Impact of News Events on the Financial Markets

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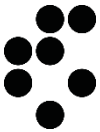


Problem Setting

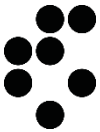
Goal: market analysis using world-wide events

Approach: observe the change in volume (price) between the closing value of today and the day after the event

- Extend traditional technical market analysis to include unstructured datasets
- Combine data sources
  - information from the news
  - historical market data

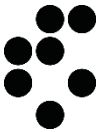
Usage:

- risk management tool against large market movements around news events
- trading strategy



Overview

- Data: Market and News
- Methods
- Results
- Conclusion and future work



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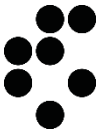
Data

- Combine two sources:
  1. Historical Markets Data
  2. News events

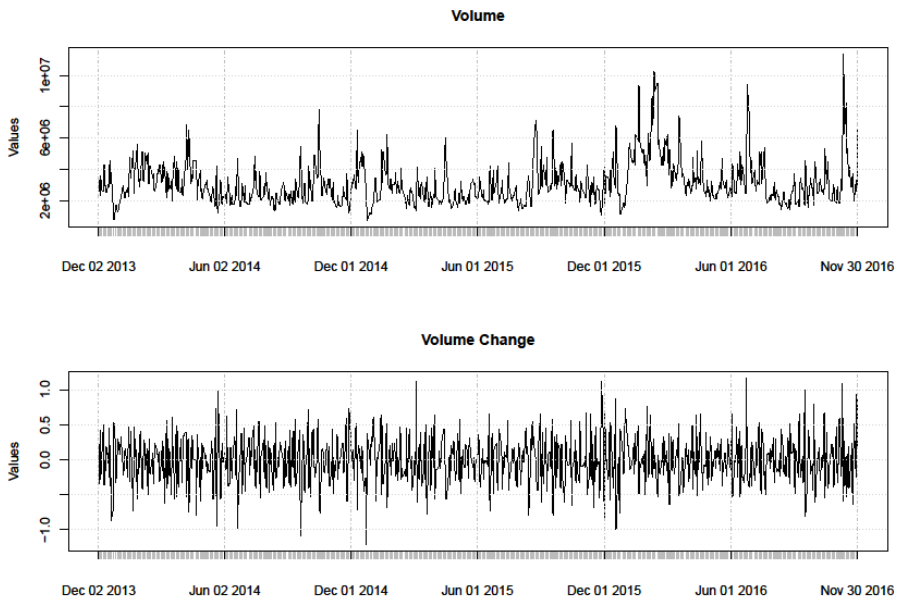
- Analysis done on data of investment bank Goldman Sachs

- Period: 2.12.2013 – 30.12.2016
  - 777 trading days
  - 4336 news events from Event Registry



Market Data

- Open, close, high, low and volume value
- VIX index as measure of volatility
- Daily frequency
- Source : Yahoo Finance



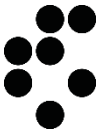
Market data pre-processing

- Market change measured through change in volume and price:

$$(\text{Volume Change})_t \equiv VC_t = \frac{V_{t+1} - V_t}{V_t},$$

$$(\text{Returns})_t \equiv r_t = \frac{P_{t+1} - P_t}{P_t}.$$

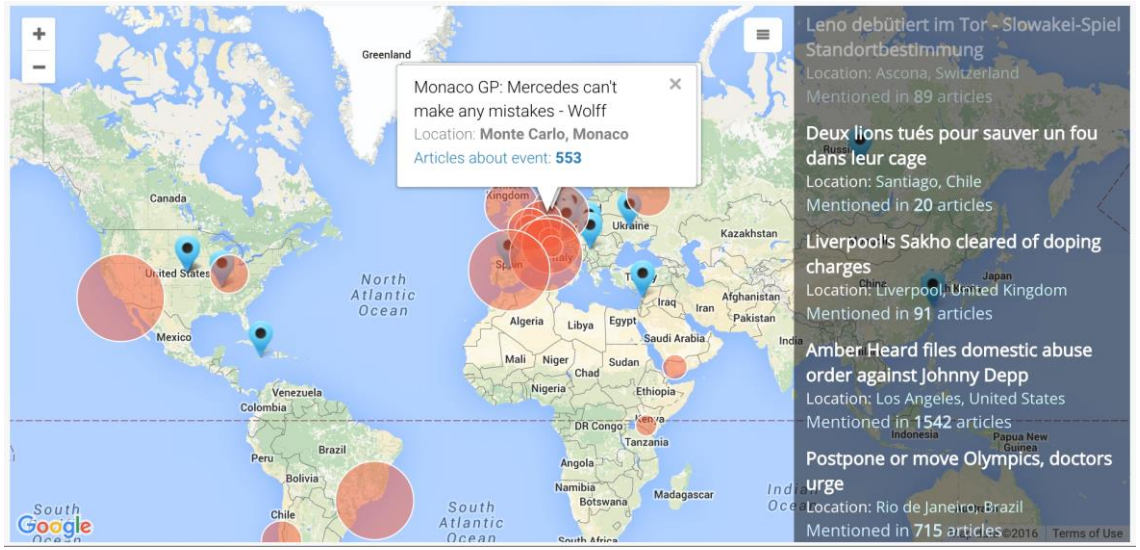
- V_t , P_t are volume and price at time t
- Additionally calculated: Rolling mean and Exponential Moving Average (EMA) for 5 and 10 days of VC_t, r_t



News data

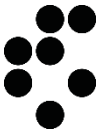
- News event:
  - Cluster of articles
  - Multilingual (100+ languages)
  - Extracted: concepts, topics, date, location, social score, …

- Source: Event Registry

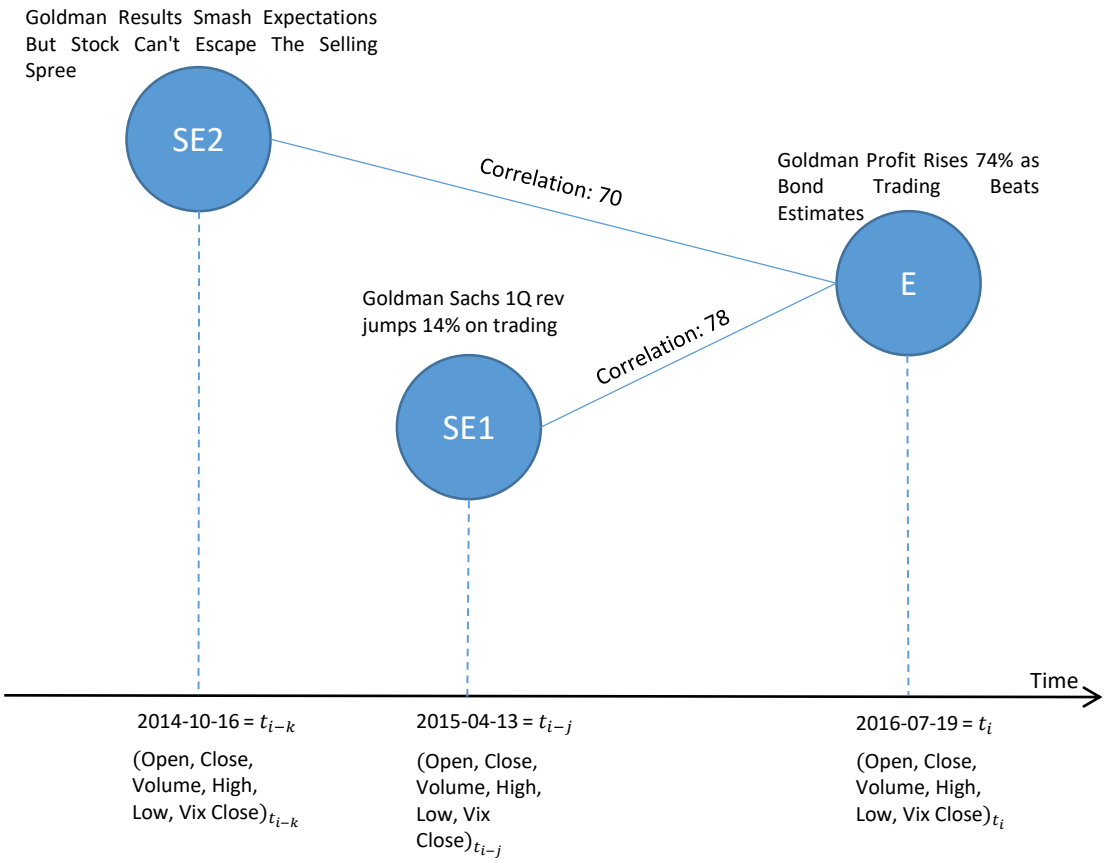


News data (cont.)

- To reduce noise lower boundary for relevance was set, left with 424 events
- For each event, past similar events were found
- Change of market on the dates of past similar events was used as dataset for making prediction about impact of current event
- Prediction from similar events used as a feature in the time series model



Similar Events - example




Correlation between events relating to Goldman Sachs
Node Connections
80
70
60
50
40
30
20
10
0
Data source: [Event Registry]
EDIT CHART

Methods – Time series model

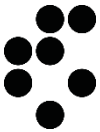
- ARMA(p,q) model:

$$X_t = \mu_t + Z_t,$$

$$\mu_t = \sum_{i=0}^{p} \alpha_i X_{t-i} + \sum_{j=1}^{q} \omega_j Z_{t-j}$$

$$Z_t = \sigma\epsilon \Rightarrow Z \sim N(0, \sigma^2)$$

$X_t \ldots$ Target variable
$\mu_t \ldots$ Equation for the mean
$\epsilon \ldots$ Iid normaly distributed noise term
$\sigma \ldots$ Variance

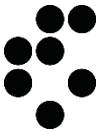


Methods (cont.)

- Extend the ARMA model to non-constant variance, GARCH model:

$$\sigma_t^2 = \beta_0 + \sum_{i=1}^{r} \beta_i Z_{t-i}^2 + \sum_{j=1}^{s} \gamma_j \sigma_{t-j}^2$$

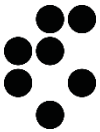
- Evaluation criteria
  - Stationarity assumption tested with Augmented Dicky Fuller and KPSS Test
  - Model selection with Akaike and Bayesian Information Criterion (AIC, BIC)



Results

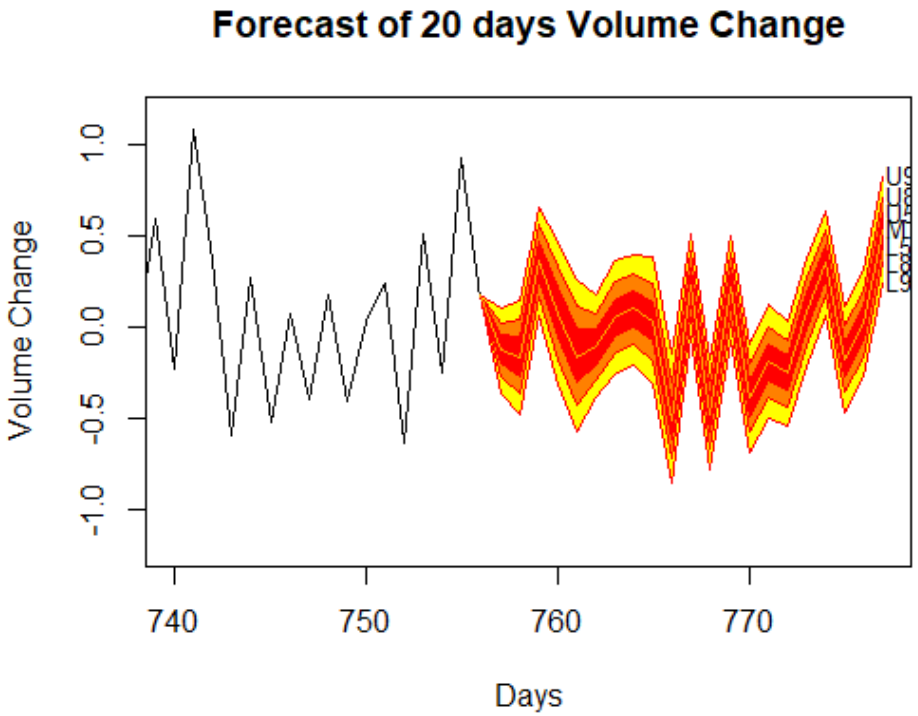
- Relevant features:
  - Volatility - VIX Close price
  - Rolling mean 5 and 10 days
  - Rolling EMA 5 and 10 days
  - Prediction of Returns from similar events

- Predictions from the similar events improve model
- Final Model: ARMA (2,2) – GARCH (5,1)



Results (cont.)

- Improvement in AIC by 11 (drop in relative information lost when a given model is used)
- In terms of relative likelihood, the baseline model is 0.007 times as likely as the proposed model to minimize information loss



Conclusion

- Approach to determining the impact of news events on the financial markets
- Complex news data source was used and combined with market data
- Predictions of returns from past similar events shown to be statistically significant improvement for modelling volume change
- Future work includes further analysis of network formed from similar events

Acknowledgments

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