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A Credit Scoring Model Based on Contour Subspaces

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Standard credit scoring model

$$f : X \to \{good, bad\}$$

$$X = \{x_1, x_2, ..., x_m\}$$

$$X = \{client's\ attributes, loan\ attributes\}$$

The expert's comment

"Apparent superiority of more sophisticated methods may be something of an illusion. In particular, simple methods typically yield performance almost as good as more sophisticated methods, to the extent that the difference in performance may be swamped by other sources of uncertainty that generally are not considered in the classical supervised classification paradigm."
Hand, D. J. (2006). Classifier technology and the illusion of progress. Statistical science, 21(1), 1-14.

The proposed model

$$F(P, M, T) = Q(X')$$

$$F(loan\ attributes) = Q(client's\ attributes)$$

P - loan rate;

M - loan amount;

T - loan period;

Q - creditworthiness.

Construction of the credit risk model

$$P_i = F_P^{-1}(Q, T, M) = \sum_{i=0}^{n} (a_i M^i + b_i T^i + c_i Q^i),$$

$$a_i, b_i, c_i \in R, i = 0, 1, ..., n$$

$$M_i^{lim} = F_M^{-1}(Q, T, P) = \sum_{i=0}^{n} (w_i P^i + u_i T^i + v_i Q^i),$$

$$w_i, u_i, v_i \in R, i = 0, 1, ..., n$$

Applications

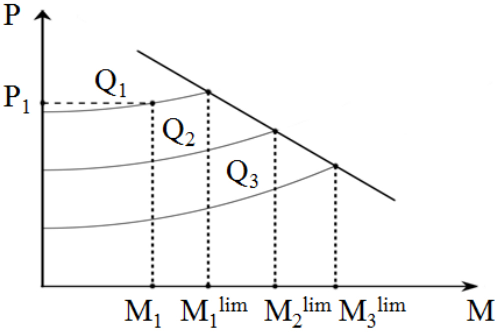
1. credit terms set up according to a client's individual creditworthiness value;
2. credit terms visualisation for clients according to their individual creditworthiness value by a contour subspace of credit terms;
3. credit terms on-line management depending on the dynamics in creditworthiness.

$$P_i = F_P^{-1}(Q, T, M) = \sum_{i=0}^{n}(a_i M^i + b_i T^i + c_i Q^i),$$

$$a_i, b_i, c_i \in R, i = 0, 1, ..., n$$

P - loan rate;
M - loan amount;
T - loan period;
Q - creditworthiness;
F_P^{-1} - inverse function F by argument P;
a_i, b_i, c_i - coefficients.

2. Visualisation of credit terms

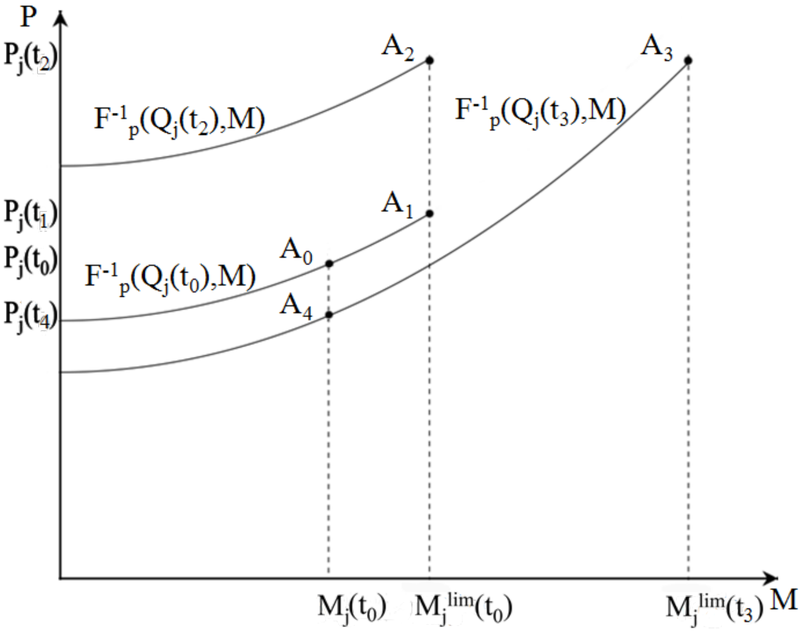


$$F(P, M) = Q_i; Q_1 < Q_2 < Q_3; P_1 = F_P^{-1}(M_1, Q_1)$$

3. Management of credit terms

$$Q_j(t) = \beta, Q_j(t-1) = \alpha, P_j(t-1) = P_j(t)$$

$$\begin{aligned}
&\triangle M_i^{lim}(t) = M_i^{lim}(t) - M_i^{lim}(t-1) = \\
&= F_M^{-1}(P_j(t), \beta) - F_M^{-1}(P_j(t-1), \alpha) = \\
&= \sum_{i=0}^{n} (w_i P_j^i(t) + v_i \beta^i) - \sum_{i=0}^{n} (w_i P_j^i(t) + v_i \alpha^i) = \\
&= \sum_{i=0}^{n} v_i (\beta^i - \alpha^i)
\end{aligned}$$


P
$P_j(t_2)$
A_2
A_3
$F^{-1}_p(Q_j(t_2),M)$
$F^{-1}_p(Q_j(t_3),M)$
$P_j(t_1)$
A_1
A_0
$P_j(t_0)$
$F^{-1}_p(Q_j(t_0),M)$
A_4
$P_j(t_4)$
$M_j(t_0)$
$M_j^{lim}(t_0)$
$M_j^{lim}(t_3)$
M