Prediction Company:

The Business of Model-Based Trading

History

Corporate		Modeling
Foundation of the company Principals: Farmer, Packard, McGill	1991	Modeling financial futures (contracts on rates, indices, Fx).
	1992	
Contract with O'Connor & Associates O'Connor → SBC	1993	Modeling other futures
	1994	
		Modeling Equities
Renewal of contract	1995	
	1996	
		Begin ramping equities to large size
	1997	
SBC → UBS	1998	
	1999	
Renewal of contract UBS buys equity stake in Prediction Company	2000	Globalize, Diversify

Foundation of Contract with UBS

- Prediction Company builds models to predict financial markets from historical data.
- Bank commits to trade based on predictions (given performance threshold).
- Profits are shared.

Nature of the relationship

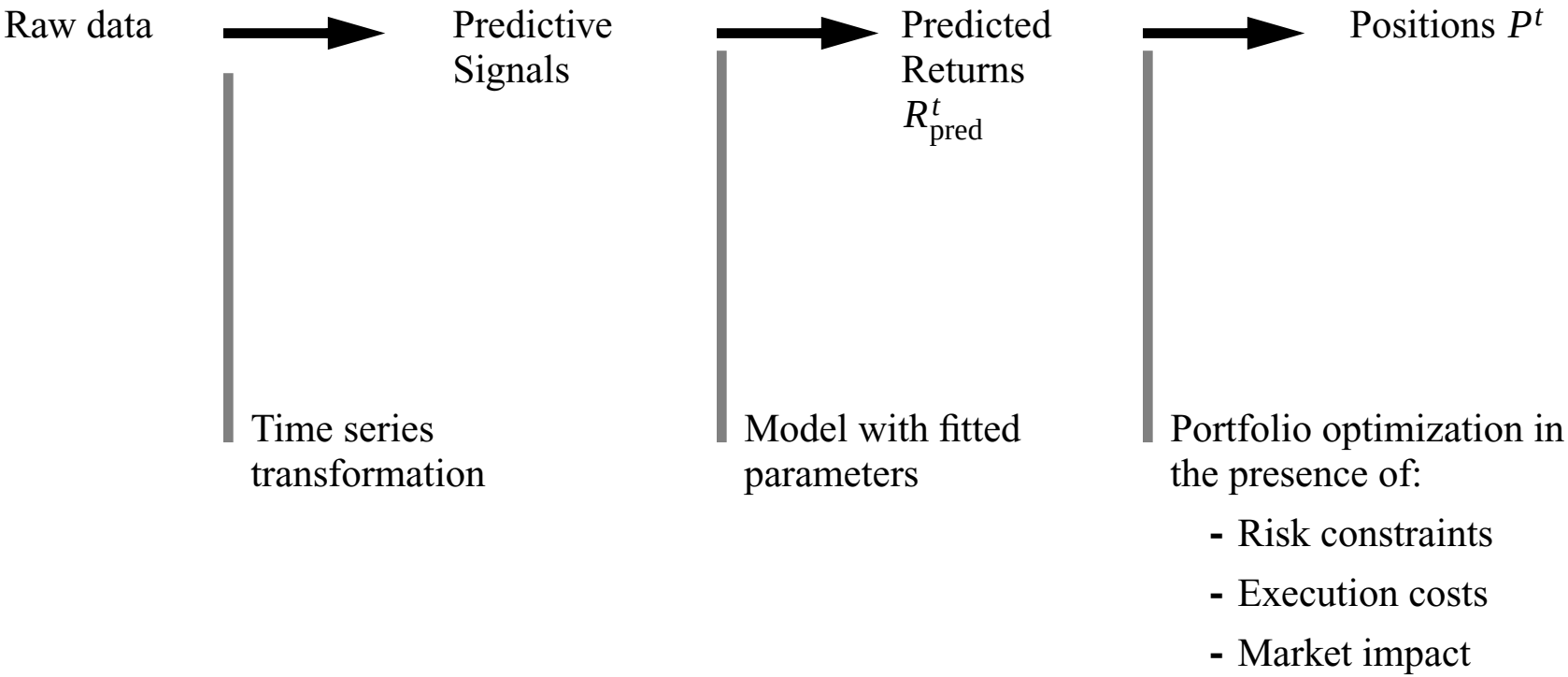
- Model-based trading experiment is quite pure (no traders).
- Bank monitors trading, does all back-office.
- Trading by bank is proprietary (no publically available fund, currently).
- Prediction Company is mostly comprised of software engineers and researchers (ratio of 2:1).

  No traders.
- Prediction Company has developed substantial technology in order to implement model-based trading. Both research infrastructure and production infrastructure.

Modeling: what is needed

- Clean (or at least cleanable) data, e.g. at least 10 years.
- Predictable structure in the data, strong enough to overcome execution costs.
- Many instances (many degrees of freedom).

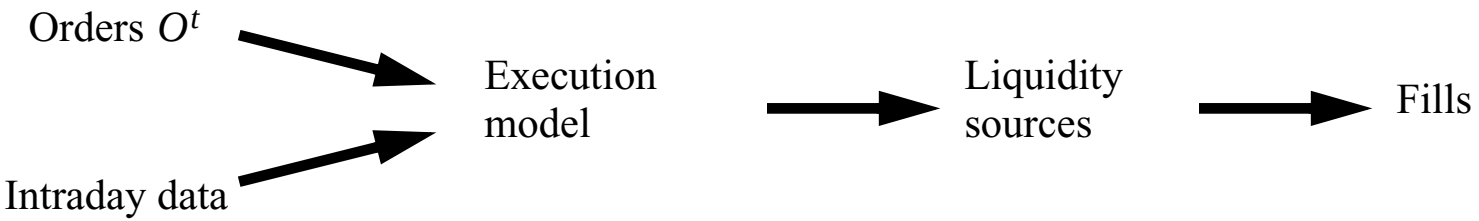
Modeling: producing aim positions



Modeling: executing orders

Orders are produced by change in position:

$$O^t = \delta P^t = P^t - P^{t-1}$$



Prediction Company Models

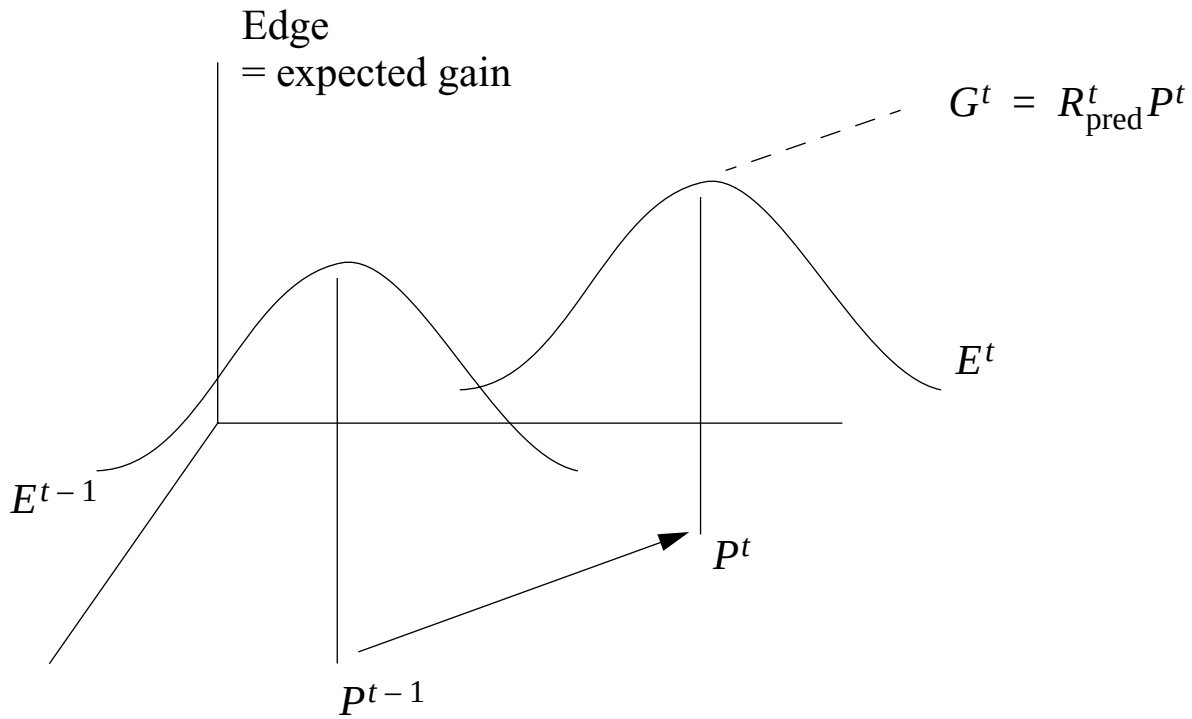
Used to generate aim positions daily:

- Long term return predictions (months)
- Medium term return predictions (days)
- Transaction cost predictions (built from execution data)
- Market impact predictions

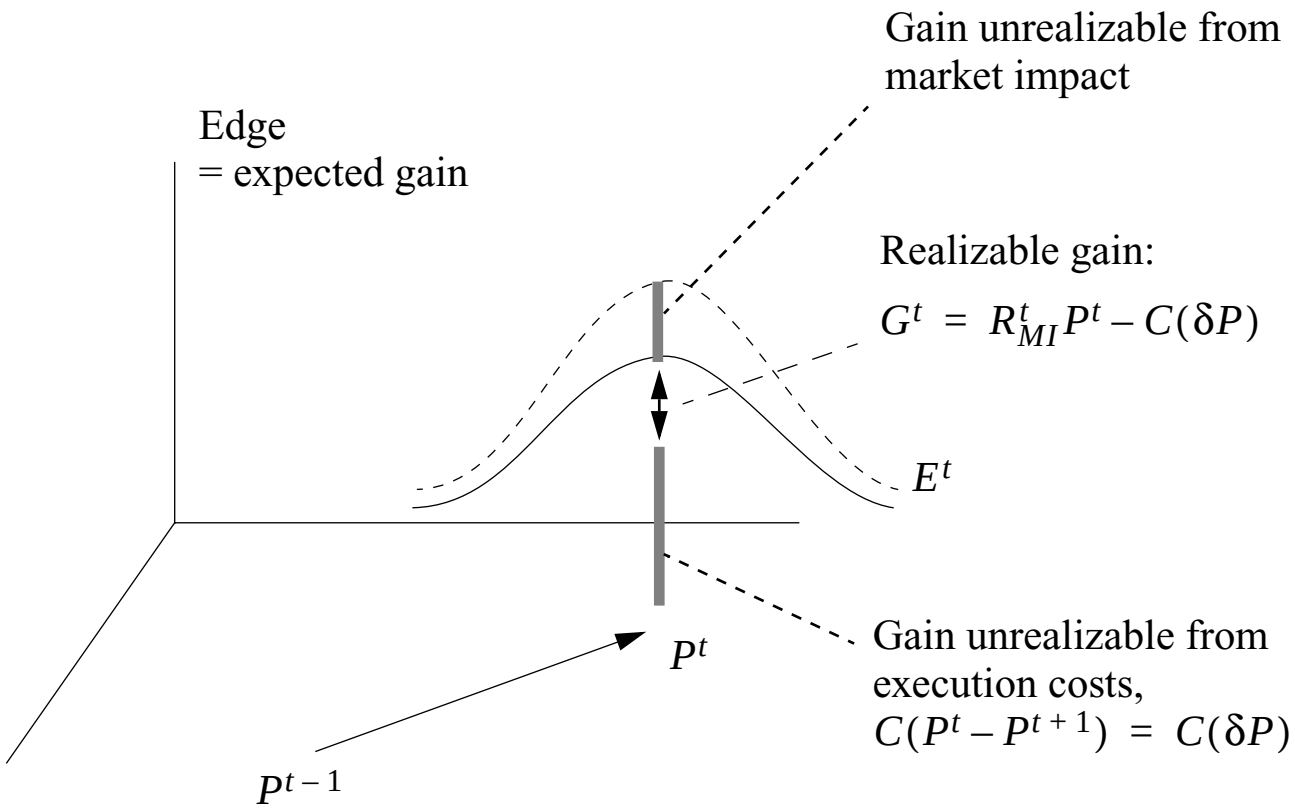
Used to execute orders intra-day:

- Short term (minutes - hours) predictions of both direction and liquidity.

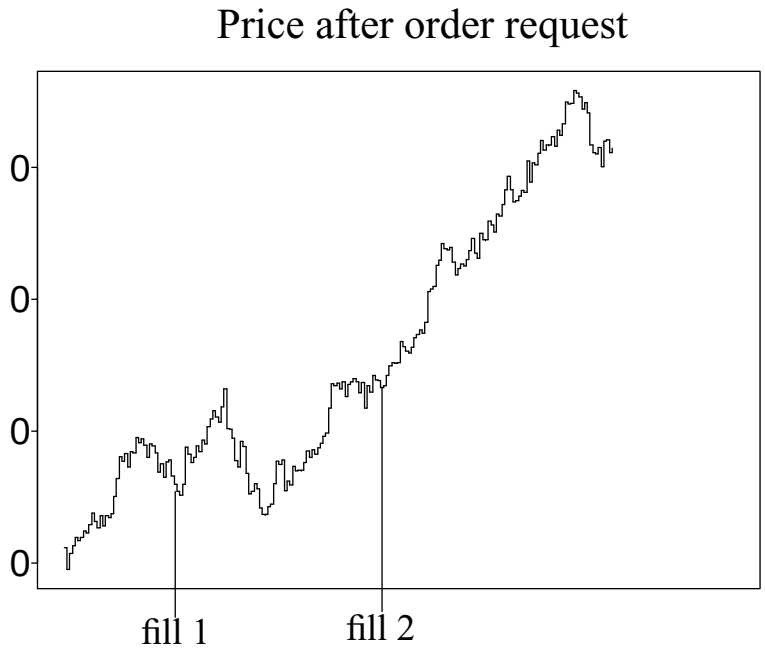
Modeling: a geometric picture



Modeling: a more realistic picture

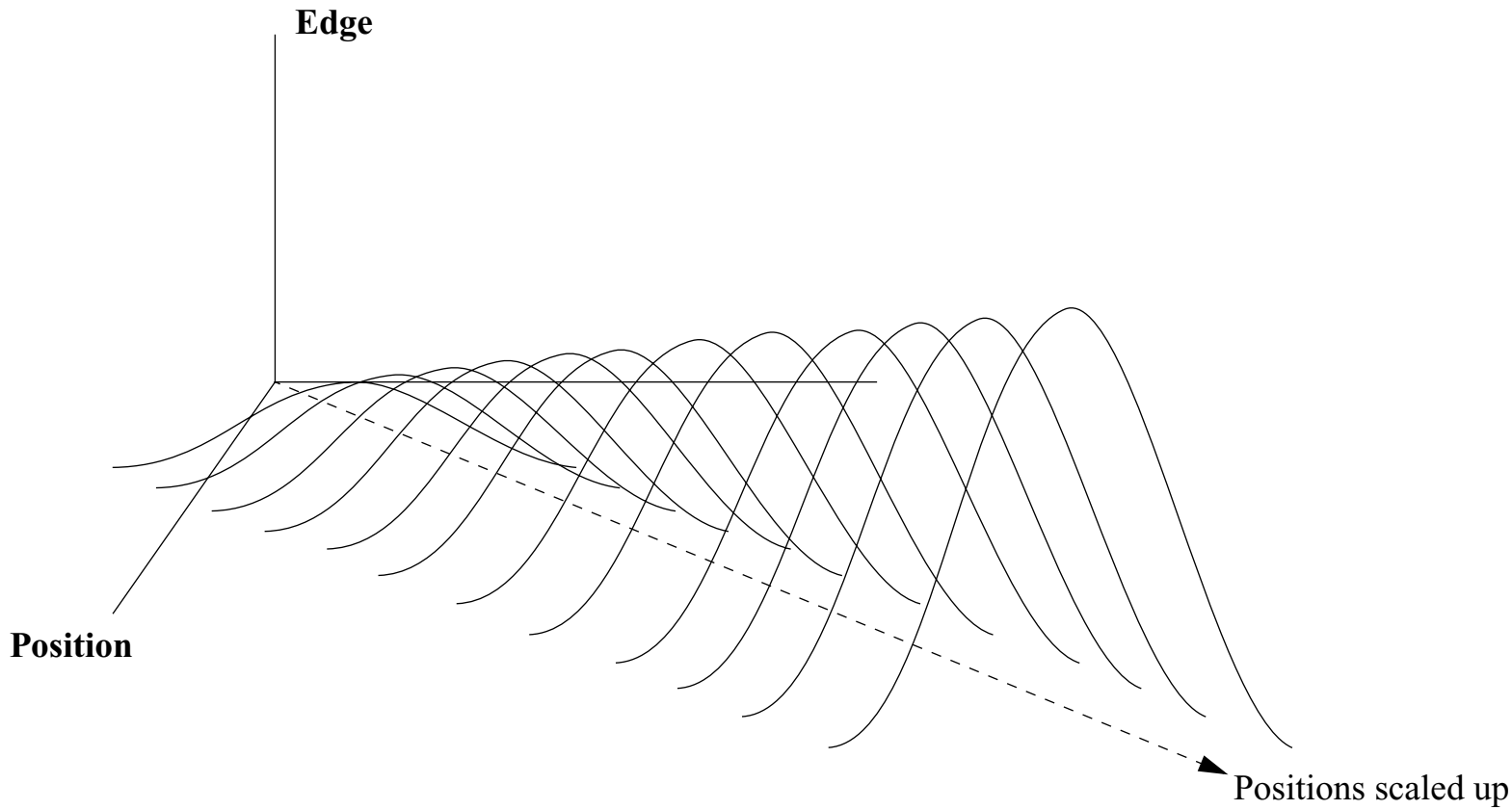


Modeling: importance of modeling execution costs

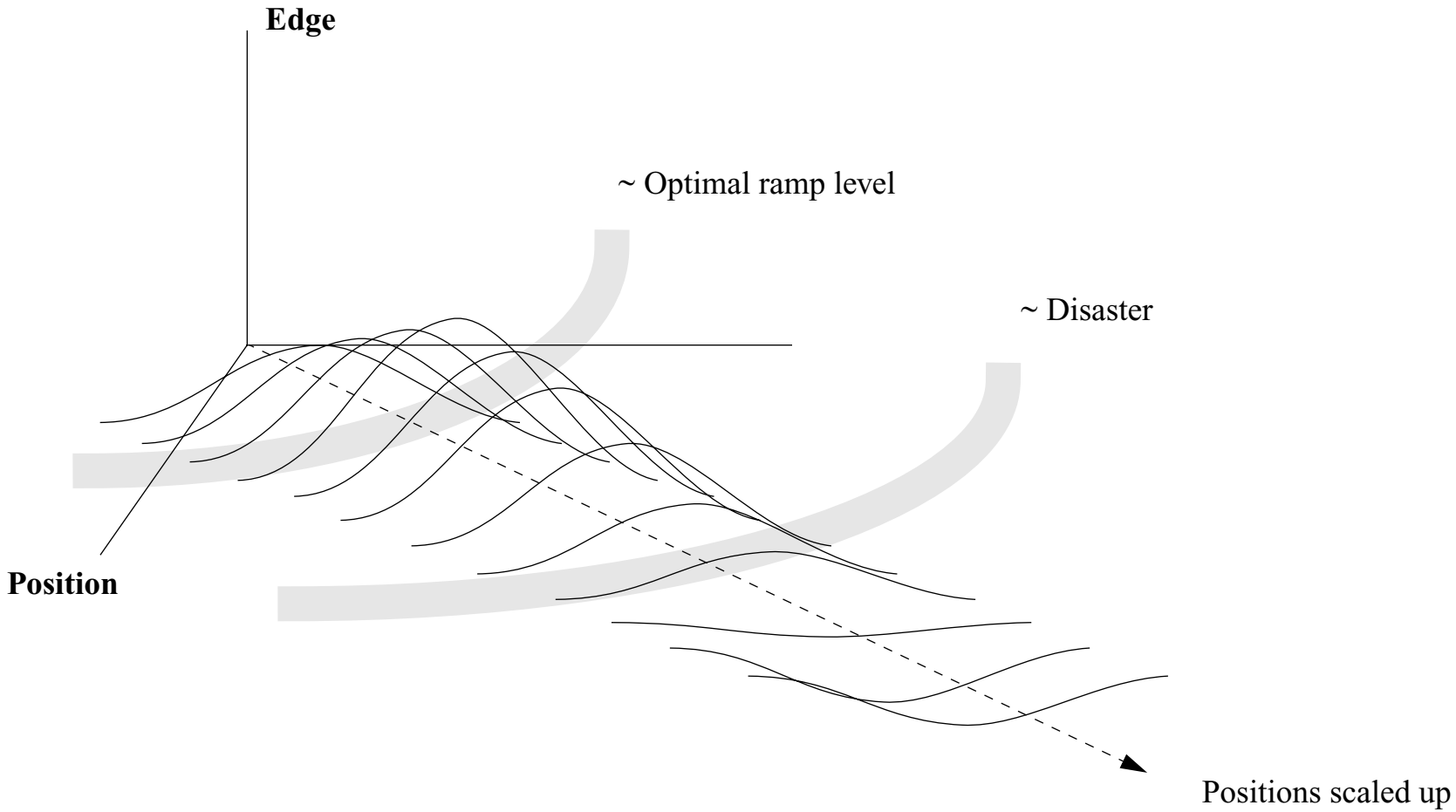


- Execution costs (slippage + fees + opportunity cost) can be accurately modeled only from execution data.
- Third party execution cost calculation available (e.g. Plexus).
- Execution cost models are used for:
  - Performance estimation
  - Portfolio balancing algorithm
  - ramp analysis

Ramping up: wishful thinking



Ramping up: more realistic



Making Believable Models

Two biggest problems:

- Limited data $\Rightarrow$ overfitting
- Nonstationarity

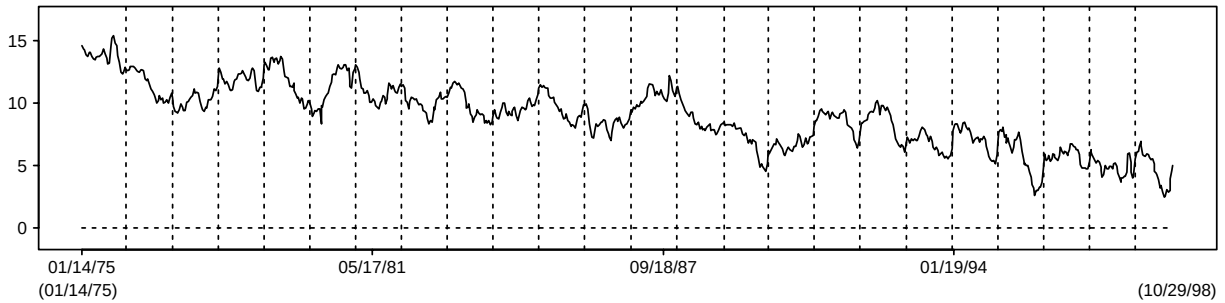
Main approaches to coping with the problems

- Regularization, e.g.
  - ridge regression for linear fits
  - weight decay for neural networks
- Adaptive models
  - Crucial issue: time scale of adaptation
- Temporal consistency conditions
- Appropriate statistics to judge "reality" of structure discovered in data (cf. Hal White, "A Reality Check for Data Snooping", A. Lo, C. Mackinley, "Data Snooping Biases in Tests of Financial Asset Pricing Models")

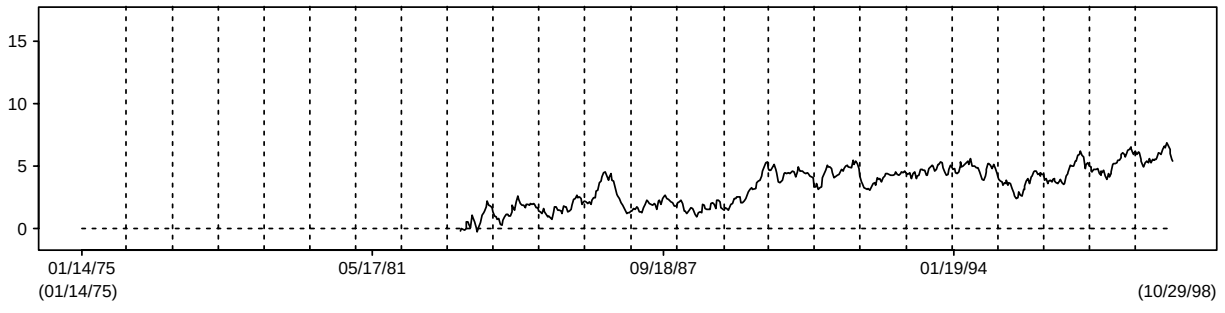
Nonstationarity

Predictive signal strength from 1975 - 1998 for two predictive signals:

Slow decay:



Slow strengthening:



What else can go wrong

- "Sudden" nonstationarity: sudden interruption or shifts in market dynamics (e.g. large money flows from one sector to another; exposure to unrecognized, unhedged risk factors).
- Indirect exposure to risk factors (e.g. market correlation)
- Increase in execution costs (causing possible over-ramped positions).
- Structural market changes (e.g. decimalization, day-trading?).
- Structural investor change (e.g. LTCM effects; political climate of partner).

Future Business Directions

Fund-based trading products

- Lower frequency (longer time-scale), higher capacity products; eventually toward asset management products.
- Higher frequency products, eventually toward automated market making, execution products.
- Move to other markets (Fx, commodities).

Other fincancial products

- Weaken purity? E.g., decision support.
- Sell execution (wholesale: mutual funds; retail: online brokerage).
- Individual investor services.

Non financial products

Large scale data-mining on proprietary data. E.g.:

- Predict customer preferences
- Analysis of Bio/pharm data
- Predict packet flow through networks