

# **Consumer Confidence and Stock Prices**

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## I. INTRODUCTION

A decline in consumer confidence has the potential to become a self-fulfilling prophecy. A downturn in consumer confidence could lead to less consumer spending, a fall in consumption and a recession. This paper examines the relationship between consumer confidence and nine different stock indices. A novice analyst may expect a direct relationship between consumer confidence and an index of stock prices. Optimistic consumers spend more, simultaneously increasing firms' profits and raising the firms' stock prices. More sophisticated analysts may argue that efficient markets result in stock prices that already embody expected changes in consumer confidence and it is only the unexpected changes in consumer confidence that affect stock prices. To analyze these questions, this paper examines the relationship between consumer confidence and a potpourri of nine different stock indices: the Dow Jones Industrials, the S&P 500, the NASDAQ, the NASDAQ 100, the S&P 100, the Russell 1000, 2000 and 3000, and the Wilshire 5000.

This paper focuses on the short-run and long-run relationship between stock indices and measures of consumer sentiment, and it presents four key empirical results. First, consumer confidence and the nine different stock indices are nonstationary time series with unit roots. Second, cointegration tests confirm that there is no long-run relationship between different stock indices and the University of Michigan's measure of consumer confidence. Third, regarding the short-run relationship between stock indices and consumer confidence, Granger-causality tests indicate that stock prices affect consumer confidence, but consumer confidence does not affect stock prices. Fourth, while expected changes in consumer confidence have no effect on stock prices, unexpected changes in consumer confidence are directly related to changes in stock prices.

Following this introduction, the second section of the paper presents a brief literature review about the relationship between measures of consumer confidence and other economic variables. Unit root tests, cointegration tests, and Granger causality tests are discussed in the third section. The fourth

section of paper presents a model to predict consumer confidence. These predictions and their errors are used to explain stock prices. The final section of the paper summarizes the results and offers conclusions.

## **II. LITERATURE REVIEW**

Researchers have recently turned their attention to links between stock indexes and measures of consumer confidence. Generally, stock indexes and measures of consumer confidence appear to be contemporaneously correlated, with the direction of influence running from stock price movements to consumer confidence but not the other way (Otoo, 1999; Jansen and Nahuis, 2002). Though this empirical evidence of causation has been classified as weak, there are reasonable theoretical links between stock indexes and consumer confidence. Moreover, it is possible that the direction of causation simultaneously works in both directions, complicating the detection of causal relationships.

The two published measures of consumer confidence in the United States are the Conference Board Consumer Confidence Index and the University of Michigan's Index of Consumer Sentiment (ICS).<sup>1</sup> Of the two indices, the University of Michigan's index has a longer time series, and most academic research has focused on this measure. Because of this longer data series, the ICS is also the focus of this paper. The ICS is based on a sample of 500 people responding to five different questions. Two questions survey the respondents about their current financial situation and how they feel it will change over the next twelve months. Two other questions ask participants about their views of future business conditions for the country as a whole. Finally, the last question asks respondents whether it is good time to purchase a major household appliance. The individual survey questions and the actual calculation of the index are described in the paper's appendix.

Movements in stock indices influence consumer confidence through two separate channels. The first channel is the traditional wealth effect where movements in stock indexes cause changes in households' current wealth which directly influences consumer sentiment. The second channel is the

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<sup>1</sup> For a comparison of these two measures of consumer confidence, see the discussion by Bram and Ludvigson (1998).

"leading indicator" channel, in which consumers interpret current changes in stock indexes as reliable indicators of future income changes (Poterba and Samwick, 1995; Morck, Shleifer and Vishny, 1990). Either scenario -- changes in current wealth or anticipated changes in future income -- may reasonably be expected to directly influence consumer sentiment. Using individual observations from the University of Michigan Consumer Sentiment survey and data from the Wilshire 5000 stock index, Otoo (1999) argues that the empirical results are more consistent with the second channel where households use changes in equity prices as a leading indicator.

Jansen and Nahuis (2002) extend Otoo's analysis to eleven European countries. With few exceptions, they find that stock returns and changes in consumer confidence are positively correlated. Like Otoo, they find that stock prices Granger-cause consumer confidence, but consumer confidence does not Granger-cause stock prices. Their empirical results confirm Otoo's finding that higher stock prices are a leading indicator that increases consumer confidence. Jansen and Nahuis characterize this leading indicator link as the "confidence channel," that is independent of the traditional "wealth effect" that states higher stock prices lead to increased household wealth and higher levels of consumer confidence. The empirical results of both Otoo and Jansen and Nahuis suggest that the confidence channel is a separate transmission mechanism that is not part of the conventional wealth effect.

Explanations of possible causal relationships between consumer confidence and equity prices that work in the other direction are theoretically reasonable, but empirically unsupported. There are again two possible ways how measures of consumer confidence affect stock indices. The first channel is the link between consumer spending and corporate profits. There is evidence that changes in consumer sentiment indexes affect changes in consumer spending. If this is so, then there should be a link between consumer sentiment and expected corporate profits, thus providing a direct relationship between consumer sentiment and stock prices. Several studies show that measures of lagged consumer sentiment are statistically significant explanatory variables in explaining the behavior of current

household spending.<sup>2</sup> However, the relationship between consumer sentiment and output measures differs considerably across countries and across the different measures of consumer confidence. In terms of predicting future output, measures of consumer confidence have less explanatory power than measures of business confidence.<sup>3</sup> The second potential channel of influence is the so-called "publication effect" (Jansen and Nahuis, 2002), whereby publication of consumer survey data exerts a psychological effect on the market.

Fisher and Statman (2002) find that measures of consumer confidence can predict changes in the stock market. For the NASDAQ and small cap stocks, they find a statistically significant, inverse relationship between consumer confidence in one month and stock returns in the following month. Fisher and Statman also find a statistically significant, direct relationship between changes in consumer confidence and current stock returns. They conclude "high stock returns boost consumer confidence."

What other factors affect consumer confidence? Lovell and Tien (1999) find that changes in the unemployment rate, the rate of change in the S&P 500 index and the growth rate of real GDP are statistically significant explanatory variables that explain the behavior of consumer confidence. However, the rate of inflation and the popularity of the current president proved to be poor explanatory variables that lacked statistical significance.

### **III. UNIT ROOT, COINTEGRATION, AND GRANGER CAUSALITY TESTS**

#### **The data**

Nine different stock indices are used to explore the relationship between stock prices and measures of consumer sentiment. While Otoo's study only used the Wilshire 5000 index, this study uses the Wilshire 5000, the Dow Jones Industrials, the S&P 500, the NASDAQ, the S&P 100, the NASDAQ 100, the Russell 1000, 2000, and 3000 indices.

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<sup>2</sup> See Carroll, Fuhrer, and Wilcox (1994), Bram and Ludvigson (1998), and Souleles (2001).

<sup>3</sup> See Santero and Westerland (1996).

The unemployment rate, expected inflation, and real personal income are used as explanatory variables to describe the behavior of consumer sentiment. The expected inflation values also come from the data collected by the University of Michigan surveys. The 10-year U.S. government bond rate and real personal income are also used as explanatory variables in the specification describing the behavior of the stock indices. All of the data are monthly time series.

### **Unit root tests**

To avoid regressions with spurious results, each time series is tested for a unit root. First, all the variables are expressed in their natural logs. Table 1 reports the augmented Dickey-Fuller tests for both levels data and first-differenced data. Each test statistic is derived by including the number of lagged dependent variables that minimizes the Akaike Information Criteria (AIC) for each specification. However, if autocorrelation is still present after the AIC was minimized, additional lags are included until serial correlation was no longer present. Using a level of significance equal to one percent, the Dickey-Fuller tests indicate all the variables are nonstationary, but their first differences are stationary.

Referring to the results for levels data in Table 1, the augmented Dickey-Fuller tests indicate that the null hypothesis of a zero root cannot be rejected for all the variables at the one percent level. However, at the five percent level, the null hypothesis of a zero root is rejected for consumer confidence, the Russell 2000 stock index, and the interest rate on the ten-year U.S. government bond. Using the first-differenced data, the null hypothesis of a zero root is rejected at the one-percent level for every variable.

Given empirical evidence that the logs of consumer confidence and the nine different stock indices all have unit roots at the one-percent level, regressions with these variables are estimated with first-differenced data to avoid spurious results and improper statistical inferences. In their study of the relationship between consumer confidence and stock indices in Europe, Jansen and Nahuis also found that their time series exhibited zero roots.

## **Cointegration tests**

Given that the consumer confidence and stock indices have zero roots and are integrated of order one, Johansen cointegration test are preformed to determine whether a long-run relationship exists between consumer confidence and each of the stock indices. If consumer confidence and a stock index are cointegrated, then a long-run relationship exists between the two variables. Nine independent statistical tests are performed to determine whether consumer confidence and each of the individual stock indices are pair wise cointegrated. The results of the cointegration tests are reported in Table 2.

The test statistics reported in Table 2 are based on the null hypothesis that a cointegrating vector between consumer confidence and a given stock index does not exist. In other words, the null hypothesis is there is no long-run relationship between consumer sentiment and a given stock index. The trace test indicates that such a long-run relationship does not exist. In each of the nine cases, the p-value of the test statistic was greater than 0.01, indicating the null hypothesis of no cointegrating vector cannot be rejected at the one-percent level of significance. As Table 2 indicates, the hypothesis that no cointegrating vector exists between consumer confidence and the Wilshire 5000 index can be rejected at the relatively weaker level of significance of five percent. Likewise, the null hypothesis of no long-run relationship between consumer confidence and either the S&P 100 stock index or the Russell 3000 index can be rejected at the weakest level of significance of 10 percent. Hence, using a strict one-percent level of significance, the null hypothesis of no long-run relationship between consumer confidence and any of the stock indices considered here cannot be rejected.

Likewise, in all nine cases, the p-value associated with the max-eigenvalue test statistic is greater than 0.01, indicating that the null hypothesis of no cointegrating vector cannot be rejected at the one-percent level. This adds additional statistical evidence that the null hypothesis of no long-run relationship cannot be rejected. However, at the weaker five-percent level of significance, the hypothesis of no cointegrating vector can be rejected in the case of the Russell 1000 and the Wilshire 5000 stock indices. The null hypothesis of no cointegrating vector is rejected at the 10-percent level in

the case of the S&P 100 and the Russell 3000 stock indices. But like the trace test, if the level of significance is set at one percent, the null hypothesis of no long-run relationship between consumer confidence and any one of the nine stock indices listed in Table 2 cannot be rejected. The outcomes of these cointegration tests are similar to the results that Jansen and Nahuis found with their European data.

### Granger-causality tests

Given that there is no long-run statistical relationship between consumer confidence and the stock indices, the nature of the short-run relationship was explored. Granger-causality test were performed by estimating a two-equation, vector autoregressive system. Let the index of consumer confidence in month  $t$  be denoted by  $C_t$ , while the given stock index in month  $t$  is denoted by  $S_t$ . There are two equations in the VAR. The first equation in the two-equation system of seemingly unrelated equations is

$$\Delta \ln C_t = \delta_0 + \sum_{i=1}^N \delta_i \Delta \ln C_{t-i} + \sum_{i=1}^N \gamma_i \Delta \ln S_{t-i} + u_t, \quad (1)$$

and the second equation of the VAR is

$$\Delta \ln S_t = \theta_0 + \sum_{i=1}^N \theta_i \Delta \ln C_{t-i} + \sum_{i=1}^N \varphi_i \Delta \ln S_{t-i} + e_t. \quad (2)$$

Notice that both equations (1) and (2) have the same lag structure, that is, there are  $N$  lagged explanatory variables for both the stock index in question and the consumer sentiment. Referring to equation (1), if  $\gamma_i = 0$  for every  $i$ , then one concludes that the stock index does not Granger cause consumer confidence. Likewise, if  $\theta_i = 0$  for every  $i$ , then consumer confidence does not Granger cause the stock index.

The results of the Granger causality tests are reported in Table 3. Again the regressions are performed on first-differences of the natural logs of the variables. The length of the lag is the one that minimized the AIC for each VAR. Regardless the stock index used, the results were the same. In all nine cases, the null hypothesis that a given stock index did not Granger cause consumer sentiment was

rejected at the one-percent level of significance. Likewise, in each of the nine cases, the null hypothesis that consumer confidence does not Granger cause measures of the stock index cannot be rejected.

The finding that stock indices affect consumer confidence, but not the reverse, is consistent with the findings of Otoo and Jansen and Nahius. However, neither of these studies investigate whether the impact of expected changes in consumer confidence and unexpected changes in consumer confidence differ. If the stock market is efficient, then expected changes in consumer confidence should already be reflected in the prices of equity. In an efficient stock market, expected changes in consumer confidence should not affect stock prices. On the other hand, unexpected changes in consumer confidence are surprise announcements that should change the level of a stock index.<sup>4</sup> These questions are explored in the paper's next section.

#### **IV. EFFECT OF EXPECTED AND UNEXPECTED CONSUMER CONFIDENCE**

##### **The regression predicting consumer confidence**

To estimate the expected and unexpected changes in consumer confidence, a regression describing the behavior of consumer sentiment must be specified. The predicted values of this regression are used to proxy the expected changes in consumer confidence, while the residuals from the regression serve as proxy for the unexpected changes in consumer confidence.

A regression model describing the behavior of consumer sentiment ( $C_t$ ) is specified, and it includes lagged measures of the stock index ( $S_{t-1}$ ), the unemployment rate ( $U_{t-1}$ ), expected inflation ( $\pi_{t-1}^e$ ), and real personal income ( $Y_{t-1}$ ) as explanatory variables. The regression model is

$$\Delta \ln C_t = \alpha_0 + \alpha_1 \Delta \ln S_{t-1} + \alpha_2 \Delta \ln U_{t-1} + \alpha_3 \Delta \ln \pi_{t-1}^e + \alpha_4 \Delta \ln Y_{t-1} + \varepsilon_t \quad (3)$$

where the  $\alpha_i$ ,  $i = 0, \dots, 4$ , are the unknown regression coefficients to be estimated, and  $\varepsilon_t$  is the random error. The model is in pseudo-reduced form. The lagged explanatory variables are used to avoid any simultaneity bias. The regression is estimated with first differences of the natural logs of the variables to

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<sup>4</sup> See Fama (1969).

avoid the spurious correlation problems caused by regressing time series with unit roots on other time series with unit roots.

A priori, changes in consumer confidence should be directly related to changes in stock prices and real personal income. Consequently, both  $\alpha_1$  and  $\alpha_4$  are expected to be positive. Conversely, changes in consumer confidence should be inversely related to changes in the unemployment rate and expected inflation. Thus, both  $\alpha_2$  and  $\alpha_3$  should be negative.

Table 4 lists the results of estimating equation (3). Nine regression results are reported, one regression for each of the nine stock indices. Referring to Table 4, the column labeled “Model 1” assumes the relevant stock index is the Dow Jones Industrials, the column labeled “Model 2” assumes that  $S_t$  was proxied by the S&P 500 stock index, the column labeled “Model 3” assumes that  $S_t$  is the NASDAQ composite and so on. Because the data is in first-differenced form, the  $R^2$  is typically very low.

Regardless the specification, all of the estimated slope coefficients reported in Table 4 have the expected sign. The coefficient associated with the stock indices is always positive and statistically significant at the one-percent level. The regression coefficients associated with unemployment have the anticipated negative sign and are statistically significant at the five- or ten-percent level in eight of the nine cases. The coefficients associated with real income are significant eight of the nine times. While the estimated coefficients for expected inflation are statistically significant in only four of the nine cases (and only at the ten-percent level, the weakest level of significance), the variable is left in the model’s specification because of its theoretical underpinnings and it always has the correct sign.

Estimation of these regressions generates estimates of the expected and unexpected changes in consumer sentiment. The predicted values produced by the models in Table 4,  $\widehat{\Delta \ln C}_t$ , serve as proxies for expected changes in consumer sentiment. These are the forecasts of changes in consumer confidence

given available data as captured by the explanatory variables in Table 4. The residuals,  $\hat{\epsilon}_t$ , from the models in Table 4 proxy the unexpected changes in consumer confidence.

### **The impact of expected and unexpected changes in consumer confidence on stock prices**

The estimates of the expected and unexpected changes in consumer confidence are used to explain the changes in stock prices as measured by an incremental change in a given stock index. For each of the nine stock indices, Table 5 reports the regression results for two models: Model A and Model B. Actual consumer confidence ( $\Delta \ln C_t$ ) is used as one of the explanatory variables in Model A or

$$\text{Model A: } \Delta \ln S_t = \alpha_0 + \alpha_1 \Delta \ln i_{t-1} + \alpha_2 \Delta \ln Y_{t-1} + \gamma_1 \Delta \ln C_t + v_t \quad (4)$$

Instead of including actual measures of consumer confidence, Model B includes proxies for the predicted changes in consumer confidence ( $\widehat{\Delta \ln C_t}$ ) and the unexpected changes in consumer confidence ( $\hat{\epsilon}_t$ ) or

$$\text{Model B: } \Delta \ln S_t = \alpha_0 + \alpha_1 \Delta \ln i_{t-1} + \alpha_2 \Delta \ln Y_{t-1} + \beta_1 \widehat{\Delta \ln C_t} + \beta_2 \hat{\epsilon}_t + \mu_t \quad (5)$$

where the  $\alpha_0$ ,  $\alpha_1$ ,  $\alpha_2$ ,  $\beta_1$ ,  $\beta_2$  and  $\gamma_1$  in equations (4) and (5) denote the unknown regression parameters,  $v_t$  in equation (4) and  $\mu_t$  in equation (5) denote random errors, and  $i_{t-1}$  is the yield on the previous month's 10-year U.S. government bond. The Gordon stock price model assumes that current stock prices are equal to the present value of future dividend payments. The price of equity should increase as firms' future dividend payments increase with their future profits. If the investors' discount rate increases, the Gordon stock price model predicts equity prices would fall. The lagged interest rate in equations (4) and (5) is included to capture changes in the discount rate of investors, and a priori,  $\alpha_1$  is expected to be negative. Since a monthly time series for corporate profits is not available, lagged monthly real income is included in the model to serve as a proxy for corporate profits and dividend payments. Hence, according to the Gordon discounted stock price model,  $\alpha_2$  should be positive.

To distinguish between the effects of expected and unexpected changes in consumer confidence, both  $\widehat{\Delta \ln C}_t$  and  $\hat{\varepsilon}_t$  are included as explanatory variables in Model B. If the stock market is efficient,  $\beta_1$  should be equal to zero. Given efficient equity markets, available information used to forecast expected changes in consumer confidence is already embodied in equity prices, and changes in expected consumer confidence should have no impact on changes in a stock index. However, unexpected changes in consumer confidence are innovations in data that are not incorporated in current equity prices. These surprises contain new information that impacts equity markets.  $\beta_2$  is expected to be positive, a priori, as stock prices should be directly related to unexpected changes in consumer confidence.

The regression estimates reported in Table 5 confirm the efficient markets hypothesis. Notice that the regression coefficients associated with actual consumer confidence ( $\gamma_1$ ) in the results for Model A are always positive and statistically different from zero, for all nine stock indices. But the results differ when actual consumer confidence is partitioned to into expected and unexpected changes. Turning to the results for Model B, regardless of the stock index used as the dependent variable, the regression coefficients associated with expected changes in consumer confidence ( $\beta_1$ ) are statistically insignificant at the one-percent level in all nine equations. Thus, stock prices do not respond to expected changes in consumer confidence. But if the change in consumer confidence is unexpected, then stock prices are affected. Estimates of  $\beta_2$  reported in Table 5 are always positive and statistically different from zero.

The estimated coefficient accompanying the yield on the ten-year U.S. government bond ( $\alpha_1$ ) always has the expected negative sign. The estimated parameters are statistically different from zero in six of the nine regression results for Model A. In the regression results for Model B, the estimated coefficients on the interest rate variable are still negative, but they are statistically significant in only three of the nine cases. The estimated coefficients accompanying changes in real income ( $\alpha_2$ ) were

usually positive (with the exception of the results for the Wilshire 5000 index), but these coefficients were never statistically different from zero.

## **V. CONCLUSIONS**

Similar to the results of Jansen and Nahuis for European countries, this paper finds that measures of consumer confidence and stock indices exhibit unit roots. The finding that no long-run relationship between U.S. measures of consumer confidence and stock indices exists also agrees with findings of Jansen and Nahuis. In terms of the short-run relationship between these variables, Granger-causality test indicate that the stock index affects consumer confidence, but the opposite does not hold. Jansen and Nahuis found the same result using European data, while Otoo found a similar relationship in the U.S. using only the Wilshire 5000 stock index. This paper extends Otoo's findings to the more commonly used indices of the Dow Jones, the S&P 500, and the NASDAQ, along with five other stock indices.

However, in a departure from the studies of Jansen and Nahuis and Otoo, this paper finds that while expected changes in consumer confidence have no effect on stock prices, unexpected changes in consumer confidence have a direct relationship with stock prices. This finding complements the theoretical conclusions of the efficient markets literature. Forecasts of expected changes in consumer confidence based on commonly available data should have no effect on stock prices. This currently available information has already been embodied in equity prices. Stock prices already reflect this available information. However, if the change in consumer confidence is unexpected, then stock prices would be affected in a proportional direction.

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Table 1  
Augmented Dickey-Fuller Tests for Unit Roots

<i>Levels Data: In natural logs</i>				<i>First-Differences of Natural Logs</i>			
Variable	Test Statistic	Lags	Sample	Variable	Test Statistic	Lags	Sample
Consumer Confidence	-3.12**	0	78:2 – 07:10 <sup>†</sup>	Consumer Confidence	-10.72*	4	78:7 – 07:10
Dow Jones Industrial	-2.17	0	78:2 – 07:10 <sup>‡</sup>	Dow Jones Industrial	-19.03*	0	78:3 – 07:10 <sup>†</sup>
S&P 500	-1.92	0	78:2 – 07:10 <sup>‡</sup>	S&P 500	-8.10*	4	78:7 – 07:10 <sup>†</sup>
NASDAQ	-2.55	1	78:3 – 07:10 <sup>‡</sup>	NASDAQ	-16.75*	0	78:3 – 07:10 <sup>†</sup>
S&P 100	-1.54	0	82:9 – 07:10 <sup>†</sup>	S&P 100	-12.66*	1	82:11 – 07:10 <sup>†</sup>
NASDAQ 100	2.13	0	85:11 – 07:10	NASDAQ 100	-14.93*	0	85:12 – 07:10
Russell 1000	2.33	0	93:1 – 07:10	Russell 1000	-12.79*	0	93:2 – 07:10
Russell 2000	-3.59**	1	87:11 – 07:10 <sup>‡</sup>	Russell 2000	-14.85*	0	87:11 – 07:10
Russell 3000	2.32	0	87:10 – 07:10	Russell 3000	-15.56*	0	87:11 – 07:10
Wilshire 5000	-2.84	0	00:11 – 07:10 <sup>‡</sup>	Wilshire 5000	-8.49*	0	00:12 – 07:10
Unemployment Rate	-3.00	6	78:8 – 07:10 <sup>‡</sup>	Unemployment Rate	-5.64 <sup>†</sup>	4	78:7 – 07:10
Real Personal Income	-3.36	12	79:2 – 07:10 <sup>‡</sup>	Real Personal Income	-3.99*	11	79:2 – 07:10 <sup>†</sup>
10-Year Government Bond	-3.94**	3	78:5 – 07:10 <sup>‡</sup>	10-Year Government Bond	-10.14*	2	78:5 – 07:10
Expected Inflation	-2.21	7	78:9 – 07:10 <sup>†</sup>	Expected Inflation	-10.45*	6	78:9 – 07:10

\* indicates the null hypothesis that the time series has a unit root is rejected at the 1% level, while \*\* indicates the same null hypothesis is rejected at the 5% level. † indicates that the regression model included an intercept, while ‡ indicates the regression included both an intercept and a time trend.

Table 2

The Long-Run Relationship between Consumer Confidence and a Stock Index: Johansen Cointegration Test Results

<i>Null Hypothesis: A cointegrating equation for consumer confidence and a stock index does not exist.</i>								
Stock Index	Trace Statistic	Maximum Eigenvalue Statistic	Lags	Level data has deterministic linear trend?	Cointegrating Equation		Akaike Information Criterion (AIC)	Sample
					Includes intercept?	Includes trend?		
Dow Jones	12.343 (0.141)	11.909 (0.114)	2	Yes	Yes	No	-6.786	78:4 – 07:10
S&P 500	13.205 (0.108)	12.111 (0.107)	2	Yes	Yes	No	-6.818	78:4 – 07:10
NASDAQ	12.440 (0.137)	11.185 (0.145)	2	Yes	Yes	No	-5.985	78:4 – 07:10
S&P 100	24.846 <sup>***</sup> (0.067)	21.040 <sup>***</sup> (0.029)	1	Yes	Yes	Yes	-6.958	82:10 – 07:10
NASDAQ 100	18.785 (0.294)	16.180 (0.138)	2	Yes	Yes	Yes	-5.740	86:1 – 07:10
Russell 1000	24.387 <sup>***</sup> (0.076)	21.734 <sup>**</sup> (0.022)	1	Yes	Yes	Yes	-7.241	93:2 – 07:10
Russell 2000	21.481 (0.160)	13.419 (0.295)	3	Yes	Yes	Yes	-6.550	88:1 – 07:10
Russell 3000	20.595 (0.197)	17.249 <sup>***</sup> (0.100)	1	Yes	Yes	Yes	-7.044	87:11 – 07:10
Wilshire 5000	20.569 <sup>**</sup> (0.045)	19.320 <sup>**</sup> (0.014)	1	No	No	No	-6.970	00:12 – 07:10

\*\* (\*\*\*) indicates the null hypothesis of no cointegrating vector is rejected at the 5% (10%) level. P-values of the test statistics are in parentheses.

Table 3  
Pair-wise Granger Causality Tests

$$\text{Model A: } \Delta \ln C_t = \delta_0 + \sum_{i=1}^N \delta_i \Delta \ln C_{t-i} + \sum_{i=1}^N \gamma_i \Delta \ln S_{t-i} + u_t$$

$$\text{Model B: } \Delta \ln S_t = \theta_0 + \sum_{i=1}^N \theta_i \Delta \ln C_{t-i} + \sum_{i=1}^N \phi_i \Delta \ln S_{t-i} + e_t$$

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*All dependent and explanatory variables are first differences of natural logs.*

Stock Index	F Statistics		Sample
	<u>Null Hypothesis</u> Stock Index Does Not Granger Cause Consumer Confidence (Model A)	<u>Null Hypothesis</u> Consumer Confidence Does Not Granger Cause Stock Index (Model B)	
	Dow Jones	15.777*	
S&P 500	15.596*	0.049	78:4 - 07:10
NASDAQ	19.750*	0.158	78:4 - 07:10
S&P 100	12.271*	0.105	82:11 - 07:10
NASDAQ 100	12.944*	0.147	86:1 - 07:10
Russell 1000 <sup>†</sup>	13.374*	0.007	93:2 - 07:10
Russell 2000 <sup>†</sup>	17.534*	0.483	87:11 - 07:10
Russell 3000	9.668*	0.289	87:12 - 07:10
Wilshire 5000 <sup>†</sup>	10.582*	0.146	00:12 - 07:10

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\* indicates the null hypothesis can be rejected at the 1% level. † indicates a stock market variable where model specifications A and B above had only one lag, all other stock variables had model specifications with two lags.

Table 4  
The Determinants of Consumer Confidence: Models 1 - 9  
Regression Model:  $\Delta \ln C_t = \alpha_0 + \alpha_1 \Delta \ln S_{t-1} + \alpha_2 \Delta \ln U_{t-1} + \alpha_3 \Delta \ln \pi_{t-1}^e + \alpha_4 \Delta \ln Y_{t-1} + \rho u_{t-1} + \varepsilon_t$

<i>All data: first differences of the natural log. Dependent variable: consumer confidence.</i>						
Parameter	Explanatory Variable	Model 1	Model 2	Model 3	Model 4	Model 5
$\alpha_1$	Dow Jones <sub>t-1</sub> (S <sub>t-1</sub> )	0.300* (0.057)				
$\alpha_1$	S&P 500 <sub>t-1</sub> (S <sub>t-1</sub> )		0.280* (0.058)			
$\alpha_1$	NASDAQ <sub>t-1</sub> (S <sub>t-1</sub> )			0.198* (0.037)		
$\alpha_1$	S&P 100 <sub>t-1</sub> (S <sub>t-1</sub> )				0.250* (0.055)	
$\alpha_1$	NASDAQ 100 <sub>t-1</sub> (S <sub>t-1</sub> )					0.143* (0.034)
$\alpha_2$	Unemployment Rate <sub>t-1</sub> (U <sub>t-1</sub> )	-0.175** (0.094)	-0.174** (0.094)	-0.183** (0.094)	-0.221** (0.095)	-0.220** (0.106)
$\alpha_3$	Expected Inflation <sub>t-1</sub> ( $\pi_{t-1}^e$ )	-0.026*** (0.016)	-0.025*** (0.017)	-0.023*** (0.017)	-0.017 (0.015)	-0.015 (0.018)
$\alpha_4$	Real Personal Income <sub>t-1</sub> (Y <sub>t-1</sub> )	1.050* (0.417)	1.002* (0.420)	0.978** (0.419)	0.703** (0.386)	0.840** (0.426)
$\alpha_0$	Intercept	-0.005 <sup>††</sup> (0.002)	-0.004 <sup>†††</sup> (0.002)	-0.004 <sup>†††</sup> (0.002)	-0.004 (0.003)	-0.004 (0.003)
$\rho$	AR(1)	-0.119 <sup>††</sup> (0.055)	-0.118 <sup>††</sup> (0.055)	-0.133 <sup>††</sup> (0.055)		-0.117 <sup>†††</sup> (0.055)
R <sup>2</sup>		0.101	0.090	0.100	0.096	0.094
DW		2.015	2.016	2.021	2.162	2.018
F-test		7.870 <sup>‡</sup>	6.935 <sup>‡</sup>	7.839 <sup>‡</sup>	7.902 <sup>‡</sup>	5.336 <sup>‡</sup>
Sample		78:4 - 07:10	78:4 - 07:10	78:4 - 07:10	82:10 - 07:10	86:1 - 07:10

Standard errors are in parentheses. \*, \*\*, and \*\*\* indicate these regression parameters have the correct, anticipated sign at the 1%, 5%, and 10% level of significance, respectively, using one-tail t tests. †, ††, and ††† indicate that the null hypothesis that the slope coefficient is equal to zero is rejected at the 1%, 5%, and 10% level of significance, respectively, using two-tail t tests. ‡ indicates that the null hypothesis that all the slope coefficients are simultaneously equal zero is rejected at the 1% level.

Table 4 (continued)  
The Determinants of Consumer Confidence

$$\text{Regression Model: } \Delta \ln C_t = \alpha_0 + \alpha_1 \Delta \ln S_{t-1} + \alpha_2 \Delta \ln U_{t-1} + \alpha_3 \Delta \ln \pi_{t-1}^e + \alpha_4 \Delta \ln Y_{t-1} + \rho u_{t-1} + \varepsilon_t$$

<i>All data: first differences of the natural log. Dependent variable: consumer confidence.</i>					
Parameter	Explanatory Variable	Model 6	Model 7	Model 8	Model 9
$\alpha_1$	Russell 1000 <sub>t-1</sub> (S <sub>t-1</sub> )	0.275* (0.075)			
$\alpha_1$	Russell 2000 <sub>t-1</sub> (S <sub>t-1</sub> )		0.223* (0.055)		
$\alpha_1$	Russell 3000 <sub>t-1</sub> (S <sub>t-1</sub> )			0.274* (0.066)	
$\alpha_1$	Wilshire 5000 <sub>t-1</sub> (S <sub>t-1</sub> )				0.375* (0.138)
$\alpha_2$	Unemployment Rate <sub>t-1</sub> (U <sub>t-1</sub> )	-0.175*** (0.119)	-0.263** (0.113)	-0.256** (0.112)	-0.121 (0.222)
$\alpha_3$	Expected Inflation <sub>t-1</sub> ( $\pi_{t-1}^e$ )	-0.013 (0.017)	-0.020*** (0.018)	-0.016 (0.018)	-0.006 (0.022)
$\alpha_4$	Real Personal Income <sub>t-1</sub> (Y <sub>t-1</sub> )	1.181* (0.501)	0.838** (0.445)	0.681*** (0.419)	0.917 (0.834)
$\alpha_0$	Intercept	-0.005††† (0.003)	-0.004 (0.003)	-0.004 (0.003)	-0.005 (0.006)
$\rho$	AR(1)	-0.174†† (0.055)	-0.119††† (0.068)		
R <sup>2</sup>		0.124	0.102	0.107	0.123
DW		2.038	2.019	2.188	2.245
F-test		4.828‡ (0.017)	5.3085‡ (0.018)	7.025‡ (0.018)	2.723‡‡ (0.022)
Sample		93:3 - 07:10	87:12 - 07:10	87:11 - 07:10	00:12 - 07:10

Standard errors are in parentheses. \*, \*\*, and \*\*\* indicate these regression parameters have the correct, anticipated sign at the 1%, 5%, and 10% level of significance, respectively, using one-tail t tests. †, ††, and ††† indicate that the null hypothesis that the slope coefficient is equal to zero is rejected at the 1%, 5%, and 10% level of significance, respectively, using two-tail t tests. ‡ (‡‡) indicates that the null hypothesis that all the slope coefficients are simultaneously equal zero is rejected at the 1% (5%) level.

Table 5  
The Effect of Expected and Unexpected Changes in Consumer Confidence on Stock Indices

$$\text{Model A: } \Delta \ln S_t = \alpha_0 + \alpha_1 \Delta \ln i_{t-1} + \alpha_2 \Delta \ln Y_{t-1} + \gamma_1 \Delta \ln C_t + v_t$$

$$\text{Model B: } \Delta \ln S_t = \alpha_0 + \alpha_1 \Delta \ln i_{t-1} + \alpha_2 \ln \Delta Y_{t-1} + \beta_1 \widehat{\Delta \ln C}_t + \beta_2 \hat{\varepsilon}_t + \mu_t$$

<i>All variables are first differences of natural logs.</i>										
Parameter	<i>Dependent Variables</i>									
	Dow Jones		S & P 500		NASDAQ		S& P 100		NASDAQ 100	
	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B
$\gamma_1$	0.159* (0.047)		0.168* (0.046)		0.276* (0.071)		0.183* (0.057)		0.289* (0.108)	
$\beta_1$		0.043 (0.158)		0.045 (0.166)		0.495** (0.235)		0.119 (0.199)		0.556 (0.113)
$\beta_2$		0.172* (0.049)		0.181* (0.048)		0.260* (0.075)		0.193* (0.060)		0.263** (0.113)
$\alpha_1$	-0.187* (0.053)	-0.192 (0.053)	-0.159* (0.052)	-0.164* (0.053)	-0.177** (0.081)	-0.172** (0.081)	-0.154** (0.060)	-0.159* (0.061)	-0.153** (0.115)	-0.148 (0.115)
$\alpha_2$	0.087 (0.370)	0.212 (0.406)	0.143 (0.367)	0.275 (0.408)	0.554 (0.564)	0.307 (0.615)	0.104 (0.399)	0.154 (0.430)	0.591 (0.731)	0.380 (0.786)
$\alpha_0$	0.008* (0.002)	0.007* (0.002)	0.008* (0.002)	0.007* (0.002)	0.008** (0.004)	0.008* (0.004)	0.007* (0.003)	0.007* (0.003)	0.010*** (0.005)	0.010** (0.005)
$R^2$	0.068	0.070	0.064	0.067	0.053	0.064	0.053	0.055	0.037	0.038
DW	2.140	2.069	2.129	2.067	2.130	1.978	2.130	2.078	1.961	2.045
F	8.577†	6.635†	8.049†	6.262†	5.531†	6.006†	5.531†	4.286†	3.292††	2.575††
N	78:3-07:10	78:4-07:10	78:3-07:10	78:4-07:10	78:3-07:10	78:4-07:10	82:9-07:10	82:10-07:10	85:11-07:10	85:11-07:10

Standard errors are in parentheses. \*, \*\*, and \*\*\* indicate that the null hypothesis that the slope coefficient is equal to zero is rejected at the 1%, 5%, and 10% level of significance, respectively, using two-tail t tests. † and †† indicate that the null hypothesis that all the slope coefficients are simultaneously equal zero is rejected at the 1% and 5% level, respectively.

Table 5 (Continued)  
The Effect of Expected and Unexpected Changes in Consumer Confidence on Stock Indices  
Model A:  $\Delta \ln S_t = \alpha_0 + \alpha_1 \Delta \ln i_{t-1} + \alpha_2 \Delta \ln Y_{t-1} + \gamma_1 \Delta \ln C_t + v_t$   
Model B:  $\Delta \ln S_t = \alpha_0 + \alpha_1 \Delta \ln i_{t-1} + \alpha_2 \ln \Delta Y_{t-1} + \beta_1 \widehat{\Delta \ln C_t} + \beta_2 \hat{\varepsilon}_t + \mu_t$

<i>All variables are first differences of natural logs.</i>								
Parameter	<i>Dependent Variables</i>							
	Russell 1000		Russell 2000		Russell 3000		Wilshire 5000	
	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B
$\gamma_1$	0.134 <sup>***</sup> (0.072)		0.310 <sup>*</sup> (0.078)		0.190 <sup>*</sup> (0.060)		0.238 <sup>*</sup> (0.086)	
$\beta_1$		0.173 (0.219)		0.463 (0.238)		0.132 (0.182)		0.511 <sup>***</sup> (0.199)
$\beta_2$		0.129 <sup>***</sup> (0.077)		0.248 <sup>*</sup> (0.075)		0.155 <sup>*</sup> (0.059)		0.227 <sup>*</sup> (0.086)
$\alpha_1$	-0.080 (0.068)	-0.079 (0.068)	-0.109 (0.087)	-0.033 (0.080)	-0.131 <sup>***</sup> (0.067)	-0.079 (0.063)	-0.089 (0.089)	-0.118 (0.088)
$\alpha_2$	0.216 (0.396)	0.244 (0.487)	0.337 (0.527)	0.463 (0.238)	0.147 (0.407)	0.183 (0.406)	-0.295 (0.657)	-0.734 (0.736)
$\alpha_0$	0.007 <sup>**</sup> (0.003)	0.007 <sup>**</sup> (0.003)	0.006 (0.004)	0.008 <sup>**</sup> (0.003)	0.006 <sup>**</sup> (0.003)	0.008 <sup>*</sup> (0.003)	0.003 (0.004)	0.006 (0.005)
$R^2$	0.029	0.029	0.071	0.065	0.055	0.038	0.093	0.123
DW	2.092	2.131	1.771	2.011	1.915	2.098	1.813	2.078
F	1.716	1.306	6.802 <sup>†</sup>	4.045 <sup>†</sup>	4.582 <sup>†</sup>	2.328 <sup>††</sup>	2.737 <sup>††</sup>	2.738 <sup>††</sup>
N	93:1-07:10	93:1-07:10	87:10-07:10	87:12-07:10	87:10-07:10	87:12-07:10	00:11-07:10	00:12-07:10

Standard errors are in parentheses. \*, \*\*, and \*\*\* indicate that the null hypothesis that the slope coefficient is equal to zero is rejected at the 1%, 5%, and 10% level of significance, respectively, using two-tail t tests. † and †† indicate that the null hypothesis that all the slope coefficients are simultaneously equal zero is rejected at the 1% and 5% level, respectively.

## APPENDIX

The Index of Consumer Sentiment (ICS)  
Calculated by the Survey Research Center, University of Michigan

The ICS is derived from the responses to the following five questions.	
x <sub>1</sub>	“We are interested in how people are getting along financially these days. Would you say that you (and your family living there) are better off or worse off financially than you were a year ago?”
x <sub>2</sub>	“Now looking ahead - - do you think that a year from now you (and your family living there) will be better off financially, or worse off, or just about the same as now?”
x <sub>3</sub>	“Now turning to business conditions in the country as a whole - - do you think that during the next twelve months we’ll have good times financially, or bad times, or what?”
x <sub>4</sub>	“Looking ahead, which would you say is more likely - - that in the country as a whole we’ll have continuous good times during the next five years or so, or that we will have periods of widespread unemployment or depression, or what?”
x <sub>5</sub>	“About the big things people buy for their homes - - such as furniture, a refrigerator, stove, television, and things like that. Generally speaking, do you think now is a good or bad time for people to buy major household items?”

x<sub>i</sub> is equal to the percent of favorable replies minus percent of unfavorable replies plus 100, rounded to nearest whole number.

$$ICS = \frac{x_1 + x_2 + x_3 + x_4 + x_5}{6.7558} + 2.0$$

The denominator, 6.7558, is the 1966 base period total, and the addition of 2.0 corrects for survey design changes that occurred in the 1950s.

Source: Survey Research Center, University of Michigan, <http://www.sca.isr.umich.edu> .