Assessing the accuracy of the OK-Score Model for the period 2000-2013

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Content

Introduction

The OK-Score™ Model is a diagnostic tool that can be used for making a credit risk assessment of a company. The required input is the financial statements of a company (minimum five consecutive years). The output is a credit score[i] for every one of these years. The Model is a learning model, which means that the quality of the credit scores improves over the years. After five years the credit score is considered reliable: as from the fifth year the credit scores are official OK-Scores[ii].

Scope

The OK-Score Model has been developed by Mr. Willem Okkerse[iii]. Since the Model has become operational in 2000 it has determined more than 2,000 credit scores[iv], a mix of real life monitoring[v] and backtracking[vi]. This population includes 46 situations of Business Failure[vii]. Our accuracy assessment relates to the entire population of 2,000 credit scores, and more specifically the 46 cases of Business Failure.

Methodology

The OK-Score Model requires input from the financial statements of (minimum) five consecutive financial years: balance sheet, profit and loss account, cash-flow statement. The Model determines a credit score for every single year but only as from the fifth year this is considered a true OK-Score. The Model is a learning model, which means that the reliability of the annual credit scores improves until and including the fifth year. For this reason the backtracking period is five years.

The OK-Score is based on two separate ratios. The first ratio is the *OK-Solvency*, a modified version of the solvency ratio. The second ratio is the *OK-Ratio*, based on an in-depth analysis of the five financial statements. Apart from the usual financial ratios this analysis is based on 125 input fields, 25 per financial year.

The OK-Score Model can be applied to all sorts of companies, except financial institutions and real estate companies. The main reason is that the structure of the financial statements of companies in these industries is too different.

Classification

Both the *OK-Solvency* and the *OK-Ratio* are reported on a scale from 1-9.

OK-Solvency - The best Class (1) consists of companies with an OK-Solvency from 49 - 100%. The next classes (2-8) have a 0 - 49% solvency. The weakest class (9) consists of companies with negative shareholders' equity.

OK-Ratio - The OK-Ratio is also divided into 9 Classes. The best Classes (1-2) have positive ratios of [+0,5] and [0] respectively. The next Classes (3-9) have negative ratios: [-1] [-2] [-4] [-16] [-256] [-65536] [-∞].

The OK-Score is derived from the 81 possible combinations of OK-Solvency and OK-Ratio. There are 10 Classes of OK-Scores: Class 1 stands for a perfect certainty about creditworthiness and vitality. Class-10 is a warning for Business Failure.

OK-Class	Rating	Meaning
1	AAA	Almost perfect security. Very large capacity for expansion, also with borrowed capital.
2	AA	Excellent security. Large capacity for expansion, also with borrowed capital.
3	A	Solid security. Capacity for expansion, also with borrowed capital.
4	BBB	Good security, potential for expansion, also with borrowed capital.
5	BB	Normal security. Some potential for expansion, however alert in expansion with borrowed capital.
6	B	Moderate security. Improvements desirable. Expansion with borrowed capital is not wise.
7	CCC	Inadequate security. Improvements necessary. Expansion with borrowed capital dissuaded strongly
8	CC	Worrying security. Improvements urgently needed. Expansion with borrowed capital can be life threatening.
9	C	Hazardous security. Substantial improvements needed by return. Expansion with borrowed capital not possible.
10	D	Business failure within 3 years. Immediate action required such as recapitalization, asset stripping, forced sale or turnaround required. The situation can become fatal: default, Chapter 11 or bankruptcy.

Companies with an OK-Solvency of more than 49% will not automatically obtain an OK-Score 1. Several companies (WorldCom, L&H, Tulip) had a top solvency ratio (>49%) in combination with an OK-Ratio 9. The final judgment must be based on the combination of OK-Solvency and OK-Ratio.

Not Accounted For

While determining the credit scores, the OK-Score Model will also flag any values in the financial statements that don't make sense. The total of such values is named *Not Accounted For*. Any substantial amount of *Not Accounted For* requires further investigation. In some cases an explanation can be found in manipulation of the financial statements or any other form of fraud.

Fraud

The Business Failures Data Base contains more than 2,000 credit scores that the OK-Score Institute has computed in the period 2000-2013 (closing 31 August). It contains several cases (real life monitoring or backtracking) where fraud is an important cause of the Business Failure. The Model has flagged these frauds at least one year before they came out in the media. The Model flags fraud via the item *Not Accounted For*.

In the Business Failures Data Base the various cases of corporate fraud have been earmarked "FR": Moulinex, LCI and Enron in 2001, WorldCom in 2002, Ahold[viii] in 2002, Landis in 2003 and Parmalat in 2004.

Accountability

The reproduction of research results is a cornerstone of science. Since the OK-Score Model has become operational in the year 2000, regulators, scientists and journalists have had the opportunity to verify all public OK-Scores.

The following conditions apply to all OK-Scores that are included in the public statistics:

- Real life monitoring: the OK-Score can be reproduced[ix] and compared to the real events;
- Backtracking: the OK-Score can be reproduced and the back tracking is normally performed under the supervision from qualified external parties.

Accuracy

Type-1 and Type-2 Error

After the OK-Score Model became operational in 2000, it has warned for 97.8% of the Business Failures by giving an OK-Score 10. Since the year 2000 more than 2,000 credit scores have been computed by the Model, a mix of backtracking[x] and real live monitoring. This population included 46 Business Failures. 1,954 times there was no Business Failure. Since the Model became operational it has given an OK-Score 10 on 46 occasions. On 45 occasions a Business Failure occurred within 3 years. The moment when the scores were issued has been documented.

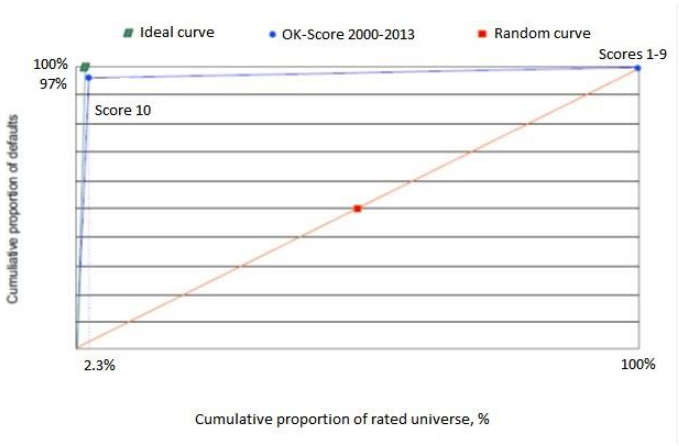
Error	Percentage
False positive / Type-1 error: The likelihood that a company that does not have a Business Failure does have an OK-Score 10 *(divided by the number of companies without Business Failure)*	1/1,954 = 0.05%
False negative / Type-2 error: The likelihood that a Business Failure has not been preceded by an OK-Score 10 in the three previous years *(divided by the number of companies with a Business Failure)*	1/46 = 2.2%
False alarm rate: The likelihood that an OK-Score 10 does not lead to a Business Failure within three years. *(divided by the number of OK-Scores 10)*	1/46 = 2.2%

Gini-coefficient

The Gini-coefficient is based on the Lorenz-curve (see next paragraph). The Gini-coefficient of the OK-Score Model is 97.75% which can be analyzed as follows: 100% minus 2.2% (Type-2 error) minus 0.05% (Type-1 error).

Cumulative Accuracy Profile[xi]

The reliability of a credit score or a credit rating can also be expressed with the Cumulative Accuracy Profile, which is based on the Lorenz-curve. The Lorenz curve for the OK-Score Model is as follows:



Business Failures Data Base

The data base contains more than 2,000 credit scores. Here we only mention the *Business Failures.*

Backtracking

Company	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Type	Supervision	Business Failure	Event
Moulinex-FR	10	R	B/FR	†													Backtracking	ABP	1	Bankruptcy
LCI-NL	10	R	B/FR	†													Backtracking	VEB	2	Bankruptcy
Numico-NL	10	10	AS														Backtracking	Auditor	3	AS
Enron-USA		10	B/FR	†													Backtracking	FD	4	Bankruptcy
Parmalat-IT				10	B/FR	†											Backtracking	NRC	5	Bankruptcy
Laurus-NL					10	R	S	†									Backtracking	Laurus	6	Bankruptcy
Neschen-GER					10	R											Backtracking	Everling	7	R
Vilenzo-NL					10	B	†										Backtracking	Receiver	8	Bankruptcy
Lockheed-USA						10	SS										Backtracking	Dubash	9	SS
Comcast-USA						10	LC		10	LC							Backtracking	Dubash	10/11	LC
Ford-USA						10	SS										Backtracking	Dubash	12	SS
ASR-BE							10	B	†								Backtracking	Triforensic	13	Bankruptcy
Anonymous								10	B	†							Backtracking	PWC	14	Bankruptcy
Anonymous								10	B	†							Backtracking	PWC	15	Bankruptcy
Anonymous								10	B	†							Backtracking	PWC	16	Bankruptcy
Anonymous								10	B	†							Backtracking	PWC	17	Bankruptcy
Sprint-USA									10	R							Backtracking	Dubash	18	R
Weyerhauser-USA										10	10	R					Backtracking	Dubash	19	R
Caterpillar-USA											10	R					Backtracking	Dubash	20	R
EastmanKodak-USA											10	10	10	CH	B	†	Backtracking	Dubash	21	Bankruptcy

Real life monitoring

Company	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Type	Supervsion	Business Failure	Event
Landis-NL		10	10	B/FR	†												Real Life	NVT	22	Bankruptcy
Getronics-NL		10	AS	AS	R	10	10	10	S	†							Real Life	NVT	23/24	AS / R / S
Unilever-NL		10	T	T	#	#	#	#	#	#	#	#	#	#	#		Real Life	NVT	25	T
Ahold-NL		10	R	FR	R	10	AS	#	#	#	#	#	#	#	#		Real Life	NVT	26/27	R / FR / AS
Wolters Kluwer-NL		10	10	AS	AS	10	R	10	10	R	#	#	#	#	#		Real Life	NVT	28/30	AS / R
KPN-NL			10	10	R	#	#	#	#	#	#	#	#	#	#		Real Life	NVT	31	R
ASML-NL			10	10	10	R	#	#	#	#	#	#	#	#	#		Real Life	NVT	32	R
Numico-NL				10	AS	10	10	R	S	†							Real Life	NVT	33/34	AS / R / S
SBM-NL						10	R	#	#	#	#	#	#	10	R		Real Life	NVT	35/36	R
Innoconcepts-NL											10	10	B	†			Real Life	NVT	37	Bankruptcy
Air Berlin-GER											10	10	NA	R	NA		Real Life	NVT	38	R
Anonymous-ESP												10	10	R	NA		Real Life	NVT	39	R
Norske Skog-NO													10	AS	AS		Real Life	NVT	40	AS
Praktiker-GER													10	10	B	†	Real Life	NVT	41	Bankruptcy
Alpine-AUT														10	B	†	Real Life	NVT	42	Bankruptcy
AirFrance-KLM-NL														10	R		Real Life	NVT	43	R
Porr-AUT														10	R		Real Life	NVT	44	R
Imtech-NL														10	R		Real Life	NVT	45	R

Errors

Company	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Type	Error	Business failure	Event
WorldCom-US	9	9	9	FR	†												Backtracking	Type-2	46	Bankruptcy
Anonymous											10	NBF	NBF	NBF			Real Life	Type-1	-	NBF

Legend

Abbreviation	Meaning	Abbreviation	Meaning
AS	Asset Stripping		
B	Bankruptcy	R	Forced recapitalization
CH	Chapter 11	CH	Forced sale
FR	Fraud	SS	State support
LC	Litigation Claim	T	Turnaround
NA	Not available	#	Confidential
NBF	No Business Failure	B	Bankruptcy
NVT	Not applicable	9,10	OK-Score 9, 10

The Business Failures Data Base shows all business failures and all OK-Scores 10 that can be reproduced and that have been issued since the OK-Score Model became operational in the year 2000.

References

Engelman B., Hayden, E., Tache D, Testing Rating Accuracy, www.risk.net, January 2003, http://wwwold-m4.ma.tum.de/pers/tasche/testing.pdf

Lammers, E.J., *Early warning for business failure*, Kredit & Rating Praxis 2013/3, June 2013, http://www.triforensic.be/uploads/documents/lammers_article_krp_18062013.pdf

OK-Score Institute, www.ok-ratinginstitute.eu

Footnotes

[i] A credit score is a number that reflects the creditworthiness and vitality of a company

[ii] OK-Score: a credit score that has been developed by Mr. W.D. Okkerse during a PhD research at Universiteit van Amsterdam in the years 1995-2000. OK-Scores are reported on a scale from 1 to 10, where Class-1 consists of highly creditworthy and vital companies and Class-10 consists of companies facing a Business Failure.

[iii] Willem D. Okkerse (1946) is Managing Director of the OK-Score Institute and Chairman of the Rating Committee of European Rating House.

[iv] Input updated until 31 August 2013

[v] Real life monitoring: The computation of a credit score over a recent period of time. The accuracy of the credit score cannot yet be assessed as the rating period has ended only recently. Real time monitoring is usually performed as a part of the global monitoring of an organization by shareholders, bondholders or credit suppliers.

[vi] Backtracking: The computation of a credit score over a period of time lying one or more years in the past. After computing the credit score it can be compared directly to real developments since. Example: today credit scores could be computed for Enron over the five years (1996-2000) preceding the Business Failure (2001). With hindsight one can then assess whether these credit scores reflect the increased risk timely and accurately.

[vii] Business Failure: The situation of Default, Chapter 11 or Bankruptcy or strong measures such as asset stripping, forced recapitalization, turnaround or forced take-over, in combination with a substantial decline of the stock price of the company. Such strong measures are the responsibility of the Executive Board and the Supervisory Board and they are usually forced by the shareholders and other stakeholders. A timely warning will be of importance. The OK-Score Model warns up to three years in advance. The substantial decline of the stock price which that comes with any Business Failure, can cause serious damage to shareholders, bondholders and other stakeholders. In some cases fraud can be identified as the main cause of the Business Failure as many accounting scandals have shown.

[viii] More information on these fraud cases is available on www.ok-ratinginstitute.eu

[ix] Reproduction: The re-computation of a credit score by using the same information and credit scoring model as in the past. If one can determine that the credit scoring model is unchanged (via hash totals of other checks) one can assess whether the first credit score had been computed accurately. Reproduction is normally performed by or in presence of another person than the credit rating analyst. Reproduction can be real time (self-control, internal control, etc.) or via backtracking (regulatory compliance, due diligence, etc.).

[x] The Cumulative Accuracy Profile is based on the Lorenz-curve and is calculated as follows: The horizontal (X) axis shows the cumulative amount of credit scores, as a percentage. Counting from the center it starts with the Business Failures. The vertical (Y) axis shows the cumulative amount of Business Failures, as a percentage. Counting from the center it starts with the poorest credit scores. The curve shows in which zone of the credit scores the Business Failures can be found. Conclusion: 100% of the Business Failures can be found in 2.2% of the population.