Asymmetric and Regime-Dependent Impacts of Consumer Sentiment on Gold Markets

Bisma Raina
Samaresh Bardhan
Indian Institute of Technology Ropar

9th IGPC-IIMA Annual Gold & Gold Markets Conference 2026
India Gold Policy Centre at IIM Ahmedabad
May 21-22, 2026

Consumer Sentiment and Markets

- Sentiment is found to have a significant influence on the stock market returns across advanced and industrialised economies (Schmeling, 2009).

- The influence of sentiment is found to be **more pronounced in economies characterised by "weaker market integrity" and "stronger herd behaviour"**, features commonly associated with EMEs.

- **Sentiment As a Direct Transmission Channel:** Unlike uncertainty or risk premia, ***sentiment operates through psychological and belief-based channels***, shaping expectations, asset demand, and valuation dynamics (Negi et al., 2025).

- **Behavioural Finance Challenges Traditional Assumptions:** In EMEs, investor sentiment and consumer psychology demonstrate a ***more pronounced effect*** on asset pricing than in AEs, often driving prices away from fundamentals.

contd.

Why Consumer Sentiment Surveys Matter?

- Consumer sentiment surveys capture households' expectations, confidence, and perceptions, rather than realised economic outcomes.

- Consumer Sentiment (CS) Surveys are ideal for exploring the behaviour of consumers with different characteristics as these types of survey are representative (Nguyen and Claus, 2013).

- Historical evidence shows that sharp declines in consumer sentiment have preceded major contractions in consumption expenditure, leading to its use as a **leading indicator of consumer expectations.**

- Consumer sentiment reflects not only objective economic conditions but also the **subjective state of mind of consumers** (Katona, 1951).

contd.

Why Gold? A Sentiment-Based Perspective?

- Gold in India carries both investment and sentimental value, emotionally driven attachments significantly shape holding and disposal decisions independent of fundamentals (Narayan et al., 2024).

- Households form systematically biased, sentiment-driven expectations about gold returns, underestimating volatility and downside risks (Schleritzko, 2023).

- Gold holds a **'unique'** socio-economic and financial position as both a consumption good and an investment asset in India. Beyond its role as a long-term strategic investment and reserve asset, it is also perceived as quasi-cash (Chiang, 2022). Thus, sentiment-driven shifts can affect both holding and purchasing decisions.

- India's gold market document that households increased holdings or maintained robust demand during periods of macro stress and uncertainty consistent with safe-haven and precautionary motives (WGC, 2024).

- It has been found that perceptions, expectations, and sentiment materially shape gold buying behaviour, and cultural/psychological attachments to gold are crucial in India (WGC, 2023).

Existing Literature, Gaps, and Contributions

Existing Literature

- Investor Sentiment is a priced risk factor in equity markets (Baker and Wurgler, 2006); sentiment significantly affects stock returns across developed countries (Schmeling, 2009); Investor sentiment explains short-term stock price movements beyond fundamental value (Lee et al., 2002).
- Evidence suggests asymmetric consumer responses to positive and negative news, with confidence shocks transmitting to asset prices, particularly in EMEs (Nguyen and Claus, 2013; Bartesaghi et al., 2025).
- Despite these advances, direct measures of consumer sentiment—especially survey-based indices—remain underexplored in explaining gold demand.

Contributions

- Demonstrates that ***gold markets react asymmetrically to positive and negative consumer sentiment***, highlighting the importance of segment-level analysis in gold market studies.
- Disaggregates the gold market into ***investment demand (gold futures)*** and ***consumption demand (gold bars and jewellery)*** to assess whether sentiment operates differently across gold segments.
- Examines ***regime-dependent effects of consumer sentiment on gold demand*** by distinguishing between pre- and post-COVID periods, capturing structural shifts in precautionary and safe-haven behaviour.

Hypotheses

- **In order to empirically estimate the relationship between gold markets and consumer sentiment, we have developed the following hypotheses:**

• H1: Consumer sentiment significantly influences the gold market dynamics in India
• H2: Positive and negative changes in consumer sentiment exert asymmetric effects on the gold market
• H3: The impact of consumer sentiment differs between investment-oriented and consumption-oriented segments of the gold market

Empirical Framework and Methodology

- The study employs both the ***linear*** and ***nonlinear specifications*** of the ***Autoregressive Distributed Lag model***. Accordingly, the standard ARDL framework developed by Pesaran et al. (2001) and the nonlinear ARDL approach introduced by Shin et al. (2014) are used.
- ARDL enables:
  - **Simultaneous estimation of long-run and short-run dynamics,** making ARDL suitable for macroeconomic and financial time-series with heterogeneous integration properties
  - **Suitability for mixed orders of integration**; I(0) and I(1), but not I(2)
  - **Good small-sample properties**
- The basic ARDL

- The ARDL Error-Correction form can be specified as:

(10)

- In the ARDL specification ***CSI*** represents the consumer sentiment index, ***CPI*** denotes the consumer price index, ***EPU*** stands for economic policy uncertainty, ***RER*** denotes the real exchange rate, ***BSE*** is the stock market index, ***VIX*** is the implied-volatility index, ***IIP*** is the index of industrial production, ***BRENT*** is the spot crude oil price, is the error term.
- In the ECM form, denotes the speed of adjustment towards the LR equilibrium.
- denotes the first-difference operator

contd.

- Since, the linear ARDL framework assumes **symmetric effects** of consumer sentiment; therefore we employ the non-linear ARDL (NARDL) to capture the asymmetric effects.
- NARDL allows:
  - For asymmetric **long-run** and **short-run** effects
  - Decomposes the explanatory variable into **positive** and **negative partial sums**
  - Captures **behavioral and market responses** that may differ depending on the direction of shocks, which is particularly relevant for sentiment-driven variables
- The baseline NARDL

(11)

where and denote the positive and negative partial sums of changes in consumer sentiment, capturing potential asymmetric effects

contd.

- The NARDL ECM specification of NARDL model is

(12)

where associated with measures the speed of adjustment toward equilibrium and is expected to be negative and statistically significant, indicting that any short-run disequilibrium is corrected over time

NARDL specification is more relevant in our study because:

- Gold occupies a dual position, therefore favourable and adverse macroeconomic conditions may not influence gold demand symmetrically.
- The distinction between short- and long-run asymmetric effects enabled by NARDL is particularly relevant in the Indian market where shifts in macroeconomic conditions and household expectations may generate uneven adjustments across time horizons.

Data and Variables

Variable	**Description**	Source
lcsi	log of Consumer Sentiment Index (CSI)	Economic Outlook, CMIE
lgf	log of gold futures prices, a proxy for investment dimension of gold	MCX, India
lgbr	log of gold bars (INR), a proxy for consumption aspect of gold	DGCIS, Ministry of Commerce
lgjew	log of gold jewellery (INR), a proxy for consumption aspect of gold demand	DGCIS, Ministry of Commerce
lcpi	log Consumer Price Index (CPI)	Ministry of Statistics and Programme Implementation (MOSPI)
liip	log of Index of Industrial Production (IIP), proxy for real economic activity	MOSPI
lbse	log of BSE SENSEX, a proxy for equity markets	SENSEX
lbrent	log of BRENT crude oil spot price	IEA
lepu	log of EPU, a proxy for economic & policy uncertainties	EPU Website
lrer	log of Real Exchange Rate	Investing.com
lvix	log of India-VIX	Investing.com

contd.

- The study uses monthly data from ***January 2016 to February 2025***, yielding ***111 observations*****,** constrained by the availability of Consumer Sentiment Index (CSI) data which is available from 2016 onwards.
- Monthly frequency is chosen because consumer sentiment is a survey-based measure that reflects medium-term expectations rather than high-frequency daily fluctuations.
- CSI is sourced from ***Consumer Pyramids Household Survey (CPHS).*** CMIE conducts this survey on a panel of 178,677 households selected from 328 towns and 3,965 villages across India by using the method of stratified sampling. **CPHS is a continuous survey.**
- The ***dependent variables*** comprise segmented measures of gold demand, namely ***gold futures*** (investment demand), ***gold bars*** (savings and precautionary demand), and ***gold jewellery*** (consumption-oriented demand).
- ***CSI*** serves as the ***key explanatory variable***, with macroeconomic and financial variables included as controls.

Empirical Results

- Table 1: Unit-root Tests

	ADF		PP		KPSS	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
lcpi	-0.372	-7.396***	-0.371	-6.682***	1.170	0.055***
lcpir	-0.314	-7.271***	-0.331	-6.417***	1.165	0.058***
lcpiu	-0.523	-7.668***	-0.481	-7.199***	1.175	0.050***
lcsi	-1.778	-8.386***	-1.580	-8.329***	0.222**	
lcsir	-1.474	-8.658***	-1.688	-8.569***	0.240**	
lcsiu	-1.502	-8.767***	-1.705	-8.710***	0.225**	
lepu	-3.922***		-5.884***		0.557***	
lgf	0.323	-7.492***	-0.048	-7.374***	1.124	0.105**
lgiew	-2.434	-11.848***	-4.955***	-16.963***	0.489***	
lgbkg	-5.841***		-5.932***		0.260**	
lgbinr	-6.128***		-6.118***		0.168**	
lbrent	-2.634*	-8.664***	-3.050**	-8.401***	0.157**	
lbse	-1.527	-11.243***	-1.475	-11.272***	1.092	0.062***
liip	-4.952***		-4.844***		0.802	0.282***
lvix	-4.059***		-3.959***		0.186**	
lrer	-2.035	-8.977***	-2.161	-8.953***	1.019	0.037***

For the ADF and PP tests, *, **, * correspond to rejection of the unit-root null at the 10%, 5%, and 1% levels. For the KPSS test, the null hypothesis (is level stationary. The asymptotic critical values are 0.347 (10%), 0.463 (5%), and 0.739 (1%).**

Table 2: ARDL Results

	Investment demand	Consumption demand	
	lgf	lgbr	lgiew
Long-run			
c	-1.031 (0.620)	34.888*** (12.784)	19.926 (13.421)
lcsi	-0.110** (0.054)	0.678* (0.395)	1.567** (0.681)
lepu	0.109** (0.044)	-0.365* (0.209)	-0.071 (0.301)
lcpi	1.206*** (0.279)	-4.212* (2.307)	-2.854 (3.615)
lbse	0.354** (0.141)	2.451** (0.989)	2.156 (1.685)
lrer	1.010*** (0.319)	-5.033** (2.152)	-2.450 (3.787)
liip	0.187 (0.178)	-0.444 (1.812)	-3.942 (2.635)
lbrent	-0.212*** (0.059)	-0.633 (0.427)	-0.089 (0.720)
lvix	-0.025 (0.058)	0.198 (0.291)	-0.996 (0.701)
Short-run			
	-0.295*** (0.069)	-0.805*** (0.105)	-0.530*** (0.092)
	0.312*** (0.093)	0.152* (0.083)	
		8.071*** (1.176)	3.326** (1.297)
	-0.021** (0.009)	0.356** (0.140)	
	-0.017** (0.007)		
	-0.885*** (0.193)	-8.068** (3.774)	
	-0.151** (0.070)		-4.249*** (1.400)
	-0.090 (0.068)		3.089** (1.511)
			-6.499** (2.871)
	-0.117*** (0.041)	-0.463 (1.146)	3.220*** (0.766)
		-1.896** (0.835)	
	0.045 (0.028)	-0.660 (0.541)	
	0.040 (0.024)	1.570*** (0.588)	
	-0.009 (0.020)		0.506 (0.440)
	-0.041** (0.017)		0.875** (0.362)
Obs	111	111	111

Table 3: ARDL Model Diagnostic Tests

		lgf		
		F-statistic	**p-value**	**Decision**
LM Breusch–Godfrey (1)	0.014		0.905	No serial correlation
HET White test	108.0		0.454	No heteroscedasticity
RESET test		0.38	0.766	No misspecification
CUSUM	Stable			Stable
		lgbr		
LM Breusch–Godfrey (1)	0.116		0.733	No serial correlation
HET White test	108.0		0.454	No heteroscedasticity
RESET test		1.51	0.216	No misspecification
CUSUM	Stable			Stable
		lgiew		
LM Breusch–Godfrey (1)	0.055		0.814	No serial correlation
HET White test	103.0		0.453	No heteroscedasticity
RESET test		2.20	0.094	Weak misspecification at 10%
CUSUM	Unstable			Unstable

contd.

Table 4: ARDL Bounds Test

		10% UB	5% UB	1% UB	Conclusion
lgf	3.954	3.202	3.613	4.504	Cointegration
lgbr	11.270	3.197	3.606	4.489	Cointegration
lgjew	5.433	3.205	3.618	4.513	Cointegration

Table 5: NARDL Results

	Investment demand	Consumption demand	
	lgf	lgbr	lgiew
Long-run			
c	-0.284 (0.846)	9.350 (15.26)	17.826 (18.552)
csi_pos	-0.256 (0.255)	9.482*** (1.929)	3.190 (4.861)
csi_neg	-0.338 (0.269)	10.054*** (2.045)	2.690 (5.064)
lepu	0.109** (0.051)	-0.339* (0.201)	0.552 (0.433)
lcpi	0.815** (0.405)	0.152 (2.093)	-2.556 (5.147)
lbse	0.274 (0.172)	2.642** (1.042)	0.700 (2.035)
lrer	0.902** (0.380)	-3.171 (2.142)	-0.161 (4.308)
liip	0.210 (0.215)	0.519 (1.446)	-1.259 (2.680)
lbrent	-0.204*** (0.068)	-0.552 (0.409)	-0.108 (0.817)
lvix	0.066 (0.058)	0.074 (0.255)	-2.141** (0.729)
Short-run			
	-0.258*** (0.069)	-0.825*** (0.104)	-0.477*** (0.093)
	0.327*** (0.097)	0.155* (0.083)	
			3.348 (2.610)
	-0.910*** (0.207)	-9.108** (3.745)	
	0.328 (0.229)		
		0.340** (0.139)	-0.283* (0.166)
	-0.124* (0.070)		-3.971** (1.541)
			3.074** (1.528)
			-6.233** (2.923)
	-0.110*** (0.041)	-0.956 (1.068)	1.651* (0.979)
		-2.050** (0.827)	-1.056 (0.639)
	0.048* (0.028)	-0.651 (0.542)	
	0.053** (0.024)	1.503** (0.583)	
	-0.010 (0.020)		0.892** (0.430)
	-0.035** (0.017)		1.237** (0.377)
Obs	111	111	111

Table 6: NARDL Model Diagnostic Tests

		lgf		
		F-statistic	**p-value**	**Decision**
LM Breusch–Godfrey (1)	0.081		0.776	No serial correlation
HET White test	108.0		0.454	No heteroscedasticity
RESET test		0.61	0.609	No misspecification
		1.91	0.1708	
	-	-	-	
CUSUM	Stable			Stable
		lgbr		
LM Breusch–Godfrey (1)	0.289		0.591	No serial correlation
HET White test	108.0		0.454	No heteroscedasticity
RESET test		1.59	0.198	No misspecification
		2.88	0.093	
CUSUM	Stable			Stable
		lgiew		
LM Breusch–Godfrey (1)	2.054		0.151	No serial correlation
HET White test	103.0		0.453	No heteroscedasticity
RESET test		2.40	0.074	Weak misspecification
		0.49	0.487	
	-	-	-	
CUSUM	Unstable			Unstable

contd.

Table 7: NARDL Bounds Test

		10% UB	5% UB	1% UB	Conclusion
lgf	3.403	3.147	3.540	4.391	Weak Cointegration
lgbr	12.679	3.140	3.530	4.371	Cointegration
lgjew	4.318	3.154	3.551	4.413	Cointegration

Partial sum decomposition of CSI

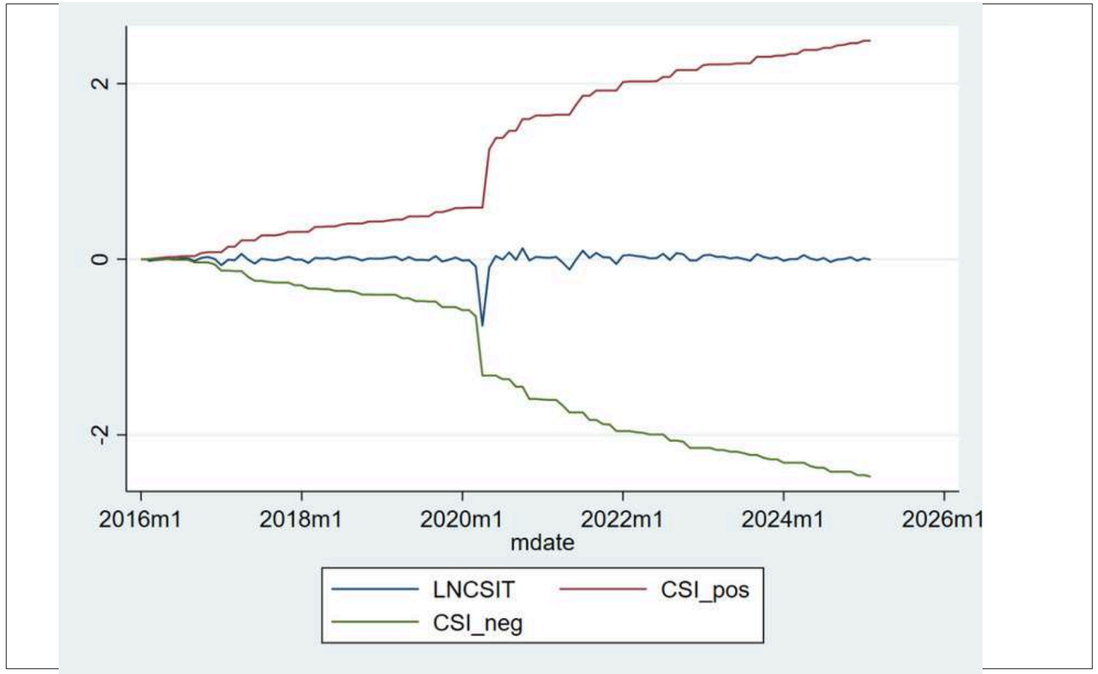

Table 8: Sub-Sample COVID-19 Analysis for Gold Bars

	Full sample post-COVID	Pre-COVID subsample	Post-COVID subsample
lgbr (Long-run)			
c	-8.243 (22.535)	19.322 (38.584)	9.210 (38.139)
csi_pos	9.209*** (2.174)	4.331 (6.229)	7.463*** (2.067)
csi_neg	10.760*** (2.200)	5.364 (5.555)	9.086*** (2.156)
lcpi	2.994 (3.297)	-4.764 (6.956)	3.074 (3.489)
lepu	-0.417* (0.235)	-0.452 (0.311)	-0.688** (0.254)
lrer	-2.655 (2.614)	-0.011 (3.320)	-5.527 (3.427)
lbse	3.037** (1.316)	2.743 (2.903)	3.012** (1.465)
lvix	0.034 (0.359)	0.123 (0.672)	0.290 (0.387)
liip	1.060 (1.394)	-2.294 (4.175)	-0.756 (1.487)
lbrent	-0.272 (0.492)	0.455 (0.783)	-0.196 (0.502)
post-COVID	1.016 (1.056)		
lgbr (Short-run)			
	-0.721*** (0.069)	-0.612*** (0.149)	-1.051*** (0.134)
		5.461 (3.257)	-3.795** (1.562)
		-4.387 (3.623)	
	-5.897* (3.540)		-11.816** (5.414)
	0.303** (0.142)	0.261* (0.134)	0.545** (0.232)
		1.720 (1.389)	
		-1.253* (0.653)	

Table 9: Sub-Sample COVID-19 Analysis for Gold Jewellery

	Full sample post-COVID	Pre-COVID subsample	Post-COVID subsample
lgiew (Long-run)			
c	96.257*** (35.200)	222.313*** (74.802)	-105.75** (45.203)
csi_pos	8.395*** (3.026)	11.790 (6.998)	1.837 (2.557)
csi_neg	1.932 (2.711)	4.702 (6.332)	3.645 (2.699)
lcpi	-14.621** (6.744)	-34.339*** (11.469)	15.212** (5.682)
lepu	-0.128 (0.271)	-0.410 (0.385)	0.020 (0.284)
lrer	-8.082** (4.127)	-14.604** (5.521)	14.228*** (5.219)
lbse	-3.152 (2.279)	-1.711 (4.940)	4.082** (2.149)
lvix	-0.655 (0.519)	0.911 (1.086)	-0.076 (0.548)
liip	-2.796 (2.437)	-15.488** (6.560)	2.749 (1.971)
lbrent	-0.942 (0.735)	0.303 (1.294)	-0.093 (0.686)
post-COVID	-7.378*** (2.318)		
lgiew (Short-run)			
	-0.554*** (0.092)	-0.671*** (0.138)	-0.656*** (0.164)
	-2.972* (1.595)	-6.570** (2.973)	-3.170** (1.510)
	-5.386** (2.768)	-8.842** (4.428)	-5.831 (4.080)
	2.362*** (0.725)	6.064** (2.618)	2.146** (0.877)
	3.541*** (1.187)		

Major Findings

- Consumer sentiment ***exerts a statistically significant influence on gold demand in India***, confirming the relevance of expectations and confidence in shaping safe-asset demand.
- The impact of consumer sentiment on gold is ***asymmetric***, with ***negative sentiment shocks*** generating stronger and more persistent responses than positive sentiment changes.
- Among physical gold segments, ***gold bars respond more strongly to sentiment changes than jewellery***, reflecting precautionary and savings-oriented consumption behavior.
- The sentiment–gold relationship is ***regime-dependent***, with sentiment effects intensifying during the ***post-COVID period***, highlighting heightened precautionary and safe-haven motives under crisis conditions.