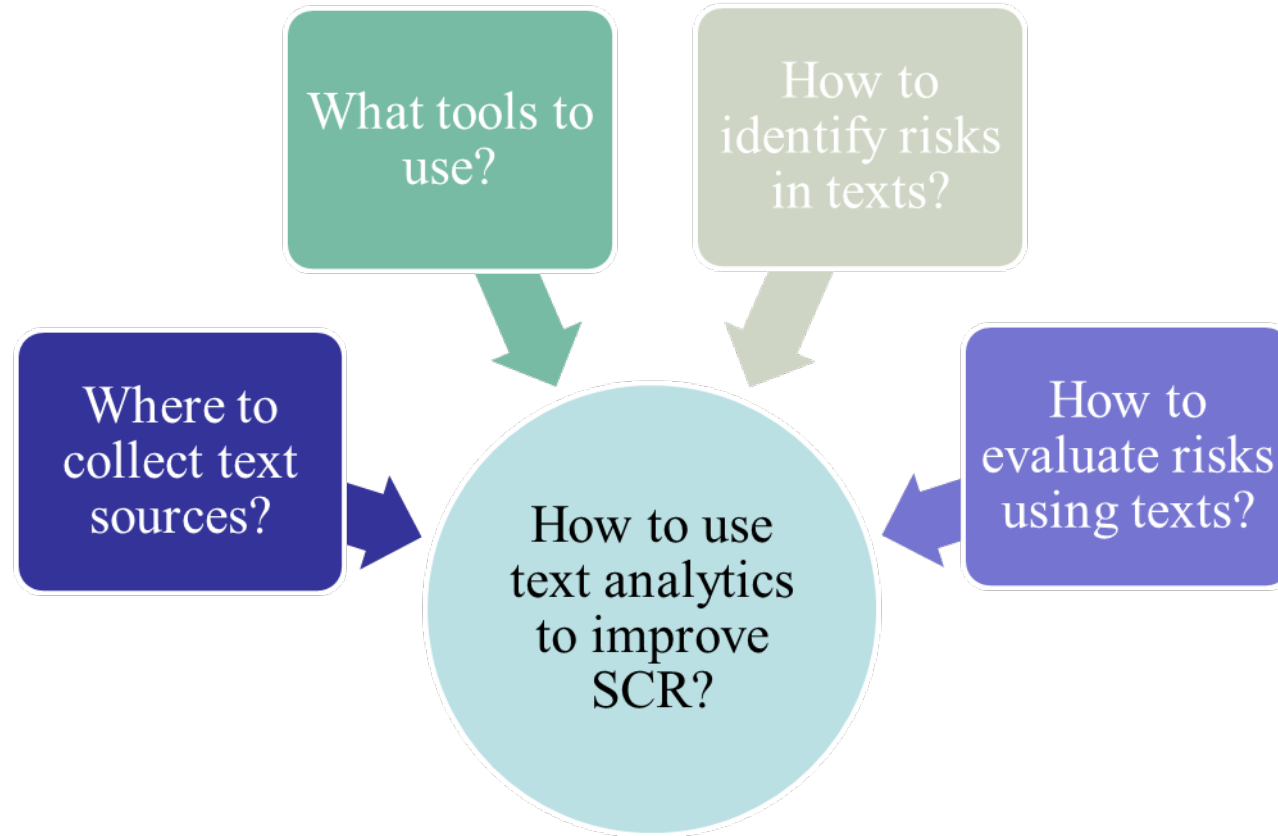
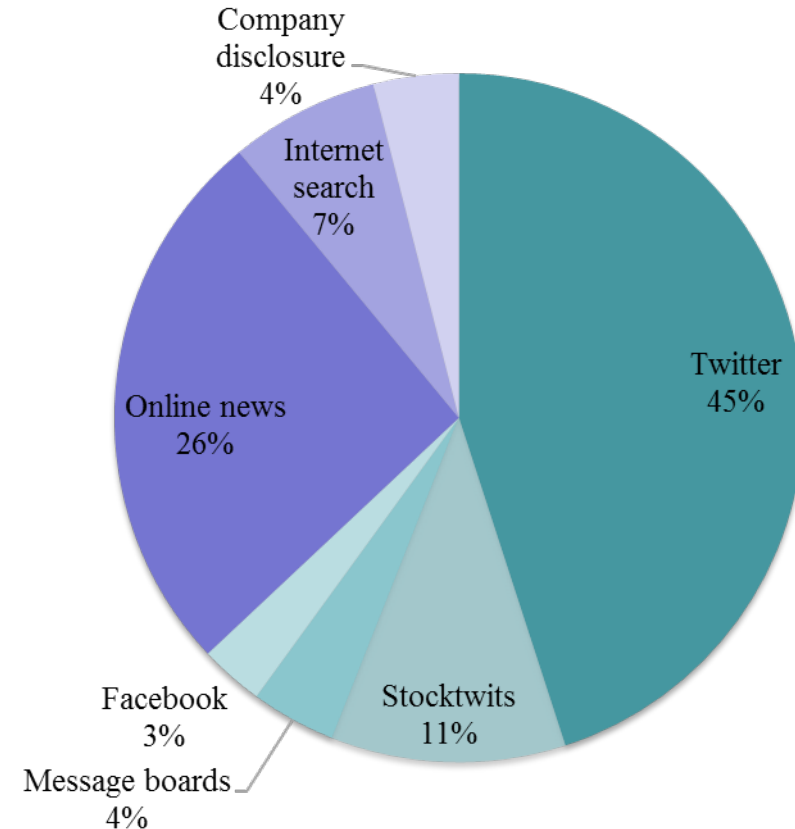


Research question roadmap



Where to collect text sources?

- Less studies applied text analytics to supply chain risk management
- Many analyzed texts for stock market prediction
- The distribution on the right is based on 73 highly cited studies using texts for stock markets



What tools/methods to use?

Data pre-processing

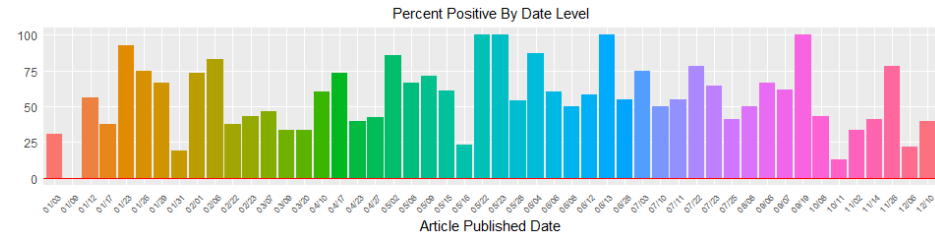
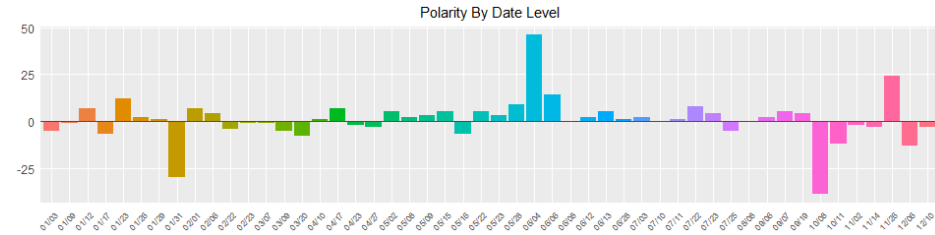
Feature extraction	Feature selection	Feature representation
<ul style="list-style-type: none">• Bag-of-words• N-gram• Noun phrase• Proper noun• Named entity • Document counts, number of messages or tweets• Predefined list of words (e.g. sentiment lexicons)	<ul style="list-style-type: none">• Stop words/ numbers removal• Stemming• Lemmatization• Part-of-speech tagging• Term frequency (TF) and term frequency-inverse document frequency (TF-IDF)	<ul style="list-style-type: none">• TF and TF-IDF• Sentiment scores• Sentiment polarity

Modeling

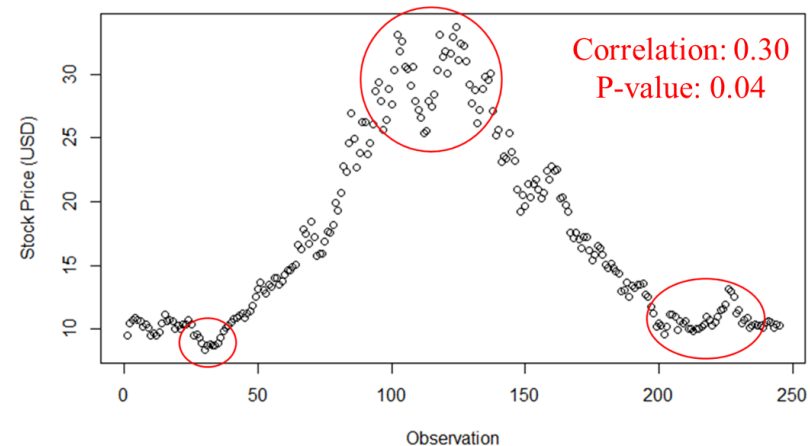
Mathematical	Statistical	Machine learning
<ul style="list-style-type: none">• Fuzzy logic/theory• Optimization	<ul style="list-style-type: none">• Correlation coefficients• Granger causality• Regression analysis	<ul style="list-style-type: none">• Association rule• Naïve Bayes/Bayesian network• Decision tree• Support vector machine• Artificial neural network• Deep learning

Risk categorization and sentiment analysis

Risk factor	Risk type
“terror” / terrorism and terrorist	Political
“war” / war	
“transport” / transportation	Logistic
“distribut” / distribution	
“disast” / disaster	Environmental
“natur” / nature and natural	
“catastroph” / catastrophe	
“tsunami” / tsunami	
“earthquak” / earthquake	
“bankruptci” / bankruptcy	Financial
“financi” / financial	
“suppli” / supply and supplier	Supply and demand
“substitut” / substitute and substitution	
“sourc” / source	
“manufactur” / manufacturer, manufacture, and manufacturing	System
“demand” / demand	
“network” / network	
“uncertain” / uncertain and uncertainty	
“disrupt” / disruption	Operational
“compete” / competitor	
“utilis” / utilization	



Yageo Corp. Stock (Close) Price in 2018



Risk importance and evaluation

Resource limits variables	W_i
Capacity increase	0.046
Equipment failure	0.042
Patent disputes	0.041
Plant opening	0.045
Product obsolescence	0.043
Research restrictions	0.010
Supply Increase	0.045
Transportation disruption	0.041
Assembly bottleneck	0.080
Capacity decrease	0.078
Plant closure	0.073
Supply decrease	0.081
Power outage	0.121
Capacity shortage	0.125
Component shortage	0.128

Company resource limits index (CRLI)

$$CRLI = \sum_{i=1}^n (W_i \times R_i)$$

$$Adjusted\ CRLI = \frac{CRLI}{market\ capital}$$

Supply chain resource limits vulnerability index (SCRLI)

$$SCRLI = \frac{\sum_{j=1}^N CRLI_j}{N}$$

Examples of CRLI and adjusted CRLI

