportunities of investing in stocks for individual investors. As a result, real stock returns and uncertainty in real stock returns would reasonably be expected to have a greater impact on consumer behavior than before. In order to detect this possible fundamental change in consumer behavior, the Chow test is performed on a two-factor model for the consumption of durable goods which has been verified to be very sensitive to both real stock returns and stock volatility (Table 3).

The overall sample period in this study covers 52 years. Some significant political and economic events occurred in this period, such as breaks of war, major changes in tax codes, etc., may have profound impacts on consumption. In order to effectively examine the Nasdaq effect on consumption, a shorter sample period should be used for the Chow test. The period should be "short" enough not to contain too many noises that prevent from identifying a structural break caused by the establishment of Nasdaq. Therefore, a six-year sample period is selected for the Chow test: three years prior to and three years after the inception of Nasdaq. The detailed results of the Chow test are reported in Table 4. During the sample period there is only one structural break that occurred in the first quarter of 1971 in which Nasdaq began trading. The Chow test statistic is 4.123 and significant at the two percent level. The OLS results on the first and second three-year periods provide supportive evidence for the structural break. The coefficient of real stock returns increased from -0.133 to 0.458 between the two periods. The coefficient of determination jumped from 0.09 to 0.42 over the same interval.

Based on the structural break the entire sample can be divided into two sub-periods, the pre- and post-Nasdaq periods. The descriptive statistics for the two sub-periods are contained in Table 5. It is not surprising to see weak correlations (statistically insignificant) between the consumption of durable goods and real stock returns (0.76%) and stock volatility (11.83%) over the pre-Nasdaq period (the second quarter of 1948 through the fourth quarter of 1970). In contrast, the coefficient of correlation between the consumption of durable goods and real stock returns increases to 32.85% with a t-value of 3.73 in the post-Nasdaq period (the first quarter of 1971 through the first quarter of 2000). In the post-Nasdaq period, the correlation between the durable good consumption and stock volatility increases to -6.71% with a t-value of -1.82.

For the consumption of nondurable goods, the correlation with real stock returns is significant and with stock volatility insignificant in both periods. However, the coefficient of correlation with real stock returns increases from 18.87% in the pre-Nasdaq period to 37.37% in the post period. Over the same interval, the correlation with stock volatility, in contrast, decreases from -13.87% to -4.66%. The consumption of services shows higher correlations with real stock returns (26.85%) and stock volatility (9.03%) in the post-Nasdaq period than the pre-Nasdaq period, 15.24% and 8.03%, respectively.

The negative correlations between unemployment and consumption are significant in both pre- and post-Nasdaq periods. The results suggest that labor market conditions are always a relevant factor in consumption decision making throughout the entire sample period.

It is interesting to note that the correlations between disposable personal income and the consumption of nondurable goods and services are significantly positive in both pre- and post-Nasdaq periods. However, the correlations between income and consumption of durable goods are insignificant in both periods.

TABLE 4
THE CHOW TEST FOR THE STRUCTURAL BREAK IN THE MODEL FOR
CONSUMPTION OF DURABLE GOODS DURING THE PERIOD OF 1968-1973

The variable $\ln(DU_t)$ is the natural log of consumption of durable goods in quarter t , $\ln(SP_t)$ is the natural log of the S&P 500 index deflated by CPI in quarter t , and STD_{t-1} is one-quarter lagged standard deviation of real stock returns. The Chow test is based on the following two-factor regression model:

$$[\ln(DU_t) - \ln(DU_{t-1})] = a + b_1[\ln(SP_t) - \ln(SP_{t-1})] + b_2STD_{t-1} + e_t.$$

R^2 is the coefficient of determination.

Period 1	vs.	Period 2	Chow test		P-value		
Q1/68-Q4/68		Q1/69-Q4/73		0.631			0.604
Q1/68-Q1/69		Q2/69-Q4/73		0.651			0.593
Q1/68-Q2/69		Q3/69-Q4/73		0.410			0.748
Q1/68-Q3/69		Q4/69-Q4/73		0.143			0.933
Q1/68-Q4/69		Q1/70-Q4/73		0.157			0.924
Q1/68-Q1/70		Q2/70-Q4/73		0.108			0.954
Q1/68-Q2/70		Q3/70-Q4/73		0.170			0.915
Q1/68-Q3/70		Q4/70-Q4/73		0.186			0.905
Q1/68-Q4/70		Q1/71-Q4/73		4.123			0.022
Q1/68-Q1/71		Q2/71-Q4/73		0.706			0.561
Q1/68-Q2/71		Q3/71-Q4/73		0.601			0.623
Q1/68-Q3/71		Q4/71-Q4/73		0.715			0.556
Q1/68-Q4/71		Q1/72-Q4/73		0.593			0.628
Q1/68-Q1/72		Q2/72-Q4/73		0.982			0.423
Q1/68-Q2/72		Q3/72-Q4/73		1.011			0.411
Q1/68-Q3/72		Q4/72-Q4/73		1.008			0.412
Q1/68-Q4/72		Q1/73-Q4/73		0.885			0.468
Period	a	b ₁	b ₂	t(a)	t(b ₁)	t(b ₂)	R ²
Q1/68-Q4/73	0.017	0.172	0.007	2.26	1.35	0.98	0.02
Q1/68-Q4/70	-0.002	-0.133	0.012	-0.17	-0.83	1.39	0.09
Q1/71-Q4/73	0.027	0.458	0.000	3.43	3.15	0.06	0.42

TABLE 5
DESCRIPTIVE STATISTICS (IN PERCENT) FOR
THE PRE- AND POST-NASDAQ PERIODS

The variable $\ln(DU_t)$ is the natural log of consumption of durable goods in quarter t , $\ln(ND_t)$ is the natural log of consumption of nondurable goods in quarter t , $\ln(SV_t)$ is the natural log of consumption of services in quarter t , $\ln(SP_t)$ is the natural log of the S&P 500 index deflated by CPI in quarter t , $\ln(UM_t)$ is the natural log of unemployment level in quarter t , $\ln(IN_t)$ is the

natural log of disposable personal income in quarter t, and STD_{t-1} is one-quarter lagged standard deviation of real stock returns. R^2 is the adjusted coefficient of determination.

A. Quarter 2, 1948 through Quarter 4, 1970 (91 quarters)

Correlations										
Variable	Mean	Std. Dev.	$\ln(DU_t)-\ln(DU_{t-1})$	$\ln(ND_t)-\ln(ND_{t-1})$	$\ln(SV_t)-\ln(SV_{t-1})$	$\ln(SP_t)-\ln(SP_{t-1})$	$\ln(UM_t)-\ln(UM_{t-1})$	STD_{t-1}		
$\ln(DU_t)-\ln(DU_{t-1})$	1.12	5.00								
$\ln(ND_t)-\ln(ND_{t-1})$	0.73	0.88	39.76 (4.09)							
$\ln(SV_t)-\ln(SV_{t-1})$	1.13	0.50	18.00 (1.73)	31.13 (3.09)						
$\ln(SP_t)-\ln(SP_{t-1})$	1.39	5.31	0.76 (0.07)	18.87 (1.81)	15.24 (1.45)					
$\ln(UM_t)-\ln(UM_{t-1})$	0.84	9.78	-34.81 (-3.50)	-29.03 (-2.86)	-41.29 (-4.28)	-16.31 (-1.56)				
STD_{t-1}	0.00	85.86	-11.83 (-1.12)	-13.87 (-1.32)	-8.03 (-0.76)	-10.72 (-1.02)	-8.70 (-0.82)			
$\ln(IN_t)-\ln(IN_{t-1})^1$	0.56	0.30	6.40 (0.44)	27.65 (1.95)	28.58 (2.02)	-1.48 (-0.10)	-17.25 (-1.19)	30.32 (2.16)		

B. Quarter 1, 1971 through Quarter 1, 2000 (117 quarters)

Correlations										
Variable	Mean	Std. Dev.	$\ln(DU_t)-\ln(DU_{t-1})$	$\ln(ND_t)-\ln(ND_{t-1})$	$\ln(SV_t)-\ln(SV_{t-1})$	$\ln(SP_t)-\ln(SP_{t-1})$	$\ln(UM_t)-\ln(UM_{t-1})$	STD_{t-1}		
$\ln(DU_t)-\ln(DU_{t-1})$	1.40	3.40								
$\ln(ND_t)-\ln(ND_{t-1})$	0.65	0.70	48.74 (5.99)							
$\ln(SV_t)-\ln(SV_{t-1})$	0.85	0.44	32.88 (3.73)	40.83 (4.80)						
$\ln(SP_t)-\ln(SP_{t-1})$	1.15	6.29	32.82 (3.73)	37.37 (4.32)	26.85 (2.99)					
$\ln(UM_t)-\ln(UM_{t-1})$	0.14	4.78	-42.66 (-5.06)	-42.56 (-5.04)	-36.69 (-4.32)	-7.29 (-0.78)				
STD_{t-1}	0.00	95.36	-16.71 (-1.82)	-4.66 (-0.50)	-9.03 (-0.97)	-6.38 (-0.69)	11.88 (1.26)			
$\ln(IN_t)-\ln(IN_{t-1})$	0.63	0.40	12.42 (1.34)	19.51 (2.13)	29.07 (3.26)	-11.67 (-1.25)	-12.61 (-1.36)	-0.64 (-1.15)		

t-values in parentheses

¹ Disposable personal income for the pre-Nasdaq period is from Quarter 2, 1959 to Quarter 4, 1970.

TABLE 6
THE ORDINARY LEAST SQUARES (OLS) REGRESSION ESTIMATES FOR THE
PRE-NASDAQ PERIOD: QUARTER 2, 1948 THROUGH QUARTER 4, 1970

The variable $\ln(DU_t)$ is the natural log of consumption of durable goods in quarter t , $\ln(ND_t)$ is the natural log of consumption of nondurable goods in quarter t , $\ln(SV_t)$ is the natural log of consumption of services in quarter t , $\ln(SP_t)$ is the natural log of the S&P 500 index deflated by CPI in quarter t , $\ln(UM_t)$ is the natural log of unemployment level in quarter t , $\ln(IN_t)$ is the natural log of disposable personal income in quarter t , and STD_{t-1} is one-quarter lagged standard deviation of real stock returns. The OLS estimates are based on the following basic regression model:

$$[\ln(DU_t) - \ln(DU_{t-1})] \text{ or } [\ln(ND_t) - \ln(ND_{t-1})] \text{ or } [\ln(SV_t) - \ln(SV_{t-1})]$$

$$= a + b_1[\ln(SP_t) - \ln(SP_{t-1})] + b_2STD_{t-1} + b_3[\ln(UM_t) - \ln(UM_{t-1})] + b_4[\ln(IN_t) - \ln(IN_{t-1})] + e_t.$$

The sample size is 91 quarters. R^2 is the adjusted coefficient of determination.

Dependent variable: $[\ln(DU_t) - \ln(DU_{t-1})]$											
Model	a	b ₁	b ₂	b ₃	b ₄	t(a)	t(b ₁)	t(b ₂)	t(b ₃)	t(b ₄)	R ²
D1	0.011	-0.005	-0.007			2.08	-0.05	-1.12			-0.01
D2	0.013			-0.178		2.57			-3.50		0.11
D3	0.014	-0.066	-0.009	-0.191		2.68	-0.70	-1.58	-3.70		0.12
D4 ¹	0.015	-0.094	-0.005	-0.339	0.131	1.77	-1.26	-0.98	-5.31	0.10	0.35

Dependent variable: $[\ln(ND_t) - \ln(ND_{t-1})]$											
Model	a	b ₁	b ₂	b ₃	b ₄	t(a)	t(b ₁)	t(b ₂)	t(b ₃)	t(b ₄)	R ²
N1	0.007	0.029	-0.001			7.37	1.68	-1.15			0.03
N2	0.008			-0.026		8.49			-2.86		0.07
N3	0.007	0.021	-0.002	-0.025		7.94	1.24	-1.48	-2.77		0.10
N4 ¹	0.005	0.019	-0.003	-0.032	0.564	2.23	1.03	-0.25	-2.00	1.65	0.12

Dependent variable: $[\ln(SV_t) - \ln(SV_{t-1})]$											
Model	a	b ₁	b ₂	b ₃	b ₄	t(a)	t(b ₁)	t(b ₂)	t(b ₃)	t(b ₄)	R ²
S1	0.011	0.014	-0.000			20.27	1.38	-0.61			0.01
S2	0.011			-0.021		23.52			-4.28		0.16
S3	0.011	0.007	-0.001	-0.021		22.43	0.75	-1.11	-4.17		0.16
S4 ¹	0.010	0.011	-0.001	-0.026	0.318	9.50	1.14	-0.85	-3.23	1.87	0.25

¹ Based on the period of Quarter 2, 1959 through Quarter 4, 1970.

Regression Results for the Pre-Nasdaq Period (quarter 2 of 1948 - quarter 4 of 1970)

This is a period right after World War II. Most of this period can be characterized as economic booming. Inflation was never a major threat to the economy during this period. In early 1960s the U.S. government launched a war against poverty and developed a comprehensive social security system. Equity investments were far less popular and stock markets far less efficient than today. As a result, consumer spending on durable goods is greatly affected by job

security for most people. Evidence provided by regression analysis for the period suggests the same thing. Real stock returns and uncertainty in real stock returns have no any significant effects on the consumption of durable goods. Coefficients of both variables are small and statistically insignificant in all relevant models (Table 6). Even disposable income cannot affect the consumption of durable goods in a significant way. On the other hand, the coefficient of unemployment is sizable and significant. It can explain about 11 percent of variation on the consumption of durable goods. Clearly, labor market conditions, rather than real stock returns and stock volatility, are the major factor affecting spending on durable goods in the pre-Nasdaq period.

In the case of nondurable goods, the coefficient of real stock returns is positive and stock volatility negative; but both are not statistically significant, when the variable of unemployment is included in models. It means that changes in the stock market cannot alter spending on nondurable goods in a meaningful manner. Nevertheless, the spending might be significantly affected by labor market conditions and probably, disposable personal income as well, as suggested by regression results: the variable of unemployment has very stable and significant coefficients in different models and the coefficient of income is marginally significant (Table 6).

Labor market conditions and disposable income play an even more important role in the consumption of services. Coefficients of unemployment are stable and highly significant in different models and can explain 16 percent of variation on the consumption of services (S2, Table 6). This is the evidence that the variable of unemployment catches some variation on the consumption of services that cannot be explained by either real stock returns or uncertainty in stock returns. For instance, the coefficient of real stock returns is 0.014 in the first model, it shrinks to 0.007 when the variable of unemployment is included in the model (S3, Table 5). The result clearly indicates that the higher coefficient for real stock returns in the first model reflects some covariation between this variable and the variable of unemployment. It may be the reason why the effect of real stock returns on the consumption of services becomes smaller when unemployment is used as a control variable in the third model. In addition, personal income does have an important explanatory power on services spending in the pre-Nasdaq period.

Regression Results for the Post-Nasdaq Period (quarter 1 of 1971 - quarter 1 of 2000)

The wealth effect of stock market on spending on durable/nondurable consumer goods and services is expected to be greater in the post-Nasdaq period. In this period people are aware of more financial opportunities and better understand volatility of the stock market because of education they received. For example, baby boomers, as a new generation, are no longer satisfied with returns from traditional bank CDs and willing to explore new investment vehicles, in order to reach their financial goals. On the other hand, many new financial products, for instance, a variety of mutual funds and retirement accounts, are created to meet investors' different needs. The emergence of Nasdaq not only provides investors with new tools and opportunities for their investment needs, but also enhances the efficiency level of stock prices. As a result, the overall stock market has a greater impact on consumer spending, the spending on durable goods in particular. Empirical results of this study provide strong evidence. The coefficient of real stock returns is 0.172 with a t-value of 3.64 (D1, Table 7). It means that the real stock returns are a major driving force for the consumption of durable goods during the post-Nasdaq period. At the same time, the consumption is seriously and adversely affected by uncertainty in stock prices. The coefficient of stock volatility is -0.005 with a t-value of -1.68. The two stock market variables can explain 11 percent of variation on the consumption of

durable goods. As the results over the entire sample period suggested in section B, their impacts may be exaggerated. Once again, when the variable of unemployment is included in the model, the coefficient of real stock returns reduces to 0.159 and the coefficient of stock volatility reduces to -0.004 (D3, Table 6). The coefficient of unemployment is the largest (-0.280) and pushes the adjusted coefficient of determination from 0.11 to 0.26. The addition of the variable of disposable personal income to the model does not change the picture much. The variable has no any important influence on the consumption of durable goods.

In contrast to the pre-Nasdaq period, the stock market has a more significant impact on nondurable goods spending in the post-Nasdaq period. The coefficient of real stock returns is 0.041 with a t-value of 4.28 (N1, Table 6). However, the coefficient of stock volatility is trivial, -0.0002. The adjusted coefficient of determination is 0.13. The result of model N2 suggests that labor market conditions are a more important variable in deciding the consumption of nondurable goods. The coefficient of unemployment is -0.062 with a t-value of -5.04, and the adjusted coefficient of determination for the model is 0.17. When all these variables are included in a single model, the coefficient of real stock returns declines to 0.038, nevertheless, the coefficient of unemployment is still the largest, -0.059 with a t-value of -5.07. Meanwhile, the adjusted coefficient of determination for the model increases to 0.28 (N3, Table 7). Unlike the case of durable goods, the personal income variable exercises important influence on the consumption of nondurable goods and pushes the adjusted R-square to 0.31 (N4, Table 7).

The consumption of services, like nondurable goods, is also significantly affected by real stock returns in the post-Nasdaq period. About six percent of variation on services spending is explained by the two stock market variables. However, it is not surprising that labor market conditions are, again, a more influential factor in this case. Changes in unemployment can explain 13 percent of variation on the consumption of services. The coefficient of unemployment is -0.032 in model S3 and greater than the coefficient of real stock returns (0.017) in terms of absolute value. The coefficient of stock volatility is almost zero. Finally, disposable personal income has a very significant impact on services spending. The variable has a coefficient of 0.314 with a t-value of 3.44. It also enhances the adjusted coefficient of determination from 0.17 to 0.25 (S4, Table 7).

The above regression results unequivocally suggest that compared with the pre-Nasdaq period, stock returns have more important effects on consumption of durable/nondurable goods and services in the post-Nasdaq period. Results of the Chow test over the whole sample period in Table 8 further indicate that the differences between the two sub-periods represent structural breaks of the models. The Chow test is based on a three-index model excluding the variable of disposable personal income, because the variable starts in Quarter 2 of 1959, therefore, contains 44 less observations. Although the results for durable/nondurable goods are not as strong as that for services, they are significant at the ten percent level. More importantly, the results suggest that the inauguration of Nasdaq in 1971 may be responsible for the permanent alterations in consumer behavior.

TABLE 7
THE ORDINARY LEAST SQUARES (OLS) REGRESSION ESTIMATES FOR
THE POST-NASDAQ PERIOD: QUARTER 1, 1971 THROUGH QUARTER 1, 2000

The variable $\ln(DU_t)$ is the natural log of consumption of durable goods in quarter t, $\ln(ND_t)$ is the natural log of consumption of nondurable goods in quarter t, $\ln(SV_t)$ is the natural log of

consumption of services in quarter t, $\ln(SP_t)$ is the natural log of the S&P 500 index deflated by CPI in quarter t, $\ln(UM_t)$ is the natural log of unemployment level in quarter t, $\ln(IN_t)$ is the natural log of disposable personal income in quarter t, and STD_{t-1} is one-quarter lagged standard deviation of real stock returns. The OLS estimates are based on the following basic regression model:

$$[\ln(DU_t) - \ln(DU_{t-1})] \text{ or } [\ln(ND_t) - \ln(ND_{t-1})] \text{ or } [\ln(SV_t) - \ln(SV_{t-1})]$$

$$= a + b_1[\ln(SP_t) - \ln(SP_{t-1})] + b_2STD_{t-1} + b_3[\ln(UM_t) - \ln(UM_{t-1})] + b_4[\ln(IN_t) - \ln(IN_{t-1})] + e_t.$$

The sample size is 117 quarters. R^2 is the adjusted coefficient of determination.

Dependent variable: $[\ln(DU_t) - \ln(DU_{t-1})]$											
Model	a	b_1	b_2	b_3	b_4	t(a)	t(b_1)	t(b_2)	t(b_3)	t(b_4)	R^2
D1	0.012	0.173	-0.005			3.99	3.64	-1.68			0.11
D2	0.014			-0.304		5.03			-5.06		0.17
D3	0.013	0.159	-0.004	-0.280		4.56	3.66	-1.26	-4.88		0.26
D4	0.007	0.166	-0.003	-0.271	0.866	1.35	3.80	-1.13	-4.70	1.26	0.27

Dependent variable: $[\ln(ND_t) - \ln(ND_{t-1})]$											
Model	a	b_1	b_2	b_3	b_4	t(a)	t(b_1)	t(b_2)	t(b_3)	t(b_4)	R^2
N1	0.006	0.041	-0.000			9.83	4.28	-0.26			0.13
N2	0.007			-0.062		11.24			-5.04		0.17
N3	0.006	0.038	0.000	-0.059		11.04	4.38	0.29	-5.07		0.28
N4	0.004	0.041	0.000	-0.055	0.338	3.86	4.76	0.55	-4.84	2.48	0.31

Dependent variable: $[\ln(SV_t) - \ln(SV_{t-1})]$											
Model	a	b_1	b_2	b_3	b_4	t(a)	t(b_1)	t(b_2)	t(b_3)	t(b_4)	R^2
S1	0.008	0.019	-0.000			20.42	2.93	-0.81			0.06
S2	0.009			-0.034		22.20			-4.23		0.13
S3	0.008	0.017	-0.000	-0.032		21.90	2.85	-0.40	-4.05		0.17
S4	0.006	0.020	-0.000	-0.029	0.314	9.19	3.41	-0.07	-3.78	3.44	0.25

TABLE 8
THE CHOW TEST FOR THE WHOLE SAMPLE PERIOD
QUARTER 2, 1948-QUARTER 4, 1970 VS. QUARTER 1, 1971-QUARTER 1, 2000

The variable $\ln(DU_t)$ is the natural log of consumption of durable goods in quarter t, $\ln(ND_t)$ is the natural log of consumption of nondurable goods in quarter t, $\ln(SV_t)$ is the natural log of consumption of services in quarter t, $\ln(SP_t)$ is the natural log of the S&P 500 index deflated by CPI in quarter t, $\ln(UM_t)$ is the natural log of unemployment level in quarter t, $\ln(IN_t)$ is the natural log of disposable personal income in quarter t, and STD_{t-1} is one-quarter lagged standard deviation of real stock returns. The OLS estimates are based on the following basic regression model:

$$[\ln(DU_t) - \ln(DU_{t-1})] \text{ or } [\ln(ND_t) - \ln(ND_{t-1})] \text{ or } [\ln(SV_t) - \ln(SV_{t-1})]$$

$$= a + b_1[\ln(SP_t) - \ln(SP_{t-1})] + b_2STD_{t-1} + b_3[\ln(UM_t) - \ln(UM_{t-1})] + e_t.$$

Dependent variable	Chow test	P-value
$[\ln(DU_t) - \ln(DU_{t-1})]$	1.94	0.10
$[\ln(ND_t) - \ln(ND_{t-1})]$	2.17	0.07
$[\ln(SV_t) - \ln(SV_{t-1})]$	6.49	0.00

Exclusion of Possible Influential Observations

There is a possibility that some influential observations in durable/nondurable or services may alter regression relationships. Indeed, there was an abnormal index number for consumption of durable goods, 28.38, in the fourth quarter of 1970. The third quarter of 1970 was 30.59 and the first quarter of 1971 was 31.51. It means that the drop in consumption of durable goods was more than 7% in the last quarter of 1970, and the increase in the durable goods consumption was about 11% in the first quarter of 1971. This dramatic change is caused by the General Motors' strike in the later 1971. Does this influential quarter have significant impacts on the wealth effects over the pre- and post-Nasdaq periods? The model for consumption of durable goods is re-estimated for the pre-Nasdaq period excluding the last quarter of 1970 and the post-Nasdaq period excluding the first quarter of 1971. Results are reported in Table 9. In the pre-Nasdaq period, the only meaningful explanatory variable for consumption of durable goods is unemployment rate. This finding is in line with results in Table 6. Real stock returns become another important variable, along with unemployment rate, in the post-Nasdaq period. This result is consistent with that reported in Table 7. Therefore, the major results of this study are not distorted by the striking change in the last quarter of 1970.

TABLE 9
THE REGRESSION AND CHOW TEST RESULTS EXCLUDING TWO
QUESTIONABLE OBSERVATIONS (Q4 OF 1970 AND Q1 OF 1971)

The variable $\ln(DU_t)$ is the natural log of consumption of durable goods in quarter t, $\ln(SP_t)$ is the natural log of the S&P 500 index deflated by CPI in quarter t, $\ln(UM_t)$ is the natural log of unemployment level in quarter t, $\ln(IN_t)$ is the natural log of disposable personal income in quarter t, and STD_{t-1} is one-quarter lagged standard deviation of real stock returns.

The OLS estimates are based on the following basic regression model:

$$[\ln(DU_t) - \ln(DU_{t-1})] = a + b_1[\ln(SP_t) - \ln(SP_{t-1})] + b_2STD_{t-1} + b_3[\ln(UM_t) - \ln(UM_{t-1})] + b_4[\ln(IN_t) - \ln(IN_{t-1})] + e_t.$$

R^2 is the adjusted coefficient of determination.

Model	Estimation period: Quarter 2, 1948 - Quarter 3, 1970					t(a)	t(b ₁)	t(b ₂)	t(b ₃)	t(b ₄)	R ²
	a	b ₁	b ₂	b ₃	b ₄						
D1	0.012	0.017	-0.008			2.24	0.17	-1.28			-0.00
D2	0.013			-0.169		2.71			-3.32		0.10
D3	0.014	-0.046	-0.010	-0.180		2.78	-0.48	-1.68	-3.48		0.11
D4 ¹	0.016	-0.064	-0.005	-0.290	-0.269	1.95	-0.85	-1.11	-4.34	-0.20	0.26

Estimation period: Quarter 2, 1971 - Quarter 1, 2000

Model	a	b ₁	b ₂	b ₃	b ₄	t(a)	t(b ₁)	t(b ₂)	t(b ₃)	t(b ₄)	R ²
D1	0.012	0.156	-0.005			3.91	3.33	-1.78			0.10
D2	0.014			-0.311		4.92			-5.40		0.20
D3	0.012	0.140	-0.004	-0.288		4.52	3.31	-1.38	-5.19		0.27
D4	0.008	0.146	-0.004	-0.281	0.661	1.55	3.41	-1.27	-5.02	0.98	0.27

[†] Based on the period of Quarter 2, 1959 through Quarter 3, 1970.

The Chow test is based on the following basic regression model:

$$[\ln(DU_t) - \ln(DU_{t-1})] = a + b_1[\ln(SP_t) - \ln(SP_{t-1})] + b_2STD_{t-1} + e_t.$$

Period1	vs.	Period 2	Chow test	P-value
Q1/69-Q4/69		Q1/70-Q4/72	0.966	0.455
Q1/69-Q1/70		Q2/70-Q4/72	2.486	0.135
Q1/69-Q2/70		Q3/70-Q4/72	2.495	0.134
Q1/69-Q3/70		Q2/71-Q4/72	5.339	0.026
Q1/69-Q2/71		Q3/71-Q4/72	4.980	0.031
Q1/69-Q3/71		Q4/71-Q4/72	3.064	0.091
Q1/69-Q4/71		Q1/72-Q4/72	0.907	0.479

Furthermore, the exclusion of the two questionable observations (Quarter 4 of 1970 and Quarter 1 of 1971) does not fundamentally change the picture of the structural break between 1970 and 1971. The Chow test provides evidence that a significant structural change in the model for consumption of durable goods occurs between the period of Quarter 1 of 1969-Quarter 3 of 1970 and the period of Quarter 2 of 1971- Quarter 1 of 2000. The Chow test statistic is 5.34 with a p-value of 0.026 (Table 9). The result indicates that the inauguration of Nasdaq in 1971 may be responsible for the break after eliminating the big effect of the GM strike on consumption of durable goods. Nevertheless, the exclusion of the two observations makes the picture less clear than the results discussed in Part C, because the Chow test suggests other two important breaks over the 4-year period, although they are less significant.

TABLE 10
DIRECT IMPACTS OF STOCK RETURNS ON CONSUMPTION

The variable $\ln(DU_t)$ is the natural log of consumption of durable goods in quarter t, $\ln(ND_t)$ is the natural log of consumption of nondurable goods in quarter t, $\ln(SV_t)$ is the natural log of consumption of services in quarter t, $\ln(SP_t)$ is the natural log of the S&P 500 index deflated by CPI in quarter t, $\ln(CS_t)$ is the natural log of the Consumer Sentiment Index in quarter t, and $RESI_t$ is the error term (e_t) in the following model:

$$\ln(SP_t) - \ln(SP_{t-1}) = a + b_1[\ln(CS_t) - \ln(CS_{t-1})] + b_2[\ln(CS_{t-1}) - \ln(CS_{t-2})] + e_t.$$

The OLS estimates are based on the following regression model:

$[\ln(DU_t) - \ln(DU_{t-1})]$ or $[\ln(ND_t) - \ln(ND_{t-1})]$ or $[\ln(SV_t) - \ln(SV_{t-1})]$

$$= a + b_1RESI_t + b_2[\ln(UM_t) - \ln(UM_{t-1})] + b_3[\ln(IN_t) - \ln(IN_{t-1})] + e_t.$$

R^2 is the adjusted coefficient of determination.

A. Quarter 2, 1960 through Quarter 4, 1970 (43 quarters)

Dependent variable	a	b ₁	b ₂	b ₃	t(a)	t(b ₁)	t(b ₂)	t(b ₃)	R ²
$\ln(DU_t) - \ln(DU_{t-1})$	0.015	-0.124	-0.325	-0.108	1.64	-1.63	-4.62	-0.08	0.330
$\ln(ND_t) - \ln(ND_{t-1})$	0.006	0.018	-0.045	0.437	2.55	0.91	-2.49	1.21	0.151
$\ln(SV_t) - \ln(SV_{t-1})$	0.010	0.016	-0.027	0.326	8.59	1.63	-2.96	1.81	0.266

B. Quarter 1, 1971 through Quarter 1, 2000 (117 quarters)

Dependent variable	a	b ₁	b ₂	b ₃	t(a)	t(b ₁)	t(b ₂)	t(b ₃)	R ²
$\ln(DU_t) - \ln(DU_{t-1})$	0.008	0.124	-0.301	0.961	1.53	2.44	-5.07	1.33	0.207
$\ln(ND_t) - \ln(ND_{t-1})$	0.004	0.041	-0.060	0.367	4.07	4.20	-5.27	2.63	0.291
$\ln(SV_t) - \ln(SV_{t-1})$	0.007	0.014	-0.032	0.316	9.33	2.16	-4.07	3.35	0.207

Direct Wealth Effects of Stock Returns on Consumption

Results of the Geweke causality tests in section A clearly suggest that changes in real stock returns may cause changes in consumer confidence which reflects expectations of consumers about future economic activities, including labor markets and personal income. Higher (lower) stock returns are perceived by consumers, including those without stock holdings, greater (smaller) purchasing power, via an increase (decrease) in consumer confidence. It is the indirect wealth effects of stock returns on consumption. The influence of consumer confidence on consumption should be excluded from the estimation model, in order to measure direct wealth effects of stock returns on consumption of households with direct or indirect stock holdings. This is done by regressing the variable of real stock returns against the current and one-quarter lagged consumer sentiment index. Residuals from the model replace stock returns and volatility and are used as an independent variable in the second-stage regression analysis to explain variation in consumption of durable/nondurable goods and services. Results are reported in Table 10.

In the pre-Nasdaq period, there are no significant direct wealth effects of real stock returns on consumption of durable/nondurable goods and services. The consumption is significantly affected by changes in unemployment levels. Changes in disposable personal income have an important impact on the consumption of services. The results are basically in line with those reported in Table 6 and reflect the fact that the ownership of stocks was limited to a small number of households. Therefore, changes in stock prices have a direct impact only on a limited number of consumers. As the number of direct and indirect stockholders increases, changes in real stock returns can directly influence consumer spending on durable/ nondurable goods and services in a significant way in the post-Nasdaq period. In contrast to the coefficients of real

stock returns in models D4, and S4 in Table 7, it is not surprising that coefficients and their t-values in Table 10 are smaller. It means that the direct wealth effects of stock returns on consumption are always smaller than the overall wealth effects.

CONCLUDING COMMENTS

It is not difficult to understand the direct effects of stock returns on the wealth and consumption of consumers with direct or indirect stock holdings. However, the indirect wealth effects are not so straightforward. In order to explain why changes in stock prices can affect spending by households that do not own any stocks, the consumer confidence argument is developed in the literature. According to the argument, stock returns may indirectly affect consumption of households without stock holdings via consumer confidence. Results of the Geweke causality tests in this study provide supportive evidence for the consumer confidence argument. Changes in stock returns are found to Granger cause changes in consumer confidence in the overall sample period (quarter 4 of 1960 - quarter 1 of 2000), especially, the post-Nasdaq period.

In order to accurately measure the overall effects (direct and indirect combined) of real stock returns and stock volatility on consumption, the influence of other relevant factors, for instance, personal income and labor market conditions proxied by disposable personal income and unemployment changes, must be controlled. Results of this study indicate that the inclusion of unemployment variable reduces coefficients of real stock returns, but increases the explanatory power of models for consumption of durable/nondurable goods and service. Over the entire sample period (quarter 2 of 1948 - quarter 1 of 2000) both real stock returns and unemployment changes play significant positive roles in determining consumption of durable/nondurable goods and services. However, their impacts on spending on durable goods are far greater than on nondurable goods and services. Stock volatility has a meaningful negative impact only on the consumption of durable goods that are considered irreversible. On the other hand, the consumption of nondurable goods and services is very sensitive to changes in disposable personal income.

The effects of real stock returns and stock volatility are not expected to be constant over time. That is, they keep changing over time, due to important influence of major political and economic events. The emergence of Nasdaq not only greatly enhanced the efficiency level of the capital market, but also notably expanded the size of the capital market. Therefore, it is expected to have a profound impact on the effects of real stock returns and uncertainty in real stock returns on consumption. The result of the Chow test suggests a structural change in sensitivities of the consumption of durable goods to real stock returns and stock volatility during a six-year period (three years before and three years after the inception of Nasdaq). The structural break occurs in the first quarter of 1971 in which Nasdaq started to trade stocks. Based on this Nasdaq effect, the entire sample period is divided into two sub-periods, the pre- and post-Nasdaq periods. The two periods are structurally different for all three consumption models, as suggested by the Chow test.

There is no empirical evidence found in this study to support the overall wealth effect of stock market on consumption in the pre-Nasdaq period. The consumption of durable/nondurable goods and services is not sensitive to real stock returns and uncertainty in real stock returns. The only relevant factor is labor market conditions which play a significant role on consumer spending in the pre-Nasdaq period and the post-Nasdaq period as well. Disposable personal

income is another important explanatory variable for the consumption of services and nondurable goods in the two periods. Real stock returns have significant effects on consumption, particularly the consumption of durable goods in the post-Nasdaq period.

This study also examines the direct wealth effects of stock returns on consumption. The results do not suggest that changes in stock prices can significantly affect consumption in the pre-Nasdaq period, due to the limited number of households with stock holdings. The evidence of the strong direct wealth effects of stock returns on consumption is found only for the post-Nasdaq period.

REFERENCES

- Barro, Robert J. (1989). The Stock Market and the Macroeconomy: Implication of the October 1987 Crash. In R. W. Kamphius, R. C. Kormendi, and J. W. H. Watson, eds: Black Monday and the Future of Financial Markets, Homewood, IL: Dow Jones Irwin.
- Barro, Robert J. (1990). The Stock Market and Investment. Review of Financial Studies, 3, 115-131.
- Bernanke, Ben S. (1983). Irreversibility, Uncertainty, and Cyclical Investment. Quarterly Journal of Economics, 98, 85-106.
- Fama, Eugene F. (1981). Stock Returns, Real Activity, Inflation, and Money. The American Economic Review, 71, 545-565.
- Fama, E. F. (1990). Stock Returns, Expected Returns, and Real Activity. Journal of Finance, 45, 1089-1108.
- Geske, Robert & Roll, R. (1983). The Monetary and Fiscal Linkage between Stock Returns and Inflation. Journal of Finance, 38, 1-33.
- Geweke, J. (1982). Measurement of Linear Dependence and Feedback between Multiple Time Series. Journal of American Statistical Association, 77, 304-313.
- He, L.T. & McGarrity, J.P. (2005). A Reexamination of the Wealth Effect and Uncertainty Effect. International Advances in Economic Research, 11, 379-398.
- Hsiao, C. (1979). Causality Tests in Econometrics. Journal of Economic Dynamics and Control, 1, 321-346.
- Huang, Roger D. & Kracaw, W.A. (1984). Stock Market Returns and Real Activity: A Note. Journal of Finance, 39, 267-273.
- Kaul, Gautum (1987). Stock Returns and Inflation: The Role of the Monetary Sector. Journal of Financial Economics, 18, 253-276.

Lettau, Martin & Ludvigson, Sydney (2001). Consumption, Aggregate Wealth, and Expected Stock Returns. Journal of Finance, 56, 815-849.

Lettau, Martin & Ludvigson, Sydney (2004). Understanding Trend and Cycle in Asset Values: Reevaluating the Wealth Effect on Consumption. The American Economic Review, 94, 276-299.

Ludvigson, Sydney & Steindel, Charles (1999). How Important Is the Stock Market Effect on Consumption? Federal reserve Bank of New York Economic Policy Review, 5, July, 29-51.

Mankiw, N. G. & Zeldes, Steven (1991). The Consumption of Stockholders and Non-Stockholders. Journal of Financial Economics, 29, 97-112.

Nasdaq. 2001. www.marketdata.nasdaq.com/asp/Sec1Summary.asp.

New York Times Index. 1971.

Parker, Jonathan (1999). Spendthrift in America? On Two Decades of Decline in the U.S. Saving Rates. In Ben Bernanke and Julio Rotemberg, eds: NBER Macroeconomics Annual 1999, Cambridge: MIT Press.

Pindyck, Robert S. (1991). Irreversibility, Uncertainty, and Investment. Journal of Economic Literature, 29, 1110-1148.

Poterba, James M. (2000). Stock Market Wealth and Consumption. Journal of Economic Perspectives, 14, 99-118.

Romer, Christina (1990). The Great Crash and the Onset of the Great Depression. Quarterly Journal of Economics, 105, 597-624.

Schwert, G. William (1990). Stock Returns and Real Activity: A Century of Evidence. Journal of Finance, 45, 1237-1257.

Shibata, R. (1976). Selection of the Order on an Autoregressive Model by Akaike's Information Criterion. Biometrika, 63, 117-126.

Smith, J.W., Selway III, J.P. & McCormick, D.T. (1998). The Nasdaq Stock Market: Historical Background and Current Operation. NASD working paper 98-01. National Association of Securities Dealers, Inc.

Starr-McCluer, Martha (1998). Stock Market Wealth and Consumer Spending. Division of Research and Statistics and Monetary Affairs, Federal Reserve Board of Governors.

The New York Stock Exchange (2000). The New York Stock Exchange 2000 fact book, New York: The New York Stock Exchange.

Zandi, Mark R. (1999). Wealth Worries. Regional Financial Review, August, 1-8.