CEP 10-08

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Lilia Karnizova
University of Ottawa

Hashmat Khan
Carleton University

September 2010; revised 30 June 2014

CARLETON ECONOMIC PAPERS

Department of Economics

1125 Colonel By Drive
Ottawa, Ontario, Canada
K1S 5B6

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Lilia Karnizova[†]
University of Ottawa

Hashmat Khan[‡]
Carleton University

June 2014

Abstract

Two channels through which stock prices can affect consumption are wealth effects and shifts in consumer confidence. We examine the evidence for the latter channel for Canada, using consumer confidence survey data. The composition of households' financial wealth between stock and pension funds holdings as well as the unique 6-month forecast horizon in the consumer confidence survey make Canada a particularly interesting case relative to the U.S. and European countries. We find that both stock price changes and their volatility are significant predictors of consumer responses to questions that are unrelated to expectations of future personal finances, even after controlling for inflation, unemployment and interest rates. Moreover, there is a significant short-term increase in consumer pessimism after an unexpected rise in stock market volatility. Overall, the evidence for the confidence channel suggests that this channel can amplify the effects of the well-understood wealth channel. Consequently, it should be taken into account in determining quantitative impacts of the stock market on consumer behaviour.

Keywords: stock market; consumer confidence; confidence channel; wealth; Canada

JEL classification: E44, E21, G17

*We thank two anonymous referees for helpful comments and suggestions. We also thank Todd Crawford from the Conference Board of Canada for clarifying several questions regarding the data construction methodology.

[†]Corresponding author: Department of Economics, University of Ottawa, 120 University, room 9053, Ottawa, Canada, K1N 6N5, tel: +1 613 562 5800 ext. 2017. *E-mail:* Lilia.Karnizova@uOttawa.ca.

[‡]Department of Economics, Carleton University, D891 Loeb, 1125 Colonel By Drive, Ottawa, Canada, K1S 5B6, tel: +1 613 520 2600 ext. 1561. *E-mail:* Hashmat.Khan@Carleton.ca.

And higher stock prices will boost consumer wealth and help increase confidence, which can also spur spending. Bernanke (2010)

1 Introduction

The global financial crisis of 2007-2009 has brought the need to better understand the linkages between financial markets and the real side of the economy to the forefront of economic and policy research. In this paper, we focus on effects of stock market developments on consumer behaviour. A conventional transmission mechanism from stock market movements to consumption operates through wealth effects. When stock prices rise, the value of financial wealth increases, thereby increasing the lifetime resources of stockholders and hence their consumption. The wealth effects from stock price changes are estimated to be rather modest.[1] However, movements of the stock market may also affect consumer spending by influencing consumer confidence. The objective of the paper is to explore the existence of this second -confidence-channel of the stock price transmission.[2]

Higher stock prices can boost consumer optimism through higher wealth.[3] According to the confidence channel, however, consumer confidence and consumer spending can react to changing stock prices for two additional reasons. First, stock prices are a readily available leading indicator of the real economy. A bullish stock market may signal market anticipations of higher labour income and hence boost consumers' optimism and spending. This effect is different from the wealth effect, through which rising stock prices make people feel richer and consume more due to an increase in the expected lifetime wealth. Second, stock price variability may influence consumers' perceptions of uncertainty about future economic conditions. At times of increased uncertainty, consumers may prefer postponing major purchases until they feel more confident about their income.

There is one critical distinction between the wealth channel and the confidence channel

[1] The estimates of the marginal propensity to consume out of stock wealth vary across studies, with a majority of the values falling below 0.05. See, for example, Poterba (2000) and Pichette (2004).

[2] The confidence channel was first proposed by Romer (1990).

[3] While our discussion is framed in terms of increasing stock prices, a fall in stock prices is expected to have the symmetric opposite impact on consumer behaviour.

of the stock price transmission. If an independent confidence channel exists, then changes in stock prices may influence attitudes and spending decisions of not only stockholders, but also of households who do not own stock. As a result, changes in consumer confidence can serve as a mechanism that amplifies effects of stock price changes on consumption.[4]

Previous research has followed different approaches in evaluating the existence of the confidence channel of stock prices. Romer (1990) examined how consumption reacted to changes in stock prices and their volatility. She argued that the stock market crash in October 1929 increased uncertainty about future income, and thus was critical in explaining U.S. consumer spending between 1929 and 1932. Otoo (1999) and Jansen and Nahuis (2003) worked directly with measures of consumer confidence. Otoo (1999) found a significant positive effect of U.S. stock prices on consumer confidence at the aggregate level. More importantly, her results with confidence measures for individual consumers also supported the implication of the confidence channel. In her sample, there was no difference in how consumers who did not own stocks responded to stock price changes relative to stock owners. Jansen and Nahuis (2003) used subquestions of consumer confidence surveys for eleven European countries to differentiate between the wealth and the confidence channels. They found some evidence of a causal impact of stock prices on consumer confidence. This impact was stronger for consumer confidence questions related to perceptions of future economic conditions than for expectations of future personal finances. We contribute to this literature by evaluating how consumer confidence measures react to stock market volatility, in addition to stock price changes.

Our empirical methodology consists of two strategies. First, we test the ability of stock price changes and their volatility to forecast future values of consumer confidence. We use the aggregate index of consumer confidence and the subquestions of consumer confidence surveys. Following Jansen and Nahuis (2003), we make inference about the existence of the consumer confidence channel by assessing whether the forecasting power of stock market measures varies with the question-level indices of consumer confidence. If the consumer confidence

[4]This role of confidence as an amplification mechanism is distinct from its possible role as an independent driving force of business cycles. See, for example, Akerlof and Shiller (2009) and Farmer (2010) for the analysis of the latter role of confidence.

channel exists, we expect to find stronger impact of stock market measures on consumers' perceptions of future employment prospects and current buying conditions, relative to their perceptions of past and future personal finances.

In contrast to Jansen and Nahuis (2003) and Otoo (1999), our stock market measures include not only stock prices, but also their volatility. Thus, our empirical tests of forecastability provide insights on two possible effects of stock market measures on consumer confidence. Stock prices are expected to capture wealth effects as well as effects of the confidence channel, arising due to leading indicator property of stock prices for economic activity. Volatility of stock price changes is expected to represent impacts of economic uncertainty. Our results show that including stock market volatility in forecasting equations is important for understanding the relation between the stock market and consumer confidence. Studies that omit stock market volatility are likely to underestimate quantitative impacts of stock market developments on consumer behaviour.

Our second strategy to testing the uncertainty aspect of the confidence channel is novel to the literature. We estimate an unexpected increase in stock market volatility using recursive vector autoregession (VAR) models, following Bloom (2009). We then compute how consumer confidence measures respond to this volatility shock over time. The resulting dynamics of consumer confidence measures follow an interesting pattern, consistent with the "wait and see" implications of heightened uncertainty emphasized by Bloom (2009). Such dynamics are difficult to reconcile with the wealth effects of stock price changes alone. Our results from the VARs, therefore, give additional support for the existence of the confidence channel.

Our analysis is carried out using Canadian data on consumer confidence and stock market measures. Canada provides an interesting case study for two reasons. First, there are significant differences in the structure of households' financial wealth in Canada, relative to other countries. One the one hand, direct holdings of stock and mutual funds in households' financial wealth is more than three times smaller in Canada than in the U.S. and Europe. On the other hand, private pension funds are more than two times larger in Canada. It is not clear a-priori how the distinctive features of financial wealth composition may affect the

relation between the stock market and confidence measures of Canadian households.

Second, Canadian measures of consumer confidence are based on a unique horizon of 6 months. In the U.S. and in the European countries, households are asked to give their opinions regarding various changes over the next 12 months. Jansen and Nahuis (2003) find that stock price changes tend to affect consumer confidence in Europe at very short horizons (from two weeks to one month). The strength of the relation between the stock market and consumer confidence may be stronger for shorter forecasting horizons of households. Additional evidence for the different time horizon of survey questions would enhance our understanding of possible linkages between the stock market and consumer confidence.

Through the confidence channel, stock price changes are expected to affect consumption decisions of households by changing their level of confidence. Previous research for Canada has documented the second part of the confidence channel, according to which consumer confidence affects consumption. Kwan and Cotsomitis (2006) found that consumer confidence was a reliable predictor of household spending. Côté and Johnson (1998) showed that measures of consumer confidence mattered in consumption equations. In this paper, we focus on the first part of the confidence channel that emphasizes the relationship between stock market measures and consumer confidence. Overall, our estimation and test results imply that stock market developments affect consumer attitudes in Canada not only through the conventional wealth channel, but also through an independent confidence channel.

The rest of the paper is organized as follows. Section 2 describes our measures of consumer confidence and stock market indicators. Section 3 discusses the structure of households' financial wealth in Canada, in comparison with the U.S. and Europe. Sections 4 and 5 evaluate whether stock price changes alone and stock market volatility alone can forecast consumer confidence. Section 6 tests the joint forecasting power of stock market indicators. Section 7 estimates and analyses the dynamic responses of consumer confidence measures to an unexpected increase in stock market volatility. Section 8 concludes.

2 Data description

This sections describes the data on consumer confidence, stock prices and stock market volatility, which are central for our analysis.[5] For convenience, Table 1 summarizes the notation and the description of these variables. Figures 1 and 2 plot the quarterly series.

Measures of consumer confidence in Canada are published by the Conference Board of Canada, based on a survey of Canadian households. The survey consists of the following four questions.

> Q1 (Financial position realization): *Considering everything, would you say that your family is better or worse off financially than six months ago?*
>
> Q2 (Financial position expectation): *Again, considering everything, do you think that your family will be better off, the same or worse off financially six months from now?*
>
> Q3 (Community employment prospects): *How do you feel the job situation and overall employment will be in this community six months from now?*
>
> Q4 (Current buying conditions): *Do you think that right now is a good or bad time for the average person to make a major outlay for items such as a home, car or other major item?*

The consumer confidence index for each of the four questions is derived by taking a ratio of the percentage of positive responses, relative to the sum of the percentage of positive responses and the percentage of negative responses. The indices are normalized to 100 in 2002. The aggregate index, ICC, is the arithmetic average of the indices by questions.

The indices of consumer confidence are publicly available from 1982:03 onward. Until 2001:12, however, the data were collected on a quarterly basis. The household surveys were conducted in the first two weeks of the last month of each quarter. The results were typically released one week after each survey. In this paper, we work with monthly and quarterly indices at the national level. Our monthly sample runs from 2001:12 to 2013:12

[5] Our data sets are available as a supplementary material (Online Resources 2-4).

(145 observations). The quarterly sample covers the period from 1982:Q1 to 2013:Q4 (128 observations). For consistency, we set the values of the quarterly series to the indices in the *third* month of each quarter (e.g. in March, June, September and December) after 2001.

The primary indicator of Canadian equity markets is the Standard&Poor's/Toronto stock exchange composite index (TSX). The monthly TSX index is the average of close daily values for all opening days of Toronto stock exchange. The natural logarithm of this index is denoted by SPM. We use the daily and monthly observations for the sample from 1983:3 to 2013:12.

We construct two monthly measures of stock market volatility. The first measure, VOLM, is equal to the standard deviation of the log-difference (in %) of the daily TSX index. The second monthly measure, VGHM, is the time-varying standard deviation of the log-difference (in %) of the monthly TSX index, based on the estimated generalized autoregressive conditional heteroskedasticity model GARCH(1,1) (see Bollerslev 1986) for the sample 1982:3-2013:12.[6] Both measures are positively correlated, with the correlation coefficient of 0.59. Figure 2 illustrates that the GARCH-based volatility smooths out many daily stock price fluctuations present in our first volatility measure. Both the VOLM and the VGHM series measure the realized stock market volatility. Our results in support of the consumer confidence channel are robust to the use of an alternative volatility series - the 30-day implied volatility of the Canadian stock market VIXC. Since VIXC is available for a much shorter sample (2009:10-2013:12), we report the estimation results with this series in a supplementary Web Appendix (Online Resource 1).

At a quarterly frequency, we use several stock market indicators. To be consistent with the timing of the consumer confidence survey, our benchmark quarterly measures of stock prices and their volatility (SP3, VOL3 and VGH3) equal to the values of SPM, VOLM and VGHM in the third month of each quarter. To exploit the fact that stock market data are available at a higher frequency than confidence measures, we consider four alternative stock market variables. The series ΔSP32 is set to the log-difference (in %) of the monthly TSX index between the third and the second months of each quarter. The volatility index VOL2 equals to the values of VOLM in the second month of each quarter. The index VOLAV is

[6] We are grateful to the anonymous referee for suggesting the second measure.

the quarterly average of the monthly series VOLM.

As a preliminary step, the data are tested for stationarity. Table 2 reports the results of the augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) unit root tests for the monthly and quarterly series. The tests consistently fail to reject a unit root in stock price measures, but indicate stationarity of the stock price changes and of the volatility measures. The ADF and PP tests are less conclusive with regards to confidence indices. In the monthly sample, the results indicate a failure to reject the null hypothesis of a unit root, with an exception of the Q2-index. In the quarterly sample, all but the Q1-index appear to be stationary. The unit root tests reject a unit root in the first differences of all confidence measures. Given the mixed results of the unit root tests and for comparability with the previous studies, we consider the differences in consumer confidence indices in our benchmark specifications.[7] To check the robustness, we also report the results of empirical specifications in which the consumer confidence indices enter in levels.

3 Particularities of the financial wealth in Canada

Higher stock prices can boost confidence of stockholders through the wealth effect, by increasing the value of their financial portfolio. The wealth effect is expected to be more pronounced in the aggregate data when the share of equities in financial wealth is larger and when more households are exposed to financial markets. This section discusses several statistics that provide a first glance on a potential importance of the wealth channel of the stock price transmission in Canada, relative to other countries.

Table 3 reports a composition of households' financial wealth in Canada, in the U.S. and in the aggregate of six European countries (Germany, France, Italy, the Netherlands, Spain and the United Kingdom) in 1999. In addition to the reported categories, the financial wealth includes deposits in financial institutions, bonds and other financial assets.

The first feature to note is that the value of stocks and mutual funds, as a fraction of the

[7] Jansen and Nahuis (2003) found that monthly confidence indices were integrated of order one in the European countries. Consequently, they worked with the differences of stock prices and confidence measures. Otoo (1999) also examined a relation between the differences of consumer confidence and stock price measures in the U.S., even though she did not discuss the results of unit root tests explicitly.

overall financial wealth, is more than three times smaller in Canada than in the U.S. and Europe. According to Statistics Canada, less than one-third of households owned equities, either directly or through mutual funds in 1999.[8] Based on these statistics, the direct wealth effect of stock prices could be expected to be small in Canada. Such expectation could be overturned, however, when pension fund holdings are taken into account.

Table 3 indicates that the system of private pensions is much more important in Canada than in the U.S. and Europe. To combat problems with publicly funded pensions in the era of aging Canadian population, the government of Canada has put in place a variety of programs to stimulate private savings for retirement. Private pension assets, reported in Table 3 for Canada, include "individual savings in registered retirement savings plans (RRSPs) and in registered retirement income funds (RRIFs), the value of the pension plans benefits "earned" through participation in an employer-sponsored registered pension plan (EPP) and other pension savings held in vehicles such as annuities and deferred profit sharing plans (DPSPs)" (Statistics Canada, 2005, p. 11) Not only private pension assets are a significant fraction of households' financial wealth in Canada, they are also held widely. In 1999, almost 70% of Canadian households had private pension assets (Table 5, Statistics Canada 2005). By contrast, Babeau and Priso (2001, p. 76) report that "households' claims on pension funds are only really substantial in the United Kingdom and the Netherlands," while in Germany "they correspond to households' rights on pension reserves in corporations' balance sheet."

Many pension assets comprise of stocks and mutual funds. A reliance on these assets as a significant source of income post-retirement could give incentives to many Canadians to closely monitor the stock market. Such incentives may intensify the link between the stock market and consumer confidence.

Measures of wealth inequality provide additional reasons why the strength of the direct wealth channel of the stock prices may very across countries. For example, financial wealth is much less concentrated in Canada relative to the U.S. economy. Poterba (2000, p. 101) reports that the top 1% of equity holders in the U.S. account for roughly half of household

[8]More specifically, 9.9% of the households reported to own stocks, and 14% invested in mutual funds, investment funds or income trusts (Statistics Canada, 2005).

holdings of corporate stock, while the bottom 80% account for only 4% of total holdings in 1998 (p. 101). Brzozowski, Gervais, Klein, and Suzuki (2010) compute the statistics for distribution of financial wealth in Canada. In 1999, the top 1% in Canada held about 16% of the financial wealth, while the top 5% held about 40%.[9] The less skewed financial wealth distribution implies that stock price changes are likely to have a direct impact on decisions of more households in Canada. Consequently, we may expect to find stronger wealth effects of stock price changes on consumer confidence in Canada, relative to countries with more a skewed distribution of stock holdings.

4 Do stock prices forecast consumer confidence?

This section evaluates whether stock price changes alone help forecast consumer attitudes. We expect to find a positive impact of stock prices on the indices of consumer confidence, either through the wealth channel or through a leading indicator property of stock prices. If the confidence channel is important, then changes in stock market values can affect confidence of consumers who do not even own stock. In this case, the consumer behaviour will be more strongly linked to the stock market. Ideally, one would like to know how beliefs of non-stockholders are affected by stock price changes relative to beliefs of stockholders.[10] Unfortunately, this approach is not feasible with the Canadian confidence data. To evaluate the existence of the confidence channel, we analyze whether stock price changes have different impacts on the four questions of the consumer confidence survey.

4.1 Methodology

The analysis is based on forecasting equations in a form

$$\mathrm{Y}_t = \alpha + \sum_{i=1}^{k} \beta_i \Delta \mathrm{SP}_{t-i} + \sum_{i=1}^{k} \gamma_i \mathrm{Y}_{t-i} + \varepsilon_t, \tag{1}$$

where Y_t is a measure of consumer confidence and $\Delta\mathrm{SP}_t$ represents stock prices. In what follows, we will refer to a 'difference specification' if a confidence measure is included in

[9] See Table 7 in Brzozowski, Gervais, Klein, and Suzuki (2010).

[10] Otoo (1999) was able to implement such strategy for the U.S. using individual observations from the University Michigan's survey of consumer sentiment.

the first differences. The 'level specification' will denote the equations with the levels of confidence measure. The past values of consumer confidence are included to capture a possibility that consumer confidence may spread contagiously over time. The zero mean error term ε_t is assumed to be serially uncorrelated. The value of k corresponds to the maximum lag. We will maintain the notation and the assumptions about the error terms and k throughout the paper.

Responses to all four questions in the survey of consumer confidence can be affected by changes in financial wealth. Questions Q1 and Q2 ask about personal finances. If a respondent holds stocks traded on the TSX directly or indirectly, through mutual funds and pension plans, then changes in the stock market should affect questions Q1 and Q2. Perceptions of better community employment prospects (Q3) are likely be associated with higher future cash flows from labour income, which could potentially be invested in the stock market. An increase in financial wealth can facilitate relaxing possible liquidity constraints of households. As a result, more consumers can answer that the current time is good for undertaking major expenditures (Q4).

While the wealth channel of stock prices transmission can affect responses to all questions, the confidence channel is likely to have a stronger impact on the responses to questions Q3 and Q4. These questions deal with overall, rather than individual employment prospects, as well as with spending decisions of an average person. According to a confidence channel, signals of the future path of the economy, contained in stock prices, can affect views and decisions of all consumers, not only stock-holders.

We evaluate the relative importance of the wealth and the confidence channels by examining the forecasting power of the stock prices in equation (1) for each question of the consumer confidence survey. We first test the joint significance of the regression coefficients β_is. This approach to testing the forecasting power of stock prices is similar to direct Granger causality tests implemented by Jansen and Nahuis (2003) for the European countries. Then we go one step further by assessing a quantitative contribution of the stock prices. This is done by reporting the incremental $\bar{R}^2$s statistics. These statistics are computed as the difference between the adjusted $\bar{R}^2$ corresponding to the regressions that include the stock

prices relative to the regressions that exclude them.

4.2 Results

Table 4 reports the marginal significance levels ($p-$values) for the $\chi^2(k)$ tests of the joint significance of the regression coefficients for the stock prices in equation (1), estimated by Ordinary Least Squares. The number of lags k in each specification is determined by the Akaike information criterion. Hypothesis tests are conducted using a heteroskedasticity and serial correlation robust covariance matrix computed with the Newey-West estimator with the four lag window. The null hypothesis of zero coefficients β_i $(i = 1, ..., k)$ can be rejected if the corresponding p-value falls below the desired level of significance.

In the monthly sample, stock prices ΔSPM have a significant impact on the aggregate index of consumer confidence ΔICC, the responses about the past finances (the ΔQ1-index) and the employment prospects (the ΔQ3-index) in the difference specifications. Quantitatively, stock prices explain 7, 6 and 9 % of the variation in these confidence measures, as indicated by the incremental $\bar{R}^2$s.

In the quarterly sample, both ΔSP3 and ΔSP32 help improve forecasts of future values of ΔICC, ΔQ1 and ΔQ4. Consumers' responses about future finances (the ΔQ2-index) and the employment prospects (the ΔQ3-index) depend on the horizon over which stock price changes are computed. Personal financial position expectations (the ΔQ2-index) are affected by stock price changes computed over a longer-time horizon, but not over shorter horizon.[11] By contrast, employment prospects appear to be responsive to more immediate changes in the stock market. The test results provide a strong support that ΔSP32 helps forecast future consumers' responses to question Q3. Further, stock price changes can explain 14% of the variation in the ΔQ3-index. It is also worth noting the increased values for the incremental $\bar{R}^2 s$ for ΔICC and the ΔQ4 index, associated with ΔSP32.

The inference about the ability of stock prices to forecast the levels of consumer confidence indices is generally consistent with the results from the specifications in differences. However,

[11] Recall that ΔSP3 measures the stock price changes between the third months of each quarter, the periods when the consumer opinions are determined. The values of ΔSP32 equal the stock price changes between the third and the second months of each quarter.

the quantitative importance of stock price changes, as measured by the incremental $\bar{R}^2$s, is uniformly weaker, as shown in the panel B of Table 4.

Overall, our results point to statistically significant effects of stock price changes on future consumer confidence. The responses to question Q1 about the past changes in personal finances provide evidence for the well functioning wealth channel. Canadian households relate the realized changes in their finances to the past developments in the stock market. Our findings of the sensitivity of the test results to the timing to stock prices for the Q2-index may be related to the transitory nature of many stock market gains. Lettau and Ludvigson (2004) document that most of the variations in wealth are transitory and are largely attributable to fluctuations in equity prices. They also find that transitory shocks in wealth are "unrelated to aggregate consumer spending, contemporaneously and at any future date" (p. 294). Our result of a weak predictive power of stock prices for the Q2-index is consistent with an explanation that Canadian consumers likely recognize the transitory nature of stock price fluctuations and tend to be cautious in extrapolating temporary gains into wealth changes into the future.

The results in Table 4 show that stock price changes, especially those that occur closer to the timing of the consumer survey, have a significant impact on consumers' assessments of future community employment prospects. The differences in the forecasting power of stock prices for the Q2 and Q3 indices suggest that the effects of stock price changes on consumer confidence go beyond the traditional wealth effects. As a leading indicator, stock prices may influence perceptions of all consumers, irrespective whether they hold stocks or not. The effects of the stock market on the current buying conditions (the Q4-index) may be attributed to both the wealth and the confidence channels of stock prices. It could be that Canadian consumers perceive the stock market to have more important wealth consequences on purchasing decisions of an average person than on their personal financial position. It could also be the case that the assessment of consumers' willingness to spend is particularly susceptible to variations in economic uncertainty, proxied by stock market volatility.

5 Does stock market volatility forecast confidence?

This section tests the uncertainty aspect of the confidence channel. Romer (1990) and Flacco and Parker (1992) have argued that stock price volatility is a good proxy for the uncertainty about future income. More recently, Bloom (2009) has used stock price volatility as a measure of overall economic uncertainty. The main channel through which uncertainty can affect consumers' decisions is the option value theory of investment, outlined by Bernanke (1983) and Romer (1990). Increased variability of stock prices can make households uncertain about the level of future income. A temporary increase in income uncertainty will raise the value of waiting to buy costly and possibly irreversible durable goods or to invest in housing. Consumers may become nervous about making large outlays and may find it beneficial to postpone purchases until they are more certain about their income. To test the ability of stock market volatility to forecast confidence measures, we estimate forecasting equations in a form

$$\mathrm{Y}_t = \alpha + \sum_{i=1}^{k} \delta_i \mathrm{VOL}_{t-i} + \sum_{i=1}^{k} \gamma_i \mathrm{Y}_{t-i} + \varepsilon_t. \tag{2}$$

Here Y_t is a measure of consumer confidence, in differences or in levels, and VOL_t is a measure of stock market volatility. The coefficients δ_i are expected to capture the impact of uncertainty on consumer confidence. The results of the joint significance of δ_i and the incremental $\bar{R}^2$s are reported in Table 5.

In the monthly sample, both measures of stock market volatility have a significant impact on consumers' responses to questions Q1 and Q3, in the difference and the level specifications. The incremental $\bar{R}^2$s indicate that these effects are economically important in explaining ΔQ1 and ΔQ3. The results for both volatility measures imply that expectations of future personal finances are unaffected by stock market fluctuations. While there is some sensitivity in the results for the ICC and Q4 indices, the null hypothesis of no forecasting power of stock market volatility is rejected in some specifications even for these indices.

The test results of the significance of stock market volatility in predicting consumer confidence indices Q1, Q2 and Q3 are generally consistent between the quarterly and monthly

samples. In contrast with the monthly sample, however, stock market volatility matters for the aggregate index ICC and for the responses about current buying conditions (Q4). The differences in the p-values and the incremental $\bar{R}^2$s suggest that a relation between stock market volatility and consumer confidence may depend on the horizon over which the volatility measures are computed. Volatility measures over a longer horizon (VOLAV and VGH3) tend to smooth out transitory movements in stock price changes. As a result, they may convey more information about future income uncertainty and therefore to explain the strength of the impacts of stock market volatility on consumer confidence measure Q4 observed in the data.

6 Joint forecasting power of stock market indicators

This section evaluates the joint contribution of stock price changes and their volatility to forecasting future confidence measures.

6.1 Three-variable specifications

We first estimate forecasting equations in a form

$$\mathrm{Y}_t = \alpha + \sum_{i=1}^{k} \beta_i \Delta\mathrm{SP}_{t-i} + \sum_{i=1}^{k} \delta_i \mathrm{VOL}_{t-i} + \sum_{i=1}^{k} \gamma_i \mathrm{Y}_{t-i} + \varepsilon_t \tag{3}$$

The coefficients on the stock prices β_i may reflect both the wealth effects and the leading indicator properties of the stock prices. The coefficients δ_i are expected to capture the impact of uncertainty about future income on consumer confidence. The results of the joint significance of the β_i and δ_i coefficients, along with the incremental $\bar{R}^2$s, are reported in Table 6. For the quarterly sample, we present three specifications that differ by the volatility measure used as well as by the horizon over which stock price changes and volatility are computed.

Overall, the results in Table 6 are consistent with the those from Tables 4 and 5. They indicate that stock market developments affect consumer confidence in a way that is statistically significant and economically relevant.

Consistent with our previous discussions, Canadian households pay attention to the stock market in assessing the realized changes in their personal finances (Q1). Yet, Canadian households seem to be cautious in interpolating past changes into the future (Q2). Stock price changes and their volatility, computed in the months less distant from the periods when the consumer surveys took place, have a stronger impact on consumers' assessments of future employment prospects (Q3) and current buying conditions (Q4). In the specifications with ΔSP32 and VOL2, the incremental $\bar{R}^2$s for the joint contribution of stock market indicators to forecast future ΔQ3 and ΔQ4 increases to 16% and 21%. Our findings imply that studies that do not take into account possible effects of stock market volatility may underestimate the quantitative importance of stock market changes on consumers' decisions.

6.2 Six-variable specifications

As a leading indicator or as a proxy for uncertainty, stock market measures may reflect information contained in other economic indicators. To investigate this possibility, we augment equation (3) with a vector of control variables Z_t:

$$\mathrm{Y}_t = \alpha + \sum_{i=1}^{k} \beta_i \Delta\mathrm{SP}_{t-i} + \sum_{i=1}^{k} \delta_i \mathrm{VOL}_{t-i} + \sum_{i=1}^{k} \gamma_i \mathrm{Y}_{t-i} + \sum_{i=1}^{k} \eta_i \mathrm{Z}_{t-i} + \varepsilon_t. \tag{4}$$

The choice of control variables is, of course, inherently somewhat arbitrary. In this paper, we use economic indicators regularly discussed in the media: interest rates and the rates of unemployment and inflation. These variables can be interpreted as measuring general economic uncertainty. Further, the inflation rate and interest rate changes may affect consumers' assessment of the real value of their financial portfolios. The national unemployment rate is likely to be important for assessing future community employment prospects.

The data on the unemployment rate, consumer prices and interest rates are available at a monthly frequency from the CANSIM database of Statistics Canada.[12] We synchronize the timing of the control variables with the timing of the stock market measures. In the monthly sample, vector Z includes monthly changes in the unemployment rate and the rate

[12] CANSIM series v2062815, v41690973 and v122530.

of inflation, set to the percentage changes in the monthly consumer price index (CPI). It also includes monthly changes in the bank rate, which is the policy rate of the Bank of Canada. For the quarterly sample, we again consider three specifications. The quarterly specifications with ΔSP3 include the changes in the unemployment rate, the rate of inflation and changes in the bank rate between the third months of each quarter. In the specifications with ΔSP32, these variables are computed using the values of the unemployment rate, the CPI and the bank rate in the third and the second months of each quarter.

Table 7 reports the p-values for the $\chi^2(2k)$-tests of the joint significance of the β_i and δ_i coefficients in equation (4). It also reports the quantitative contribution of the stock market measures in the form of the incremental $\bar{R}^2$s. The table indicates that controlling for economic indicators is important for interpreting the relationship between the stock market and consumer confidence. Evidently, some, but not all, of the information in the stock prices and their volatility is held in common with the control variables. The quantitative contribution of the stock market to forecasting future confidence declines. Yet, it is remarkable that the stock market indicators remain significant in forecasting the aggregate index of consumer confidence in all specifications.

The test results for the individual survey questions suggest that the stock market affects consumer attitudes in Canada not only through the conventional wealth channel, but also through an independent confidence channel. The stock market developments are weakly relevant for explaining the consumers' assessment of their future finances (Q2). By contrast, the stock market indicators remain significant in forecasting employment prospects (the Q3-index) at the monthly frequency and in the quarterly sample with a shorter time horizon of stock prices and VOL2. Finally, the assessment of the current buying conditions has the strongest link to the stock market in the six-variable regressions. In the quarterly sample, stock market measures explain up to 22% of the variation in ΔQ4.

7 Uncertainty shocks and consumer confidence

The results in the previous sections have established the significance and the quantitative contribution of the stock market indicators in forecasting future consumer confidence. In this section, we trace the dynamic responses of consumer confidence measures to surprise increases in stock market volatility. To this end, we use standard, recursively identified vector autoregression models.

Our benchmark VARs are six-variables systems for the quarterly sample. We report impulse responses for the VARs that include stock market volatility VOL3, stock price changes (ΔSP3), changes in a consumer confidence measure (ΔCC), changes in the unemployment and bank rates between the third months of each quarter, the rate of inflation between the third months of each quarter and a constant. The number of lags is set to one, the optimal lag value according to the Akaike information criterion in each VAR. We order stock market volatility first, following Bloom (2009) and Bachmann, Elstner, and Sims (2013).[13]

Figure 3 plots impulse responses of stock market volatility, stock price changes and changes in consumer confidence indices to an unexpected one-standard deviation shock to the volatility measure VOL3. The shaded areas are +/- one standard error bootstrap confidence bands, following Sims and Zha (1999).[14] Figure 2 in the Web Appendix (Online Resource 1) presents a similar picture for the six-variable VARs with the VGH3 measures of volatility, and demonstrates consistency of the responses of consumer confidence measures to a stock market volatility shock identified in the systems with different measures of volatility.

A temporary increase in uncertainty, measured by stock market volatility, has a negative impact on the stock prices. More importantly, it generates interesting dynamics for the consumer confidence measures. Facing a more uncertain economic environment, Canadian households become more cautious. All measures of the consumer confidence decline on impact. The increased pessimism of Canadian households is only temporary. A rebound in consumers' perceptions occurs one to two quarters after the shock. The values of the

[13] Our results for the responses of stock price and consumer confidence measures to an expected shock to stock market volatility are qualitatively robust to specifications in levels as well as to the use of the monthly data.

[14] The confidence bands were computed using the procedure mcvardodraws in RATS.

aggregate index ΔICC and of the questions about employment prospects ΔQ3 and current buying conditions ΔQ4 significantly overshoot their original levels, before returning to the status-quo in about six quarters. Overall, the responses of the confidence measures follow the paths consistent with the "wait and see" dynamics emphasized by Bloom (2009).

The quantitative differences in the responses of the individual survey questions are difficult to reconcile with the wealth channel of the stock price transmission alone. The responses of the ΔQ2-index about future personal finances are only marginally significant. By contrast, a shock to stock market volatility has a strong impact on the responses to the questions about employment prospects (Q3) and current buying conditions (Q4).

8 Conclusion

In the aftermath of the global financial crisis of 2007-2008, many industrialized and emerging market countries have undergone a period of sustained weakness in aggregate demand, of which consumption is the largest component. Influential policy makers, such as the former Chairman of the Federal Reserve System Ben Bernanke, have hypothesized how increases in stock prices can boost consumer wealth and help increase confidence, which can in turn spur consumption spending. The confidence channel of the stock price transmission can arise because stock prices signal the future path of the economy and because stock price volatility reflects economic uncertainty. In this paper, we have evaluated the confidence channel of stock price transmission using measures of consumer confidence, stock price changes and their volatility. We have implemented two empirical strategies to assess possible impacts of stock market developments on consumer confidence and applied these strategies to the Canadian data.

Our main conclusion is that stock market developments affect consumer attitudes not only through the conventional wealth channel, but also through an independent confidence channel. We find that stock price changes are more relevant to explaining consumers' perceptions of future employment prospects and the current buying conditions, rather than

their assessment of future personal finances[15]. These results are generally consistent with the findings of Otoo (1999) for the U.S. and Jansen and Nahuis (2003) for Europe.

Relative to the previous research, we provide novel evidence on impacts of stock market volatility on consumer confidence. Measures of stock market volatility help improve forecasts of consumer confidence on their own and in combination with stock price changes. Consequently, studies that do not take into account stock market volatility may underestimate the quantitative importance of stock market changes on consumers' decisions.

We also estimate the dynamic responses of consumer confidence to surprise increases in stock market volatility. A temporary increase in uncertainty has minimal impact on households' assessment of their future finances. By contrast, it has strong negative impacts on consumers' perceptions of future employment prospects and current buying conditions. These negative effects are quickly reversed and followed by a rebound in consumer confidence. Such dynamic responses of confidence are difficult to reconcile with the wealth effects of stock prices alone. Thus, the VAR-based analysis provides additional evidence on the presence of a confidence channel. While our analysis is based on the Canadian data, our results for the effects of stock market volatility on confidence are likely to remain valid in other countries.

The existence of the confidence channel implies that a contribution of the stock market to explaining consumer behaviour is likely to be larger than what the traditional estimates of the wealth effects would suggest. The confidence channel may amplify the effects of stock market changes on consumption. The amplification effects may be particularly relevant at the onset of a recession. Romer (1990) argues that it was the case for the U.S. Great Depression. Blanchard (1993) finds that a consumption shock, possibly driven by the uncertainty surrounding the Gulf War I, as a likely origin of the 1990-1991 recession. More recently, a possibility of the U.S. stock market feeding economic fear, causing consumers to postpone their purchases and pulling the U.S. economy back into a recession was a real concern in the summer 2011.[16] In addition, our evidence for the confidence channel provides a piece

[15]These results hold even after controlling for other economic indicators, such as the unemployment, inflation and interest rates.

[16]For example, an article by "Stock Market Begins to Feed Economic Fear" appearing in the *The New York Times* on August 21, 2011 highlights a potential negative impact of "plunging stocks" and "dismal economic

in the bigger picture of the type of policy responses needed to address the slow recovery in many economies. Our findings suggest that policies aimed at reducing uncertainty in the financial markets can also affect consumer confidence. To the extent that consumer confidence matters for forecasting consumption expenditures, an improved predictability of consumer confidence measures can better inform policy makers about the future direction of the economy. Thus, further research on quantifying the effects of stock market movements on aggregate spending through the consumer confidence channel would be clearly warranted.

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Table 1: List of main variables

Monthly series (2001:12-2013:12)	
ICC	Aggregate consumer confidence (index 2002 = 100).
Q_j	Consumer confidence for question j=1,...,4 (index 2002 = 100).
ΔCC	Difference between the levels of consumer confidence CC in two consecutive months; CC$\in$\{ICC, Q1, Q2, Q3, Q4\}.
SPM	Logarithm of the monthly TSX index.
ΔSPM	Difference between the values of SPM in two consecutive months (in %).
ΔSPM	Log-difference of the monthly TSX index in two consecutive months (in %).
VOLM	Standard deviation of the log-difference of the daily TSX index (in %) within each month.
VGHM	Standard deviation of ΔSPM based on the estimated GARCH(1,1) model.

Quarterly series (1982:Q1-2013:Q4)	
ICC	Aggregate consumer confidence in the thirf month of each quarter (index 2002 = 100).
Q_j	Consumer confidence for question j=1,...,4 in the 3rd month of each quarter (index 2002 = 100).
ΔCC	Difference between the levels of consumer confidence CC in the 3rd months of each quarter; CC$\in$\{ICC, Q1, Q2, Q3, Q4\}.
ΔSP3	Log-difference between the monthly TSX index in the third months of each quarter (in %).
ΔSP32	Log-difference between the monthly TSX index in the third and the second months of each quarter (in %).
VOL3	Values of VOLM in the third month of each quarter.
VOL2	Values of VOLM in the second month of each quarter.
VOLAV	Quarterly averages of the monthly series VOLM.
VGH3	Values of VGHM in the third month of each quarter.

Table 2: Unit root tests

	Monthly (2001:12-2013:12)				Quarterly (1982:Q1-2013:Q3)		
	ADF-lev	ADF-diff	PP-lev		ADF-lev	ADF-diff	PP-lev
ICC	-2.12	-13.97^{**}	-2.52		-3.47^{**}	-7.22^{**}	-3.67^{**}
Q1	-1.96	-15.87^{**}	-2.49		-2.23	-9.26^{**}	-2.86
Q2	-3.12^{*}	-7.98^{**}	-3.74^{**}		-3.07^{*}	-8.38^{**}	-4.07^{**}
Q3	-2.65	-6.02^{**}	-3.36^{*}		-4.50^{**}	-6.72^{**}	-4.58^{**}
Q4	-2.05	13.56^{**}	-1.95		-4.25^{**}	-7.49^{**}	-4.44^{**}
SPM	-1.48	-9.37^{**}	-1.49	SP3	-1.63	-10.18^{**}	-1.65
VOLM	-3.44^{**}	-	-4.28^{**}	VOL3	-4.91^{**}	-	-4.98^{**}
VGHM	-3.60^{**}	-	-3.30^{*}	VGH3	-6.51^{**}	-	-6.60^{**}
Critical values							
1%(**)	-3.48	-2.58	-3.48		-3.48	-2.58	-3.48
5%(*)	-2.88	-1.94	-2.88		-2.88	-1.94	-2.88

This table reports test statistics for the augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) unit root tests. The specifications in levels include an intercept, while the difference specifications contain no intercept. The number of lags of the explanatory variable is chosen based on the Akaike information criterion for each variable in the ADF tests. The number of lags in the spectral estimation window in the PP tests is four. While the critical values vary with the number of observations, these values, reported in the table, are identical up to two digit approximations. The unit root can be rejected at 5% and 1% level of significance (denoted by * and **), if the test statistics falls below the corresponding critical value

Table 3: Structure of housholds' financial wealth in 1999 (in %)

	Europe	U.S.		Canada
Stocks (listed and non-listed) and mutual funds	36.1	45.2	Stocks (listed only) and multual funds	11.9
Insurance and pension funds	29.7	35.1	Private pension assets	70.3

The data for Europe and U.S. are from Table 8 in Babeau and Priso (2001). "Europe" corresponds to the aggregated data for Germany, France, Italy, the Netherlands, Spain and the United Kingdom. The data for Canada are computed by the authors based on Table 4 in Statistics Canada (2005). Private pension assets exclude public plans administered or sponsored by governments

Table 4: Forecasting power of stock market prices in equation (1)

	Joint significance of the lags of stock price changes (p-values)									
ΔSP	ΔICC	ΔQ1	ΔQ2	ΔQ3	ΔQ4	ICC	Q1	Q2	Q3	Q4
Monthly										
ΔSPM	0.008	0.009	0.339	0.000	0.136	0.004	0.028	0.156	0.000	0.081
Quarterly										
ΔSP3	0.002	0.001	0.043	0.112	0.006	0.008	0.002	0.108	0.065	0.010
ΔSP32	0.000	0.004	0.113	0.000	0.000	0.000	0.018	0.125	0.000	0.000
	Incremental $\bar{R}^2$s for stock price changes									
ΔSP	ΔICC	ΔQ1	ΔQ2	ΔQ3	ΔQ4	ICC	Q1	Q2	Q3	Q4
Monthly										
ΔSPM	0.07	0.06	0.00	0.09	0.03	0.02	0.01	0.02	0.02	0.00
Quarterly										
ΔSP3	0.08	0.07	0.01	0.02	0.06	0.02	0.02	0.00	0.02	0.00
ΔSP32	0.10	0.05	0.01	0.14	0.15	0.04	0.01	0.01	0.05	0.05

Panel A reports p-values of the joint significance of the lags of stock price changes in equation (1). Panel B indicates the increment to the adjusted $\bar{R}^2$ in the regressions that include stock prices relative to the regressions that exclude them. The number of lags is determined by the Akaike information criterion for each regression. Hypothesis tests are conducted using a heteroskedasticity and serial correlation robust covariance matrix. All variables are defined in Table 2

Table 5: Forecasting power of stock market volatility in equation (2)

Joint significance of the lags of stock market volatility (p-values)										
VOL	ΔICC	ΔQ1	ΔQ2	ΔQ3	ΔQ4	ICC	Q1	Q2	Q3	Q4
Monthly										
VOLM	0.000	0.000	0.824	0.000	0.894	0.000	0.000	0.179	0.000	0.248
VGHM	0.672	0.001	0.490	0.000	0.042	0.034	0.000	0.915	0.001	0.178
Quarterly										
VOL3	0.001	0.000	0.070	0.130	0.001	0.006	0.000	0.088	0.014	0.007
VOL2	0.001	0.061	0.859	0.005	0.000	0.001	0.106	0.986	0.002	0.000
VOLAV	0.000	0.016	0.912	0.002	0.000	0.000	0.015	0.158	0.000	0.000
VGH3	0.018	0.002	0.073	0.001	0.010	0.021	0.002	0.099	0.013	0.000
Incremental $\bar{R}^2$s for stock market volatility										
VOL	ΔICC	ΔQ1	ΔQ2	ΔQ3	ΔQ4	ICC	Q1	Q2	Q3	Q4
Monthly										
VOLM	0.12	0.11	-0.01	0.12	-0.01	0.01	0.03	0.00	0.02	0.00
VGHM	-0.01	0.03	0.00	0.05	0.01	0.00	0.01	0.00	0.01	0.00
Quarterly										
VOL3	0.09	0.10	0.02	0.04	0.04	0.03	0.03	0.01	0.02	0.01
VOL2	0.05	0.03	-0.01	0.06	0.07	0.02	0.01	-0.01	0.02	0.03
VOLAV	0.10	0.07	-0.01	0.07	0.13	0.03	0.02	0.00	0.03	0.05
VGH3	0.02	0.04	0.02	0.05	0.04	0.00	0.00	0.00	0.01	-0.02

Panel A reports p-values of the joint significance of the lags of stock market volatility in equation (2). Panel B indicates the increment to the adjusted $\bar{R}^2$ in the regressions that include stock market volatility relative to the regressions that exclude it. The number of lags is determined by the Akaike information criterion for each regression. Hypothesis tests are conducted using a heteroskedasticity and serial correlation robust covariance matrix. All variables are defined in Table 2

Table 6: Joint forecasting power of stock market indicators in equation (3)

Joint significance of stock price indicators (p-values)										
VOL	ΔICC	ΔQ1	ΔQ2	ΔQ3	ΔQ4	ICC	Q1	Q2	Q3	Q4
Monthly, with ΔSPM										
VOLM	0.034	0.000	0.459	0.001	0.235	0.000	0.000	0.028	0.000	0.134
VGHM	0.009	0.001	0.436	0.000	0.006	0.005	0.000	0.292	0.000	0.109
Quarterly, with ΔSP3										
VOL3	0.000	0.000	0.015	0.150	0.000	0.001	0.000	0.098	0.035	0.005
VGH3	0.000	0.005	0.052	0.000	0.000	0.000	0.000	0.068	0.000	0.000
Quarterly, with ΔSP32										
VOL2	0.000	0.003	0.231	0.000	0.000	0.000	0.013	0.310	0.000	0.000
Incremental $\bar{R}^2$s for stock market indicators										
VOL	ΔICC	ΔQ1	ΔQ2	ΔQ3	ΔQ4	ICC	Q1	Q2	Q3	Q4
Monthly, with ΔSPM										
VOLM	0.06	0.12	0.00	0.08	0.02	0.02	0.03	0.00	0.03	0.00
VGHM	0.07	0.06	0.00	0.16	0.05	0.02	0.02	0.02	0.04	0.00
Quarterly, with ΔSP3										
VOL3	0.14	0.16	0.05	0.05	0.11	0.03	0.04	0.01	0.02	0.00
VGH3	0.14	0.07	0.02	0.12	0.15	0.04	0.02	0.01	0.04	0.03
Quarterly, with ΔSP32										
VOL2	0.17	0.08	0.01	0.16	0.21	0.05	0.01	0.00	0.06	0.07

Panels A reports p-values of the joint significance of the lags of stock price changes and stock market volatility in equation(3). Panel B indicates the increments to the adjusted $\bar{R}^2$ in the regressions that include stock market indicators relative to the regressions that exclude them. The number of lags is determined by the Akaike information criterion for each regression. Hypothesis tests are conducted using a heteroskedasticity and serial correlation robust covariance matrix. All variables are defined in Table 2

Table 7: Joint forecasting power of stock market indicators conditional on other economic variables in equation (4)

Joint significance of stock market indicators (p-values)										
VOL	ΔICC	ΔQ1	ΔQ2	ΔQ3	ΔQ4	ICC	Q1	Q2	Q3	Q4
Monthly, with ΔSPM										
VOLM	0.007	0.000	0.060	0.001	0.229	0.000	0.000	0.062	0.000	0.240
VGHM	0.000	0.000	0.034	0.000	0.021	0.000	0.000	0.089	0.000	0.022
Quarterly, with ΔSP3										
VOL3	0.005	0.003	0.053	0.463	0.000	0.001	0.000	0.265	0.143	0.000
VGH3	0.004	0.005	0.113	0.118	0.000	0.000	0.000	0.165	0.011	0.000
Quarterly, with ΔSP32										
VOL2	0.000	0.257	0.235	0.000	0.000	0.005	0.038	0.599	0.000	0.000
Incremental $\bar{R}^2$s for stock market indicators										
VOL	ΔICC	ΔQ1	ΔQ2	ΔQ3	ΔQ4	ICC	Q1	Q2	Q3	Q4
Monthly, with ΔSPM										
VOLM	0.08	0.11	0.02	0.10	0.03	0.02	0.02	0.01	0.03	0.00
VGHM	0.12	0.08	0.01	0.15	0.04	0.02	0.01	0.01	0.04	0.00
Quarterly, with ΔSP3										
VOL3	0.07	0.03	0.01	0.01	0.04	0.03	0.04	0.00	0.02	0.02
VGH3	0.10	0.02	0.01	0.03	0.08	0.04	0.02	0.00	0.04	0.03
Quarterly, with ΔSP32										
VOL2	0.10	0.00	0.00	0.10	0.22	0.03	0.01	-0.01	0.05	0.08

Panel A reports p-values of the joint significance of the lags of stock price changes and stock market volatility in eq. (4), which includes the inflation rate and changes in the unemployment rate and in the bank rate, in addition to stock market measures and consumer confidence. Panel B indicates the increments to the adjusted $\bar{R}^2$ in regressions that include stock market measures relative to the regressions that exclude them. The number of lags is determined by the Akaike information criterion for each regression. Hypothesis tests are conducted using a heteroskedasticity and serial correlation robust covariance matrix. All variables are defined in Table 2

Figure 1: **Consumer Confidence Measures (1982:Q1-2013:Q4)**

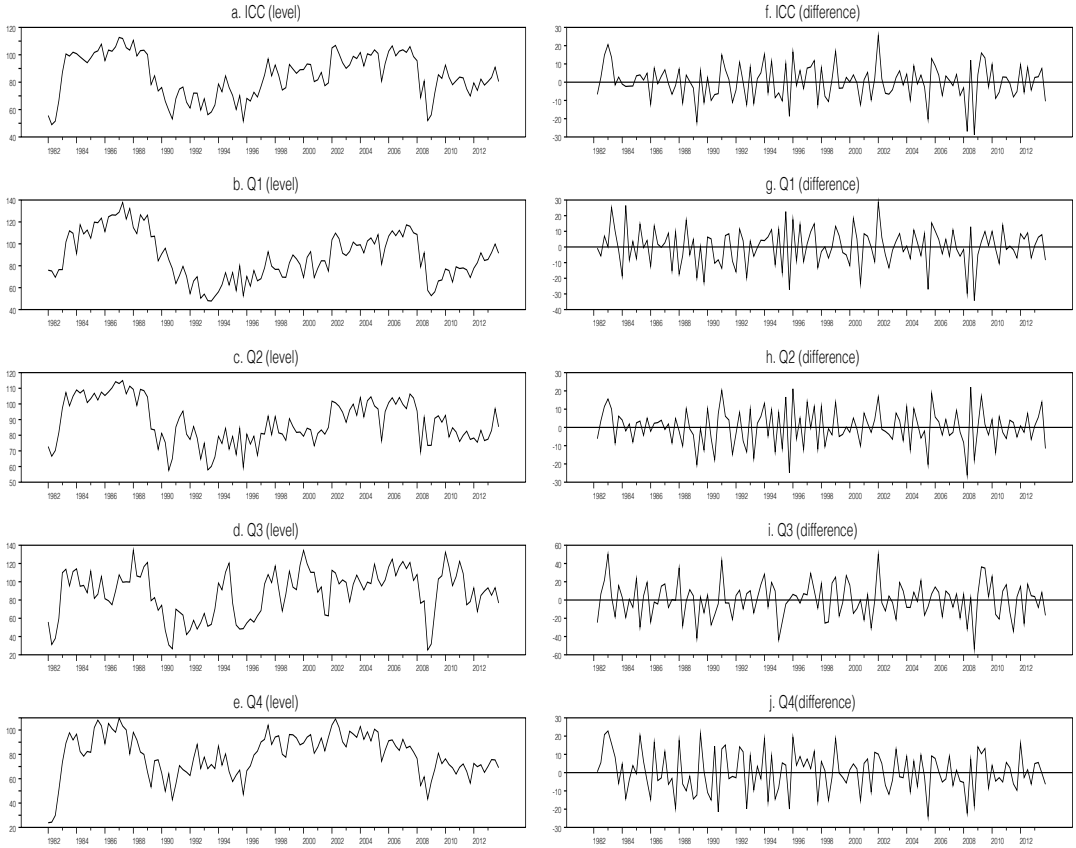


Figure 2: **Stock Market Indicators (1982:Q1-2013:Q4)**

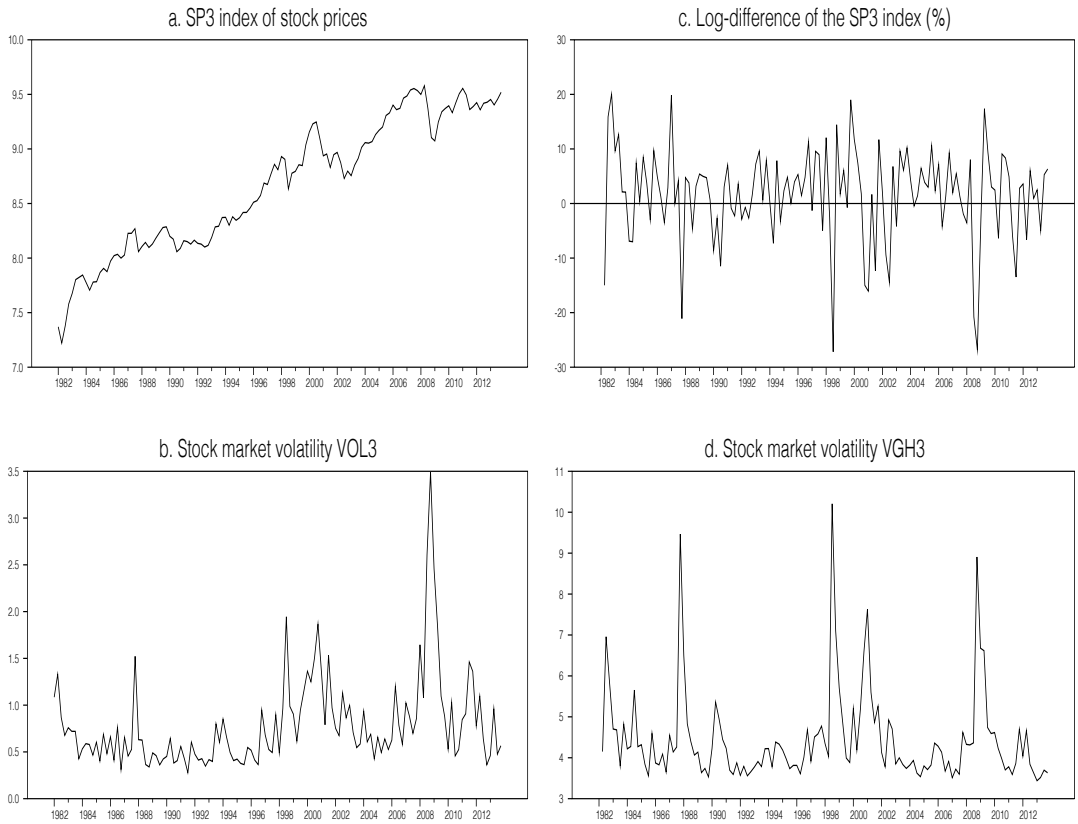
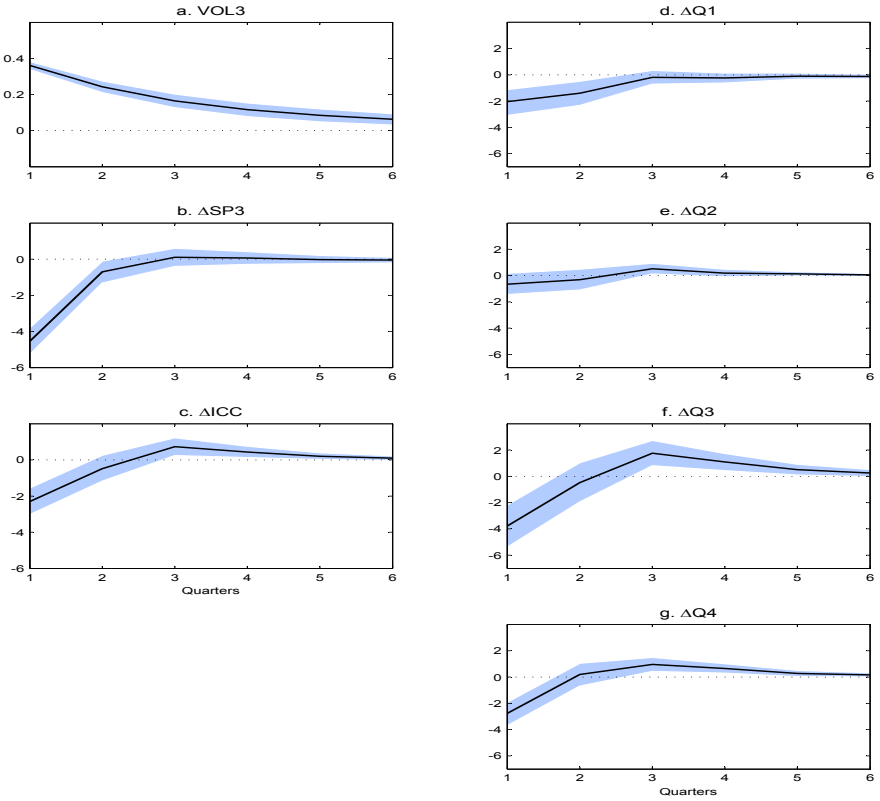


Figure 3: **Impulse Responses to a Volatility Shock (1982:Q1-2013:Q4)**



Notes: The figure plots impulses responses to an unexpected one-standard deviation shock to stock market volatility VOL3, identified through a recursive ordering. The responses are obtained from separately estimating a six-variable VAR for each measure of consumer confidence. Each VAR includes VOL3, Δ SP3,Δ CC, changes in the unemployment and bank rates between the third months of each quarter, the rate of inflation between the third months of each quarter and a constant. CC=ICC for panels a-c, and CC=Qj for panels d-g. The shaded areas are +/- one standard error bootstrap confidence bands.