Assessing the Impact of Covid-19 on Inflation Expectations and Volatility: Insights from the Consumer Confidence Survey

*Muhammad Musa**

* *PhD Scholar, Department of Economics, International Islamic University Malaysia*

KEYWORDS

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ABSTRACT

The outbreak of COVID-19 has caused unprecedented global health and economic challenges that have affected individuals, businesses, and governments worldwide. This study examines the impact of the COVID-19 pandemic on inflation expectations and volatility using insights from the Consumer Confidence Survey. Using the GARCHX (Generalized Autoregressive Conditional Heteroscedasticity with Exogenous Variable) model, we analyze the data from January 2019 to March 2021. Our results indicate that the COVID-19 outbreak has had a positive impact on inflation expectations and their volatility. The pandemic's impact on consumer confidence has significantly increased the uncertainty and risk associated with inflation, resulting in higher volatility. Additionally, our analysis suggests that these results have implications for the real economy. Policymakers must closely monitor inflation expectations as they may signal risks of inflation expectations un-anchoring. Our study contributes to the growing literature on the economic consequences of the COVID-19 pandemic and emphasizes the need for a coordinated policy response to address inflationary pressures and restore confidence in the economy.

1 Introduction

Inflation expectations and its impact on inflation is a complex and highly debated subject in economic literature. The significance of inflation expectations lies in their potential to deviate from the central bank's target in the long term, causing lasting changes in the inflation rate. With the emergence of the COVID-19 pandemic, the effects of the pandemic on inflation remain highly uncertain. Early estimates suggest that the pandemic's simultaneous impact on both supply and demand may result in varying levels of inflation, disinflation, or deflation. In light of this uncertainty, it is crucial to monitor inflation uncertainty and the influence of COVID-19 in generating this uncertainty to design effective policy responses.

The hypothesis that volatile inflation rates have significant adverse effects on the economy is widely supported in empirical literature. Several studies, including (Fatas and Mihov, 2001; Grier and Grier, 2006; Elder, 2004), have found that uncertainty about future prices leads to risk premia for long-term contracts and unanticipated changes in wealth distribution. However, there is limited theoretical agreement on the causal direction and relationship between inflation and inflation uncertainty. Empirical research shows that inflation uncertainty has a positive association with inflation through various channels, as demonstrated in studies by (Grier and Perry, 1998; Saleem, 2008; Javed et al., 2012; Omotosho and Doguwa, 2013; Hanif, 2012; Caporale et al., 2012; Sharaf, 2015; Rizvi et al., 2014). Despite the dominant hypothesis, some theories propose neutrality or even a negative relationship between inflation uncertainty and inflation levels, as suggested by (Grier and Perry, 1998; Rondan and Chavez, 2005).

Apart from the burgeoning literature on inflation dynamics, only a few studies have examined the impact of the pandemic on inflation expectations and their volatility, despite the growing body of literature on inflation dynamics. (Armantier et al., 2020) investigated this issue using the Survey of Consumer Confidence and found no discernible trend in inflation expectations since the pandemic's outbreak. However, they noted an unprecedented increase in disagreement among respondents about future inflation, indicating greater uncertainty in inflation expectations. On the other hand, (Coleman and Nautz, 2020) conducted an online poll of German individuals to assess the credibility of inflation expectations, revealing that credibility had significantly eroded, particularly during the Covid-19 pandemic. Germans now have higher expectations that inflation will exceed 2% in the medium term, contributing to this erosion. (Apergis and Apergis, 2020) further explored this view by conducting a study in the United States, revealing that the Covid-19 pandemic had a positive impact on inflation expectations and their volatility.

This study aims to contribute to the growing literature on inflation dynamics and the Covid-19 pandemic by examining its impact on inflation expectations in Pakistan. To achieve this goal, we employ micro-level data from bi-monthly surveys and apply the Consumer Confidence Index. Our study is unique in that it is the first of its kind in Pakistan, filling an important gap in the literature. Consumer confidence is widely recognized as one of the leading indicators of economic activity, influencing a range of economic decisions, such as consumption, saving, borrowing, interest rates, and employment. As such, macroeconomists and policymakers frequently use consumer confidence measures at different horizons due to their policy relevance (Sausa and Yatmen, 2016). By investigating the impact of Covid-19 on consumer confidence and its subsequent effects on inflation expectations, we provide valuable insights into the inflationary expectations process in Pakistan. Our study also contributes to the broader literature on the impact of consumer confidence on inflation. Prior research has shown that consumer confidence has a direct impact on realized inflation, particularly through its influence on consumer spending and inflation expectations (Kim et al., 2020). By examining the relationship between Covid-19, consumer confidence, and inflation expectations, we can shed light on the mechanisms through which the pandemic affects inflation dynamics in Pakistan. Overall, this study has important implications for policymakers and researchers interested in inflation dynamics, consumer behavior, and the impact of Covid-19 on the economy. By providing a detailed analysis of the inflationary expectations process in Pakistan, we can help policymakers make informed decisions about economic policies and interventions during and after the pandemic.

Along with Introduction, we organized remainder of this paper in the following manner. The next section presents a review of the theoretical and empirical literature relevant to our research. In Section 3, we describe the GARCHX model proposed by Bollerslev (1986), which serves as the empirical specification for our study. We also derive our own model specification to test the impact of Covid-19 on inflationary expectations using the micro-level data. Section 4 provides a description of the data and presents a preliminary analysis of its interesting features. In Section 5, we present the results of our empirical analysis and discuss their implications. Finally, Section 6 summarizes the key findings of our study and considers their policy implications.

2 Literature Review

The empirical literature has extensively investigated the relationship between inflation uncertainty and inflation, with many studies exploring the nexus between these two variables. High and unpredictable inflation can adversely affect economic agents' inter- and intra-temporal decisions, leading to inefficient

allocation of resources and reduced output growth. This distortion of relative prices can result in decreased productivity, slower economic growth, and increased income inequality. Studies such as (Rondán and Chávez, 2004; Grier and Grier, 2006) have provided evidence of the significant negative impact of inflation uncertainty on economic activity. Conversely, others, including (Armantier et al., 2020; Coleman and Nautz, 2020; Apergis and Apergis, 2020), have argued that the relationship between inflation and inflation uncertainty is complex and dependent on the context. Despite some divergent findings, it is generally agreed that reducing inflation uncertainty can promote sustainable economic growth and stabilize the economy.

Table 1. Comparison of current literature.

	Ref	**Approach**	**Description**
Positive impact of inflation uncertainty on inflation	Grier, K. B., & Perry, M. J. (1998).	GARCH models and Granger methods	This study confirms Friedman and Ball's theoretical predictions that increasing inflation enhances the level of inflation uncertainty even over a very short horizon.
	Saleem, N. (2008).	VAR framework, ARCH/GARCH model, and EGARCH model	The paper's key conclusion is that inflation volatility is considerably and positively linked to inflation levels, which might generate uncertainty in the economy.
	Rizvi, S. K., & Naqvi, B. (2010)	asymmetric EGARCH and GJR-GARCH models	The conclusion drawn from this paper is that the Friedman-Ball inflation uncertainty hypothesis is applicable to Pakistan, indicating that high levels of inflation lead to greater inflation uncertainty, and the direction of causality runs from inflation to inflation uncertainty. The findings provide substantial evidence to support this relationship between inflation and inflation uncertainty in Pakistan's context.
	Caporale et al., (2012)	bivariate VAR framework (Especially ARGARCH model)	The findings of this study suggest a steady decline in both steady-state inflation and inflation uncertainty since the establishment of the European macroeconomic environment (EMU).

	Hanif, M. N. (2012)	structural vector autoregression (SVAR) approach	The main finding of the study is that wholesale markets in Pakistan absorbed some volatility in global food inflation, resulting in lower volatility in retail food inflation. However, food inflation volatility in Pakistan is more persistent than global levels.
	Javed, S. A. et al., (2012)	ARMA-GARCH modeling	The findings corroborate the Friedman-Ball hypothesis. As it comprehends a positive link between levels of inflation and inflation uncertainty, implying that greater inflation rates result in higher rates of uncertainty.
	Omotosho, B. S., & Doguwa, S. I. (2012)	GARCH model	Their analysis revealed that times of high inflation volatility were linked to specific government policy changes, food price shocks, and a lack of coordination between monetary and fiscal policies.
	Sharaf, M. F. (2015)	GARCH-M model	The results show a significant degree of inflation-volatility persistence in response to inflationary shocks. In addition, a statistically significant, bi-directionally positive relation between inflation and inflation uncertainty has been shown in the Granger-causality test together with symmetric and as asymmetric GARCH-M models, thereby verifying both the Friedman–Ball and the Cukiermann–Meltzer hypotheses.
Negative relationship between inflation and inflation uncertainty	Rondán, N. R. R., &Chávez, J. C. A., (2004).	Generalized Method of Moments (GMM) estimation methodology	This study shows that the links between total productivity factors (TFP) growth and high inflation and among TFP growth and inflation volatility are negative.
	Grier, R., & Grier, K. B. (2006).	Augmented multivariate GARCH-M model	The findings of their study indicate a negative correlation between high levels of inflation and inflation volatility with Total Factor Productivity (TFP) growth.

Evolution of inflation expectations since the emergence of COVID19 pandemic.	Armantier et al., (2020)	local linear regression approach	The key takeaway from the research is that household inflation expectations are primarily driven by short-term considerations and display a sluggish response.
Time-varying credibility of the inflation expectation	Coleman and Nautz (2020)	Qualitative analysis	According to their findings, credibility has eroded significantly, particularly during the Covid19 pandemic. This drop is primarily due to Germans' increased expectation that inflation would be substantially higher than 2% in the medium term.
The impact of the Covid-19 epidemic on inflation expectations and their volatility.	(Apergis, E. & Apergis, E. 2020)	GARCHX (Generalized Autoregressive Conditional Heteroskedasticity model with Exogenous Variable)	They found that the Covid-19 epidemic had a positive impact on inflation expectations and their volatility in the United States.

3 Methodology

This empirical study employs the GARCHX (Generalized Autoregressive Conditional Heteroskedasticity with Exogenous Variable) version (Engle, Ng, and Rothchild, 1990) to represent uncertainty in the analysis of inflation. The GARCHX model allows the inclusion of additional factors that affect mean inflation and its volatility, with a general framework consisting of two equations: a conditional mean equation and a conditional variance equation. The Covid-19 component is allowed to enter both equations. To estimate errors, the study uses an inflation process ARMA (p, q) as a starting point, which has been done in previous literature (Grier and Perry 1998; Fountas 2001; Hartmann and Herwartz, 2012).

$$CCI_t = a + \sum_{i=1}^{p} b_i \, CCI_{t-1} + \sum_{i=1}^{q} c_i \, v_{t-1} + \varepsilon_t \qquad (1)$$

Where the model comprises of two components, the autoregressive (AR) and moving average (MA) components, represented by the first and second sums, respectively, with a and ε denoting a constant and error term, respectively. In the next step, additional variables such as oil prices (oil), average exchange rate (ER), and the Covid-19 component are incorporated into the mean equation, resulting in the GARCHX specification of the model.

$$CCI_t = a + \sum_{i=1}^{p} b_i \, CCI_{t-1} + \sum_{i=1}^{q} c_i \, v_{t-1} + d_1 ER_t + d_2 Oil_t + d_3 Covid - 19_t + \eta_t \qquad (2)$$

In the final step, normalization has been applied to the mean equation variables by subtracting their mean and dividing them by their standard deviation. Additionally, the equation for conditional volatility within a GARCH (1,1) framework can be expressed as follows:

$$h_t = f + g_1 h_{t-1} + g_2 \varepsilon_t^2{}_{-1} \qquad (3)$$

Where ε signifies residuals from the mean equation (1), h represents a proxy for conditional volatility in the GARCH framework. The GARCHX model also incorporates the Covid-19 variable, which explicitly accounts for the impact of the pandemic on conditional inflation volatility.

$$h_t = f + g_1 h_{t-1} + g_2 \eta_t^2{}_{-1} + g_3 Covid - 19_t \qquad (4)$$

Because the stability criteria remain unchanged from the standard GARCH (1,1) model, i.e., g1+g2<1, Equations (2) and (4) will be estimated in the empirical study. The study will estimate these equations during two periods: the pre-Covid19 regime (2 January 2019-24 February 2020) and the pandemic period (25 February 2020 - 31 March 2021).

4 Data

In this study, we investigate the impact of Covid-19 on Pakistan's inflation expectation process using daily data over the period of 2 January 2019 to 31 March 2021. To gauge the effect of Covid-19, we utilize two proxies: the total number of confirmed cases (Covid19-1) and the number of deaths (Covid19-2). Additionally, the analysis incorporates daily exchange rate data and monthly oil prices, specifically Gasoline 95 Octane prices. The Consumer Confidence Index (CCI) is also included in the analysis as a proxy for consumer sentiment. All data are sourced from the State Bank database except for oil prices, which are obtained from the Pakistan State Oil archives. Figure 1 displays the trend of CCI from January 2019 to March 2021, showing a gradual decline since the emergence of Covid-19 cases and deaths in March 2020, followed by a steady recovery. Figure 2 presents the number of Covid-19 fatalities in Pakistan.

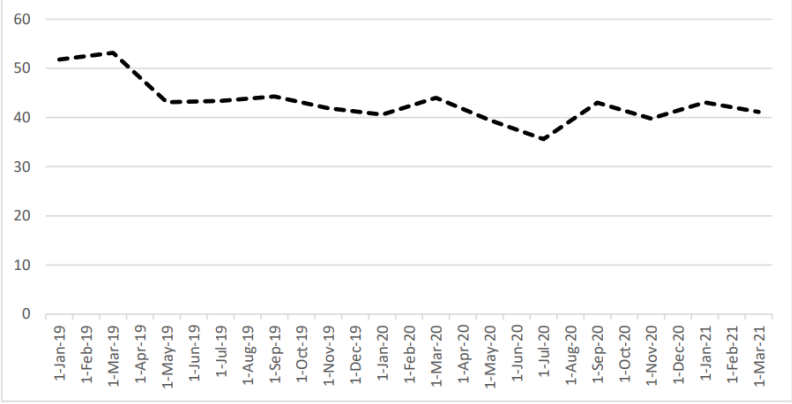

Figure 1. Consumer Confidence Index

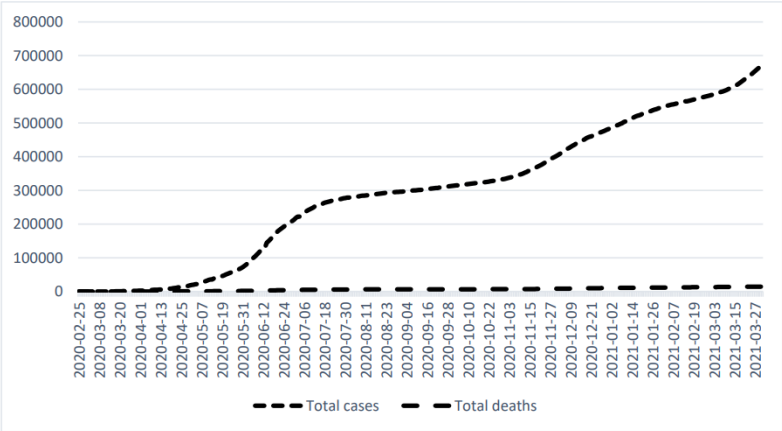

Figure 2. Covid-19 total and death cases

5 Empirical Analysis

Table 1 presents a comprehensive overview of the descriptive statistics of the bimonthly consumer confidence series relative to other key economic indicators in Pakistan, including the monthly oil price, inflation rates, and daily exchange and Covid incidence rates. The data was collected over a specified period, and the table reveals that the bi-monthly consumer confidence index for Pakistan has an average value of 43.17. Furthermore, the average monthly inflation and oil price rates during the study period were 9.32 and 104.51, respectively. This information provides a critical foundation for understanding the economic climate in Pakistan and serves as a valuable resource for policymakers and researchers seeking to gain insight into the country's economic performance.

Table 1: Descriptive statistics

Variables	**Mean**	**Std. Dev.**	**Skewness**	**Kurtosis**
Consumer Confidence	43.17	4.57	1.03	1.56
Oil Price	104.51	11.08	-1.08	0.81
Inflation Rate	9.32	2.09	0.63	0.46
Exchange Rate	156.21	8.57	-0.84	-0.13
Covid19-1	293617.05	200553.44	-0.03	-1.10
Covid19-2	6209.47	4345.30	0.08	-1.02

Skewness and kurtosis are two essential statistical measures used to assess the extent to which a time series deviates from normality. In a normally distributed series, the skewness value is zero, and the kurtosis value is three. A positive or negative skewness value indicates the presence of asymmetry in the time series, while a kurtosis value greater than or less than three suggests peakedness or flatness of the data. The calculated

skewness coefficients for consumer confidence, oil price, inflation rates, and daily exchange and Covid incidence rates are 1.03, -1.08, 0.63, -0.84, -0.03, and 0.08, respectively. These coefficients indicate that all variables exhibit negative skewness, which implies that there are more negative changes in the data than would be expected in a normal distribution. Additionally, the kurtosis coefficients for all variables indicate evidence of a peaked distribution. The implication of leptokurtic variables is that extreme observations are much more likely to occur for a significant proportion of the time, which has important implications for policymakers and researchers seeking to understand the behavior of these economic indicators.

In addition, the model specifications in Equations (2) and (4) were used to estimate the coefficient values, and the results are presented in Table 1. The study employs two different proxies to represent the Covid-19 variable: Covid19-1, which is the total number of confirmed incidents in Pakistan on a daily basis, and Covid19-2, which is the total daily fatalities in Pakistan. The table includes four different specifications, corresponding to these two proxies for the pre-Covid-19 period (2 January 2019 - 24 February 2020) in Panel A, and for the Covid-19 regime (25 February 2020 - 31 March 2021) in Panel B. These findings are of great significance for policymakers and researchers alike as they offer insights into the economic consequences of the unprecedented global event that is the Covid-19 pandemic.

Table 2. The role of Covid-19 in Consumer Confidence, according to GARCHX estimations:

Mean Equation	**Covid -19-1**	**Covid -19-2**
Panel A: Pre Covid-19 Regime		
Consumer Confidence	0.698***	0.723***
	[0.00]	[0.00]
Oil Price	0.59***	0.61***
	[0.00]	[0.00]
Exchange Rate	0.52***	0.53***
	[0.00]	[0.00]
Panel B: Covid-19 Regime		
Consumer Confidence	0.620***	0.637***
	[0.00]	[0.00]
Covid -19	0.440***	0.480***
	[0.00]	[0.00]
Oil Price	0.55***	0.63***
	[0.00]	[0.00]
Exchange Rate	0.62***	0.68***

	[0.00]	[0.00]
Conditional Volatility Equation		
Panel A: Pre Covid-19 Regime		
$\eta^2(-1)$	0.297***	0.310***
	[0.00]	[0.00]
$h\ (-1)$	0.547***	0.551***
	[0.00]	[0.00]
Panel B: Covid-19 Regime		
$\eta^2(-1)$	0.258***	0.270***
	[0.00]	[0.00]
$h\ (-1)$	0.519***	0.523***
	[0.00]	[0.00]
Covid -19	0.092***	0.129***
	[0.00]	[0.00]
Diagnostic: Pre Covid-19 Regime		
LM test for Heteroscedasticity	[0.69]	[0.75]
Log-likelihood	3,353.20	3,599.40
No of obs.	303	303
Diagnostic: Covid-19 Regime		
LM test for Heteroscedasticity	[0.65]	[0.70]
Log-likelihood	3,250.80	3,300.60
No of obs.	252	252

There was a constant, but because of its statistical insignificance it was omitted. Figures in parentheses represent p-values, Covid-19-1 represents Covid-19 occurrences, and Covid-19-2 represents Covid-19 fatalities.

Finally, the results of the GARCHX model in this study satisfy the condition of g1 + g2 < 1, which ensures mean reversion in both regimes. All estimates in the conditional variance equation are statistically significant, and the data reveal that the Covid-19 pandemic has a positive impact on mean breakeven inflation. The results are consistent across both definitions of the Covid-19 measure, and more pronounced

when total fatalities are used as a proxy for the disease. The study also finds that the pandemic has a positive impact on breakeven inflation volatility. In terms of economic interpretation, a one-standard deviation increase in Covid-19 deaths leads to a 0.435-0.513 increase in mean inflation in Pakistan, with mean inflation in the Covid-19 regime ranging from 2.125 to 2.296. Oil prices and exchange rates also have a positive impact on the mean of breakeven inflation in both regimes, despite the pandemic regime increasing exchange rate uncertainty. These results have important implications for policymakers and researchers interested in understanding the economic effects of the Covid-19 pandemic on Pakistan's economy. The findings are presented in Table 1, where the coefficient estimates of the GARCHX model are shown for the pre-Covid-19 and Covid-19 regimes, with two distinct proxies used for the Covid-19 variable.

6 Conclusion

In conclusion, this study has examined the impact of inflation expectations and its volatility on consumer confidence in the context of the Covid-19 pandemic in Pakistan. The results suggest that inflation expectations have a positive impact on consumer confidence, indicating the importance of monitoring such expectations in real-time. The study's findings have broader implications for the economy, highlighting the risks associated with unanchored inflation expectations, which can lead to adverse economic outcomes. Therefore, policymakers and market participants should take proactive steps to anchor inflation expectations and ensure transparency and predictability in policy decisions. By doing so, they can help support a stable and prosperous economy for all. Future research could explore the impact of other factors on inflation expectations and consumer confidence in the context of the pandemic and beyond.

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