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Relationship between the Stock Market Index and Consumer Confidence after the 2007-2008 Financial Crisis

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Abstract

The paper investigates potential Granger causality between the stock market index (SMI) and the consumer confidence (sentiment) index (CSI) for the period between 2007 and 2013. While studying SMI-CSI relations, the model is calibrated for US data (S&P500 and the Michigan Survey Research Centre measures of consumer confidence) and shows causality is from the stock market index to consumer confidence. This result is a consequence of the stock market index towards the consumers' attitudes, as they consider the index to be the leading indicator of the future situation, regardless of whether they own stocks or not. They also maintain a degree of optimism regarding the future economic situation.

Keywords: Consumer sentiment; Stock market index; Granger causality; Cointegration; VAR; VECM; JEL: G01; G1

Introduction

Knowledge of the prevailing relationship between stock prices, on the one hand, and macroeconomic variables, such as consumption, investment and industrial production, on the other, is predominantly postulated in a variety of economic models.

Consumer confidence (sentiment) plays an important role both in macroeconomics and finance. It is based on the "information view" [1] and it reflects the "subjective" of consumers' state of mind that cannot be deducted from the economic variables. Caroll et al. find that higher levels of consumer confidence decrease consumption today relative to tomorrow for the USA, which implies improvements in consumers' confidence stimulate consumption growth in the short run. Ludvigson [2] found that consumer confidence indicators have some forecasting power for future labour income growth. Easaw et al. [3] find that consumer confidence indices predict households' consumption of durable goods in the UK.

The relationship between stock prices and consumer sentiment has been the subject of intense research over the past three decades. Ottoo [4] showed that changes in equity values and consumer sentiment for the US are contemporaneously correlated and that increases in the equity price boost consumer confidence with a (short) lag; however, the reverse does not hold. Fisher and Statman [5] presented that consumer confidence predicts the stock market. On the other hand, results from these studies have compelled some authors to question the traditional notion of the causal chain. Meanwhile, time-series analysis has developed recently and numerous studies have investigated the connection between the two variables by using the Granger causality concept. Most previous studies have dealt with the question of temporal independence between the stock market and consumer sentiment using country panel data. For example, this is the case in both the study of eleven European countries by Jansen, Nahius [6] and the causality analysis by Chih-Chiang Hsu et al. [7]. The present paper is a contribution to this literature through analysis of several aspects of the link between stock market index and consumer confidence. Previous studies have used the consumer confidence sentiment index as the proxies of individual investors, as well as the stock market index as a stock return indicator (for example, Fisher and Statman).

Before the 2007/2008 financial crisis, all researches cited a short-term correlation between consumer confidence and the stock market index. However, the condition of the relationship after a financial crisis needs to be examined. To answer this question, consumer confidence and stock index are modelled bivariate in vector auto regressive (VAR) or vector-error (VEC) models for the United States of America and causality tests performed. The advantage of the VECM approach is that it can distinguish between long- and short-run relationships among the variables to identify sources of causation that cannot be detected by Granger causality.

The paper is structured with Section 2 presenting a description of the data, Section 3 providing an overview of the empirical analysis and Section 4 concluding the paper.

Data Source for the Study

As previously mentioned, the objective of this study is to determine the linkage between the US stock market index and the consumer confidence index. The study covers a 7-year period from January 2006 to March 2013, which was selected because it is within a jam-packed decade of financial events in the United States and around the world, including some good, some bad and all newsworthy. All of the financial events have been important for small businesses and consumers.

A. Consumer confidence

Consumer confidence, or consumer sentiment, is both an economic concept and a set of statistical measures. Alan Greespan considered consumer confidence to be a key determinant of near-term economic growth; moreover, Qiu and Welch [8] provided evidence that his index is a good proxy for investor sentiment in the US. The index is based on the responses to five questions via surveys of 500 households and is published by the University of Michigan and Thomson Reuters. The questions are:

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1. We are interested in how people are getting along financially these days. Would you say that you (and your family) are better off or worse off financially than you were a year ago?

2. Looking ahead, do you think that a year from now you (and your family) will be better off financially, worse off or just about the same as now?

3. 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, bad times or what?

4. 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, we will have periods of widespread unemployment or depression or what?

5. 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 a bad time for people to buy major household items?

B. The stock market index

The Standard and Poors 500 index is used as the proxy of the stock market index. It is a value-weighted index that reflects the market value of all 500 components US stocks relative to a particular base period. The Standard and Poor's Index Committee determine the selection and management of the index, which is chosen for two main reasons; firstly, the S&P500 is a better representation of the US market and, secondly, the academic community quickly adopted the S&P 500 as the benchmark used in evaluation of investment theories. As part of his work in developing the Capital Asset Pricing Model (1964), William Sharpe created the notion of the market portfolio, one of the major characteristics of which is that each asset in that portfolio is held in exact proportion to its market value. That notion also happens to be the basis upon which the S&P 500 is constructed, a fact noted not only by the researchers who used it to develop modern portfolio theory but also by the creators of indexed stock funds.

Following the research of Otoo, Jansen and Nahius and others used a monthly frequency in their work concerning the relationship between the stock market and consumer sentiment since it is the most logical option given the need to observe changes in consumer confidence over time. The two series, obtained in real values, have been transformed in their logarithmic values before modelling.

Figure 1 shows how just a quick view on the data can support a positive relation between the two variables. The analysis in this paper will show, in formal terms, the kind of relation that can be hypothesized for these two variables.

Estimation strategy

A. Vector auto regression model: In order to verify the empirical analysis, this paper uses the Vector Auto Regression (VAR) model to explore the relationship between the stock market index and consumer confidence index; therefore, according to Jansen and Nahuis, the following two equations can be specified:

$$CSI_t = \alpha_c + \sum_{i=1}^{k} \beta_{c_i} CSI_{t-i} + \sum_{i=1}^{k} \gamma_{c_i} SMI_{t-i} + \mu_{c_t} \quad (1)$$

$$SMI_t = \alpha_p + \sum_{i=1}^{k} \beta_{p_i} CSI_{t-i} + \sum_{i=1}^{k} \gamma_{p_i} SMI_{t-i} + \mu_{p_t} \quad (2)$$

Where CSI_t is the consumer confidence index of an individual investor at time t and SMI_t is the stock market index at time t,μ_{ct} is the residual of the consumer confidence index and μ_{pt} is the residual of the stock market index.

In equation (1), the stock market index Granger-causes the consumer sentiment index, if the null hypothesis that lagged coefficients, $\gamma_{c_1} = \gamma_{c_2} = \ldots = \gamma_{c_i} = 0$ (i=1,2, ,k), are zero is rejected. In equation (2), the consumer sentiment index Granger-causes the

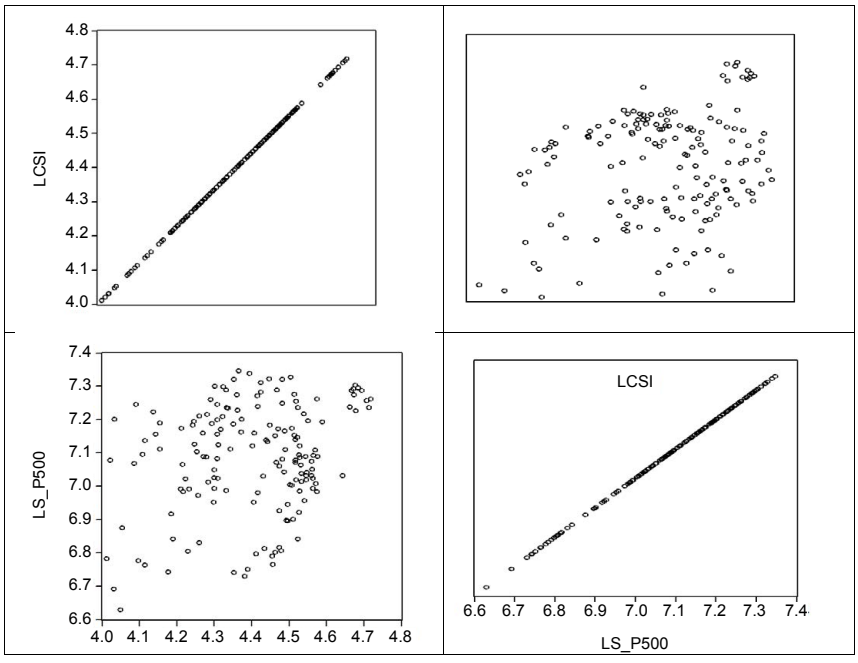

Figure 1: Scatter plot for LS&P500 and LCSI evolution.

stock market index, if the null hypothesis that lagged coefficients, $\beta_{p_1} = \beta_{p_2} = \cdots = \beta_{p_i} = 0$ (i=1,2, ,k), is rejected. Based on the estimated OLS coefficients for equations (1) and (2), four different hypotheses concerning the relationship between consumer sentiment index and stock market index can be formulated:

If $\sum_{i=1}^{k}\gamma_{c_i} \neq 0 et \sum_{i=1}^{k}\gamma_{p_i} = 0$, then stock prices increase the prediction for consumer confidence but not vice versa; thus, we have *unidirectional Granger-Causality from LS_P500 to LCSI.*

If $\sum_{i=1}^{k}\gamma_{c_i} = 0 et \sum_{i=1}^{k}\gamma_{p_i} \neq 0$, then consumer confidence increases the prediction for the stock prices but not vice versa; in this case, we have *unidirectional Granger-Causality from LCSI to LS_P500.*

If $\sum_{i=1}^{k}\gamma_{c_i} \neq 0 et \sum_{i=1}^{k}\gamma_{p_i} \neq 0$, then consumer confidence increases stock prices and vice versa; thus, we have *bidirectional (or feedback) causality*.

If $\sum_{i=1}^{k}\gamma_{c_i} = 0 et \sum_{i=1}^{k}\gamma_{p_i} = 0$, then there is *independence between LCSI and LS_P500;* in this case, there is *no Granger-Causality in any direction*.

B. Causality testing and co-integration: It should be noted that there may be some co-integrating relationship in both equations (1) and (2). Therefore, vector δ can be interpreted as a vector of adjustment coefficients that measures the strength of the deviation from equilibrium feedback into the system. Tests for co-integration are based on the estimated Eingen values of the Π-matrix, in which testing is done sequentially so that the null rank 0 is tested against the alternative of rank 1 fist, and rank 1 against rank next. Equations (1) and (2) can be rewritten after adding the co-integration assumptions, as follows:

$$CSI_t = \alpha_c + \sum_{i=1}^{k}\beta_{c_i} CSI_{t-i} + \sum_{i=1}^{k}\gamma_{c_i} SMI_{t-i} + \delta_{11} CSI_{t-1} + \delta_{12} SMI_{t-1} + \mu_{c_t} \quad (1')$$

$$SMI_t = \alpha_p + \sum_{i=1}^{k}\beta_{p_i} CSI_{t-i} + \sum_{i=1}^{k}\gamma_{p_i} SMI_{t-i} + \delta_{21} CSI_{t-1} + \delta_{22} SMI_{t-1} + \mu_{p_t} \quad .(2')$$

Where α_c and α_p are the drift components and μ_{c_t} and μ_{p_t} are white noise, the terms with summation signs represent the error correction dynamics, while the second part of the equation with δ corresponds to the long-run relationship.

The first step in the VECM test approach is to use F-tests for the existing long-run relationship among variables. The null hypothesis in the equation is $\delta_{11=}\delta_{12=}0$ for the consumer sentiment index equation and $\delta_{21=}\delta_{22=}0$ for the stock market index equation. This indicates the existence of a long-run relationship.

The alternative hypothesis is: H_1: $\delta_{11}\neq 0$, $\delta_{12}\neq 0$, $\delta_{21}\neq 0$, $\delta_{22}\neq 0$. The long run should not be interpreted in a temporal sense here; deviations from the equilibrium are, of course, partially corrected between each period in a "mechanical" sense.

The calculated F-statistics are compared with the two sets of critical values suggested by Pesaran et al. (2001). One set assumes that all variables are I(0) and the other assumes they are I(1). If the calculated F-statistics exceed the upper critical value, the null hypothesis of no co-integration will be rejected irrespective of whether the variables are I(0) or I(1). If it is below the lower value, the null hypothesis of no co-integration cannot be rejected; however, if it falls inside the critical value band, the test is inconclusive (Pesaran & Pesaran). To choose the optimal lag length for each variable, the VECM method estimates (p+1) k number of regressions, where p is the maximum number of lags and k is the number of variables in the equation. The model can be selected on the basis of the Schwartz–Bayesian Criteria (SBC) and the Akaike Information Criteria (AIC). The SBC is known as a parsimonious model that selects the smallest possible lag length; meanwhile, the AIC is known for selecting the maximum relevant lag length.

In the second step, the long-run relationship using the selected ECM model is estimated through AIC or SBC. When a long-run relationship exists among the variables, there is error correction representation. The following error correction model is also estimated:

$$CSI_t = \alpha_c + \sum_{i=1}^{k}\beta_{c_i} CSI_{t-i} + \sum_{i=1}^{k}\gamma_{c_i} SMI_{t-i} + \varphi_c ECM_{t-1} + \mu_{c_t} \quad (3)$$

$$SMI_t = \alpha_p + \sum_{i=1}^{k}\beta_{p_i} CSI_{t-i} + \sum_{i=1}^{k}\gamma_{p_i} SMI_{t-i} + \varphi_p ECM_{t-1} + \mu_{p_t} \,. \quad (4)$$

The error correction term ECMt-1 indicates the speed of adjustment back to long-run equilibrium after a short-run shock.

Empirical Results

The first step is to implement unit root tests to ensure the integration of all variables. For this purpose, the study uses the Augmented Dickey and Fuller (ADF) [9-11] and MacKinnon [12] one-side p-values tests. As evident from the results shown in Table 1, LSMI and LCSI are non-stationary but their first difference is stationary. Then, LSMI and LCSI are *integrated of order 1 I(1).*

In order to establish the direction of causality between these two variables, the Granger-Causality test has been employed and the results are presented in Table 2. F-statistic and Probability are values constructed under the null hypothesis H_0 of no causality. This is evidence that there is a causal relationship between the two variables (Jansen and Nahius) and, importantly, the one-way causality runs through the stock market index to the consumer sentiment index [13-15].

As shown in Table 3 below, there is evidence of co-integration between two variables. The stock market index is close to be stationary variable; however, the trend coefficient is significant, which means the stationary combination of the stock market and consumer confidence also need to include a time trend.

Turning to the estimated δ-coefficients and tests for long-run causality, Table 4 shows a test for significance of the impact coefficient in the stock market index equation (2') could not be rejected, whereas a corresponding test for the coefficient in the consumer confidence

Variable	ADF	Prob.*
LCSI	-0.57	0.46
LSMI	0.14	0.72
LCSI	-10.78	0
LSMI	-8.06	0

*MacKinnon (1996) one-sided p-values.

Table 1: Unit root tests.

Null Hypothesis:	F-Statistic	Probability
LCSI does not Granger Cause LSMI	0.091	0.76
LSMI does not Granger Cause LCSI	4.819	0.02

Table 2: Granger causality test.

	LSMI	LCSI	trend
Est β'	1	-4	-0.01
Trend t-stat			5.39
Coeff t-stat		6.37	

Table 3: Cointegration analysis.

Rank	Trace-Stat	Engen-Value
None	0.150649	33.33425
At most 1	0.047854*	7.698782*

Superscript* indicates that test is significant on the 5%-level.

Eq	Coeff.	Standar Error	t-statistics
(1')	0.01	0.09	0.02
(2')	0.11	0.05	26.5

Table 4: Long-run causality test.

Regressors	ΔLCSI	ΔLSMI
Constant	1.74	8.22
ECM_{t-1}	-0.02	0.05
	-0.01	-0.01
$DLCSI_{t-1}$	0.006	
	-0.08	
$DLSMI_{t-1}$	0.34	0.23
	-0.11	-0.08
R^2	0.08	
AIC	-3.55	
Schwarz SC	-3.47	

Table 5: Vector Error Correction Estimates.

index equation (1') could. Hence, the results tend to favour a long-run causality that is unidirectional from stock market index to consumer confidence. Changes in the stock market index induced by disequilibria can, through ECM, cause consumer confidence but the data does not indicate an arrow of causality in the opposite direction.

Consequently, these causal chains are the only ones that are statistically significant. The only fluctuations of the stock market index and consumer confidence that can be explained by other variables in the system are changes stemming from the error correction dynamic. The statistically positive coefficient of LCSI confirms that an increase in stock market index leads to an improvement in the consumer sentiment. This result is in line with Fisher and Statman (Table 5).

These results led us to modify equations (3) and (4) as follows:

$$CSI_t = \alpha_c + \sum_{i=1}^{k} \beta_{c_i} CSI_{t-i} + \sum_{i=1}^{k} \gamma_{c_i} SMI_{t-i} + \varphi_c ECM_{t-1} + \mu_{c_t}$$

$$SMI_t = \alpha_p + \sum_{i=1}^{k} \gamma_{p_i} SMI_{t-i} + \mu_{p_t}$$

Summary and Conclusion

This paper examined the causal relationship between stock price and consumer sentiment for the United States of America over the period 2008-2013 using a bivariate model of S&P and consumer sentiment index. To test causality, the Granger test and the VECM was used because strong evidence was found that the variables are co-integrated and the object was to study the short-run relationship as well as the long-run dynamics. The empirical study of the U.S. suggests the existence of unidirectional long- and short-run causality running from stock price to consumer sentiment. Therefore, investors seemed to follow the stock market index more closely. Although consumer confidence predicts economy, it does not predict the stock market. As it is suspected that temporal aggregation of either quarterly or monthly data to annual data may weaken causal relationships between the variables, it may well be worth studying this effect in the future.

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