BayesCredit – an efficient tool for risk prediction - helps Nykredit meet the Basel II requirements

Starting in January 2007, the Basel II Accord is not only a requirement, but also an evolutionary program of risk improvement for more than 30,000 banks and financial institutions in over 100 countries.

Because of Basel II and the great demand for standardization during the credit process, the development of statistical models has been a major focus area at Nykredit. In 2001 Nykredit launched the development of a tool called *BayesCredit* for predicting default events for large corporates. *BayesCredit* is a Bayesian network that can predict the risk of a corporate defaulting within the next year.

BayesCredit from Nykredit was developed using the advanced BN-based software from Hugin Expert A/S.

Company Background

Nykredit is a leading player in the Danish market for property financing. Nykredit's main business is providing mortgage credit products to customers in the private, commercial, agricultural and subsidized housing sectors. Nykredit offers a wide range of financial services including banking, insurance, asset management and real estate services. The company has 500,000 private and 80,000 commercial customers, and had pre-tax profits in 2002 of DKK 2.4 billion.

Definition of default

A default event is a situation in which a borrower fails to meet his obligations. The use of statistical default models makes it possible to perform scenario simulation and stress testing at portfolio level. What is more, for purposes of overall risk management Nykredit has found the traditional individual and manual methods of credit analysis to be inadequate.

BayesCredit: A Bayesian network for predicting default

BayesCredit makes use of wide-ranging data, with both external and internal data forming the basis of the model. Examples of external data include bankruptcy information and standard key financial ratios; internal data include arrears, provision and size of exposure.

Using a single model for all types of corporates is unrealistic given the diversity of the corporate portfolio. Nykredit has therefore divided corporates into segments, and today *BayesCredit* consists of three models representing each of the segments: Industry, Commerce and Property.

- ❖ **In 2001 Nykredit launched the development of the BayesCredit tool**

- ❖ **BayesCredit consists of three models for: Industry, Commerce and Property**

- ❖ **Nykredit chose to use Bayesian Networks for modeling their problem**

- ❖ **Bayesian Networks are capable of modeling highly complex systems**

- ❖ **Nykredit achieved many benefits using Hugin and Bayesian networks**

- ❖ **Nykredit found Hugin Expert to be the best software provider for this task**

- ❖ **"Standard & Poors" tested BayesCredit – with a high score**

During the development of *BayesCredit*, Nykredit achieved several benefits using Hugin and Bayesian networks:

- ✓ **Powerful communication tool** One of the strengths of Bayesian networks is that they can capture vast amounts of knowledge in their graphical structure. Many key properties of a model can be recognized without needing to compute probabilities. This makes Bayesian networks a powerful communication tool, both during the initial discussion of a problem and when explaining results after analysis. And because Bayesian networks are hierarchical with the numbers 'hidden' within the nodes, the focus of attention is on the relationship between variables.

- ✓ **Combines expert knowledge and data** Because default data is so sparse, it was unlikely that Nykredit could build a strong statistical model based on data alone. During the development of *BayesCredit*, Nykredit greatly relied on knowledge from credit specialists, and the two sources of information – expert knowledge and data - were combined in a flexible and sophisticated way.

- ✓ **Handles missing observations** Hugin contains algorithms that can handle missing observations in an exact way since basic axioms of probability are used to compute probabilities. The capability to handle missing observations is crucial for *BayesCredit,* as Nykredit must be able to compute the probability of default even in cases where financial data is unavailable.

- ✓ **Highly efficient algorithms** The algorithms in Hugin software are highly efficient because they exploit properties of the algebra of multiplication and the marginalization of probability tables. This is essential to Nykredit as *BayesCredit* is applied in real-time, which requires the instant calculation of default probability.

Why did Nykredit choose Hugin Expert A/S as its software provider?

"Hugin Expert A/S was a natural choice for us when we were planning the development of our risk model. Hugin Expert A/S is well established on the market, and their software is known to be a very reliable, efficient and user-friendly tool. What is more, the Hugin software package is equipped with a variety of functionalities that Nykredit has found to be very useful, for example, Hugin's capability to identify conflict in data," says Esben Ejsing, *Chief Analyst at Nykredit. "Another important consideration for us when we selected a software provider was the excellent service offered by Hugin. Besides its core technology, Hugin Expert also provides professional training, consultancy and very effective technical support."*

Implementation of BayesCredit

"We have been using *BayesCredit* successfully at Nykredit since September 2003. After building the *BayesCredit* tool, our final challenge was to implement it on mainframe. This challenge also proved achievable for Nykredit using the Hugin software."

"*BayesCredit* has been tested by the credit analysis agency "Standard & Poors", where *BayesCredit* received a high score compared to other risk models," was the concluding remark from Esben Ejsing.

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