POLITECNICO DI MILANO

FINANCIAL ENGINEERING

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Financial Risk Laboratory
3. Corporate Bond Credit Portfolio

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1 Results:

We started by marking to market the portfolio, the result as a percentage of the notional is:

—— **Q1**: MtM of the portfolio ——
MtM of the portfolio: **88.43%**

We then computed the 1 year forward value of a zero coupon bond first assuming that it would stay IG the next year, then that it would be downgraded to HY, the results are:

—— **Q2**: FV in 1y if no downgrade ——
FV (all IG): **94.55%**

—— **Q3**: FV in 1y if downgrade ——
FV (all HY): **92.31%**

We then performed a Monte Carlo simulation to obtain the value of the issuers and compare it with the thresholds (represented in Figure 1) to compute the following quantities:

—— **Q4**: Average Number of Defaults——
Expected defaults: **0.99953000**

—— **Q5**: Average Number of Downgrade——
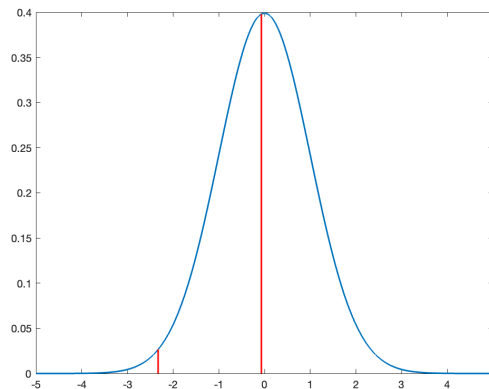Expected downgrade: **46.19398000**

Figure 1: Thresholds

Lastly, we computed the VaR at 99.9% only considering the defaults and then adding also the other credit events and got the following results:

—— **Q6**: Credit VaR——
Credit VaR: **329.42388357**

—— **Q7**: Credit VaR——
Credit VaR: **282.99490809**

2 Discussion:

Following the calculation of VaR with 3 values of rho:

	$\rho = 0$	$\rho = 0.12$	$\rho = 0.24$
Defaults	274.52	329.42	439.23
Defaults and migration	234.56	282.994	403.85

Firstly, we notice that the VaR with migration risk (computing all the different types of all losses) is a bit lower than the one that only considers default risk. This is in accordance with what we expected, in fact, if we think about the distribution of the losses, when we consider also the losses due to downgrade and unchanged grade, it becomes more spread also on lower values that correspond to the losses in cases that are not default. As a consequence the quantile at 99.9% value will be shifted to the left.

Secondly, increasing the correlation ρ the VaR increases. We explain this result observing that as the correlation factor approaches 1, the AVRs become more similar (y becomes more relevant than epsilon). This implies that when default happens for an issuer the probability that it happened for other issuers is higher. The result is a fatter right tale in the distribution and so a higher quantile (VaR).