



Covid -19

Impact on Life Technical Provisions

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Introduction

We try to understand what impacts the Covid – 19 outbreak could have on technical provisions (reserves for balance sheet or Solvency purposes) in a Life Insurance Entity.

Those impacts are “potential” because depend on the assumptions about the medium and long term tails of pandemic risks.

Before, I show which data are essential to pay attention for measuring Covid 19.

Data about daily cases, deaths, recoveries as well as statistics such as $R(t)$ index and weekly cases per 100000 exposures (inhabitants) are essentials.

The acquaintance of vaccination trends is important, as well.

Furthermore, prior to worry about reserves, we have to understand what are the sudden effects on profits and losses and on net assets of the additional actual claims for Covid - 19

Contagion risk. Weekly cases

in light blue and italics: weekly cases / 100000 >=200

in light pink and italics: weekly cases <=50

Contagion Risk	Rate x 100																	
Region	average first 10 weeks	average weeks 11-20	average weeks 21-30	average weeks 31-40	average weeks 41-50	average weeks 51-60	Rt x 100, 61st week	Rt x 100, 62nd week	Rt x 100, 63rd week	Rt x 100, 64th week	Rt x 100, 65th week	Rt x 100, 66th week	Rt x 100, 67th week	Rt x 100, 68th week	Rt x 100, 69th week	Rt x 100, 70th week	Rt x 100, 71th week	Zone
Abruzzo	59	96	125	91	96	78	103	119	114	106	118	124	114	106	101	85	78	C
Basilicata	13	23	119	89	121	93	99	96	97	120	146	148	148	148	141	124	101	S
South Tirol	50	87	138	94	81	87	62	99	133	136	115	92	94	92	81	93	102	NE
Calabria	28	58	118	89	103	75	77	90	91	117	136	117	108	108	109	98	84	S
Campania	58	98	130	79	118	75	75	108	120	119	118	117	119	110	95	90	85	S
Emilia Romagna	79	83	121	92	99	77	69	92	127	165	167	132	109	95	89	85	81	N
Friuli Venezia Giulia	70	73	127	88	97	75	80	93	112	128	141	143	117	97	96	96	95	NE
Lazio	96	80	114	90	97	76	69	85	126	163	141	89	83	89	85	78	76	C
Liguria	65	112	114	93	102	76	64	101	150	188	187	136	107	105	104	95	85	NW
Lombardia	85	91	138	95	97	75	66	91	126	150	140	120	102	88	86	92	97	NW
Marche	70	85	116	92	99	83	59	97	127	134	190	199	160	121	86	94	114	C
Molise	50	25	122	116	114	75	23	12	2	25	30	37	42	60	101	102	136	C
Piemonte	68	90	140	84	103	71	58	85	129	167	182	142	109	100	99	97	91	NW
Puglia	59	86	125	97	104	79	64	79	108	140	160	144	130	115	101	92	85	S
Sardegna	23	79	97	84	102	73	108	135	191	219	161	113	93	82	88	81	62	S
Sicilia	55	112	119	89	97	82	68	90	120	150	156	130	119	119	116	99	83	S
Toscana	80	98	132	89	110	78	61	94	137	178	195	160	126	109	99	89	83	C
Trentino	54	96	118	85	95	86	72	90	128	183	183	118	98	111	107	93	86	NE
Umbria	47	81	125	97	93	86	85	89	107	152	181	139	104	92	86	83	82	C
Valle D'aosta	41	41	139	85	128	82	76	68	34	59	135	161	161	137	94	63	75	NW
Veneto	83	110	127	89	102	76	69	112	160	185	168	124	101	89	89	88	84	NE

Contagion risk. Weekly cases

The contagion risk $R(t)$ depends on the rate of increase / decrease of new cases compared to the actual cases

The number of weekly cases per 100.000 inhabitants is more intuitive.

The report unveils the trend over the last ten weeks until 15th September 2021 as well as $R(t)$ from the beginning of survey averaged in clusters 10 weeks wide.

Do contagion and weekly cases supply the same information?

Yes in most of cases. You can see how regions Abruzzo and Trentino drop below $R(t)$ below 100 in the last week and at the same time weekly cases drop below 50.

Nevertheless there are some apparent inconsistencies. For example, Lombardia, Veneto and Sardegna have their $R(t)$ below 100 over the last 3 weeks, any way only Lombardia shows weekly cases below 50.

$R(t)$ seems to react more quickly (i.e. in advance) to changes than weekly cases. Thus, it works as early warning indicator of trend movements

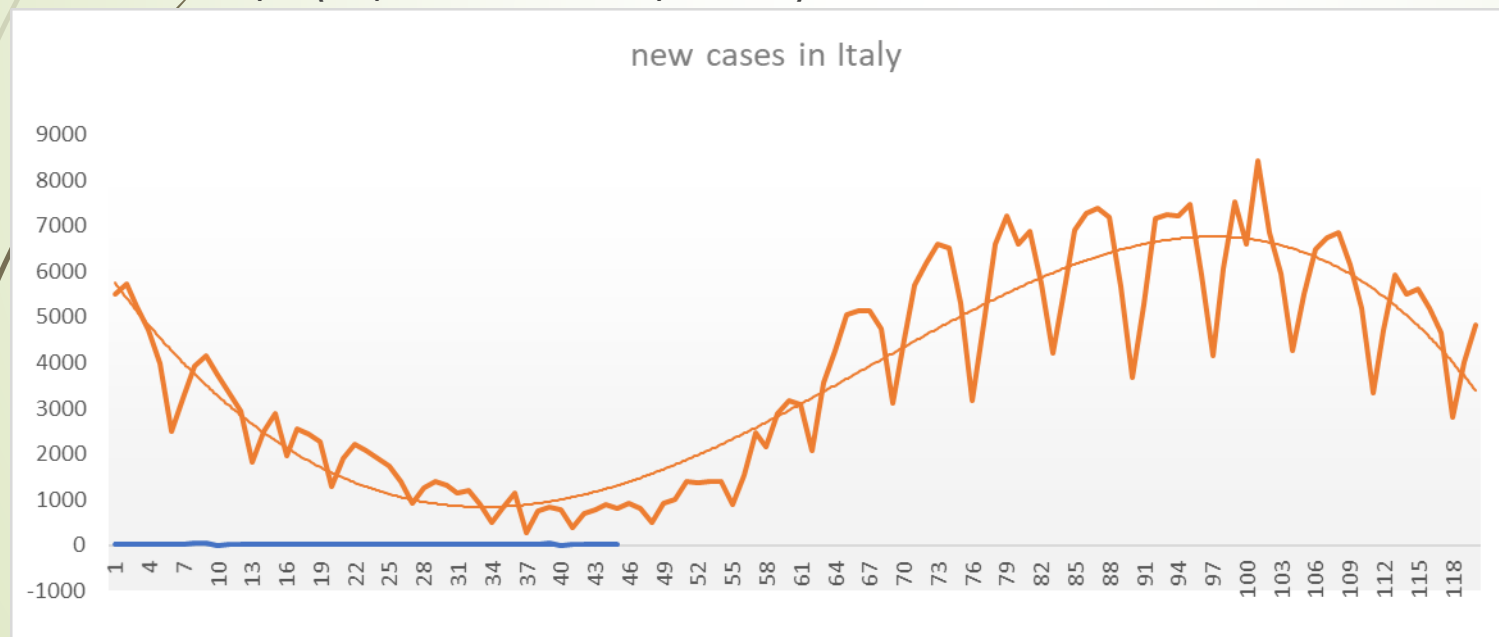
New cases

The new cases have a trend consistent with $R(t)$ and weekly cases.

We can note how the trend of decrease coincides with the trend shown in the previous exhibit.

The graph refers to the last 120 days till to September 15th 2021.

The weekly falls depends on the reduced number of tests carried out On Saturdays and on Sundays (reported 1 day later)



Lethality rates

Exhibit 1a		update 15 Sept					
age	Men cases	Men deaths	% Men cases	Women cases	Women deaths	average mortality rate	
0-19	385.731	17	52,0%	355.625	16	0,004%	
20-29	296.601	45	51,5%	279.770	28	0,013%	
30-39	285.514	174	49,0%	297.127	104	0,048%	
40-49	349.500	823	47,7%	383.816	360	0,16%	
50-59	383.177	3.372	49,0%	398.334	1.331	0,60%	
60-69	255.334	9.728	51,8%	237.175	3.725	2,73%	
70-79	179.903	22.070	50,7%	175.257	10.613	9,20%	
80-89	107.917	28.267	41,0%	155.573	23.847	19,78%	
>=90	22.013	8.674	24,4%	68.315	16.358	27,71%	
TOT	2.265.690	73.170	49,1%	2.350.992	56.382	2,81%	

age	men	new deaths last 8 weeks	women
until 39	15		14
40-49	36		23
50-59	117		61

Lethality rates

Lethality rates measure the frequencies of deaths of Covid – 19 cases. At last, it's a good measure of the probability to die once having infected by Coronavirus.

Frequencies have not materially changed from 1st wave (February –June 2020).

Apparently, the ratio between deaths and total cases has reduced from 1st Wave to the others. However, if we look at the ratios for each class age, the frequency has not changed. The overall reduction is then due to the younger age on average of new cases occurred since March 2021 who, of course, have had a good reaction to the flue compared to old ages.

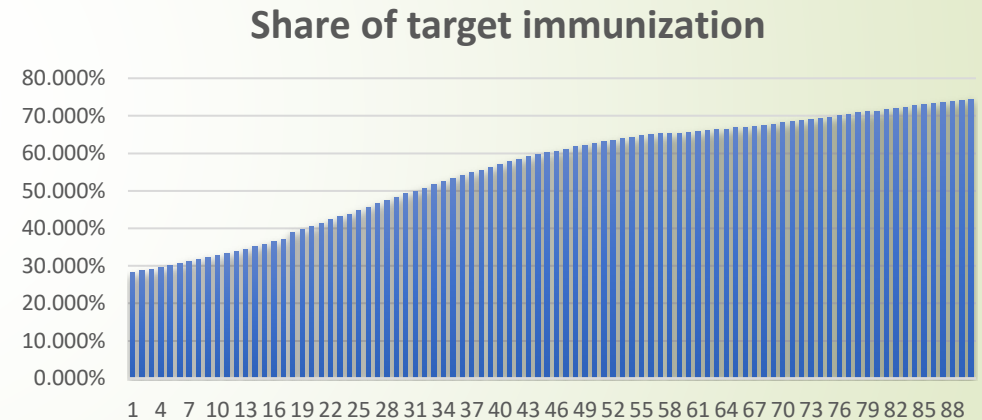
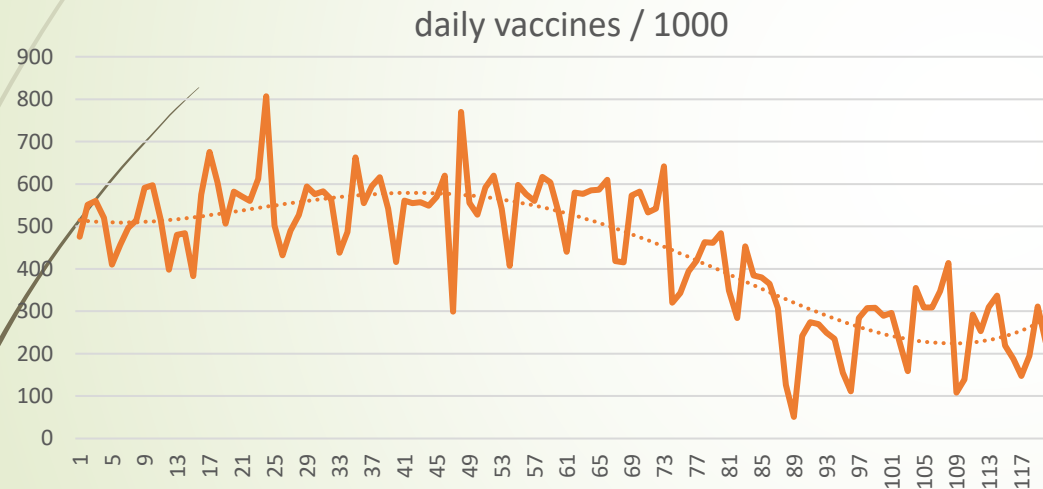
Covid -19 has bitten more often young people from March 2021 because most of old people had been vaccinated in the meantime.

No changes of mortality rates within same age classes entails the new variants of Coronavirus provide the same mortality risks as of the original 1st wave virus.

Plenty of young people has been dying for the last 8 weeks. Note also how women die no less than men at ages below 40. Girl deaths are even the same as boys looking at the overall pandemic period: look at ages <20

Vaccination

Daily vaccinations have succeeded until beginning of July. The 1st graph shows data during the last 120 days until 15 September. The number has declined in July for a temporary shortage of available doses in Italy, later on for people working holidays and, in September, for the rare willingness to be vaccinated (no vax – fear – unawareness of Covid – 19 circulation).



The share of target immunization (see the graph over the last 90 days) is shown in respect to 90% of Population, independent of age.

On 18 September, 3,4 million citizens over 50 are still not vaccinated and 12.5% of available doses (11.6 million out of 93.7) are waiting to be used.

Mortality rates in the Life Insurance Portfolio (1/2)

The next slides provide answer on whether so many deaths have materially affected the P&L of a Life Insurance Entity.

I proceed step by step on the reasoning.

Question 1: what kind of balance sheet / financial statement should I consider?

Answer: the impact is the quite the same irrespective of I am looking at Local GAAP (i.e. Italian one), Solvency II, IFRS4 and even IFRS17.

The last one prescribes that any experience variance of cash outflows having insurance characteristics shall be recognized in profits & losses.

The impact in Solvency II is only in term of net assets since there's no P&L to be done.

Question 2: How can I disclose the impacts to P&L (and to Net Assets)?

Answer: I have to measure the capital at risk on claims, both settled and outstanding. That's true in Local GAAP and in IFRS4.

In Solvency II the impact is the difference between the sum assured and the opening best estimate + risk margin: it's slightly greater than in local GAAP & IFRS4.

In IFRS17 I measure the experience variance of the expected death benefits in excess of deposit compared to the corresponding deaths incurred, partially offset by release of risk adjustment. Since the first term is deemed to be nil, the impact is the same as Solvency II, if risk margin and risk adjustment are similar. There are other not material side impacts which, anyway, are recognized against the Contractual Service Margin rather than to P&L.

Mortality rates in the Life Insurance Portfolio (2/2)

Question 3: is there any provision for pandemic risk?

Answer: Yes, in Solvency II. The CAT risk allows for adverse changes of net assets if a CAT risk (i.e. pandemic risk) incurs over the next 12 months.

The probability is set to 0.5% and the metric is the VAR → the corresponding mortality rates are 0.15% irrespective on age. The additional rate is applied (added) to the basis mortality rates for every age and only for the next 12 months of projections, without any consideration of long term effects.

Question 4: how many deaths Solvency II SCR CAT risk (standard formula) has foreseen compared to the actual Covid – 19 claims?

Answer: the SF CAT risk forecast was 135.000 deaths for pandemic risk over 18 months, just above the actual deaths, namely 130.000

Question 5: has the Solvency II Cat risk provided the same outcome experienced in Covid – 19?

Answer: No, the adverse impact in term of capital at risk has been only 5-10% of the prevision of CAT Risk according to the Solvency II SCR Standard Formula

The next slides try to explain why the impact has been so immaterial despite the good prevision in terms of number of deaths

Low impact on P&L (1/3)

Selection

The next exhibit shows the relationship between the health status, before Covid – 19, and mortality.

Deaths for number of contextual illness/disease			
0	2,90%	mean	3,7
1	11,60%	mean square error	2,05
2	18,10%		
>=3	67,40%	Updated to 21 July	

The most part of deaths relates to people with a previous history of at least 3 serious diseases, prior to being struck by Covid – 19

At odds, the major part of people insured in “term insurance” have had at most 1 critical illness.

Thus, 85% of customers subject (i.e. exposed) to Covid – 19 lethality were not insurable for coverage with important exposures in term of capitals at risk, namely term insurance.

Low impact on P&L (2/3)

Selection

The next exhibit shows details of critical illnesses suffered by people died for Covid – 19.

Red indicates increase from the previous report,

While green denotes decrease

Deaths for kind of contextual illness/disease		Updated to 21 July
cardiopatia ischemica		28,1% ischemic heart disease
fibrilazione atriale		24,5% atrial fibrillation
scompenso cardiaco		15,7% heart failure
ictus		11,5% stroke
ipertensione arteriosa		65,8% hypertension
diabete mellito		29,3% diabetes mellitus
demenza		23,6% dementia
BPCO	smoking behaviour	17,2% Chronic Obstructive Pulmonary Disease Active cancer last 5 years
Cancro attivo ultimi 5 anni		16,3%
Epatopatia cronica		5,0% Chronic liver disease
Insufficienza renale cronica		21,2% Chronic renal failure
HIV		0,2% HIV
malattie autoimmuni		4,6% autoimmune diseases
obesità		11,3% obesity
insufficienza respiratoria		6,8% respiratory failure
dialisi		2,2% dialysis

Low impact on P&L (3/3)

Age

The most part of deaths are concentrated at ages above 75.

Term insurance in Italy generally covers until age 75.

The SCR CAT risk has wrongly foreseen an additional constant mortality for every age whereas, in contrast, the Covid – 19 mortality has struck older people largely more than young people

If impact on P&L is not so immaterial at all

In case impact has been serious, there are a couple of possible reasons:

Not accurate selection of policyholders in term insurance. Even anti (adverse) selection at entry.

Collective (group) contracts whose heads insured are not subdued to any medical check before insurance

Assumptions for technical provisions (1/3)

The question is: should actuaries propose change of mortality assumptions for running technical provisions?

In Italy, those changes, if done, would be applicable to the Solvency II Best Estimates (and indirectly to the risk margin).

In next future, they would be applicable to IFRS17 fulfilment cash flows. However, the adverse impact would be immediately recognized into CSM, hence the adverse impact would be delayed and recognized smoothly over the residual lifetime of portfolio.

Local GAAP reserves would be subject to the test for the eventual recognition of additional reserves for mortality. Additional reserves are likely due if original pricing assumptions (being used also for reserving as reserving assumptions are generally locked in at inception) are insufficient compared to post Covid – 19 mortality assumptions.

Changes of Local GAAP reserves reflect immediately in IFRS4 reserves even though an additional formal Liability Adequacy Test is necessary

Assumptions for technical provisions (2/3)

The question is: should actuaries propose change of mortality assumptions for running technical provisions?

Changes of mortality assumptions mean “long term” i.e. permanent effects of Covid -19.

There's no evidence of long term effects of Covid – 19

However, there's some evidence that 1st wave cases, recovered after hospitalization, have died for causes other than Covid -19 over the following 12 months, with frequencies well higher than the relevant peers.

If confirmed in the long term, Mortality assumption need to be refreshed for Technical Provisions.

For example, if X% of entity heads insured have survived from Covid – 19 and the long term tail is represented by the vector y_1, y_2, \dots, y_t ($y_i > 0$ for every $i > 0$), then the new mortality rate for a given age z , projected t years after the valuation date, is refreshed as follows:

$$q(z, t) = q(z, 0) * (1 + x\%y_t)$$

Where $q(z,0)$ is the mortality rate for a customer never affected by Covid - 19

Assumptions for technical provisions (3/3)

An additional consideration relates to people who, despite they have never been affected by Covid -19, will suffer from higher mortality rates than before Covid – 19 time

They may include:

- ▶ Non - vaccinated
- ▶ Vaccinated who give up hospitalization in case of illnesses other than Covid - 19

These phenomena might occur if Covid -19 will continue during the next years, although with low cases compared to the period 2/2020 – current.

If so, there's some shortage of attention to other critical illnesses; in some cases, people could waive hospitalization if they fear sharing spaces near Covid – 19 patients.

That said, if 1-X% of entity heads insured have never been affected by Covid – 19 and the long term tail is represented by the vector w_1, w_2, \dots, w_t ($w_i > 0$ for every $i > 0$), then the new mortality rate for a given age z , projected t years after the valuation date, is refreshed as follows:

$$q(z, t) = q(z, 0) * [1 + x\%y_t + (1 - x\%)w_t]$$

Where $q(z,0)$ is the mortality rate for a customer before Covid – 19 outbreak

Diversification with longevity (risk) exposure

If insurers believe on long term tail and hence, they refresh their reserving assumptions of mortality for term insurance and any other business subject to mortality risks such as participating endowment contracts,

if they deem there's no evidence of anti / adverse selection of their customers,

then, they can assume that the same mortality refresh could be applied to life contingent annuities and to any other business exposed to longevity risks (including Long Term Care).

Such a diversification could be able to offset the adverse impact seen in term insurance, at least in part.

Asset and Liability matching

As for the Asset Liability Management, the increase of mortality assumptions made on contracts exposed to mortality and longevity, is in any case able to reduce the duration of liabilities.

If the insurer does not reflect such a change on management actions of the assets underlying the technical provisions, the portfolio becomes exposed to interest rate risk up (increase of interest rates) as well as more to the increase of credit spreads, i.e. the adjustment with liquidity premium or volatility adjustment or any similar measure reflecting part of credit spreads on the liability side might become less efficient

Non – Covid 19 update of mortality assumptions

This slide deals with the concern of updating the long term mortality assumptions independent on the consequences, if any, of Covid – 19 outbreak.

The problem consists in the capacity to interpret the entity experience mortality over years 2020 and 2021 net of Covid – 19 effects.

I show two possible and opposite situations. The portfolio under examination (term insurance) is likely to be in the midst of them.

Case 1: individual contracts low exposed to Covid – 19 thanks to the preliminary selection of risks.

If so, the entity keeps a database with capital at risks settled or reserved as outstanding limited to deaths directly caused by Covid – 19.

The actuary could link these data with the general deaths incurred by the entity in the same period for cleaning the overall deaths so that to identify the non – Covid 19 death incurred

Case 2: collective contracts without risk selection

The actuary could compare the change of entity specific mortality against the change of mortality of national (general) population in the same period. As regards general population, the actuary shall measure what change is due to the trend and what is due to the temporary increase by Covid – 19. At last, the actuary deducts the Covid – 19 additional & temporary mortality from the entity specific data experience.

Data sources

Data about Covid – 19 are available, amongst the others,
in

www.governo.it

lab.gedidigital.it

www.epicentro.iss.it