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Dynamics and asymmetries between consumer sentiment and consumption in pre- and during-COVID-19 time: Evidence from the US

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ABSTRACT
We study the dynamic relationships between consumer expenditures and consumer sentiment in the pre- and during the COVID-19 periods. Our results indicate that sentiment is closely related to consumption as consumers seem to maintain a long memory of the impact of sentiment during the period of the pandemic relative to the pre-pandemic period. We also found asymmetric behavior of consumption growth with and without the influence of sentiment during each sub-period. We offer some specific policy implications that are beneficial to the US economy and other countries.

1. Introduction
Several studies documented the importance of consumption expenditure as the main driver of economic growth in most countries (Juhro, 2015a, 2015b; Pardede & Zahro, 2017; Juhro & Iyke, 2020, among others). The association between consumption patterns and business cycle fluctuations show that a decline in consumption will cause a decline in production and in the demand for inputs, resulting in a further decrease in income, and an increase in unemployment (Iyke & Ho, 2019). Accordingly, understanding the reasons for the decline in consumption holds significance in forecasting future cycle fluctuations and developing appropriate macroeconomic policies that minimize any undesirable impacts. Timely and appropriate actions that enhance consumption by increasing the purchasing power of lower-income groups, such as subsidies and social assistance, are very important to lessen the impact of a reduction in consumption on business continuity and unemployment.

While no agreement exists on whether consumer sentiment is a good variable for forecasting consumption or not, consumer confidence is considered one of the leading economic indicators. It is regarded as a provider of information on the future level of consumption and a predictor of future changes in major macroeconomic variables especially during times of uncertainty (Celik, 2010). Given that consumer confidence assesses an economy’s most recent directions and expectations of its future outcomes, it has been considered as a key variable in predicting the outlook of an economy (Celik, 2010; Kellstedt et al., 2013; Karagoz & Aktaş, 2015). In

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this context, the consumer sentiment index is the actual measure of consumers’ perception of the probability of financial distress. Hence, a decline in the index would suggest that consumers have perceived a rise in the likelihood of financial distress and restrict or limit their purchases and spending. That is, consumer sentiment seems to be perceived as a significant indicator that is representative of the nation’s future economic fluctuations. However, Fuehrer’s study (1993) indicates that consumer sentiment plays more passive role, primarily reflecting rather than causing current economic conditions such as levels of income growth, inflation, unemployment, and interest rates.

In general, the extant literature on the linkage(s) between consumption expenditures and consumer sentiment is mixed. In addition, no studies have examined the extent and nature of that linkage during the COVID-19 pandemic period. This paper fills this gap by investigating the relationship between consumption expenditures and consumer confidence in the United States (US henceforth) before and during the COVID-19 pandemic periods (2016–2021). Our research questions are threefold. First, what was the extent and nature of the dynamics, at the mean level of consumer spending and the volatility level? We examine the first part via several vector autoregression specifications and the second part via the standard GARCH model. An empirical analysis of the dynamics between consumer spending and consumer sentiment at the volatility level has also not been studied before.

Second, has there been asymmetric behavior in the volatility dynamics of consumption expenditures as well as between consumer expenditures and sentiment? If we find that people reacted more to bad news than to good news, then this would be evidence of the so-called ‘negativity bias’. Specifically, we explore the impact of bad and good news, as reflected in consumer sentiment, on consumption in the two periods. We analyze consumer reactions to new public information. For example, if the unemployment rate falls, that is good news regardless of what people expected. Put differently, it is not the extent of the changes in some macroeconomic news that concerns us in this paper, but the decline/rise is still good news regardless. Although the assessment of good and bad news as reflected in consumer sentiment holds explanatory power in unfolding certain trends in consumer behavior, no consensus is reached concerning the reliability of this measure as a predictor of consumption, particularly in the US. Hence, this paper is the first to uncover the dynamic characteristics of these magnitudes and their linkages.

Third, how has the COVID-19 pandemic changed the relationship, if any, between consumer sentiment and consumption. Furthermore, which policy actions could be relevant based on the nature of the current connection between consumer sentiment and consumption. Insights could help restore consumer confidence to lessen the impact of COVID-19 by offering policy suggestions to guide the policymakers in taking the appropriate steps to reduce any undesirable impacts on consumption during the current or future crisis periods. Finally, our paper contributes to the literature by studying consumer sentiment and consumer spending responses during the COVID-19 period in a very important economy and can be used as an example for similar economies.

The remainder of this paper is structured as follows. Section 2 presents a survey of the existing literature on the subject matter. Section 3 discusses the dataset and the econometric methodologies. Section 4 presents the preliminary and main empirical results and lastly, section 5 concludes the paper and makes some policy recommendations.

2. Literature review

A vast body of literature has studied the relationship between consumer sentiment and consumer spending to examine the predictive power of consumer sentiment indexes in predicting future levels of consumption. This relationship has its theoretical foundations to Friedman (1957, pp. 20–37) and his permanent income hypothesis, stating that people’s consumption is not merely a function of current income but rather it is impacted by the expected income in the future. Keynes (1936) also had pointed to the connection between consumption behavior and consumer sentiment.

Acemoglu and Scott (1994), using UK data spanning over the years from 1976 to 1990, found that an increase in consumer confidence will translate into higher levels of consumption. Carroll et al. (1994) reported that changes in household spending might be driven by lagged values of the consumer sentiment and possibly by other channels. Mehra and Martin (2003), building on the work of Carroll et al. (1994), showed that consumer sentiment could be an effective tool in forecasting household spending whereby consumer spending was shown to respond to changes in current income. Lahiri et al. (2016) studied the effect of consumer confidence in anticipating real personal consumption and reported that during the period of the great recession of 2007–2009, consumer sentiment was found to have a stronger effect on the three components of aggregate consumption (services, durable goods, and non-durable). Finally, Gelper et al. (2007) investigated the causality between the consumer sentiment index and real consumption using data on the US from January 1978 to February 2004 and showed that the consumer sentiment index might explain the consumption of services in a better way than consumption of goods whether being durables or non-durables.

Although the majority of the existing literature argues that consumer sentiment does affect consumer spending, some scholars argued that this relationship might only hold under specific conditions while others argued that it holds with limited effects. Malgarini and Margani (2007) examined the effect of the consumer sentiment index of Italy on the consumption of individuals, from 1982 to 2004, and reported that the effect of consumer sentiment varied according to expenditure groups. The authors also argued that economic fluctuations may have little power in explaining fluctuations in consumer sentiment. Cotsoimitis and Kwan (2006) investigated the effect of sentiment on consumption using multicounty data from the European Commission Business and Consumer Survey.1 Their results pointed out to limitations of the consumer sentiment effect on consumption. Nguyen and Claus (2013) investigated the effect of the news on sentiment and consumption and concluded that the reaction of consumption to changes in consumer

1 The sample periods employed were: 1987:IV-2002:III for Belgium, Denmark, France, Germany, Italy, Spain, and the United Kingdom; 1988:1–2002:111 for the Netherlands; and 1988:11–2002:111 for Portugal.
sentiment is asymmetric whereby drops in consumer sentiment would lead to a drop in consumption, but the opposite does not hold.

Several studies have found no link between consumer sentiment and consumption. Fan and Wong (1998) examined whether consumer confidence indices may explain changes in the future level of consumption of individuals in Hong Kong and found that sentiment had limited ability in explaining changes in future consumption and hence it cannot be used as a tool to forecast future consumption. Similarly, Croushore (2005) argued that even when using real-time data, he found that consumer confidence indices have no significant power in predicting future spending and may produce misleading predictions of consumer spending.2

Existing studies have also been conducted for many other countries as well. Acuña, Echeverría, and Pinto-Gutiérrez (2020) investigated whether consumer confidence forecasted future consumption in Chile and found that consumer confidence indicators were positively related to later consumption growth, suggesting that consumption increases after periods of high consumer confidence. Juhro and Iyke (2020) found that confidence predicted consumption expenditure in Indonesia even when using various measures of confidence (consumer and business confidence indexes) and three predictors of consumption (labor income, stock price, and interest rate).

Finally, we note the effect of consumer sentiment on consumption decisions during COVID-19 has been demonstrated in only a couple of papers. Chauhan and Shah (2020) investigated the latter relationship during the COVID-19 outbreak in India and found that consumer sentiment has been affected by the pandemic and this effect translated into changes in the consumption behavior of people. Similarly, Prentice et al. (2020) investigated the impact of COVID-19 in affecting consumer sentiment and consumer spending in Australia and found that governmental measures to combat COVID-19 altered consumer sentiment and caused disturbances to consumer spending (leading to “panic buying”). A couple of recent studies have examined the impact of COVID-19 on consumer spending and sentiment (Andersen, Niels Johannesen, & Adam, 2020; Avan der Wielen & Barrios, 2020) but not on the effect of one magnitude on another, which is the focus of this paper.

In sum, given the general inconclusiveness of the relationship in the empirical literature, this paper re-examines the issue using variables such as the unemployment rate, the federal funds rate (a proxy for short-term interest rates), and the volatility index which prior studies had not used. In addition, determining the impact of consumer sentiment on consumption volatility, done for the first time in this paper, would yield additional insights for investors, consumers, and policymakers ultimately leading to a better understanding of that relationship around the pandemic period in the US.

3. Methodology and data

We begin with the examination of the dynamics between consumer expenditures and consumer sentiment, at the mean level, for the pre-COVID-19 and during the COVID-19 periods. The sample spans from January 2016 to April 2021. The assessment of the dynamic linkages between these magnitudes is carried out via an unrestricted Vector Autoregressive (VAR) setting. Before deciding on a VAR or VECM, we first checked all variables for stationarity and found that they were I(0) when differenced once. Next, we checked for co-integration (using the Johansen approach) and found that there was no co-integration at any level for all variables investigated.3 Thus, we proceed with the estimation of a VAR with all variables in first differences. The general VAR specification can be presented as follows:

\[
Y_t = a + \sum_{i=1}^{k} b_i Y_{t-i} + \epsilon_t, \quad \epsilon_t \sim i.i.d(0, \Sigma) \tag{1}
\]

where \(Y\)'s are vectors of (stationary) endogenous variables, \(a\) is a \(px1\) vector of constants, \(b\) is a \(pxp\) matrix of parameters to be estimated, \(\epsilon\) represents an uncorrelated vector of disturbances, \(px1\), which are \(i.i.d.,\) and \(k\) is the order for the vector of \(Y\) variables. The determination of the optimal lag length is based on the Schwarz information criterion (SIC).

In studying the volatility dynamics between consumer spending and consumer sentiment, we employ the standard GARCH volatility model, where the first variable is studied in terms of its volatility. The general GARCH(p,q) model specification is as follows:

\[
r_t = \mu + \epsilon_t \tag{2a}
\]

\[
\epsilon_t | \Psi_{t-1} \sim N(0, \sigma^2_t) \tag{2b}
\]

\[
\sigma^2_t = \omega + \sum_{j=1}^{p} \alpha_j \epsilon^2_{t-j} + \sum_{j=1}^{q} \beta_j \sigma^2_{t-j} \tag{2c}
\]

Where \(r\) is the change in the relevant variable (here, the change in consumer spending), \(\alpha\) is the coefficient of past innovations, \(\epsilon^2_{t-i}\) (the ARCH effect), \(\beta\) is the coefficient of past variance, \(\sigma^2_{t-i}\) (the GARCH effect) and \(p\) and \(q\) are the effects’ orders, respectively. Equation (2a) is the conditional mean and equation (2c) is the conditional variance. The conditional variance pertains to the volatility of consumer spending. The optimal GARCH(p,q) specification will be determined based on the Schwarz Information Criterion (SIC).

The data comprise several variables such as consumer sentiment index, personal consumption expenditures, the short-term interest rate (the federal funds rate), the unemployment rate, and a policy uncertainty index (or the so-called, fear gauge), the VIX. Data were

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2 Real-time data (RTD) is information that is delivered immediately after collection. There is no delay in the timeliness of the information provided. Real-time data is often used for navigation or tracking.

3 Results are available upon request.
obtained from the *Federal Reserve Economic Data* (FRED) database. Variables were collected in raw format (levels) and all of them were transformed in some manner. Specifically, the consumption expenditures variable was transformed into log returns, the consumer sentiment index, the interest rate, the unemployment rate, and the VIX were converted into first differences. The reason is to make these variables stationary for a proper empirical investigation given that they were found to be non-stationary in their levels (results are available upon request).

4. Empirical results

We start first with some preliminary (descriptive) statistics for the variables. Second, we proceed with the estimation of the various VAR models. Finally, we present and discuss the results using the standard volatility model of GARCH(p,q) and its asymmetric extension.

4.1. Preliminary statistical results

Fig. 1 shows the close linkage between the growth of consumption expenditures (CON) and changes in consumer confidence (CS). Before the pandemic, both magnitudes fared normally with consumer sentiment being more volatile than consumer spending. Notice, however, the sharp dip in both magnitudes in the first and second quarter of 2020 and the huge spike in consumer spending in the third quarter of 2020. Finally, both magnitudes became volatile during the pandemic period. The close relationship between these magnitudes has been verified earlier by other research such as that by Carroll et al. (1994) and Dées and Brinca (2011), among others.

Table 1 exhibits the descriptive statistics (Panel A) and the correlations between pairs of variables (Panel B). They show that all magnitude, except for the federal funds rate, experienced great variations (based on the min, max, and standard deviation values) over the full period (2016:01–2021:04). The consumer sentiment’s decline in value implies a deterioration in consumer expectations. The remaining statistics simply verify the non-normality of each series (based on the Jarque-Bera statistic values) implying leptokurtosis (high kurtosis values) and asymmetry (non-zero skewness values).

The bivariate correlations indicate a mixed picture of positive and negative correlations among the variables. Specifically, the unemployment rate is consistently associated with all other variables in a negative manner suggesting that it moves opposite to these magnitudes’ trends. The negative correlation between consumption and the VIX makes sense given that consumers curtail their expenditures when uncertainty is high. Ordinarily, a negative correlation should also be expected between CON and FFR but this rate is not directly relevant to consumers. However, we use this interest rate as a proxy for the monetary policy, since the fed funds rate is its main instrument. These correlations are static and do not reveal the true dynamic linkages between and among the variables. A more robust approach is needed to uncover such relationships, to which we turn next.

4.2. VAR empirical results

We have run several VAR specifications, bivariate and multivariate, and decided to present and discuss the selected ones. In all cases, the optimal lag length, according to the Schwartz Information Criterion, was two lags (months).Fig. 2 displays the impulse responses of consumption (CON) to shocks from consumer sentiment (CS) and the fed funds rate (FFR) for all three subperiods. The dotted lines around the responses are the 95% error bands (bootstrapped 1000 times by the Monte Carlo approach). The definition of the impulse used was ±2 standard deviations, using the Cholesky decomposition.

From these graphs in all three subperiods, we see a positive response of consumption to shocks from consumer sentiment, initially, subsiding by the 6th month and by the 8th month during the COVID-19 subperiod. Note the stronger reaction of consumption to sentiment shocks during the pandemic subperiod. Consumption was also strongly reacted to shocks from the short-term interest rates which were also more pronounced during the COVID-19 subperiod. However, the nature of the responses was different in the pre-pandemic and during the pandemic subperiods. Specifically, the initial responses of consumption to the rate shock were positive in the full period and pandemic subperiod, but negative during the pre-pandemic subperiod. In all cases, the response turned negative by the third month before subsiding by the 9th month. Finally, the reaction of consumption to fed funds shocks during the pandemic subperiod was more turbulent than in the previous cases, a result that makes good sense given the global crisis. This is because consumers are forward-looking and project that a rise (shock) in the interest rate would reduce their consumption expenditures. Note that even though the simple correlations (see Panel B of Table 1) did not show a negative relationship between CON and FFR (although the correlation between the two during the non-COVID period was 0.097 but was not reported), this analysis showed a negative relationship between the two.

Fig. 3 shows the reactions of CON to shocks from the VIX and CS for each period. Here, we see that the VIX plays a more significant role in determining the consumption patterns. The responses of consumption to fed funds shocks during the pre-pandemic and COVID-19 subperiods were positive and strong. However, during the pandemic subperiod, consumption was strongly declined in response to fed funds rate shocks. This result is consistent with the literature that suggests that consumers are more sensitive to interest rate changes during the pandemic period.

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4 We had also included the unemployment rate as the fourth variable in the full-period VAR but did not seem to impact the main magnitudes in a statistically significant manner. Also, we could not estimate subperiods because of the insufficient data points. Hence, we omitted the presentation of these results.

5 Siriopoulos et al. (2021) used the generalized impulse responses approach to examine the impact of shocks within the system. In our case, we do not have a large system (of entities and/or variables) and thus the standard Choleski impulse response functions are appropriate.

6 A rearrangement of variables, in an attempt to dispel any worries about the variable ordering, did not show any distinct deviations from the results reported.
role in consumer expenditures in all three periods in the sense that CON is depressed (for three months ahead) and emerges as more turbulent in the COVID-19 subperiod. The latter finding makes sense because if consumers were wary during a ‘quiet period, a global pandemic, which spread very rapidly worldwide, would make them even jittery in their expenditures. In addition, in the pre-COVID period, the uncertainty shock decayed within six months, while in the COVID-19 period the same shock negatively affected consumption and took almost a whole year to subside. In general, an increase in uncertainty (via changes in the VIX) makes consumers postpone purchases of durable items and thus spending falls in the short run. However, since the shock is temporary, as uncertainty falls consumer demand rises again. Consumer sentiment shocks were also important to consumption before and during the pandemic but were more pronounced in the latter subperiod. The alternating swings, between positive and negative, of consumption following sentiment shocks may be due to the changing moods of consumers as they were going through the pandemic period (hence, the spike in consumer spending observed in Fig. 1).

As far as the variance decompositions are concerned (see Table 2), which show the extent to which a given variable is accounted for by the other variables in the VAR, the following comments can be made. First, from Panel A, there was a smaller influence of FFR shocks compared to CS ones on CON, averaging approximately 8%, in the pre-COVID period, but a significant amount of 33% during the COVID period. Second, CS accounted for a greater fraction of the error forecast variance of CON in the pre-COVID period, averaging around 15%, and 6% in the COVID period. Own CON explained 75% and 60% of CON variations in the pre-COVID and during the COVID subperiods. Thus, as also seen in the impulse response graphs, consumer sentiment played a significant role in moving consumer spending in the pre-pandemic period, but the short-term interest rate was more important for consumption during the COVID period.

Panel B contains the variance decompositions for CON with CS and VIX. In this case, we see higher accountability of CS to the variance of CON (in the period without the COVID months), around 23%, but greater accountability of the VIX in the COVID period, reaching 63% relative to 11% in the pre-COVID period. The former finding is intuitive and suggests that the consumption’s error
variance decomposition was accounted for by consumer sentiment as well as financial uncertainty. Further, the amount of information in CON accounted for by the VIX is much higher in the COVID-19 period than that of CS, a finding which also makes sense because general financial uncertainty (and fear) was more relevant to consumers than just their sentiment.

4.3. GARCH empirical results

Next, we examine the impact of consumer sentiment on the volatility of consumption given that it has been suggested that consumer sentiment could be helpful during periods of major economic shocks as such periods are usually associated with the high volatility of consumer sentiment. Consequently, large swings in sentiment could be useful indicators of consumption growth (see Desroches & Gosselin, 2004). To investigate this claim, we employed a GARCH(p,q) specification for consumer growth where consumer sentiment appears as an explanatory variable in the consumer spending variable’s conditional variance.\footnote{We could have included that variable also in the conditional mean equation, but it would not offer insightful results.}

A GARCH(1,1) was found to be the optimal specification. Hence, our specific model specification is:

\begin{align}
    g_{\text{con}_t} &= \mu + \varepsilon_t \\
    \sigma^2_t &= \omega + \alpha \varepsilon^2_{t-1} + \beta \sigma^2_{t-1} + \lambda d_{\text{CS}}_t
\end{align}

Fig. 2. Impulse response graphs, CON, CS and FFR.
Where $g_{\text{con}}$ is consumption growth, $\mu$ is the constant and $\lambda$ is the coefficient of changes in consumer sentiment, $d_{\text{cs}}$, in the conditional variance equation (3b). Our focus in this section is on that coefficient.

Table 3 contains the empirical results for the estimated parameters of the conditional variance equation (3b) for three sub-periods, the full period (2016:01–2021:04), the pre-COVID-19 subperiod (2016:01–2019:12), and the COVID-19 subperiod (2020:01–2021:04). A number of interesting results have emerged. First, the (high value of, and) negative coefficient of the change in consumer sentiment, $\lambda$, although marginally statistically significant for the whole period, does imply that consumer sentiment reduced the volatility in consumer spending. This was an expected result because spending had drastically dropped during the COVID-19 period. Second, the same coefficient is positive but not statistically significant during the pre-COVID-19 sub-period, again an expected result given that consumer sentiment simply boosts consumer spending. The consumer sentiment coefficient in the third sub-period, although negative, it surfaced as statistically insignificant. Finally, the ARCH (coefficient $\alpha_1$) and GARCH (coefficient $\beta_1$) effects were marginally and strongly statistically significant, in the whole period only, but insignificant in the other two subperiods. Again, this is an expected result because macroeconomic magnitudes (at the monthly frequency) do not generally exhibit such effects.

Finally, residual diagnostics (not presented but available upon request) such as residuals graphs and correlograms for evidence of both the lineairities and non-linearities in the residuals did not indicate any significance. Thus, it is concluded that the GARCH(1,1) specification was the appropriate one.
4.4. Testing for asymmetries

There are various ways to test for asymmetric behavior in a financial/economic series.\(^8\) We employ the exponential GARCH (EGARCH) model to test for asymmetries in the conditional variance of consumer expenditures with and without the influence of consumer sentiment \((dcs)\).

The EGARCH model is specified as follows:

\[
g_{\text{consumer}} = \mu + \varepsilon_t \tag{4a}
\]

\[
\ln(\sigma_t^2) = \omega + \beta \ln(\sigma_{t-1}^2) + \gamma \frac{\varepsilon_t}{\sqrt{\sigma_t^2}} + \alpha \left( \frac{|\varepsilon_t|}{\sqrt{\sigma_t^2}} - \sqrt{\frac{2}{\pi}} \right) + \delta (dcs) \tag{4b}
\]

The focus here is on parameter \(\gamma\) which when zero, there is no asymmetry when \(\gamma < 0\), then positive shocks or innovations (good news) generate less volatility than negative shocks (bad news), and when \(\gamma > 0\), positive innovations are more destabilizing than negative innovations. The conditional variance equation (4b) has also another term, \(\delta (dcs)\), to examine the impact of the changes in consumer sentiment on the conditional variance of consumption growth.

Table 4 contains selected estimates of the above equations for both subperiods. We observe that the asymmetry coefficient \(\gamma\) was negative and statistically significant in the pre-COVID-19 subperiod, whereas the change in consumer sentiment coefficient \(\delta\) was statistically insignificant. Hence, there was asymmetric behavior present in the consumer expenditures’ conditional variance during that period but movements in consumer sentiment did not seem to affect the conditional variance in a statistically significant manner. This result is in line with the study of Baghestani and Kherfi (2015) who also found asymmetric behavior consistent with a psychological negativity bias. Moreover, this finding is expected because during normal, growth times consumer sentiment changes boost consumption or that consumer moods favorably affect consumption.

By contrast, during the COVID-19 subperiod, there was no asymmetry detected in consumption’s conditional variance but changes in consumer sentiment (specifically, bad news from the virus pandemic, among other things, or depressed consumer moods due to

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\(^8\) For example, Tsagkanos and Siriopoulos (2015) used the Threshold cointegration model, which included an error-correction term, to capture the specific type of shocks during the period of investigation. In our case, however, there was no cointegration detected among the series and thus a similar cointegration approach is not needed.

\(^9\) The use of the EGARCH model is ad hoc. We could have used the Glosten, Jagannathan and Runkle (1993) specification, but the former model captures a bit more explicitly the impact of positive and negative shocks whereas the latter does so implicitly (through an indicator function).
declines in economic activity) negatively impacted upon consumption’s conditional variance, albeit not in a statistically significant manner. Hence, although consumer sentiment movements did affect consumption expenditures at the mean level (from the earlier analysis), there is no evidence (from the results in this study) that a similar impact was observed at the volatility level. This makes sense because there was no pronounced volatility in consumption during that subperiod. This is also seen in Fig. 1 where consumption expenditures fell after July 2020.

Next, we explore the differential impact of good and bad news (innovations), as explicitly reflected in consumer sentiment, on the (the mean level of) consumption expenditures in the pre-COVID-19 and COVID-19 subperiods. To accomplish this, we estimate the following distributed lag regression to examine whether rises and falls in aggregate sentiment have asymmetric effects on aggregate consumption:

\[ g_{\text{con}t} = c + \sum_{i=0}^{\lambda} \left( \psi^+_{i} dcs^+_{t;i} + \psi^-_{i} dcs^-_{t;i} \right) + u_t \]  

(5)

Where \(dcs^+_{t;i}\) and \(dcs^-_{t;i}\) denote rises and falls in the consumer sentiment index, \(u_t\) is an unobserved disturbance, and \(\psi^+_{i}\) captures the effect of rises/falls in consumer sentiment on the aggregate consumption after \(i\) months. The estimates of \(\psi^+_{i}\) are expected to be positive implying that rises/falls in consumer sentiment increase/decrease aggregate consumption. Finally, assuming that households smooth their consumptions over time, we allow changes in sentiment to affect consumption for up to 12 months. The optimal lag length is obtained by employing the Schwartz Information Criterion and the estimation procedure was done using the Newey-West heteroscedasticity- and autocorrelation-consistent (HAC) technique.

Table 5 reports selected results from the estimation of equation (5) for both subperiods only.\(^{10}\) For the pre-COVID-19 subperiod, we see that lagged rises in consumer sentiment (good news) positively and statistically strongly affect consumption growth, whereas falls in consumer sentiment (bad news) marginally add to consumption growth in a statistically weak manner. For the COVID-19 subperiod, we essentially observe similar things in the sense that both positive and negative news impact consumption growth, although the latter show up in an alternating fashion (negative and positive, occasionally) extending to three months. The other finding is that positive news is only pertinent for one month before it negatively affects consumption growth. This may make sense during a period of high uncertainty and fear before things start improving. Finally, the fact that rises/falls in consumer sentiment does not affect consumption contemporaneously but with lags (up to three months) may be a manifestation of the consumption-smoothing behavior of households.

\(^{10}\) Full-period results are available upon request.
In sum, we deduce similar conclusions as with the results with the EGARCH specification (on consumption volatility). Also, we found some evidence of the ‘negativity bias’ effect, where households react only to bad news or declines in consumer sentiment, but it was not strong.\(^{11}\) Finally, increases and mainly decreases in consumer sentiment, explained 21% and 64% of monthly variations in consumption growth over the pre-COVID-9 and COVID-19 subperiods, respectively, based on the R-squared values.

5. Discussion and conclusion

In this paper, we investigated the relationship between consumer sentiment and consumer spending to examine whether this relation holds during COVID-19 time. Our main results showed that following a shock to the consumer sentiment during the period of COVID-19, consumers’ spending behavior significantly changed, and this impact lasted almost for a year. This indicates that consumers seem to maintain a long memory of the impact of sentiment during the period of COVID-19, as compared to without the COVID-19 period. Also, a shock in the VIX on consumer spending revealed a decline (for four months ahead) in the latter and emerged as more turbulent than in the pre-COVID period. Finally, when examining the impact of changes on consumer sentiment on the volatility of consumer spending, we found that it had a significant and negative impact during the COVID-19 period suggesting that consumer sentiment was a determinant of the consumer spending’s volatility structure. This phenomenon has also been termed the uncertainty of the pandemic in the literature (Leduc & Liu, 2020).

The results from the GARCH model indicated that consumer sentiment reduced the volatility in consumer spending during the COVID-19 subperiod. Further, when testing for asymmetric behavior in consumption expenditures it was found that the asymmetry coefficient was negative and statistically significant in the pre-COVID-19 subperiod, whereas the change in consumer sentiment coefficient was statistically insignificant. Hence, there was asymmetric behavior present in the consumer expenditures’ conditional variance during that period but movements in consumer sentiment did not seem to affect it in a statistically significant manner.

Overall, our results indicated that the impact associated with the COVID-19 period require more policy actions to bring the consumers’ confidence back and stimulate consumption levels. In addition, asymmetric behavior of consumption growth implies that consumption tends to be impacted more when income declines than when it increases. Therefore, the US government needs to support the income of households who have experienced big negative income change by an amount greater than that is used to support the income of households who have experienced smaller negative changes. Moreover, the asymmetric response of consumption suggests that policymakers should be very careful about changes in the money supply during current economic times.

Finally, our findings may serve as food for thought for future research. First, managerial resource adjustments may have an impact based on our reported results. Specifically, while initially, resource cost may decline, later on, it will increase (and sharply in some cases) as business returns to normal and this may have serious implications for market agents. Second, as the virus pandemic is ongoing, we recognize that any macroeconomic predictions of the long-term impact of the pandemic on the change in consumers’ confidence are subject to uncertainty. This is an example of another issue that offers an example of directions for future research in this subject. Finally, given the dynamics of COVID-19-related variables during the investigated period, it would be suitable to evaluate the impact of the COVID-19 pandemic on selected economic-sentiment indicators during different phases of the pandemic (global spread, the second wave of the pandemic, beginning of vaccination, etc.). Hence, dealing with these limitations could be the direction for future research.

CRediT authorship contribution statement

Salah Abosedra: Conceptualization, Writing – original draft, Validation, Writing – review & editing. Nikiforos T. Laopodis: Methodology, Software, Writing – review & editing, Investigation, Validation. Ali Fakih: Conceptualization, Writing – original draft, Visualization, Investigation, Validation, Writing – review & editing.

\(^{11}\) See Kahneman, Knetsch and Thaler (1991).
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