Daily vs. Monthly returns

Empirical evidence from Commodity Trading Advisors

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Outline

- The problem
- The CTA industry
- The data set
- Daily vs. Monthly
- Pricing of fund-linked products

Problem description

Hedge funds market themselves through monthly data but in a managed account it is possible to follow a hedge fund investment every day.

How will the daily risk and quantitative properties experienced by the investor differ from what they expect from the monthly figures?

Commodity Trading Advisors

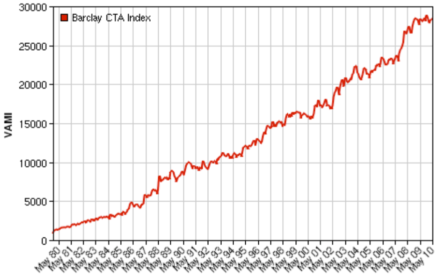
CTA - Managed futures industry

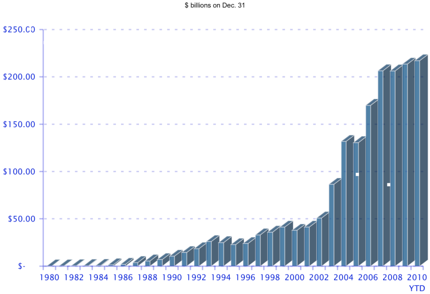
- A 30-year-old asset class
- Chartists and trend followers
- Business legend - Turtle traders

Industry figures

BarclayHedge CTA database collects monthly data for CTA programs. Figures from 2010 Q1 shows:

- 1058 funds totally over 20 years
- Annual return 11.6%, Sharpe ratio 0.41
- 553 active funds managing \$217.2B
- Systematic programs constitute the main part, \$169.31B





The data set

- Daily return series from 77 CTA funds of which 65 were active
- No proforma, only live trading
- At least 2 years track record
- Mainly classic CTA strategies, mid- to -long term trend following

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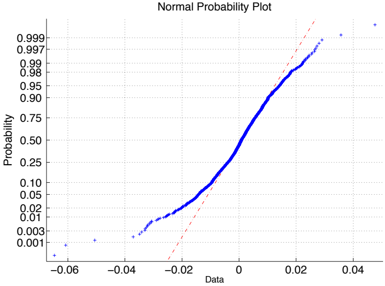
- Survivorship bias
  - *Only the fittest survives, blow-ups are rarely reported*

Moments

		Min	Mean	Median	Max
Daily					
	Mean return	-0.000178	0.000566	0.000546	0.001818
	St. deviation	0.00242	0.010767	0.00938	0.02550
	Skewness	-1.235	-0.1447	-0.1424	2.3446
	Kurtosis	3.7552	9.4731	7.093	58.3304
Monthly					
	Mean return	-0.0038	0.0123	0.0118	0.0752
	St. deviation	0.0109	0.0501	0.0443	0.1642
	Skewness	-0.9147	0.2686	0.1447	2.0355
	Kurtosis	1.8328	4.0179	3.3589	12.3661

Table: Properties of the first four moments for all managers as a group.

Non-normality



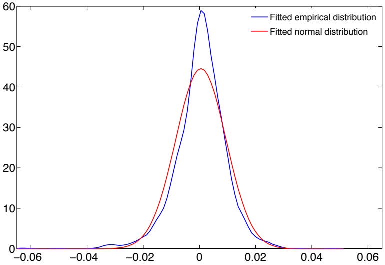


Figure: *Left:* Normal probability plot of returns clearly showing the occurrence of fat tails. *Right:* Empirical distribution (blue) using a Epanechnikov kernel, together with a fitted normal distribution (red)

Statistical tests

	Daily		Monthly	
Jacque-Berra test	100%		20%	
Lilliefors test	99%		14%	
Lags	1	10	1	10
Ljung-Box on returns	50%	50%	12%	26%
Ljung-Box on absolute returns	100%	100%	25%	22%
ARCH-test	90%	97.5%	17%	39%

Table: Percentage of funds rejecting the null hypothesis for statistical tests on daily and monthly figures.

Autocorrelation

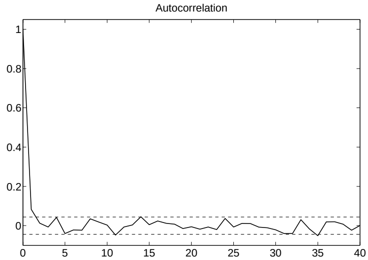


Figure: *Left:* Autocorrelation function for log-returns. *Right:* Autocorrelation for the absolute value of the log-returns. Absolute values show an irrefutable correlation, pointing towards the existence of volatility clustering.

Pricing of fund-linked products

To illustrate the effect of non-normal higher moments we construct simulation examples using a Normal inverse Gaussian distribution:

$$\begin{aligned} \mathrm{d}S_t &= (\mu + \beta\sigma^2(t))S_t + \mathrm{d}t + \sigma(t)S_t\,\mathrm{d}B_t, \quad S_0 = s > 0, \\ \mathrm{d}\sigma_t^2 &= -\lambda\sigma_t^2\,\mathrm{d}t + \mathrm{d}L_{\lambda t}, \quad \sigma_0^2 = y > 0, \end{aligned}$$

B_t - Brownian motion, $L_{\lambda t}$ - pure jump subordinator.

Fixed threshold products

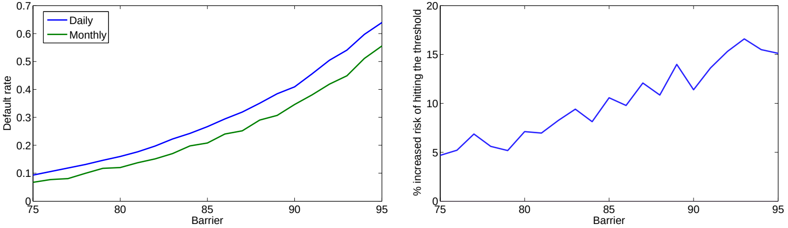


Figure: Fixed threshold product over a five years horizon. *Left:* Rate of the fund investment hitting the barrier for a range of barrier values. *Right:* Percentage increased risk of hitting the barrier when using a NIG-distribution instead of a normal distribution.

CPPI

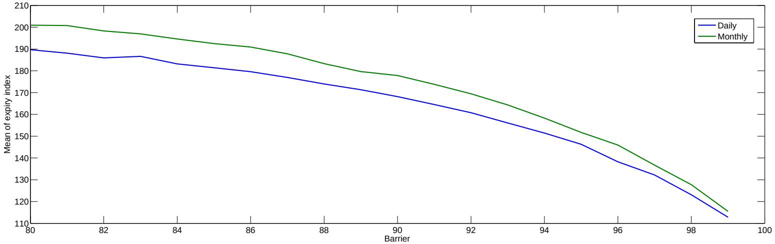


Figure: Constant proportion portfolio insurance product simulated of over five years for different insurance levels and leverage factor 4. The expected result at expiry is clearly lower for a product simulated using high order moments.