Financial Risk Laboratory: 2. Credit Portfolio Risk

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Case 2 Risk Management

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Subject mail: Assignment 2 Group # RM

POLIMI Bank: Portfolio

The **Corporate Bond** desk of POLIMI Bank is invested in a portfolio composed by 200 fixed rate bonds issued by different IG names.
All bonds are analogous, with two years maturity and s/a coupon payments, annual coupon rate 5.4814% (same for each bond) and same market price (dirty) 100.00

Rating Transition Matrix

Students shall use the simplified rating transition matrix, reduced to only two rating grades below:

	IG	HY	Def
IG	77.90%	21.60%	0.50%
HY	40.79%	55.29%	3.92%

Legend: Investment Grade (IG), High Yield (HY), Defaulted (Def)

Transition probabilities are defined over a *one year* time horizon. Transition probabilities to the *Defaulted* state (q_{i3}) are one-year unconditional default probabilities[1].

Other market data are provided in the Matlab template

[1] Denoted by the symbol *PD* in the BCBS documents

Questions, First Part

We are assuming that any name in our basket of bonds is totally indipendent.

The Credit Portfolio Model of POLIMI Bank is based on a single-factor MC simulation (at least $100k$ scenarios) with configurable AVRs correlations.

Questions under the Baseline Case (independent issuers: $\rho = 0$)

1. Evaluate the Present Value in a years'time according to the CreditMetrics approach for a single IG bond, using the rating transition matrix provided to determine the forward value of the bond under each simulated rating in a years' time (hint: issuers follow a time-homogeneous Markov chain process). -> IMPORTANT: the from zero to 1 matrix is the same of the one from 1 to 2
2. Evaluate the one-year and 99.9% VaR (percentage of the current portfolio market value) by taking into account defaults only.
3. Evaluate the one-year and 99.9% VaR like point 2., but by taking into account defaults and migrations.

required to evaluate the barrier and the losses so your bond is replaced by a four values vector: forget about having a bond, it could be any exposure

Questions, Second Part

LOOP ON THE ISSUERS, NOT ONE THE SCENARIOS

How relevant is the **AVRs correlation**? Repeat the exercise described in the last question of slide 4 and evaluate the one-year and 99.9% VaR by taking into account defaults and migrations under the following hypotheses:

Available values for the AVR correlation

1. $\rho = \sqrt{0.12}$
2. $\rho = \sqrt{0.24}$
3. ρ determined by the issuer one-year PD according to the IRB formula (large corporate)

Do not deliver Matlab code to answer to the questions above, simply list the three VaR results in the pdf document.

Questions, Third Part

How relevant is the **concentration** of the portfolio?
Imagine that PoliMi bank has allocated its corporate bond portfolio in a similar way as described in slide 2, but diversifying the investment into only 20 bonds instead of 200.
Repeat the exercise described in the last question of slide 4 and evaluate the one-year and 99.9% VaR by taking into account defaults and migrations under the following hypothesis:

Available values for the AVR correlation

1. $\rho = \sqrt{0.12}$
2. $\rho = \sqrt{0.24}$
3. ρ determined by the issuer one-year PD according to the IRB formula (large corporate)

Do not deliver Matlab code to answer to the questions above, simply list the three VaR results in the pdf document.

Discussion

Based on your results, critically discuss, stating if **true** or **false**, the following arguments:

1. Inclusion of migration risk at very high confidence level (e.g. 99.9%) has no material impact on VaR measurement if the portfolio is well diversified.
2. Portfolio VaR is very sensitive to AVR correlations.
3. Inclusion of migration risk causes the increase of VaR under any correlation assumptions.
4. A Credit Portfolio Model is not sensitive to concentration risk if it is based on a single systematic factor

Case RM2: Instructions

From course beep download:

- Ex02_template.m: Code template

Follow instructions on code template.
Deliver your Matlab code (*runExerciseRM2_GroupXX.m*) and a maximum two–page document (pdf) with results and discussion.