PSEDYS | TECHNICAL REFERENCE MANUAL V3.0

Linear Regression Channel — Technical Reference Manual v1.0

Linear Regression Channel — Technical Reference Manual v1.0

PSEDYS | Complete Edition

Least Squares · Slope · Intercept · StdDev Residuals · R² · LRC vs BB · Mean Reversion · Slope Filter · MTF · Bot vs TradingView

CONTENTS

1. What is the Linear Regression Channel? Concept and Statistics
2. Calculation Formula — Complete
   - 2.1 Step 1 — Linear Regression Parameters (slope and intercept)
   - 2.2 Step 2 — Regression Line Value at the Current Bar
   - 2.3 Step 3 — Standard Deviation of Residuals (StdDev)
   - 2.4 Step 4 — Channel Bands (Upper / Lower)
   - 2.5 Step 5 — R² (Coefficient of Determination)
   - 2.6 Step 6 — Slope % per Bar
   - 2.7 Simple Verified Example (5 bars)
   - 2.8 Complete Numeric Example — period=50, 100 bars
   - 2.9 Alternative Parameters
3. Regression Line vs EMA/SMA — Fundamental Difference
4. Statistical Properties of the Channel
5. R² — Linear Trend Quality Filter
6. Slope — Direction, Strength, and Angle
7. Lag and Warm-up
8. Trading Signals
   - 8.1 Price vs Channel — Mean Reversion and Breakout
   - 8.2 Slope as a Trend Filter
   - 8.3 R² as a Regime Filter
   - 8.4 Combined Filters
9. LRC vs Bollinger Bands — Detailed Comparison
10. LRC in a Sideways Market
11. Multi-Timeframe Analysis (MTF)

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

12. PSEDYS — LRC as a Regime Filter and Dynamic S/R
13. Bot vs TradingView Validation
14. Practical Exercises with Complete Answers
15. Cheat Sheet — Quick Summary

---

1. What is the Linear Regression Channel? Concept and Statistics

The Linear Regression Channel (LRC) applies **linear regression using the ordinary least squares method** on the Close prices of the last N bars, producing:

1. **Regression line (midline)** — the best-fit line through prices. Minimizes the sum of the squares of the vertical distances between prices and the line.
2. **Upper band** — regression line + multiplier × standard deviation of residuals
3. **Lower band** — regression line − multiplier × standard deviation

Statistical principle: If prices follow a linear trend, ~95% of variations should fit within the ±2σ band (with multiplier=2.0). Exits from the channel indicate statistical deviations from the trend.

LRC vs all other indicators in the series:

Feature	LRC	EMA/SMA	Bollinger Bands	ATR-based (ST, PSAR)
Mathematical basis	Least Squares Regression	Weighted/Uniform Average	SMA + Price StdDev	ATR (volatility)
Channel center	Regression line (fitted)	Moving average (lagged)	SMA (uniform)	Price ± ATR
Band width	StdDev of residuals from trend	N/A	Price StdDev from SMA	mult × ATR
Trend quality	**R^2** (0–1)	EMA Slope	BB Width	ADX
Trend direction	**Slope b** (direct)	EMA Slope	SMA slope	—
Smoothing	**None**	EMA/SMA	SMA	Wilder RMA
Effective lag	Minimal at endpoint	(N-1)/2	(N-1)/2	~4.5 bars

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

2. Calculation Formula — Complete

2.1 Step 1 — Linear Regression Parameters (slope and intercept)

```
Window: Close[i−N+1 .. i]  → N values
x = indices 0, 1, 2, ..., N−1  (0 = oldest, N−1 = current bar)
y = Close[i−N+1 .. i]

x_mean = (N−1) / 2            ← geometric center of the window
y_mean = sum(y) / N           ← SMA(Close, N)

slope (b) = Σ[(xⱼ − x_mean) × (yⱼ − y_mean)] / Σ[(xⱼ − x_mean)²]
intercept (a) = y_mean − b × x_mean
```

Simplified formula for slope:

```
Σ(xⱼ − x_mean)² = N(N²−1)/12  ← constant for fixed window

slope (b) = [12 × Σ(xⱼ × yⱼ) − 6(N−1) × Σyⱼ] / [N(N²−1)]
```

Significance of slope b:

```
b > 0: upward trend — price increases on average by b units per bar
b < 0: downward trend
b = 0: no linear trend detected
```

2.2 Step 2 — Regression Line Value at the Current Bar

```
LR_value[i] = a + b × (N−1)
```

This is the regression line value **at the right endpoint** of the window (current bar). It is the **forecast point** of the linear trend — where the linear trend would predict the price to be.

```
LR_value ≠ SMA:
  SMA = uniform average of all prices in the window (temporal center)
  LR  = value adjusted at the right endpoint, considering the trend in the window

  In a bullish trend: LR_value > SMA (line endpoint is above the average)
  In a bearish trend: LR_value < SMA
```

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

2.3 Step 3 — Standard Deviation of Residuals

Residuals = vertical distances between each price and the regression line:

```
e[j] = y[j] − (a + b × j)     for j = 0..N−1
```

Standard deviation of residuals (population):

```
StdDev = √(Σ(e[j]²) / N)
```

This is NOT the standard deviation of prices (as in Bollinger Bands). It is the deviation from the **adjusted trend line** — smaller and more precise in trends.

2.4 Step 4 — Channel Bands

```
Upper = LR_value + mult × StdDev
Lower = LR_value − mult × StdDev
```

With standard multiplier 2.0:

```
~95.4% of prices should be within the channel (if residuals are normally distributed)
~4.6% of bars appear outside the channel under normal conditions
```

2.5 Step 5 — R² (Coefficient of Determination)

```
SS_res = Σ(e[j]²)                    ← sum of squares of residuals
SS_tot = Σ(y[j] − y_mean)²           ← total variation of prices

R² = 1 − SS_res / SS_tot             ← proportion of variation explained by regression
```

R² Interpretation:

R² Value	Fit Quality	Significance
0.90 – 1.00	Excellent	Strong and consistent linear trend
0.70 – 0.90	Good	Linear trend present with moderate deviations
0.50 – 0.70	Moderate	Partially linear trend, significant noise
0.30 – 0.50	Weak	Vague trend, not clearly linear
0.00 – 0.30	Absent	No linear trend — sideways or chaotic

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

2.6 Step 6 — Slope % per Bar

```
Slope_pct = b / LR_value × 100    ← percentage increase/decrease per bar
```

Trading Interpretation (5M, period=50):

```
> +0.05% per bar: moderate bullish trend    (50 bars × 0.05% = +2.5% trend)
> +0.10% per bar: active bullish trend      (50 bars × 0.10% = +5% trend)
< −0.05% per bar: moderate bearish trend
Near 0%: sideways or absent linear trend
```

2.7 Simple Verified Example (5 bars, period=5)

Data: y = [100.0, 101.5, 102.0, 103.5, 104.0]

```
x = [0, 1, 2, 3, 4],  x_mean = 2.0,  y_mean = 102.2000

Numerator of slope: Σ(xⱼ-2)(yⱼ-102.2):
  (0-2)(100.0-102.2) = (-2)(-2.2) = +4.4
  (1-2)(101.5-102.2) = (-1)(-0.7) = +0.7
  (2-2)(102.0-102.2) = (0)(-0.2)  = 0.0
  (3-2)(103.5-102.2) = (1)(1.3)   = +1.3
  (4-2)(104.0-102.2) = (2)(1.8)   = +3.6
  Total = +10.0

Denominator of slope: Σ(xⱼ-2)²:
  4 + 1 + 0 + 1 + 4 = 10.0

slope b = 10.0 / 10.0 = 1.0000 USD per bar  ✓
intercept a = 102.2 − 1.0×2.0 = 100.2000  ✓
LR_value (x=4) = 100.2 + 1.0×4 = 104.2000  ✓

Residuals: [−0.2, +0.3, −0.2, +0.3, −0.2]
StdDev = √(0.30/5) = √0.06 = 0.2449  ✓
R² = 1 − 0.30/10.30 = 0.9709  ✓ (excellent fit)

Upper = 104.200 + 2×0.245 = 104.690  ✓
Lower = 104.200 − 2×0.245 = 103.710  ✓
```

2.8 Complete Numeric Example — period=50, 100 bars

Data: upward trend with mid-retracement (bars 40–60)

Bar 50 (first valid value) — manually verified:

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

```
y_mean (SMA 50) = 104.9908
slope b = 0.238011 USD/bar → +0.2148% per bar
intercept a = 99.1595
LR_value = 99.1595 + 0.238011×49 = 110.8221  ✓
StdDev residuals = 1.0917
Upper = 113.0055, Lower = 108.6386  ✓
R² = 0.9082  → excellent fit (strong linear trend)
Close = 108.01 → BELOW lower band (active retracement)
```

Key bars table:

Bar	Close	LR Midline	LR Upper	LR Lower	Slope%/bar	R²	Position
50	108.01	110.822	113.005	108.639	+0.2148%	0.908	BELOW ↓
55	108.54	110.999	113.660	108.338	+0.1887%	0.838	INSIDE
60	107.15	110.435	113.641	107.229	+0.1415%	0.664	BELOW ↓
65	109.15	110.022	113.239	106.805	+0.1017%	0.502	INSIDE
70	111.93	110.410	113.430	107.390	+0.0868%	0.456	INSIDE
75	114.59	111.482	114.642	108.323	+0.0905%	0.459	INSIDE
80	115.40	112.890	116.407	109.373	+0.1058%	0.490	INSIDE
85	117.85	114.880	118.826	110.934	+0.1419%	0.587	INSIDE
90	120.08	117.658	121.397	113.919	+0.2023%	0.771	INSIDE
95	121.13	120.314	122.898	117.730	+0.2528%	0.920	INSIDE
100	124.63	123.052	125.130	120.973	+0.2879%	**0.960**	INSIDE

Observations:

- R² decreases from 0.908 to 0.456 (bars 50–70) — retracement creates a weaker fit
- R² increases to 0.96 at bar 100 — bullish trend consolidates and becomes more linear
- Slope% increases from 0.087% to 0.288% per bar — trend accelerates
- Close below the lower band at bars 50 and 60 → Long mean reversion opportunities

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

2.9 Alternative Parameters

Variant	Period	Mult	Warm-up	Usage
Standard	**50**	**2.0**	**50**	**PSEDYS default — swing/medium**
Scalp	20	2.0	20	Rapid entry on small TFs
Macro	100	2.0	100	Macro trend 4H/1D
Tight channel	50	1.5	50	Tight SL, more signals
Wide channel	50	2.5	50	Volatile crypto — fewer false signals

3. Linear Regression Line vs EMA/SMA — Fundamental Difference

3.1 Why LR endpoint ≠ SMA

```
SMA(N) = arithmetic mean of the last N prices
       = value at the TEMPORAL CENTER of the window (lag = (N-1)/2)

LR_value = value at the RIGHT END of the best-fit line
         = where the linear trend predicts the price would be now
```

Example with bullish trend:

```
Prices over 5 bars: [100, 101, 102, 103, 104]

SMA(5) = (100+101+102+103+104)/5 = 102.0 (center of the series)
LR_value = 100.2 + 1.0×4 = 104.2   (endpoint of the linear trend)

→ LR_value > SMA in bullish trend (LR "knows" the trend is up)
→ LR_value < SMA in bearish trend (LR "knows" the trend is down)
```

3.2 LR as predictor vs EMA as follower

```
EMA: follows the price with a lag — reacts to what WAS
LR:  adjusts to the trend of the period → endpoint is a "prediction" of the trend

In stable bullish trend: LR_value > Typical Close (price "catches up" to LR)
In stable bearish trend: LR_value < Typical Close (price "falls" to LR)
```

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

3.3 Advantage of LR over EMA

- LR is **sensitive to trend**, not to absolute values
- The regression line CANNOT be "pulled" to extremes by spikes (treats them as residuals)
- R^2 directly measures the quality of the fit — EMA offers no equivalent
- Channel based on residual StdDev = statistically more precise than channel based on ATR

---

4. Statistical Properties of the Channel

4.1 Price distribution relative to the channel

If price residuals relative to the regression line are **normally distributed** (reasonable approximation on stable trends):

```
Probability Close INSIDE channel ±2σ: ~95.4%
Probability Close OUTSIDE channel ±2σ: ~4.6%
```

From the numeric example (bars 50–100):
- 46/51 bars INSIDE (90.2%) — slightly below 95.4% due to pullback in bars 50–60
- 5/51 bars BELOW channel (9.8%) — concentrated in the pullback period

4.2 Significance of exiting the channel

```
Close > Upper band (+2σ):  price is statistically "too high" relative to trend
                           → high probability of reverting to midline
                           → NOT necessarily a Short signal (could be a breakout)

Close < Lower band (−2σ):  price is statistically "too low" relative to trend
                           → high probability of bouncing to midline
                           → NOT necessarily a Long signal without confirmation

Probability of reverting to midline after exit: ~60–70% (depends on R²)
```

4.3 Channel Width and volatility

```
Channel_Width = Upper − Lower = 2 × mult × StdDev

Large width → large residuals → price deviates significantly from trend → more volatile
Small width → small residuals → price closely follows the trend → stable and clear trend
```

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

5. R² — The Quality Filter of the Linear Trend

5.1 Using R² as a regime filter

R² is **the most valuable single element of LRC** compared to other indicators — directly confirms if current trends are linear:

```
R² > 0.8: solid linear trend → LRC signals are reliable (price vs channel)
R² 0.5–0.8: partially linear trend → valid signals but with additional confirmation
R² < 0.5: weak fit → trends are not linear → skip pure LRC signals
R² < 0.3: sideways or nonlinear trend → do not use LRC as a decision basis
```

Combining R² with slope:

```
R² > 0.8 + slope > 0.05%/bar = high-quality bullish linear trend
R² > 0.8 + slope < -0.05%/bar = high-quality bearish linear trend
R² > 0.8 + slope ≈ 0 = perfect lateral trend (range trading)
R² < 0.5 + any slope = chaotic or transitioning market
```

5.2 R² vs Choppiness Index

Both measure "trend quality" but from different angles:

Aspect	R² (LRC)	Choppiness Index
Basis	Linear fit	ATR / Range ratio
Range	0–1 (1=perfect linear trend)	38–100 (100=perfect chaos)
"Confirmed Trend"	R² > 0.7	Choppiness < 50
"Sideways"	R² < 0.3	Choppiness > 61.8
Detects	LINEAR fit quality	General directionality

Optimal combination: R² > 0.7 + Choppiness < 55 + ADX > 20 = triple confirmation of solid trend

---

6. Slope — Direction, Strength, and Angle

6.1 Slope as a direction indicator

Unlike indicators based on crossover or comparison to a reference line, the LRC slope gives **trend direction directly as a number**:

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

```
slope b = X USD per bar
  b = +0.50: price increases by 0.50 USD per bar on average
  b = −0.30: price decreases by 0.30 USD per bar on average
  b ≈ 0:     no detectable linear trend
```

6.2 Slope % as a filter

```
slope_pct = slope_b / lr_value * 100   # % per bar

# PSEDYS thresholds (5M, period=50):
slope_bull  = slope_pct > +0.03%    # bullish trend
slope_bear  = slope_pct < -0.03%    # bearish trend
slope_flat  = -0.03% <= slope_pct <= +0.03%  # flat/sideways → skip
```

Adapting the threshold to timeframe:

```
1M:   threshold ±0.05% (small bars, small movements)
5M:   threshold ±0.03%
15M:  threshold ±0.02%
1H:   threshold ±0.01%
4H:   threshold ±0.005%
```

6.3 Slope as a trailing indicator of acceleration

Comparing slopes over consecutive bars:

```
slope_acceleration = slope_pct[-1] - slope_pct[-5]
# Positive: trend accelerates (rises faster)
# Negative: trend decelerates (rises slower or reverses)
```

---

7. Lag and Warm-up

7.1 LRC Lag

LRC has a unique relationship with lag compared to moving averages:

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

```
SMA(N) lag at midpoint: (N-1)/2 bars
LR_value lag at endpoint: MINIMAL — endpoint of the window is the CURRENT BAR

However: LR_value reflects the trend of the past window → implicit lag of ~(N/2) bars
         for "current trend" (not for point value)
```

Practically: LR_value updates with each bar with a new regression — it is not "lagged" in the EMA/SMA sense, but reflects the trend from the last N bars.

7.2 Warm-up

```
Minimum bars: N (period) bars → first value at bar N
Recommended warm-up: N bars (no seed cascade as in MACD/ADX)
Production: N+ bars immediately
Cold start: no problem — each LRC is a complete regression on available N bars
```

Advantage over MACD/ADX: No distorted seed — the first LRC value is as valid as the 1000th (provided N bars are available).

---

8. Trading Signals

8.1 Price vs Channel — Mean Reversion and Breakout

Mean Reversion Strategy (probabilistic):

```
Close < Lower band + R² > 0.7 + slope > 0:
→ Price below channel in bullish trend → statistical deviation
→ Probability of bounce to midline: ~65–70%
→ Entry Long with SL below Lower band

Close > Upper band + R² > 0.7 + slope < 0:
→ Price above channel in bearish trend
→ Probability of reverting to midline
→ Entry Short with SL above Upper band
```

Breakout Strategy:

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

```
Close > Upper band + increased volume + ADX > 25:
→ Breakout from channel → trend accelerates → probable bullish continuation
→ Not a Short signal! It is a Long continuation signal
→ Confirm with EMA stack + MACD

Close < Lower band + increased volume + ADX > 25:
→ Breakdown → bearish continuation
```

Midline as dynamic S/R:

```
Midline (LR_value) acts as a magnet:
  → Price above midline: midline = dynamic support
  → Price below midline: midline = dynamic resistance
  → Pullback to midline = classic entry opportunity
```

8.2 Slope as Trend Filter

```
Entry Long ONLY when: slope_pct > +0.03% per bar (5M)
Entry Short ONLY when: slope_pct < -0.03% per bar
Skip WHEN: slope_pct ≈ 0 (−0.03% ... +0.03%) → flat trend
```

8.3 R² as Regime Filter

```
R² > 0.75:  → Valid LRC → use price vs channel signals
R² 0.50–0.75: → Partially valid LRC → additional confirmation with ADX
R² < 0.50:  → Skip LRC signals → use other indicators (ADX, MACD)
```

8.4 Combined PSEDYS Filters

```
# Complete Long LRC setup:
lrc_valid = (
    r_squared > 0.70           and    # good linear fit
    slope_pct > 0.03           and    # bullish trend
    close < lower_band * 1.005 and    # price near or below lower band
    adx > 18                   and    # strong trend
    ema_stack_bullish                  # EMA confirmed
)
```

Optimal Long entry zone: price between Lower band and Midline (retracement in trend)

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

Zones to avoid:
- Price above Upper band → overextended relative to regression
- Price near Midline without clear direction
- $R^2 < 0.5$

---

9. LRC vs Bollinger Bands — Detailed Comparison

Aspect	LRC	Bollinger Bands
Center	Regression line (fitted trend)	SMA (uniform average)
Band width	StdDev of residuals relative to trend	StdDev relative to SMA
Center in trend	Follows trend direction	Lags behind trend
Statistical significance	±σ relative to adjusted trend	±σ relative to average
Smaller StdDev in trend	Yes — small residuals in clear trend	No — StdDev includes trend
Slope	Directly available (b)	Not directly
R^2	Available	No
Primary use	Mean reversion relative to linear trend	BB Squeeze, breakout
Bollinger Bounce	Analog: price at lower band → bounce	Classic BB setup

Why LRC produces narrower bands in trend:

```
Bollinger: StdDev(y[i] - SMA) also includes price variation caused by trend
LRC:       StdDev(residuals) = variation relative to trend line → smaller

Example bullish trend +1 USD/bar:
  BB StdDev includes "distance" caused by trend (+1 USD/bar offset)
  LRC StdDev: residuals are small if price closely follows the line → narrow and precise channel
```

Indicator manual: Linear Regression Channel — Technical Reference Manual v1.0 Part 3 of 4.

10. LRC in Sideways Market

10.1 LRC Behavior in Sideways

In a sideways market:
- **slope b ≈ 0** → regression line is horizontal
- **Low R^2 (< 0.3)** → price does not follow a linear trend

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

- **High StdDev** → large residuals → wide channel
- **LR_value ≈ SMA** (with slope=0, there is no difference)

```
LRC in sideways:
  → Horizontal midline = static S/R level (not dynamic)
  → Price oscillates randomly around the midline
  → Upper/Lower = statistical range levels
  → Mean reversion signals become stronger (low R² = range market)
```

10.2 LRC as a Range Detector

When R² is low and slope ≈ 0, LRC defines a **statistical range**:
- Upper band ≈ range resistance
- Lower band ≈ range support
- Midline = middle of the range

```
# Range detection with LRC:
is_range = (
    abs(slope_pct) < 0.02 and    # flat trend
    r_squared < 0.40              # weak linear fit
)
if is_range:
    range_top = lr_upper          # range resistance
    range_bottom = lr_lower       # range support
    range_mid = lr_value          # middle of the range
```

---

11. Multi-Timeframe Analysis (MTF)

11.1 MTF Hierarchy PSEDYS — LRC

Level	Timeframe	Period	LRC Usage	Role
1 (Macro)	4H	100	Slope + R² + price position vs channel	Macro regime
2 (Meso)	1H	50	Slope + R²	Trend confirmation
3 (Micro)	15M	50	R² + price position	Entry filter
4 (Entry)	5M	20	Price position vs channel + slope	Entry timing

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

11.2 MTF LRC Score

LRC 4H	LRC 1H	LRC 15M	LRC 5M	Action
R²>0.7, slope+ □	R²>0.7, slope+ □	R²>0.5, slope+ □	Price at lower band □	Full Long entry
R²>0.7, slope+ □	R²>0.7, slope+ □	R²<0.5 ⚠	any	50% Entry — weak 15M confirmation
R²>0.7, slope+ □	R²<0.5 ⚠	any	any	Skip — weak 1H fit
R²<0.5 □	any	any	any	Skip — non-linear macro trend

12. PSEDYS — LRC as Regime Filter and Dynamic S/R

12.1 LRC as a Macro Regime Filter

```
# LRC on 4H as a regime filter:
if r_squared_4h > 0.75 and slope_pct_4h > 0.02:
    regime = "BULLISH_LINEAR"      # bullish trend with solid linear fit
elif r_squared_4h > 0.75 and slope_pct_4h < -0.02:
    regime = "BEARISH_LINEAR"      # bearish trend with solid linear fit
elif r_squared_4h < 0.40:
    regime = "RANGE_OR_CHOPPY"     # market without linear trend
else:
    regime = "TRANSITIONAL"        # trend is forming or weakening
```

12.2 LRC as S/R Level for SL Placement

```
-- LRC lower band as SL level for Long positions:
-- Calculated from GM API + open positions query:
SELECT lp.symbol, lp.direction, lp.entry_price, lp.stop_loss,
       lp.entry_features->>'adx' AS adx
FROM live_positions lp
WHERE lower(lp.state) != 'closed'
  AND lp.direction = 'LONG'
ORDER BY lp.opened_at DESC;
-- Optimal SL = LRC lower band on 15M (calculated from GM candles)
-- If current SL < LRC lower → SL too tight → risk of premature exit
```

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

13. Bot vs TradingView Validation

13.1 Main Sources of Divergence

Source	Probability	Impact
Population StdDev (÷N) vs Sample (÷N-1)	High	Different channel width
LR_value at current bar vs previous bar	Medium	1 bar lag
Close vs HLC3 as price source	Low	Minor
Inclusive vs exclusive window	Medium	Significant

13.2 Validation Checklist

```
STEP 1 — Check slope formula:
□ x = [0, 1, ..., N-1] (0=oldest, N-1=current)
□ x_mean = (N-1)/2
□ b = Σ[(xj-x_mean)(yj-y_mean)] / Σ[(xj-x_mean)²]

STEP 2 — Check LR_value:
□ LR_value = a + b*(N-1)  ← window endpoint = current bar
□ NOT a + b*N (would be 1 bar in the future)
□ NOT y_mean (that is SMA)

STEP 3 — Check StdDev:
□ StdDev = sqrt(Σ(e²)/N)  ← population (÷N)
□ TradingView default = population
□ If ÷N-1 → bands ~0.5-1% wider on period=50

STEP 4 — Numeric test:
□ Compare LR_value, Upper, Lower with TradingView
□ Tolerance: < 0.01% for LR_value
□ If different bands: check ÷N vs ÷(N-1)

STEP 5 — Check price source:
□ TradingView Linear Regression = Close
□ Some implementations use HLC3 or HL2
```

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

13.3 Python Validation Script

```
import math

def linear_regression_channel(closes, period=50, mult=2.0):
    n = len(closes)
    lr_val, lr_up, lr_dn, slopes, r2s = [None]*n, [None]*n, [None]*n, [None]*n, [None]*n

    for i in range(period-1, n):
        y = closes[i-period+1:i+1]
        x = list(range(period))
        xm = (period-1) / 2
        ym = sum(y) / period

        # Slope and intercept
        num = sum((x[j]-xm)*(y[j]-ym) for j in range(period))
        den = sum((x[j]-xm)**2 for j in range(period))
        b = num / den if den != 0 else 0
        a = ym - b * xm

        # LR value at current bar (endpoint)
        lv = a + b * (period - 1)

        # StdDev of residuals — POPULATION (÷N)
        residuals = [y[j] - (a + b*j) for j in range(period)]
        std = math.sqrt(sum(r**2 for r in residuals) / period)

        # R²
        ss_res = sum(r**2 for r in residuals)
        ss_tot = sum((y[j]-ym)**2 for j in range(period))
        r2 = 1 - ss_res/ss_tot if ss_tot > 0 else 1.0

        lr_val[i] = round(lv, 6)
        lr_up[i]  = round(lv + mult*std, 6)
        lr_dn[i]  = round(lv - mult*std, 6)
        slopes[i] = round(b/lv*100, 6) if lv > 0 else 0
        r2s[i]    = round(r2, 6)

    return lr_val, lr_up, lr_dn, slopes, r2s

# Validation: lr_val[-1] vs TradingView → difference < 0.01% = OK
```

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

14. Practical Exercises with Complete Answers

Exercise 1: Low R^2 — Do you use LRC or not?

Situation: On 4H, LRC(50) shows: slope = +0.08%/bar (bullish), but $R^2 = 0.42$. On 5M, the price reached the Lower band LRC and bounced slightly.

Question: Do you go Long on the bounce at the Lower band LRC 4H?

Answer:

NO — $R^2 = 0.42$ invalidates the LRC signal.

- **$R^2 < 0.5$ = weak fit:** the regression line does not well describe the price behavior on 4H. The price deviates randomly from the line — Lower band does not have clear statistical significance.
- **What happens in practice:** Lower band calculated on a weak fit can be easily crossed without a bounce — there is no statistical force behind the level.
- **Correct action:** Skip the LRC signal. Use other indicators: ADX + EMA stack on 4H to evaluate direction. Wait for $R^2 > 0.70$ (more linear trend) to reactivate LRC signals.

Exercise 2: Price exits the channel → breakout or mean reversion?

Situation: On 1H, LRC(50): $R^2 = 0.88$, slope = +0.12%/bar, Close exceeded Upper band (+2σ) by 0.8%. ADX = 38, MACD Histogram increasing, volume 60% above average.

Question: Price above Upper band — is it overextension or breakout?

Answer:

It is a BREAKOUT, not mean reversion — context confirms continuation.

- **$R^2 = 0.88$ + strong slope** = solid linear trend and accelerating.
- **ADX = 38** = trend with significant strength.
- **MACD Histogram increasing** = active momentum.
- **Volume +60%** = real pressure behind the move.
- **Conclusion:** Exiting the channel with all factors aligned = trend acceleration, not a statistical deviation requiring reversion.
- **Correct action:**
- Do not go Short (counter-trend).
- If you are Long: maintain the position, move SL to Upper band (which now becomes support).
- If not in position: you can go Long on the retest of the Upper band (if the price returns to Upper without crossing below).

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

Exercise 3: LRC vs EMA — which direction do you follow?

Situation: On 15M, EMA 200 is at 50,000 (price above = bullish). But LRC(50) on 15M: slope = −0.05%/bar (bearish), R^2 = 0.82 (solid fit). Close at Upper band.

Question: EMA 200 says bullish macro. LRC says local bearish trend. Do you go Long?

Answer:

Real conflict — DO NOT go Long on 15M.

- **EMA 200 (macro):** Price above EMA 200 = medium/long-term bias is bullish. Correct.
- **LRC 15M (local):** Slope −0.05%/bar over 50 bars = over the last ~4 hours, the trend on 15M is linearly descending, with a solid fit (R^2=0.82). Price at Upper band = above the local bearish trend.
- **Combined interpretation:** We are in a correction/pullback on 15M within a larger bullish trend. Close at Upper band LRC = price at the local resistance of the pullback.
- **Correct action:**
- Do not go Long at Upper band LRC with negative slope — SL would be immediately above and R/R unfavorable.
- Wait: either slope LRC 15M turns positive (pullback is over), or price reaches Lower band LRC 15M (opportunity to go Long with confirmation that we are at the support of the pullback).

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

15. Cheat Sheet — Rapid Summary

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

Concept	Value / Rule
Formula slope b	`Σ[(xi−x̄)(yi−ȳ)] / Σ[(xi−x̄)²]` — Least Squares
x̄ (x_mean)	`(N−1)/2` — center of the window
ȳ (y_mean)	`sum(Close)/N = SMA(N)`
LR_value	`a + b×(N−1)` — endpoint at the current bar
Intercept a	`ȳ − b × x̄`
StdDev	`sqrt(Σ(residuals²)/N)` — POPULATION (÷N)
Upper	`LR_value + mult × StdDev`
Lower	`LR_value − mult × StdDev`
R²	`1 − SS_res/SS_tot` → 0=no fit, 1=perfect fit
Slope %	`b / LR_value × 100` per bar
Standard period	50
Standard mult	2.0 → ~95.4% of prices INSIDE
Warm-up	N bars (no seed cascade)
Lag	Minimal at endpoint; trend reflects ~N/2 past bars
R² > 0.8	Solid linear trend → reliable LRC signals
R² 0.5–0.8	Signal with additional confirmation
R² < 0.5	Skip LRC signals
Slope > +0.03%	Bullish trend (5M, period=50)
Slope < −0.03%	Bearish trend
Slope ≈ 0	Flat/sideways → skip
Close < Lower + R²>0.7 + slope+	Entry Long (mean reversion in trend)
Close > Upper + ADX>25 + volume	Breakout Long (trend continuation)
Close > Upper + R²>0.7 + slope-	Short mean reversion in bearish trend
Midline = Dynamic S/R	Support in bullish trend, resistance in bearish
LRC vs SMA	LR endpoint > SMA in bullish; < SMA in bearish
LRC vs BB	LRC StdDev < BB StdDev in trend (residuals < total deviation)

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

Concept	Value / Rule
LRC vs BB center	LRC = fitted line; BB = lagged SMA
R² + Choppiness	R²>0.7 + Choppiness<55 = double trend confirmation
Bot vs TV Tolerance	< 0.01% LR_value; identical StdDev if ÷N (not ÷N-1)
Cause #1 divergence	StdDev ÷N−1 instead of ÷N → wider bands
Cause #2 divergence	LR_value at bar N (future) instead of N−1 (current)

PSEDYS LRC Technical Manual v1.0 — May 2026
Covers: Least Squares Regression (slope b, intercept a, LR_value endpoint), standard deviation of residuals (population ÷N), R² as trend quality filter, channel ±2σ with statistical interpretation (~95.4%), simple 5-bar check (slope=1.0, LR=104.20, R²=0.9709 ✓), verified 100-bar numeric example (bar 50: LR=110.822, Up=113.006, Dn=108.639, R²=0.908 ✓), LR vs SMA (endpoint vs center), LRC vs BB (residual vs total StdDev), R² as regime filter (R²<0.5→skip), slope % per bar with thresholds per TF, mean reversion vs breakout logic, MTF 4 levels with score, PSEDYS integration, bot vs TradingView validation (÷N vs ÷N-1 + LR_value at N-1), Python script

---

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS

Downloaded from PSEDYS Ecosystem | t.me/PSEDYS