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Business Cycles in India
Financial signals, trade dynamics and regional synchronisation

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Abstract
This article reviews selected studies of Indian business cycles and develops a statistical framework for evaluating their findings. It examines financial indicators, trade behaviour, historical cycle duration and regional co-movement. The review separates annual evidence on credit and investment from monthly evidence on stock-market signals. It also distinguishes a slowdown relative to trend from an absolute fall in output. Published estimates indicate that financial markets can contain information about subsequent industrial activity, but the size and stability of that information require testing with data available at the forecast date. Historical cycle durations cannot be treated as a timetable for future downturns. A proposed empirical framework combines trend extraction, lead–lag correlations, turning-point dating, structural vector autoregression and regional concordance measures. No new time-series estimates are presented. The article argues for monitoring several indicators together, reporting sensitivity to measurement choices and retaining state-level evidence when assessing national conditions.
Keywords: Indian economy; growth cycles; credit; stock markets; net exports; regional synchronisation
JEL codes: E32, E44, E51, R11

1 Introduction

A useful account of business cycles must explain what is being measured before it explains why activity changes. A fall in output, a fall in its growth rate, and a decline relative to the estimated trend describe different events. Conflating them can turn a historical research result into a misleading claim about recession risk.

This article asks three questions. Which financial variables provide information about subsequent activity? How should trade and regional differences enter the assessment? What statistical procedures would establish whether a published relationship remains useful outside its original sample? The contribution is a source-based synthesis and a reproducible research design, rather than a new econometric estimation.

2 Review design and source assessment

The review is purposive, starting from the studies supplied for this article. Publisher versions and institution-hosted papers were preferred. The ISPP overview was used to locate underlying studies, rather than to substitute for them. The regional paper was read in the author-uploaded version of the RBI Bulletin article because the supplied RBI link did not return the article. This is not an exhaustive systematic review or a meta-analysis.

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Table 1 Sources and analytical scope

Study	Data and method	Use in this review
Garg and Sah 2024	Annual 1980–2021; HP filter, SVAR and Granger tests	Credit and investment relationships
Garg and Sah 2025	Monthly April 1996–March 2024; HP filter, turning points and SVAR	Stock-market signals for IIP
Ghate et al. 2013	Annual 1950–2010, with quarterly checks	Pre-reform and post-reform properties
Pandey et al. 2017; 2018	Quarterly output and growth-cycle dating	Historical durations and chronology
Sahoo et al. 2024	Annual 1980–81 to 2019–20; regional GSDP filters	National and regional co-movement

Source: The publications listed in the references. Their periods and statistical units differ; estimates are not pooled.

3 Findings from the selected literature

Garg and Sah (2024) examine credit, investment and business cycles using annual observations. Their results support studying these variables jointly. Annual data, however, cannot identify a precise lead of one to three months. A separate monthly paper by the same authors reports that stock-market cycles lead the IIP-based cycle by that interval (Garg and Sah, 2025). Its abstract describes a bidirectional relationship between broad money and activity; it does not establish that every financial variable has the same lead.

These findings concern different questions. Credit may respond to financing needs while also affecting subsequent investment. Market capitalisation may incorporate expectations before production changes. Neither interpretation can be selected solely from correlation. The distinction is particularly important when an early-warning claim is transferred from one paper or data frequency to another.

Table 2 Selected historical business-cycle statistics

Indicator	1950–1991	1992–2010
Real GDP cycle standard deviation	2.13	1.78
Investment correlation with output	0.22	0.77
Imports correlation with output	−0.19	0.70
Net exports correlation with output	0.24	−0.69
M_3 correlation with output	−0.01	0.65

Source: Ghate et al. (2013), Table 2. These are published sample statistics, not estimates calculated for this article. Correlations are unitless; the GDP statistic uses the source's cyclical scale.

The trade results show a move from weak positive co-movement of net exports to a negative correlation, alongside stronger import procyclicality. Ghate et al. (2013) also report closer investment–output co-movement. These patterns are consistent with a more demand-

sensitive economy, but do not imply that every downturn improves exports or that trade integration alone caused the changes. Net exports can improve because imports weaken.

Pandey et al. (2017) identify growth-cycle episodes using filtered output and turning-point procedures. Their approximate phase averages are historical summaries. The NIPFP synthesis reports 12 quarters for acceleration and 9.3 for deceleration (Pandey et al., 2018). These describe movement relative to trend; the word recession in this literature should not automatically be read as an absolute output contraction.

Table 3 Historical phase summaries

Published measure	Reported value	Interpretation
Mean acceleration duration	12 quarters	Historical sample average
Mean deceleration duration	9.3 quarters	About 9 quarters when rounded
Mean acceleration amplitude	2.5 per cent	Source-defined cycle amplitude
Mean deceleration amplitude	2.2 per cent	Source-defined cycle amplitude

Source: Pandey et al. (2018), Table 1. Amplitudes are not annual GDP growth rates. Calendar-quarter and turning-point conventions must be retained when reproducing individual episode dates.

Sahoo et al. (2024) find stronger co-movement of western and southern regional cycles with the national cycle since the 2000s. Their study also finds a role for geographical proximity and examines common and idiosyncratic components. The finding does not justify treating every state in other regions as detached from national conditions. The sample excludes pandemic-era aberrations, so its regional pattern is not a direct estimate of post-pandemic synchronisation. The authors state that their views do not represent those of the RBI.

4 Statistical framework for further empirical analysis

The formulas below specify an analytical design. They are not regressions estimated in this article. Each implementation would require a documented dataset, transformations, sample dates, code and uncertainty estimates.

4.1 Trend extraction and volatility

$$x_t = \tau_t + c_t \qquad (1)$$

For a positive-valued series, x_t may be its logarithm; τ_t is the estimated trend and c_t the cyclical component. Net exports can be negative and should instead be analysed as a ratio to GDP, without mechanically taking logarithms.

$$min\,\{\tau_t\}\ \Sigma_{t=1}{}^{T}(x_t - \tau_t)^2 + \lambda\,\Sigma_{t=2}{}^{T-1}[(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})]^2 \qquad (2)$$

The HP objective balances fit and trend smoothness through λ. The smoothing parameter and frequency must be reported. Compare the resulting cycle with alternative filters and examine endpoint revisions; a full-sample filtered cycle uses information unavailable in real time.

$$s(c_x) = \sqrt{[\Sigma_{t=1}{}^{T}(c_{xt} - \bar{c}_x)^2/(T-1)]}; \quad RV_x = s(c_x)/s(c_\gamma) \qquad (3)$$

$s(c_x)$ is sample cyclical volatility and RV_x is volatility relative to the output cycle c_γ. A value above one means greater variability on a comparable transformation and scale.

4.2 Lead and lag relationships

$$\rho_{xy}(k) = Corr(c_{x,t}, c_{y,t+k}) \qquad (4)$$

With this convention, k > 0 means that x leads y. Estimate each correlation using aligned observations. A peak at k = 2 in monthly data would indicate a two-month lead, not evidence of a causal effect. Report uncertainty and adjust interpretation when searching across many lags.

$$y_t = \alpha + \Sigma_{j=1}{}^{p} a_j y_{t-j} + \Sigma_{j=1}{}^{p} b_j x_{t-j} + \gamma' w_{t-1} + u_t \qquad (5)$$

A joint test of H_0: $b_1 = \ldots = b_p = 0$ assesses incremental predictive content conditional on the included information w. Under conventional OLS assumptions, $F = [(SSR_r - SSR_u)/q]/[SSR_u/(n - K)]$, where q is the restriction count and K the unrestricted parameter count. Serial correlation or heteroskedasticity requires suitable robust inference. Granger predictability is not structural causation.

4.3 Structural dynamics

$$A_0 z_t = a + \Sigma_{j=1}{}^{p} A_j z_{t-j} + B\varepsilon_t \qquad (6)$$

A candidate vector z_t contains appropriately transformed activity, credit, investment, money and equity variables. Structural shocks ε_t require explicit identification restrictions. Their economic interpretation depends on those restrictions; changing the ordering or restrictions should be part of sensitivity analysis. Non-stationary levels and cointegration require appropriate treatment before estimation.

4.4 Duration amplitude and synchronisation

$$D_j^E = t_j^P - t_j^T; \quad D_j^c = t_{j+1}^T - t_j^P; \quad D = \Sigma_{j=1}{}^{J} D_j / J \qquad (7)$$

t^P and t^T denote a dated peak and trough. Durations use elapsed intervals. If a study instead counts phase-labelled observations inclusively, the convention must be stated. Endpoint-incomplete phases should be identified rather than silently included in the average.

$$A_j^E = 100(c_j^P - c_j^T); \quad A_j^c = 100(c_j^P - c_{j+1}^T) \qquad (8)$$

These are positive phase amplitudes when c is a log cycle and the dated movements have the indicated direction. They are approximate percentage-point movements in deviations from trend, not necessarily the amplitude definition used in every reviewed paper.

$$CI_i{}^N = (1/T)\Sigma_{t=1}{}^{T}[S_{it}S_t^N + (1 - S_{it})(1 - S_t^N)] \qquad (9)$$

S equals one in expansion and zero otherwise. CI measures the share of periods in which state i and the national economy share a phase. It ranges from zero to one. High concordance can arise when both series spend most periods expanding; interpret it alongside phase frequencies and cyclical correlations.

5 Data and validation plan

Table 4 Proposed data design

Block	Variables	Validation requirement
National quarterly	Real GDP, fixed investment, exports and imports	Consistent base years and seasonal adjustment
National monthly	IIP, non-food credit, M_3 and equity indicators	Publication dates, deflation and revisions
Regional annual	Real GSDP and sectoral composition	Common coverage and comparable definitions

Block	Variables	Validation requirement
External controls	Global activity, oil prices and exchange rates	Timing and plausible transmission channels

Proposed sources for implementation: MoSPI, RBI and official exchange releases. This article does not download or estimate these series. BSE and NSE capitalisations must not be added and labelled unique equity wealth without addressing overlapping listings.
Replication should first reproduce each paper on its own frequency and sample. A later extension can examine common periods, but annual credit observations should not be interpolated into artificial monthly observations to claim a monthly lead. Nominal market values and money should be distinguished from real quantities. Structural breaks, changes in national accounts and crisis observations require explicit treatment.
Forecast validation should use rolling or expanding training windows. Filters and model selection must be recomputed within each window to avoid information leakage. Compare forecasts with a simple benchmark and report errors, false alarms and missed turning points. A statistically significant full-sample association is insufficient if it fails this exercise.

6 Discussion and policy implications

The proposed interpretation is that financial indicators belong in a broader monitoring system. A short lead may be useful for surveillance while offering little time for a policy response. Its value depends on publication delays, revisions and the costs of false signals. Policymakers would therefore need an explicit decision rule before translating a market movement into an intervention.

Table 5 Interpretation and decision limits

Signal	Question for monitoring	Limit
Credit and investment weaken	Is financing supply tightening or demand falling?	Direction cannot be inferred from co-movement alone
Equities turn before IIP	Does the signal improve real-time prediction?	Historical lead may be unstable
Net exports improve in a slowdown	Are imports falling or exports rising?	A better balance need not mean stronger demand
Regional cycles differ	Which sectors and places face stress?	National averages can conceal local conditions

Source: Author's analytical implications from the reviewed evidence; these are recommendations for evaluation, not newly estimated findings.
Regional monitoring is especially relevant when programmes operate through state budgets and local labour markets. A national indicator can guide overall surveillance while sectoral and state data inform delivery. This article does not estimate district, tribal-area or household effects; applying national cycle results to these populations would require separate evidence.

7 Limitations and conclusion

The selected studies use different frequencies, samples, filters and definitions. Their estimates therefore cannot be combined into a single universal cycle. The review has no new

dataset and supplies no fresh coefficients, p-values or causal estimates. Some potentially relevant studies in the supplied list were not used because their full bibliographic identity or specific claims were not verified.

The evidence supports examining financial signals, trade behaviour and regional activity together. Its practical lesson is to preserve distinctions: annual credit evidence differs from a monthly equity lead, a growth-cycle downturn differs from falling output, and a national pattern differs from the experience of every state. A credible extension would document these distinctions and assess predictive performance using information genuinely available at the time.

Data availability

No original dataset was generated. The evidence tables reproduce selected published statistics or summarise identified studies. The formulas and proposed validation procedures specify future empirical work.

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