Politecnico di Milano

Insurance Project

Group 3

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Contents

1 Case Study

Consider a simplified insurance company whose assets and liabilities sides are characterized as follows:

ASSETS:

- there is a unique fund made of a bond combined with an equity.
- at every time step t the value of the fund (before deducting the fees) is $F_t = B_t + S_t$.
- at the beginning (t=0) the value of the fund is equal to the insured capital $F_0 = C_0 = 1000$.

- Bond features:

o AAA corporate zero coupon bond with maturity T=10
o B0=800, face amount N=1000

- Equity features:

o listed in the regulated markets in the EEA
o S0=200
o No dividend yield
o to be simulated with a Risk Neutral GBM (sigma=20%) and a time varying instantaneous risk free rate r derived from the yield curve (EIOPA IT with VA 31.03.20), supposing linear interpolation of the zero rates and using the formula $DF_{t+dt} = DF_t \exp[-r_t dt]$.

LIABILITIES:

- Term Life policy with term T=10
- the insured capital given in case of death/lapse and survivor at maturity is equal to :

o CASE A:
- guaranteed - $C_t = max(C_0, F'_t)$

o CASE B:
- not guaranteed
- $C_t = F'_t$ o where:
- $F'_t = F_t – Fees_t$
- $Fees_t = 1.50\% F_{t-1}$

- male insured aged x=60.
- mortality rates derived from the life table SI2017 (ISTAT website).

- flat annual lapse rates $l_x = 5\%$.

Other specifications:

- the interest rates dynamic is deterministic, while the equity one is stochastic

- the default (credit) spread s has to be computed in the plain case (no IR stress) to match the zero coupon bond price $B_0 = 800$

QUESTIONS:

1. For both cases A and B, code a Matlab script to compute the Basic Solvency Capital Requirement via Standard Formula and provide comments on the results obtained in A and B. The risks to be considered are:

o Market Interest
o Market equity
o Market spread
o Life mortality
o Life lapse
o Life cat

2. Calculate the duration of the liabilities in all the cases and provide comments on the results obtained

3. Replicate the same calculations in an Excel spread sheet using a deterministic projection. Do the results differ from 1? If so, what is the reason behind?

4. Open questions:

o what happens to the asset and liabilities when the risk free rate increases/decreases? Describe all the effects
o what happens to the liabilities if the insured age increases? What if there were two model points, one male and one female?

2 Asset and Liabilities analysis

2.1 Assets

In order to compute the assets, we should first compute the prices of the Bonds at an annual grid of time and make a simulation of the equity which will enable us to have the value of the Fund each time which is $F_t = S_t + B_t$. To do so it is required to calibrate the spread from the price of the zero-coupon Bond which is: $spread = -\ln(B_0/DF(0,T))/T$. (Under the deterministic dynamics of interest rates hypothesis).

Indeed the discount factors are given by $DF(0,t) = \dfrac{1}{(1+r)^t}$ where r are the rates of Italy taken from EIOPA[1] with Volatility adjustment.

Afterward, we Computed the forward discount factors using the fact that $DF^{fwd}(t,T) = \dfrac{DF(t_0,T)}{DF(t_0,t)}$.

Indeed we have supposed that the interest rate dynamic is deterministic so we can use those forward discount factors to compute the price of the zero-coupon bond each time

$B_t = NDF^{fwd}(t,T)\exp\left(-(T-t)spread\right)$ where N is the National.

For the equity, we have used the fact that the price is following a geometric Brownian motion but with stochastic interest rate so it would be required this time to compute the path of the rates in a grid of time. We have approximated the dynamic of the discounted factors since if we choose a lapse of time

$\dfrac{DF(0,t+dt)}{DF(0,t)} = \exp - \displaystyle\int_t^{t+dt} r_s ds = exp(-r_t dt)$ so we can interpolate our rates using the zero rates that we have computed by the fact that $Zrate = -\dfrac{\ln(DF(0,t))}{t}$.

The number of steps that we have chosen is $Nbsteps = 500$, so our dt=0.02 in year fraction Finally we recall the dynamic of the equity which is: $S_{t_{i+1}} = S_{ti}\exp\{(r_t - \frac{\sigma^2}{2})dt + \sigma\Delta W_{ti}\}$ where each $\Delta W_{ti} = \sqrt{t_{i+1} - t_i}G_i$ and $G_i \sim N(0,1)$ and the G_i are independent. In order to make a simulation we have generated a set of normal distributions using a number of simulations which is equal Nbtraj=1000.

[1] the rates are from : EIOPA_RFR_20200331_Term_Structures, in the 7th page

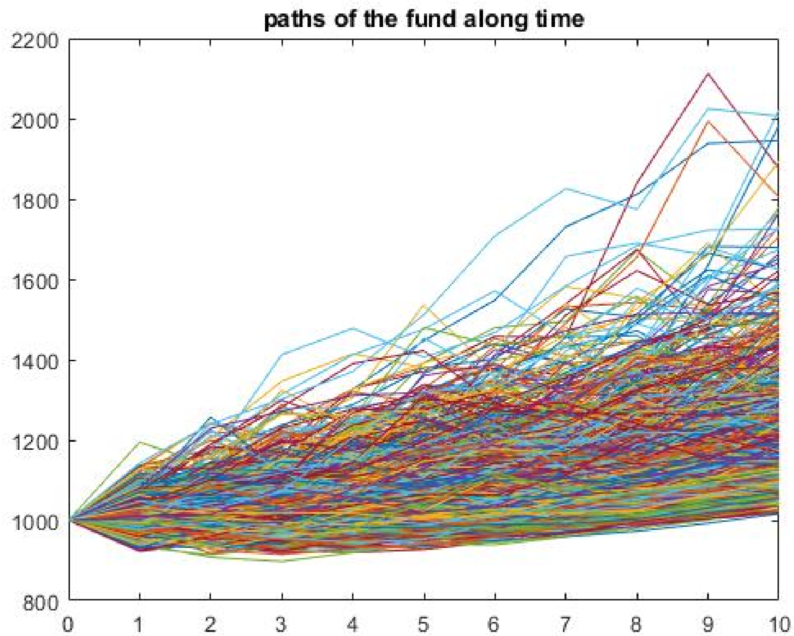


Figure 1: Fund simulation in the 10 years

Once we have done the simulation of the stock one can be able also to perform the simulation of the process of the fund since $F_t = B_t + S_t$, so we can restrict our simulation to the annual values of the equity, henceforth the plot shows us a simulation of the fund for the 10 years written on 1000 scénarios.

2.2 Liabilities

we can compute the liabilities using Montecarlo on the expected value of the claims C_t Under the hypothesis that there is Independence between the survival of the policy holder for n years and the fund value process

$$Liability = \sum_{t=1}^{T} \pi_t DF(0,t) E[C_t] \qquad (*)$$

where $C_t = \max(F'_t, C_0)$ in Case of A and $C_t = F'_t$ in Case of B. Where F'_t is the value of the fund after taking the fees that are $fees_t = 1.5\% F_{t-1}$ and we have supposed that the expenses are taken on yearly basis and π_t is the probability of payments which is considered by two cases either the policyholder dies or decide to withdraw from the contract. so he has to stay in the contract until the year of death or withdrawal. Hence, the probability should be

$$\pi_t = \prod_{i=1}^{t-1} (1 - {}_iq_x)(1 - l_x)({}_iq_x + l_x(1 - {}_iq_x)) \qquad t \leq T - 1$$

and $\pi_T = \prod_{i=1}^{T}(1 - {}_iq_x)(1 - l_x) + \prod_{i=1}^{T-1}(1 - {}_iq_x)(1 - l_x)({}_Tq_x + l_x(1 - {}_Tq_x))$,where ${}_iq_x$ is the probability of dying before age x+i and l_x is the flat lapse rate.

Comment

The numerical results that we have found show us that the liabilities for both cases A and B are bigger than the assets which give us a basic own fund $BOF_A = -112,90$ and $BOF_B = -116,9$. We have thought about using loss variable or the negative Present Value of Future Profits for the CASE A which is
$L = Liabilities - Assets$ and we have tried to compute the Unexpected Loss that should be $UL = VAR_\alpha(L) - E(L)$ so as to have an idea about the stressed scenarios that are inside the portfolio. From the graph, one can see a catastrophic amount of loss in the first period and it is represented by a $VAR_{99.5\%}$ which we think due to the guaranteed value that is 100% of the value of the fund.

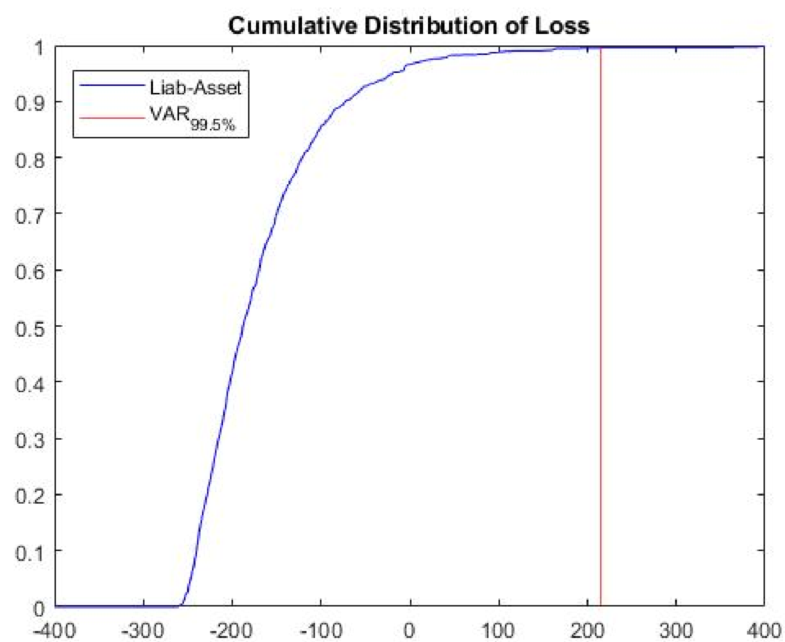


Figure 2: Loss of portfolio A and the VAR with 99.5% level

Indeed, if we try to see the dynamic of the BOF_t we will notice that the assets will start being greater than the Liabilities because of the returns of the equity. We have computed the strip of BOF_t at different times and the results show that the major loss is corporated in the two years.
As you can see from the projections along the 10 years that the assets become bigger and bigger for both cases for the same argument that we have stated before.

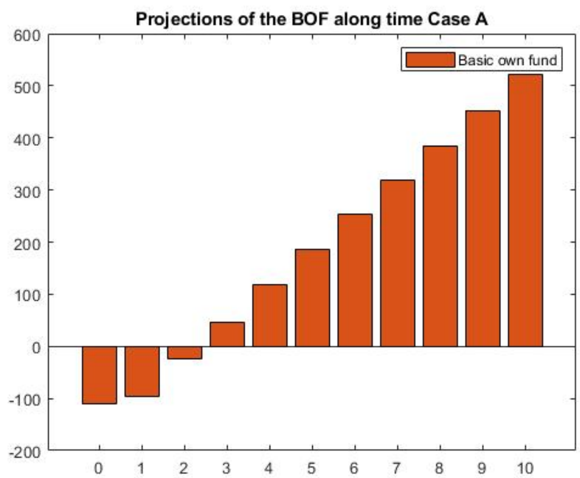


Figure 3: Dynamic of BOF for Case A

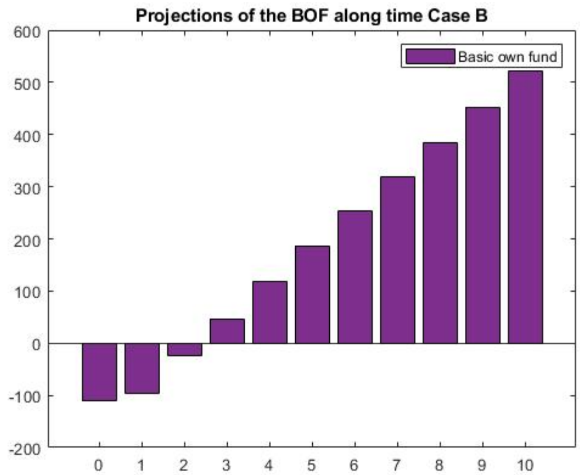


Figure 4: Dynamic of BOF for Case B

2.3 Duration

In order to compute the duration of the liabilities we have used the Macauley duration which is:

$$D = \frac{\sum_{t=1}^{T} \pi_t * t * DF(0,t)E[C_t]}{Liability} .$$

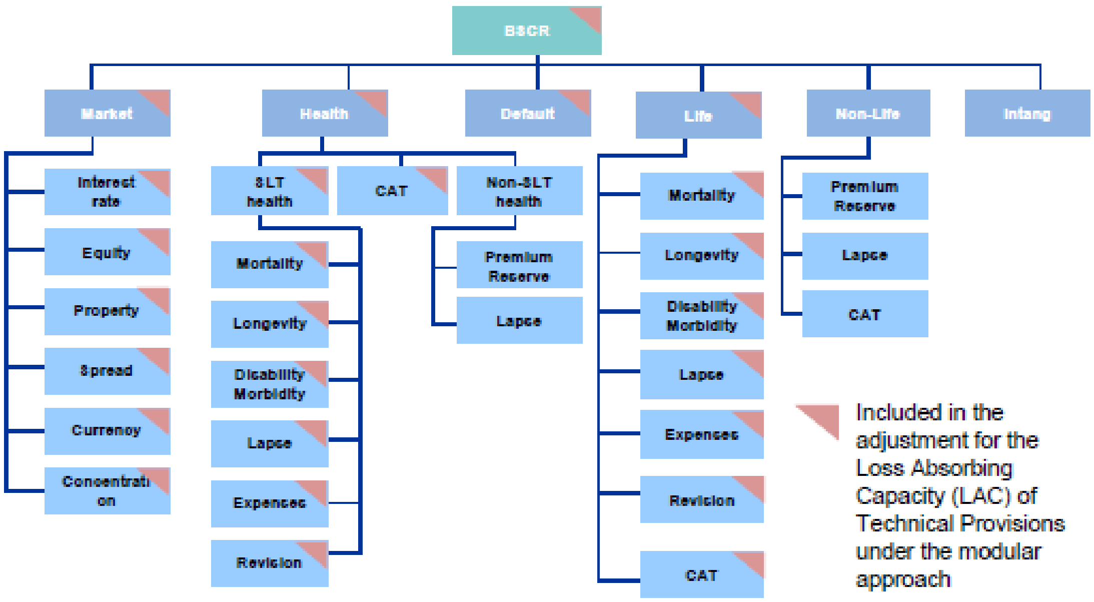
Indeed we have noticed that in general the duration of liabilities with respect to all risks are typically the same. However, we have noticed also that the liabilities of the lapse down (8,7Y) and the lapse mass (5,5Y) are very different which implies a high or less sensitivity to the shocks on interest rates

3 Solvency Capital requirements Analysis

The Solvency II is the amount of solvency capital that an insurance company should have in order to deal with different types of risks. In this framework we will be interested in two major risks which the financial risk and the demographic and we consider only the basic capital solvency requirements (BSCR).

3.1 Market Risk

The market risk is defined as the risk due to the level and the volatility of the financial instruments of the company.



3.1.1 Interest rate risk

The Interest rate risk includes two stress scenarios: up-shift of the interest rate curve (zero-coupon bond rate) and down-shift of the interest rate curve. In order to compute the BOF and dBOF, we have to compute first the new price of the zero-coupon Bond B_0 using the shifted up rates which is
$B_0 = NDF_{up}(0,T)\exp(-T spread)$.
Henceforth, we have the value of the asset at time t=0, Indeed for the liabilities, we computed using the same formula as in (*) but with the shifted rates. After computing the BOF by $BOF_{up/down} = Asset_{up/down} - Liabilities_{up/down}$

Then we can compute the difference between the Basic and the stressed own fund. In fact, we have noticed that the difference of BOF is negative for both cases A and B for downward scenario so the $SCR_{down} = \max(dBOF_{down}, 0) = 0$ however for the upward case we have a little effect on A in fact:
$SCR_{up} = \max(dBOF_{up}, 0) = 1.4$ however the SCR_{up} is equal to 0 in case B we note that in order to compute the dBOF we have used:

$$dBOF = (Asset_{plain} - Liabilities_{plain}) - (Asset_{stressed} - Liabilities_{stressed})$$

Conclusion: the effect of interest rate risk is negligible.

3.1.2 Equity risk

In this case, we have a shock such that the equity lost 39% of its own value so $S0_{shocked} = (1 - 39\%)S0$ indeed ,as usual, we compute the BOF which is $BOF = Asset_{equity} - Liabilities_{equity}$ and then the dBOF
which is $dBOF = (Asset_{plain} - Liabilities_{plain}) - (Asset_{equity} - Liabilities_{equity})$

In our analysis we have noticed the effect only on the first case (A), however, it is negligible for the second case, and we think that the guaranteed capital controls the fund and hence controls the equity by $max(F_t', C_0)$ so any change of the stock will affect directly the liability, however for the second case the equity is having more freedom so it won't affect much the liability.

Afterwards, one can compute the solvency capital requirements for the interest rate which is
$SCR_{IR} = max(SCR_{up}, SCR_{lapse-down})$

3.1.3 Spread risk

the risk of spread is more delicate since one has to choose the most parsimonious features that impact the portfolio. As we have seen the quality of the bond and it's duration reflects that risk of the spread.
In literature, we have found that mainly the change in BOF

$$dBOF = f(QualityoftheBond, duration) * B_0 + \Delta Liabilities$$

So in order to compute the change in the BOF and to compute the SCR_{spread} one has to calibrate the spread from the new price of the zero-coupon Bond since $B0_{shocked} = (1 - f(AAA, Duration))B_0$ from the table we can derive f since we have a 10 duration for the bond with credit quality AAA that makes

$$f(AAA, 10Y) = 0.045 + 0.005 * (10 - 5)$$

Indeed we compute the new spread as in Base case

$$spread_{shocked} = -\ln\left(B0_{shocked}/DF(0,T)\right)/T.$$

Henceforth, one can compute the new fund and the new liabilities using the same formulas above. The results show a big shock for the spread for both cases A and B which is 48,9 for A and 42,7 for B and we assume that this effect is big because of the long maturities. since we have a good credit quality for the Bond.

3.2 Life Underwriting Risk

3.2.1 lapse risk

We have three major risks for lapses that are a long-term increase of the lapse rates, a long-term decrease of the lapse rates, and a massive immediate lapse of 40% of the policyholders.

$$
\begin{aligned}
&lx_{up} = min(1.5 * lx, 1) && : \text{Increase in lapse rate} \\
&lx_{down} = max(0.5 * lx, lx - 0.2) && : \text{Decrease in lapse rate} \\
&lx_{mass} = [0.4; lx(2 : end)] && : \text{massive immediate lapse}
\end{aligned}
$$

In this case we will change only the liabilities since the assets are unaffected by changes of lapses. the changes in the liabilities come from the probability of payments. we have noticed those results which are

$SCR_{lapse-up} = SCR_{lapse-mass} = 0$ for both cases A and B however the decrease of lapse rates has a significant impact on the solvency capital requirement since
$SCR_{lapse-down-A} = 13, 10$ and for $SCR_{lapse-down-B} = 15, 30$
Which is a logical result since the liabilities will increase because there is less chance that the policy holder will surrender. henceforth, we can derive the solvency capital requirements for the lapses which is :

$SCR_{lapse} = max(CR_{lapse-mass}, SCR_{lapse-up}, SCR_{lapse-down})$

3.2.2 Mortality risk

The mortality stress is as an increase of the mortality rates by 1.5% . ${}_iq_x^{new} = 1.5\%_i q_x$. However, in this case, we didn't notice any effect on the solvency capital requirement since $dBOF = -0, 6$. And it could be understandable since the misestimation of the parameters of the mortality won't have an impact on the liabilities with a certain level.

3.2.3 CAT risk

The catastrophic shock is defined as an irregular event such as storms, pandemics ... and that it's hard to capture it with underwriting risk which affects the mortality rates and then we have to take it into consideration, so we express this shock as an increase by 1.5% of the chance that the policy holder will die next year so $q_x^{new} = 1.5\% q_x$ the SCR is computed also as the usual method by $(dBOF, 0)$. the results show us that this risk could be negligible

3.3 Basic solvency capital requirements

After computing the solvency capital requirements for different sources of risk, we now have all the ingredients to compute the BSCR for both cases A and

B, we start by computing the SCR_{market} and SCR_{life} using the correlations matrices below.
For market risk we have : $SCR_{market} = \sqrt{\sum_{i,j} Corr^{(1)}_{i,j} SCR_i SCR_j}$ where $Corr^{(1)}_{i,j}$ are the coefficients of the correlation matrix below.

	Interest	Equity	Spread
Interest	1.00	A	A
Equity	A	1.00	0.75
Spread	A	0.75	1.00

A is equal to 0 if exposed to IR_{up} and 0.5 if exposed to IR_{down}

Indeed for life risks we have three sources of risks : lapses, Mortality, CAT and SCR_{life} is computed using $SCR_{market} = \sqrt{\sum_{i,j} Corr^{(2)}_{i,j} SCR_i SCR_j}$ where $Corr^{(2)}_{i,j}$ are the coefficients of the correlation matrix below.

	Mortality	Lapse	CAT
Mortality	1.00	0.00	0.25
Lapse	0.00	1.00	0.25
CAT	0.25	0.25	1.00

Finally, we can compute the BSCR using the SCR_{market} and SCR_{life}
$BSCR_{market} = \sqrt{\sum_{i,j} Corr^{(3)}_{i,j} SCR_i SCR_j}$ where i or j is in $\{market, life\}$ and $Corr^{(3)}_{i,j}$ are the coefficients of the correlation matrix below.

	Market	Life
Market	1.00	0.25
Life	0.00	0.25

4 Open Questions

Increasing the rates by 1000 bp has a huge decrease in the liabilities and the assets since they lose 50% of their own value, which perfectly matches our intuition because increasing the rates will lead to a decrease in the price of the zero-coupon bond. But we didn't notice any change for the Solvency capital requirements since increasing the rates more and more will lead to a decrease in the dBOF and that's why we will get always a SCR_{up} that is equal to 0. This effect is noticed in Case of A and Case of B however we have noticed in case of B that once we are increasing more and more the rates the difference between the liabilities and the assets is in the neighborhood of 0 but for the case of A we are not in the same scale, B decreases much faster than A; here are the tables of asset and liabilities after an increase of 100bp in the rates. Indeed the duration of the liabilities decreases in both cases from 7.9 to 7.25 for A and a decrease from 7.9 to 7.84.

$Assets_A$	$Liabilities_A$	durl	SCR_{up}
482.7066	593.9418	7.25	0

$Assets_B$	$Liabilities_B$	durl	SCR_{up}
482.7066	542.9321	7.84	0

Decreasing the rates by 1000 bp consider as a remarkable risk since we have a huge increase in the liabilities and also an increase in the assets but the major risk is the SCR that went from 0 to 203.96 which is a catastrophic number . Indeed, if we take the case of A we have noticed that $\frac{Liabilities_{down}}{Liabilities_{plain}} = 2.5$ which is a huge increase, for liabilities we have noticed a little increase for both cases A and B.

$Assets_A$	$Liabilities_A$	durl	SCR_{down}
2485.7	2800.91	7.9138	203.9609

$Assets_B$	$Liabilities_B$	durl	SCR_{down}
2485.7	2800.7	7.9137	207.0352

If we increase the age of the policy holder we will notice a decrease in the liabilities since the probability of survival becomes very low, However, the main types of risks with solvency capital different from 0 remain the same and the BSCR decreased a bit as shown in the tables that we have found by shifting the age of the policy holder with 20 years.

$BSCR_A^{+20Y}$	$BSCR_A^{+20Y}$
60.3629	45.3829

In case of female, we didn't notice a big change for the assets and the liabilities, for the durations we have notice an increase overall by 0.1. and also one can see that the BSCR didn't change too much when moving to the females.

$BSCR_A^{male}$	$BSCR_B^{male}$
64.95807	50.7900

$BSCR_A^{female}$	$BSCR_B^{female}$
60.4988	49.8284

5 Deterministic Projections

Time	IR	qx	IR_{up}	IR_{down}	Lapse	DF_{plain}	DF_{Up}	DF_{Down}	ZR	ZR_{up}	ZR_{down}
1	0,0006	0,0066	0,0106	0,0006	0,05	0,9994	0,9895	0,9994	0,0006	0,0105	0,0006
2	0,0004	0,0073	0,0104	0,0004	0,05	0,9992	0,9795	0,9992	0,0004	0,0103	0,0004
3	0,0006	0,008	0,0106	0,0006	0,05	0,9982	0,9689	0,9982	0,0006	0,0105	0,0006
4	0,0009	0,0088	0,0109	0,0009	0,05	0,9964	0,9576	0,9964	0,0009	0,0108	0,0009
5	0,0014	0,0097	0,0114	0,0014	0,05	0,9930	0,9449	0,9930	0,0014	0,0113	0,0014
6	0,0017	0,0107	0,0117	0,0017	0,05	0,9899	0,9326	0,9899	0,0017	0,0116	0,0017
7	0,0021	0,0119	0,0121	0,0021	0,05	0,9854	0,9193	0,9854	0,0021	0,0120	0,0021
8	0,0025	0,013	0,0125	0,0025	0,05	0,9802	0,9054	0,9802	0,0025	0,0124	0,0025
9	0,003	0,0146	0,013	0,003	0,05	0,9734	0,8903	0,9734	0,0030	0,0129	0,0030
10	0,0034	0,0154	0,0134	0,0034	0,05	0,9666	0,8754	0,9666	0,0034	0,0133	0,0034

Data
Rating='AAA'
C_0(Insured Capital)= 1000
F_0(The value of the fund at time 0)= 1000
B_0(Zero coupon bond price)= 800
N(Face amount) =1000
T(Maturity) =10
S_0(Equity at time 0) = 200
σ(Volatility) = 0,2
N_{steps}(Number of steps) = 500

Bond	Bond$_{Up}$	Bond$_{Down}$
800	724,4725825	800
815,7693615	746,1362719	815,7693615
831,5170569	768,1436393	831,5170569
848,2467346	791,4264305	848,2467346
866,0049261	816,0605035	866,0049261
885,5486908	842,7935901	885,5486908
905,3519833	870,2296615	905,3519833
926,7994218	899,7135489	926,7994218
949,5115987	930,9309009	949,5115987
974,4297295	964,8484513	974,4297295
1000	1000	1000

Spread	0,01892012206

5.1 Base Scénario

$Fee_{rate} = 0,015$

Equity	$Fund_{plain}$	F'_{plain}	CASE A	CASE B
200	1000	NA		
196,1573585	1011,92672	996,92672	1008,688248	1008,688248
192,3500918	1023,867149	1008,688248	1008,688248	1008,688248
188,6544296	1036,901164	1021,543157	1021,543157	1021,543157
185,0852486	1051,090175	1035,536657	1035,536657	1035,536657
181,6743035	1067,222994	1051,456642	1051,456642	1051,456642
178,379642	1083,731625	1067,72328	1067,72328	1067,72328
175,2146682	1102,01409	1085,758116	1085,758116	1085,758116
172,1745483	1121,686147	1105,155936	1105,155936	1105,155936
169,2715596	1143,701289	1126,875997	1126,875997	1126,875997
169,3390657	1169,339066	1152,183546	1152,183546	1152,183546

5.2 Stressed Case Upwards Rate

Equity	F_{up}	F'_{up}	CASE A	CASE B
200	924,4725825	NA		
198,1177558	944,2540278	930,3869391	1000	930,3869391
196,214387	964,3580263	950,1942158	1000	950,1942158
194,36777	985,7942006	971,3288302	1000	971,3288302
192,5956878	1008,656191	993,8692783	1000	993,8692783
190,9341529	1033,727743	1018,5979	1018,5979	1018,5979
189,3430981	1059,57276	1044,066843	1044,066843	1044,066843
187,8395392	1087,553088	1071,659497	1071,659497	1071,659497
186,421568	1117,352469	1101,039173	1101,039173	1101,039173
185,1056659	1149,954117	1133,19383	1133,19383	1133,19383
183,8716285	1183,871629	1166,622317	1166,622317	1166,622317

5.3 Stressed Case Downwards Rate

Equity	F_{down}	F'_{down}	CASE A	CASE B
200	1000	NA		
196,1573585	1011,92672	996,92672	1000	996,92672
192,3500918	1023,867149	1008,688248	1008,688248	1008,688248
188,6544296	1036,901164	1021,543157	1021,543157	1021,543157
185,0852486	1051,090175	1035,536657	1035,536657	1035,536657
181,6743035	1067,222994	1051,456642	1051,456642	1051,456642
178,379642	1083,731625	1067,72328	1067,72328	1067,72328
175,2146682	1102,01409	1085,758116	1085,758116	1085,758116
172,1745483	1121,686147	1105,155936	1105,155936	1105,155936
169,2715596	1143,701289	1126,875997	1126,875997	1126,875997
169,3390657	1169,339066	1152,183546	1152,183546	1152,183546

$liability_A^{plain}$	$liability_B^{plain}$
1087,29	1087,12

$liability_A^{up}$	$liability_B^{up}$
1007,26	999,05

We have noticed a considerable difference between the deterministic projections and the one that we have got using the simulation and we think that estimating the equity by it's mean is very misleading since we have to take into consideration the movements of the market because that's where the profit comes from.

6 Conclusion

Our analysis shows that the spread risk and lapses and the equity are the major risks that should be taken into consideration for the solvency capital requirements of both guaranteed and non-guaranteed insurance product. However, the effect of mortality and CAT are negligible. The effect of interest rate in our case is not significant indeed, However, we have shown that if we shift the rates by 1000bp we may notice huge effect that it depends on the upward or downward change. Moreover, we have also discussed the effect of the gender which was not that significant. One can also, notice that our first part dealed with the Value at risk of level 99,5 % in the loss of our portfolio which showed a huge amount of loss but we have triggered also basic own fund which was increasing after the second year since the returns on the equity changed significantly after the first two years. For the Monte Carlo Method one can also enhances the quality of his results bu using antithetic variables which increase the quality of the approximation.

7 Summary Tables with the results obtained

Case A	Assets	Liabilities	Bof	d_{Bof}	d_{urL}	SCR
Base	1000,00	1112,90	-112,90	NaN	7,90	NaN
IR up	924,50	1038,70	-114,20	1,40	7,80	1,40
IR down	1000,00	1111,50	-111,50	-1,40	7,90	0,00
Equity	922,00	1049,60	-127,60	14,70	7,80	14,70
Spread	944,00	1105,70	-161,70	48,90	7,90	48,90
Mortality	1000,00	1112,30	-112,30	-0,60	7.80	0,00
Lapse Up	1000,00	1112,20	-112,20	-0,70	7,80	0,00
Lapse down	1000,00	1126,00	-126,00	13,10	8,70	13,10
Lapse Mass	1000,00	1077,20	-77,20	-35,70	5,50	0,00
CAT	1000,00	1112,90	-112,90	0,00	7,90	0,00

Case B	Assets	Liabilities	Bof	d_{Bof}	d_{urL}	SCR
Base	1000,00	1116,90	-116,90	NaN	7,90	NaN
IR up	924,50	1027,40	-102,90	-14,00	7,90	0.00
IR down	1000,00	1112,70	-112,70	-4,20	7.90	0,00
Equity	922,00	1032,40	-110,40	-6,50	7,90	0,00
Spread	944,00	1103,60	-159,60	42,70	8,00	42,7
Mortality	1000,00	1116,2	-116,20	-0,70	7,90	0,00
Lapse Up	1000,00	1103,60	-103,60	-13,40	7,20	0,00
Lapse down	1000,00	1132,20	132,20	15,30	8,70	15,30
Lapse Mass	1000,00	1074,70	-74,70	-42,20	5,50	0,00
CAT	1000,00	1116,90	-116,90	0,00	7,90	0,00

$BSCR_A^{male}$	$BSCR_B^{male}$
64.95807	50.7900