SwissScientific TECHNOLOGIES

Mandelbrot Strategy

strategy description

The price of financial options depends on the probability distribution of returns of the underlying instrument. The dominant term (and the only one if a normal distribution is assumed) is given by the second moment of the distribution, the standard deviation, or volatility. Volatility arbitrage is a trading strategy where one tries to exploit the difference between the volatility implied by options and the volatility eventually realized by the underlying instrument at maturity. As Mandelbrot has shown, however, returns are not normally distributed and higher order terms, measuring e.g. the asymmetry (skewness) of the distribution or the fatness of its tails (kurtosis), play an important role. The Mandelbrot strategy is a volatility skew arbitrage strategy in which we trade synthetic volatility skew swaps. The skewness of options is very often mispriced: the volatility skew arbitrage strategy identifies these opportunities to realize profits. In some cases, profits can be locked in after a relatively brief period, otherwise they will be realized at option expiration every quarter (see however "risk"). In all standard cases (as defined in "risk") the eventual profit can be computed in advance.

key facts

Currency : USD / EUR
Instruments : Index options and futures (S&P500 / DAX)
Liquidity : quarterly
Risk factors : options and futures
Type of strategy : arbitrage with synthetic skew swaps
Trading : algorithmic big data analysis + semiautomatic, opportunity-driven trading

risk

Profit lock-in is possible if either a trading opportunity arises that leaves a completely neutral position or if the underlying stays in a range of about 15%-25% (depending on initial volatility) of its initial value during the three-months period of the trade. Otherwise the position has to be adjusted, with possible losses as a consequence.

historical performance

Year	Q1: average P&L/swap	Q2: average P&L/swap	Q3: average P&L/swap	Q4: average P&L/swap
2000	104.34	141.13	82.67	242.23
2001	233.29	89.43	72.64	92.53
2002	78.09	43.23	56.17	64.1
2003	50.51	33.67	20.84	25.94
2004	59.34	33.59	41.09	4.34
2005	0.00	26.84	0.00	0.00
2006	0.00	0.00	24.34	0.00
2007	6.42	0.00	25.59	98.87
2008	117.39	133.87	89.86	219.34
2009	128.20	52.83	67.72	90.98
2010	89.76	106.47	244.67	97.84
2011	28.98	29.93	58.56	139.22
2012	71.93	37.54	52.61	30.71

In this backtest we could reproduce only a limited set of trading opportunities since only end-of-day-data were available. This leads to vanishing profits in some quartals; in reality the available opportunities are much more numerous. Also, due to the impossibility of backtesting margin requirements we can only report total profits/losses, which were never negative in the test period of 13 years. A measure of the relative performance of the strategy can be gained from the following table, in which we additionally report net profit/losses per swap as a % of initial margin requirements for the years in which the strategy has been traded live (starting Q2/2014).

live performance

Year	Q1: avg. P&L/swap (on margin)	Q2: avg. P&L/swap (on margin)	Q3: avg. P&L/swap (on margin)	Q4: avg. P&L/swap (on margin)
2014	-	111.36 (9.23%)	54.87 (6.05%)	77.87 (32.25%)
2015	72.73 (41.40%)	*(no live trading)*	*(no live trading)*	638.07 (64.09%)
2016	325.06 (11.31%)	*(no live trading)*	*(no live trading)*	*(no live trading)*
2017	*(no live trading)*	*(no live trading)*	*(no live trading)*	*(no live trading)*