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Diagnosis of Bankruptcy as a Phased Process

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ABSTRACT

Corporate bankruptcy can be understood as a phase-based managerial process in which weak signals, together with the informational noise that obscures them, shape the trajectory of organizational degradation long before the actual collapse occurs. This conclusion emerges from shifting the focus of bankruptcy diagnostics away from traditional accounting and financial reporting toward institutional sensitivity. The concept of the phase dynamics of bankruptcy is synthesized from the phenomenology of the discrepancy between declared and actual practices, the assessment of feedback intensity, and the tonal analysis of a company's public communications. The **aim** of this study is to develop a phase model for the early diagnosis of bankruptcy and to determine the threshold of loss of reflexivity, which marks a point of no return for the managerial system. The empirical part of the study includes the reconstruction of pre-crisis bankruptcy profiles of Enron, Long-Term Capital Management, and Barings Bank. Based on qualitative and quantitative analysis of behavioral patterns and public communications using the authors' original indicators, it was established that a stable simultaneous exceedance of their threshold values is accompanied by the contraction of the "window of opportunity" for decision-makers and by an acceleration of escalation dynamics. The **findings** allow a shift in emphasis from reactive to proactive management, thereby reducing the likelihood of an avalanche-like transition to the irreversible phase of crisis.

Keywords: bankruptcy; weak signals; information noise; phase model; feedback; early warning

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"Decisions made without accounting for weak signals are a gamble against the future."

I. Ansoff (Managing Strategic Surprise by Response to Weak Signals, 1975)

INTRODUCTION

"We confuse the appearance of stability with its essence — and are surprised when it is not the weak but the seemingly strong that collapses," wrote Plato [1]. A similar idea is expressed by Nassim Nicholas Taleb: "It is not surprising that the fragile collapses; what is surprising is that what was considered unbreakable collapses," highlighting the unexpected failure of outwardly prosperous companies [2]. A number of scholarly studies suggest that bankruptcies occur not as a result of a single shock, but due to the prolonged accumulation of weak signals that remain unnoticed by stakeholders within the frameworks of prevailing control models [3–6].

Traditionally, the problem of bankruptcy has been examined within the framework of financial and legal diagnostics, based on retrospective analysis of indicators and the *ex post* (Latin: after the event) identification of insolvency. In the present study, however, bankruptcy is interpreted not as a financial collapse, but as a deficit state of the management system, manifested in the gradual loss by the organization of institutional sensitivity, as well as its capacity for adaptation and self-reflection [6, 7].

In this regard, classical insolvency criteria should be supplemented with relevant substantive characteristics [8, 9]:

1. Bankruptcy is not a sudden financial or legal incident, but a phase trajectory of the loss of top management's sensitivity to feedback, compensated by demonstrative masking rhetoric in which weak signals and informational noise function not as peripheral, but as system-forming elements of

organizational dynamics, while the number of available managerial options progressively decreases.

2. The path to bankruptcy begins at the moment when overconfident management, consciously or intuitively, engages in a strategic gamble — going “all in” by making decisions that amplify risk and amount to “betting against reality” [2]. A potential bankrupt entity operates according to an “*all-in*” logic, concentrating all available resources on the implementation of a single business scenario, the outcome of which may be either maximum profit or collapse [10]. Within this logic, the firm intensively expends scarce resources, hoping either to restore them by a certain control date or to extract gains before an audit reveals the discrepancy between declared prosperity and actual conditions, such that the benefits obtained will outweigh potential losses. In such situations, external observers and stakeholders are misled, mistaking a simulation of stability for its reality.

3. An actor on the trajectory toward bankruptcy loses the capacity “to be otherwise”: the leader becomes unable to “play a secondary role,” to recognize the limits of their own competence, or to acknowledge alternative viewpoints [7]. The organization loses its ability to respond to challenges and gradually forfeits financial stability [11]. In this article, bankruptcy is conceptualized as the crossing of a minimally acceptable threshold of managerial sensitivity, at which weak signals are lost within a stream of communicative redundancy, simulated success, and managerial overconfidence — collectively programming an inevitable systemic crisis [6, 7].

4. Weak signals are difficult to incorporate into standard risk registers and to capture in reporting systems. They exist at the boundary between controllability and probability [8] and are therefore often dismissed as informational noise [4].

5. The latter (pre-crisis signals) are of a semantic and behavioral nature [5]. Under conditions of cognitive bias, managers tend to overestimate the significance of emotionally salient events while simultaneously underestimating subtle indicators.

Only a limited number of studies focus on developing systemic methodologies for identifying and interpreting pre-crisis states concealed behind rhetoric of well-being. The principal challenge of early bankruptcy diagnostics lies in detecting weak signals within informational noise. Accordingly, there is a growing need for analytical approaches capable of statistically forecasting financial insolvency, complementing traditional reporting metrics [12–15].

The phase-based model of early bankruptcy diagnostics developed in this study aims, firstly, to refine the concepts of “weak signal” and “informational noise” and, secondly, to empirically validate the proposed phase model using the cases of Enron,¹ LTCM,² and Barings Bank.³

The key objectives of the study are as follows:

- 1) to provide a theoretical substantiation of the phase-based nature of bankruptcy and to develop a diagnostic model that includes the conceptualization of the deficit state, the classification of signal patterns of misalignment, and the formalization of weak signals and informational noise;
- 2) to carry out an empirical validation of the diagnostic model based on cases of corporate crises and to identify indicators of phase transitions.

The practical significance of the study lies in the potential application by the highest bodies of corporate governance of phase-based monitoring as an early warning tool, complementing risk management systems with behavioral and semantic indicators.

¹ Enron — the largest energy trading enterprise in the United States, which collapsed in 2001 due to schemes involving hidden debt and accounting manipulation, resulting in a high-profile bankruptcy and subsequent corporate governance reforms.

² LTCM (Long-Term Capital Management) — a hedge fund founded by Nobel laureates that collapsed in 1998 due to excessive leverage and market instability, requiring intervention by the Federal Reserve to prevent a systemic financial crisis

³ Barings Bank — the oldest British investment bank, which went bankrupt in 1995 as a result of fraudulent trading activities by trader Nick Leeson involving derivatives in Asian markets.

THEORETICAL FOUNDATIONS OF THE STUDY

The study is grounded in several theoretical frameworks: strategic management (weak signals, organizational resilience) [2, 8, 9]; organizational theory (institutional sensitivity) [3, 16, 17]; and behavioral economics (cognitive biases and heuristics of risk perception) [4, 15, 18]. A comparative method and qualitative analysis of open sources were employed to reconstruct the communication patterns underlying the bankruptcies of Enron, Long-Term Capital Management, and Barings Bank.

In the English-language management tradition, the term bankrupt implies not only financial collapse but also the loss of essential qualities or a “complete absence of a necessary attribute.”⁴ Accordingly, bankruptcy may be understood as the loss by an organization of a key element of resilience — its capacity for renewal and response to external challenges — when management ceases to perceive signals from both external and internal environments, ignoring facts that do not align with the chosen strategy [7]. This interpretation brings the concept of bankruptcy closer to the philosophy of alterity developed by Emmanuel Levinas: the system loses sensitivity not only to specific weak signals but to any form of “otherness” — that is, to everything that does not correspond to its self-image [19, 20]. These conclusions are consistent with studies on corporate tone and earnings manipulation, which demonstrate that excessive rhetorical optimism and managerial narcissism systematically reduce the transparency of reporting and the accuracy of weak signal perception [21, 22].

High-Reliability Theory points to the phenomenon of the illusion of stability: in companies with consistently favorable performance, errors may accumulate while being suppressed under the assumption that “everything is fine” [23]. Sustained success fosters complacency and a reluctance to recognize weak signals [6, 19]. As a result, a growing yet reversible gap emerges between declared

and actual conditions — referred to here as a delta state [8].

Historically, bankruptcy diagnostics has been shaped within a financial and legal paradigm in which insolvency is identified through retrospective indicators [6, 24], often overlooking the pre-crisis stages characterized by weak signals of degradation [8].

A phase-based perspective makes it possible to interpret bankruptcy not as a discrete event but as a process of the gradual loss of cognitive and managerial sensitivity by the organization [3, 8]. Within this framework, collapse represents the final stage of institutional degradation.

One of the paradoxical features of the pre-crisis state is not a decline but an intensification of external rhetorical and behavioral activity: the company amplifies communications about leadership and innovation against the backdrop of internal resource depletion [2, 5]. This phenomenon may be defined as rhetorical inversion — the substitution of actual degradation with a narrative of growth [25, 26].

In this study, the concept of “noise” is understood as intensive rhetoric (press releases, advertising campaigns, manifestos, awards and dividends, rankings) devoid of operational substance, employed to mask a deficit state and not reflecting the real dynamics of the organization’s resources [3]. Such noise creates a secondary layer of governance in which the image-driven agenda replaces the actual coordination of processes: the system loses its capacity to “see” its own failures and continues to transmit “signals of strength” despite declining effectiveness [6, 26]. Building on the concept of “noise” developed by Claude Shannon, informational (or model) noise may be defined as a form of signal distortion arising when empirical sensitivity is replaced by a constructed one. This refers to aberrations in managerial perception generated by the system itself, whereby a legitimized belief in the correctness of the model obstructs the perception of reality [24]. As a result, a gap emerges between rhetoric and action — a characteristic symptom of an impending crisis [6].

⁴ Merriam-Webster Dictionary.

RESEARCH METHODOLOGY

Research Design

The study was conducted within a mixed-methods framework, combining: (a) *qualitative analysis* of weak signals in the pre-bankruptcy phase through the examination of discourse, corporate communications, and behavioral patterns; and (b) *quantitative interpretation* of semantic and behavioral deviations using four original indicators: the HR-Index, Tone Gap, NII, and the S-Index. To systematize the observed signals and relate them to typical forms of informational noise, the case study method was employed.

To clarify the logic of the study, it is necessary to distinguish between the terms “weak signal” and “risk”: the former can be observed, interpreted, and responded to managerially, whereas the latter belongs to the domain of probability and represents a hypothetical event. Working with weak signals enhances the organization’s anticipatory capabilities, logically complementing existing risk management systems.

Identification of the Sources of Weak Signals: external channels (market dynamics, regulatory influences, public communications); internal channels (reports, personnel changes, managerial decisions).

Classification of Signals by Content: market-related (price fluctuations, changes in demand, market positioning); operational (disruptions in production or service processes); behavioral (changes in managerial culture and communication patterns); regulatory (compliance with or deviation from regulatory requirements and standards).

Data Sources and Selection Criteria

The study draws on annual and quarterly public reports of companies, as well as materials from auditors and regulators, press releases, and corporate blogs. The analysis covers the period from 1 to 24 months prior to the moment of legal bankruptcy. Primary unstructured data used for case reconstruction, along with supplementary sources, are available in the study’s electronic archive at: [https://docs.](https://docs.google.com/document/d/1YC1VG2aQ7Wd6Xs_IkloFjkX0Ks2UQrOwZBIwf_9k10Y/edit?tab=t.0)

[google.com/document/d/1YC1VG2aQ7Wd6Xs_IkloFjkX0Ks2UQrOwZBIwf_9k10Y/edit?tab=t.0](https://docs.google.com/document/d/1YC1VG2aQ7Wd6Xs_IkloFjkX0Ks2UQrOwZBIwf_9k10Y/edit?tab=t.0).

Case Selection Criteria. The sample includes three canonical cases of corporate collapse — Enron, Long-Term Capital Management, and Barings Bank — which meet the criteria of (i) a *sufficient volume* of documented communications and public reporting prior to bankruptcy, and (ii) the *identifiability* of weak signals observable in both public and internal media environments.

Limitations of the Concept. The concept of management based on weak signals cannot be effectively applied to cases of deliberate fraud, where collapse results from intentional unlawful actions (“bankruptcy for profit” [24]); to cases with an insufficient documentary base for phase reconstruction; or to situations dominated by a single exogenous shock without pre-crisis dynamics (*force majeure*).

The study is retrospective in nature and is subject to historical bias, as the volume and quality of sources vary across cases. Cross-industry differences limit comparability, and threshold values are heuristic. The empirical analysis may also be affected by overlapping external shocks (regulatory, market, macroeconomic). In addition, linguistic and genre-specific features of sources may influence tone and density metrics.

Procedure for Matching Signals and Noise

The methodology is based on a phase-oriented approach to the analysis of pre-bankruptcy states and comprises four steps:

1. Identification of signal phases — for each case, a retrospective sequence of transitions from the early delta state to collapse is established.
2. Classification of weak signals — signals are categorized into four types: market-related [3, 4], operational [7, 8, 23], behavioral [5, 21], and regulatory [3, 14, 16, 22].
3. Mapping of “noise” forms — signals are matched with masking mechanisms, including rhetorical [3, 4, 6], model-based [4, 24, 26], cult-like [21, 26], and PR-driven expansion [2, 4, 15, 26].
4. Cross-phase and cross-case comparison — a signal profile is constructed for each organization,

identifying the phase and the intensity of noise at which managerial sensitivity is lost.

Synthesis of Bankruptcy Phases

The phase-based model of bankruptcy, grounded in the analysis of weak signals, is developed as a methodological bridge that connects the gap between the actual emergence of problems and their recognition. If the onset of crisis is understood as the organization's loss of sensitivity to its own dysfunctions, then the central managerial task becomes their early detection, enabling either normalization of the situation or mitigation of negative consequences. The pre-crisis period may last for months or even years, encompassing four successive informational phases:

Ph1 — Loss of sensitivity (weakening of feedback, emergence of initial weak signals);

Ph2 — Rhetorical compensation (thematic imbalance, tonal overheating, rituals of recognition);

Ph3 — Structural rupture (growing “promise–reality” delta, operational disruptions);

Ph4 — Legal recognition of insolvency.

Formalization: Signals and Noise

Weak signals manifest in behavioral patterns, communication disruptions, and managerial decisions, often embedded in indirect and barely perceptible information: a critical customer review, the departure of a key employee, unusual managerial rhetoric, or episodic evidence of internal organizational tension. These signals are difficult to detect against a background of strategic “bravado,” which can easily be mistaken for indicators of success [4, 14, 15]. Many companies that eventually went bankrupt displayed outward signs of prosperity prior to collapse — market leadership, high ratings, and public approval [3, 9]. The strategy of “fake it till you make it” may, under conditions of simulated success, transform into “fake it till you break it”, ultimately leading to systemic failure.

In accordance with the concept of strategic sensitivity proposed by Igor Ansoff, two types of weak signals can be distinguished [9]:

(a) Input signals — impulses received by the system from the external environment. These indicate potential changes in demand, technology,

regulation, or competitive structure. They manifest through the monitoring of micro-shifts in customer behavior, competitor positioning, regulatory dynamics, as well as tonal changes in the media. Input signals are typically primary in Ph1 (the delta state); their neglect contributes to the transition to Ph2 (noise-based compensation).

(b) Output signals — signals generated and transmitted by the organization itself. These are interpreted by external stakeholders as indicators of its condition. They can be formalized through the observation of personnel and financial micro-shifts and their public representation (e.g., the departure of key specialists, extended settlement periods, an atypical surge in press releases in the absence of substantive developments). Output signals intensify in Ph2, while in Ph3 they no longer enter feedback loops, reflecting a loss of reflexivity.

Within sensemaking theory as developed by Karl Weick, an organization does not merely respond to environmental signals but actively constructs elements of that environment through its interpretations and actions [3, 12]. From a cognitive perspective, Daniel Kahneman and Nate Silver point to a “feedback loop” effect, whereby an organization, by generating signals, alters the environment, which in turn produces new signals that amplify or distort the original impulse [4, 5].

The signal paradox lies in the fact that, as bankruptcy approaches, public rhetoric becomes increasingly optimistic and demonstrative: rather than declining, informational activity intensifies — companies expand communications about success, masking warning signals and refusing to acknowledge problems [15, 22]. Comparative case analysis confirms this pattern: peaks in external media activity tend to coincide with phases of operational stagnation or the onset of decline [12, 14].

Systemic Limitations of Traditional Bankruptcy Diagnostic Models

Widely used bankruptcy risk assessment models — such as the Altman Z-score,⁵ Moody's KMV

⁵ Z-score — a discriminant model developed by Edward Altman (1968) that estimates the probability of corporate bankruptcy based on financial ratios.

model,⁶ and rating methodologies of S&P Global⁷ — exhibit several limitations that prevent the full realization of early warning system potential. These limitations have a dual nature: some stem from the retrospective character of financial analysis, while others arise from cognitive and organizational processes.

Ex post nature of data. These models rely on official reporting that captures events only after they have occurred and thus signal problems primarily at the final stage (Ph4), when the situation is already irreversible. They are unable to detect earlier phases (Ph1, Ph2) [5, 7]. Even when highly accurate, financial statements often fail to reflect latent processes of degradation and merely record the past [6]; the accumulation of concealed

⁶ Moody's KMV (named after its developers — Stephen Kealhofer, John McQuown, Oldřich Vasicek) — a credit risk assessment model (Kealhofer–McQuown–Vasicek) based on the market value of a firm's assets and its probability of default.

⁷ Standard & Poor's (S&P) — a rating system developed by the international agency, based on the assessment of default probability.

negative information alongside optimistic rhetoric increases the risk of sudden crises [22].

Neglect of the semantic and behavioral context. Early indicators of insolvency that are non-financial in nature remain outside the scope of these models: the character of corporate communications, the tone of managerial discourse, turnover among key personnel, the degradation of internal feedback mechanisms, and the simulation of innovative activity [4, 6, 8].

The "institutional icon" effect. A high credit rating or the status of a "market leader" generates a priori trust among regulators and investors. This creates a blind spot in which warning signals are dismissed as statistical noise or temporary difficulties faced by an entity perceived as "too big to fail." Oversight systems become less sensitive precisely where risk is assumed to be minimal [2, 3, 15].

Coherence heuristic and cognitive biases. Actors operating under a belief in their own infallibility tend to subconsciously reject information that

Table 1

Phase Model of Pre-Crisis Organizational Development

Phase Attribute	Ph1. Noise / Early Delta-Condition)	Ph2. Signal / Noise Compensation	Ph3. Indicator / Loss of Reflexivity	Ph4. Crisis / Accelerated Collapse
Signal	Chaotic, statistically imperceptible deviations in indicators and narratives, attributed to seasonality or randomness	Persistent deviations indicating structural malfunction	Accumulation of degradation; increased frequency of negative events	Sharp increase in amplitude and frequency of negative indicators; cascade of legal and financial triggers
Noise	Background information flows	Increasing PR activity: declarations of "breakthroughs," intensification of media agenda; rhetorical compensation	Narrowing of feedback channels; institutional deafness; rhetoric of "success" ignores operational realities	Image-making practices lose relevance; formal declaration of bankruptcy occurs
Consequences	Deviations are still reversible	The window of opportunity remains open but is narrowing; noise blocks signal recognition and pushes the system toward Ph3	Communications accelerate irreversible processes and increase noise without addressing root causes	Event dynamics become avalanche-like; external communications act as a catalyst of final collapse
Operational status of phases	Observability (Ph1)	Intervention (Ph2)	Partial irreversibility (Ph3)	Liquidation decisions (Ph4)
Interpretation	Monitoring and verification of alternative explanations for identified signals	Elimination of root causes (processes, structure, resources) rather than escalation of PR activity	Loss of feedback; PR measures are acceptable only as accompaniment to deep restructuring	Liquidation procedures; external rhetoric is minimal

Source: compiled by authors.

contradicts their established worldview [3]. Weak signals that do not fit the dominant narrative of success are dismissed as insignificant anomalies. In organizations with a long history of success, complacency tends to develop [6, 23].

Organizational defensive routines. Corporate cultures may develop mechanisms that protect the status quo and collective identity from uncomfortable truths (e.g., punishment for “bad news”) [12]. As a result, weak signals are not merely ignored but are actively suppressed at the institutional level.

“All-in” strategy and rational neglect. A crisis-stricken company may consciously bet on the possibility that the market will collapse before it does, or that the regulatory environment will change [13]. Under such conditions, acknowledging weak signals becomes counterproductive, as it interferes with a high-risk “survival game”: management, operating on an “all-in” principle, has a rational incentive to ignore early warning signs of collapse.

Both types of limitations reinforce one another. Financial models fail to capture intangible indicators, while cognitive biases prevent managers from correctly interpreting available data. This underscores the need for an additional diagnostic framework integrating both quantitative and qualitative parameters.

Indicators and Metrics

For the purposes of this study, the authors introduce a set of indices:

The HR Turbulence Index (HR-Index) is a normalized measure of turnover among key personnel: a weighted ratio of departures/rotations in critical roles to average headcount, with monthly smoothing applied.

The Rhetorical Tone Gap (Tone Gap) refers to the discrepancy between the tone of external communications and operational dynamics. It is calculated as a differential (or ratio) between the positivity of rhetoric and the actual changes in KPIs/risks over comparable periods.

The Noise Inflation Index (NII) measures the excessiveness of external communications across three dimensions: intensity (frequency of messages over a given period), scale (amplification strength, i.e., media mentions), and reach (breadth of audience and communication channels). The index assesses the extent to which communicative activity outpaces actual operational dynamics.

The Signal Index (S-Index) is an aggregated metric of the semantic sensitivity of managerial discourse, measuring the density of predicative deviations between normative and reporting vocabularies across five types of transformation: reduction, inversion, cyclicity, level shift, and substitution.

Based on these indicators, a coding scheme is constructed that enables the mapping of weak signals to archetypes of masking noise – stable forms of informational distortion that conceal weak signals beneath an appearance of normality.

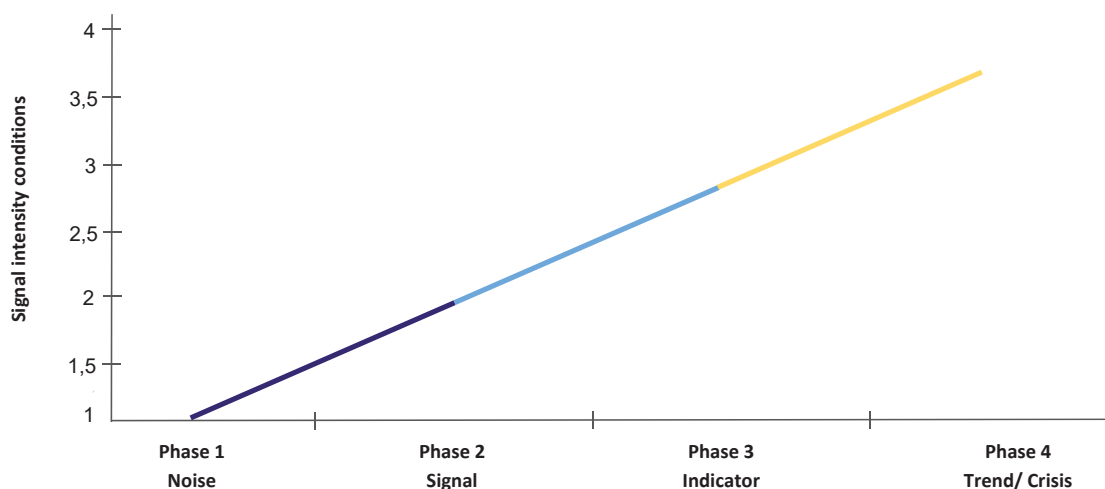


Fig. 1. Escalation of a Weak Signal within the Information Flow of a Pre-Bankruptcy State

Source: compiled by authors.

Phase Model

Within the framework of the phase model, the organization's transition from local deviations to bankruptcy is conceptualized as a four-stage process. The characteristics of these stages are systematized in *Table 1*.

The data in *Table 1* allow for the following conclusion to be made: the greatest effect of managerial interventions is achieved prior to the transition from Ph2 to Ph3; beyond this point, the endogenous rate of deterioration increases, thereby narrowing the space for decision-making.

RESEARCH RESULTS: PHASE PROFILES OF BANKRUPTCIES

The analysis of the Enron, LTCM, and Barings cases confirms the applicability of the phase model ("noise → signal → indicator/trend → crisis") and its diagnostic value for the early detection of failure trajectories. The focus is on the pre-crisis interval, which contains a window of opportunity for managerial action.

The comparative case analysis reveals a stable sequence of pre-crisis dynamics: personnel turbulence (increase in the HR Index); divergence between positive rhetoric and operational facts (widening of the Tone Gap); and inflation of PR activity relative to actual events (increase in the NII). The

joint exceeding of these thresholds marks entry into Ph3, when weak signals are no longer absorbed by noise and become consolidated as an indicative trend. This moment can be defined as a "point of no return," where further expansion of communications without structural correction accelerates the transition to Ph4 [13, 15, 22]. Consequently, the HR Index, Tone Gap, and NII constitute a sufficient monitoring framework for pre-crisis conditions and provide a key to diagnosing the managerial window of opportunity between Ph2 and Ph3.

Diagnostic Dimensions: Phase Dynamics and the "Phase × Noise Archetype" Matrix

When examining the indicators and, subsequently, the integrated picture of escalation, it is necessary to analyze phase dynamics — i.e., the rate and sequence of transitions between system states — in conjunction with the "phase × noise archetype" matrix, which captures the distribution of masking practices that shape these transitions.

Figure 1 illustrates how the system moves from background fluctuations (Ph1) to persistent deviations (Ph2), then to an indicator-based trend (Ph3), and finally to crisis dynamics (Ph4). The critical interval is the Ph2 → Ph3 transition, where the signal-to-noise ratio becomes sufficient for reliable diagnosis while the consequences remain reversible.

Phase/ Archetyp	Rhetorical compensation	Model M=Noise	Cult of Personality	PR Expansion	Digital Mist
Phase 1 Noise	0,125	0,200	0,000	0,000	0,000
Phase 2 Signal	1,000	1,000	0,000	1,000	0,857
Phase 3 Indicator	0,625	0,800	1,000	0,714	1,000
Phase 4 Trend/ Crisis	0,000	0,000	0,222	0,143	0,143

Fig. 2. "Phase×Noise Archetype" Matrix

Source: compiled by authors.

Table 2

Phase Reconstruction of Bankruptcy in the Examined Cases

Parameter	Enron	LTCM	Barings Bank
Type of signal	Market-based	Market-based	Behavioral
Form of noise	Rhetorical compensation (inversion)	Model-based (intellectual) noise; overreliance on strategy	Cult of personality ("trading genius," institutional status of the bank)
Duration of Ph2–Ph3	~18 months	~1–2 months (minimal; effectively a direct Ph1 → Ph4 trajectory)	~12 months
Key delta (delta-state)	Gap between innovation narrative and degradation of the operational model	Gap between model logic and real market volatility	Trust in an individual despite warning indicators
Behavioral deviation	External expansion amid internal signs of crisis; aggressive public discourse until collapse	Analytical euphoria and model faith suppressed institutional sensitivity	Institutional blindness and refusal of control; organizational self-deception
Weak signal	Derived from predicative deviations in strategic and reporting texts prior to collapse	Market instability linked to the emerging markets crisis	Behavioral anomalies related to trading positions and accumulated hidden losses
Noise	Highly intensive but low-informational or misleading public communications	Dominance of model-driven rhetoric ("intellectual leadership") and overconfidence in formalized models	Internal organizational mythology: cult of the trader's personality, belief in "genius" and in the bank's legacy; masking of warning indicators
Outcome	Rapid bankruptcy (2001), criminal proceedings, loss of investor confidence	Fund collapse (1998), emergency Federal Reserve intervention, reputational damage	Losses of \$ 1.3 billion, bank collapse (1995), sale to ING for £1

Source: compiled by authors.

The data in Fig. 1 are presented as a model sequence representing the phased escalation of a weak signal in pre-bankruptcy development. The colored segments reflect shifts in the quality of perception: purple (Ph1 → Ph2) indicates the transition from noise to signal; blue (Ph2 → Ph3) represents the conversion of a signal into a statistically stable indicator; and yellow (Ph3 → Ph4) denotes the transformation of the indicator into a trend and an irreversible crisis trajectory. Signal intensity is a normalized variable (scale 1–4) aggregating the frequency and amplitude of indicators within each phase. The graph clearly demonstrates that weak signals are not static; rather, they evolve across phases, progressively accumulating intensity and reshaping the organization's managerial sensitivity contour.

Figure 2 presents the topography of noise archetypes. At the stage of false stability (Ph2), rhetorical compensation and PR expansion dom-

inate, whereas at the stage of loss of feedback (Ph3), informational (model) noise and the "cult of personality" become more pronounced.

For comparability, the data are based on normalized expert assessments of the manifestation of noise archetypes across the phases of the crisis process. For each phase, the intensity of each archetype was measured on a scale from 0 to 1. The values in the matrix cells reflect the normalized intensity of the corresponding noise archetype in corporate communications, calculated as the ratio of the number of observed markers in each phase of the signal cycle to the maximum value of that archetype within the case. Threshold levels are defined using a tercile-based interpretation: 0–0.33 indicates low intensity, 0.34–0.66 medium intensity, and 0.67–1.00 high intensity. The purpose of the matrix is to demonstrate how different forms of informational noise accumulate and dominate at different stages of

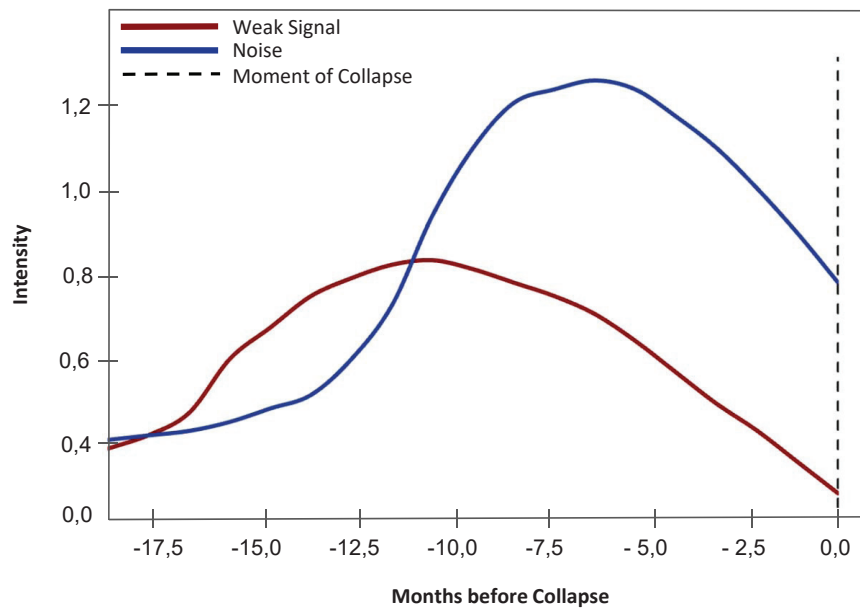


Fig. 3. Signal-Noise Profile of Enron in Pre-bankruptcy Development (1999–2001)

Source: compiled by authors.

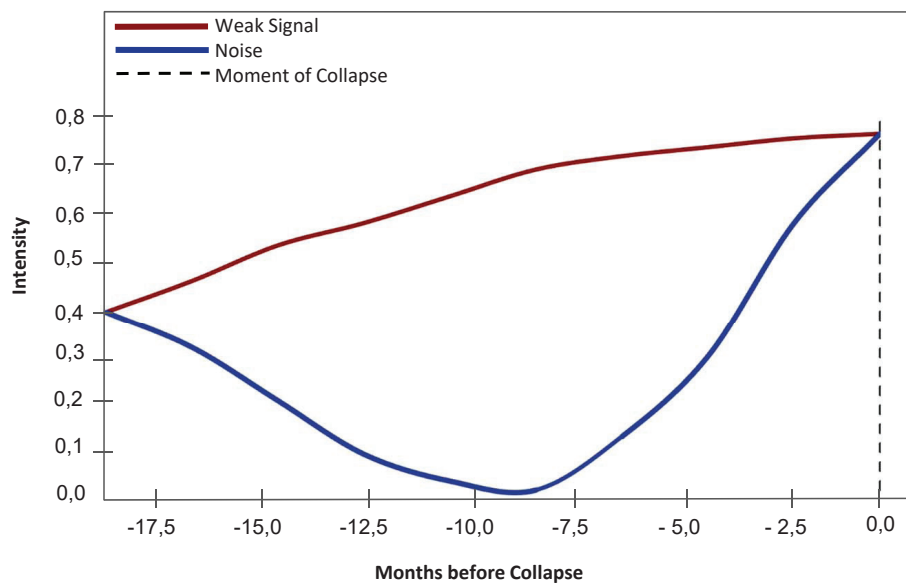


Fig. 4. Signal-Noise Profile of LTCM: Contraction of the Pre-Crisis Window (1997–1998)

Source: compiled by authors.

organizational degradation, thereby masking weak signals.

The combination of the phase curve (Fig. 1) and the noise matrix forms a diagnostic surface that enables the localization of the moment of system-state transition and the identification of the masking practices that facilitate it.

Case Comparison: Signal and Noise Dynamics

The comparison of normalized series across cases reveals a stable sequence: an increase in

the HR Index typically precedes or coincides with a widening of the Tone Gap, followed by a rise in the NII. This sequence forms a corridor of decreasing reflexivity along which the system accelerates toward the phase of loss of feedback (Table 2).

Enron: Market Signal and Rhetorical Inversion

In the 18 months preceding the collapse, a high rate of rhetorical expansion was sustained: weekly press releases highlighting “innovation,”

intensive engagement with analysts, and the amplification of a positive media environment. Outgoing market signals (spreads between derivative prices and physical delivery, cash flow gaps) were systematically ignored. The transition into Ph3 was accompanied by a complete loss of feedback mechanisms, which accelerated the collapse (*Figure 3*).

In *Figure 3*, the red line representing the weak signal (S-index) initially remains at a low level and then gradually increases. Approximately 18 months prior to the company's collapse, it is overtaken by noise (NII), represented by the blue line. At the intersection point, noise exceeds the signal, marking the Ph2 → Ph3 threshold, after which the company loses sensitivity to feedback. Until the moment of bankruptcy, noise continues to intensify while the weak signal declines.

The X-axis represents time in months to collapse ($t = 0$); the vertical dashed line indicates the official declaration of Enron's bankruptcy in December 2001.

This case demonstrates that prolonged false stability was accompanied by rhetorical expansion and growing PR activity, alongside the deterioration of cash flows and personnel stability. The point of

intersection between the curves (*Fig. 3*) represents a point of no return, after which large-scale communication efforts paradoxically accelerated the collapse, which materialized in December 2001.

LTCM (Market Signal / Model-Based Noise)

The LTCM case reflects a direct transition from Ph1 to Ph4: model-based noise displaced signals of instability in emerging markets, leading to a rapid devaluation of portfolio value and necessitating emergency intervention by the U.S. Federal Reserve [26]. A dynamic visualization of LTCM's collapse trajectory is presented in *Fig. 4*.

The LTCM profile demonstrates a very short false-stability phase — less than two months. The weak signal (market instability) remains near zero for most of the period and begins to rise sharply only 6–7 months prior to bankruptcy. Noise is initially high and consistently dominates the signal throughout the entire trajectory.

Noise remains above the signal until $t = 0$ — the moment of the fund's collapse and the emergency intervention of the U.S. Federal Reserve in September 1998, represented on the graph by a dashed vertical line.

LTCM represents an extreme case of intellectual noise: dogmatic confidence in the universality

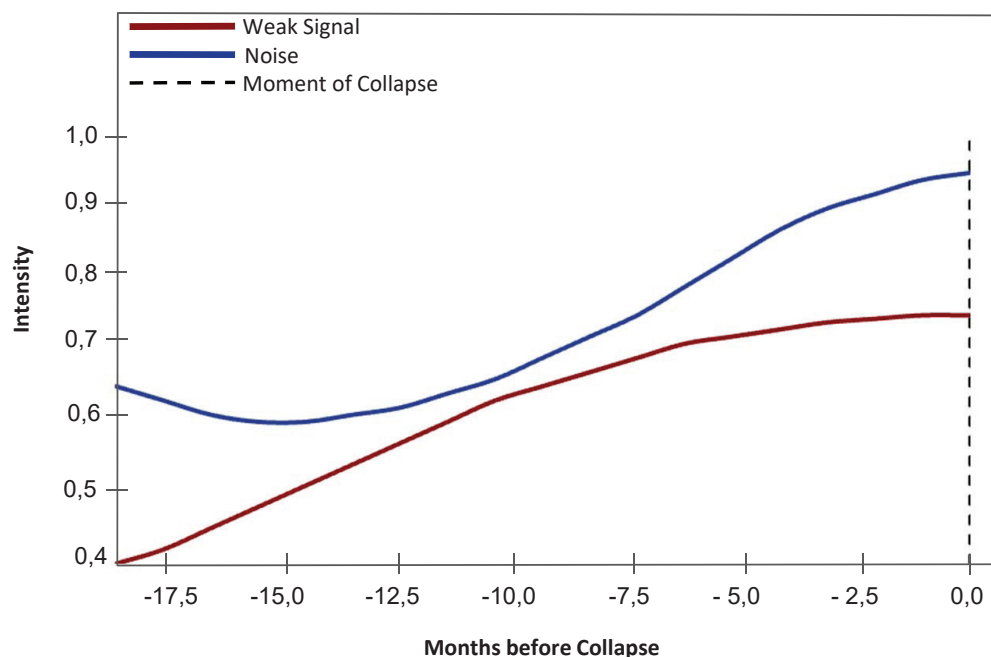


Fig. 5. Signal-Noise Profile of Barings Bank: Cult of Personality and Loss of Control (1994–1995)

Source: compiled by authors.

of a mathematical “risk-free arbitrage” model led to the suppression of weak market signals.

Barings Bank (Behavioral Signal / Cult-of-Personality Noise)

This case is characterized by the dominance of an internal behavioral signal – abnormal positions in Japanese Nikkei 225 futures markets – and a “cult of personality” (the absolutization of the authority of the “trading genius” Nick Leeson), which disabled control mechanisms. The Ph3 stage lasted approximately one year, after which collapse followed. The dynamics of declining managerial sensitivity are reflected in the signal and noise curves (Fig. 5).

The Barings Bank profile is characterized by the dominance of internal noise over a weak signal, which gradually increases over approximately 12 months prior to collapse. Noise remains at a high level from the beginning of the period and increases slightly toward its end. The crisis materializes under conditions of dominant noise: the signal approaches it closely but does not manage to exceed it. The dashed vertical line ($t = 0$) corresponds to the moment of disclosure of losses amounting to £827 million in February 1995, after which Barings Bank collapsed. The X-axis represents time in months prior to the collapse.

The Barings Bank case demonstrates how internal mythology can block institutional feedback mechanisms. Despite the growth of behavioral signals (abnormal trading positions), these were interpreted as confirmation of exceptional performance rather than as a threat. This phenomenon of the “cult of personality” aligns with findings on the tendency of narcissistic leaders to manipulate profit indicators and suppress weak signals [21].

Typology of Signal–Noise Interaction Archetypes

The analysis of the cases shows that weak signals and the informational noise masking them do not merely evolve independently but form stable archetypal interaction trajectories reflecting the degree of managerial sensitivity of the system. Despite institutional differences, the evolution of pre-crisis states converges into three fundamental types of signal–noise behav-

ior: convergence, direct divergence, and inverse divergence.

1. Convergence (signal–noise convergence)

Convergence refers to situations in which a weak signal gradually gains statistical stability and approaches the level of noise, which remains persistently high. This behavior reflects a critical loss of feedback: the system still retains the potential for managerial intervention, but the signal is no longer suppressed by rhetorical compensation. The Barings Bank case exemplifies this pattern: the behavioral signal reaches visibility only at the moment when cult-driven noise already dominates. The system recognizes the signal too late.

2. Direct divergence (noise outpacing signal)

Direct divergence describes cases in which the growth of communication activity and narratives of success outpace the emergence of warning indicators. External stability increases while internal dynamics deteriorate. The Enron case illustrates this pattern: the NII consistently exceeds the S-index 12–18 months before collapse, producing a prolonged phase of false stability.

3. Inverse divergence (signal outpacing noise, but too late)

Inverse divergence occurs when the signal briefly breaks through the noise barrier and becomes visible; however, the phase transition is so rapid that the system cannot respond in time. The LTCM case is typical: formal divergence is minimal, and the signal emerges abruptly against a background of dominant model-based noise, leading to a direct Ph1 → Ph4 transition.

Each archetype generates a specific “noise dome,” which either suppresses signals (direct divergence), delays their visibility (convergence), or entirely blocks feedback until systemic collapse (inverse divergence).

CONCLUSION

The conducted study confirms that corporate bankruptcy is a phase-based process of progressive loss of managerial sensitivity, in which the trajectory of degradation is determined by the in-

teraction between weak signals and the informational noise that masks them. In the cases examined, the latter is characterized by a stable “wishful thinking” pattern [25]. Informational oversaturation during the pre-crisis phase reduces the visibility of real problems: the louder the rhetoric becomes, the less distinguishable weak signals are. This finding highlights the central premise of the study: the problem is not the absence of signals, but failures in their interpretation.

Empirical validation of the framework using the Enron, LTCM, and Barings cases demonstrates the recurrence of the Ph2 → Ph3 threshold as a point of feedback loss: beyond this transition, communication measures cease to perform a corrective function and instead accelerate escalation, whereas prior to it, a managerial window for effective intervention remains available.

The objective set by the authors has been achieved: bankruptcy has been formalized as a multi-stage trajectory of institutional degradation; signal patterns have been typologized

and mapped to informational noise archetypes; and an indicator framework has been developed that enables quantitative identification of the phase of sensitivity loss. Reconstruction of signal–noise profiles has allowed the localization of the “point of no return” precisely at the Ph2 → Ph3 transition, confirming the universality of this threshold [15, 22].

The practical implication is the necessity of monitoring the growth of weak signals and noise and initiating crisis intervention prior to the Ph2 → Ph3 transition. The authors propose incorporating the S-index and NII into board-level monitoring systems and calibrating covenants based on the simultaneous growth of all indicators over multiple monitoring periods. The use of these indicators transforms early diagnosis into a structured managerial procedure with defined activation conditions and establishes a framework for anticipatory governance, thereby reducing the likelihood of an avalanche-like transition into the final crisis phase.

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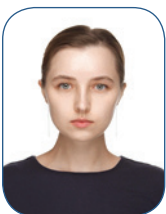


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