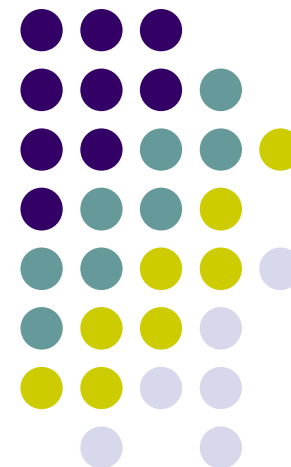




Exploiting Market Sentiment to Create Daily Trading Signals

Presented by: Dr Xiang Yu

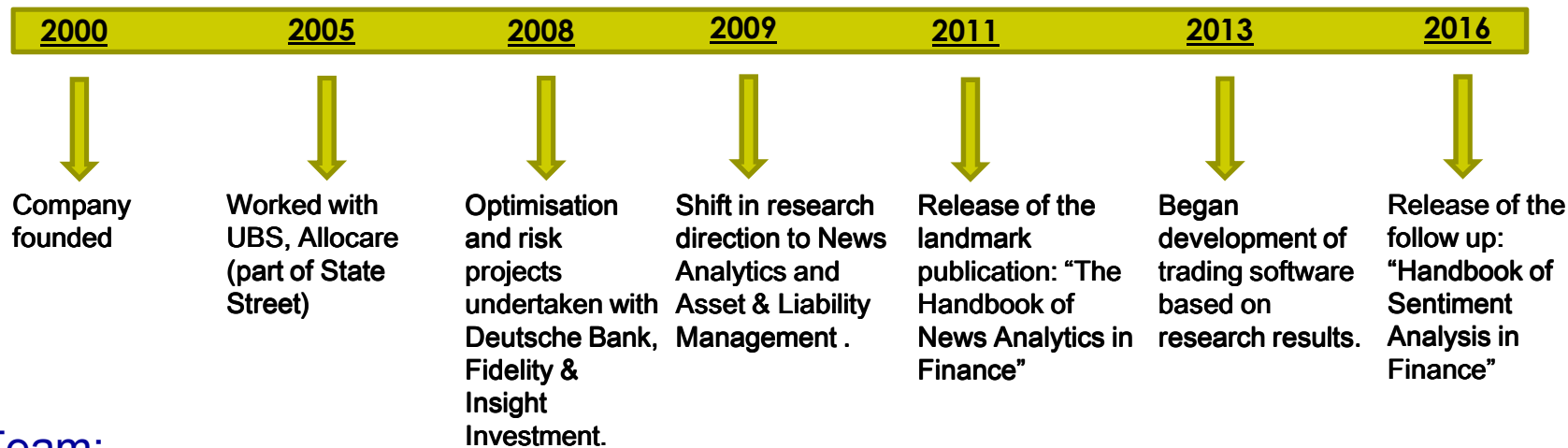
*LT-Accelerate
22 November 2016, Brussels*



OptiRisk Systems Ltd.



OptiRisk specializes in optimization and risk analytics and is renowned for its research and development of models and software systems in these domains.



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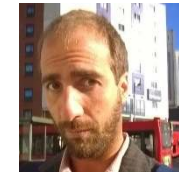
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Lucas



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Outline



- Define financial market sentiment
- How is it calculated
- Impact of sentiment
- Predictive properties
- Applications in Finance
- How to trade using sentiment

Define Financial Market Sentiment - Background



- Sentiment analysis captures the mood of markets and provides insight into upcoming influential events.
- Previous concepts were ambiguous: Investor, media, market
- Pioneer of news sentiment: Tetlock (2007)
- Contrasts with Efficient Market Hypothesis, which is a cornerstone of modern financial theory.

Define Financial Market Sentiment...



- Traditionally, financial market indicators have been
 - VIX – volatility index, fear factor
 - Buying & selling ratios
 - Liquidity figures....
- Nowadays, sentiment can be measured **precisely**.
- Thanks to text analytics, opinion mining, NLP and machine learning.

Define Financial Market Sentiment...



- News is an event
- News has an associated sentiment
- Investors are influenced by news sentiment
- Collective response of investors is the market sentiment
- News → investors → markets

Sources of information



- **News wires**
 - Reuters
 - Bloomberg
- **Social media**
 - Microblogs (Twitter, Weibo)
 - Flickr, YouTube
- **Online search information**
 - Google
 - Wikipedia

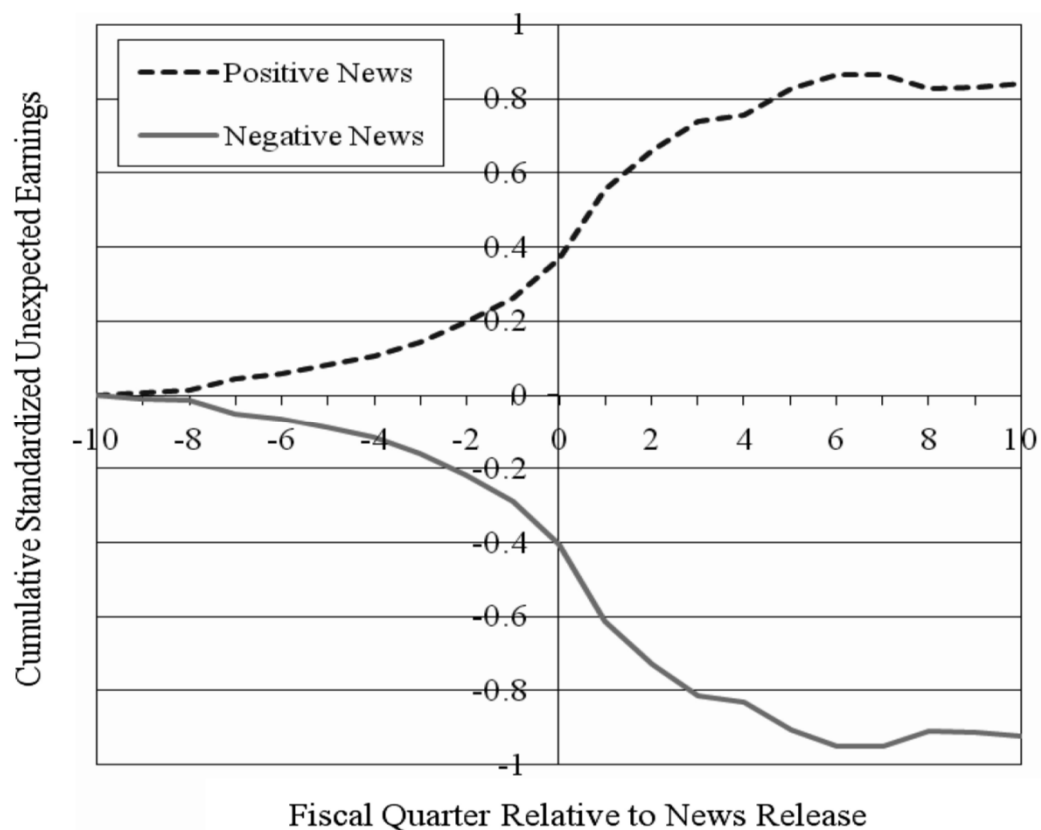


How is sentiment calculated?

- From textual content and big data
- Simplified version: 3 steps
 1. Entity recognition
 2. Classify sentiment using combination of techniques e.g. text mining, NLP, machine learning
 3. Scoring
- Algorithms that can run real-time
- Important to state the perspective



Motivation – Sentiment vs. Prices





Motivation – Sentiment vs. Prices



Stock price of Walt Disney Co. and Twitter on 26 September 2016.

Source: Bloomberg

Headline: “Disney said to be working with adviser on potential Twitter bid”



Impact of sentiment

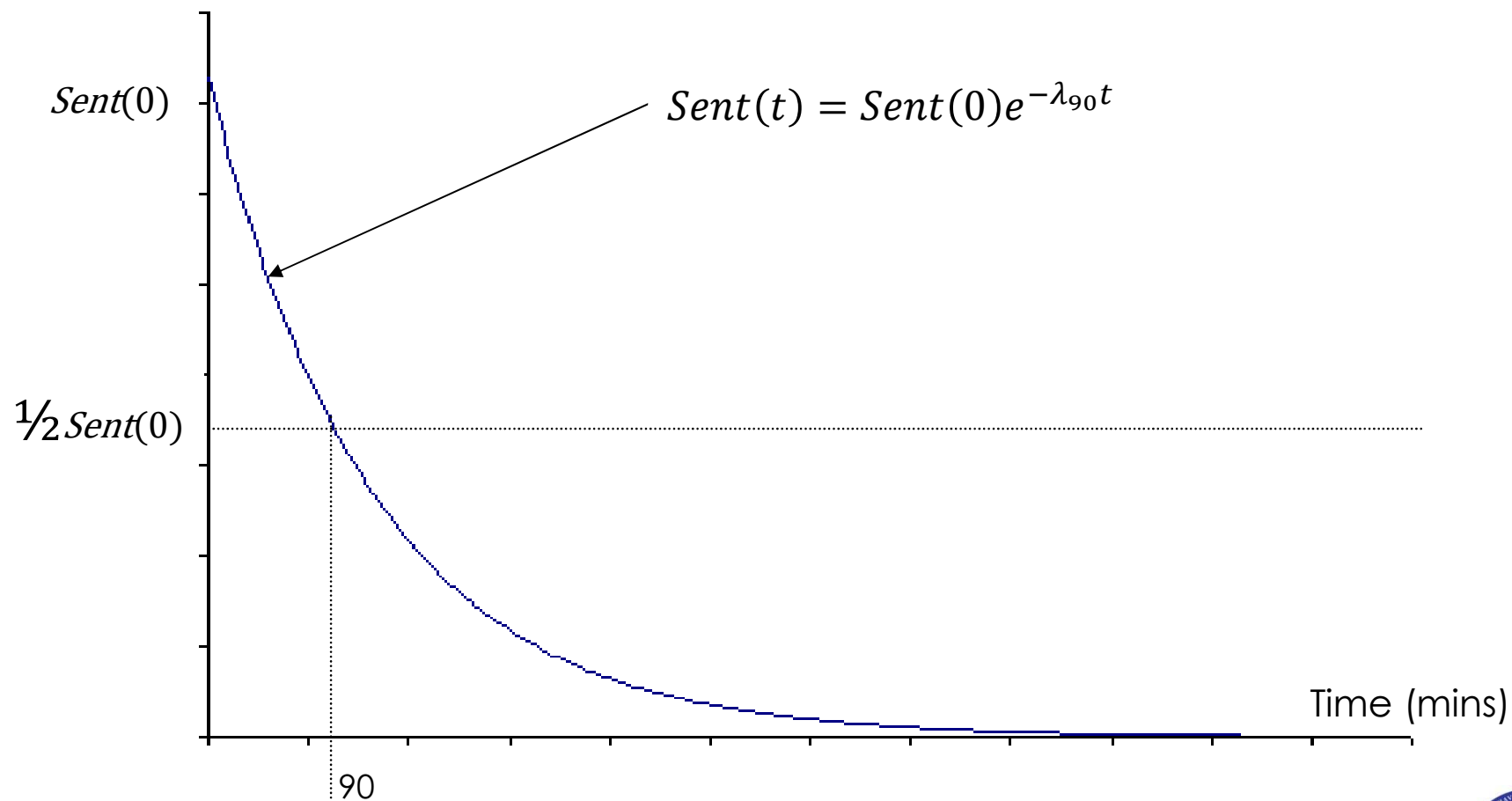
$$PImpact(t) = \sum_{\substack{k \in News^+ \\ t(k) < t}} PSent(k, t(k)) e^{-\lambda(t-t(k))}$$

$$NImpact(t) = \sum_{\substack{k \in News^- \\ t(k) < t}} NSent(k, t(k)) e^{-\lambda(t-t(k))}$$

- It is the aggregated sequence of news driven sentiment that moves investors and markets
- The impact depends on (i) number of news items and (ii) the decay of news sentiment over time

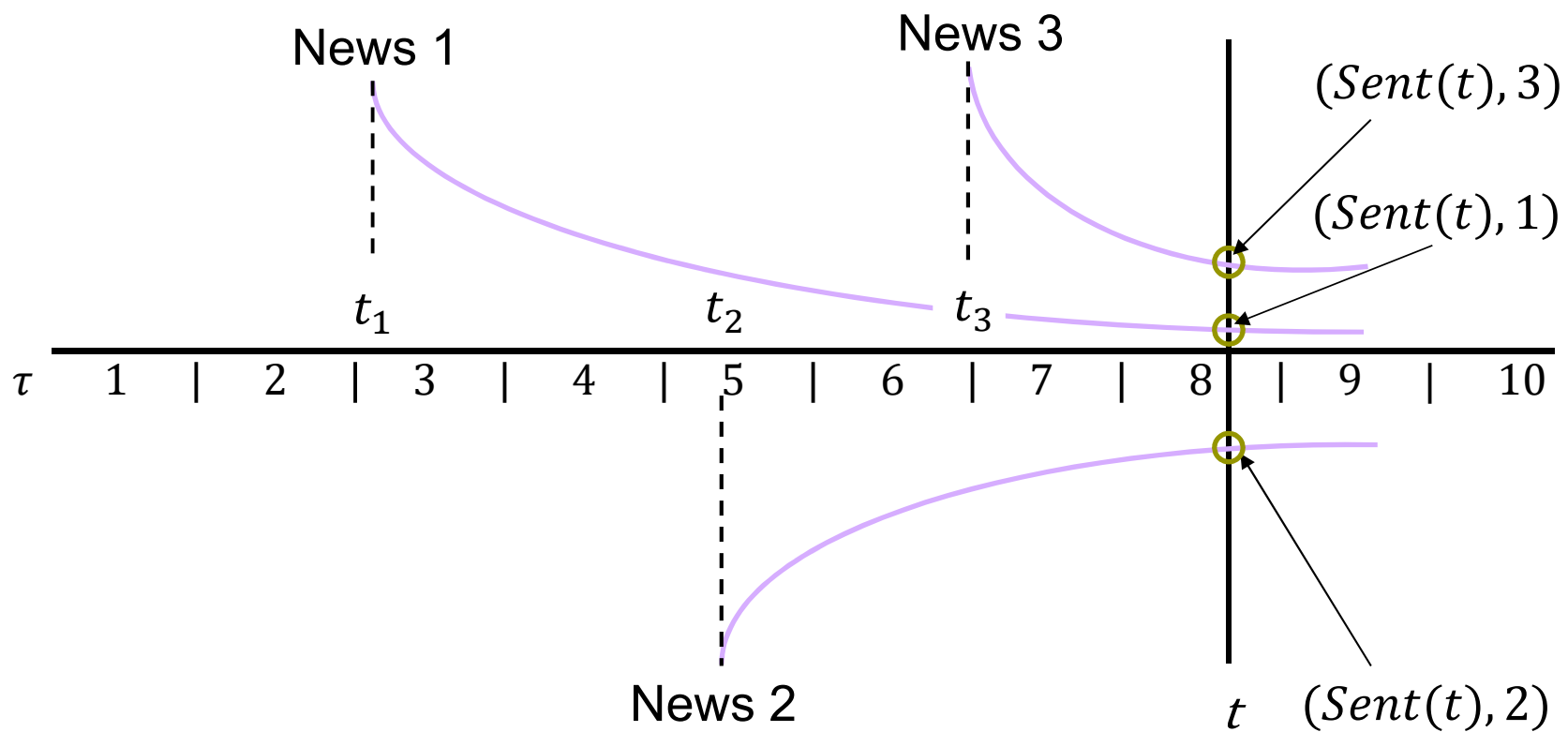


Impact of sentiment





Impact of sentiment





Predicting Volatility with News

$$r_t = \mu + \epsilon_t,$$

where $\epsilon_t = \sigma_t z_t$.

$$\sigma_t^2 = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \beta_1 \sigma_{t-1}^2 + \omega_1 PImpact_{t-1} + \omega_2 NImpact_{t-1} (+\omega_3 Newsflow_{t-1}) + u_t$$

where σ_t^2 is the volatility at time t , ϵ_{t-1}^2 is the lagged log-return residuals, σ_{t-1}^2 is the lagged volatility, $PImpact_{t-1}$ and $NImpact_{t-1}$ are the positive and negative news impact score of the previous time interval respectively, and u_t is the error term.



Predicting Volatility with News

Volatility Residuals for Finance Companies



Predicting Volatility with News



Other news parameters to consider:

- Newsflow
- Expected vs. unexpected news
- News by sector

Depending on properties of news parameter, apply:

- T-GARCH
- e-GARCH
- GJR-GARCH

Applications of Sentiment Analysis in Finance



- Prediction of
 - asset behaviour - returns, volatility and liquidity
 - economic activity
 - commodity prices
- Risk management
- Regulation

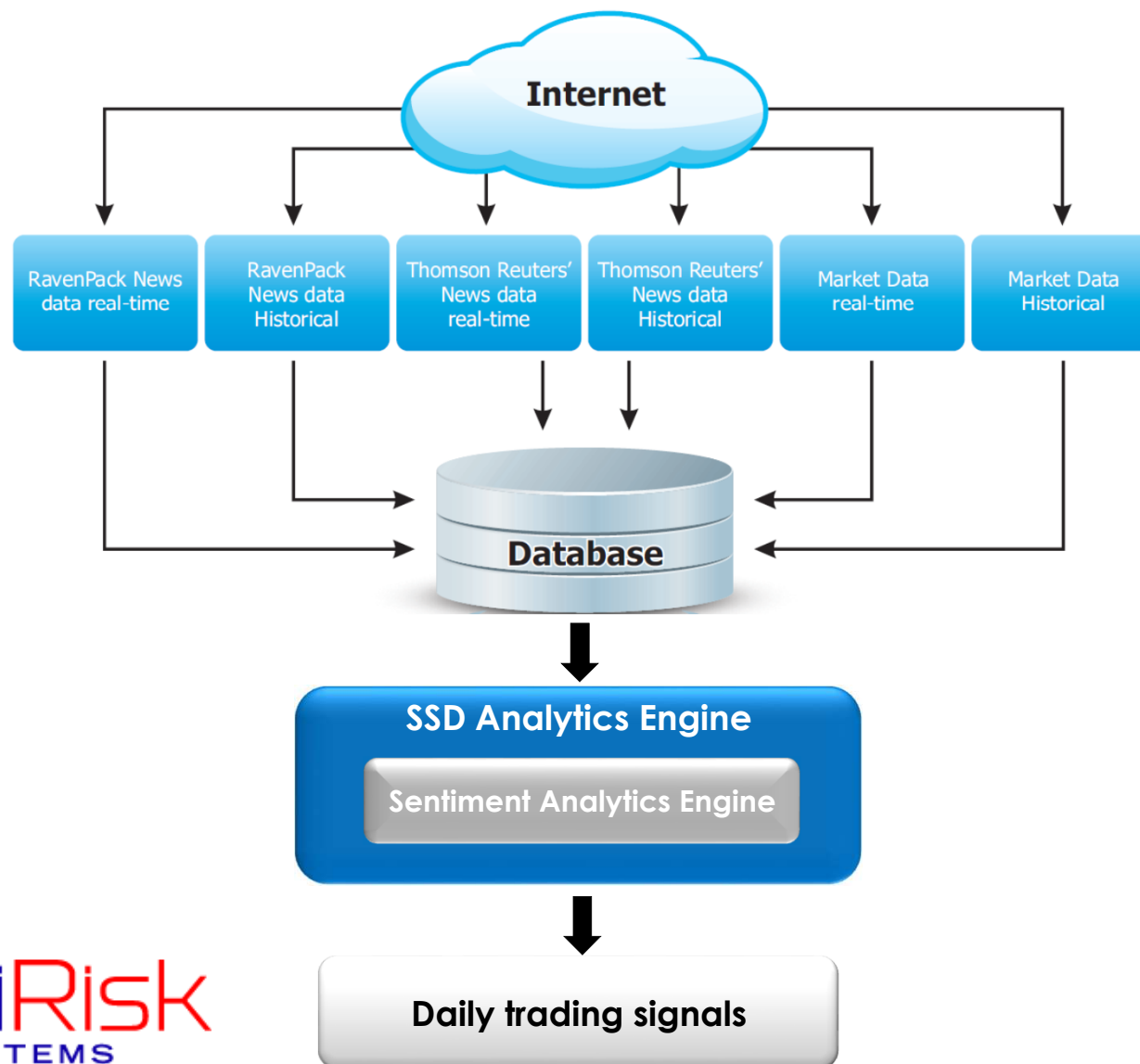
How sentiment analysis affects trading



- Removes all limitations on:
 - Speed
 - Information sources
 - Financial instrument coverage
- Ultimately, tries to beat the market & other participants
- Best at low frequencies – daily, intraday



SSD Signals





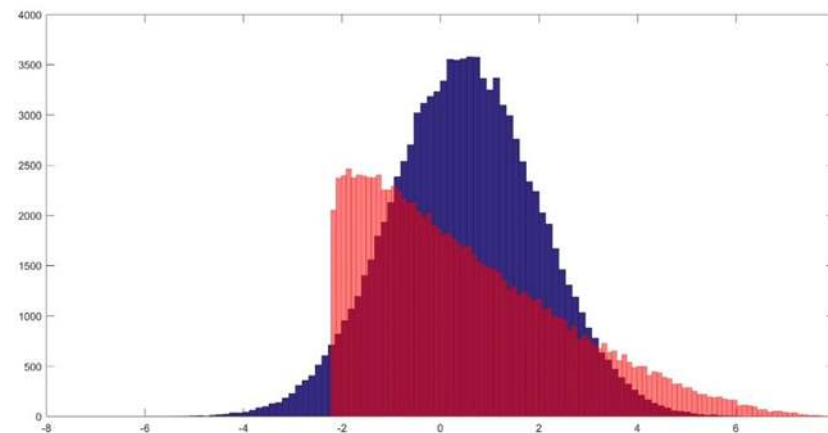
SSD – Second Order Stochastic Dominance

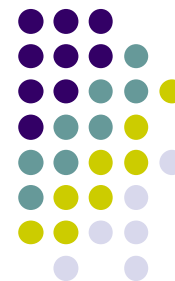
- What is the goal the investor wants to achieve?

Given her knowledge (historical asset prices, news...), she wants to select promising assets and construct a portfolio π (long/short), where the predicted return distribution has several *nice* features (e.g. high expectation, low variance, low downside risk [value-at-risk, CVaR, ...])

- The challenge for her is to select a desired portfolio amongst many.

- → Stochastic dominance is a method of stochastic ordering and an approach in stochastic decision theory.





Performance of SES

1. **The SES portfolio is rebalanced every day with (adjusted) closing prices and only assets that are part of the index are considered.**
2. **We assume a yearly risk free rate of 2%.**
3. **Transaction costs of 5 basis points for both buying and selling.**
4. **Money management at 50% of mark-to-market portfolio value.**
5. **We reshape the reference distribution to achieve an improved positive skewness.**

For each test we present a graphic with the portfolios performance and a table with further statistics. The tables contain the following columns:

Excess RFR (%): Annualised excess return over a risk-free rate, given in percentage.

Sharpe Ratio: Annualised Sharpe ratio of portfolio returns.

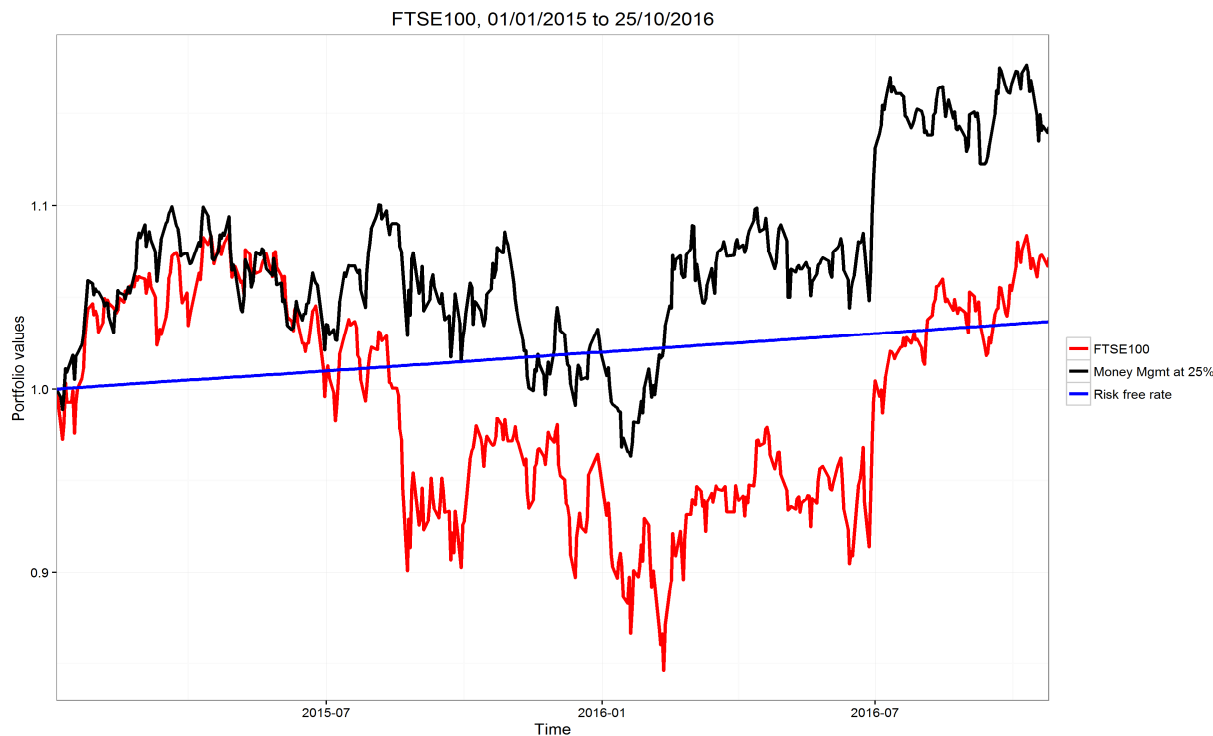
Sortino Ratio: Annualised Sortino ratio of portfolio returns

Max drawdown (%): maximum drop in portfolio value, in percentage.

Max. rec. days: Maximum number of days for the portfolio to recover from a drop in value.



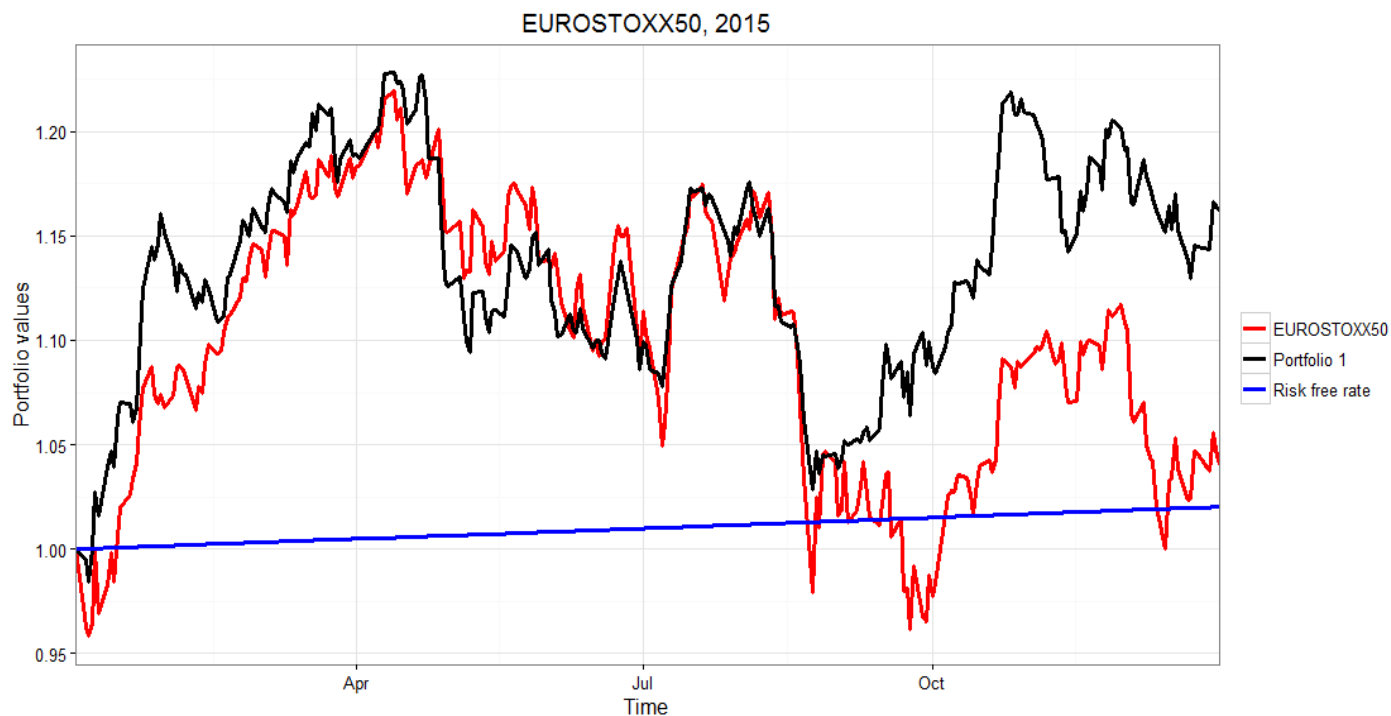
FTSE100 Results



Portfolio	Final value	Excess RFR (%)	Sharpe ratio	Sortino ratio	Max drawdown (%)	Max. rec. days
FTSE100	1.07	1.91	0.10	0.15	22.06	379
SES	1.14	5.64	0.40	0.57	12.49	227



EUROSTOXX Results



Portfolio	Final value	Excess RFR (%)	Sharpe ratio	Sortino ratio	Max drawdown (%)	Max. rec. days
EUROSTOXX50	1.04	2.05	0.09	0.12	21.14	186
SES	1.16	14.00	0.72	1.10	16.23	186

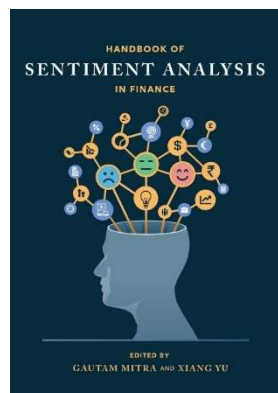
Summary



- Computing power available nowadays makes it possible to accurately calculate the sentiment of markets.
- Masses of text, multitude of sources and the whole crowd.
- Predictive value have been found in many applications across many financial instruments.
- We found sentiment data to be most powerful in predicting volatility.
- This information then enhances the portfolio selection decision using optimisation models for trading purposes.
- All in a fully automated process.
- Taking subjective information to build an objective system.



Thank you!



The Handbook of Sentiment Analysis in Finance

Edited by Prof Gautam Mitra and Dr Xiang Yu

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