

# Mean Reversion Strategies

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This is an online workshop conducted in real-time through Adobe Connect by Ernest Chan ([www.epchan.com](http://www.epchan.com)). The workshop focuses on the theories and practical implementation of mean reversion. (Free MATLAB trial licenses and pre-recorded MATLAB programming tutorials are included.) The math requirement assumed is basic college-level statistics.

- Total hours: 6.
- Registration: [ernest@epchan.com](mailto:ernest@epchan.com).

## Course outline:

1. Stationarity and cointegration of time series
  - a. Stationarity and mean-reversion: the practical benefits.
  - b. Statistical test for stationarity: ADF.
  - c. Exercise: Using MATLAB and spatial-econometrics toolbox to find out if AUDCAD is stationary.
  - d. Exercise: Adapt Bollinger band strategy to trade AUDCAD.
  - e. Cointegration and its practical benefits.
  - f. Cointegration vs correlation.
  - g. Statistical test for cointegration: CADF.
  - h. Exercise: Find out if GLD-GDX is cointegrating using CADF.
  - i. Order-dependence of CADF.
  - j. Statistical test for cointegration: Johansen.
  - k. Exercise: Find out if GLD-GDX is cointegrating using Johansen.
2. Mean-reversion trading of pairs and triplets
  - a. Finding hedge ratio through linear regression (LR).
  - b. Exercise: Find hedge ratio for GLD-GDX using LR.
  - c. Order-dependence of hedge ratio based on LR.
  - d. Finding hedge ratio through Johansen test.
  - e. Exercise: Backtest Bollinger band strategy for GLD-GDX.
  - f. Case study: The breakdown of cointegration of GLD-GDX, the economic reasons and the remedy.
  - g. Exercise: Backtest Bollinger band strategy for GLD-GDX-USO.
  - h. A general guide to surviving the breakdown of cointegration.
3. Half-life of mean-reversion
  - a. Practical importance of half-life.
  - b. The Ornstein-Uhlenbeck formula.
  - c. Exercise: Computing the half-life of the GLD-GDX spread.
  - d. Parameterless-trading revisited: using half-life to eliminate lookback parameter.
4. Risk management of mean-reversion strategies
  - a. The pros and cons of using stop loss for mean-reversion strategies.

- b. The use of implicit stop losses.
5. What are the best markets for pair trading strategies?
- a. Pros and cons of pair trading ETFs, stocks, currencies, futures, and other markets.
  - b. Why sometimes economically-related pairs of futures do not cointegrate.
  - c. Exercise: Test for cointegration of WTI vs Brent crude oil futures.
  - d. Exercise: Test for stationarity of “crack spread”.
6. Index arbitrage
- a. Trading an ETF against a basket of its component stocks.
  - b. Two ways of constructing a basket: linear regression and constrained optimization.
  - c. Exercise: Backtest a trading model of XLE against its components.
  - d. Issues with index arbitrage.
7. Long-short portfolio
- a. Exercise: A long-short portfolio strategy of stocks in the S&P 500.
  - b. Relevance of strategy to 2007 quant funds meltdown.
  - c. The importance of universe selection: impact of market capitalization, liquidity, and transactions costs on strategies.
  - d. Strategy refinement: how small changes can make big differences in performance.