CLASSIS CAPITAL

The importance of a Credit Culture for Capital Markets

Crediamo nella supremazia della Conoscenza.

Crediamo nelle forza delle Idee.

Crediamo nell'Ispirazione.

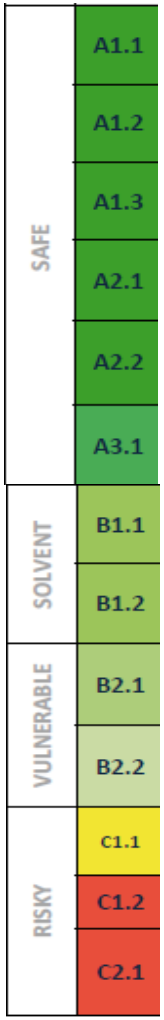
Prof. Edward I. Altman
NYU Stern School of Business
Senior Advisor & Co-Founder Classis Capital SIM
Milan, June 11th 2014

The Importance of Credit Ratings

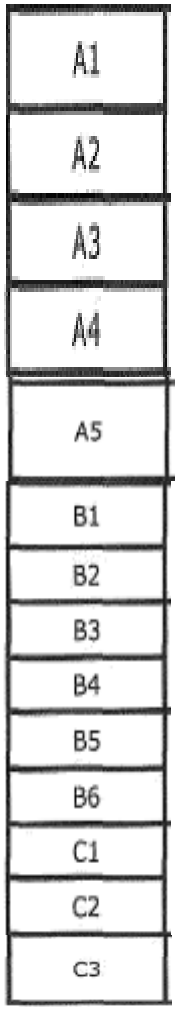
- General and accepted risk measurement metric
  - International Language of Credit
- Linkage between internal credit scoring models and external agency bond and loan ratings
  - Basis for internal ratings based (IRB) models
- BIS standards on Capital Adequacy
  - Bucket approach based on external (possibly internal) ratings – Basel II
  - Model approach-linked to ratings and portfolio risk
- Databases – Defaults and Rating Migration
  - Statistics based on original rating (Altman-Mortality) and (Static Pool - S&P, Cohorts - Moody's) yearly and cumulative default rates
  - Major influence on structured finance products
- Credit Derivatives
  - Price linked to current rating, expected default and recovery rates, arbitrage
- Role of a Credit Culture in the **Italian Minibond market**
  - Greater understanding between borrowers and investors

Agencies Bond Rating Categories

Moody's		S&P/Fitch
Aaa		AAA
Aa1		AA+
Aa2		AA
Aa3		AA-
A1		A+
A2		A
A3		A-
Baa1		BBB+
Baa2	Investment	BBB
Baa3	Grade	BBB-
Ba1	High Yield	BB+
Ba2	("Junk")	BB
Ba3		BB-
B1		B+
B2		B
B3		B-
Caa1		CCC+
Caa		CCC
Caa3		CCC-
Ca		CC
		C
C		D



Cerved



Crif

Rating System: An Example

Map Internal Ratings to Public Rating Agencies

Internal Credit Ratings	Code	Meaning	Corresponding Moody's
1	A	Exceptional	Aaa
2	B	Excellent	Aa1
3	C	Strong	Aa2/Aa3
4	D	Good	A1/A2/A3
5	E	Satisfactory	Baa1/Baa2/Baa3
6	F	Adequate	Ba1
7	G	Watch List	Ba2/Ba3
8	H	Weak	B1
9	I	Substandard	B2/B3
10	L	Doubtful	Caa - O
	N	In Elimination	
	S	In Consolidation	
	Z	Pending Classification	

Source: Large italian banks

The Link Between Internal and External Rating Systems to Estimate Default Rates and Loss Given Default

The Link is a Three-Step Process:

1. Construct and Test an internal credit scoring system based on samples of defaulted and non-defaulted firms.

2. Link the resulting credit scores with bond-rating-equivalents (BRE) from external rating agencies.

3. Estimate the marginal and cumulative probabilities of default based on either the (1) original external bond rating* or (2) a basket of firms in a particular external rating on a given date.**

** Altman - Mortality Rate (Actuarial) Approach, $ Face Value Based*

*** Rating Agencies' Approach, usually issuer-based.*

Z-Score Component Definitions and Weightings

Variable	Definition	Weighting Factor
X_1	$\frac{\text{Working Capital}}{\text{Total Assets}}$	1.2
X_2	$\frac{\text{Retained Earnings}}{\text{Total Assets}}$	1.4
X_3	$\frac{\text{EBIT}}{\text{Total Assets}}$	3.3
X_4	$\frac{\text{Market Value of Equity}}{\text{Book Value of Total Liabilities}}$	0.6
X_5	$\frac{\text{Sales}}{\text{Total Assets}}$	1.0

Median Z-Score by S&P Bond Rating Equivalent for U.S. Manufacturing Firms: 1992 - 2013

Rating	2013 (No.)	2004-2010	1996-2001	1992-1995
AAA/AA	4.13 (15)	4.18	6.20*	4.80*
A	4.00 (64)	3.71	4.22	3.87
BBB	3.01 (131)	3.26	3.74	2.75
BB	2.69 (119)	2.48	2.81	2.25
B	1.66 (80)	1.74	1.80	1.87
CCC/CC	0.23 (3)	0.46	0.33	0.40
D	0.01 (33)	-0.04	-0.20	0.05

*AAA Only.

Sources: SP Capital IQ Database, mainly S&P 500 firms, compilation by NYU Salomon Center, Stern School of Business.

7

Marginal and Cumulative Mortality Rate Methodology

$$MMR_{(t)} = \frac{\textit{Total value of defaulting debt in year (t)}}{\textit{total value of the population at the start of the year (t)}}$$

MMR = Marginal Mortality Rate

One can measure the cumulative mortality rate (CMR) over a specific time period (1,2,…, T years) by subtracting the product of the surviving populations of each of the previous years from one (1.0), that is,

$$CMR_{(t)} = 1 - \prod_{t=1} SR_{(t)},$$

here CMR $_{(t)}$ = Cumulative Mortality Rate in $_{(t)}$,
SR $_{(t)}$ = Survival Rate in $_{(t)}$, 1 - MMR $_{(t)}$

Mortality Rate Concept
(Illustrative Calculation)

For BB Rated Issues

Security No.	Issued Amount	Year 1 Default	Year 1 Call	Year 1 SF	Year 2 Default	Year 2 Call	Year 2 SF
1	50	--	--	5	--	--	5
2	50	50	--	--	NE	NE	NE
3	100	--	100	--	NE	NE	NE
4	100	--	--	--	100	--	--
5	150	--	--	--	--	--	15
6	150	--	--	--	--	--	--
7	200	--	--	20	--	--	20
8	200	--	--	--	--	200	--
9	250	--	--	--	--	--	--
10	250	--	--	--	--	--	--
Total	1,500	50	100	25	100	200	40

Amount Start of Period								
1,500	-		175	-	1,325	- 340	=	985

	Year 1	Year 2
Marginal Mortality Rate	50/1,500 = 3.3%	100/1,325 = 7.5%
Cumulative Rate	3.3%	1 - (SR1 x SR2) = CMR2 1 - (96.7% x 92.5%) = 10.55%

NE = No longer in existence
SF = Sinking fund

Mortality Rates by Original Rating

All Rated Corporate Bonds*
1971-2013

Years After Issuance

		1	2	3	4	5	6	7	8	9	10
AAA	Marginal	0.00%	0.00%	0.00%	0.00%	0.01%	0.02%	0.01%	0.00%	0.00%	0.00%
	Cumulative	0.00%	0.00%	0.00%	0.00%	0.01%	0.03%	0.04%	0.04%	0.04%	0.04%
AA	Marginal	0.00%	0.00%	0.23%	0.09%	0.02%	0.01%	0.01%	0.01%	0.02%	0.01%
	Cumulative	0.00%	0.00%	0.23%	0.32%	0.34%	0.35%	0.36%	0.37%	0.39%	0.40%
A	Marginal	0.01%	0.04%	0.14%	0.15%	0.12%	0.08%	0.02%	0.27%	0.09%	0.06%
	Cumulative	0.01%	0.05%	0.19%	0.34%	0.46%	0.54%	0.56%	0.83%	0.92%	0.98%
BBB	Marginal	0.35%	2.40%	1.30%	1.02%	0.52%	0.25%	0.28%	0.16%	0.16%	0.34%
	Cumulative	0.35%	2.74%	4.01%	4.99%	5.48%	5.72%	5.98%	6.13%	6.28%	6.60%
BB	Marginal	0.96%	2.05%	3.92%	1.98%	2.35%	1.50%	1.48%	1.13%	1.47%	3.16%
	Cumulative	0.96%	2.99%	6.79%	8.64%	10.79%	12.12%	13.42%	14.40%	15.66%	18.33%
B	Marginal	2.88%	7.75%	7.88%	7.82%	5.72%	4.48%	3.58%	2.10%	1.78%	0.78%
	Cumulative	2.88%	10.41%	17.47%	23.92%	28.27%	31.49%	33.94%	35.33%	36.48%	36.97%
CCC	Marginal	8.20%	12.45%	17.95%	16.30%	4.70%	11.55%	5.40%	4.86%	0.70%	4.32%
	Cumulative	8.20%	19.63%	34.06%	44.80%	47.40%	53.47%	55.99%	58.13%	58.42%	60.22%

*Rated by S&P at Issuance
Based on 2,779 issues
Source: Standard & Poor's (New York) and Author's Compilation

Mortality Losses by Original Rating

All Rated Corporate Bonds*
1971-2013

Years After Issuance

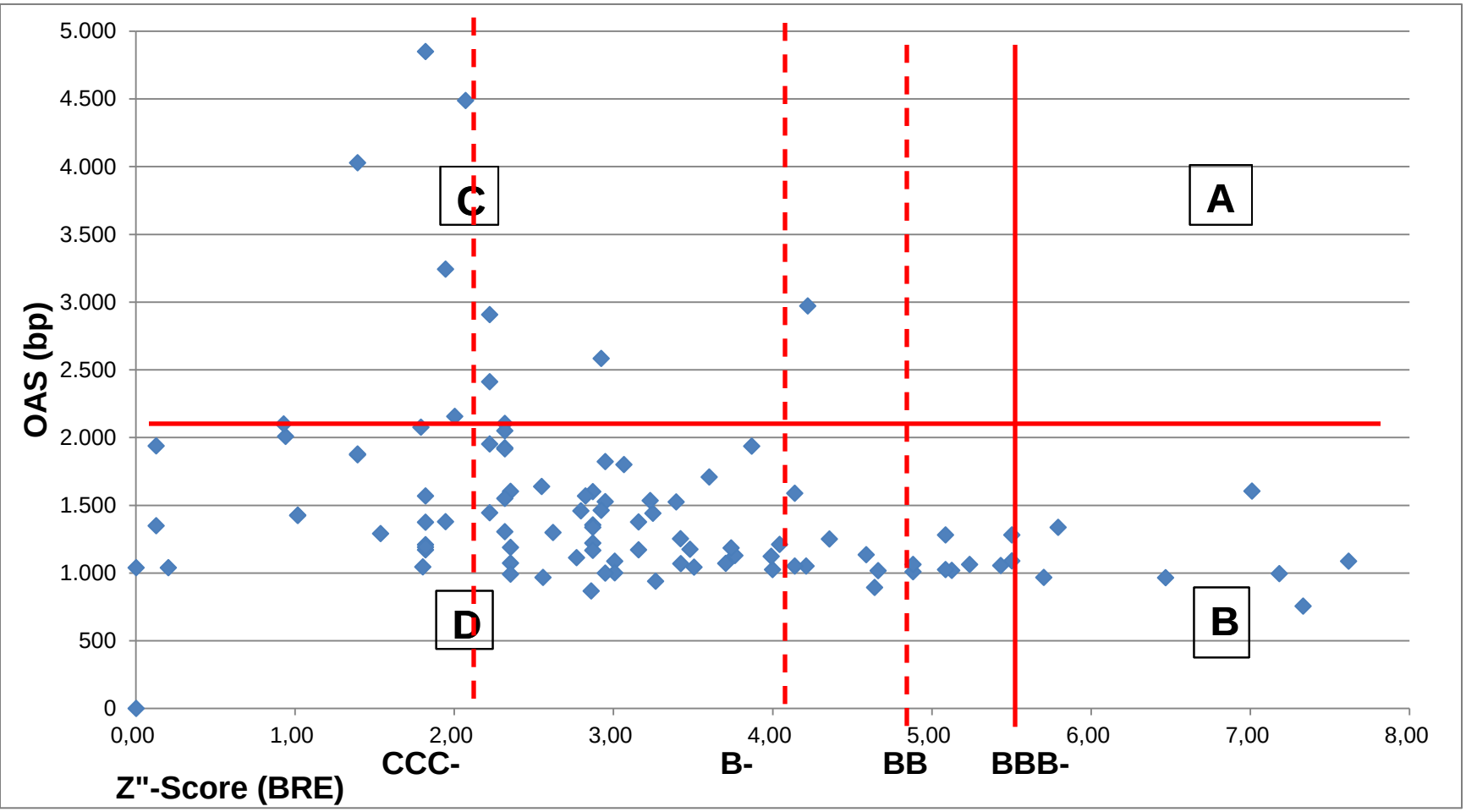
		1	2	3	4	5	6	7	8	9	10
AAA	Marginal	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%
	Cumulative	0.00%	0.00%	0.00%	0.00%	0.01%	0.02%	0.03%	0.03%	0.03%	0.03%
AA	Marginal	0.00%	0.00%	0.03%	0.03%	0.01%	0.01%	0.00%	0.01%	0.01%	0.01%
	Cumulative	0.00%	0.00%	0.03%	0.06%	0.07%	0.08%	0.08%	0.09%	0.10%	0.11%
A	Marginal	0.00%	0.02%	0.06%	0.07%	0.07%	0.04%	0.02%	0.03%	0.06%	0.03%
	Cumulative	0.00%	0.02%	0.08%	0.15%	0.22%	0.26%	0.28%	0.31%	0.37%	0.40%
BBB	Marginal	0.25%	1.56%	0.78%	0.60%	0.28%	0.15%	0.17%	0.10%	0.10%	0.19%
	Cumulative	0.25%	1.81%	2.57%	3.16%	3.43%	3.57%	3.74%	3.83%	3.93%	4.11%
BB	Marginal	0.57%	1.19%	2.33%	1.13%	1.34%	0.72%	0.80%	0.50%	0.76%	1.12%
	Cumulative	0.57%	1.75%	4.04%	5.13%	6.40%	7.07%	7.82%	8.28%	8.97%	9.99%
B	Marginal	1.93%	5.42%	5.35%	5.23%	3.78%	2.46%	2.33%	1.16%	0.93%	0.54%
	Cumulative	1.93%	7.25%	12.21%	16.80%	19.94%	21.91%	23.73%	24.62%	25.32%	25.72%
CCC	Marginal	5.41%	8.71%	12.56%	11.48%	3.33%	8.66%	4.05%	3.40%	0.43%	2.76%
	Cumulative	5.41%	13.65%	24.49%	33.16%	35.39%	40.98%	43.37%	45.30%	45.53%	47.04%

*Rated by S&P at Issuance
Based on 2,290 issues
Source: Standard & Poor's (New York) and Author's Compilation

Quality Junk Strategy

Return/Risk Tradeoffs – Distressed Bonds

As of December 31, 2012



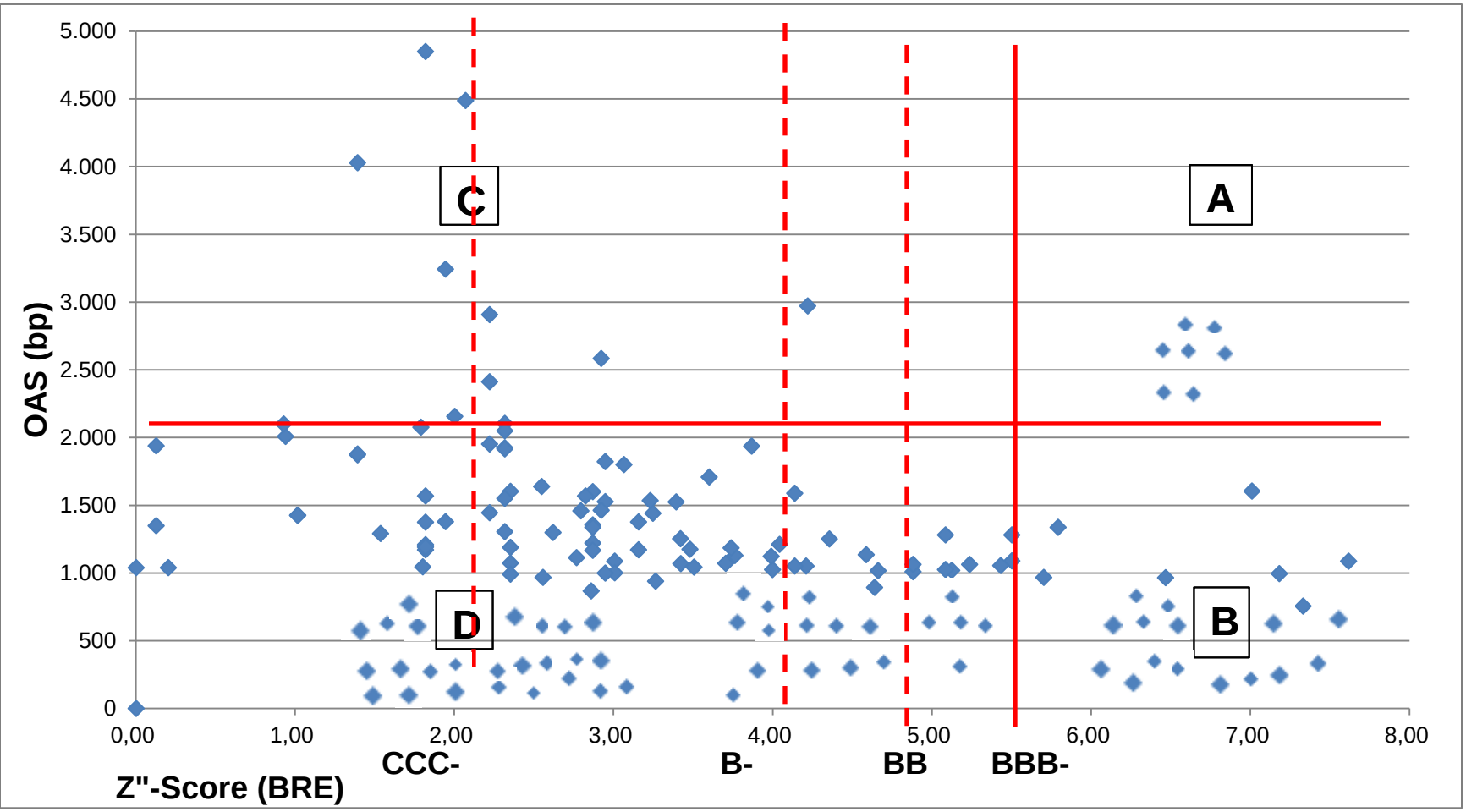
$$Z'' = 3.25 + 6.56X1 + 3.26X2 + 6.72X3 + 1.05X4$$

X1 = CA – CL / TA; X2 = RE / TA; X3 = EBIT / TA; X4 = BVE / TL

A = Very High Return **/** Low Risk
B = High Return **/** Low Risk
C = Very High Return **/** High Risk
D = High Return **/** High Risk

Return/Risk Tradeoffs – Distressed Bonds

As of December 31, 2012



$Z'' = 3.25 + 6.56X1 + 3.26X2 + 6.72X3 + 1.05X4$

X1 = CA – CL / TA; X2 = RE / TA; X3 = EBIT / TA; X4 = BVE / TL

A = Very High Return **/** Low Risk
B = High Return **/** Low Risk
C = Very High Return **/** High Risk
D = High Return **/** High Risk

Junk quality strategy
or
short high-yield strategy

Rating Stability and Rating Accuracy are Conflicting Investor's Objectives

- "Moody's analysts attempt to balance the market's need for timely updates on issuer risk profiles, with its conflicting expectation for stable ratings" (Cantor, 2001).

- Rating stability affects the default prediction performance significantly (Altman and Rijken, 2004).

- Hamilton and Cantor (2004) have shown a significant improvement in default prediction when agency ratings are combined with agencies' Outlook / Review information.

- The agencies "through-the-cycle" methodology is aimed to find an optimal level of rating stability. This "through-the-cycle" methodology has two aspects
  - Long default horizon: filtering of short term credit quality fluctuations.
  - Prudent migration policy: a rating is triggered if the (long-term) credit quality movements exceeds a certain threshold and - if triggered - it is only partly adjusted.

The Impact of Rating-Stability Objectives on the Credit Process

• Ratings stability is an expressed objective and practice of the rating agencies and some investors [Fons, Cantor & Mahoney (Moody's) 2002, Hamilton & Cantor, 2004 and S&P (2003)].

- Avoiding rating reversals and too frequent rating changes.

• Ratings stability is consistent with a through-the-cycle (TTC) rating strategy, i.e., rating changes should be enduring.

• Impact of the stability objective on the accuracy for Type I (Default) and Type II (Non-Default) forecasts

-Rating agencies' ratings are likely to have lower Type I accuracy and higher Type II accuracy

-Can partially explain why point-in-time (PIT) models consistently outperform TTC "models" in predicting defaults, e.g., Z-Scores and EDFs have been shown to have lower Type I errors, especially for short-term (one-year) predictive accuracy?

- Longer-term (3-5 years) accuracies tend to be similar between PIT and TTC approaches.

Of concern is the Timeliness of Agency Ratings

- Association for Financial Professionals (2002): most respondents believe that agency ratings are slow.
- Baker and Mansi (2001): 27% of the issuers and 71% of the institutional investors have doubts on the timeliness of agency ratings.
- Ellis (1998): 70% of investors indicate ratings should reflect recent changes. even if they are likely to be reversed within a year.
- Saunders and Allen (2002): case studies Enron and Worldcom.

But at the same time investor's desire rating stability

- Ellis (1998): investor's don't want ratings to be updated to reflect small, marginal changes in financial condition.
- Moody's (2002): Institutional buyside investors value the current rating stability level and do not want ratings to simply follow market prices.
- S&P (2003)

Investors, Companies and Financial Authorities Value a Certain Level of Rating Stability

1. "The value of its rating products is greatest when its ratings focus on the long term and do not fluctuate with near term performance. Ratings should never be a mere snapshot of the present situation ratings" (Standard & Poor's, 2003).

2. Timely ratings, which adjust promptly and fully to the actual creditworthiness, could deepen a financial crisis. Rating stability could dampen procyclicality effects.

3. A certain level of rating stability protects the reputation of agencies. "Better be late and right than fast and wrong".

Rating Stability: Empirical Results

(E. Altman and H. Rijken, "How Rating Agencies Achieve Rating Stability," JBF, 1984 and NYU Salomon Center Working Paper, 2003)

Major Sources of Observed Rating Stability Tested

- Rating agencies change ratings only when they are reasonably sure that there will not be a subsequent reversal (a type of speed-of adjustment factor) resulting in a "migration policy."

- Rating agencies use stressed-events scenarios in a "Through-the-Cycle" methodology to assess default probabilities and this results in slower adjustments.

Methodology of the Study
(Altman & Rijken, 2004)

Compare Results from Three Models:

1. A point-in-time model from a logit-regression of firm financial characteristics on actual default events, which results in a type of "distance-to-default" metric (Default Prediction [DP] Score).

2. An Agency-Rating-Score (AR Score) resulting in predictive values from a multinormal logit regression of actual assigned ratings using the same financial characteristics as found in the DP Scoring approach. Assume that the predicted credit rating represents a Through-the-Cycle rating of firms without any "migration policy" of agencies.

3. Actual Agency Credit Ratings (1-17), which represents the agencies', own models and migration policy.

Default Prediction Credit Scoring Model (DP-model) is Based on a Logit Regression Methodology

$$DP-score = \alpha + \beta_1 \frac{WK}{TA} + \beta_2 \frac{RE}{TA} + \beta_3 \frac{EBIT}{TA} + \beta_4 \frac{ME}{BL} + \beta_5 Size + \beta_6 Age$$

$$\log\left(\frac{p_i}{1-p_i}\right) = DP-score$$

- Choice of model variables is based on the original Z-score model (Altman, 1968).
- The variables RE/TA, EBIT/TA and ME/BL are log transformed:
  RE/TA $\rightarrow$ -ln(1 - RE/TA), EBIT/TA $\rightarrow$ -ln(1 - EBIT/TA) and
  ME/BL $\rightarrow$ 1 + ln(ME/BL).

The Dynamics of Agency Ratings are Nearly Perfectly Simulated by AR(1.8,0.65) Ratings for the Full Rating Scale

agency ratings

	AAA	AA	A	BBB	BB	B	CCC	default
AAA	0.87	0.12	0.01	0.00	0.00	0.00	0.00	0.00
AA	0.04	0.83	0.13	0.00	0.00	0.00	0.00	0.00
A	0.00	0.05	0.85	0.09	0.00	0.00	0.00	0.00
BBB	0.00	0.00	0.09	0.79	0.11	0.00	0.00	0.00
BB	0.00	0.00	0.00	0.11	0.78	0.10	0.00	0.00
B	0.00	0.00	0.00	0.00	0.10	0.86	0.03	0.01
CCC/CC	0.00	0.00	0.00	0.00	0.00	0.19	0.63	0.18

AR(1.8,0.65)-ratings

	AAA	AA	A	BBB	BB	B	CCC	default
AAA	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00
AA	0.01	0.97	0.02	0.00	0.00	0.00	0.00	0.00
A	0.00	0.01	0.97	0.02	0.00	0.00	0.00	0.00
BBB	0.00	0.00	0.01	0.97	0.01	0.00	0.00	0.00
BB	0.00	0.00	0.00	0.01	0.96	0.02	0.00	0.00
B	0.00	0.00	0.00	0.00	0.02	0.96	0.01	0.01
CCC/CC	0.00	0.00	0.00	0.00	0.00	0.04	0.84	0.12

Major Findings

- Actual agency ratings are **more stable** than results using model-ratings from the **DP** and **AR** models. The likelihood of a change in a rating in one year is about three times greater for a DP-Model than the actual observed rating change.

- We observe a "**drift**" in ratings over time in actual rating changes whose magnitude is conditional on whether there was downgrade or an upgrade in the prior period (the well known autocorrelation of negative rating changes). In contrast, there is no drift observed in DP or AR model results. [Thus, we conclude the observed "drift" is due to "**migration policy**" on the part of rating agencies].

- Agencies only partially adjust their ratings based on comparing changes in AR scores with actual rating changes (i.e., adjustments are typically made in two or more steps instead of a full adjustment). The agency rating migration "policy" is characterized by a threshold of 1.8 notch and an adjustment fraction of 0.65.

- Therefore, both the stability objective and the migration "Policy" of rating agencies affect the timeliness of agency ratings.

Classis Approach for the Italian Minibond Market

Role of a Credit Culture in the

Italian Minibond market

- Greater understanding between borrowers and investors
- Create a Shadow Rating Model

Disclaimer

The information in this document is neither verified nor updated. This document is provided for informational purposes only and is not intended as investment advice or as an offer or solicitation for the purchase or sale of any financial instrument.

The authors make no express or implied warranties relating to the information, provided herein or as to the consequences to the recipient from any use whatsoever of this document of the information provided herein. The authors will not be liable in any way for inaccuracies, errors in, or omissions of, or in the transmission of, any use of, information provided in this document, of for any damages arising there from.

The information contained herein regarding prices and statistical data, if any, has been obtained from sources which we believe to be reliable but in no way are warranted by us to accuracy or completeness.

Classis (classem, classì, classis) è il termine Latino che indica la Flotta.

Classis era conosciuta come la flotta navale della marina dell'impero Romano. La sua funzione era quella di controllare le acque attorno alle province di Roma. Il suo compito era quello di dare supporto logistico, tenendo aperte le rotte di comunicazione marittime.

CLASSIS CAPITAL

Classis Capital SIM S.p.A
V. Vittor Pisani, 19
20124 Milano

www.classiscapital.it