Linear Regression Channel Update (Pearson's R, & $R^{2)}$

Original Linear Regression Channel

The original version of the indicator produced a linear regression channel with multiple deviation bands.

It successfully plotted:

- A central regression line
- ±1σ, ±2σ, ±3σ deviation envelopes
- A visual trend structure across the chosen lookback window

However, the statistical values it displayed were not mathematically valid.
The value labeled "r" was not Pearson's correlation coefficient.

Updated Script

The updated version introduces a fully correct statistical engine based on ordinary least squares (OLS).

It now computes:

- True Pearson's r
- True R^2 (coefficient of determination)
- RSS (Residual Sum of Squares)
- TSS (Total Sum of Squares)

Key improvements include:

- Correct OLS intercept (removing the erroneous +slope term)
- Proper predicted values using (y_{hat} = b_0 + b_1 x)
- Correct centering around the actual mean of the data
- Removal of correlation logic from the deviation engine
- Clean separation between statistical computation and volatility computation

These changes ensure that the displayed r and R^2 values are mathematically valid, bounded, and interpretable. The regression channel itself remains visually identical, but the underlying statistics are now accurate.

Lookback Periods and How They Affect Trend Strength

The lookback length determines how many bars are included in the regression. Because each bar represents one unit of time on the active timeframe, the same numeric length corresponds to different real-world durations.

Example on a weekly chart:

- 40 bars ≈ 10 months
- 100 bars ≈ 2 years
- 200 bars ≈ 3.8 years
- 220 bars ≈ 4.2 years

How lookback affects r and R^2:

Short lookbacks (20–60 bars):

- Capture local swings
- More sensitive to volatility
- r and R^2 tend to be lower

Medium lookbacks (80–150 bars):

- Capture intermediate trends
- Balanced sensitivity
- r and R^2 stabilize

Long lookbacks (150–300 bars):

- Capture structural or macro trends
- Smooth out noise
- r and R^2 often rise significantly

How to find a strong coefficient:

Adjust the lookback until r and R^2 stabilize at high values without *overfitting*.
A strong coefficient typically means:

- $r > 0.70$ → strong directional trend
- $R^2 > 0.60$ → meaningful linear structure
- $R^2 > 0.80$ → very strong, stable trend