Abstract: In this talk, we present a framework for statistical arbitrage and pairs trading, following Avellaneda and Lee (2010). A pair of traded assets (or portfolios) is constructed to hedge the risk. A mean reversion model, such as the Ornstein-Uhlenbeck process, serves as a co-integration residual for the matched pair that generates signals to guide trading strategies. Some issues regarding parameter estimation, backtesting and portfolio selection are to be discussed with some numerical results. Motivated by bifurcation in catastrophe theory, an alternative (stochastic cusp) residual model will also be proposed. This is a joint work with Jiaying Li.