

Paper title

Detecting Business-Cycle Phases in Firm-Level Market Data

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Brief overview of the research

Firms make technology investments whose returns arrive only after years of building complementary intangible capital, so the payoff depends on where the firm is in the business cycle when it invests. This study builds a two-stage framework to place an individual firm in its cycle. Stage One treats Expansion, Peak, Contraction, and Trough (anchored to the NBER chronology and its six inflection points from 1996 to 2026) as a classification target. It uses daily equity prices, 44 technical indicators, and 56 MarketPsych news and social-media sentiment indices for 74 S&P 500 IT and communication-services firms, and compares five classifiers: Decision Tree, Random Forest, 1D CNN, LSTM, and the Chronos-2 foundation model. A Random Forest detects phases almost perfectly within the cycles it was trained on (macro-F1 = 0.975). When it is tested in a later cycle, macro-F1 falls to 0.379, which is a clear case of concept drift at the turning points. Sentiment data do not improve out-of-sample detection, and IT-specific sentiment topics do worse than generic emotional ones. Stage Two links phases to Compustat outcomes using firm fixed-effects regressions, a difference-in-differences design around trough years, and a re-estimation with the firm-level detected phases. Downturn phases go with significantly lower ROA, operating ROA, sales growth, and Tobin's Q. Contrary to absorptive-capacity theory, R&D intensity does not cushion the decline; the downturn penalty is actually larger for R&D-intensive firms.

Why this research matters

Record AI investment and circular financing among the largest technology firms make the timing of IT investment a first-order strategic question. However, official business-cycle dating is aggregate and published with long lags. By making cycle phase a firm-level, near-real-time construct, the study gives managers a decision input for timing capital expenditure, hiring, R&D, and acquisitions. It also tells them which data matter: a firm's own price-based technical indicators carry most of the signal, while costly sentiment feeds add little. Equally important, the study measures the limits of such a signal. Detection is reliable within a cycle but breaks down at the inflection points where decisions matter most, so any monitoring tool needs to be recalibrated each cycle rather than deployed once. Finally, the finding that R&D intensity reflects operating rigidity and growth exposure in downturns, rather than adaptive resilience, challenges a common assumption in the IT business value literature.