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Scoring and Rating Systems

Basel III Requirements

Dr. Anatoliy Antonov
Eurorisk Systems Ltd.

- Regulatory requirements for rating systems
- Rating system for risk assessment within the banking system
- Structure and architecture of the rating system
- Quantitative factors: Balance and ODA dates, Indicators
- Qualitative factors: subjective assessments and criteria
- Steps of the rating process
 1. Calculation of the performance indicators for the balance
 2. Standardization of indicators
 3. Aggregation of factors through weighing
 4. Comparison with the Master Scale for default probabilities
 5. Changes to other rating scales
- Customize balance sheet reports and models
- Scoring / Rating approaches
- Rating system functions
- Methods for generating migration matrices
- User Interface (UI) for WEB and Windows
- Report generation: ClikView, Crystal Reporter, Excel

Regulation (EU) No. 575/2013 of the European Parliament and Council, from July 26th 2013

Definition

Article 142

Rating Systems refer to a number of:

- Methods, processes, control mechanisms
- Data collections and information systems

that support

- Credit risk evaluation,
- Assignment of exposures according to rating categories or groups, and
- Quantification of exposure defaults and losses

Debt Category represents:

- A risk category (**Rating**) within a **Rating Scala**
- In a given rating system

that categorizes

- The debtor, based on a specific and unambiguous set of **rating criteria**, which serve as a source of **Probability of Default (PD)** estimates

Long and Short-term Rating represents: long-term (over 1 year) and short-term (up to 1 year) credit ratings

Rating Scales represent:

- For IRB: at least **7 Ratings** and **1 Rating** for non-performance
- For Standardized Approach: **Risk Weights**, credit rating : 1 2 3 4 5 6

Risk weight, ex.: 20% 50% 50% 100% 100% 150%

Counterparty Risk or "CCR" represents:

- The risk of the counterparty **defaulting** on a particular transaction, prior to the final settlement of the transaction
- Calculation of expected losses from derivatives : **CVA** and **DVA**

Article 170

The **Structure of Rating Systems** must meet the following requirements :

- The rating system is consistent with the risk characteristics of the **debtor** and the **transaction**
- The rating system includes a **rating scale for debtors** that allows a quantitative estimate of the debtor's default risk
- The rating scale of the debtor has at least seven categories for regular borrowers and one category for defaulting debtors;

Article 171

Assignment to Categories or Groups :

- The institution has specific **definitions**, **procedures** and **criteria** for allocating exposures by risk category within the rating system
- Category definitions and criteria are sufficiently **detailed** and contain **instructions for the assignment** of ratings
- The **documentation** of the rating process allows third parties to understand, reproduce and evaluate the assignment of exposures to categories;

Article 174

Application and Validation of Models

- The institution must have a periodical validation process (**validation**)
- **Observation** of model results, model stability, model specifications and results
- Comprehensive **statistical process**, including tests, that uses data outside the recorded period and outside the sample, in order to validate the model;

Article 175

Rating Systeme Documentation

- Institutions document the structure, functions and justifications of the rating system
- The documentation confirms:
 - Compliance with requirements, differentiation of portfolios, allocation criteria of ratings
 - Responsibilities of persons who determine the rating of debtors and exposures
 - Independent monitoring of credit risk: control, design and definition of internal rating models
 - Frequency of the verification of given ratings and control of the rating process
 - Organization and rating allocation process, as well as the structure of internal control.

Article 176

Database Maintenance

The institutions **collect and store data** on rating elements, such as:

- Comprehensive **historical data** on the ratings of debtors and established guarantors
- Data on which ratings are allocated
- **Output data and methodology** for rating allocations
- **Persons** responsible for the assigned ratings
- Identification of debtors and exposures that are **in default**
- Date of occurrence and circumstances that caused the default
- Data for the **PD parameter**, actual **default rates** for the rating categories and the migration between them, **Migration Matrix formation**.

Article 177

- Useage of **Stress Tests** for **Capital Adequacy** assessments

Article 178

Probability of Default

- The **Probability of Default** is predicted on the basis of historical records of defaults, i.e.:
 - When the likelihood of the debtor fully repaying his loan obligations is low, and/or
 - When the debtor is in arrears for more than 90 days (180 days for real estate collaterals)

Article 185

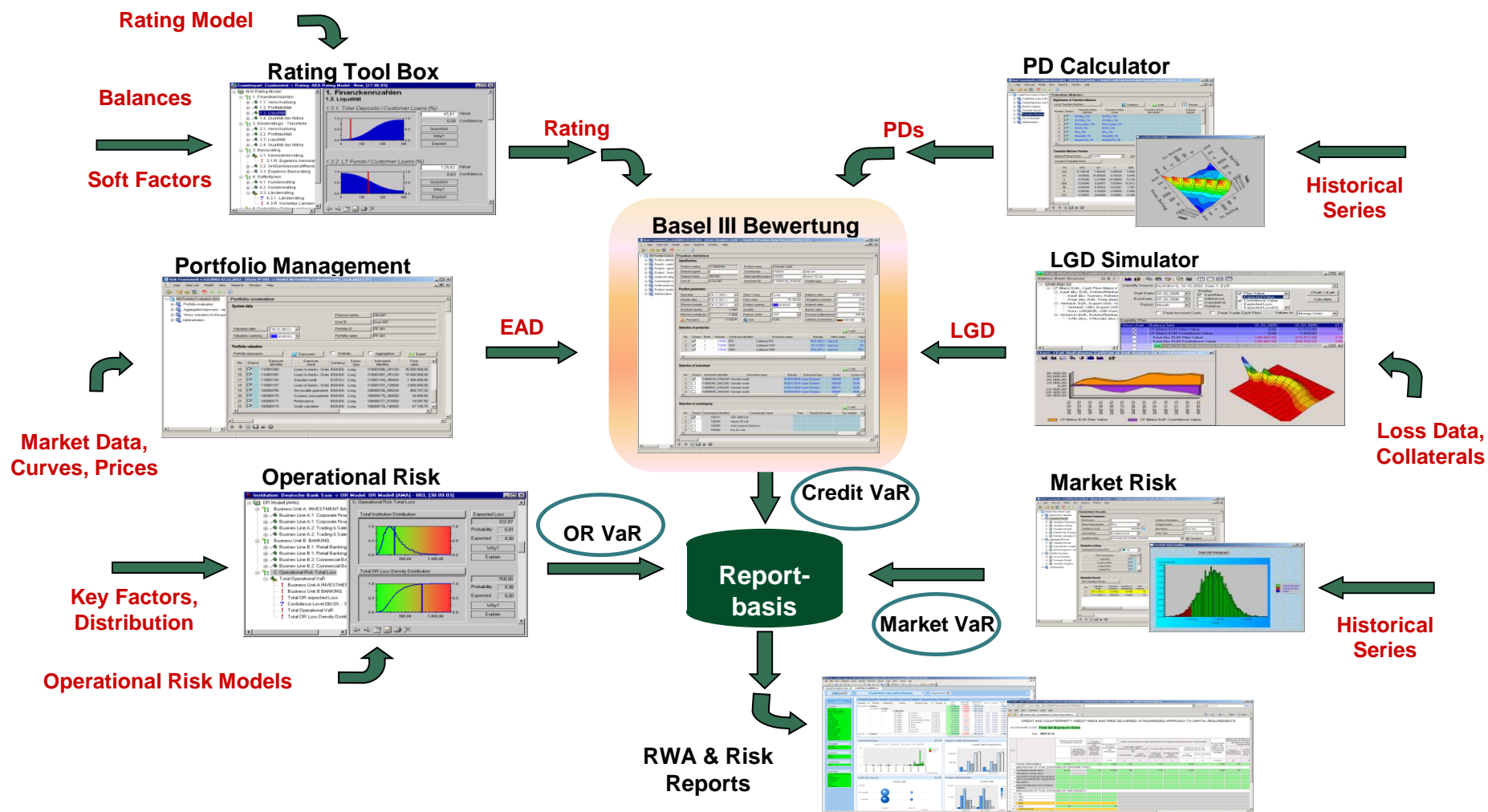
Validation of Internal Ratings

- The institutions have **reliable systems for the validation** of the accuracy and consistency of rating systems, procedures and the evaluation of all relevant risk parameters
- The institutions also use **other quantitative validation tools** and comparisons to appropriate external data sources
- The analysis is based on data that is relevant to the portfolio, that is regularly updated and covers the longest observation period.

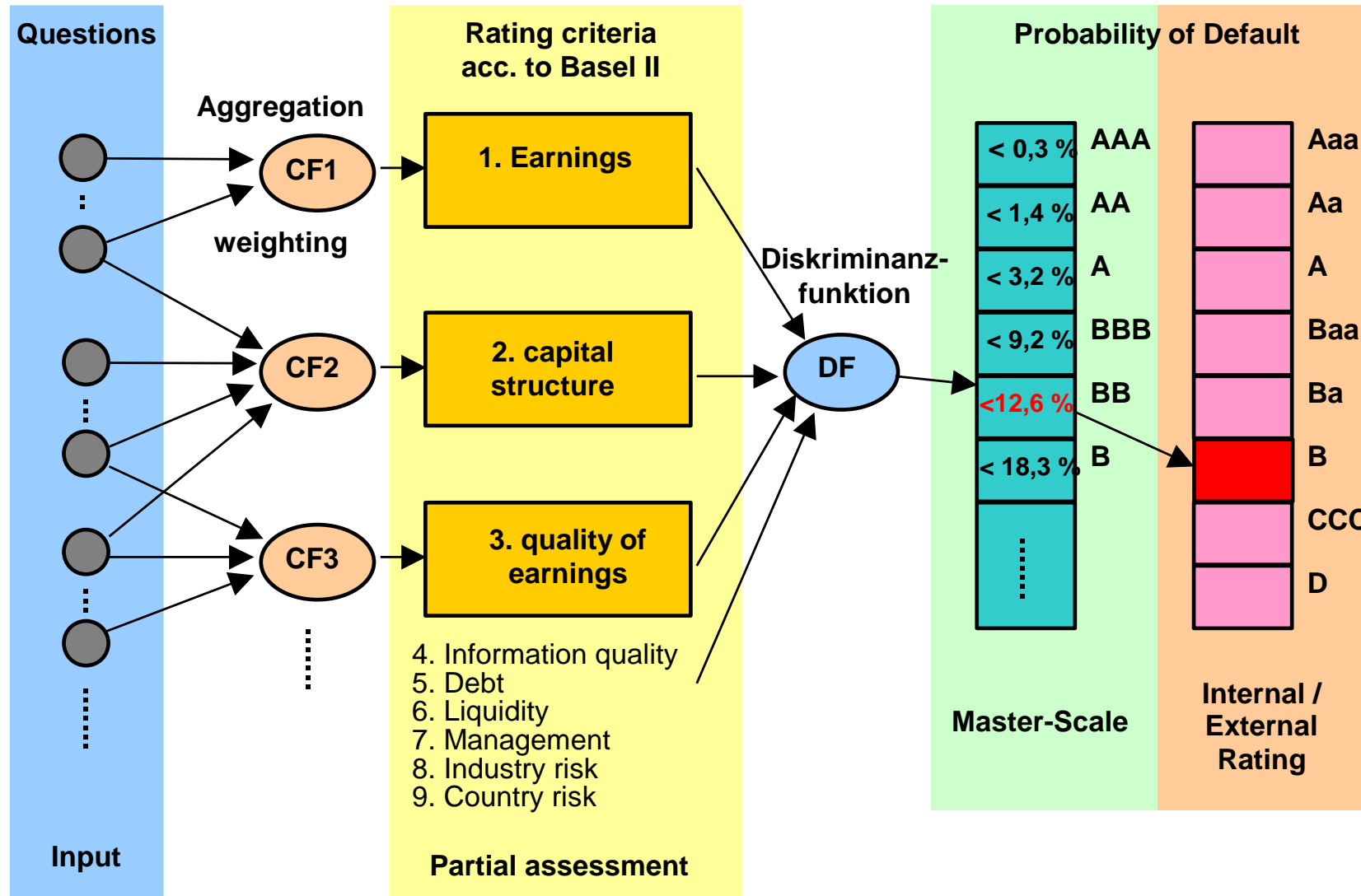
Requirements for the IT Application

- System and administration models for users, rights, roles, validations
- Scoring and rating of Retail and Corporate clients, loan offers
- Maintenance and evaluation of collaterals
- Models for the evaluation and analysis of rating models
 - Discriminant-Function (Gini-Indicator), statistical significance of variables and results
 - Exception rules and criteria, Proof of Default
- Models for the adjustment of rating models
- Models for the maintenance of standard data and credit data of customers and balancing
 - RatingFactors: ex. Capital structure, Cashflow, Rate of return, Flow of information, Management, Industrial risk, Government risk, Financial flexibility, Liquidity, etc.
- Connection and integration to existing banking systems
- Remote access via the Internet, ex. access from branches

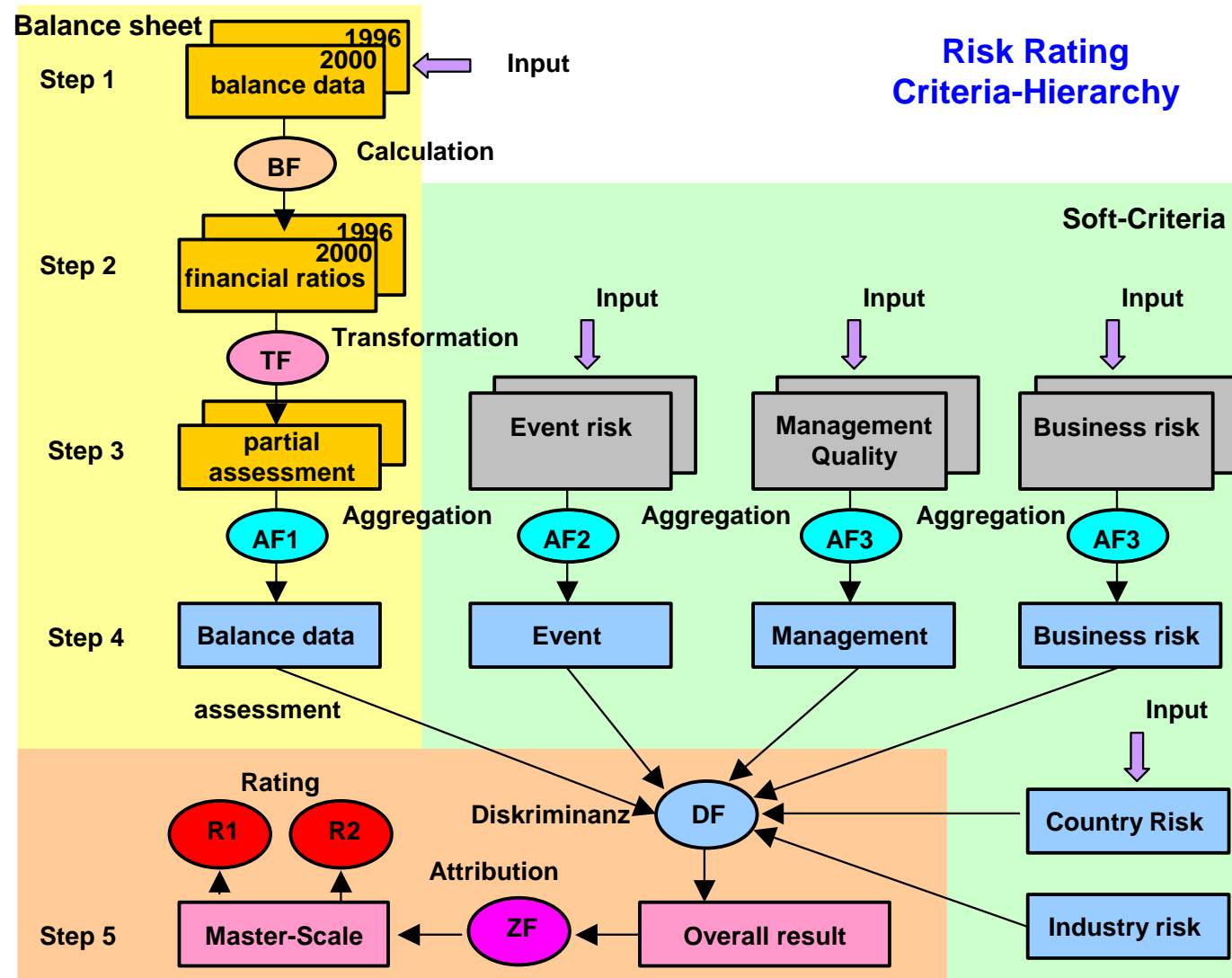
The Rating System within the Risk Evaluation System



Rating System Structure



Steps of the Rating Process



Balance Sheet data		(TDM)
1. Assets		4.522,10
2. Financial Assets		161,30
3. Intangible Assets		2.954,70
4. Balance Sheet Total		12.828,00
5. Equity		2.973,60
6. Long-Term Payables		3.805,10
7. Short-Term Payables		584,50
8. Revenues		13.188,60
9. Cash-Flow		1.171,40
10. EBIT		796,90
11. Interest Expense		228,00
12. Annual Result		413,90

Financial Ratios	Calculated Data	Partial Assessment (0..10)
1.ROI	6,0 %	7,2
2.Return on Equity	13,9 %	8,4
3.Return on Sales	3,1 %	4,7
4.Equity Ratio	23,1 %	6,9
5.Working Capital Ratio II	88,7 %	4,4
6.EBIT/Interest	3,4	6,9
7.Cashflow/Payables	26,6	5,3

Overall result (0..10)		6.6
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Quantitative Factors

- Quantitative rating factors are calculated as indicators of the debtor's balance, ex.:
 - Equity Ratio
 - Percentage of Cashflows
 - Profitability of Sales
 - Liquidation of Obligations
 - Interest Rate Capital
- The balance sheet results for the past 3 years allow the tracking and inclusion of trends in final evaluations.

Business Risk

Industrial Risk	Dependence on Suppliers
Dependence on Products	Dependence on Investments
Dependence on Exports	Production Process
Dependence on Customers	Return from Core Business

Management Quality

Management	Knowhow
Decision making Ability	Reliability
Elaborateness	Objectiveness

Event Risk

Order Situation	Dependence on Experts
Utilization	Dependence on HR
Account Processing	Accounting

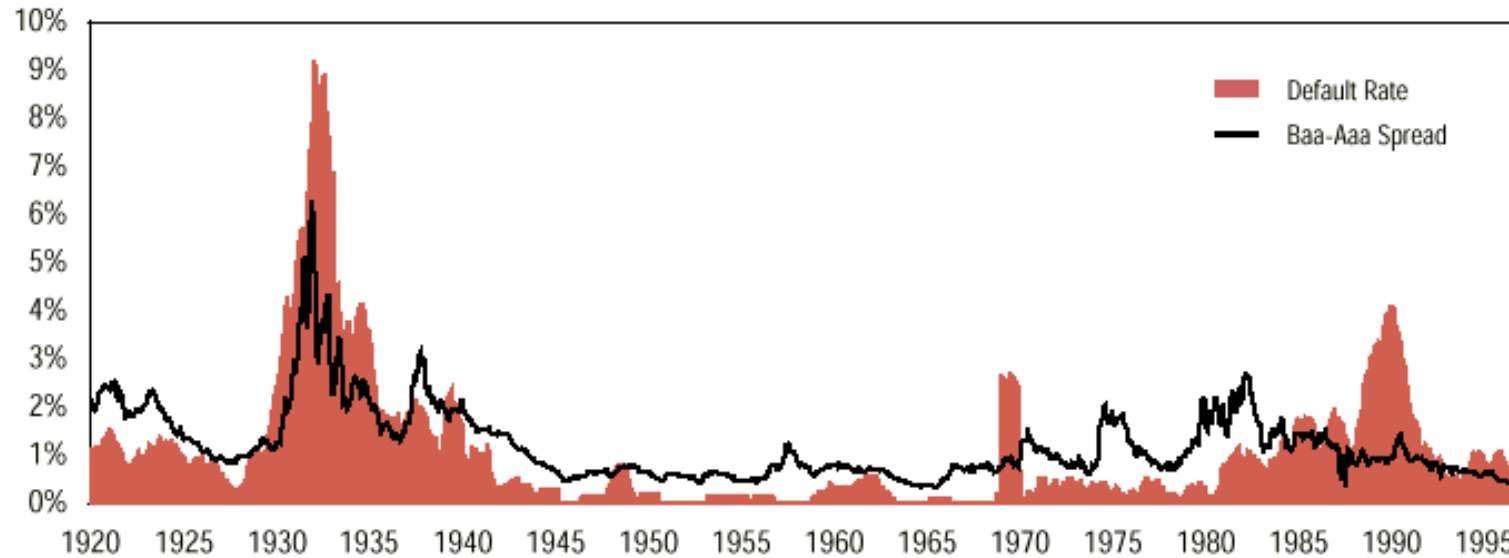
Qualitative Factors

Qualitative factors can be assessed via subjective evaluations, ex. between 0 und 5:

- 0 Unknown factor value
- 1...5 factor estimate
(1 - best, 5 - worst)

Qualitative factors are divided into groups, for which intermediate estimates according to groups are defined, ex.:

- Personal profile of the management
- Company valuation
- Business risk factors
- Global indicators
- Industry evaluation etc.



Hence:
Rating models and criteria have to change according to the
changing economic environment.

Standardized Solutions for Different Customer Segments

Customer Segment	Available Quantitative Information	Available Qualitative Information
Institutional customer (ex. banks, insurance companies)	Financial reports (International accounting standards - Standard IFRS)	Business reports, Press releases, Customer connectivity, Immediate reports
Large corporations	Financial reports (International accounting standards - Standard IFRS)	Press releases, Customer connectivity, Immediate reports, Reports by industry
Medium-sized companies with large volumes	Financial reports (International accounting standards - Standard IFRS), planning	Press releases, Customer connectivity, Reports by industry
Medium-sized companies	Financial reports (Standard IFRS)	Customer connectivity, Reports by industry
Small businesses	Tax reports / OPR	Customer connectivity, Reports by industry
Natural people	Asset reports, Credits	Reports by industry

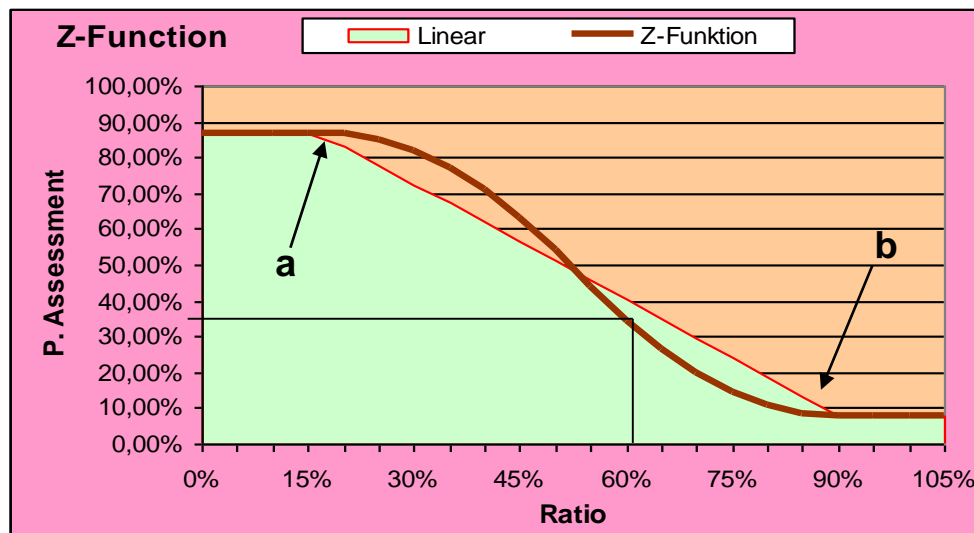
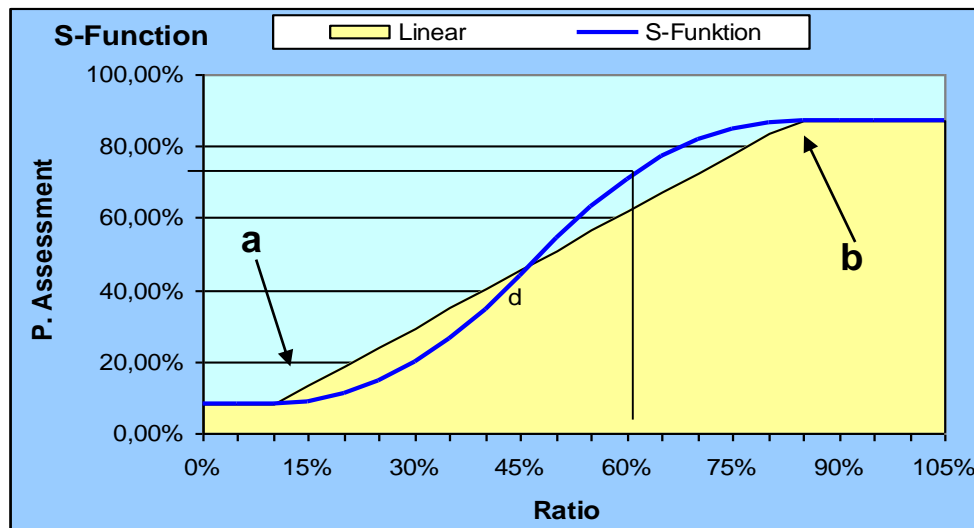


Specific Models

Step 1. Calculation Balance Sheet Indicators

Financial Quotas	Example-Computation
Return on Equity	$\text{Annual profit} \times 100 / \text{Equity}$
Return on Investment (ROI)	$(\text{Profit} + \text{Interest}) \times 100 / \text{Capital}$
Return on Sales	$\text{Profit} \times 100 / \text{Sales}$
Cashflow-Revenue Earning Rate	$\text{Cashflow} \times 100 / \text{Sales}$
Equity Quota	$\text{Equity} / \text{Overall Result}$
Debt Quota	$\text{Debt} \times 100 / \text{Equity}$
Dynamic Debt Ratio	$\text{Cashflow} / \text{Financial Debts}$
Interest Coverage Ratio	$\text{EBIT} / \text{Interest Expenses}$
Return on Investment (ROI)	$(\text{Profit} / \text{Sales}) (\text{Sales} / \text{Capital})$
.....

Step 2. Standardization of Indicators



Transformation

ratio (X) to p.assessment (Y)

a, b – depending on industry

S-Function: $Y = S(X,a,b)$

$$X \leq a \\ S(X,a,b) = 0$$

$$X > b \\ S(X,a,b) = 1$$

$$a < X \leq (a+b)/2 \\ S(X,a,b) = 2(X-a)/(b-a)$$

$$(a+b)/2 < X \leq b \\ S(X,a,b) = 1 - 2(b-X)/(b-a)$$

Z-Function: $Y = Z(X,a,b)$

$$Z(X,a,b) = 1 - S(X,a,b)$$

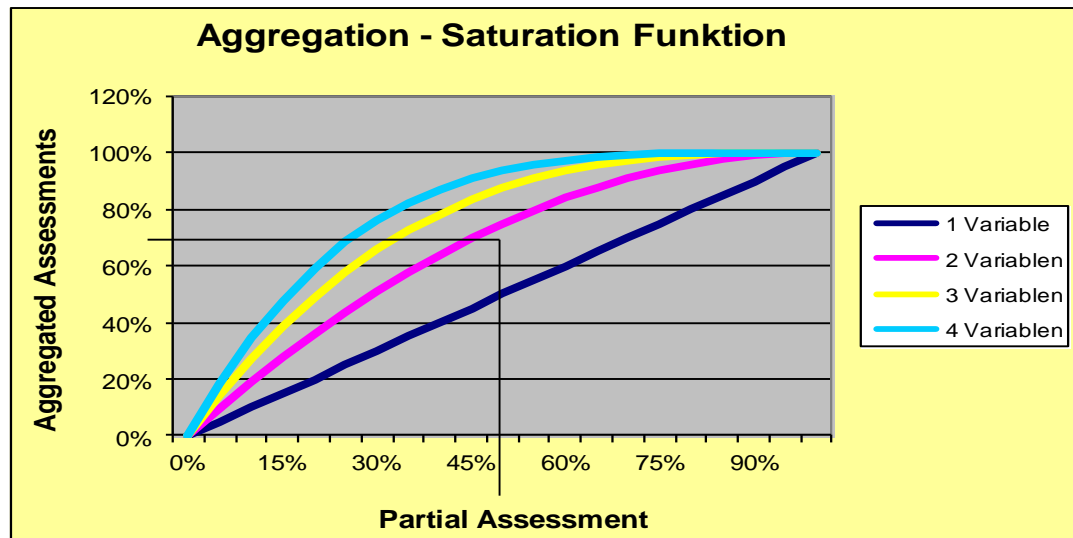
Step 3. Aggregation of Variables by Weighing

Weighing: $\text{Assessment} = (a * \text{Factor 1} + b * \text{Factor 2} + \dots + N * \text{Factor N}) / (a + b + \dots + N)$

Example: $\text{Assessment} = (3,5 * 63\% + 4,5 * 36\% + 7,2 * 48\%) / (3,5 + 4,5 + 7,2) = 47,9\%$

Aggregation: $\text{Assessment} = 1 - (1 - \text{Factor 1}) * (1 - \text{Factor 2}) * \dots * (1 - \text{Factor N})$

Example: $\text{Assessment} = 1 - (1 - 63\%) * (1 - 36\%) * (1 - 48\%) = 87,7\%$



Aggregation by Saturation Function, used in expert systems:

For factor = 50,00%, the following aggregation applies:

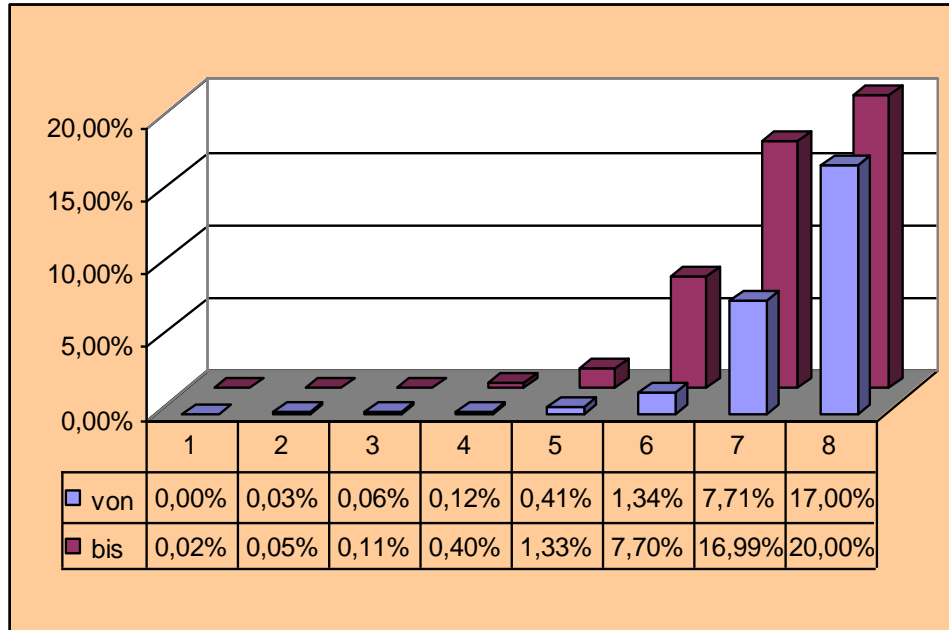
1 Variables = 50,00%

2 Variables = 75,00%

3 Variables = 87,50%

4 Variables = 93,75%

Step 4. Comparison with the Master Scale of Probability of Default

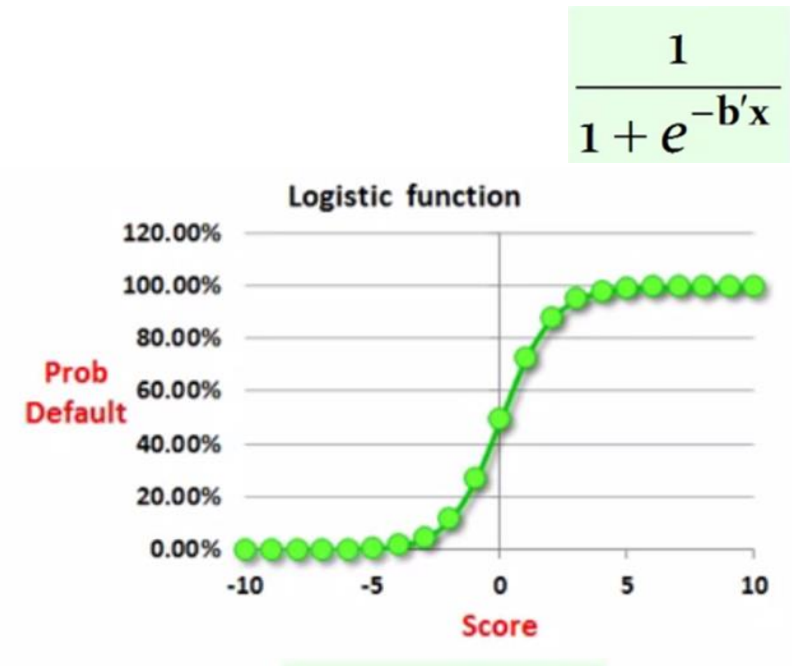


Probability of Default

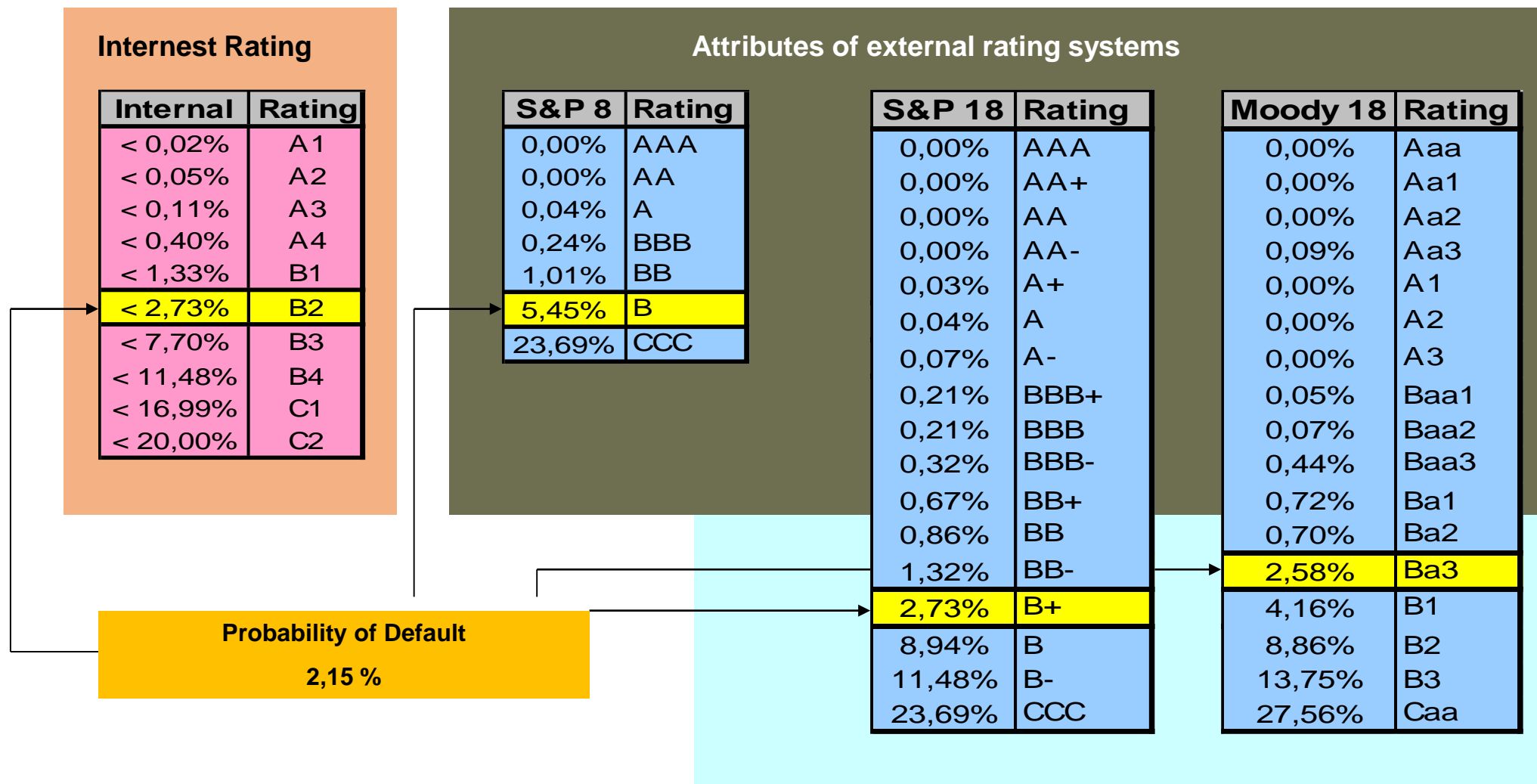
2,15 %

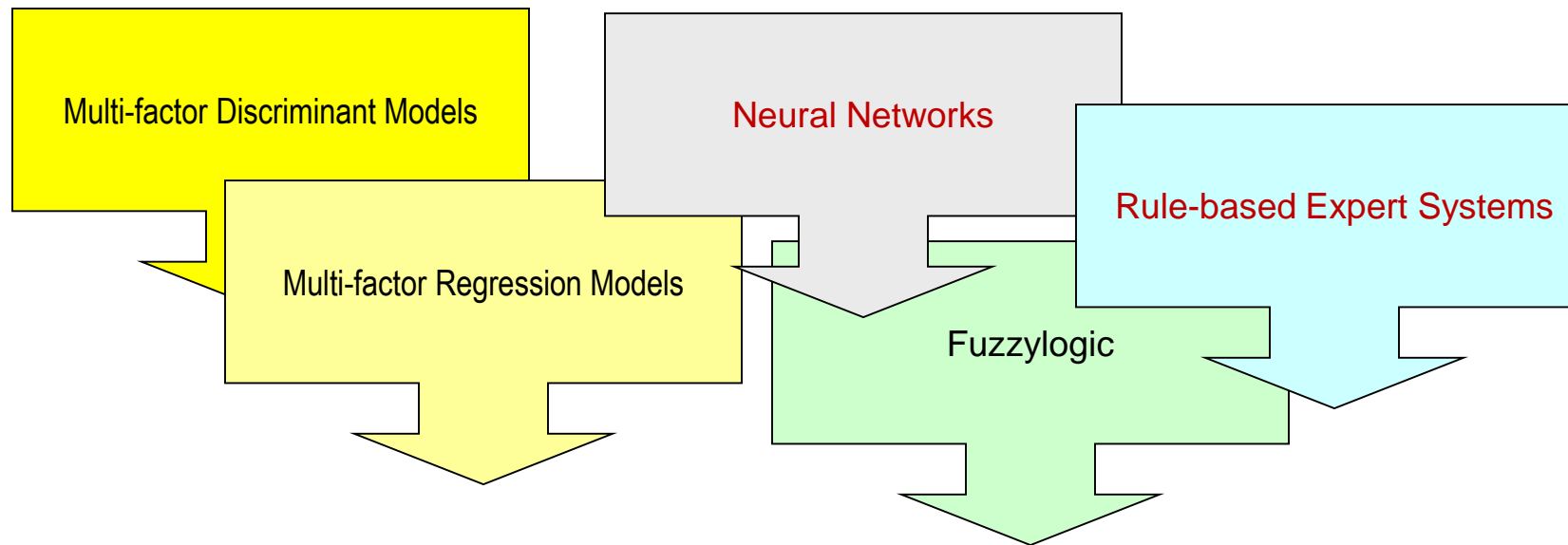
Comparison with an industry Master Scale
or with a Logistic Function

Total Result = 4,34



Step 5. Transition to other Rating Scales



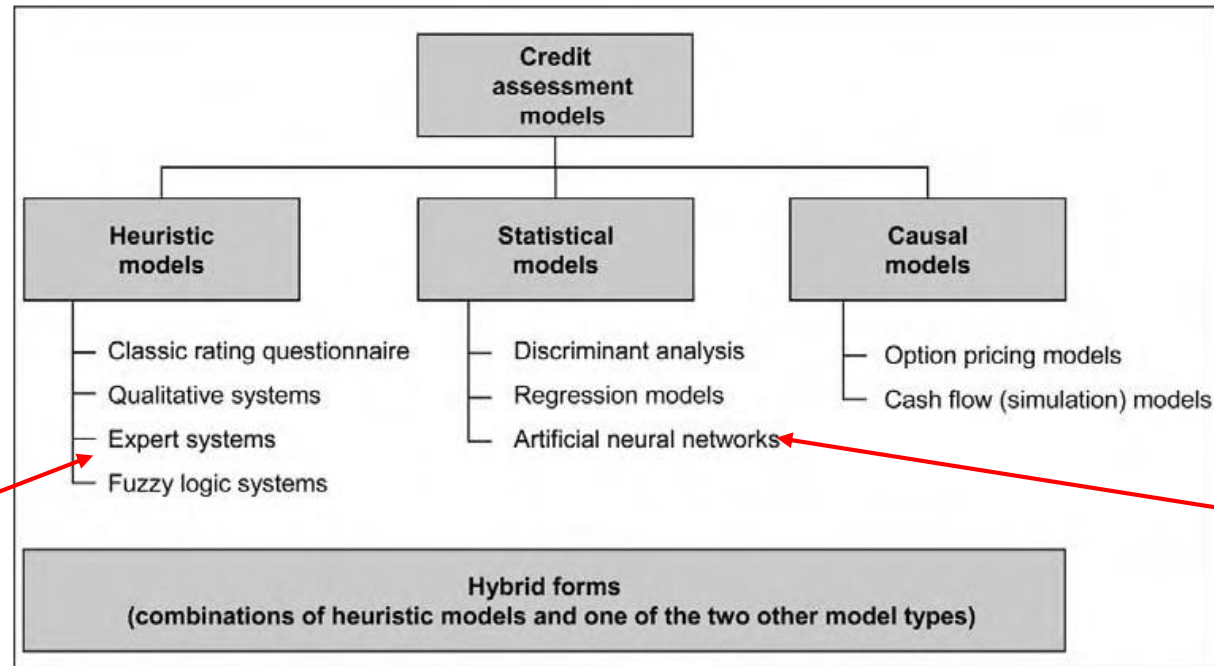


Weighing: $\text{Assessment} = (a * \text{Factor 1} + b * \text{Factor 2} + \dots + N * \text{Factor N}) / (a + b + \dots N)$

Example : $\text{Assessment} = (3,5 * 63\% + 4,5 * 36\% + 7,2 * 48\%) / (3,5 + 4,5 + 7,2) = 47,9\%$

Aggregation: Assessment $= 1 - (1 - \text{Factor 1}) * (1 - \text{Factor 2}) * \dots * (1 - \text{Factor N})$

Exaple: **Assessment** $= 1 - (1 - 63\%) * (1 - 36\%) * (1 - 48\%) = 87,7\%$

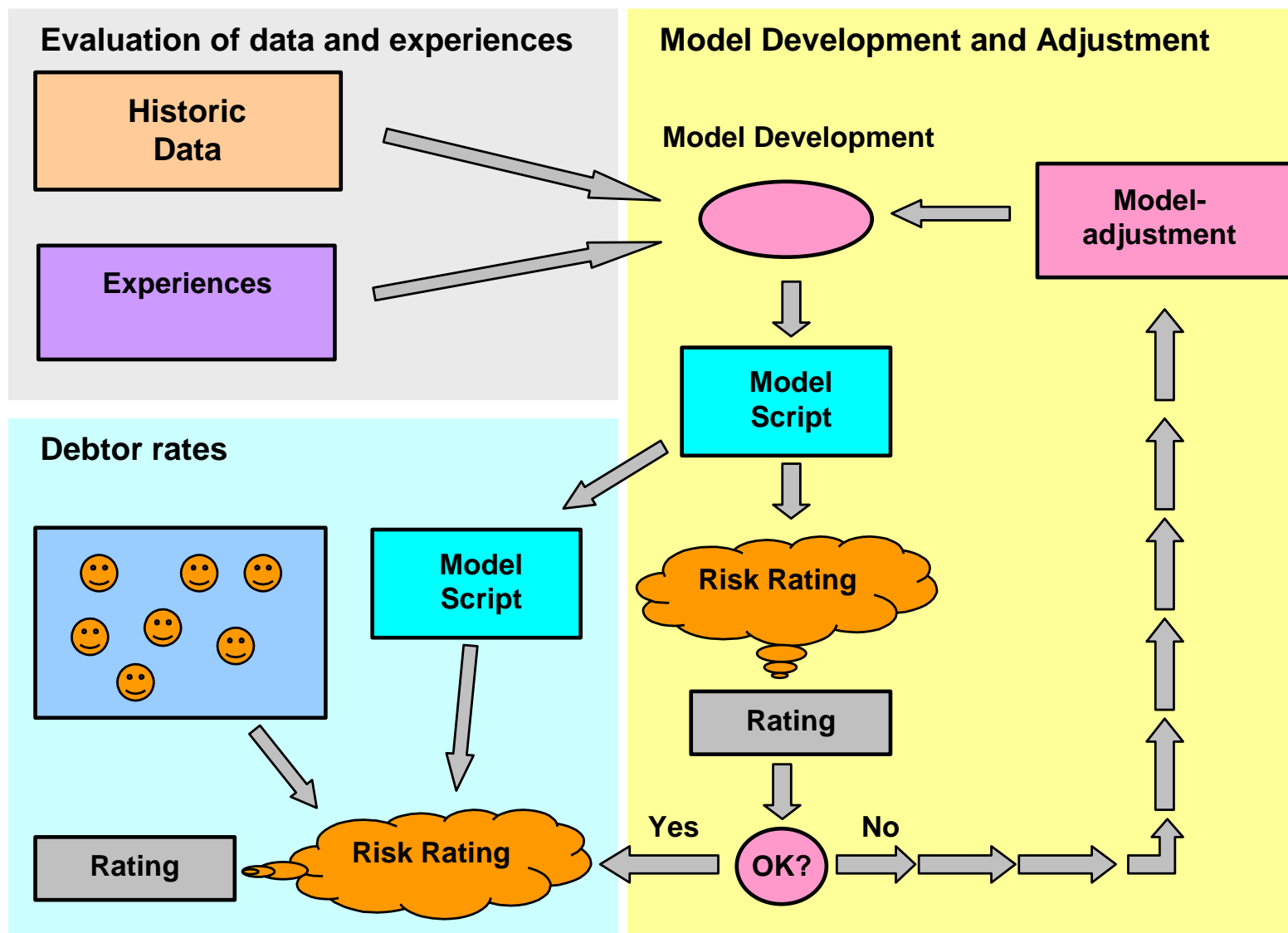


Rating-Logic Rules

Analysis, Evaluation

The described Scoring and Rating Models are based on a hierarchical set of rules, that perform weighing, balance, saturation, K.O. conditions etc. on selected key factors, which determine the debtor's ability to generate revenue, in order to meet its obligations in future periods.

Evolution and Model Improvement



- ⇒ Several rating models are available for each debtor
- ⇒ Historical recordings of criteria and ratings in the database
- ⇒ Application of expert systems
- ⇒ Determination of correlations between scoring and default probabilities
- ⇒ Automatic ratings of a debtor group
- ⇒ Assistant (Wizard) in the model development
- ⇒ Integration into a credit risk rating system
- ⇒ Administration and assignment of user rights

⇒ Rating models consist of: Facts, Criteria, Classes, Results and Rules

⇒ Functions of the Rating Model :

⇒ Processing rating models using Rule Script data

⇒ Loading debtor data from a database

⇒ Linking debtor data with the loaded rating models

⇒ Activation of the user interface and processing of data

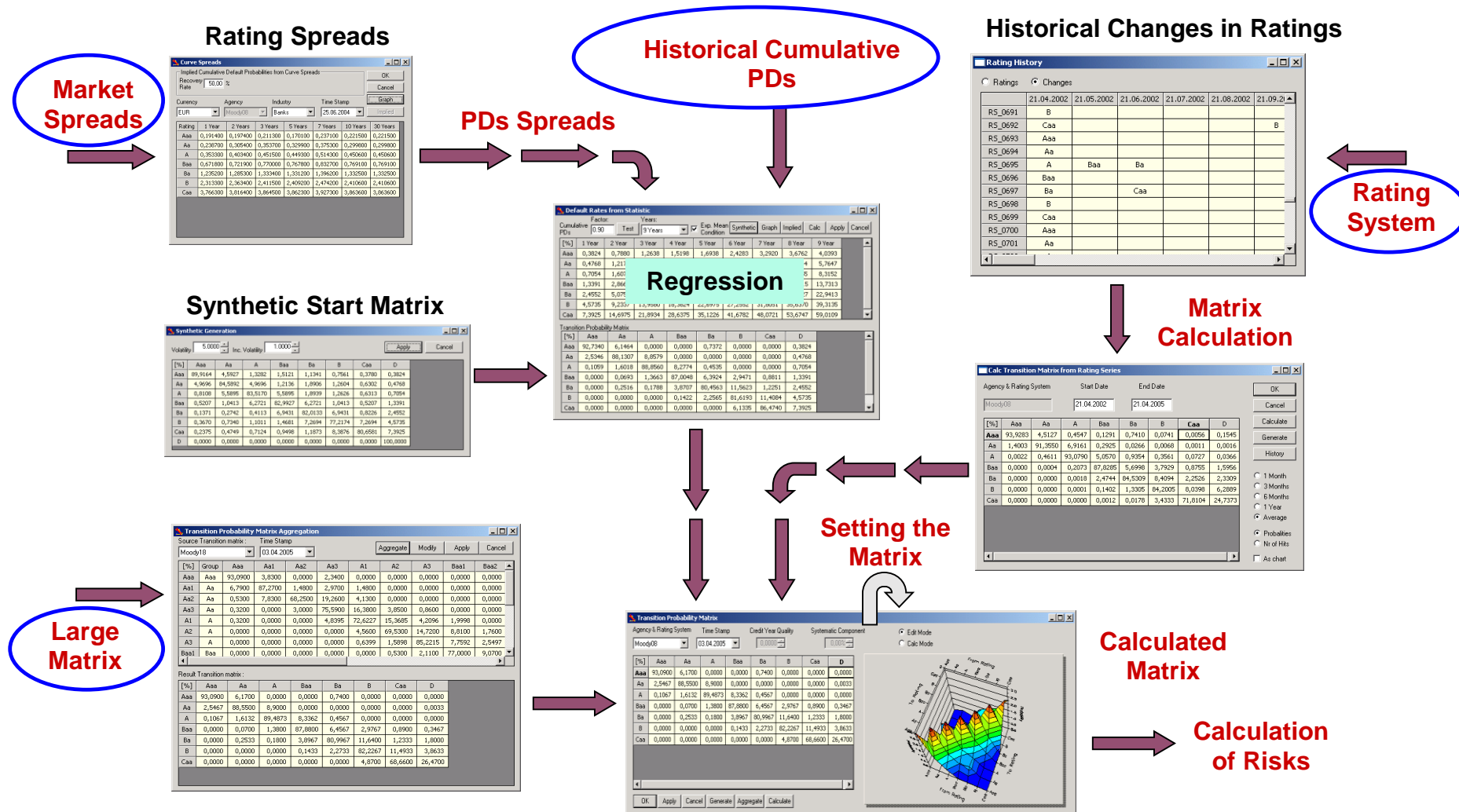
⇒ Storage of debtor data in the database

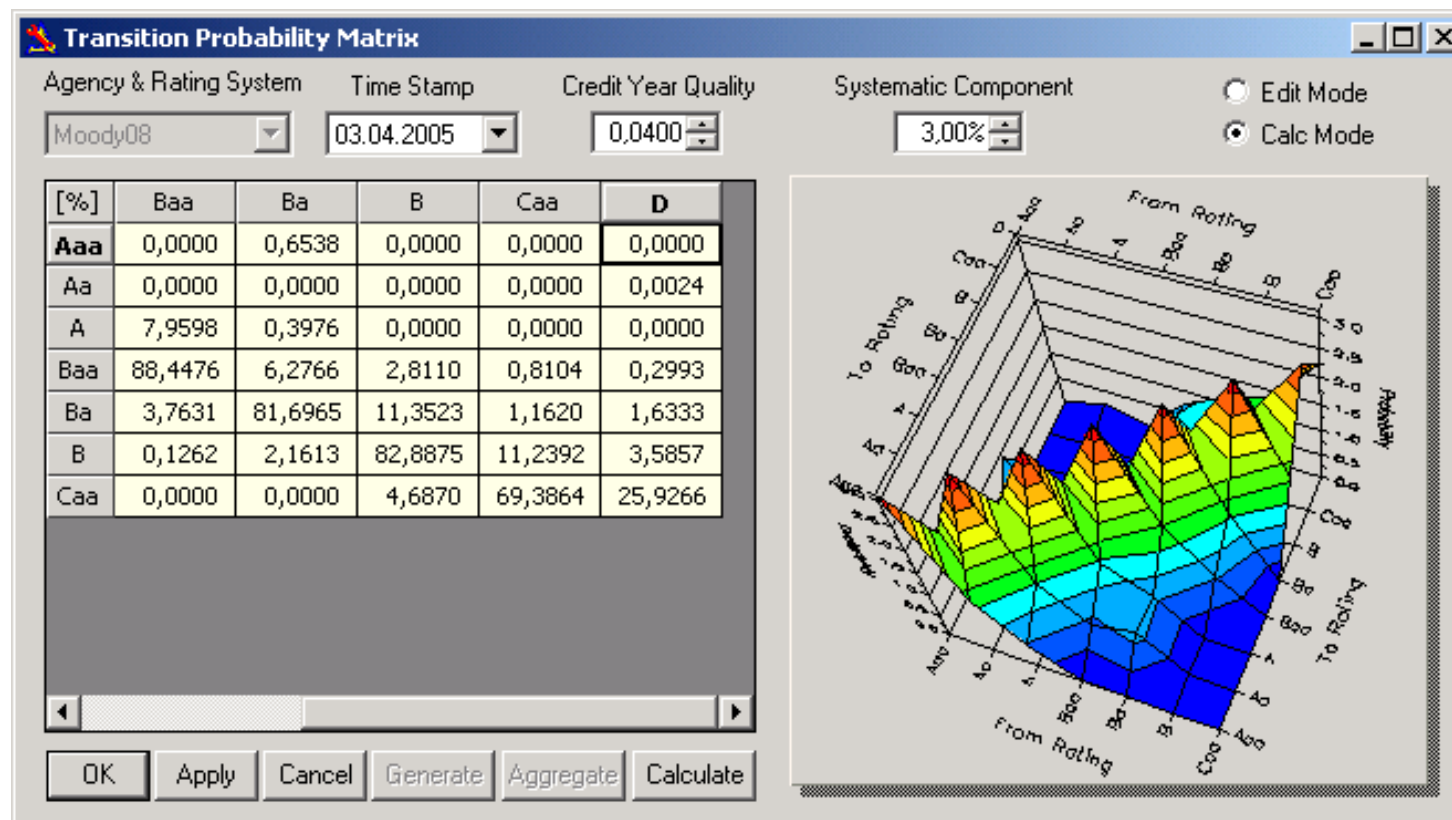
⇒ Launching the mechanism for evaluation and generation of scorings and ratings

⇒ Presentation of results on the user interface

⇒ Storage of debtor data and results in the database for future usage

Methods for Migration Matrix Generation





[2] Dr. Barry Belkin

A one-parameter representation of credit risk and transition matrices
RiskMetrics Group, CreditMetrics® Monitor, Third Quarter 1998

Cumulative PDs

Default Rates from Statistic

Factor: Cumulative PDs: 0.90 Test Years: 9 Years ☒ Exp. Mean Condition Synthetic Graph Implied Calc Apply Cancel

[%]	1 Year	2 Year	3 Year	4 Year	5 Year	6 Year	7 Year	8 Year	9 Year
Aaa	0,0000	0,0135	0,0429	0,0914	0,1622	0,2579	0,3808	0,5325	0,7147
Aa	0,0033	0,0062	0,0125	0,0283	0,0621	0,1231	0,2215	0,3670	0,5693
A	0,0000	0,0372	0,1451	0,3524	0,6824	1,1524	1,7744	2,5550	3,4961
Baa	0,3467	1,1182	2,2916	3,8379	5,7218	7,9027	10,3369	12,9802	15,7887
Ba	1,8000	4,0476	6,8534	10,1821	13,9327	17,9833	22,2152	26,5235	30,8221
B	3,8633	10,1237	17,4340	24,9946	32,3492	39,2546	45,5978	51,3432	56,4999
Caa	26,4700	44,8324	57,7450	66,9667	73,6666	78,6249	82,3656	85,2428	87,4981

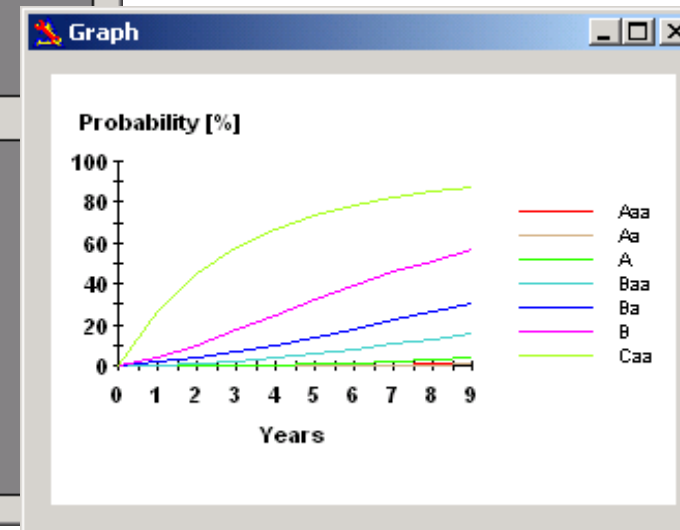
Transition Matrix

Transition Probability Matrix

[%]	Aaa	Aa	A	Baa	Ba	B	Caa	D
Aaa	93,0900	6,1700	0,0000	0,0000	0,7400	0,0000	0,0000	0,0000
Aa	2,5467	88,5500	8,9000	0,0000	0,0000	0,0000	0,0000	0,0033
A	0,1067	1,6132	89,4873	8,3362	0,4567	0,0000	0,0000	0,0000
Baa	0,0000	0,0700	1,3800	87,8800	6,4567	2,9767	0,8900	0,3467
Ba	0,0000	0,2533	0,1800	3,8967	80,9967	11,6400	1,2333	1,8000
B	0,0000	0,0000	0,0000	0,1433	2,2733	82,2267	11,4933	3,8633
Caa	0,0000	0,0000	0,0000	0,0000	0,0000	4,8700	68,6600	26,4700
D	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	100,0000

Regression Approach

1. Start matrix
2. Cumulative PDs
3. Matrix grading
4. Matrix regression
 - using the best match
 - by comparing the cumulative PDs with those of the grades



Implicit Cumulative PDs from Rating Spreads

Rating Spreads

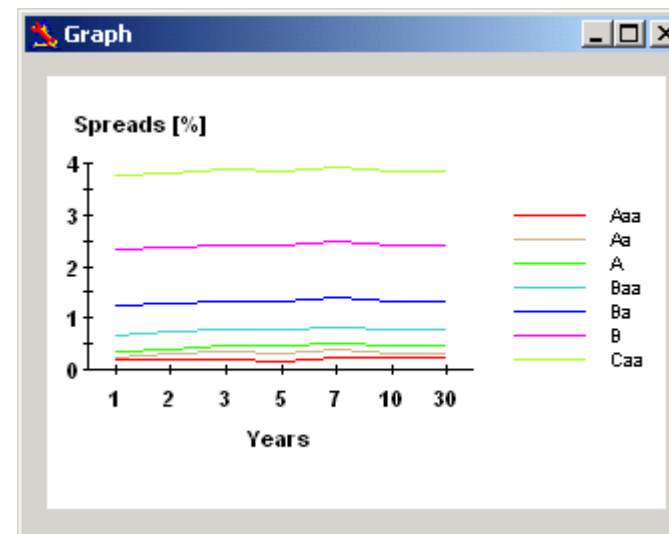
Curve Spreads

Implied Cumulative Default Probabilities from Curve Spreads

Recovery Rate: 50,00 %

Currency: EUR Agency: Moody08 Industry: Banks Time Stamp: 25.06.2004

Rating	1 Year	2 Years	3 Years	5 Years	7 Years	10 Years	30 Years
Aaa	0,191400	0,197400	0,211300	0,170100	0,237100	0,221500	0,221500
Aa	0,238700	0,305400	0,353700	0,329900	0,375300	0,299800	0,299800
A	0,353300	0,403400	0,451500	0,449300	0,514300	0,450600	0,450600
Baa	0,671800	0,721900	0,770000	0,767800	0,832700	0,769100	0,769100
Ba	1,235200	1,285300	1,333400	1,331200	1,396200	1,332500	1,332500
B	2,313300	2,363400	2,411500	2,409300	2,474300	2,410600	2,410600
Caa	3,766300	3,816400	3,864500	3,862300	3,927300	3,863600	3,863600



Synthetic Matrix

Synthetic Generation

Volatility: 5.0000 Inc. Volatility: 1.0000

Apply Cancel

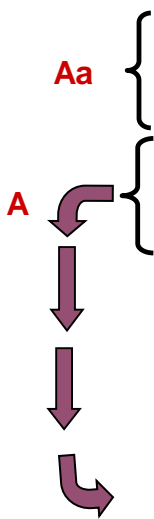
[%]	Aaa	Aa	A	Baa	Ba	B	Caa	D
Aaa	89,9164	4,5927	1,3282	1,5121	1,1341	0,7561	0,3780	0,3824
Aa	4,9696	84,5892	4,9696	1,2136	1,8906	1,2604	0,6302	0,4768
A	0,8108	5,5895	83,5170	5,5895	1,8939	1,2626	0,6313	0,7054
Baa	0,5207	1,0413	6,2721	82,9927	6,2721	1,0413	0,5207	1,3391
Ba	0,1371	0,2742	0,4113	6,9431	82,0133	6,9431	0,8226	2,4552
B	0,3670	0,7340	1,1011	1,4681	7,2694	77,2174	7,2694	4,5735
Caa	0,2375	0,4749	0,7124	0,9498	1,1873	8,3876	80,6581	7,3925
D	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	100,0000

Migration Matrix Aggregation

Aa
A

Aa

A



Source Transition matrix :		Time Stamp								
Moody18		03.04.2005		<input type="button" value="Aggregate"/> <input type="button" value="Modify"/> <input type="button" value="Apply"/> <input type="button" value="Cancel"/>						
[%]	Group	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2
Aaa	Aaa	93,0900	3,8300	0,0000	2,3400	0,0000	0,0000	0,0000	0,0000	0,0000
Aa1	Aa	6,7900	87,2700	1,4800	2,9700	1,4800	0,0000	0,0000	0,0000	0,0000
Aa2	Aa	0,5300	7,8300	68,2500	19,2600	4,1300	0,0000	0,0000	0,0000	0,0000
Aa3	Aa	0,3200	0,0000	3,0000	75,5900	16,3800	3,8500	0,8600	0,0000	0,0000
A1	A	0,3200	0,0000	0,0000	4,8395	72,6227	15,3685	4,2096	1,9998	0,0000
A2	A	0,0000	0,0000	0,0000	0,0000	4,5600	69,5300	14,7200	8,8100	1,7600
A3	A	0,0000	0,0000	0,0000	0,0000	0,6399	1,5898	85,2215	7,7592	2,5497
Baa1	Baa	0,0000	0,0000	0,0000	0,0000	0,0000	0,5300	2,1100	77,0000	9,0700

[%]	Aaa	Aa	A	Baa	Ba	B	Caa	D
Aaa	93,0900	6,1700	0,0000	0,0000	0,7400	0,0000	0,0000	0,0000
Aa	2,5467	88,5500	8,9000	0,0000	0,0000	0,0000	0,0000	0,0033
A	0,1067	1,6132	89,4873	8,3362	0,4567	0,0000	0,0000	0,0000
Baa	0,0000	0,0700	1,3800	87,8800	6,4567	2,9767	0,8900	0,3467
Ba	0,0000	0,2533	0,1800	3,8967	80,9967	11,6400	1,2333	1,8000
B	0,0000	0,0000	0,0000	0,1433	2,2733	82,2267	11,4933	3,8633
Caa	0,0000	0,0000	0,0000	0,0000	0,0000	4,8700	68,6600	26,4700

Migration Matrix, Expectations for Rating Changes

Synthetical Rating Changes (for 3 years, monthly, 1000 debtors)

Generate Rating Series

Agency & Rating System

Number of Partners

GroupID Prefix

History (Years)

Rating Date

Frequency (Months)

Credit Year Quality

Systematic Component

Close

Delete

Moody08

1000

RS_

3

21.04.2005

1

0,0000

0,00%

Init

Step

☐ As chart
 ☒ DB Store

1 Year Transition Matrix

[%]	Aaa	Aa	A	Baa	Ba
Aaa	93,0900	6,1701	0,0000	0,0000	0,7399
Aa	2,5466	88,5501	8,9001	0,0000	0,0000
A	0,1065	1,6132	89,4874	8,3363	0,4566
Baa	0,0000	0,0698	1,3800	87,8801	6,4567
Ba	0,0000	0,2532	0,1800	3,8967	80,9968
B	0,0000	0,0000	0,0000	0,1433	2,2733
Caa	0,0000	0,0000	0,0000	0,0000	0,0000

Hits till Rating Date

	Aaa	Aa	A	Baa	Ba	B	Caa	D
Aaa	4613	23	0	0	4	0	0	0
Aa	6	4878	37	0	0	0	0	0
A	0	3	5089	29	4	0	0	0
Baa	0	0	1	4804	33	17	2	6
Ba	0	0	0	12	4614	51	5	7
B	0	0	0	0	8	5063	56	24
Caa	0	0	0	0	0	16	3795	103

Probabilities:

Transition Hits:

☒ 1 Year
 ☐ Frequency
 ☐ Current
 ☐ Total

Probabilities:

Transitions Hits:

☐ 1 Year
 ☐ Frequency
 ☐ Current
 ☒ Total

Migration Matrix, Expectations for Rating Changes

Historical Monthly Rating Changes of Debtors

Rating Status

Rating History						
	<input checked="" type="radio"/> Ratings <input type="radio"/> Changes					
	21.04.2002	21.05.2002	21.06.2002	21.07.2002	21.08.2002	21.09.2002
RS_0691	B	B	B	B	B	B
RS_0692	Caa	Caa	Caa	Caa	Caa	B
RS_0693	Aaa	Aaa	Aaa	Aaa	Aaa	Aaa
RS_0694	Aa	Aa	Aa	Aa	Aa	Aa
RS_0695	A	Baa	Ba	Ba	Ba	Ba
RS_0696	Baa	Baa	Baa	Baa	Baa	Baa
RS_0697	Ba	Ba	Caa	Caa	Caa	Caa
RS_0698	B	B	B	B	B	B
RS_0699	Caa	Caa	Caa	Caa	Caa	Caa
RS_0700	Aaa	Aaa	Aaa	Aaa	Aaa	Aaa
RS_0701	Aa	Aa	Aa	Aa	Aa	Aa

Rating Changes

Rating History						
	<input type="radio"/> Ratings <input checked="" type="radio"/> Changes					
	21.04.2002	21.05.2002	21.06.2002	21.07.2002	21.08.2002	21.09.2002
RS_0691	B					
RS_0692	Caa					B
RS_0693	Aaa					
RS_0694	Aa					
RS_0695	A	Baa	Ba			
RS_0696	Baa					
RS_0697	Ba		Caa			
RS_0698	B					
RS_0699	Caa					
RS_0700	Aaa					
RS_0701	Aa					

Generation of a Migration Matrix from Rating Changes

Statistical Tracking of Historical Changes

Number of rating changes "from-to"

Calc Transition Matrix from Rating Series

Agency & Rating System: Start Date: End Date:

	Aaa	Aa	A	Baa	Ba	B	Caa	D
Aaa	4409	162	18	10	24	7	0	10
Aa	72	4547	291	11	0	0	0	0
A	0	16	4834	210	39	21	5	0
Baa	0	0	7	4334	241	168	52	61
Ba	0	0	0	104	4068	296	109	112
B	0	0	0	10	54	4460	345	282
Caa	0	0	0	0	0	114	2934	866

☐ 1 Month
☐ 3 Months
☐ 6 Months
☒ 1 Year
☐ Average
☐ Probabilities
☒ Nr of Hits
☐ As chart

Buttons: OK, Cancel, Calculate, Generate, History

Statistical Approach

1. Tracking with monthly frequency
2. Number of rating changes "from-to" for 1, 3, 6 and 12 months
3. Definition of 4 transition matrices
4. Determination of an averaged matrix

matrix from Rating Series

Item: Start Date: End Date:

	Aa	A	Baa	Ba	B	Caa	D
Aa	0,5127	0,4547	0,1291	0,7410	0,0741	0,0056	0,1545
A	0,3550	6,9161	0,2925	0,0266	0,0068	0,0011	0,0016
Baa	0,4611	93,0790	5,0570	0,9354	0,3561	0,0727	0,0366
Ba	0,0004	0,2073	87,8285	5,6998	3,7929	0,8755	1,5956
B	0,0000	0,0018	2,4744	84,5309	8,4094	2,2526	2,3309
Caa	0,0000	0,0001	0,1402	1,3305	84,2005	8,0398	6,2889
D	0,0000	0,0000	0,0012	0,0178	3,4333	71,8104	24,7373

☐ 1 Month
☐ 3 Months
☐ 6 Months
☐ 1 Year
☒ Average
☒ Probabilities
☐ Nr of Hits
☐ As chart

Buttons: OK, Cancel, Calculate, Generate, History

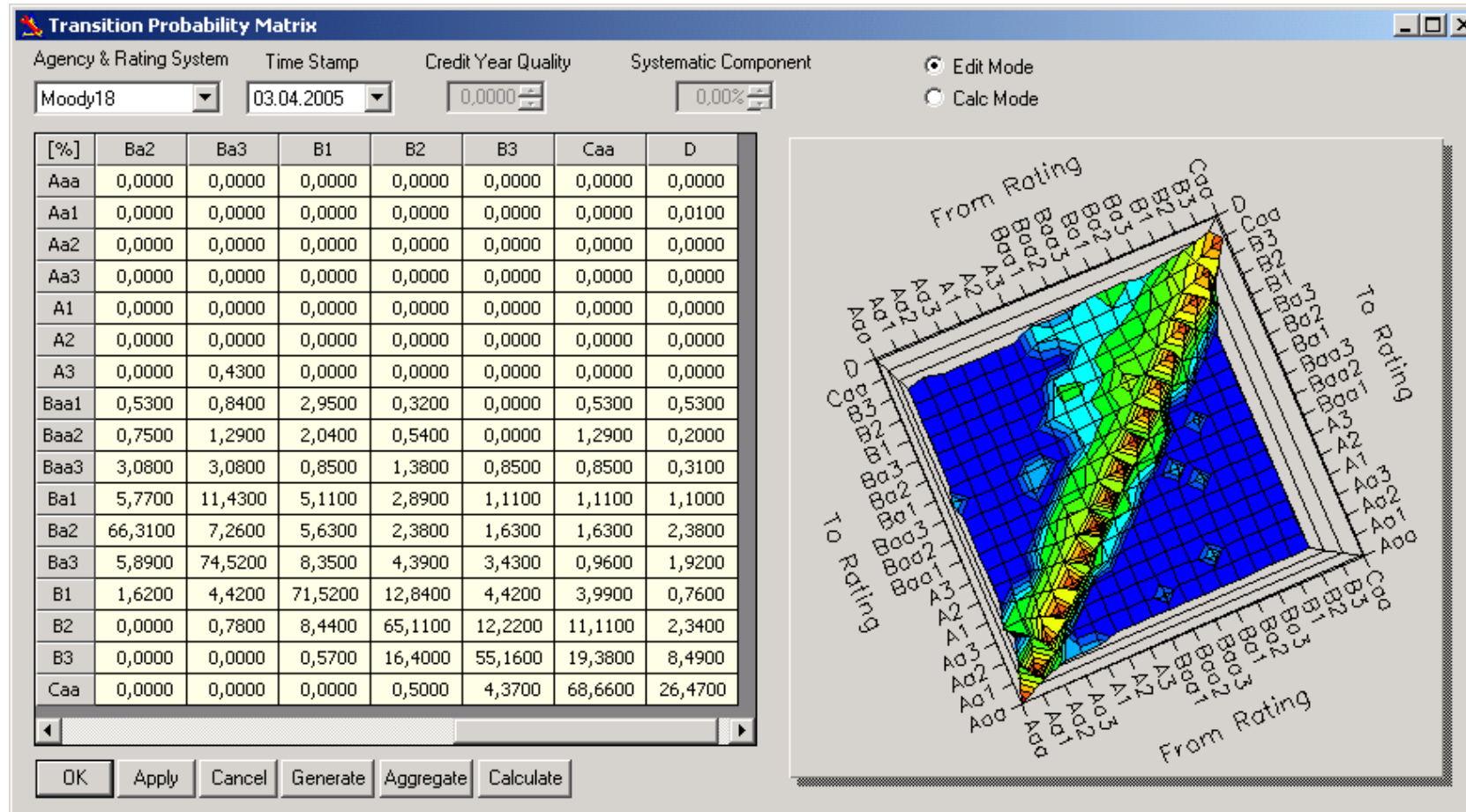
Average matrix

$$S^{\text{Rating}}(t) = 1 - PD^{\text{Rating}}(t)$$

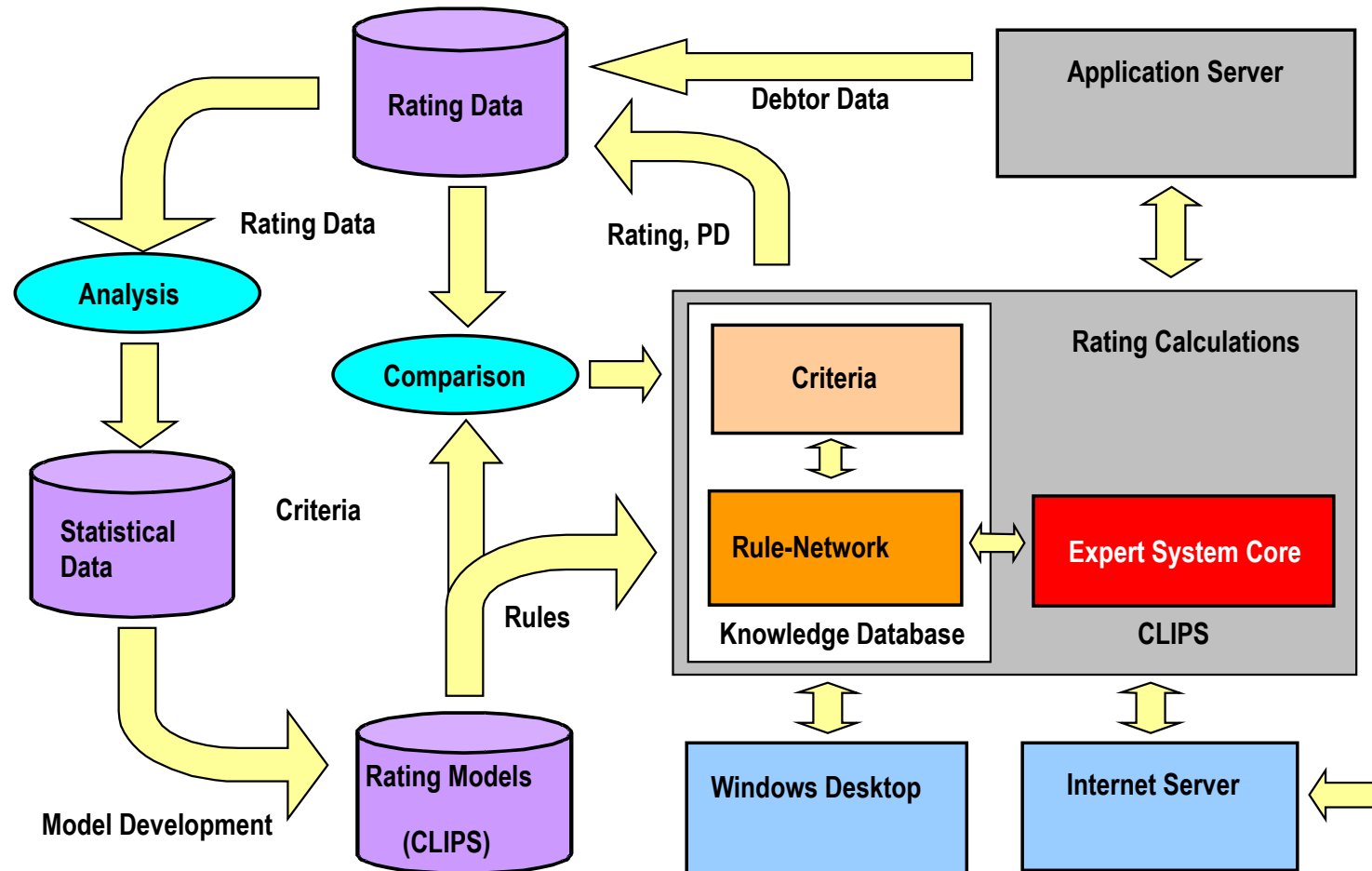
$$S^{\text{Rating}}(t) = S^{\text{Rating}}(1 \text{ Year})^t$$

$$PD^{\text{Rating}}(t) = 1 - (1 - PD^{\text{Rating}}(1 \text{ Year}))^t$$

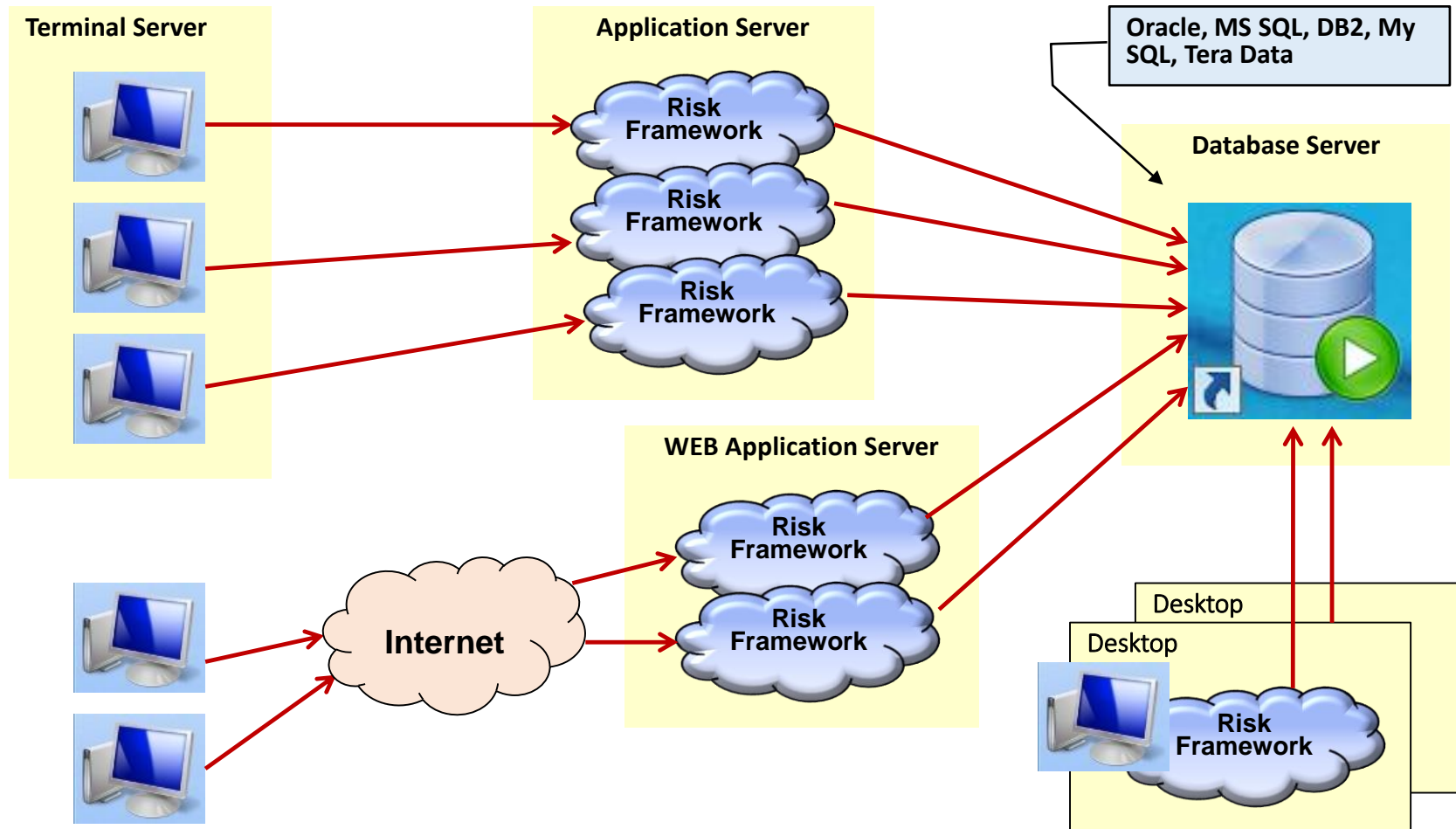
Moody 18 Migration Matrix



Rating System Architecture



Risk Framework Architecture



Risk Framework Demo | E x Risk Framework® x

www.eurorisksystems.com:8080/RiskFramework/Session

System Settings

System data Balance analysis Management and Enterprise Branche Rating Administration

Corporate Client Rating

- System data
- Balance analysis
- Management and Enterprise
- Branche
- Rating
- Administration

Balance indicators

	Enter/Import	Scores
Equity ratio	12.9 %	43.02
Cash-flow ratio before tax	4.5 %	21.17
Sales profitability	-1.3 %	0.00
Dynamic gearing	14.0 years	30.36
Return on total capital	2.3 %	7.10
Scores - Balance analysis without trend calculation		27.13

Trend calculation

Balance indicators for last three years Estimates/Scores	Balance years			Trend/Scores				
	31/12/2011	31/12/2012	31/12/2013					
Equity ratio	10.6	35.20	10.2	34.12	12.9	43.02	7.87	50.89
Cash-flow ratio before tax	4.5	21.17	4.5	21.17	4.5	21.17	0.00	21.17
Sales profitability	-1.3	0.00	-1.3	0.00	-1.3	0.00	0.00	0.00
Dynamic gearing	13.5	32.79	14.0	30.36	14.0	30.36	-1.18	29.18
Return on total capital	2.4	7.54	2.3	7.31	2.3	7.10	-3.00	4.09
Scores - Balance analysis with trend calculation							29.35	

Rating of Balance analysis

Calculated estimate 4.53 ☒ Estimate correction 3.80

Remarks Reason for correction:

Estimate after correction 3.80 Scores after correction 44.00

Rating BB

Risk Framework v.4.0/B003 17.09.2013 - [Item: Client 001 -> Model: Corporate Client Rating, [12.8.2012 r.]]

User Item List Model View Reports Window Help

Corporate Client Rating

- System data
- Balance analysis**
- Management and Enterprise
- Branche
- Rating
- Administration

Balance analysis

Balance indicators

	Enter/Import	Scores
Equity ratio	83,3 %	100,00
Cash-flow ratio before tax	-10,0 %	0,00
Sales profitability	-10,0 %	0,00
Dynamic gearing	-1,0 years	0,00
Return on total capital	-16,7 %	0,00
Scores - Balance analysis without trend calculation		35,00

Trend calculation

Balance years	Balance indicators for last three years Estimates/Scores						Trend/Scores	
	2010	2011	2012					
Equity ratio	0,0	0,00	0,0	0,00	83,3	100,00	0,00	100,00
Cash-flow ratio before tax	0,0	0,00	0,0	0,00	-10,0	0,00	0,00	0,00
Sales profitability	0,0	0,00	0,0	0,00	-10,0	0,00	0,00	0,00
Dynamic gearing	20,0	0,00	20,0	0,00	-1,0	0,00	0,00	0,00
Return on total capital	0,0	0,00	0,0	0,00	-16,7	0,00	0,00	0,00
Scores - Balance analysis with trend calculation							35,00	

Rating of Balance analysis

Calculated estimate	4,25	<input checked="" type="checkbox"/> Estimate correction	3,20
Remarks	Description of correction		
Estimate after correction	3,20	Scores after correction	56,00
		Rating	BBB

Система: [Настойки](#)

Рейтинг на фирмени клиенти | **Балансов анализ** | Управление на предприятието | Оценка за бранша | Рейтинг | Администрация

Балансови години: 31/12/2013 | 31/12/2014 | 31/12/2015 | Тенденция/Точки

Квота на собствения капитал	16.67	55.56	17.53	58.42	12.37	41.24	-14.95	26.29
Процент на CF преди данъци	5.02	14.34	3.23	9.22	6.81	19.46	8.96	28.42
Рентабилност на оборота	3.23	17.44	3.23	17.44	3.23	17.44	0.00	17.44
Ликвидиране на задълженията	12.14	39.40	17.78	11.14	8.95	55.43	8.33	63.76
Лихв. ставка на съвк. капитал	8.33	23.15	8.76	24.34	8.76	24.34	1.72	26.06
Точки за Балансов анализ с отчитане на тенденцията							33.41	

Оценка и рейтинг за Балансов анализ

Изчислена оценка: 4.33 ☐ Корекция на оценката: 0.00

Забележка:

Оценка след корекция: 4.33 Точки след корекция: 33.41

Рейтинг: B

Графика за оценка на баланса

Точки по показатели

Показатели

Точки

Години

Зареден

Risk Framework Demo | E x Risk Framework® x

www.eurorisksystems.com:8080/RiskFramework/Session

System Settings

System data Balance analysis **Management and Enterprise** Branche Rating Administration

Corporate Client Rating

- System data
- Balance analysis**
 - Management and Enterprise
 - Management**
 - Qualification Input
 - Qualification Scores
 - Progressiveness Input
 - Progressiveness Score
 - Decision-making ability 1
 - Decision-making ability S
 - Reliability Input
 - Reliability Scores
 - Cost Awareness Input
 - Cost Awareness Scores
 - Persuasiveness Input
 - Persuasiveness Scores
 - Accuracy Input
 - Accuracy Scores
 - Estimate for Management
 - Scores for Management
 - Enterprise**
 - Order Situation Input
 - Order Situation Scores
 - Accounting and Cotrolling
 - Accounting and Cotrolling
 - Adaptability of Capacities
 - Adaptability of Capacities
 - Investment Policy Input
 - Investment Policy Scores
 - Information Behavior Input
 - Information Behavior Score
 - Staff Development Input
 - Staff Development Score
 - Estimate for Enterprise
 - Scores for Enterprise
 - Economic risk
 - Global indicators
 - Rating of Management and Enterprise
 - Branche

Management

Qualification	1	100.00
Progressiveness	3	65.00
Decision-making ability	2	83.00
Reliability	3	65.00
Cost Awareness	3	65.00
Persuasiveness	2	83.00
Accuracy	3	65.00
Management	2.43	75.14

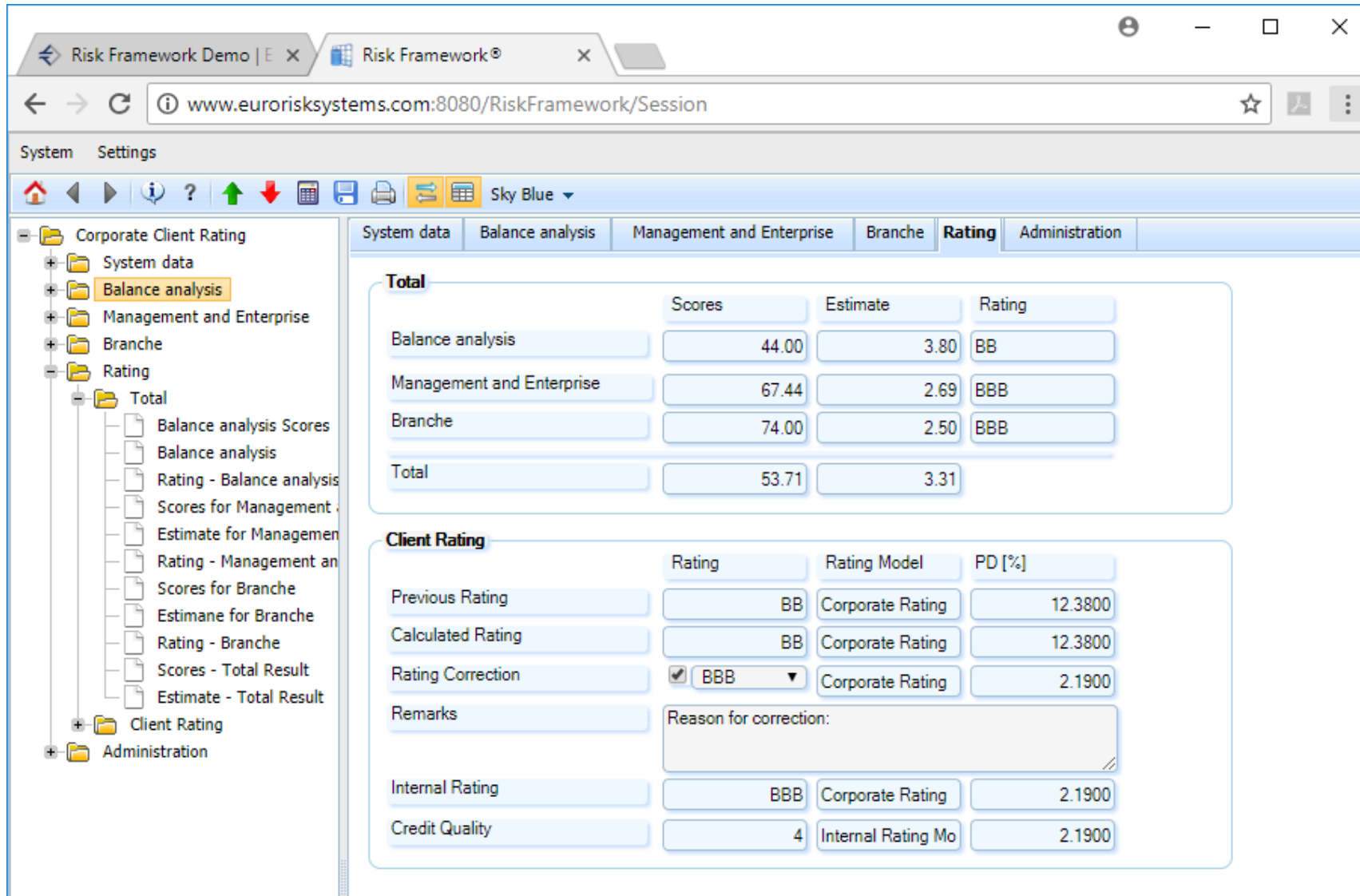
Enterprise

Order Situation	3	65.00
Accounting and Cotrolling	4	47.00
Adaptability of Capacities	3	65.00
Investment Policy	3	65.00
Information Behavior	4	47.00
Staff Development	3	65.00
Enterprise	3.33	59.00

Economic risk

Business Competition	3	65.00
Product Risk	3	65.00
Economic Management	2	83.00
Effectiveness of Accounting	1	100.00
Dependence on Export	3	65.00
Dependence on Suppliers	3	65.00
Dependence on Customers	1	100.00

WEB User Interface – Final Rating



The screenshot shows a web browser window with the URL `www.eurorisksystems.com:8080/RiskFramework/Session`. The application has a sidebar menu on the left with the following structure:

- Corporate Client Rating
 - System data
 - Balance analysis
 - Management and Enterprise
 - Branche
 - Rating
 - Total
 - Balance analysis Scores
 - Balance analysis
 - Rating - Balance analysis
 - Scores for Management
 - Estimate for Management
 - Rating - Management an
 - Scores for Branche
 - Estimate for Branche
 - Rating - Branche
 - Scores - Total Result
 - Estimate - Total Result
 - Client Rating
 - Administration

The main content area has a tabbed interface with the following tabs: System data, Balance analysis, Management and Enterprise, Branche, **Rating**, and Administration. The **Rating** tab is active.

Total

	Scores	Estimate	Rating
Balance analysis	44.00	3.80	BB
Management and Enterprise	67.44	2.69	BBB
Branche	74.00	2.50	BBB
Total	53.71	3.31	

Client Rating

	Rating	Rating Model	PD [%]
Previous Rating	BB	Corporate Rating	12.3800
Calculated Rating	BB	Corporate Rating	12.3800
Rating Correction	<input checked="" type="checkbox"/> BBB	Corporate Rating	2.1900
Remarks	<div>Reason for correction:</div>		
Internal Rating	BBB	Corporate Rating	2.1900
Credit Quality	4	Internal Rating Mo	2.1900

WEB User Interface – Balance Data

Risk Framework Demo | E X Risk Framework®

www.eurorisksystems.com:8080/RiskFramework/Session

System Settings

Sky Blue

Common data Assets Equity and liabilities Guarantees and other commitments Income statement Financial ratios Administration

Fixed Assets

Intangible assets

	Input	Correction	Result	in [%]
Concessions, patents, licences, etc.	14070.00	0.00	14070.00	0.4
Remark				
Goodwill (+/-)	289575.00	0.00	289575.00	9.2
Remark				
Advance payments	0.00	0.00	0.00	0.0
Remark				
Total intangible assets	303645.00	0.00	303645.00	9.6

Tangible assets

	Input	Correction	Result	in [%]
Land and buildings	532210.00	0.00	532210.00	16.8
Remark				
Plant and machinery	439653.00	0.00	439653.00	13.9
Remark				
Fixtures, fittings, tools and equipment	80212.00	0.00	80212.00	2.5
Remark				
Advance payments and assets under construction	30188.00	0.00	30188.00	1.0
Remark				

Loaded

Customer Data in QlikView in Cyrillic

QlikView x64 - Partner's Copy - [D:\work.d\disk_d\EuroRisk\RFW\exe\reports\QlikView\CorporateRating.qvw]

File Edit View Selections Layout Settings Bookmarks Reports Tools Object Window Help

Clear Back Forward Lock Unlock

ПЕРСОНАЛНИ ДАННИ БАЛАНСОВ АНАЛИЗ УПРАВЛЕНИЕ НА ПРЕДПРИЯТИЕТО БРАНШ РЕЙТИНГ ГЕОГРАФИЯ

EURO RISK SYSTEMS LTD.

ПЕРСОНАЛНИ ДАННИ

Партньори

- ☐ АКЦИОН
- ☐ АЛЕКС ГРУП
- ☐ ДИКО-64
- ☐ ЕТ Данчо Христов
- ☒ Иванов и Сие ЕООД
- ☐ Мираж ООД

Партньор No: CR0991-01

Класификация: Издателска и полиграфическа дейност

Дата на създаване: 03.12.2013

Финансов център: Клон 006

Потребител: Admin

Име на компанията: Иванов и Сие ЕООД

Тип:

Статистически No: 765748903 Данъчен No: 275687453490

Лице за контакт: Петър Иванов Асенов

Адрес за контакт: гр. София

ул. Цар Иван Асен II 13а

Бранш: 12022 / 12000 / Издателска и полиграфическа дейност

Забележки:

Име: Петър Фамилия: Асенов

Дата на раждане: 03.12.2013 Занятие:

Място на раждане: гр. Търговище Образование: Средно специално

Гражданство: Български гражданин Забележки:

Пол: Мъж

Семеен статус: Женен / Омъжена

Държава: BG Държава - код: BG

Област/Община:

Град/Село: Пощенски код:

Адрес 1:

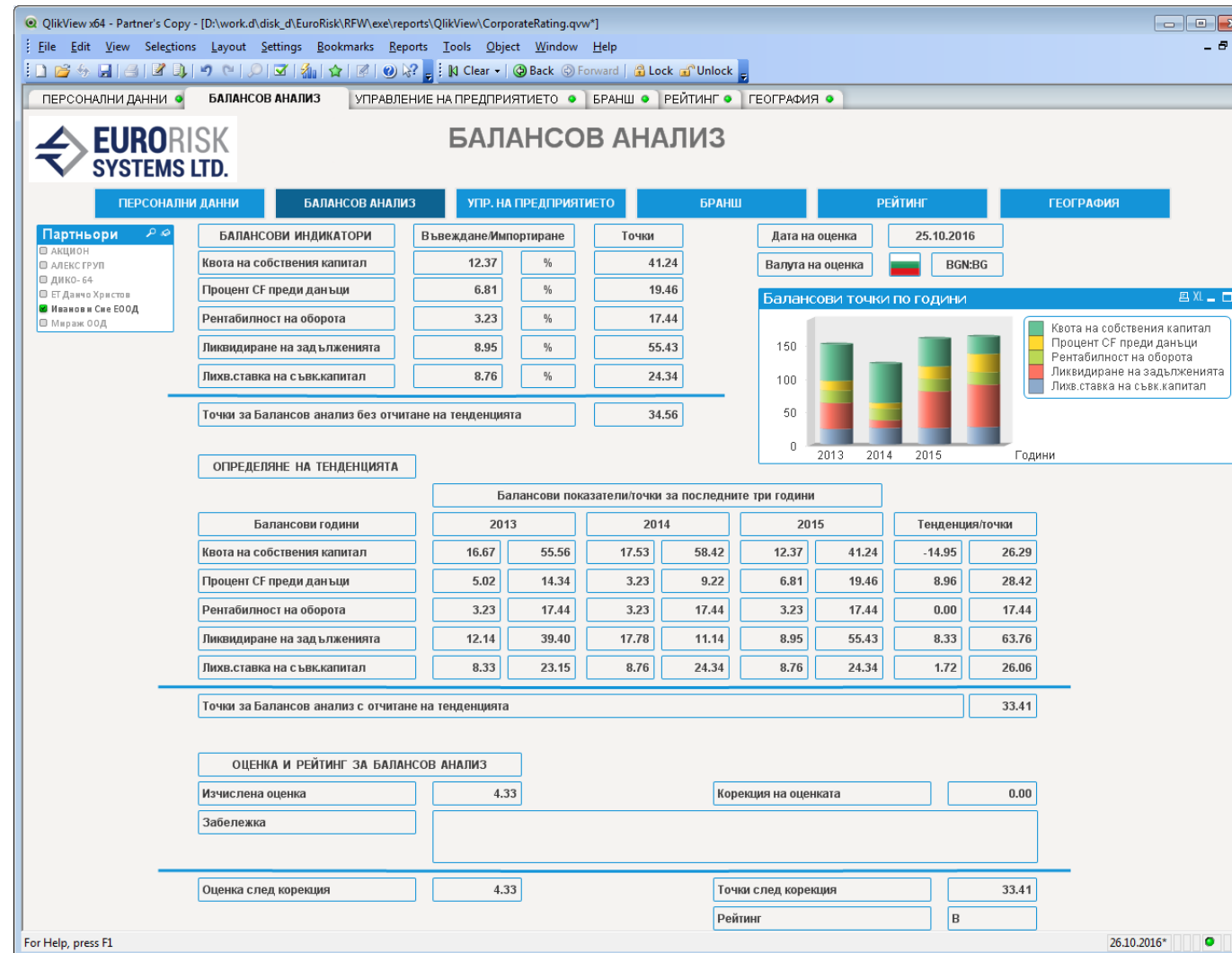
Адрес 2:

Адрес 3:

For Help, press F1

26.10.2016*

OLAP Reports in QlikView in Cyrilic



Rating Report Protocol

Corporate_Rating.xls [Compatibility Mode] - Excel Simeon Nenov

File Home Insert Page Layout Formulas Data Review View Developer Help LOAD TEST TEAM Tell me Share

Clipboard Font Alignment Number Styles Cells Editing

A28

1	1.2.1.Balance indicators			
2				
3		Name	Value	Min Max
4		1.2.1.1.Equity ratio	12.91	-100.00 100.00
5		1.2.1.2.Equity ratio Scores	43.02	0.00 100.00
6		1.2.1.3.Cash-flow ratio before tax	4.49	-100.00 100.00
7		1.2.1.4.Cash-flow ratio before tax Scores	21.17	0.00 100.00
8		1.2.1.5.Sales profitability	-1.28	-100.00 100.00
9		1.2.1.6.Sales profitability	0.00	0.00 100.00
10		1.2.1.7.Dynamic gearing	14.02	-20.00 20.00
11		1.2.1.8.Dynamic gearing Scores	30.36	0.00 100.00
12		1.2.1.9.Return on total capital	2.27	-100.00 101.50
13		1.2.1.10.Return on total capital Scores	7.10	0.00 100.00
14		1.2.1.11.Scores - Balance analysis without trend calculation	27.13	0.00 100.00
15				
16				
17	1.2.2.Trend calculation			
18		Name	Value	Min Max
19		1.2.2.1.Current year - 3	31.12.2011	
20		1.2.2.2.Current year - 2	31.12.2012	
21		1.2.2.3.Current year - 1	31.12.2013	
22		1.2.2.4.Equity ratio (year - 3)	10.56	-100.00 100.00
23		1.2.2.5.Equity ratio Scores (year - 3)	35.20	0.00 100.00
24		1.2.2.6.Equity ratio (year - 2)	10.24	-100.00 100.00
25		1.2.2.7.Equity ratio Scores (year - 2)	34.12	0.00 100.00
26		1.2.2.8.Equity ratio (year - 1)	12.91	-100.00 100.00
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66	1.2.3.Rating of Balance analysis			
67		Name	Value	Min Max
68		1.2.3.1.Calculated estimate	4.53	1.00 6.00
69		1.2.3.2.Balance rating correction	Checked	
70		1.2.3.3.Corrected estimate	3.80	1.00 6.00
71		1.2.3.4.Remarks	Description of correction	
72		1.2.3.5.Balance analysis	3.80	1.00 6.00
73		1.2.3.6.Balance analysis Scores	44.00	0.00 100.00
74		1.2.3.7.Rating	BB	
75				
76				

Main Session Data 1.1. System data 1.2. Balanc ...

Ready Count: 0 Sum: 0 100%

Rating Reports using Crystal Reporter in Cyrillic

Crystal Report Java Viewer

2 / 2+ 100% SAP CRYSTAL REPORTS®

Main Report | No group information.

БАЛАНСОВ АНАЛИЗ

БАЛАНСОВИ ИНДИКАТОРИ	Въвеждане / импортиране	Точки
Квота на собствения капитал	0.22 %	0.73
Процент CF преди данъци	0.18 %	0.33
Рентабилност на оборота	0.07 %	0.15
Ликвидиране на задълженията	8.67 %	56.64
Лихв.ставка на съвк.капитал	0.03 %	0.03

Точки за Балансов анализ без отчитане на тенденцията	11.69
--	-------

ОПРЕДЕЛЯНЕ НА ТЕНДЕНЦИЯТА

Балансови години	Балансови показатели / точки за последните три години						Тенденция / точки	
	2013 г.		2014 г.		2015 г.			
Квота на собствения капитал	0.31	1.02	0.31	1.03	0.22	0.73	0.20	0.94
Процент CF преди данъци	0.13	0.25	0.18	0.33	0.18	0.33	0.07	0.40
Рентабилност на оборота	0.01	0.02	0.07	0.15	0.07	0.15	0.10	0.24
Ликвидиране на задълженията	13.14	34.28	6.97	65.14	8.67	56.64	-7.93	48.71
Лихв.ставка на съвк.капитал	0.00	0.00	0.04	0.04	0.03	0.03	-6.06	0.00

Точки за Балансов анализ с отчитане на тенденцията	10.20
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ОЦЕНКА И РЕЙТИНГ ЗА БАЛАНСОВ АНАЛИЗ

Изчислена оценка	5.49	Корекция на оценката	4.50
Забележка			

Оценка след корекция	5.49	Точки след корекция	10.20
		Рейтинг	CCC