PRD: Distribution Detection Rules (Math, Mirror & Inversion)

Product: Terminal.AI
Feature: Distribution Detection Engine
Layer: Market Structure (feeds Decision Matrix)
Phase: Formalization / Expansion
Status: Ready for Design Review

---

1. Purpose & Positioning

This document formalizes **Distribution** as a first-class market structure, designed as a **mirror + inversion** of Accumulation logic.

Key Principle

> Distribution is **not bearishness**.
> Distribution is *supply dominance during price compression after an advance*.

The system must remain: - Conservative - Non-predictive - Override-aware (Failed Breakout > Distribution)

---

2. Structural Definition (First Principles)

Distribution is defined as:

> Sustained price compression following an advance, characterized by repeated supply rejection and lack of upside acceptance.

It is a **risk regime**, not a short signal.

---

3. Eligibility Preconditions (Critical)

Distribution **can only be evaluated if ALL are true**:

1. **Prior Advance Exists**
2. Price $\geq$ **+20%** over the last 60–120 candles

3. OR higher-high / higher-low structure confirmed

4. **Price Above Long-Term Mean**

5. Price ≥ **200 SMA** OR recently reverted from it upward

If preconditions fail → **Reject Distribution**, evaluate Accumulation / Neutral instead.

---

4. Evaluation Window

Parameter	Value	Rationale
Lookback window	20–40 candles	Symmetry with accumulation
Minimum zone length	8 candles	Noise rejection
Maximum zone length	25 candles	Beyond this = regime shift

---

5. Core Metrics (Mirror + Inversion)

5.1 Price Compression (Required)

Same as Accumulation

```
compression_pct = (zone_high – zone_low) / zone_mid
```

Thresholds: - Ideal: ≤ **4.0%** - Acceptable: ≤ **5.0%** (confidence downgrade)

5.2 Time Spent (Required)

```
8 ≤ number_of_candles ≤ 25
```

5.3 Volume Behavior (Inverted)

Key difference from accumulation

Conditions: - avg_zone_volume ≥ **80%** of avg_prior_volume
- **Expansion on down candles** OR distributional spikes

Reject if: - Volume collapses uniformly (suggests pause, not distribution)

5.4 Wick Dominance (Inverted)

Metric:

```
upper_wick_ratio = upper_wick_length / candle_range
```

Conditions: - ≥ 2 candles with upper_wick_ratio ≥ **0.35** - Preferably near zone high

This indicates **supply rejection**.

5.5 Close Location Bias (Inverted)

Metric:

```
close_position = (close - low) / (high - low)
```

Conditions: - Majority of closes ≤ **0.55**
- Frequent closes below mid-range

Reject if: - Strong closes near highs (suggests absorption, not supply)

---

6. Explicit Rejection Filters

Distribution **must be rejected** if ANY occur:

1. Sustained upside acceptance above zone high
2. Strong volume expansion on up candles
3. Qualified breakout attempt with acceptance
4. Absence of upper-wick rejection

If rejected → defer to **Neutral** or **Accumulation** via matrix.

---

7. Confidence Scoring (Mirror Model)

Condition Met	Points
Compression ≤ 4%	+2
Time window valid	+1

Condition Met	Points
Volume distribution	+2
Upper-wick dominance	+1
Close bias below mid	+1

Total: 7 points

Confidence Mapping

Points	Confidence
6–7	High
4–5	Medium
3	Low
< 3	Reject

8. Output Contract

```
{
  "state": "DISTRIBUTION",
  "confidence": "Medium",
  "summary": "Price is compressing after an advance with repeated supply
rejection.",
  "metrics": {
    "compression_pct": 0.041,
    "duration": 11,
    "volume_ratio": 0.88
  }
}
```

9. Pseudocode (Deterministic MVP)

```
if (failedBreakoutDetected) return NEUTRAL;
if (!priorAdvanceConfirmed) return NEUTRAL;

if (compression <= 0.05 && duration >= 8 && volumeDistributive) {
  score = calcDistributionScore();
  if (score >= 3) return DISTRIBUTION;
```

```
    }

    return NEUTRAL;
```

10. Explanation Mapping (UI)

High Confidence

"Repeated supply rejection during compression after an advance."

Medium Confidence

"Compression present, but supply signals are mixed."

Low Confidence

"Early distributional behavior; requires confirmation."

---

11. Non-Goals

- ❌Predict breakdown timing
- ❌Generate short signals
- ❌Replace trend analysis

The goal is **risk awareness**, not direction.

---

12. Locking Recommendation

✔️Implement after accumulation hardening ✔️Share feature-flag architecture ✔️Validate on extended uptrends (e.g., FMCG, IT)

Once locked, this completes the **Accumulation ↔ Distribution symmetry**.