Trend-following in Financial Markets
MATLAB EXPO
2014-05-22
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Agenda

- What is Lynx?
- How do futures contracts work?
- What is trend following?
- Are there any trends to follow?
- A simple univariate example
- What about covariance?
- How is MATLAB used at Lynx?
Lynx Asset Management

- Model-based trading
- Holding period $\geq$ a few days (usually)
- ~40 people
- Mostly trend following strategies
- $\approx$ 60 most liquid futures world-wide
- Asset classes:
  - Equity indices
  - Fixed income
  - Currencies
  - Commodities
- ~4.8bn USD under management
- Partly owned by Brummer & Partners (9 funds, ~17bn USD in total)
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I will buy 1,000 barrels of oil from you on Sep 16th for $106 per barrel.

Okay!

Mr Long

Mr Short
A business agreement

I will buy 1,000 barrels of oil from you on Sep 16th for $106 per barrel.

Okay!

Mr Long

Mr Short
I will buy 1,000 barrels of oil from you on Sep 16th for $100 per barrel.

Okay!

Price change since yesterday

Mr Long

Mr Short

$
Futures contracts

I will buy 1,000 barrels of oil from you on Sep 16th for $106.75 per barrel.

Mr Long

Okay!

Mr Short
Futures contracts

I will buy 1,000 barrels of oil from you on Sep 16th for $106.5 per barrel.

Okay!

Mr Long

Mr Short
Futures contracts

I will buy 1,000 barrels of oil from you on Sep 16th for $106.8 per barrel.

Okay!

Mr Long

Okay!

Mr Short
Okay!

I will buy 1,000 barrels of oil from you on Sep 16th for $106.8 per barrel.

Mr Long

Okay!

Mr Short

Price change since yesterday
Okay!

Price change since yesterday

I will buy 1,000 barrels of oil from you on Sep 16th for $108 per barrel.

Mr Long

Okay!

Mr Short

- Contract value is always zero (after mark-to-market)
- Allows for exposure without investing in the underlying asset
- Allows for leverage
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Trend following in principle
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Are there any trends to follow?

- Accumulated returns of block size 1-50
- Autocorrelation of lag 1
- 51 futures markets from 1980-2014
Are there any trends to follow?

How does the autocorrelation structure change over time?

Actual returns

Permuted returns
(mean and std. dev. over 100 simulations)
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A simple trend model
A simple trend model
The diversification effect

Profits from a trading strategy in two assets:

\[ X: \mu, \sigma \]
\[ Y: \mu, \sigma \]
\[ \text{Corr}(X, Y) = \rho \]

What is the best way to invest 2 units?

a) Portfolio \( P = 2X \):

b) Portfolio \( Q = X + Y \):

\[
\frac{\mu_Q}{\sigma_Q} = \frac{\sqrt{\sigma^2 + 1}}{\sqrt{\sigma^2 + 1}}
\]
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PCA of market returns

How do the principal components change over time?
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How is MATLAB used at Lynx?

- Model development and backtesting
- 128-core MATLAB cluster used for stability tests, etc.
- Data import using .NET-interface to in-house database client
- Data verification and quality projects
- .NET-assemblies used in production for a few models
- Monitoring of positions and results for individual models
How is MATLAB used at Lynx?

- Model development and backtesting

- Prototyping ideas for new trading models
- Backtesting on historical data
- Walk-forward parameter estimation to minimize risk of overfitting
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How is MATLAB used at Lynx?

- Almost exclusively using parfor
- Computationally expensive models (Parallelization e.g. over contracts)
- Stability tests (Parallelization over parameter instances)
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.NET-assembly

Excel client

Price DB

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Thank you!