WHITE PAPER

TAKING A LEAP FORWARD: SENTIMENT ANALYSIS TO STRENGTHEN CREDIT RISK DECISIONING

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Few months ago, the CEO of a leading AI-based automobile company tweeted his opinion on the company's stock price valuation. This triggered a massive sell out of the company's shares and erased around US$14 billion from the company's market share. Also, the CEO's own stake in the company came down by US$3 billion.This is a classic example of how today's digital-age happenings, events and updates are getting ingested and shared within a fraction of a second and leading to widespread implications.

For the financial services industry too,such examples amplify the business case for leveraging real-time data for effective decision making. Unfortunately, when we look at the risk-decisioning engines of most banks today, we see a different story. These institutions' risk decisioning is primarily based on customer risk profiles, documents and risk scores that most of the time are at least a day or two old. Resultantly, such banks are exposed to the ensuing risks of not acting based upon the most recent data updates.

In this paper, we seek to share our views on how banks could leverage Artificial Intelligence (AI) and Machine Learning (ML) to gain real-time insights on market "sentiment" on a counterparty/customer. The views shared have amplified significance given the year of turmoil we are currently going through. As per World Bank forecast, owing to the COVID-19 pandemic, the global economy would shrink by 5.2% in 2020, representing the deepest recession since World War II. The adverse economic impact of the pandemic, that potentially may last for few years, has led to large number of businesses and institutions to seek credit to ensure they stay afloat and do not end up in administration.

Lending institutions need to proactively identify and gauge all emerging risks (such as the impact of COVID -19) associated with a counterparty/customer. Sentiment analysis can be a key enabler in this regard to offer timely insights to banks and allow them to make a truly informed decision from a risk management perspective.

Sentiment analysis & scoring: Context and origin

Sentiment analysis is one of the early stage use cases of Natural Language Processing (NLP). It is an open-ended technique designed toautomatically identify whether aninformation content is positive, negative or even neutral, without the need for manual intervention. When applied to the credit risk management sphere, this technique can be used to consume qualitative information available in the public domain (e.g. news articles, social media,market analysis reports etc.) to help arrive at a sentiment score for a credit counterparty.

In simple words, a sentiment score rates a piece of information to signify whether it is positive or negative (or neither) based upon the sentiment associated with the information.This score is one of the data dimensions that can be used — in addition to the traditional quantitative data sources (such as financial ratios, balance sheets, collateral etc.) — to understand the credit health (risk) of a firm.

Usage of sentiment analysis

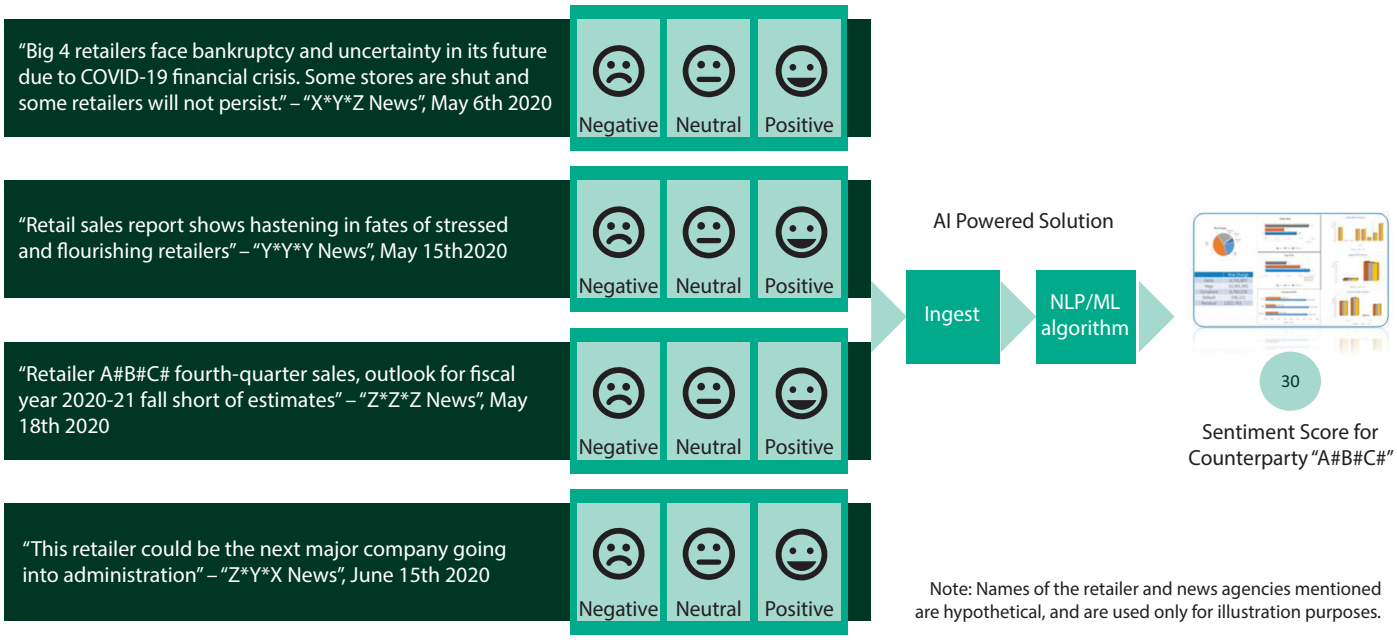
The sentiment analysis score can be configured as per an organization's requirement. Following are some of the industry trends that we observe:

- Provide +1 if feed is positive, -1 if negative, and zero if neutral (factoring in polysemy).

The net score is benchmarked against internal thresholds for any steep falls.

- Provide +1 if feed is negative (negative sentiment focused only). Higher the sentiment score, more negative is the view on the counterparty.
- Number of positive and negative words in each feed are counted to determine the sentiment score. The net score is calculated based upon the total sum of negative and positive words — wherein, each negative word is assigned -1 and each positive word +1. (Note: This approach does not factor in polysemy.)

An illustrative example: Retailer "A#B#C#"



Note: Names of the retailer and news agencies mentioned are hypothetical, and are used only for illustration purposes.

Exhibit 1: Sentiment scoring: An illustration

Use case deep dive: Credit risk decisioning

As outlined earlier, sentiment scoring is an effective tool that can enable bankers and portfolio managers to assess the market sentiments of the counterparty. Further, this metric can be utilized to gain a better view of the counterparty's ecosystem, and the associated lending risks during any phase of the credit lifecycle (including loan origination, during assessment of credit limits extension, and for credit marketing). The sentiment scores along with other factors such as credit score would provide the concerned credit risk analysts and decision-makers a real-time 360-degree view of the customer.

Refer below examples of sentiment analysis usage in credit decisioning for an institutional counterparty.

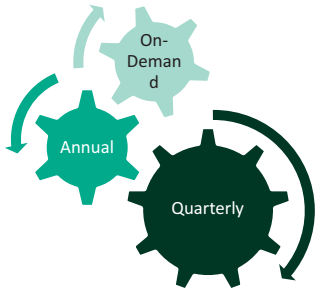
The business process: Real-time credit risk monitoring for counterparty

1 There is an existing credit risk profile for a counterparty

2 A periodic credit review becomes due or it is triggered by an event

3 Analyst performs the review process, by referring several data sources

Typical details:
- Company fundamentals
- Past performance & forecast
- Credit lines / utilizations
- Collaterals / asset valuation
- Financial figures
- Risk exposure metrics
- ….



3a. Fetch latest data

Refresh data from various sources:
- Financial & non-financial reporting / filings & other documents
- Existing / new credit lines
- Updated collateral valuations
- Credit ratings
- External media & other data feeds for sentiment scoring

3b. Run calculations (models)

Update info on counterparty's financials etc.
- Run credit risk models
- Update new collateral requirements
- Calculate new internal ratings
- Update risk profile
- Generate covenants etc.
- Generate sentiment score (Note: sentiment score is fed into & generates the composite credit score)

Scope for cognitive AI:

- Automatic extraction of information from a variety of documents
- Automatic extraction & aggregation of **negative sentiments / media news**
- Standardize / aggregate extracted data
- Calculation of **sentiment score** for the counterparty using ML/ AI models
- Feed inputs (including sentiment score) to calculation engines / credit risk models

3 Finally, analyst takes action & decision upon credit review case

- Credit risk score refresh
- Modify credit lines
- Lower / increase the risk profile
- Ask for more documentations from the counterparty
- Etc.

Exhibit 2: Sentiment analysis usage in credit decisioning for an institutional counterparty: An example

Business benefits of leveraging sentiment analysis in risk decisioning

- Widens the information spread available for decision making —by leveraging beyond the traditional information sources to encompass entire digital data footprint
- Enables holistic decision making, with robust audit & quality control measures
- Reducesthe operational risk, by eliminating manual work — through digitization of information and documents using text analytics
- Faster turnaround time and timely decision making — analysts can spend more time in "doing" rather than "gathering" data
- Increased productivity

Sentiment analysis: Other emerging use cases in financial services

While the focus of this paper is on how organizations can leverage sentiment analysis for developing a state-of-the-art credit decisioning systems for institutional customers, below are few of the early-stage use cases of sentiment analysis in other related areas:

Use Case Domain	Entity	Elaboration	Benefits
Credit Risk Management	**Citigroup**	CitiVelocity is a recently launched tool in the market primarily meant for research, market insights and analytics. The tool, as claimed, has ML algorithms used to aid in research of firms on the credit default swap indices in US and Europe. CitiVelocity makes use of data available from the media (e.g. Thomson Reuters) to categorize and list all the firms that have both positive and negative sentiments associated with the same. This data is further used by an AI-driven analytics engine to calculate the correlation between how the various credit securities perform based on the events in the news.	• Saves time and cost incurred on financial research • Enables more accurate credit risk management
Retail & SME Lending	**Lenddo EFL**	A Singapore based startup focusing on retail credit scoring launched a new NLP based product – LenddoScore. The product focuses on those markets/ individuals whose credit histories are not available easily. The product helps financial organizations to assess an individual's creditworthiness by extracting and analyzing various data points from the individual's digital footprint. The data source can be shopping, location data, social media and even web browsing to name a few. The data cluster is fed into the model to generate a score (LenndoScore) which is used to carry out all credit services.	• Promotes financial inclusion: Using LenddoScore, concerned FIs can lend to SMEs and individuals who otherwise don't have readily available credit history • Helps concerned FIs to expand their lending business while also optimally manage the associated credit risk (vis-a-vis the new borrowers who have no or little credit history)
Wealth Management	**J.P. Morgan**	JP Morgan, in partnership with a Dutch Pension Manager (APG Asset management), are experimenting and learning new ways to better manage their market research capabilities and portfolio management in equity investing. Asa part of pilot project, the joint team leveraged AI algorithms and NLP capabilities to go through nearly 250,000 analyst reports, European Central Bank (ECB) statements and equity market related news articles to comprehend financial jargon and terms. The solution processes the inputs and generates equity investment insights that prove valuable to both research and portfolio managers. For e.g., the solution can identify outlier firms that have unveiled new disruptive products in the market.	• Better returns (alpha) for the client investments (The bank has claimed that the equity investments that were made based on the solution's algorithm performed better than several indices such as NASDAQQ50.) • Saves time and cost involved in conducting equity investment research
Capital Markets	**S&P Global Research**	S&P Global Market Intelligence research describes how they used NLP techniques to measure the sentiments of institutions during Covid. They: - • Analyzed the earnings call transcripts of a sample set of institutions, to identify which companies are conscious of COVID-19 (COVID-19 Wary and COVID-19 Unwary) and calculate the Net Positivity Score. This score was then calculated QoQ to compare the change in the sentiments in early 2020 • Compared the corporate sentiments (amongst APAC COVID-19 Wary companies) with sell-side analyst sentiments to check if they are correlated (either positively or negatively) and extend the study to include companies from various countries and sectors.	• Helps analyst or investment managers closely monitor relevant investment themes in a disruptive environment (e.g. COVID-19 conscious customers) • Help predict broker recommendations (buy / sell) across countries and industry sectors for various securities
AML	**A global bank**	A major bank was hit with a huge backlog and associated costs in their KYC process due to increase in false positives and delay due to manual processing of customer related negative news information. The bank in partnership with a leading tech firm: • Implemented an NLP-based ML algorithm to process every piece of info associated with a customer • Source data ranged from third party databases to the world wide web (www) to identify both direct and indirectly linked customers	• Reduced false positive rates drastically with reduced manual intervention • Severity of event is highlighted to the analyst depending on the news event

Exhibit 3: Sentiment analysis — Other emerging use cases in financial services

Sentiment analysis: Calculation &configuration

Qualitative information (such as news, social sentiments etc.) has always been deemed as one of the views to better understand a firm's (counterparty) stability and outlook in the market. Banks, however, have traditionally found it challenging to monitor and process the massive amount of news content as it required manual effort to read and interpret.

Now with the advent of text analytics, a combination of NLP and ML techniques can be leveraged to calculate (please refer Exhibit 4) the sentiment score of counterparties based on topics, categories, themes etc. from alternative data sources. While NLP's role is quite evident in this process, ML too plays a crucial role in activities such as:

- Data aggregation
- Automation of analytics functions
- Helping the model learn contextual interpretation (e.g. polysemy words)

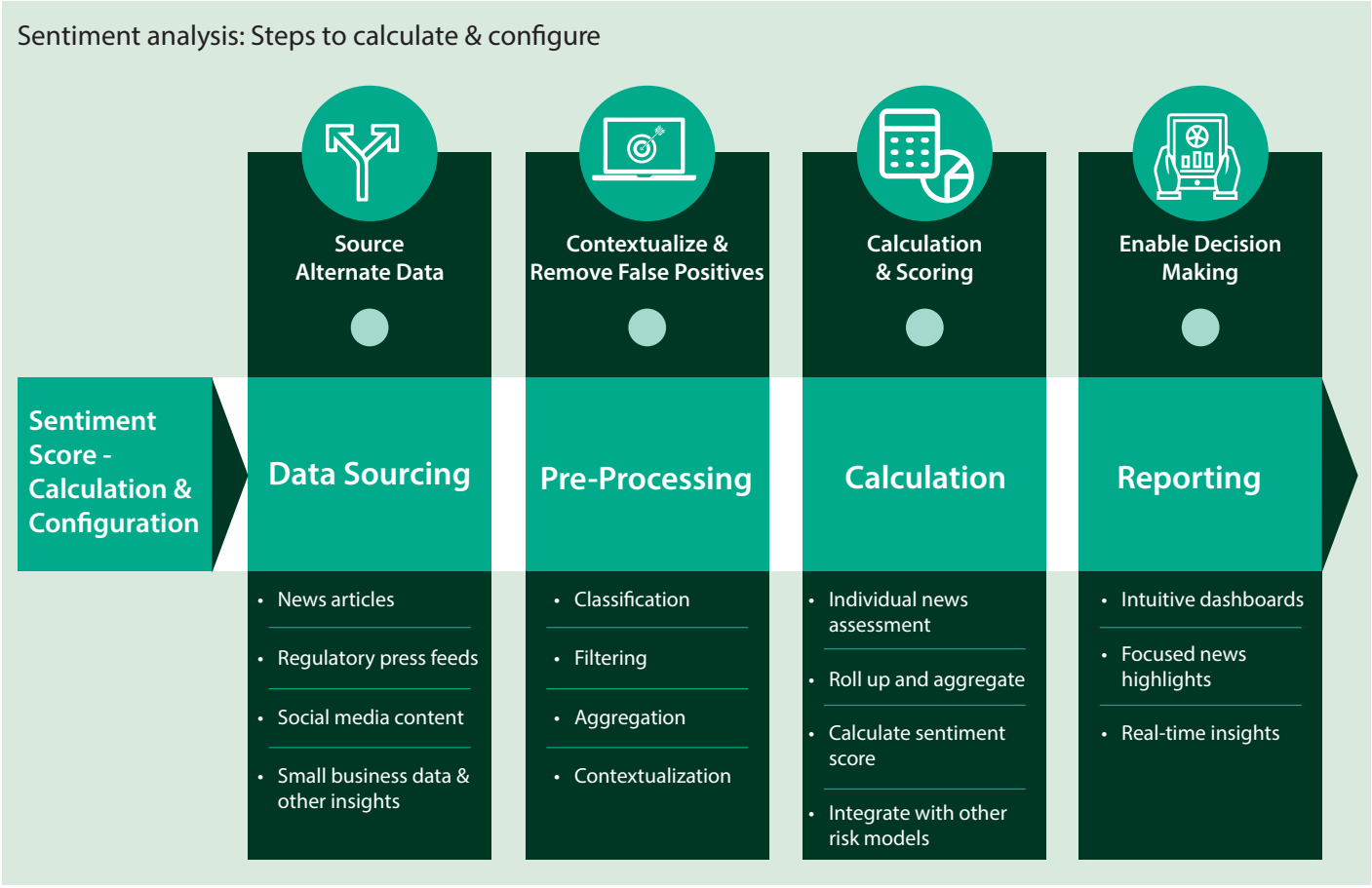


Exhibit 4: Sentiment score calculation steps

In summary, the sentiment score is a single metric that is computed based on the alternative data associated with a firm. This score is one of the early warning indicators which can be factored into the overall credit risk score associated with the concerned counterparty.

Technology sneak peak

Moody's Analytics recently launched "Coronavirus Pulse", a tool that would allow organizations to search COVID-19 related news article about counterparties or customers and include them as a part of the overall credit sentiment score. The tool uses NLP and ML to identify relevant news articles (English) and assign positive, neutral or negative sentiments ("article"/" credit") to these news items based on various risks identified (reputational, political, macroeconomic, medical and credit relevant). ML and NLP combination would ensure that the overall context of the news article is understood before calculating and assigning the sentiment scores. Moody's solution is part of an evolving technology solutions suite that utilizes advanced machine learning techniques to scan the unstructured data and deliver news sentiment analysis.

Conclusion

It is clear that digitization and the usage of sentiment analysis in credit risk management improves operational efficiency and aids in quicker decision making. However, more importantly, in today'sdigital world it can also enable banksto takemore informed credit decisions based on the latest and most up-to-date data.

In the immediate future, owing to the limitations of the current computing models and the need for even greatercost efficiencies, we foresee the proliferation of sentiment analysis more for the banks' institutional customers. However, we expect that with the passage of time, the further advancements in AI/ML techniques would enable banks to effectively leverage sentiment analysis and scoringfor all customer segments.

In future, we also foresee the sentiment score acting as a feeder to the credit risk score itself. Although, for this to happen, banks would need to gain the approval of the concerned regulatory agencies and ensure thorough ongoing compliance with the respective country-specific data privacy and protection norms.

About the Author

Navdeep Gill

Principal Consultant, Risk and Compliance Practice, Financial Services Domain Consulting Group, Infosys

Navdeep is leading the GRC COE for Financial Services Domain Consulting Group and is engaged in solution consulting and delivery management for transformational initiatives across various Infosys clients.

She has more than 13 years of experience across the financial services industry and IT consulting. She has lead multiple transformation programs in the Risk and Compliance space – with customers globally. She can be reached at Navdeep_Gill@infosys.com

Arun Krishnankutty

Senior Consultant, Risk and Compliance Practice, Financial Services Domain Consulting Group, Infosys

Arun has over 11 years of experience in financial risk management and has worked as lead business analyst and consultant for various customers in the credit risk, markets risk and capital markets area. He has worked on key transformation engagements in the risk and regulatory space . He holds an MS in Operational Research and Management Science.

He can be reached at arun.krishnankutty@infosys.com

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