Données et Statistiques en Finance: modèles d'agents: TP2

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Aims

To investigate how price predictability can be detect, exploited, and modified

1. Optimal learning

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In the following, ε_t is a zero-average Gaussian noise with standard deviation σ.

1. Choose a couple $(\sigma, \alpha > 1)$ and simulate

$$r_{t+1} = (\alpha - \hat{\alpha}_t) r_t + \varepsilon_{t+1}$$
$$\hat{\alpha}_t = \frac{r_t}{r_{t-1}} + \hat{\alpha}_{t-1}$$

2. Plot r_{t+1} as a function of t. Comment.

2. Optimal learning

1. Plot $P(|r| > R)$, i.e., 1-ecdf with logarithmic axes.
   `from statsmodels.distributions.empirical_distribution import ECDF`

2. Has $P(|r| > R)$ heavy tails?

3. Using the powerlaw library, compute the tail exponent of $P(|r|) \propto |r|^{-\gamma}$

   ```
   import powerlaw
   mypl=powerlaw.Fit(np.abs(r))
   mypl.alpha
   ```

   Check whether mypl.alpha is γ or $\gamma + 1$

3. Optimal learning

Characterize how r depends on α and σ:

1. Create a plot of the empirical average of $|r|^{1/2}$ as a function of α et σ; comment.

2. Create a plot of exponent γ as a function of α and σ; comment.

4. Optimal learning and market dynamics

1. Download the prices of ticker C (Citibank) from Yahoo Finance with `yfinance` package, from 2006-01-01 to 2012-01-01

2. Use `powerlaw.Fit` in rolling windows of 252 days (1 year of trading) to fit the absolute values of the logreturns of the 'Adj Close' column and plot the resulting exponent as a function of time (dates, really). What can the optimal learning model tell us about the timescales of the traders?

Hints: if the x labels overlap, use

```
ax=plt.plot(.........)
ax.tick_params(axis='x', labelrotation=45)
```