Linear Regression Channel Indicator

Linear regression is a statistical method that fits a straight line through a set of price observations. This is known as **the Line of Best Fit.**

The goal of Linear Regression is to capture the dominant direction of movement over a chosen lookback window.
Instead of reacting to every bar, regression smooths the noise and reveals the underlying trend.

How It's Derived

The regression line is calculated by minimizing the squared distance between each price and the fitted line. This process produces two key components: the slope (trend strength and direction) and the intercept (the line's starting point). The script computes these values manually using summations of price and index positions.

Standard Deviation

Standard deviation measures how far prices typically stray from the regression line.

A higher deviation means the market is volatile or unstable; a lower deviation means price is clustering tightly around the trend.

In this script, deviation bands are drawn at $\pm1\sigma$, $\pm2\sigma$, and $\pm3\sigma$ to show the statistical envelope around the trend.

Derivation Explanation

The script loops through each bar in the lookback window, calculates the best-fit slope using least-squares math, and then computes the intercept. It then measures how far each price deviates from that fitted line to determine the standard deviation.

Pearson's R is also calculated to quantify how well price aligns with the trend. *The Pearson correlation coefficient (r) is a statistical measure that quantifies the strength and direction of a linear relationship between two quantitative variables.*

Its Use Case is designed for equities and indexes where trends develop over meaningful horizons. It helps identify whether price is trending, mean-reverting, or breaking out of its expected statistical range.

The multi-sigma structure highlights extremes, potential exhaustion points, and volatility expansions.

Deviation Mode

The script offers two deviation modes: standard deviation (statistical dispersion) and max deviation (the farthest high/low from the regression line).

Standard deviation is smoother and more probabilistic; max deviation is more conservative and captures structural extremes.

Regime Detection

By adjusting the lookback length—daily, weekly, or monthly—the same regression logic becomes a regime detector.

Shorter windows capture tactical shifts, while longer windows reveal macro and secular cycles.

The defined presets are not arbitrary. They're based on common practice across hedge funds, macro desks, and institutional quant teams.

Different firms vary slightly, but the ranges being used (36, 60, 120, etc.) are grounded in real-world modeling conventions:

- Daily windows capture sentiment and earnings-cycle behavior.
- Weekly windows capture macro cycles and liquidity shifts
- Monthly windows capture secular and credit-cycle structure

Preset	Meaning	Horizon
Daily – Short Term Trend	Tactical trend	1–2 months
Daily – Intermediate Trend	Swing/intermediate	~5 months
Weekly – Intermediate Macro	Macro trend	1 year
Weekly – Regime Shifts	Macro regime	2 years
Monthly – Secular Trend	Secular trend	3 years
Monthly – Multi-Year Regime	Multi-year cycle	5 years
Monthly – Deep Secular Cycle	Credit/inflation cycles	10 years

Additional Institutional Lookback Periods and Use Cases

Monthly – Ultra Secular Cycle (180 bars)

- Use case: Captures ~15 years of structural trend.
- Why it matters: Useful for analyzing post-GFC to present cycles, long-term inflation regimes, and multi-decade index behavior.

Monthly – Generational Trend (220 bars)

- Use case: ~18 years of data, spanning full business cycles.
- Why it matters: This is the closest you get to a "generational slope" without overfitting. It's used by long-horizon allocators and pension-style modeling.

Monthly – Market Epoch Window (300 bars)

- Use case: ~25 years of data.
- Why it matters: Captures dot-com → GFC → post-GFC → inflation era in one continuous slope. This is extremely slow-moving and only useful for structural context.

Weekly – Long Macro Cycle (156 bars)

- Use case: 3 years of weekly data.
- Why it matters: Good for identifying multi-year liquidity cycles and policy-driven macro shifts.

Daily – Volatility Regime Window (250 bars)

- Use case: ~1 trading year.
- Why it matters: Common in volatility modeling, seasonality studies, and institutional trend filters.