TRACE MARKETS — ALGORITHM & FORMULA REFERENCE

Single source of truth for all logic, formulas, thresholds, and reasoning used inside TRACE MARKETS.

This document describes WHAT we compute and WHY — independent of code.

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1. DATA QUALITY LAYER

1.1 Coverage Score

Inputs: - Years available in processed financial tables - Expected years (default = 6)

Formula:

coverage_ratio = available_years / expected_years

Output: - available_years - expected_years - coverage_ratio - years[]

1.2 Freshness Score

Input: - years[] (strings like YYYY-MM-DD)

Steps: 1. Extract latest year 2. Convert to date (March 31 of that year) 3. age_days = today - latest_date

Thresholds: - age_days <= 180 → GOOD - age_days <= 365 → STALE - else → OLD

1.3 Confidence Band

Rules: - If coverage_ratio < 0.4 → LOW - Else if freshness == OLD → LOW - Else if coverage_ratio < 0.7 → MEDIUM - Else → HIGH

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2. FRAUD FLAGS

2.1 Profit vs Cash Mismatch

If: - Net Profit > 0 - Operating Cash Flow < 0

Flag raised

2.2 Receivables Growth

If: receivables_growth_pct > 30

Flag raised

2.3 Related Party Transactions

If: related_party_txn_pct > 10

Flag raised

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3. GOVERNANCE ENGINES

3.1 Earnings Quality Engine

Data: - Net Income series - Operating Cash Flow series

Logic: Count years where: Net Income > 0 AND CFO < 0

Result: - 0 years → CLEAN (LOW) - 1 year → MINOR_MISMATCH (MEDIUM) - >=2 years → REPEATED_MISMATCH (HIGH)

3.2 Unusual Items Persistence

Search financial rows containing keywords: - unusual - special - write off - restructuring

Count years where value != 0

Result: - 0 years → NONE (LOW) - 1 year → ONE_TIME (MEDIUM) - >=2 years → PERSISTENT (HIGH)

3.3 Tax Rate Volatility

Extract Tax Rate series

Compute: spread = max(rate) - min(rate)

Thresholds: - spread < 0.05 → STABLE (LOW) - spread < 0.15 → MODERATE (MEDIUM) - else → VOLATILE (HIGH)

3.4 Capital Allocation Discipline

Data: - Free Cash Flow - Repayment of Debt

For each year: If FCF > 0 AND Debt Repayment > 0 → bad year

Result: - 0 bad years → DISCIPLINED (LOW) - 1 bad year → QUESTIONABLE (MEDIUM) - >=2 → POOR (HIGH)

3.5 Balance Sheet Stress

Data: - Total Debt - EBITDA

Compute change: ΔDebt = latest_debt - oldest_debt ΔEBITDA = latest_ebitda - oldest_ebitda

Result: - ΔDebt <= 0 → STABLE (LOW) - ΔDebt > 0 AND ΔEBITDA > 0 → MANAGED (MEDIUM) - ΔDebt > 0 AND ΔEBITDA <= 0 → STRESSED (HIGH)

3.6 GOVERNANCE SCORE

Risk → Points: - LOW = 0 - MEDIUM = 2 - HIGH = 5 - UNKNOWN = 1

score = 100 - (sum(points) / (engines * 5)) * 100

Bands: - >=75 → LOW - >=50 → MEDIUM - <50 → HIGH

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4. STABILITY (LONG TERM QUALITY)

4.1 Median ROE

median = median(ROE values)

Thresholds: - >=18% → EXCELLENT (LOW) - >=12% → GOOD (LOW) - >=8% → AVERAGE (MEDIUM) - <8% → WEAK (HIGH)

4.2 Median Operating Margin

median = median(margin values)

Thresholds: - >=25% → EXCELLENT (LOW) - >=15% → GOOD (LOW) - >=8% → AVERAGE (MEDIUM) - <8% → WEAK (HIGH)

4.3 Revenue CAGR

CAGR = (End / Start)^(1/n) - 1

Thresholds: - >=12% → STRONG (LOW) - >=5% → MODERATE (LOW) - >=0% → WEAK (MEDIUM) - <0 → DECLINING (HIGH)

4.4 FCF CAGR

Same formula as Revenue CAGR Same thresholds

4.5 Consistency (Variance)

Compute standard deviation: - ROE std - Operating Margin std

If std > 0.05 → volatile

Result: - none volatile → CONSISTENT (LOW) - one volatile → MODERATE (MEDIUM) - both volatile → VOLATILE (HIGH)

4.6 STABILITY SCORE

Same scoring as governance

Bands: - >=75 → STRONG - >=50 → AVERAGE - <50 → WEAK

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5. VALUATION SANITY

Metrics: - PE Ratio - PB Ratio - FCF Yield

Bad conditions: - PE > 40 - PB > 8 - FCF Yield < 2%

Result: - 0 bad → REASONABLE (LOW) - 1 bad → RICH (MEDIUM) - >=2 bad → EXPENSIVE (HIGH)

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6. MASTER SCORE

Inputs: - Governance Score (G) - Stability Score (S) - Valuation Risk → converted score

Valuation mapping: - LOW → 80 - MEDIUM → 60 - HIGH → 30 - UNKNOWN → 50

Formula:

Master Score = (0.4 * G) + (0.4 * S) + (0.2 * V)

Bands: - >=75 → ELITE - >=60 → GOOD - >=45 → AVERAGE - <45 → POOR

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7. DECISION ZONES

Based primarily on conviction + risk:

- ELITE + LOW RISK → ACCUMULATE
- GOOD + LOW/MEDIUM → HOLD
- AVERAGE → REDUCE
- POOR or HIGH RISK → EXIT

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8. DESIGN PHILOSOPHY

- Multi-year > Single-year
- Cash > Profit
- Trends > Points
- Explainable > Optimized
- Conservative thresholds

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