Exploiting Market Sentiment to Create Daily Trading Signals

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LT-Accelerate
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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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2000
Company founded

2005
Worked with UBS, Allocare (part of State Street)

2008
Optimisation and risk projects undertaken with Deutsche Bank, Fidelity & Insight Investment.

2009
Shift in research direction to News Analytics and Asset & Liability Management.

2011
Release of the landmark publication: “The Handbook of News Analytics in Finance”

2013
Began development of trading software based on research results.

2016
Release of the follow up: “Handbook of Sentiment Analysis in Finance”

2009
Began development of trading software based on research results.
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

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

\[ P_{\text{Impact}}(t) = \sum_{k \in \text{News}^+} P_{\text{Sent}}(k, t(k)) e^{-\lambda(t-t(k))} \]

\[ N_{\text{Impact}}(t) = \sum_{k \in \text{News}^-} N_{\text{Sent}}(k, t(k)) e^{-\lambda(t-t(k))} \]

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

\[ Sent(t) = Sent(0)e^{-\lambda_90t} \]
Impact of sentiment

- News 1
- News 2
- News 3

$t_1$, $t_2$, $t_3$

$(Sent(t), 1)$, $(Sent(t), 2)$, $(Sent(t), 3)$
Predicting Volatility with News

\[ r_t = \mu + \epsilon_t, \]

where \( \epsilon_t = \sigma_t z_t \).

\[ \sigma_t^2 = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \beta_1 \sigma_{t-1}^2 + \omega_1 P\text{Impact}_{t-1} + \omega_2 N\text{Impact}_{t-1} + \omega_3 \text{Newsflow}_{t-1} + u_t \]

where \( \sigma_t^2 \) is the volatility at time \( t \), \( \epsilon_{t-1}^2 \) is the lagged log-return residuals, \( \sigma_{t-1}^2 \) is the lagged volatility, \( P\text{Impact}_{t-1} \) and \( N\text{Impact}_{t-1} \) 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

- Residuals market data + news data (blue)
- Residuals market data only (red)

Options: AIG, American Express, BAC, JPM, Barclays, Lloyds, RBS, Standard Chartered
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 – 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 \( \pi \) (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.

- \( \rightarrow \) 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

![Graph showing portfolio values over time for FTSE100 and SES.](image)

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Final value</th>
<th>Excess RFR (%)</th>
<th>Sharpe ratio</th>
<th>Sortino ratio</th>
<th>Max drawdown (%)</th>
<th>Max. rec. days</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTSE100</td>
<td>1.07</td>
<td>1.91</td>
<td>0.10</td>
<td>0.15</td>
<td>22.06</td>
<td>379</td>
</tr>
<tr>
<td>SES</td>
<td>1.14</td>
<td>5.64</td>
<td>0.40</td>
<td>0.57</td>
<td>12.49</td>
<td>227</td>
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</tbody>
</table>
EUROSTOXX Results

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Final value</th>
<th>Excess RFR (%)</th>
<th>Sharpe ratio</th>
<th>Sortino ratio</th>
<th>Max drawdown (%)</th>
<th>Max. rec. days</th>
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</thead>
<tbody>
<tr>
<td>EUROSTOXX50</td>
<td>1.04</td>
<td>2.05</td>
<td>0.09</td>
<td>0.12</td>
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</tr>
<tr>
<td>SES</td>
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<td>14.00</td>
<td>0.72</td>
<td>1.10</td>
<td>16.23</td>
<td>186</td>
</tr>
</tbody>
</table>
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! Thank you! Thank you! Thank you!

The Handbook of Sentiment Analysis in Finance
Edited by Prof Gautam Mitra and Dr Xiang Yu

Available on Amazon or on www.optirisk.com/publications