

The Indian Financial system from 1997 to 2026 using Prospect Theory and the Black Swan Theory

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Abstract: Financial systems are not mechanical structures that simply transmit savings into investment. They are social and institutional systems in which people repeatedly make decisions with incomplete information. This paper examines how uncertainty is interpreted through heuristics, how those interpretations interact with financial institutions, and how the resulting feedback loops can convert a relatively small disturbance into system-wide stress. The analysis combines the heuristics-and-biases framework of Tversky and Kahneman, prospect theory, Taleb's distinction between fragility, robustness and antifragility, and a Black Swan lens concerned with rare, high-impact events and the limits of prediction.

India provides a useful case because the country experienced a sequence of overlapping shocks rather than a single isolated crisis. The 2018–20 shadow-banking episode followed years of credit expansion, infrastructure lending, stressed assets and growing dependence on non-bank intermediaries. The defaults of IL&FS and DHFL then triggered uncertainty, flight to safety, funding withdrawal and a contraction in credit. COVID-19 subsequently arrived while the financial system was still repairing these weaknesses. The paper argues that the transmission of these shocks cannot be understood through liquidity or balance-sheet variables alone. Representativeness, availability, anchoring and loss aversion provide plausible behavioural mechanisms through which uncertainty was transformed into collective retrenchment, while institutional design determined how far that retrenchment could spread.

A descriptive empirical assessment reinforces this interpretation. Domestic financial intermediation deepened substantially between 1997 and 2022, while bank asset quality subsequently improved markedly. By March 2026, scheduled commercial banks reported a GNPA ratio of about 1.8 percent and a CRAR of about 17.7 percent, while RBI stress tests continued to place aggregate capital above regulatory minima under severe hypothetical shocks. These developments support a conclusion of considerable robustness and resilience. However, the evidence is not sufficient to classify the entire system as antifragile. Antifragility requires not merely surviving a shock, but demonstrably learning from volatility in ways that reduce future fragility

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1. Introduction

The financial system is a central component of economic development because it mobilises savings, allocates credit, facilitates investment, manages risk, and connects households, firms, governments, and financial institutions. In India, the evolution of the financial system has been particularly important because economic growth has increasingly depended on the ability of banks, non-bank financial companies (NBFCs), capital markets, and digital financial institutions to channel resources towards productive activity. Agarwal argues that the future trajectory of Indian economic growth is closely connected to the progress of financial-sector reforms and the ability of the financial system to withstand future shocks.

However, financial systems do not operate under conditions of perfect information or certainty. Financial institutions and market participants routinely make decisions about lending, borrowing, investment, liquidity, and risk while facing incomplete information and uncertain future outcomes. This makes uncertainty a fundamental characteristic of financial activity rather than merely an exceptional condition associated with crises.



The Indian financial system provides an important setting for examining this relationship. Over the last two decades, India has experienced substantial structural changes in financial intermediation. The combined assets of banks and non-bank financial institutions increased from approximately 59 percent of GDP in 1997 to 118 percent in 2022. At the same time, the relative importance of public-sector banks declined, while private banks and NBFCs expanded considerably. NBFC assets increased more than six-fold over the period considered by Agarwal.

This increasing complexity has created both opportunities and vulnerabilities. A diversified financial system can distribute risks across institutions and markets, but interconnectedness can also transmit shocks rapidly. The 2018–20 Indian financial crisis demonstrated this vulnerability particularly clearly. Defaults involving Infrastructure Leasing & Financial Services (IL&FS) and Dewan Housing Finance Limited (DHFL) generated concerns about the soundness of NBFCs, contributed to a reassessment of risk, and produced liquidity and confidence pressures throughout financial markets.

The COVID-19 pandemic subsequently created a different but much broader shock. The Indian financial sector entered the pandemic with pre-existing vulnerabilities, while lockdowns, declining demand, disrupted supply chains, and heightened uncertainty placed additional pressure on financial intermediation. The Reserve Bank of India (RBI) consequently faced the dual challenge of preserving financial stability while supporting economic recovery.

Against this background, the present review examines the Indian financial system through three interconnected concepts: uncertainty, heuristics, and resilience. The central argument developed in this review is that financial resilience cannot be understood exclusively through balance-sheet indicators, regulatory capital, liquidity ratios, or institutional structures. It must also be considered in relation to how financial actors respond to uncertainty and how simplified decision-making rules or behavioural heuristics can influence those responses.

2.1 Heuristics and Biases in Uncertainty

Tversky and Kahneman (1974) identify representativeness as one of the principal heuristics through which individuals make probabilistic judgments under uncertainty. Many of the probabilistic questions with which people are concerned belong to one of the following types: What is the probability that object A belongs to class B? What is the probability that event A originates from a process? B? What is the probability that process B will generate event A? In answering such questions, people typically rely on the representativeness heuristic, in which probabilities are evaluated by the degree to which A is representative of B, that is, by the degree to which A resembles B. For example, when A is highly representative of B, the probability that A originates from B is judged to be high. On the other hand, if A is not similar to B, the probability that A originates from B is judged to be low.

Tversky and Kahneman (1974) illustrate the representativeness heuristic through the case of an individual named Steve, whose personality is described as shy, orderly, withdrawn, and highly attentive to detail. When asked to assess whether Steve is more likely to be a librarian or a farmer, individuals may judge him to be a librarian because his characteristics appear more similar to the perceived stereotype of a librarian. The judgment is therefore based primarily on the extent to which Steve's description resembles the characteristics associated with the respective occupational categories. One of the most well-documented regularities in the financial markets is that investors tend to hold on to their losing stocks too long and sell their winners too soon. Shefrin and Statman (1985) label this the “disposition effect,” which has been observed in both experimental markets and financial markets (e.g., stock, futures, options, and real estate), and appears to influence investor behavior in many countries.

Kahneman and Tversky's (1979) theory of choice, “prospect theory,” together with Thaler's (1980) “mental accounting” framework, is perhaps the leading explanation for the disposition effect. The main element of prospect theory is an S-shaped value function that is concave (risk averse) in the domain of gains and convex (risk loving) in the domain of losses, both measured relative to a reference point. Mental accounting provides a foundation for the way in which decision makers set reference points for the accounts that determine gains and losses. The main idea is that decision makers tend to segregate different types of gambles into separate accounts, and then apply prospect theory to each account by ignoring possible interactions.

It is fairly easy to see that if the relevant accounts are profits in individual stocks, the prospect theory and mental accounting (PT/MA) combination generates a disposition effect. The reason is that PT/MA investors are risk averse over gambles for some stocks and locally risk loving over gambles for others. The distinction between risk attitudes towards these two classes of stocks is driven entirely by whether the stock has generated a paper capital gain or a paper capital loss. Due to this difference in risk attitudes, investors subject to PT/MA have a greater tendency to sell stocks that have gone up in value since purchase. The most notable recent attempt to explain the evidence from the efficient markets viewpoint is Fama and French (1996). The authors believe that their three-factor model can account for the overreaction evidence, but not for the continuation of short-term returns (underreaction). This evidence also presents a challenge to behavioral finance theory because early models do not successfully explain the facts. The challenge is to explain how investors might form beliefs that lead to both underreaction and overreaction.

Recent work by Cecchetti et al. (2000) has analyzed an asset pricing model with various departures from rational expectations. A major finding of that paper is that a model with conventional preferences in which consumers exhibit pessimistic beliefs can better match sample moments of asset returns than can a rational expectations model. This suggests that expectations and beliefs may deviate from the conventional assumption of rationality and that such deviations can have implications for financial outcomes.

The significance of this finding extends beyond the specific occupational example. Pessimism and doubt can help resolve important asset pricing puzzles. As already mentioned, both pessimism and doubt reduce the riskfree rate, and thus they can help resolve the riskfree rate puzzle discussed by Weil (1989). Uniform pessimism and doubt both increase the average equity premium and thus can help resolve the equity premium puzzle of Mehra and Prescott (1985). It demonstrates a broader distinction between representativeness and probability: an event may appear highly representative of a particular outcome without necessarily being highly probable. Thus, when decision-makers rely on similarity, stereotypes, or familiar patterns as indicators of likelihood, they may underweight information that is statistically relevant but less cognitively salient. This provides an important theoretical basis for understanding how judgments may be formed in uncertain environments where individuals must assess the likelihood of outcomes without possessing complete information (Tversky & Kahneman, 1974).

Tversky and Kahneman (1974) identify another consequence of the representativeness heuristic as the misconception of regression. The phenomenon is based on the statistical principle of regression toward the mean, according to which an unusually high or unusually low observation on one measure is likely to be followed by an observation closer to the average on a second, imperfectly correlated measure. The movement toward the mean does not necessarily indicate a systematic change in the underlying phenomenon; rather, it is a natural consequence of variation and imperfect correlation between observations. Tversky and Kahneman (1974) identify availability as a second major heuristic through which individuals assess the frequency or probability of events. Under this heuristic, the likelihood of an event is inferred from the ease with which relevant instances or occurrences can be brought to mind. One important source of availability bias arises from the retrievability of instances.

Availability may also be influenced by the ease with which a particular class of events can be mentally searched for. Tversky and Kahneman (1974) demonstrate that individuals may judge the frequency of an event according to the ease with which relevant examples can be generated or retrieved, even when the search mechanism itself is systematically biased. Their word-frequency example illustrates that people may judge words beginning with a particular letter to be more common than words in which the same letter occurs in another position because it is easier to search memory for words according to their initial letter. Prospect theory was first proposed by Kahneman and Tversky (1979) as a descriptive model of decision-making under risk. Its key feature is that the carriers of value are not absolute levels or outcomes, but rather gains and losses in wealth. These gains and losses are measured relative to a reference point, typically taken to be the status quo. In a financial context, we interpret this as saying that people care not only about consumption levels but also about fluctuations in the value of their financial wealth. This mechanism has particular relevance to financial markets, where investors are continuously exposed to information about market movements, economic conditions, asset prices, and volatility. Accordingly, correlations among individual stocks and the explanatory power of the market model for a typical stock have declined, whereas the number

of stocks needed to achieve a given level of diversification has increased. All the volatility measures move together countercyclically and help to predict GDP growth. Market volatility tends to lead the other volatility series. Factors that may be responsible for these findings are suggested. The relationship between financial uncertainty, expectations, and behaviour can therefore extend across the three heuristics identified by Tversky and Kahneman (1974). Financial information may be evaluated according to its similarity to familiar patterns through representativeness, its accessibility and salience through availability, or its relationship to previously observed values through anchoring. These mechanisms can influence how investors interpret uncertain financial information and form expectations about future outcomes. Tversky and Kahneman (1974) identify anchoring and adjustment as a third major heuristic through which individuals form estimates and probability judgments. Under this heuristic, individuals begin with an initial value or reference point and subsequently adjust that value in an attempt to arrive at a final estimate. The initial value may be explicitly provided in the formulation of a problem or may emerge from an individual's own preliminary calculation.

This connection is particularly important in understanding financial expectations and asset-pricing outcomes. Pessimism and doubt can influence beliefs about future economic and financial conditions, while expectations formed around existing reference points can affect subsequent judgments. In this context, the equity premium puzzle discussed by Mehra and Prescott (1985) and the risk-free-rate puzzle discussed by Weil (1989) demonstrate the broader importance of expectations and beliefs in explaining observed financial outcomes. The behavioural mechanisms through which individuals form and adjust these expectations may therefore provide an additional perspective on deviations from conventional rational-expectations assumptions. The three heuristics identified by Tversky and Kahneman (1974) should not necessarily be understood as operating independently. In financial environments characterized by uncertainty and incomplete information, an investor may simultaneously rely on representativeness when identifying patterns, availability when evaluating salient or easily recalled information, and anchoring when interpreting new information relative to an existing reference value.

The literature on rational expectations, asset pricing, volatility, and behavioural finance consequently provides an important financial context for the psychological framework developed by Tversky and Kahneman (1974). While conventional financial theory assumes that individuals use available information to form rational expectations, the heuristics-and-biases framework demonstrates that the process through which individuals interpret information may itself introduce systematic deviations. These deviations may subsequently influence financial expectations, investment decisions, and potentially market outcomes.

Thus, the significance of heuristics and biases in financial decision-making lies not simply in the claim that individuals behave “irrationally,” but in the possibility that systematic patterns in judgment can influence the formation of expectations under uncertainty. The interaction between uncertainty, cognitive heuristics, biases, and financial expectations therefore provides a theoretical foundation for examining how psychological mechanisms may shape financial decision-making and outcomes.

2.2 Prospect Theory and Risk

The idea that people maximize expected utility has dominated the analysis of risky choices. Expected utility theory was formulated three centuries ago by Daniel Bernoulli (1738). It was first axiomatized by von Neumann and Morgenstern (1944) and then generalized by Savage (1954), who integrated the notions of subjective probability and expected utility. The theory has been applied as a descriptive theory in economics to explain phenomena such as the purchase of insurance policies and lottery tickets (Friedman and Savage, 1948) and the relation between spending and saving (see Arrow, 1971). It has been applied as a normative theory in decision analysis to determine optimal decisions and policies (see, e.g., Keeney and Raiffa, 1976). The present paper shows that actual decisions under conditions of uncertainty do not obey the axioms of utility theory. Furthermore, the observed violations are common, large, and lawful; hence, they cannot be treated as random error. Consequently, we argue that utility theory, as it is commonly interpreted and applied, is not an adequate descriptive theory, and we propose an alternative account of individual choice under risk. A person is risk averse if he prefers the certain prospect (x) over any prospect with expected value

x. Clearly, risk aversion is equivalent to the concavity of the utility function. The presence of risk aversion is perhaps the best known generalization regarding risky choices. The pioneering work by Nordhaus (1977) paved the way for thinking about the interaction of the physical process of climate change with the real economy. Early papers in this literature—such as those by Nordhaus (1977, 1991, 1992)—focused on optimal climate change mitigation and worked in deterministic settings. As such, these papers did not directly speak to the ways in which climate change affects asset prices and risk premia. Subsequent work extends these models to incorporate different aspects of risk and uncertainty about climate change and its link to the economy. These attributes include the stochastic nature of physical and economic processes as well as uncertainty about models of these processes (e.g., see Kolstad 1993; Manne & Richels 1992; Nordhaus 1994; Nordhaus & Popp 1997; Kelly & Kolstad 1999; Weitzman 2001, 2009; Lemoine & Traeger 2012; Golosov et al. 2014). It is important to understand this, as prospect theory is one of the foundations to understand risks in a financial system and investor behavior. Put differently, this work suggests that the utility derived from a specific wealth change is not the same in all circumstances. Thaler and Johnson (1990) found that a loss is less painful to people when it comes after substantial earlier increases in wealth: those earlier gains cushion the subsequent loss, making it more bearable. The analogy in financial markets is that investors may not care much about a stock market dip that follows substantial prior gains because they can still say that they are up relative to a year ago, say.

Thaler and Johnson (1990) argue that this is because losses that come on the heels of other losses are more painful to investors than on average. An informal interpretation is that in the aftermath of a painful loss, while the investor is still reeling from the shock, he is particularly sensitive to additional setbacks, increasing his risk aversion. In an early application of prospect theory, Benartzi and Thaler (1995) examine single-period portfolio choice for an investor with prospect-type utility. Retail investor behavior has attracted considerable attention from academic researchers and policymakers in recent years (see, for example, Ozik et al., 2021; Barber, Huang, Odean, and Schwarz, 2022, 2024; Greenwood et al., 2022; Welch, 2022). There is also substantial interest in the informational role of retail investors in the new fintech era. While earlier studies have often characterized retail investors as noise traders whose trading activity contributes to mispricing (Baker and Wurgler, 2006, 2007; Kumar and Lee, 2006; Kumar, 2009; Han and Kumar, 2013), recent research posits that certain retail traders possess superior information or investment skills, allowing them to exploit market inefficiencies and earn abnormal profits (Kelley and Tetlock, 2017; Coval, Hirshleifer, and Shumway, 2021; Farrell, Green, Jame, and Markov, 2022; Welch, 2022). They find that loss aversion makes investors reluctant to invest in stocks, even in the face of a sizeable equity premium. This suggests that bringing prospect theory into a formal pricing model may help us understand the level of average return. Epstein and Zin (1990) offer an explanation for the high equity premium by introducing first-order risk aversion in a recursive utility specification (see also Epstein and Zin (1989, 1991) and Segal and Spivak (1990)). A model with first-order risk aversion is similar to a model of loss aversion that ignores the effect of prior outcomes. However, this literature has not yet attempted to address the excess volatility or predictability of equity returns. For the purposes of this paper, we rely on earlier work showing why deviations from efficient prices can persist (De Long et al., 1990a; Shleifer and Vishny, 1997). According to this work, an important reason why arbitrage is limited is that movements in investor sentiment are in part unpredictable, and therefore arbitrageurs betting against mispricing run the risk, at least in the short run, that investor sentiment becomes more extreme and prices move even further away from fundamental value. Daniel et al. (1998) also construct a model of investor sentiment aimed at reconciling the empirical findings of overreaction and underreaction. They, too, use concepts from psychology to support their framework, although the underpinnings of their model are overconfidence and self-attribution, which are not the same as the psychological ideas we use.

Recent innovations in finance social mediation and fintech brokerage have empowered retail investors to move the stock market (see Welch, 2022). Behavioral theories suggest that retail investors are more prone to behavioral biases. While innovations in finance social mediation may improve individuals' access to investment information, peer interactions among irrational investors can intensify behavioral biases (Barber et al., 2022). Information sharing and behavioral biases have dramatically different implications for market efficiency and asset pricing

A prospect is mixed if one outcome is positive and the other outcome is negative. It is semi-positive or semi-negative, respectively, if one outcome is zero and the other is positive or negative. It is strictly positive or negative, respectively, if the outcomes are either both positive or both negative. Intuition and prior research suggest that, in an economy with prospect theory investors who engage in narrow framing, the price of an asset will depend in part on three asset characteristics: the volatility of the asset's returns; the skewness of the asset's returns; and the average prior gain or loss since purchase across investors holding the asset, a quantity known as the asset's "capital gain overhang" (Grinblatt and Han, 2005). The domain of the value function consists of (positive or negative) changes in wealth, that is, gains and losses. This hypothesis is required to explain the reference effect. Shefrin and Statman (1985) and Odean (1998) have used prospect theory to try to understand the so-called disposition effect, the tendency of investors to sell winning rather than losing stocks. A premise of these papers is that the investor only experiences utility from investment gains or losses when they are realized through a sale of stock. This is reasonable for thinking about short-term trading behavior, but is less attractive in the longer term: an investor is likely to feel the pain of a substantial long-term decrease in a stock's value even before he sells it. Since our focus is understanding low-frequency stock market behavior, we do not distinguish between unrealized and realized gains and losses. Another set of papers, including Barberis, Shleifer, and Vishny (1998) and Daniel, Hirshleifer, and Subrahmanyam (1998) explain some empirical features of asset returns by assuming that investors exhibit irrationality when making forecasts of quantities such as cash flows. It is also compatible with some basic principles of perception and judgment. Our perceptual apparatus is attuned to the evaluation of changes or differences rather than to the evaluation of absolute magnitudes. People are much better at detecting changes in illumination or noise level than at evaluating the absolute levels of these attributes. The past and present context of experience generally defines an adaptation level, or a reference point, and stimuli are perceived in relation to an adaptation level (Helson, 1964). The idea that, due to loss aversion, more volatile assets should, all else equal, have a higher average return, is discussed by Barberis and Huang (2001) and Li and Yang (2013); the idea that, due to diminishing sensitivity, an asset's gain overhang should be positively related to its average return, is developed by Grinblatt and Han (2005) and Li and Yang (2013); and the idea that, due to probability weighting, an asset's return skewness should be negatively related to its average return, is studied by Barberis and Huang (2008a) and Baele et al. (2019), among others.

2.3 Anti-Fragility and Robustness in Financial Systems

Risk and uncertainty have long been central to economic and decision-theoretic scholarship. However, the conventional treatment of risk has largely focused on probability, prediction, and individual preferences. Taleb and collaborators propose an alternative framework that focuses on how systems respond structurally to uncertainty and volatility (Taleb & Douady, 2012). This literature, encompassing the Black Swan, fragility, robustness, and antifragility, distinguishes between systems that are harmed by volatility, remain relatively unaffected by it, or benefit from it. The framework therefore provides a useful basis for examining not only the occurrence of financial shocks but also the capacity of financial systems to absorb, withstand, and adapt to them.

A central premise of Taleb's work is that conventional forecasting models can substantially underestimate rare and high-impact events. Earlier forecasting research by Makridakis et al. (1982) and Makridakis and Hibon (2000) demonstrated the limitations of predictive models, particularly under conditions of uncertainty and structural change. Taleb (2009) extends this critique by arguing that many economic and financial phenomena exhibit fat-tailed distributions, in which extreme outcomes occur more frequently and have much larger consequences than conventional Gaussian assumptions suggest. Such failures are therefore not merely the result of inaccurate forecasts, but may reflect the structural difficulty of applying thin-tailed probabilistic assumptions to environments characterised by fat tails and extreme uncertainty. The analytical emphasis consequently shifts from predicting specific rare events toward understanding how systems respond when such events occur.

The concepts of fragility, robustness, and antifragility provide a framework for making this distinction. Fragile systems are disproportionately harmed by volatility and extreme deviations, whereas robust systems remain relatively unaffected within a given range of stress. Antifragile systems, by contrast, are theorised to derive benefits from volatility and disorder within survivable limits (Taleb, 2012; Taleb & Douady, 2012). Antifragility therefore

represents more than the ability to withstand a shock: it implies that exposure to volatility can contribute to subsequent adaptation or improvement. In financial systems, this distinction is particularly relevant because a system may survive a crisis without necessarily becoming better prepared for the next one.

An emerging literature has investigated the effects of the coronavirus crisis on financial markets, stock returns, fund performance, and the real economy (Alfaro et al., 2020; Baker et al., 2020; Ding et al., 2020; Gormsen & Koijen, 2020; Pástor & Vorsatz, 2020; Ramelli & Wagner, 2020). At the same time, a number of studies have examined the effects of increased retail trading activity in recent financial markets (Ozik et al., 2021; Barber et al., 2022; Eaton et al., 2022; Welch, 2022; Barber et al., 2024). These developments are particularly relevant to an antifragility framework because financial-system responses to extreme shocks depend not only on institutional structures but also on changes in investor behaviour, market participation, and liquidity.

Evidence from the Indian financial system provides an important context for examining these concepts. The sector's post-2008 crisis resilience has been highlighted by the relative insignificance of macroeconomic factors and the impact of the demonetisation shock. COVID-19, in contrast, had a neutral or positive effect on banking performance, largely attributed to the extensive support measures implemented by the Reserve Bank of India (RBI). The 2008 crisis produced a more negative impact, partly because of the limited effectiveness of the policies in place. Robustness checks using alternative profit indicators further confirmed the consistency of these findings, providing empirical evidence of the long-term stability and financial resilience of the Indian banking system.

COVID-19 has also been characterised in the literature as a Black Swan-type event for the global financial system, with significant consequences for India. Its rapid spread contributed to a substantial decline in major financial-market indicators, while its effect on banking-system soundness was comparatively limited. During 2019–2020, the Indian banking system, particularly scheduled commercial banks, demonstrated resilience, with improvements in asset quality, capital adequacy, and profitability. The contrast between the initial financial-market disruption and the relative stability of the banking system illustrates the importance of distinguishing between the impact of a shock and the structural response of the system to that shock.

At the same time, financial systems remain exposed to mechanisms that can amplify shocks. Large deposit funds are often uninsured because they exceed the applicable insurance limit and may therefore be highly sensitive to perceptions of bank health. Such deposits can behave as relatively mobile or “hot money”, creating an important source of vulnerability (Heeb, 2023). Large depositors may move funds rapidly in response to signs of financial weakness or even rumours, a possibility amplified by digital banking, social media, and group communication. During the Silicon Valley Bank crisis in March 2023, approximately one-quarter of the bank's deposits, around \$42 billion, were withdrawn in a single day; the concentration of deposits among a relatively small group of venture capitalists increased the potential for a bank run (Van Vo & Le, 2023).

Interest-rate risk represents another important source of vulnerability for depository institutions (Li, 2017; English, 2002). Banks are expected to demonstrate a relatively symmetric response of their interest rates to changes in market rates set by the central bank (Kho, 2024). Changes in interest rates can also affect liquidity conditions and banks' reliance on large deposits. When rates are low, banks may experience strong deposit inflows, whereas higher rates can increase the cost of retaining deposits and encourage banks to offer more attractive rates. Reliance on large deposits to address intermittent liquidity requirements can consequently expose banks to flight risk (Li, Lu, & Ma, 2024). Withdrawals by a relatively small number of large depositors may increase the potential for bank runs (Juelsrud, 2021) and influence banks' incentives regarding maturity transformation (Müller et al., 2025).

Recent studies by Zheng and Peabody (2025), Blickle et al. (2025), and Dagher and Fuster (2026) further demonstrate growing interest in deposit flightiness, bank-run episodes, and financial stability. Collectively, this literature illustrates that financial systems contain structural channels through which uncertainty and shocks can either be absorbed or amplified.

From an antifragility perspective, however, resilience and robustness do not necessarily constitute antifragility. A resilient or robust system may successfully absorb a shock and return to its previous state, whereas an antifragile system is expected to improve its capacity to respond to future disturbances as a consequence of exposure to volatility (Taleb, 2012; Taleb & Douady, 2012). The existing literature on the Indian financial system therefore provides an important empirical foundation for examining whether the post-2020 financial system merely recovered from major disruptions or whether institutional responses, changes in market behaviour, and strengthened financial conditions contributed to a greater capacity to adapt to subsequent shocks. This distinction motivates the present study's examination of whether India's financial system can be characterised primarily as fragile, robust, resilient, or potentially antifragile in the period following 2020.

The Research Gap

The existing Indian macro-financial literature has generated substantial evidence on the sources and consequences of financial fragility, particularly through studies of non-performing assets, infrastructure-finance stress, shadow-banking vulnerabilities, liquidity conditions, credit cycles, and the post-COVID repair of financial-sector balance sheets. This literature has considerably improved our understanding of where vulnerabilities emerge within the financial system and how institutional and macroeconomic conditions influence their persistence. However, an important analytical gap remains in explaining how financial systems respond to uncertainty once such vulnerabilities are exposed.

In particular, relatively limited attention has been given to the interaction between behavioural responses to uncertainty and the institutional capacity of the financial system to absorb, adapt to, and learn from shocks. Behavioural theories such as heuristics and biases and Prospect Theory explain how decision-makers may respond to uncertainty, losses, and changing reference points, while the concept of antifragility provides a framework for understanding systems that can improve through exposure to volatility and stress. Yet these perspectives have largely been developed and applied in separate strands of the literature. Their combined application to the evolution of India's macro-financial system remains comparatively underexplored.

This creates a more specific question than whether the Indian financial system is simply *fragile* or *resilient*. A system may contain significant vulnerabilities before a shock, withstand a shock without systemic collapse, or subsequently emerge with stronger balance sheets, institutions, and risk-management mechanisms. These outcomes represent conceptually different forms of fragility, robustness, and potential antifragility. Distinguishing between them requires examining not only the immediate impact of financial shocks but also how behaviour, expectations, institutional responses, and subsequent structural adjustments interact over time.

The Indian experience provides a particularly relevant setting for examining this distinction. The pre-2018 period was characterised by significant pockets of financial fragility, including stressed bank balance sheets and credit-related vulnerabilities. The IL&FS episode and the subsequent NBFC-related stress exposed weaknesses in financial intermediation and liquidity transmission, while the COVID-19 shock constituted a much broader test of the system's capacity to absorb extreme uncertainty. The subsequent period witnessed improvements in bank asset quality, capitalisation, liquidity management, and financial-sector resilience. However, whether these improvements should be interpreted merely as a recovery from fragility or as evidence of an antifragile response remains an open question.

Accordingly, the research gap addressed by this study is not the absence of research on Indian financial fragility or resilience in isolation. Rather, it is the absence of a sufficiently integrated behavioural-institutional framework for examining how uncertainty, cognitive biases, reference-dependent decision-making, and institutional adaptation collectively shape the evolution of the financial system across successive shocks. By bringing heuristics and biases, Prospect Theory, and Taleb's concept of antifragility into a common analytical framework, this study seeks to move beyond the conventional question of whether the Indian financial system is fragile or resilient and instead examine whether repeated exposure to financial stress has strengthened the system's capacity to absorb shocks, adapt to uncertainty, and potentially become more robust through experience.

The study therefore treats antifragility not as an assumption or predetermined conclusion, but as an empirically and conceptually testable possibility. This distinction is important because improvements in conventional indicators, such as a decline in the non-performing asset ratio, may demonstrate recovery or greater robustness but cannot, by themselves, establish antifragility. Antifragility would require evidence that exposure to previous disturbances contributed to improvements in the system's ability to withstand subsequent uncertainty. The study consequently addresses a broader question: has India's macro-financial system merely recovered from successive episodes of fragility, or has the process of absorbing and responding to shocks generated a system that is better equipped to withstand future uncertainty?

3. Methodological Framework

This study adopts a conceptual-descriptive methodological framework to examine the evolution of financial fragility and resilience in India, with particular attention to the interaction between behavioural decision-making, financial interconnectedness, institutional responses, and periods of heightened uncertainty. The objective is not to estimate the causal effect of individual behavioural biases on financial instability. Rather, the study develops an integrated analytical framework through which major episodes of financial stress can be interpreted alongside observable changes in the structure and health of the financial system.

The methodology combines three complementary elements: theoretical synthesis, historical episode analysis, and descriptive empirical assessment. This combination is appropriate because the central research question concerns a systemic transformation that cannot be adequately captured through a single financial indicator or a conventional econometric specification.

3.1 Research Design

The study follows a longitudinal case-study approach, examining the Indian financial system over the period from approximately 1997 to 2026. The period captures three distinct stages of financial development and adjustment: the expansion of financial intermediation and accumulation of vulnerabilities, the exposure of these vulnerabilities during the 2018–20 shadow-banking crisis, and the subsequent strengthening of the financial system following the COVID-19 shock.

The analysis is organised around major episodes rather than treating the entire period as homogeneous. This allows changes in financial conditions to be interpreted in relation to structural developments and policy responses.

The principal analytical sequence is:

Financial deepening → accumulation of vulnerabilities → financial shock → behavioural and institutional transmission → policy intervention → institutional adaptation → observed resilience

This sequence provides the basis for assessing whether improvements in the Indian financial system represent simple recovery, greater robustness, or emerging characteristics of antifragility.

3.2 Sources of Evidence

The study relies primarily on secondary data and documentary evidence. Quantitative indicators are drawn principally from official financial and macroeconomic sources, particularly publications of the Reserve Bank of India (RBI), supplemented by government reports and established academic literature.

The empirical assessment focuses on indicators that directly reflect the financial system's capacity to absorb stress, including:

- gross and net non-performing assets;
- capital adequacy and Common Equity Tier 1 ratios;
- liquidity indicators;

- credit growth and credit contraction;
- financial-sector asset composition;
- NBFC financial conditions;
- banking-sector stress-test results; and
- selected indicators of financial interconnectedness.

Academic studies are used to provide historical and theoretical interpretation of major episodes, particularly the infrastructure-credit cycle, the accumulation of NPAs, the expansion of NBFC intermediation, and the 2018–20 shadow-banking stress.

3.3 Analytical Framework

The empirical and historical evidence is interpreted through three complementary theoretical perspectives.

First, Heuristics and Biases Theory provides a framework for understanding how decision-makers may simplify complex information under uncertainty. Representativeness, availability, and anchoring are considered particularly relevant to periods of credit expansion, changing perceptions of NBFC risk, and sudden reassessment following institutional failures.

Second, Prospect Theory is used to examine reference-dependent behaviour, loss aversion, and changes in risk perception. The framework is particularly relevant when previously accepted asset values, ratings, expected returns, or funding conditions are suddenly revised.

Third, Taleb's concept of antifragility provides the basis for evaluating whether institutional responses to financial stress merely restore previous conditions or generate improvements in the system's capacity to deal with future uncertainty.

The study also incorporates a Black Swan perspective to account for situations in which historical information and conventional risk models provide an incomplete representation of extreme or structurally different shocks.

These perspectives are not treated as competing explanations. Instead, they operate at different levels of the analysis: behavioural theories explain potential decision-making mechanisms, the institutional framework explains transmission, and the antifragility framework evaluates the nature of subsequent adaptation.

3.4 Descriptive Empirical Strategy

The quantitative component of the study uses descriptive comparison rather than causal econometric estimation. Financial indicators are examined across different phases of the study period to identify changes in asset quality, capitalisation, liquidity, credit provision, and stress-absorption capacity.

The analysis proceeds in three stages.

Stage 1: Vulnerability identification.

The study identifies structural vulnerabilities that accumulated during the period of rapid financial expansion, including elevated corporate credit exposure, rising NPAs, dependence on particular funding structures, and increasing interconnectedness between banks and non-bank financial institutions.

Stage 2: Shock and transmission analysis.

The 2018–20 shadow-banking crisis and the COVID-19 shock are examined as stress episodes. The analysis considers how financial disruptions were transmitted through credit markets, funding markets, NBFCs, banks, mutual funds, and the real economy.

Stage 3: Post-shock assessment.

Financial indicators following the major stress episodes are compared with earlier conditions. Improvements in asset quality, capital buffers, liquidity, and stress-test performance are interpreted as evidence of increased robustness and resilience. Institutional reforms are then examined to determine whether the post-crisis system also demonstrates characteristics consistent with learning and adaptation.

3.5 Assessment of Fragility, Robustness, Resilience and Antifragility

A central methodological contribution of the study is to distinguish four related but conceptually different outcomes.

Fragility refers to a situation in which relatively moderate disturbances can generate disproportionate deterioration in financial conditions.

Robustness refers to the capacity of the system to withstand specified disturbances without substantial impairment of its core functions.

Resilience refers to the ability to absorb a shock, maintain essential financial functions, and recover following the disturbance.

Antifragility represents a stronger condition in which exposure to stress contributes to improvements in the system's future capacity to operate under uncertainty.

The classification is therefore based on a combination of financial indicators, crisis performance, and institutional change, rather than on any single measure.

A system is considered to display stronger evidence of antifragility only when post-crisis improvements can reasonably be connected to institutional learning and when these improvements increase preparedness for future disturbances. Consequently, a decline in NPAs or an increase in capital ratios alone is not treated as sufficient evidence of antifragility.

3.6 Comparative Periodisation

For analytical clarity, the study divides the period into five broad phases:

Period	Analytical focus
1997–2007	Financial deepening and expansion of intermediation
2008–2017	Credit expansion, infrastructure stress and accumulation of NPAs
2018–2020	Shadow-banking crisis and exposure of funding vulnerabilities
2020–2022	COVID-19 shock and policy-supported financial resilience
2023–2026	Balance-sheet strengthening, improved asset quality and institutional consolidation

This periodisation allows the study to examine financial fragility as an evolving process rather than as an isolated crisis event.

3.7 Interpretation of Evidence

The study follows a triangulation approach. No individual indicator is treated as decisive. Instead, conclusions are drawn when multiple forms of evidence point in the same direction.

For example, improved asset quality is considered alongside capitalisation, liquidity, stress-test outcomes, and institutional reforms. Similarly, evidence of resilience during COVID-19 is interpreted together with the policy measures that supported financial intermediation during the shock.

This approach is particularly important because financial indicators can improve for several reasons, including genuine balance-sheet repair, regulatory intervention, write-offs, changes in portfolio composition, or temporary policy support. The analysis therefore focuses on the consistency of evidence across indicators and periods.

Overall, the methodological framework is designed to answer a broader question than whether India's financial indicators have improved. It asks whether the nature of the financial system's response to uncertainty has changed—from vulnerability and delayed adjustment toward stronger shock absorption, institutional learning, and potentially greater adaptability.

4. CONCEPTUAL FRAMEWORK

4.1 From Uncertainty to Systemic Outcomes

This study conceptualises financial instability not as a single event but as a dynamic process through which uncertainty is translated into individual decisions, correlated financial behaviour, macro-financial feedback, and ultimately system-level outcomes. The central proposition is that the consequences of a financial shock depend not only on the magnitude of the initial disturbance but also on how economic agents interpret uncertainty, how financial institutions are interconnected, and how effectively institutions respond to emerging stress.

The framework begins with uncertainty. Financial-market participants rarely possess complete information about the probability of default, future liquidity conditions, asset values, or the extent of possible contagion. During periods of heightened uncertainty, therefore, agents cannot rely entirely on known probabilities and may instead interpret information using simplified cognitive processes. This creates the first link between uncertainty and behaviour.

The second stage involves heuristics and cognitive biases. As argued by Tversky and Kahneman, individuals frequently rely on mental shortcuts such as representativeness, availability, and anchoring when making judgements under uncertainty. In financial markets, these mechanisms can influence how investors, lenders, borrowers, and even institutions interpret new information. A recent default may become disproportionately salient; historical performance may be treated as an anchor; or the deterioration of one institution may be interpreted as evidence that similar institutions are also unsafe. Such responses can be individually rational attempts to cope with uncertainty but may generate collectively destabilising outcomes when many agents respond in similar ways.

The third stage is reference-dependent decision-making, captured in this study through Prospect Theory. Financial decisions are not necessarily evaluated against absolute levels of wealth or asset values. Instead, agents evaluate gains and losses relative to a reference point. Loss aversion implies that perceived losses may receive greater psychological weight than equivalent gains. In financial markets, this may manifest through reluctance to realise losses, rapid withdrawal from assets perceived as risky, defensive lending behaviour, or heightened sensitivity to negative information. Consequently, uncertainty can produce behavioural responses that are stronger than would be predicted by a purely expected-value framework.

The fourth stage concerns institutional transmission. Individual decisions do not occur in isolation. Financial institutions are connected through funding relationships, maturity structures, common asset exposures, payment systems, and expectations. A decision that appears individually prudent—such as withdrawing liquidity or reducing credit exposure—can become systemically important when undertaken simultaneously by many agents. Institutional characteristics such as wholesale funding dependence, maturity mismatch, interconnectedness, and concentrated exposures can therefore transform dispersed behavioural responses into a broader liquidity or credit shock.

The fifth stage is the macro-financial feedback mechanism. Financial stress can affect the real economy through reduced credit availability, lower investment, declining asset values, weaker consumption, and deterioration in borrowers' repayment capacity. These real-economy effects can subsequently weaken financial-sector balance sheets, creating a feedback loop between financial conditions and economic activity. Financial instability is therefore potentially self-reinforcing: an initial disturbance can reduce credit, weaker credit can depress economic activity, and weaker economic activity can generate additional financial stress.

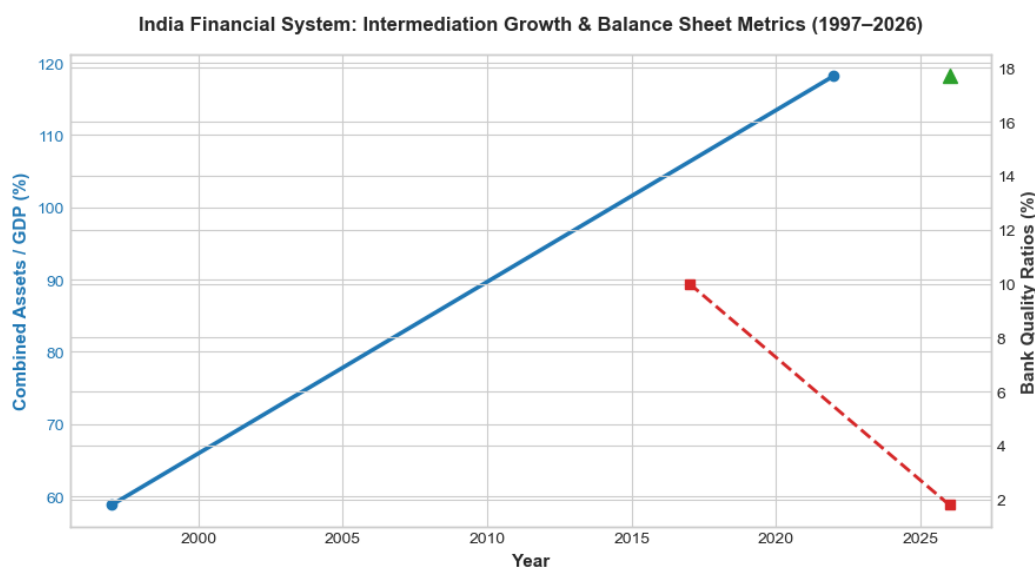
The sixth stage is institutional and policy response. The response of regulators and policymakers can determine whether financial stress remains contained or becomes systemic. Liquidity provision, regulatory intervention, bank recapitalisation, resolution mechanisms, temporary relief measures, and improvements in supervision can alter the

transmission process. Importantly, policy response is not viewed only as a mechanism for absorbing the immediate shock. It can also influence the institutional structure of the system after the crisis by changing incentives, strengthening balance sheets, improving risk management, and reducing previously identified vulnerabilities.

The final stage concerns the resulting system property. Depending on the interaction between behavioural responses, institutional structures, macro-financial feedback, and policy adaptation, a financial system may display different outcomes. It may become fragile, where shocks are amplified; remain robust or resilient, where shocks are absorbed without substantial deterioration; or potentially become antifragile, where exposure to stress contributes to improvements that increase the system's capacity to deal with subsequent disturbances.

The distinction is important. Resilience implies the ability to withstand or recover from a shock, whereas antifragility implies something stronger: the system benefits from volatility or disorder in the sense that subsequent exposure leaves it better adapted than before. Thus, the framework does not assume that India's financial system is antifragile. Rather, it uses antifragility as an analytical possibility that must be evaluated by examining whether successive episodes of financial stress have generated structural improvements in the system's capacity to absorb future uncertainty.

5. Indian Financial Architecture and the Accumulation of Vulnerabilities



India's financial architecture has undergone substantial transformation over the past two decades. Although commercial banks continue to occupy a central position in financial intermediation, non-bank financial institutions have become increasingly important in the provision of credit. Between 1997 and 2022, the combined assets of banks and non-bank financial institutions increased from approximately 58.8 per cent of GDP to 118.2 per cent of GDP. Within this expansion, private-bank assets increased from 3.2 per cent to 31.4 per cent of GDP, while NBFC assets increased from 2.6 per cent to 16.3 per cent of GDP (Agarwal, 2023).

This expansion has a dual interpretation. From a developmental perspective, financial deepening can improve access to credit, facilitate investment, support entrepreneurship, and broaden the channels through which household and corporate savings are intermediated. From a systemic-risk perspective, however, greater financial intermediation also increases the potential consequences of disruption within the financial system. As financial institutions become more deeply embedded in household, corporate, and government financing, disturbances within financial intermediation can increasingly spill over into the real economy.

The growth of NBFCs was partly a response to structural changes in the Indian financial system. Following the decline of traditional development finance institutions, public-sector banks assumed a greater role in providing long-

term finance, particularly to infrastructure and other capital-intensive sectors. As asset-quality concerns subsequently constrained the ability and willingness of banks to extend new credit, NBFCs increasingly entered segments in which banks were either less willing or less able to lend. The resulting transformation was therefore not simply a movement of market share between two categories of financial institutions. It created a more interconnected financial architecture in which NBFCs increasingly supplied credit while obtaining funding from banks, mutual funds, capital markets, and other wholesale sources.

This interconnectedness is important for understanding financial fragility. The stability of an individual institution cannot necessarily be assessed independently of the institutions with which it shares funding, asset, or liquidity relationships. A disturbance originating within one segment can therefore be transmitted through the broader financial network. The greater the degree of interconnectedness, the greater the potential for an institution-specific problem to become a system-wide event.

Financial deepening has also been uneven across regions. Credit-to-GDP ratios in some wealthier Indian states have been reported to be several times those observed in poorer states, including Bihar and Uttar Pradesh. Such disparities have implications for the measurement of financial resilience. Aggregate indicators can conceal substantial differences in access to formal finance, credit dependence, and exposure to financial shocks across regions and borrower categories. A financial system can therefore appear robust at the national level while continuing to contain pockets of vulnerability at the regional or sectoral level.

The transformation of India's financial architecture thus produced a central tension. Financial deepening increased the economy's capacity to mobilise and allocate capital, but it also increased the number and strength of channels through which financial stress could propagate. The subsequent episodes of bank stress and shadow-banking disruption should therefore be understood not simply as isolated crises but as manifestations of vulnerabilities accumulated during a period of rapid financial expansion.

5.1 The Infrastructure Boom, NPAs and the Behavioural Interpretation

The roots of later financial fragility can be traced partly to the rapid credit expansion of the 2000s. As India's infrastructure requirements increased and traditional development-finance institutions weakened, public-sector banks became important providers of long-term project finance. Bank lending expanded considerably between 2005 and 2013, with large borrowers eventually accounting for more than half of bank loan portfolios and close to 90 per cent of reported NPAs by 2016–17 (Agarwal, 2023).

Rapid infrastructure lending should not, however, be interpreted as inherently irrational. India's infrastructure deficit created genuine investment opportunities, and rapid credit growth can contribute positively to economic development when financed projects are economically and financially viable. The subsequent problem arose when the expectations underlying the credit expansion became increasingly disconnected from project-level realities. Delays, cost overruns, governance difficulties, regulatory constraints, and deteriorating borrower balance sheets gradually challenged the assumptions on which earlier lending decisions had been based.

This process can be interpreted through a behavioural-institutional lens. During an extended period of economic expansion, the prevailing growth narrative may become an important anchor for expectations. Previous project performance and expectations of continued economic growth can influence how lenders interpret new information about risk. When negative information subsequently emerges, revising the original assessment can become difficult, particularly when recognition of deterioration carries accounting, capital, organisational, or reputational costs.

Prospect Theory provides one possible behavioural mechanism through which this process can be understood. If the original carrying value of a loan functions as a reference point, recognition of impairment creates a salient loss relative to that reference point. Under such circumstances, decision-makers may have incentives—both behavioural and institutional—to postpone recognition while searching for a recovery that would allow the original position to be preserved. This interpretation is consistent with the broader phenomenon of evergreening, although it should not be interpreted as evidence that all instances of delayed recognition were caused by loss aversion. Capital constraints,

regulatory incentives, political-economy considerations, borrower pressure, and uncertainty regarding recovery values can produce similar outcomes.

The significance of the behavioural interpretation therefore lies not in replacing structural explanations but in supplementing them. Behavioural mechanisms can help explain why institutions may be slow to update assessments even after information about deteriorating asset quality becomes available.

The Asset Quality Review (AQR), initiated by the Reserve Bank of India in 2015, represented a significant change in this process. Greater scrutiny resulted in the recognition of previously under-reported stress, with the reported gross NPA ratio of scheduled commercial banks increasing substantially and reaching approximately 10 per cent at the system level by 2017. The immediate effect was necessarily disruptive. Recognition of impaired assets reduced the apparent quality of bank balance sheets and contributed to constraints on lending capacity.

However, the distinction between short-term deterioration in reported indicators and longer-term institutional repair is important. Recognition can make a financial system appear weaker in the short run precisely because previously hidden weaknesses are being revealed. From an antifragility perspective, the relevant question is therefore not whether recognition caused short-term pain, but whether the information generated by recognition subsequently contributed to improvements in institutional capacity.

The subsequent emphasis on the four Rs—recognition, resolution, recapitalisation and reform—was therefore important beyond its effect on headline NPA ratios. The Insolvency and Bankruptcy Code (IBC) introduced a more structured framework for resolving distressed assets, while recapitalisation sought to restore the lending capacity of public-sector banks. These developments altered the institutional environment in which distressed assets were managed.

The deeper question for this study is consequently whether these reforms changed the response function of the financial system. If the system simply reduced reported NPAs without changing the incentives and mechanisms governing future risk recognition, the evidence for institutional learning would be limited. If, however, earlier recognition, stronger resolution mechanisms, improved capitalisation, and enhanced supervision increased the system's capacity to identify and absorb future stress, then the post-crisis process provides stronger evidence of adaptation.

6. The 2018–20 Shadow-Banking Crisis

6.1 What Happened?

The default of Infrastructure Leasing & Financial Services (IL&FS) in September 2018 represented a significant turning point in India's financial system. IL&FS had been regarded by market participants as a highly credible financial institution, and several of its debt instruments had previously carried high credit ratings. Its default therefore generated consequences that extended beyond the institution's own balance sheet. It contributed to a reassessment of the reliability of the broader NBFC funding model and heightened uncertainty regarding the quality and liquidity of other financial intermediaries.

The importance of the episode lies partly in the way the initial disturbance was transmitted through financial markets. Mutual funds and other institutional investors reduced their exposure to instruments perceived as vulnerable, while NBFCs faced increasing difficulty in accessing wholesale funding. In response, some institutions adopted more conservative liquidity-management strategies and reduced the pace of fresh lending. The resulting contraction in credit availability affected borrowers that had become increasingly dependent on non-bank finance.

The subsequent default of Dewan Housing Finance Corporation Limited (DHFL) in 2019 intensified these concerns. Attention increasingly shifted from the financial condition of individual institutions to the possibility of broader interconnected exposures linking NBFCs, housing finance, real estate, and banks. The episode therefore illustrated how an institution-specific event can alter expectations about an entire class of financial intermediaries.

Agarwal (2023) characterises this process as a macro-financial spiral in which uncertainty generated a flight to safety, funding withdrawals encouraged liquidity conservation, reduced lending weakened borrowers and projects, and deteriorating borrower conditions subsequently increased perceived credit risk. The important feature of this mechanism is its feedback structure: financial stress altered behaviour, behavioural responses affected funding conditions, and deteriorating funding conditions generated additional financial stress.

6.2 Transmission to the Real Economy

The consequences of the shadow-banking crisis extended beyond financial markets. Sectors that depended substantially on NBFC and housing-finance credit, particularly real estate and construction, experienced increased financial pressure. Firms dependent on working-capital finance also faced more restrictive credit conditions.

The contraction in financial intermediation consequently affected real economic activity. Reduced credit availability constrained investment and working capital, while weaker economic activity reduced borrowers' capacity to service existing obligations. The resulting feedback loop linked financial-sector stress to the real economy and subsequently fed back into financial-sector risk.

India's GDP growth rate fell sharply during this period, reaching approximately 2.9 per cent in the final quarter of FY2019–20. Aggregate investment also contracted across successive quarters. Although the slowdown cannot be attributed exclusively to the shadow-banking crisis, the episode demonstrates the broader point of the conceptual framework: financial-sector disruptions can become macroeconomic disruptions when credit intermediation is sufficiently interconnected with productive activity.

The 2018–20 episode therefore represents an important transition in the paper's narrative. It exposed vulnerabilities that had accumulated during the preceding period of financial deepening and demonstrated how uncertainty, institutional interconnectedness, and behavioural responses could interact to transform an initially concentrated financial disturbance into a broader credit and economic slowdown.

7. COVID-19: Severe Uncertainty and the Black Swan Lens

The COVID-19 shock reached India at a particularly consequential point in the evolution of its financial system. The banking sector had undergone substantial asset-quality recognition and repair, while the financial system was still adjusting to the consequences of the 2018–20 shadow-banking disruption. COVID-19 therefore represented not simply another financial disturbance but a large external shock imposed on a financial system that was still undergoing institutional adjustment.

The pandemic generated an unusual combination of supply, demand, liquidity, and uncertainty shocks. Lockdowns disrupted production and employment, while restrictions on economic activity sharply affected the revenues and cash flows of households and firms. Borrowers that had previously appeared financially viable could suddenly face severe liquidity pressures. At the same time, banks and NBFCs faced uncertainty regarding the extent to which temporary disruptions would eventually translate into permanent credit losses.

7.1 COVID-19 and the Black Swan Perspective

Describing COVID-19 as a Black Swan requires conceptual caution. Pandemics were neither unknown nor entirely unforeseeable before 2020. The stronger argument is therefore not that the pandemic itself was unimaginable, but that its specific timing, scale, duration, and interaction with financial and economic systems were difficult to anticipate using conventional historical experience.

This distinction is important for the present study. Taleb's framework draws attention not merely to rare events but to the limitations of systems that infer future risk primarily from observed historical patterns. A model calibrated on relatively stable economic conditions may provide useful information about familiar risks while remaining poorly equipped to capture a shock that simultaneously changes the underlying relationships among economic variables.

COVID-19 therefore illustrates the problem of model uncertainty. Historical default rates, revenue patterns, employment relationships, and asset-price correlations became less informative when economic activity was temporarily constrained by public-health restrictions. The challenge was not necessarily that existing models were numerically incorrect. Rather, some of the assumptions underlying those models became less reliable because the environment itself had changed.

The Black Swan lens consequently complements the behavioural framework. When historical information becomes less informative, agents face greater uncertainty regarding the probability and magnitude of future outcomes. Under such circumstances, reliance on heuristics, salient information, previous reference points, and simplified narratives may become more pronounced.

The financial-market reaction in early 2020 reflected this extreme uncertainty. Equity markets experienced a sharp decline in March 2020, while corporate-bond spreads widened considerably. However, the subsequent recovery was rapid once monetary and fiscal interventions helped stabilise expectations and liquidity conditions. Major equity indices, including the Sensex and Nifty 50, recovered substantially from their March 2020 lows during the following year.

The episode therefore provides a useful illustration of an important distinction in the paper: a system's response to an extreme shock depends not only on its pre-existing vulnerabilities but also on the institutional mechanisms available to absorb uncertainty once the shock occurs.

7.2 Policy as a Shock Absorber

The policy response to COVID-19 was extensive. The Reserve Bank of India and the Government of India employed multiple instruments, including liquidity provision, reductions in policy rates, targeted long-term repo operations, government-securities market operations, loan moratoria, restructuring measures, and credit-support mechanisms.

These interventions served an important stabilising function. By providing liquidity and reducing immediate repayment pressures, policy measures helped prevent temporary disruptions in cash flow from automatically translating into widespread financial distress. In this sense, policy acted as a shock absorber, reducing the probability that a temporary liquidity shock would become a more persistent solvency crisis.

However, the policy response also creates an important measurement problem for assessing financial resilience. Regulatory forbearance and temporary relief measures can delay the recognition of credit deterioration. Consequently, an improvement in reported NPA ratios during a period of extraordinary policy support cannot automatically be interpreted as evidence that underlying credit risk has disappeared.

Three mechanisms must therefore be distinguished:

1. Genuine balance-sheet repair, in which borrowers and financial institutions become fundamentally stronger;
2. Policy absorption, in which public institutions temporarily absorb or redistribute the impact of the shock; and
3. Delayed recognition, in which the underlying deterioration remains partly hidden because recognition has been postponed.

These mechanisms can produce superficially similar improvements in headline financial indicators but have very different implications for antifragility.

From a resilience perspective, the policy response was significant because the financial system continued to function despite an unprecedented economic disruption. From an antifragility perspective, however, the more demanding question is whether the experience subsequently produced institutional changes that improved the system's capacity to withstand future disturbances.

8. Fragile, Robust, Resilient or Antifragile?

8.1 The Classification Problem

It is tempting to characterise India's financial system using a binary distinction between fragility and resilience. Such a classification, however, obscures the fact that different dimensions of the financial system can exhibit different properties simultaneously.

The system displayed significant pockets of fragility before 2018. These included stressed bank balance sheets, weaknesses in asset-quality recognition, concentrated exposures, dependence on particular sectors, and vulnerabilities associated with wholesale funding within parts of the non-bank financial sector. Yet the exposure of these vulnerabilities did not result in a complete collapse of the financial system.

This distinction allows three related but conceptually different properties to be separated.

Fragility refers to a system in which relatively small or moderate disturbances can generate disproportionately large deterioration.

Robustness refers to the ability of a system to withstand specified disturbances without substantial impairment.

Resilience incorporates a temporal dimension: a resilient system can absorb a disturbance, continue functioning, and recover its essential capacity.

Antifragility, following Taleb, represents a stronger property. An antifragile system does not merely withstand volatility; exposure to disorder or stress contributes to improvements in its subsequent capacity.

On this basis, the current Indian financial system is more appropriately described as robust and increasingly resilient than as fragile. Current capital, asset-quality, and liquidity indicators are materially stronger than during the period preceding the 2018–20 crisis, while stress-test results indicate considerable capacity to absorb specified adverse scenarios.

Resilience is also supported by the system's response to major disturbances. Neither the shadow-banking crisis nor COVID-19 resulted in a systemic collapse of the banking system, and policy interventions helped maintain the functioning of financial intermediation.

Antifragility requires a more demanding assessment.

8.2 Evidence Consistent with Emerging Antifragility

There are several developments that can be interpreted as evidence of institutional learning following financial stress.

First, the Asset Quality Review contributed to greater recognition of previously hidden asset-quality problems. Second, the Insolvency and Bankruptcy Code introduced a more structured framework for the resolution of distressed assets. Third, recapitalization strengthened the loss-absorption capacity of banks. Fourth, supervisory attention to NBFCs and interconnectedness increased following the 2018–20 crisis. Fifth, stress testing and scenario analysis have become increasingly important components of financial-stability assessment.

These developments suggest that financial stress generated information that was subsequently incorporated into institutional arrangements.

This is relevant to antifragility because the key feature is not simply that the system survived. Rather, the configuration of the system changed following the experience of stress.

However, institutional change alone does not establish antifragility. A system can learn from a crisis and become more resilient without satisfying the stronger theoretical definition of antifragility. The distinction is therefore between adaptation and benefiting from volatility. The available evidence provides stronger support for the former than for the latter.

8.3 Why the Indian System Cannot Yet Be Described as Fully Antifragile

Several limitations prevent a stronger classification.

First, funding fragility has not disappeared. NBFCs remain an important source of credit, and their reliance on market-based funding can create sensitivity to changes in investor confidence and liquidity conditions.

Second, institutional incentives remain relevant. Greater transparency and earlier recognition reduce the scope for delayed adjustment, but incentives to postpone recognition can potentially re-emerge when institutions face capital constraints or uncertainty regarding recovery values.

Third, financial resilience remains unevenly distributed. Aggregate national indicators can conceal differences across regions, sectors, institutions, and borrower groups. A large corporation with access to equity and bond markets faces a fundamentally different financial environment from a small enterprise dependent on a single intermediary.

Fourth, model uncertainty remains a structural problem. Better forecasting and more sophisticated stress tests can improve preparedness, but they cannot eliminate uncertainty surrounding genuinely novel shocks. A financial system must therefore be capable of functioning when its models are wrong.

This final point provides an important connection between Black Swan thinking and financial regulation. The objective should not be to develop a model that perfectly predicts the next crisis. Such a goal is unrealistic. The objective should instead be to construct institutional arrangements that remain sufficiently robust when forecasts fail.

Capital buffers, diversified funding structures, credible resolution mechanisms, liquidity backstops, transparency, and decentralised sources of finance can all be interpreted as forms of protection against model error and uncertainty.

8.4 Evolution of India's Financial-System Properties

The historical trajectory can therefore be summarised as follows:

Period	Dominant characteristic	Interpretation
Pre-2018	High asset-quality stress, concentrated exposures, delayed recognition, emerging non-bank funding vulnerabilities	Significant pockets of fragility
2018–20	IL&FS/DHFL stress, liquidity withdrawal, credit contraction, institutional contagion	Fragility became visible and was amplified through financial linkages
2020–22	COVID-19 shock combined with extensive policy support	Strong evidence of resilience and shock absorption
2023–26	Improved asset quality, capitalisation, liquidity, resolution architecture and stress-testing capacity	Strengthened robustness and institutional resilience
Current assessment	Stronger system with residual funding, distributional and model-related vulnerabilities	Robust and increasingly resilient, with emerging but unproven elements of antifragility

The overall classification is therefore deliberately cautious. India's financial system today is best characterised as robust and increasingly resilient, with emerging elements of antifragility, rather than as fully antifragile.

This conclusion preserves an important distinction between surviving shocks and learning from them. India's financial architecture has clearly changed following episodes of stress. Whether those changes are sufficient to establish genuine antifragility remains an open empirical question.

9. Reform Priorities for an Antifragile Financial Architecture

If the objective is to move from robustness toward greater antifragility, financial-sector reform should focus not only on preventing losses but also on creating mechanisms through which stress generates information, information produces institutional learning, and institutional learning reduces future vulnerability.

9.1 Strengthen Early Loss Recognition

The central objective should be to minimise the period during which deteriorating assets remain insufficiently recognised. The danger is not simply that a financial institution holds a bad loan; it is that the deterioration remains hidden long enough for additional credit to accumulate around the original exposure.

Supervisory incentives should therefore encourage timely recognition and realistic restructuring based on credible recovery values. Earlier recognition can reduce the influence of historical book values as anchors and limit the institutional incentives associated with delaying loss recognition.

9.2 Diversify NBFC Funding

The 2018–20 episode demonstrated the importance of funding structure. Systemically important NBFCs should maintain adequate liquidity buffers and sufficiently diversified sources of funding while continuing to perform their specialised role in credit provision.

The objective is not to eliminate wholesale funding but to reduce excessive dependence on a narrow set of funding channels whose simultaneous withdrawal can generate systemic stress.

9.3 Deepen Corporate Debt Markets

A deeper corporate bond market can provide large firms with alternatives to bank and NBFC financing. Greater diversification of funding sources can reduce concentration within particular intermediary classes and create additional channels through which savings can reach productive investment.

A more diversified financing structure can therefore improve resilience by reducing dependence on any single category of financial intermediary.

10. Limitations of the Study

This study has four principal limitations.

First, the behavioural mechanisms discussed in the analysis are conceptually interpreted rather than directly measured. The study does not employ experimental or survey-based measures of representativeness, availability, anchoring, or loss aversion. Accordingly, the behavioural framework should be understood as an interpretive mechanism for analysing financial episodes rather than as a direct test of individual-level behavioural effects.

Second, the empirical analysis is primarily descriptive rather than causal. The observed improvement in financial-sector indicators cannot be attributed to any single reform or policy intervention because several institutional and macroeconomic changes occurred simultaneously. The study therefore emphasises patterns and consistency across multiple indicators rather than claiming causal identification.

Third, the assessment of antifragility presents a conceptual measurement challenge. Resilience can be observed through the ability to withstand and recover from shocks, whereas antifragility requires evidence that previous stress subsequently improves the system's capacity to deal with future uncertainty. The present study identifies institutional developments that are consistent with such learning but does not claim to establish antifragility conclusively.

Finally, aggregate financial indicators may conceal heterogeneity across institutions, sectors, borrowers, and regions. A financially stronger banking system at the aggregate level does not imply that every segment of the financial system has become equally robust.

These limitations do not undermine the central purpose of the study. Rather, they define the scope of its contribution: to provide an integrated conceptual and descriptive assessment of how India's financial architecture has

evolved from periods of pronounced vulnerability toward greater robustness and resilience, while identifying the extent to which this evolution may represent emerging antifragile characteristics.

11. Conclusion

The evolution of India's financial system over the past two decades cannot be adequately described as a simple transition from crisis to recovery. It is better understood as a process of financial deepening, vulnerability accumulation, shock exposure, institutional adjustment, and subsequent strengthening.

The expansion of bank and non-bank financial intermediation supported economic development and widened access to credit, but it simultaneously created new channels through which financial disturbances could spread. The accumulation of stressed assets during the infrastructure-led credit expansion demonstrated the consequences of rapid lending combined with delayed recognition of deterioration. The IL&FS and DHFL episodes subsequently demonstrated how vulnerabilities within non-bank finance could interact with funding markets, investor behaviour, and institutional interconnectedness to produce broader liquidity and credit stress.

The behavioural framework developed in this paper adds an additional layer to this institutional history. Representativeness can help explain how periods of successful credit expansion may reinforce common expectations about future performance. Availability can help explain why salient failures can alter perceptions of risk across an entire category of financial institutions. Anchoring and reference dependence can help explain why historical assessments may persist even when new information points toward deterioration. Prospect Theory, particularly loss aversion, provides a framework for understanding why financial behaviour can become markedly more defensive once positions move below salient reference points.

These behavioural mechanisms should not be interpreted as substitutes for structural explanations. The Indian financial episodes examined in this paper were shaped by funding structures, balance-sheet weaknesses, information asymmetries, governance problems, macroeconomic conditions, and institutional incentives. Behavioural mechanisms become important because they can interact with these structures and influence how rapidly and extensively financial stress is transmitted.

The COVID-19 episode provides a particularly important illustration of this interaction. The pandemic generated an external shock whose scale and macro-financial consequences were difficult to assess using ordinary historical experience. The Black Swan perspective is useful here not because COVID-19 was literally unimaginable, but because it highlights the limitations of models and expectations formed primarily from relatively stable historical relationships. When the underlying environment changes, the uncertainty surrounding the model itself becomes part of the risk-management problem.

India's subsequent policy response demonstrated substantial resilience. Liquidity provision, regulatory intervention, restructuring mechanisms, and other measures helped preserve the functioning of the financial system during an extraordinary economic disruption. The post-2020 period has subsequently been characterised by substantial improvements in bank capitalisation, asset quality, liquidity, and supervisory capacity.

The descriptive evidence presented in this study is consistent with a significant strengthening of India's financial system. Current capital and liquidity buffers are substantially stronger than during the period of pronounced financial fragility, while stress-test results indicate considerable capacity to absorb specified adverse scenarios. These developments provide strong evidence of robustness and increasingly strong evidence of resilience.

The evidence for antifragility, however, requires greater caution.

Antifragility represents a stronger condition than simply surviving a shock. It implies that exposure to stress contributes to an improvement in the system's subsequent capacity. India's financial architecture contains several developments consistent with such institutional learning: the greater recognition of impaired assets, the development of formal resolution mechanisms, bank recapitalisation, stronger supervisory attention to NBFCs, and increasingly sophisticated stress-testing practices.

Yet these developments do not establish that the entire financial system has become antifragile. Funding vulnerabilities remain, financial access continues to vary across regions and borrower groups, institutional incentives can change under pressure, and genuinely novel shocks remain difficult to model. Moreover, distinguishing endogenous institutional learning from improvements generated primarily through external policy support remains an important empirical challenge.

The most defensible conclusion is therefore that India has moved from significant pockets of financial fragility toward a financial system that is substantially more robust and increasingly resilient, while displaying emerging characteristics consistent with institutional antifragility. The evidence does not justify describing the system as fully antifragile.

This distinction is more than semantic. A fragile system is damaged by volatility; a robust system withstands it; a resilient system absorbs it and continues functioning; and an antifragile system uses the information generated by stress to improve its future capacity.

India's experience suggests that the country has travelled considerably along this continuum. The challenge for financial policy is now to ensure that future shocks do not merely leave the system intact but generate improvements in information, incentives, diversification, supervision, and institutional design.

Ultimately, the objective of financial stability policy cannot be to eliminate uncertainty. Uncertainty is inherent to financial systems. The more meaningful objective is to construct institutions that remain functional when uncertainty is high, that limit the transmission of individual failures into systemic crises, and that convert the lessons of past disturbances into greater preparedness for future ones.

The distinction, therefore, is between merely surviving uncertainty and becoming better prepared because of it.

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