An Empirical Study on Corporate Spreads

Risk Management
Eurobanking 2001, Ennis

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1 Introduction

- Rapid development of credit derivatives.
- Banks often lack the data needed for an efficient calibration of internal models pricing credit sensitive instruments.
- Because of regulatory requirements, turning to the market itself seems a natural approach to find exogenous references, among which corporate spreads may prove relevant.

Those several factors work towards the growing interest of banks for the corporate bond market.

2 Which spread is the right one ?

- Zero-coupon Spreads ?

- Specificity of credit risk (default risk, downgrading risk, uncertainty on recovery rate) complicates studies at an aggregate level.

- Individual Spreads - Asset Swap Spreads

Zero-coupon spread curves

Definition

We call zero-coupon spread the difference between the yield of a risky zero-coupon corporate bond and the yield of a risk-free zero-coupon government bond.

Nelson and Siegel procedure

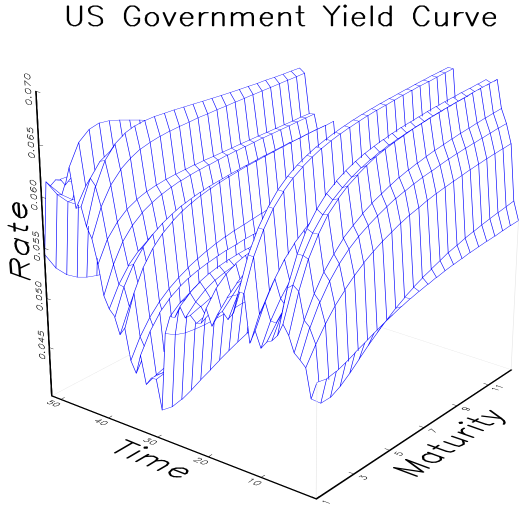
This procedure allows parametric estimation of zero-coupon rate curves for each class of rating. The curve shapes are given by the following four-parameter expression

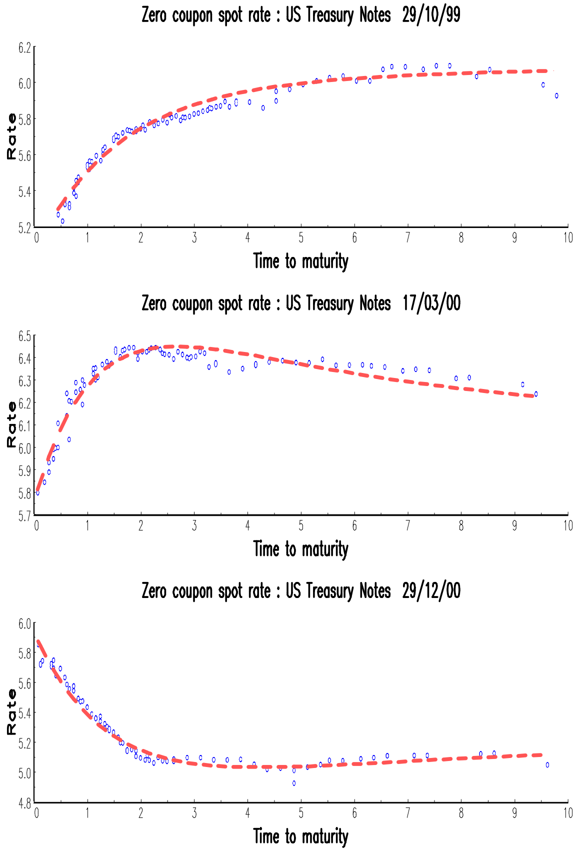
$$r(t) = \beta_0 + \beta_1 \left[\frac{1 - \exp(-\frac{t}{\tau_1})}{\frac{t}{\tau_1}} \right] + \beta_2 \left[\frac{1 - \exp(-\frac{t}{\tau_1})}{\frac{t}{\tau_1}} - \exp(-\frac{t}{\tau_1}) \right] \quad (1)$$

The estimation is obtained by choosing the curve that best fits market information on bond yields.

Government yield curves

Very good fit ...

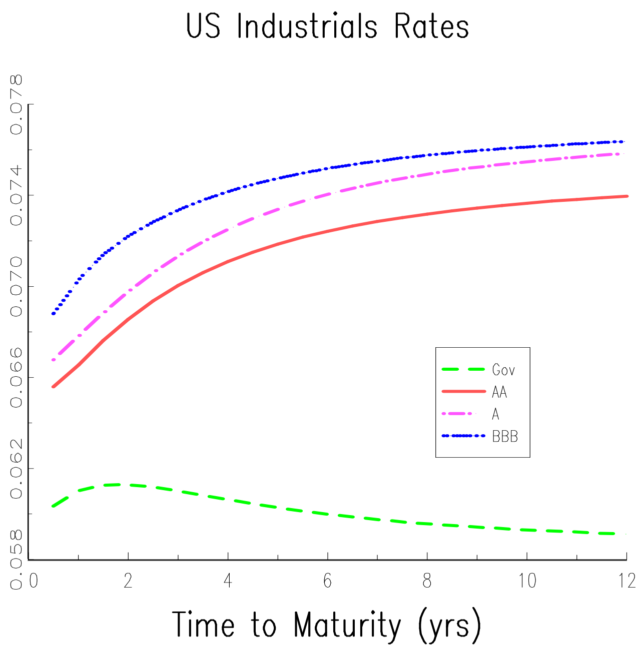


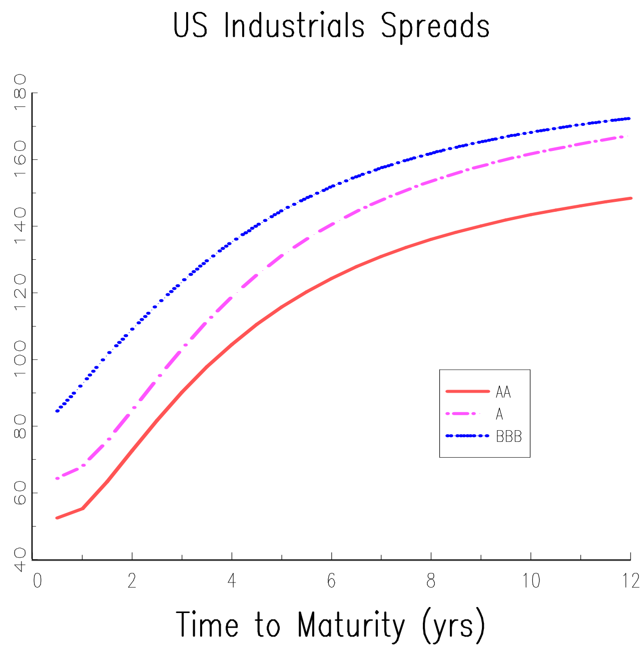


$\Rightarrow$ change in convexity

Corporate

Curves for US Industrials (2000):



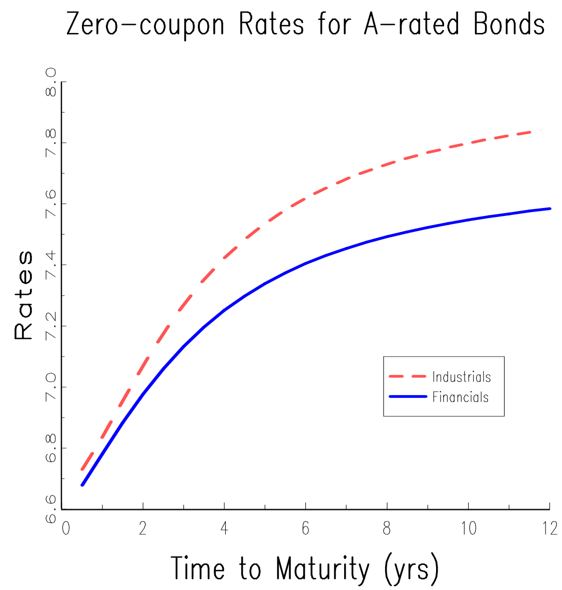


Tables:

Average spreads for US Industrials (2000)

Time to Maturity (yrs)	**AA**	**A**	**BBB**
1	55.3	67.9	92.7
2	72.7	84.7	109.1
3	90.2	103.1	123.4
4	104.6	118.8	135.3
5	115.8	131.1	144.7
6	124.3	140.6	151.9
7	130.9	147.8	157.5
8	136.1	153.5	161.9
9	140.1	158.1	165.4
10	143.4	161.7	168.2
11	146.1	164.7	170.5
12	148.4	167.2	172.4

Comparison of industrials and financials (A-rated Bonds)



Time to maturity (yrs)	Financials	Industrials
1	73.4	67.9
2	94.1	84.7
3	116.9	103.1
4	136.0	118.8
5	150.7	131.1
6	162.0	140.6
7	170.6	147.8
8	177.3	153.5
9	182.6	158.1
10	186.9	161.7
11	190.4	164.7
12	193.3	167.2

Remarks:

- curves present the expected shapes
- spreads FINANCIALS $>$ spreads INDUSTRIALS (see Elton, Gruber and al. [2001]).
- levels higher than commonly admitted ones.

Relevancy

Zero coupon spreads are the only relevant ones when arbitrage arguments are concerned.

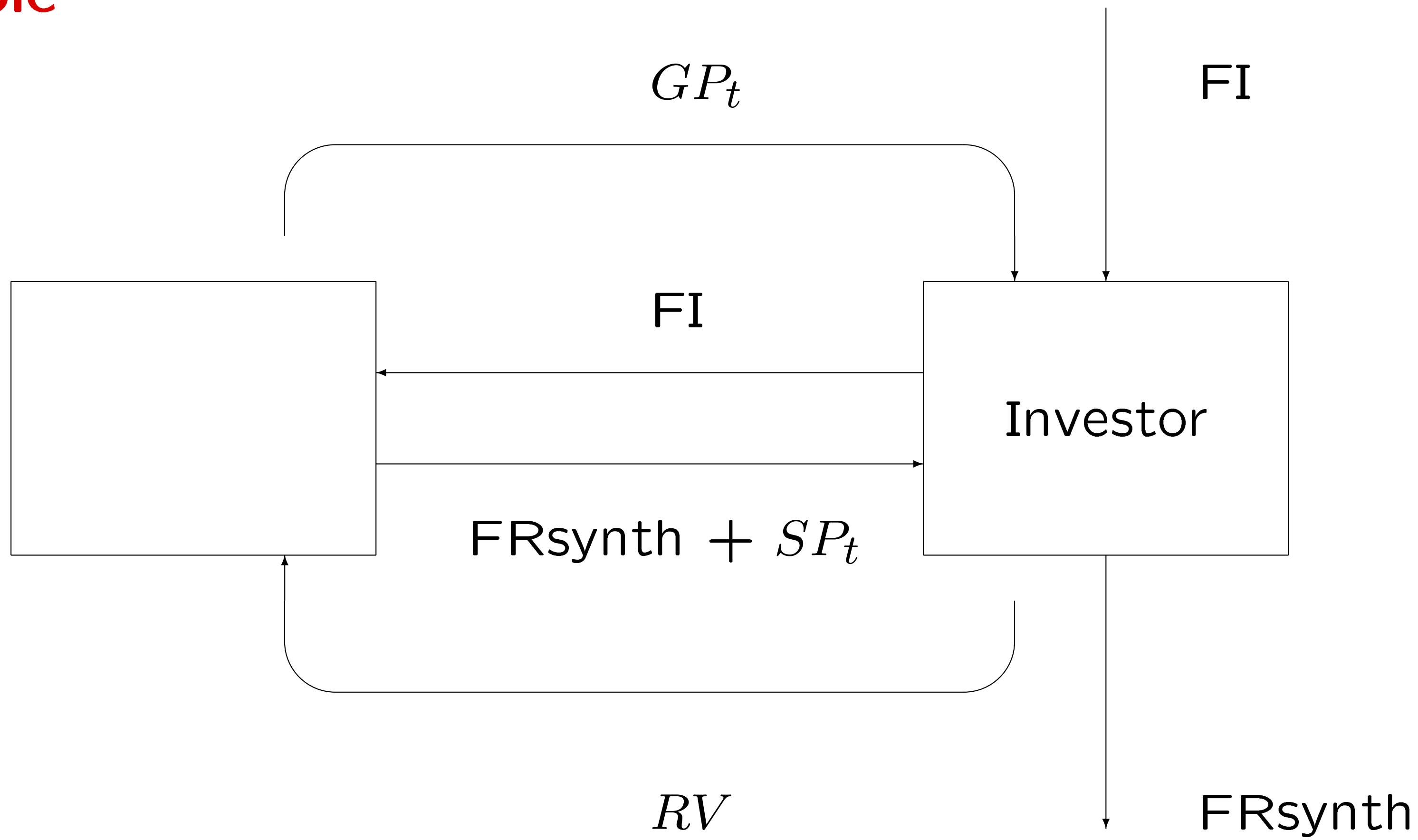
Limitations

Implementing Nelson and Siegel procedure (or any other similar regression) implies distributing bonds into predefined homogeneous credit classes (rating is not enough, see Perraudin and Taylor [1999]).

Such an approach obliterates the individual dimension of spreads (liquidity risk for example).

Individual Spreads - Asset Swap Spread

Principle



Expression

$$Sp = \frac{\sum_i CF_i DF_i - GP}{\sum_i CF_i \Delta T_i} \tag{2}$$

where

- CF_i is the cash flow of bond at date T_i
- DF_i is the risk free discount factor at date T_i
- GP is the gross price of the bond
- $\Delta T_i = T_i - T_{i-1}$ (with $\Delta T_1 = T_1$)

Remark 1

The reference is no longer the government spot rate, but the interbank market. Thus, we can obtain - slightly - negative spreads.

Remark 2

Performing quantile regression allows us to obtain curves of spreads for different credit classes, at any date.

3 Descriptive study

Data

- Historical daily prices data collected on Datastream (1996 to 2000) for US bonds (government, industrials and financials).
- Issue term conditions provided by Datastream.
- Characteristics of issuers in KMV databases.

Spreads versus rating and time to maturity

- asset swap spreads on 12/02/01
- distribution in rating homogeneous classes
- regression to obtain curves

Financials

Time to maturity (yrs)	AA	A	BBB
2	55.05	99.08	166.40
3	64.44	108.14	166.23
4	70.61	109.54	166.77
5	76.48	113.64	167.31
6	81.85	112.88	167.52
7	82.33	111.41	164.81
8	80.30	109.74	164.35
9	82.07	106.95	160.52
10	82.99	104.67	151.17

Industrials

Time to maturity (yrs)	AA	A	BBB
2	63.65	92.47	128.37
3	73.06	90.54	148.54
4	82.99	97.69	162.02
5	80.35	104.95	172.15
6	82.32	112.21	168
7	84.08	119.47	162.48
8	85.84	112.7	157.03
9	87.68	113.83	141.09
10	94.16	112.93	121.16

Spreads and liquidity

Empirical studies of spreads often neglect the impact of liquidity risk.

In fact the corporate spread incorporates a liquidity risk premium as well as a default risk premium. Distinction between default and liquidity risk has become a priority for fixed-income traders.

Monkkonen [2000] provides an empirical indicator of the liquidity premium.

Ericsson and Renault [2000] propose a binomial model of liquidity and credit risk.

Following Monkkonen [2000] ...

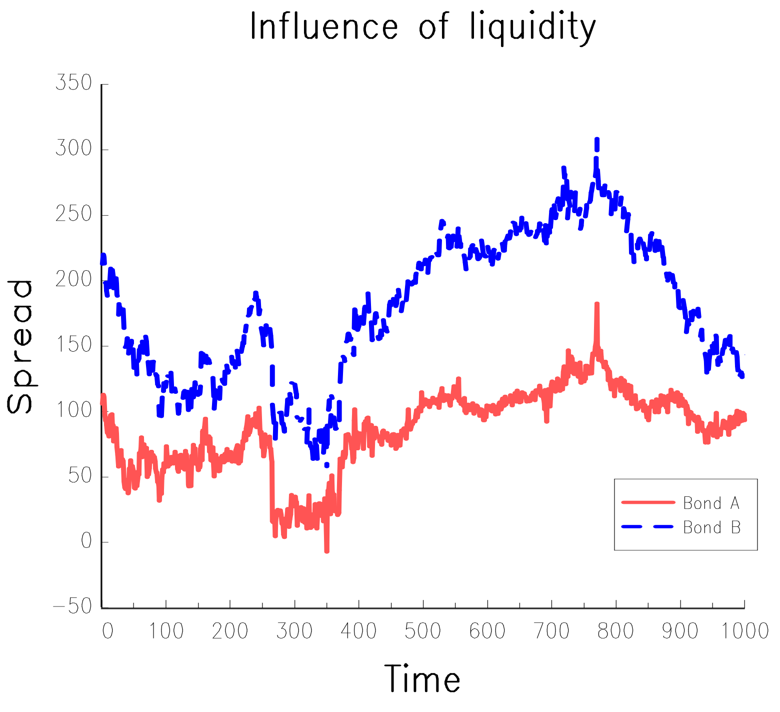
Bonds with "the same credit quality"?

- same issuer
- same seniority
- same maturity

$\Rightarrow$ Larger and newer issues trade at tighter spread level.

Bond A NEW YORK TELEPHONE 1994 7 1/4% 15/02/24 S

Bond B NEW YORK TELEPHONE 1986 8 5/8% 15/05/24 S

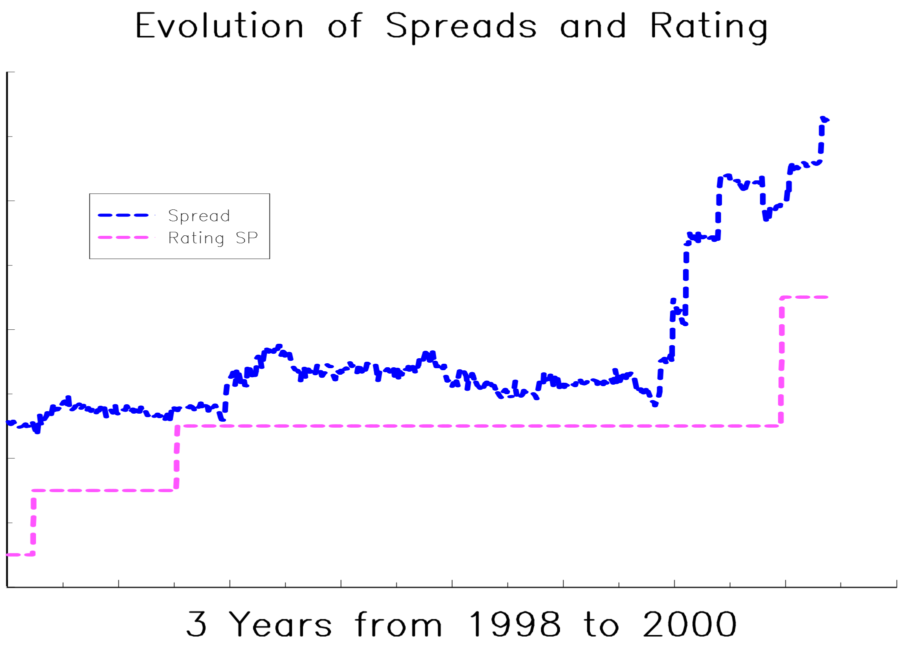


Any explicative model needs:

- macroeconomic variables accounting for a "trend"
- indicators of credit standing
- indicators of liquidity

$\Rightarrow$ See Ericsson and Renault [2000], Gauthier and Lardic [2000] for examples of such studies.

Using spreads to predict evolution of credit standing



ARMS.WLD.INDS.INCO. DEB 9 3/4% 15/04/08 S

4 Application

Calibration of internal credit risk models

Calibration of diffusion models for spreads

5 References

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