Leveraging Artificial Intelligence & Big Data to Maximize Your Early Warning Practices

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Agenda

1. AI & ML techniques
2. Panel: AI & ML applications - a multi-industry perspective
3. Use of AI/ML in credit analysis - the Credit Sentiment Score (CSS)
AI & ML techniques
Which of the following best describes ML?

A. is a type of computer algorithm.

B. is a set of computer-driven approaches aimed at generating structure or predictions from data without human intervention by finding a pattern and then applying the pattern.

C. is a set of computer-driven approaches adapted to extracting information from linear, labeled data sets.
Three main types of Machine Learning

**Supervised Learning**
- Probability of Default
- Predefined set of inputs and desired output
- Fraud detection on credit card transactions

**Unsupervised Learning**
- Predict behavior in credit or purchasing patterns
- Labeled training data not provided: algorithm learns from the data
- Speech recognition
- Visual recognition

**Deep Learning**
- Read a PDF financial report and spread the values into a file
- Sophisticated algorithms replicating human brain neural connections
- Scan news and understand what news can predict a credit deterioration
- Read the “Managm. discussion and risk sections” and predict equity returns

Applications:
- Fraud detection on credit card transactions
- Probability of Default
- Speech recognition
- Visual recognition
- Scan news and understand what news can predict a credit deterioration
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CreditEdge EDF metric
Predicted Thomas Cook default one year prior

1-Yr EDF surpassed the EDF Trigger
Panel: AI & ML applications - a multi-industry perspective
How does AI/ML currently help you monitor portfolio risk?

How has AI/ML impacted risk monitoring in your industry so far?
Cisco Systems
Challenges for global mid-size financing

Structure

- Financial data available
- Price reflects latest information
- Abundance of news

- Financials only by request, payment performance data available
- Industry/Sovereign news
- Refinancing risk

- Financial data only by request, only payment performance data if any
- Industry/Sovereign news
- Refinancing risk

Challenges

- Lowest need for additional monitoring
- Traditional CM/PM monitoring is good

- High need of monitoring
- Too many to be covered manually by CM/PM

- Highest risk / highest need of monitoring
- Too many to be covered manually by CM/PM

Highest need for AI/ML in monitoring
Not currently using AI/ML for commercial portfolio monitoring

Third party data (i.e. early warning signals) and internal metrics to pinpoint customer level and industry level concerns

Using trigger levels and establish thresholds of risk tolerance for industry portfolio monitoring

Screening news, third party research, internal scorecard commentary to extract key industry themes
How could AI/ML help you enhance your early warning monitoring?

How will AI/ML change credit monitoring for your industry?
## Cisco Systems
Evolution of Early Warnings = Data + Model

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<tr>
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PNC Bank

Future state: enhanced monitoring using AI/ML

- Human component will remain key to portfolio management
- Use AI/ML to consume credit, market, and macroeconomic data to pinpoint areas of concern
- Use AI/ML to better understand risk correlation and enhance input models
3 Use of AI/ML in credit analysis - the Credit Sentiment Score (CSS)
Signal From Noise
AI and analysis of unstructured data applied to credit analysis

- News
- Broker Reports
- Earning Calls
- Investor Decks
- Magazines
- YouTube
- Blogs

Credit Sentiment Score & Sentiment Analysis
Check Market Indicators, Fraud & QA Financials
Rating & Supplemental Credit Information
In-depth Rating Analytical Work

Discovery: Signal from Noise  Incremental Research  Certainty
Introducing Credit Sentiment Score (CSS)

Built using Moody’s Analytics unique credit modelling know-how and AI training datasets

- Weak credit risk signal
- Moderate to strong credit risk signal
- Very strong credit risk signal

0 - 25-75 - 100
# Credit Sentiment Score: example

<table>
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<th>Headlines</th>
<th>CSS</th>
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<tr>
<td>Forever 21 Inc. recently filed for bankruptcy protection under Chapter 11 of the US Bankruptcy Code.</td>
<td>100</td>
</tr>
<tr>
<td>Forever 21, struggling with global expansion, explores a debt restructuring.</td>
<td>50</td>
</tr>
<tr>
<td>Forever 21 invests in DailyLook.</td>
<td>0</td>
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Carillion Case Study
Credit Sentiment Scores capture and explain deterioration

“Operate within covenants”
But: debt repayment peak in 2020 ➔ Lenders start to worry
Warns on profits.
Announces will breach covenant.
Carillion goes into administration.
Does it work?
Yes: Scores start to diverge about eight months prior to a credit event

Study based on:
» 2027 companies in news 2010-2018
» 939 experienced negative credit event
» 561k news stories from 3500 sources
Leveraging CSS and Public EDFs
Levels show elevated risk for Retail Sector

SPDR S&P Retail ETF: Credit Sentiment Scores vs EDF
Leveraging Credit Sentiment Scores

- **Track credit relevant news**
  coverage about a company and set triggers for early warnings

- **Portfolio Analytics**
  produce portfolio level Credit Sentiment Score heat maps to understand potential stresses in portfolio

- **Relationships**
  monitor Credit Sentiment Score for an individual business or a whole portfolio of businesses

- **Sentiment Indices**
  understand past credit events and credit patterns

- **Narratives**
  provide story narrative around jumps in quantitative measures

- **Correlate news sentiment**
  with quantitative factors such as PDs, equity prices, CDS spreads, operational risk

**360 Customer View**
### Cisco Systems

#### Matching Risk with Early Warnings

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<td><strong>Country</strong></td>
<td>aka Sovereign Risk, reflecting government credit risk, <strong>annually updated, extreme shifts are rare</strong>. Any up/down reflect underlying changes in fiscal or monetary position of that country</td>
<td>Sovereign ratings by S&amp;P, Moody’s, Fitch etc. Global institutions reviews like IMF, World Bank etc. Macroeconomics variables</td>
<td>Sovereign analysis</td>
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<td><strong>Industry</strong></td>
<td>Reflecting average risk of companies within particular industry, often driven by business cycle. <strong>Updated quarterly or annually.</strong></td>
<td>Industry-level EDF Change Moody’s or S&amp;P Industrial Averages Industrial statistics</td>
<td>Peer or Industry analysis</td>
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<td><strong>Counterparty</strong></td>
<td>Risk of particular counterparty. Mostly driven by business performance, liquidity, and capital structure of that counterparty. Can be a public or private entity. <strong>Updated regularly, as events unfold</strong></td>
<td>PD/EDF Change DQ (Admin &amp; Financial) DnB Adverse News or Credit Events Portfolio Risk Metrics</td>
<td>Statistical modeling (e.g. Regression) or AI/ML models</td>
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