The New Era of Credit Risk Modeling and Validation

Presenter

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- **Boaz Galinson** is Head of the Group Credit Risk Modeling and Measurement in the Risk Management Division at Bank Leumi.

- Mr. Galinson has 20 years of experience in risk management (Market Risk and Credit Risk) for Leumi and for the Supervision Unit of the Central Bank of Israel.

- Boaz speaks frequently at professional conferences and risk conferences and lectures in the Executive MBA programs (including Kellogg) in Tel -Aviv University.

- He holds MBA degree in Finance and B.Sc degree in Mathematics from TLV University, Israel.
The New Era of Credit Risk Modeling and Validation

Boaz Galinson- V.P Credit Risk Manager
Outline

The New Era of Credit Risk Modeling and Validation

* How to kick off ML models & “Big Data” in your organization?
* What’s next in Credit Risk Modeling?
* Building Intuition with ML Models - An Example.
* Wrap up and Q&A.
How to kick off
the new generation of models (ML, AI) and “Big Data”
in your organizations?

Step 1: Join Internal Successes & Allies
How to kick off the new generation of models (ML, AI) and “Big Data” in your organizations?

Step 2: Ask for a Sand Box
How to kick off the new generation of models (ML, AI) and “Big Data” in your organizations?

Step 3: Set a Simple Work Plan
Outline

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What’s Next?

1. RTDM - Decisions based on models will be based on real time data.

Change in behavior that would affect rating

When rating is affected

Time Window with Wrong Risk Assessment and Pricing

| 1 Month |  |  |  |  |  |  |  |  |  |  |  | 2 Months |

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What’s Next?

2. ERM- ML and AI help integrating Credit Risk and Op. Risk
3. The role of models in our life will increase.

Building Eco Systems - Use of Big Data & IOT

Transportation time

Garages Availability
- Repairs stock
- Technician

Autonomy car

Car Owner Availability
- Personal
- Business
- Family
- Vacations/Holidays

Predictive Maintenance

Maintain “Right”
What’s Next?

4. Models will include structured data and unstructured data.

Banking business model has already changed
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ML/AI

“Machine learning gives computers the ability to learn without being explicitly programmed.”

Arthur Samuel

<table>
<thead>
<tr>
<th>Traditional:</th>
<th>ML/AI:</th>
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</thead>
<tbody>
<tr>
<td>DATA</td>
<td>DATA</td>
</tr>
<tr>
<td>Algorithm/program</td>
<td>Output</td>
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<tr>
<td>-&gt;output</td>
<td>-&gt;Algorithm/program</td>
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Machine learning gives computers the ability to learn without being explicitly programmed.
Typical Types of ML Models

1. **Regression** – most known and used
2. **Decision Trees** mixed with **Ensemble Methods** (Random Forest, Gradient Boosting Trees)
3. Neural Network
4. Bayesian Network
5. Support Vector Machine
6. Nearest Neighbor

How to pick the best model?

**Problem:** Each model might perform differently under different data set.

**Solution (the market standard):** Run all, compare and choose the model, which performs the best.

Is that enough?
Is that Enough?
Building the Intuition-An Example
### How well did the Random Forest compare to the Regression

<table>
<thead>
<tr>
<th>Model Type</th>
<th>Correlation between forecast ($Y^i$) and real cost per unit ($Y_i$)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a) Without U-shaped variable</strong></td>
<td></td>
</tr>
<tr>
<td>Regression</td>
<td>0.9711</td>
</tr>
<tr>
<td>Random Forest</td>
<td><strong>0.9768</strong></td>
</tr>
<tr>
<td><strong>b) With U-Shaped variable</strong></td>
<td></td>
</tr>
<tr>
<td>Regression</td>
<td>0.991</td>
</tr>
<tr>
<td>Random Forest</td>
<td><strong>0.9755</strong></td>
</tr>
</tbody>
</table>
How well did the other ML models compare to the Regression

With U-shaped variable

GBM | Neural Network | Random Forest | Projection
---|---------------|---------------|--------------
0.852 | 0.917 | 0.989 | 0.994 | 0.991

Regression
Wrap up

• The use of models will increase (Big Data, IOT).
• New types of algorithms (ML, AI) change the way we build, validate and deploy models (short SLA).
• Start your learning curve (internal successes, sand box, work plan).
• The best models still require business intuition. Current Data scientists are too technical and lack business intuition and statistical background.
• ML and Big Data are also relevant to Credit Risk modeling: Real time Decision making & ERM.
• Advance tools for models (Dynamic ABT, Model Monitoring & Manager, RTDM, MRM, SAS VA, Connect to Hadoop) are essential to develop, validate, monitor, deploy models and reduce model risk.
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