Analysis of 2022 mortality data for males and females in Austria, Germany and Switzerland

ABSTRACT:
The study made use of the 2022 mortality data provided by the respective statistics bureaus of the three leading countries in the "*Germanosphere*": Austria, Germany and Switzerland. The researchers took into account the number of survivors per age from 0 to 99 between males and females to calculate the expected value of whole life annuity, expected value of whole life annuity where benefit is paid at the insured's end of year of death and whole life benefit premium. The researchers also conducted comparative analysis to highlight potential differences amongst the mortality rates of the three countries in addition to the behavior of the three actuarial functions to bring to light the implications of such differences that eventually provide a strong foundation when it comes to understanding the nature of how the three countries calculate life insurance.

Keywords: mortality data, life contingencies

1. INTRODUCTION

This section revolves around the profile of the actuarial societies in Austria, Germany and Switzerland in addition to the scope and limitations of the study.

1.1. Background of the study

Life insurance is a contract between an insurance company and a policyholder that offers financial protection to the named beneficiaries in the case of the policyholder's death. It acts as a key safety net, ensuring that families are not left financially vulnerable during times of loss. Beyond protection, life insurance holds a significant value as a fundamental element of financial planning that helps individuals to invest for the future and prepare for unexpected financial difficulties.

Austria, Germany, and Switzerland are three pivotal countries located in Western Europe, collectively known as the Germanosphere. As of 2024, the population of Austria is approximately 9.12 million, as reported by Worldometer. Germany has a significantly larger population, with approximately 84.55 million residents, also according to Worldometer. In Switzerland, the population stands at around 8.88 million, as indicated by Statista 2024.

Life expectancy in these countries reflects their advanced healthcare systems and quality of life. According to the source in the United Nations, Department of Economic and Social Affairs, Population Division (2024), In Austria, life expectancy was estimated to be about 82.12 years, largely due to the robust health services and lifestyle factors given. While Germany's average life expectancy is approximately 81.54 years, indicating a high standard of health among its populaces. Meanwhile, Switzerland boasts the highest life expectancy among the three at around 84.09 years, demonstrating the effectiveness of public health initiatives in the region. The life expectancy figures represented by each of the three countries underline the ongoing investments in health promotion that positively affect the ongoing rate at the end of 2024.

The leading causes of death in Austria, Germany, and Switzerland are primarily attributed to non-communicable diseases. According to World Health Organization data (deaths per 100,000 population, 2021), the predominant cause of mortality in these three countries is ischemic heart disease. In Austria, the mortality rate for heart disease stands at 188.8. In Germany, the rate is slightly higher at 204.8 deaths. Meanwhile, in Switzerland, the rate is comparatively lower at 110.5 deaths, reflecting some differences in health outcomes across these countries.

Assessing the case profile of the leading three countries in the Germanosphere is ideal to conduct the analysis as they have a long-life expectancy, strong economy and stable social security systems. Therefore, conducting such study is essential to conduct given their stable demographic and economic conditions that aids in insurance firms to create an optimal package for their customers and boost their growth in the market.

1.2. Actuarial societies in Austria, Germany and Switzerland

This section revolves around the background of the actuarial societies in Austria, Germany and Switzerland.

1.2.1. Actuarial Association of Austria

Aktuarvereinigung Österreichs (AVÖ), anglicized as Actuarial Association of Austria, is the actuarial society of Austria. It was founded in 1971. The society is a member of the International Actuarial Association and Actuarial Association of Europe. This ensures that they are aligned with the global practices and standards of

practicing actuary. Currently it has over 500 members, where 380 of those members are fully qualified actuaries (Advanced Solutions International, Inc., n.d.). Furthermore, in 2005 they established the European Actuarial Academy in collaboration with the following countries: Germany, Switzerland and Netherlands. This academy focuses on being a knowledge hub for actuarial education in Europe (*European Actuarial Academy*, n.d.).

1.2.2. German Actuarial Society

Deutsche Aktuarvereinigung (DAV), anglicized as either German Actuarial Society or German Association of Actuaries, is the actuarial society of Germany. It was established on April 14, 1993. As of March 2024, it currently comprises 7,100 total members, 5,500 of which are fully qualified actuaries and 1,600 are students who are in the process of becoming fully qualified members. The DAV also maintains active membership in international organizations like International Actuarial Association and Actuarial Association of Europe (Deutsche Aktuarvereinigung e.V. (DAV), n.d.). Moreover, the society is heavily involved in the development of actuarial education in Germany as it often partners with universities for instance, with Ulm University (*German Academic Exchange Service*, n.d.).

1.2.3. Swiss Association of Actuaries

Schweizerische Aktuarvereinigung, anglicized as Swiss Association of Actuaries, is the actuarial society of Switzerland. It was established in 1905 and is the professional organization that represents actuaries in Switzerland. As of 2017, there are approximately 1,364 members of this organization where 778 of them are qualified actuaries. The Swiss Association of Actuaries are actively involved in the International Actuarial Association and Actuarial Association of Europe. Their involvement in these organizations are deemed to further shape global actuarial practices and standards. (*Schweizerische Aktuarvereinigung*, n.d.).

1.3. Scope and limitations of the study

The study solely revolves around the 2022 male and female life tables of Austria, Germany and Switzerland, which were retrieved from Statistics Austria, Statistiches Bundesamt and Bundesamt für Statistik, respectively. The ages of both genders are from 0 to 99 to compensate for the missing data of those aged 100 in Switzerland. Lastly, the variables used in the study include the columns revolving around the number of survivors per age, expected value of whole life annuity, where benefit is paid at the insured's end of year of death and whole life insurance premium.

The study shall not dwell into the life tables of the aforementioned three countries in the other years, let alone other countries. It shall not also include external factors that influence the overall mortality of the countries such as environmental and social factors.

2. METHODOLOGY

This section revolves around the methodology used in analyzing the mortality data for males and females in Austria, Germany and Switzerland. The interest rate used for Austria and Germany are at 5% whereas the interest rate for Switzerland is 0.8% with respect to the economic conditions and financial regulations imposed by the three countries' national banks.

2.1. Actuarial functions

This section contains the essential actuarial functions in the study.

Mortality rate. Mortality rate revolves around the statistical measure that measures the likelihood of death in the population given one timeframe. Furthermore, it denotes the probability of an individual dying between age x and x + n where x is any integer greater than or equal to 0 whereas n is any integer greater than 0. It is used in this study as it is useful to assess the life expectancy of a population and helps actuaries assess both population health and make informed decisions in insurance policy making. With the formula represented as q_x, the sole essential representation is ${}_nq_x$, which represents the probability an individual aged x survives to age x + n.

$$q_x = 1 - (1 - {}_nq_x)^{1/n}$$

Fig. 2.1. Formula of mortality rate

Number of survivors per age. The number of survivors per age is defined as the number of individuals in a population that are expected to survive until a particular age and further denotes the number of individuals that remain alive. It is used in this study as it is useful in tagging the associated health risks tied to a certain age, projecting future benefits and calculating insurance premiums optimally with the help of survival probability. Denoted as l_x, the sole essential representation is q_x, which represents the mortality rate.

$$l_x = nl_x[((1 - q_x)^{n-x})]$$

Fig. 2.2. Formula of number of survivors per age

Expected value of whole life annuity. The expected value of a whole life annuity is the present value of the annuity payouts given an individual's expected lifetime that are taken into account alongside both mortality rate and interest rate. It is used in the study as it is useful to assist insurance policymakers to create optimal annuity products and determine premiums. Denoted as $\ddot{a}_x$, essential parameters include the discount function and which are denoted by the discount function and , respectively.

$$\ddot{a}_x = \sum_{k=0}^{\infty} v^k {}_kp_x$$

Fig. 2.3. Formula of expected value of whole life annuity

Expected value of whole life annuity where benefit is paid at the insured's end of year of death. The expected value of the whole life annuity where benefit is paid at the insured's end of year of death is the present value of an annuity that pays the benefit at the end of the year of the death as opposed to paying it straightaway after the insured's death. It is used in the study as it is useful in studying the optimality of the payout in addition to assessing the effect of the interest rate and survival probabilities given the deferral. Denoted as A_x, essential parameters include v^k, ${}_kp_x$ and q_{x+k}, which are the discount function, probability an individual aged x survives until age x +k and probability an individual aged x+k dies before age x + k + 1.

$$A_x = \sum_{k=0}^{\infty} v^k {}_kp_x q_{x+k}$$

Fig. 2.4. Formula of expected value of whole life annuity where benefit is paid at the insured's end of year of death

Whole life benefit premium. The whole life benefit premium is the periodic payment paid by the policyholder that covers him/her for life, resulting in a death benefit for the policyholder. It is useful in the study as it assesses the optimal amount that covers the benefit of the policyholder, formulates the best package for the insurance firm to secure profitability and mitigates the associated risk in offering premiums. Denoted as P_x,, essential parameters include A_x and $\ddot{a}_x$, which represents the expected value of the whole life annuity where benefit is paid at the insured's end of year of death and expected value of a whole life annuity, respectively.

$$P_x = A_x/\ddot{a}_x$$

Fig. 2.5. Formula of whole life benefit premium

Overall, these actuarial functions are essential in the study as they help insurance firms calculate the most optimal insurance and premium packages for their clients using survival probability and mortality rates whilst prioritizing profitability and risk mitigation. Furthermore, it helps them secure financial stability in managing annuity payouts, insurance packages and premiums in achieving optimality in their allocation to clients. Lastly, it helps insurance firms boost their profile in customer value and market competitiveness by capitalizing on their optimal calculations in their products and services in hopes of attracting customers to avail them.

2.2. Data

The 2022 life tables used in the study to assess the mortality data of Austria, Germany and Switzerland were obtained from Statistics Austria, Statistiches Bundesamt und Bundesamt für Statistik, respectively. The data gives comprehensive information about the survival patterns and life expectancy trends of Austria, Germany and Switzerland. The essential variables were l_x and ${}_nq_z$ and represent the number of survivors given the age that was represented by x and the probability of dying between ages x and x + n, respectively. These variables will be utilized in the analysis to understand dynamics of the population aging and life expectancy when comparing the mortality between the countries.

Each life table assumes an initial cohort of 100,000 live births. This gives a standardised baseline in comparing the mortality rate across the populations of each country.

3. RESULTS

This section contains the results of the statistical analysis: overall tabular results of the actuarial functions and comparative analysis between ages 20, 40, 60, 80 and 99. The former was aided by a curve graph whereas the latter was aided by a bar graph and a table consisting of the five different ages.

	lx		axn		Axn		Px	
Age	Male	Female	Male	Female	Male	Female	Male	Female

0	100000	100000	20.3671	20.5057	0.0301	0.0235	0.0015	0.0011
1	99756	99755	20.3852	20.5313	0.0293	0.0223	0.0014	0.0011
2	99738	99734	20.3581	20.5122	0.0306	0.0232	0.0015	0.0011
3	99715	99724	20.3307	20.4898	0.0319	0.0243	0.0016	0.0012
4	99711	99708	20.2981	20.4676	0.0334	0.0254	0.0016	0.0012
5	99700	99701	20.2652	20.4424	0.0350	0.0266	0.0017	0.0013
6	99696	99688	20.2293	20.4172	0.0367	0.0278	0.0018	0.0014
7	99680	99685	20.1940	20.3887	0.0384	0.0291	0.0019	0.0014
8	99672	99674	20.1553	20.3604	0.0402	0.0305	0.0020	0.0015
9	99667	99667	20.1141	20.3298	0.0422	0.0319	0.0021	0.0016
10	99663	99660	20.0706	20.2977	0.0443	0.0334	0.0022	0.0016
11	99652	99648	20.0264	20.2650	0.0464	0.0350	0.0023	0.0017
12	99634	99638	19.9813	20.2303	0.0485	0.0367	0.0024	0.0018
13	99620	99636	19.9332	20.1923	0.0508	0.0385	0.0025	0.0019
14	99614	99619	19.8810	20.1553	0.0533	0.0402	0.0027	0.0020
15	99605	99612	19.8269	20.1145	0.0559	0.0422	0.0028	0.0021
16	99575	99593	19.7742	20.0740	0.0584	0.0441	0.0030	0.0022
17	99544	99572	19.7190	20.0320	0.0610	0.0461	0.0031	0.0023
18	99501	99540	19.6634	19.9900	0.0636	0.0481	0.0032	0.0024
19	99457	99519	19.6053	19.9437	0.0664	0.0503	0.0034	0.0025
20	99411	99496	19.5446	19.8955	0.0693	0.0526	0.0035	0.0026
21	99368	99461	19.4802	19.8472	0.0724	0.0549	0.0037	0.0028
22	99319	99444	19.4138	19.7930	0.0755	0.0575	0.0039	0.0029
23	99265	99415	19.3450	19.7384	0.0788	0.0601	0.0041	0.0030
24	99202	99389	19.2745	19.6804	0.0822	0.0628	0.0043	0.0032
25	99150	99376	19.1983	19.6170	0.0858	0.0659	0.0045	0.0034
26	99094	99358	19.1190	19.5514	0.0896	0.0690	0.0047	0.0035
27	99066	99340	19.0304	19.4825	0.0938	0.0723	0.0049	0.0037
28	99005	99307	18.9435	19.4131	0.0979	0.0756	0.0052	0.0039
29	98937	99273	18.8537	19.3404	0.1022	0.0790	0.0054	0.0041
30	98864	99252	18.7602	19.2615	0.1067	0.0828	0.0057	0.0043
31	98806	99221	18.6591	19.1805	0.1115	0.0866	0.0060	0.0045
32	98750	99203	18.5526	19.0930	0.1165	0.0908	0.0063	0.0048
33	98686	99165	18.4422	19.0050	0.1218	0.0950	0.0066	0.0050
34	98623	99139	18.3260	18.9102	0.1273	0.0995	0.0069	0.0053
35	98542	99091	18.2073	18.8148	0.1330	0.1041	0.0073	0.0055
36	98465	99056	18.0818	18.7121	0.1390	0.1089	0.0077	0.0058
37	98363	99006	17.9544	18.6071	0.1450	0.1139	0.0081	0.0061
38	98269	98955	17.8192	18.4970	0.1515	0.1192	0.0085	0.0064
39	98148	98919	17.6819	18.3785	0.1580	0.1248	0.0089	0.0068
40	98040	98872	17.5353	18.2561	0.1650	0.1307	0.0094	0.0072

41	97905	98820	17.3860	18.1285	0.1721	0.1367	0.0099	0.0075
42	97772	98774	17.2287	17.9933	0.1796	0.1432	0.0104	0.0080
43	97629	98713	17.0651	17.8540	0.1874	0.1498	0.0110	0.0084
44	97481	98634	16.8940	17.7108	0.1955	0.1566	0.0116	0.0088
45	97343	98548	16.7124	17.5617	0.2042	0.1637	0.0122	0.0093
46	97159	98449	16.5292	17.4073	0.2129	0.1711	0.0129	0.0098
47	96985	98334	16.3349	17.2478	0.2221	0.1787	0.0136	0.0104
48	96778	98227	16.1361	17.0788	0.2316	0.1867	0.0144	0.0109
49	96585	98108	15.9247	16.9032	0.2417	0.1951	0.0152	0.0115
50	96342	97972	15.7104	16.7215	0.2519	0.2037	0.0160	0.0122
51	96080	97824	15.4881	16.5326	0.2625	0.2127	0.0169	0.0129
52	95794	97662	15.2579	16.3362	0.2734	0.2221	0.0179	0.0136
53	95476	97486	15.0207	16.1321	0.2847	0.2318	0.0190	0.0144
54	95099	97300	14.7801	15.9191	0.2962	0.2419	0.0200	0.0152
55	94696	97092	14.5306	15.6986	0.3081	0.2524	0.0212	0.0161
56	94269	96859	14.2715	15.4707	0.3204	0.2633	0.0225	0.0170
57	93753	96569	14.0118	15.2398	0.3328	0.2743	0.0237	0.0180
58	93142	96292	13.7520	14.9948	0.3451	0.2860	0.0251	0.0191
59	92558	95977	13.4741	14.7428	0.3584	0.2980	0.0266	0.0202
60	91903	95628	13.1911	14.4826	0.3719	0.3104	0.0282	0.0214
61	91137	95243	12.9083	14.2140	0.3853	0.3231	0.0299	0.0227
62	90268	94728	12.6241	13.9501	0.3989	0.3357	0.0316	0.0241
63	89350	94193	12.3307	13.6748	0.4128	0.3488	0.0335	0.0255
64	88321	93606	12.0358	13.3920	0.4269	0.3623	0.0355	0.0271
65	87185	93037	11.7386	13.0912	0.4410	0.3766	0.0376	0.0288
66	85952	92377	11.4373	12.7865	0.4554	0.3911	0.0398	0.0306
67	84653	91594	11.1273	12.4816	0.4701	0.4056	0.0422	0.0325
68	83175	90854	10.8226	12.1539	0.4846	0.4212	0.0448	0.0347
69	81605	89937	10.5122	11.8310	0.4994	0.4366	0.0475	0.0369
70	80027	89012	10.1848	11.4907	0.5150	0.4528	0.0506	0.0394
71	78371	88012	9.8478	11.1404	0.5311	0.4695	0.0539	0.0421
72	76451	86936	9.5235	10.7792	0.5465	0.4867	0.0574	0.0452
73	74428	85745	9.1929	10.4108	0.5622	0.5042	0.0612	0.0484
74	72271	84377	8.8593	10.0416	0.5781	0.5218	0.0653	0.0520
75	69969	82831	8.5238	9.6708	0.5941	0.5395	0.0697	0.0558
76	67607	81101	8.1760	9.2986	0.6107	0.5572	0.0747	0.0599
77	64926	79174	7.8459	8.9256	0.6264	0.5750	0.0798	0.0644
78	62080	77141	7.5177	8.5412	0.6420	0.5933	0.0854	0.0695
79	59241	74956	7.1716	8.1491	0.6585	0.6119	0.0918	0.0751
80	56334	72648	6.8146	7.7450	0.6755	0.6312	0.0991	0.0815
81	53133	70133	6.4731	7.3362	0.6918	0.6507	0.1069	0.0887

82	49945	67383	6.1136	6.9245	0.7089	0.6703	0.1160	0.0968
83	46682	64186	5.7445	6.5306	0.7265	0.6890	0.1265	0.1055
84	43222	60886	5.3806	6.1219	0.7438	0.7085	0.1382	0.1157
85	39409	57128	5.0446	5.7318	0.7598	0.7271	0.1506	0.1268
86	35492	53071	4.7156	5.3481	0.7754	0.7453	0.1644	0.1394
87	31367	48523	4.4144	4.9935	0.7898	0.7622	0.1789	0.1526
88	27263	43726	4.1248	4.6532	0.8036	0.7784	0.1948	0.1673
89	23151	38800	3.8638	4.3228	0.8160	0.7942	0.2112	0.1837
90	19358	33828	3.5962	4.0018	0.8288	0.8094	0.2305	0.2023
91	15668	28805	3.3680	3.7015	0.8396	0.8237	0.2493	0.2225
92	12479	23841	3.1218	3.4271	0.8513	0.8368	0.2727	0.2442
93	9609	19155	2.8933	3.1720	0.8622	0.8490	0.2980	0.2676
94	7107	15000	2.6878	2.9123	0.8720	0.8613	0.3244	0.2958
95	5109	11466	2.4653	2.6267	0.8826	0.8749	0.3580	0.3331
96	3560	8462	2.2080	2.3144	0.8949	0.8898	0.4053	0.3845
97	2385	5854	1.8932	1.9950	0.9098	0.9050	0.4806	0.4536
98	1434	3819	1.5599	1.6015	0.9257	0.9237	0.5935	0.5768
99	843	2412	1.0000	1.0000	0.9524	0.9524	0.9524	0.9524

Fig. 3.1. Life table of Austria

It can be observed that the number of survivors per age in Austria when comparing the number from men and women is that the number of women that the number of survivorship in women is higher than the number in men with the notable exception of ages 9, 10 and 11. By age 42, the difference between the two genders crosses 1,000. By age 64, the difference between the two genders crossed 5,000 and saw the number of survivors in men diverted from the number of survivors in women greatly shortly thereafter. However, by their early 90s, the number of survivors in women started to converge with the number of survivors in men after the difference started to cool down by that time.

The expected whole life value annuity amongst Austrian women remains higher than those offered to Austrian men across all ages. However, it can be seen that the decrease in the expected whole life annuity amongst Austrian men decreases at a slightly faster rate than those amongst Austrian women. The differences amongst the two genders are not that drastic as the maximum it went is just within 2 units. The differences started to diverge by age 30 as the difference is greater than 0.5. The trend ended at age 89 as the ages starting from age 90 started to converge as seen by the differences being less than 0.5 units.

For the expected value of the benefit paid at the insurer's year of death amongst Austrian men and Austrian women, the rates in Austrian men remain higher than Austrian women until it levelled at age 99. The rates between the men and women began to diverge by age 36 as the difference stands at 0.03. From the aforementioned age, there is an ongoing trend of the expected value of the benefit paid at the insurer's year of death having a vast difference between the two genders. The trend cooled down by their late 70s as the difference started to close around that time.

For the whole life benefit amongst Austrian men and Austrian women, the rates in Austrian men remain higher than Austrian women until it levelled at age 99. The rates between the men and women began to diverge by the age 22 as the difference between the two genders began to stand at a value greater than 0.001. The trend continued until age 80 as its difference ultimately cools down and closes in the following years.

Overall, the lower count of the male survivors when compared to the female survivors reflects the higher price of the expected value of the benefit paid at the insurer's year of death and whole life benefit amongst Austrians. However, the expected whole life value annuity amongst the males is less than the expected whole life value annuity amongst the females.

	lx		axn		Axn		Px	
Age	Male	Female	Male	Female	Male	Female	Male	Female
0	100000	100000	20.3405	20.4884	0.0314	0.0244	0.0015	0.0012
1	99675	99713	20.3737	20.5217	0.0298	0.0228	0.0015	0.0011
2	99653	99692	20.3469	20.5021	0.0311	0.0237	0.0015	0.0012
3	99642	99680	20.3165	20.4797	0.0325	0.0248	0.0016	0.0012
4	99630	99670	20.2847	20.4557	0.0341	0.0259	0.0017	0.0013
5	99619	99660	20.2512	20.4305	0.0357	0.0271	0.0018	0.0013
6	99610	99654	20.2156	20.4033	0.0374	0.0284	0.0018	0.0014
7	99601	99648	20.1782	20.3747	0.0391	0.0298	0.0019	0.0015
8	99593	99642	20.1387	20.3446	0.0410	0.0312	0.0020	0.0015
9	99586	99635	20.0971	20.3133	0.0430	0.0327	0.0021	0.0016
10	99578	99629	20.0535	20.2802	0.0451	0.0343	0.0022	0.0017
11	99572	99624	20.0074	20.2452	0.0473	0.0359	0.0024	0.0018
12	99565	99618	19.9592	20.2087	0.0496	0.0377	0.0025	0.0019
13	99558	99612	19.9085	20.1703	0.0520	0.0395	0.0026	0.0020
14	99548	99604	19.8560	20.1305	0.0545	0.0414	0.0027	0.0021
15	99536	99593	19.8011	20.0892	0.0571	0.0434	0.0029	0.0022
16	99521	99581	19.7442	20.0461	0.0598	0.0454	0.0030	0.0023
17	99498	99566	19.6859	20.0014	0.0626	0.0476	0.0032	0.0024
18	99472	99551	19.6254	19.9545	0.0655	0.0498	0.0033	0.0025
19	99435	99535	19.5639	19.9054	0.0684	0.0521	0.0035	0.0026
20	99390	99517	19.5009	19.8543	0.0714	0.0546	0.0037	0.0027
21	99350	99499	19.4338	19.8006	0.0746	0.0571	0.0038	0.0029
22	99308	99480	19.3637	19.7444	0.0779	0.0598	0.0040	0.0030
23	99266	99463	19.2900	19.6850	0.0814	0.0626	0.0042	0.0032
24	99223	99446	19.2128	19.6226	0.0851	0.0656	0.0044	0.0033
25	99180	99430	19.1318	19.5568	0.0890	0.0687	0.0047	0.0035
26	99138	99411	19.0464	19.4884	0.0930	0.0720	0.0049	0.0037
27	99092	99392	18.9575	19.4165	0.0973	0.0754	0.0051	0.0039
28	99046	99373	18.8642	19.3411	0.1017	0.0790	0.0054	0.0041
29	99000	99350	18.7661	19.2626	0.1064	0.0827	0.0057	0.0043
30	98950	99327	18.6638	19.1801	0.1112	0.0867	0.0060	0.0045
31	98896	99301	18.5571	19.0941	0.1163	0.0908	0.0063	0.0048
32	98840	99271	18.4454	19.0046	0.1216	0.0950	0.0066	0.0050
33	98780	99239	18.3288	18.9109	0.1272	0.0995	0.0069	0.0053
34	98717	99203	18.2069	18.8133	0.1330	0.1041	0.0073	0.0055
35	98642	99162	18.0810	18.7117	0.1390	0.1090	0.0077	0.0058

36	98562	99117	17.9496	18.6057	0.1453	0.1140	0.0081	0.0061
37	98472	99072	17.8133	18.4944	0.1517	0.1193	0.0085	0.0065
38	98367	99020	17.6728	18.3788	0.1584	0.1248	0.0090	0.0068
39	98258	98961	17.5259	18.2586	0.1654	0.1305	0.0094	0.0071
40	98141	98897	17.3729	18.1332	0.1727	0.1365	0.0099	0.0075
41	98012	98832	17.2141	18.0017	0.1803	0.1428	0.0105	0.0079
42	97875	98755	17.0487	17.8657	0.1882	0.1493	0.0110	0.0084
43	97725	98674	16.8770	17.7235	0.1963	0.1560	0.0116	0.0088
44	97556	98581	16.6997	17.5763	0.2048	0.1630	0.0123	0.0093
45	97374	98482	16.5155	17.4226	0.2135	0.1704	0.0129	0.0098
46	97183	98377	16.3233	17.2621	0.2227	0.1780	0.0136	0.0103
47	96974	98258	16.1241	17.0959	0.2322	0.1859	0.0144	0.0109
48	96742	98131	15.9184	16.9226	0.2420	0.1942	0.0152	0.0115
49	96483	97976	15.7064	16.7452	0.2521	0.2026	0.0160	0.0121
50	96188	97810	15.4891	16.5605	0.2624	0.2114	0.0169	0.0128
51	95861	97628	15.2654	16.3690	0.2731	0.2205	0.0179	0.0135
52	95503	97430	15.0348	16.1702	0.2841	0.2300	0.0189	0.0142
53	95108	97217	14.7978	15.9636	0.2953	0.2398	0.0200	0.0150
54	94681	96979	14.5530	15.7504	0.3070	0.2500	0.0211	0.0159
55	94206	96709	14.3024	15.5311	0.3189	0.2604	0.0223	0.0168
56	93664	96415	14.0484	15.3042	0.3310	0.2712	0.0236	0.0177
57	93068	96093	13.7885	15.0697	0.3434	0.2824	0.0249	0.0187
58	92416	95736	13.5227	14.8283	0.3561	0.2939	0.0263	0.0198
59	91688	95341	13.2532	14.5799	0.3689	0.3057	0.0278	0.0210
60	90889	94901	12.9790	14.3250	0.3820	0.3179	0.0294	0.0222
61	90001	94407	12.7020	14.0644	0.3951	0.3303	0.0311	0.0235
62	89023	93876	12.4221	13.7953	0.4085	0.3431	0.0329	0.0249
63	87959	93296	12.1383	13.5185	0.4220	0.3563	0.0348	0.0264
64	86802	92654	11.8511	13.2356	0.4357	0.3697	0.0368	0.0279
65	85543	91951	11.5613	12.9456	0.4495	0.3835	0.0389	0.0296
66	84178	91183	11.2692	12.6485	0.4634	0.3977	0.0411	0.0314
67	82711	90352	10.9739	12.3434	0.4774	0.4122	0.0435	0.0334
68	81143	89471	10.6750	12.0278	0.4917	0.4272	0.0461	0.0355
69	79469	88503	10.3727	11.7059	0.5061	0.4426	0.0488	0.0378
70	77695	87447	10.0661	11.3769	0.5207	0.4582	0.0517	0.0403
71	75842	86312	9.7520	11.0390	0.5356	0.4743	0.0549	0.0430
72	73869	85081	9.4350	10.6935	0.5507	0.4908	0.0584	0.0459
73	71820	83748	9.1095	10.3402	0.5662	0.5076	0.0622	0.0491

74	69620	82293	8.7840	9.9806	0.5817	0.5247	0.0662	0.0526
75	67348	80745	8.4489	9.6104	0.5977	0.5424	0.0707	0.0564
76	64909	79035	8.1153	9.2365	0.6136	0.5602	0.0756	0.0606
77	62408	77208	7.7704	8.8530	0.6300	0.5784	0.0811	0.0653
78	59741	75198	7.4263	8.4661	0.6464	0.5969	0.0870	0.0705
79	56951	73021	7.0782	8.0731	0.6629	0.6156	0.0937	0.0762
80	54070	70683	6.7222	7.6724	0.6799	0.6346	0.1011	0.0827
81	50964	68088	6.3744	7.2730	0.6965	0.6537	0.1093	0.0899
82	47721	65270	6.0267	6.8711	0.7130	0.6728	0.1183	0.0979
83	44325	62157	5.6824	6.4734	0.7294	0.6917	0.1284	0.1069
84	40784	58742	5.3434	6.0811	0.7456	0.7104	0.1395	0.1168
85	37110	55015	5.0120	5.6966	0.7613	0.7287	0.1519	0.1279
86	33288	50908	4.6963	5.3293	0.7764	0.7462	0.1653	0.1400
87	29406	46504	4.3935	4.9763	0.7908	0.7630	0.1800	0.1533
88	25480	41808	4.1122	4.6440	0.8042	0.7789	0.1956	0.1677
89	21710	37035	3.8352	4.3193	0.8174	0.7943	0.2131	0.1839
90	18044	32165	3.5818	4.0130	0.8294	0.8089	0.2316	0.2016
91	14635	27294	3.3424	3.7283	0.8408	0.8225	0.2516	0.2206
92	11575	22621	3.1097	3.4564	0.8519	0.8354	0.2740	0.2417
93	8834	18249	2.9025	3.1972	0.8618	0.8478	0.2969	0.2652
94	6559	14325	2.6905	2.9390	0.8719	0.8600	0.3241	0.2926
95	4697	10899	2.4787	2.6759	0.8820	0.8726	0.3558	0.3261
96	3247	8028	2.2461	2.3891	0.8930	0.8862	0.3976	0.3710
97	2143	5672	1.9824	2.0644	0.9056	0.9017	0.4568	0.4368
98	1381	3896	1.6007	1.6270	0.9238	0.9225	0.5771	0.5670
99	871	2565	1.0000	1.0000	0.9524	0.9524	0.9524	0.9524

Fig. 3.2. Life table of Germany

It can be observed that the number of survivors per age in Germany when comparing the number from men and women is that the number of women remains higher than men across all ages. By age 44, the difference between the two genders crosses 1,000. By age 65, the difference between the two genders crossed 5,000 and saw the number of survivors in men diverted from the number of survivors in women greatly. However, by their mid-80s, the number of survivors in women started to converge with the number of survivors in men after the difference started to cool down by their mid-80s, closing in at the tail-end.

The expected whole life value annuity amongst German women remains higher than those offered to German men across all ages. However, it can be seen that the decrease in the expected whole life annuity amongst Austrian men decreases at a slightly faster rate than those amongst Austrian women. The differences amongst the two genders are not that drastic as the maximum it went is just within 2 units. The differences started to diverge by age 30 as the difference is greater than 0.5. There then exists a trend where the differences between the expected whole life value annuity continued to be greater than 0.5 units. The trend ended at age 89 as the ages starting from age 90 started to converge as seen by the differences being less than 0.5 units.

For the expected value of the benefit paid at the insurer's year of death amongst German men and German women, the rates in German men remain higher than German women until it levelled at age 99. The rates

between the men and women began to diverge by age 35 as the difference stands at 0.03. From the aforementioned age, there is an ongoing trend of the expected value of the benefit paid at the insurer's year of death having a vast difference between the two genders. The trend cooled down by their late 70s as the difference started to decrease around that time.

For the whole life benefit amongst German men and German women, the rates in German men remain higher than Swiss women until it levelled at age 99. The rates between the men and women began to diverge by the age 22 as the difference between the two genders began to stand at a value greater than 0.001. The trend continued until the early 80s as its difference ultimately cooled down and closed in the following years.

Overall, the lower count of the male survivors when compared to the female survivors reflects the higher price of the expected value of the benefit paid at the insurer's year of death and whole life benefit amongst Germans. However, the expected whole life value annuity amongst the males is less than the expected whole life value annuity amongst the females.

	lx		axn		Axn		Px	
Age	Male	Female	Male	Female	Male	Female	Male	Female
0	100000	100000	60.0865	62.0841	0.5231	0.5073	0.0087	0.0082
1	99575	99672	59.8134	61.7753	0.5253	0.5097	0.0088	0.0083
2	99553	99645	59.2970	61.2781	0.5294	0.5137	0.0089	0.0084
3	99538	99626	58.7722	60.7720	0.5336	0.5177	0.0091	0.0085
4	99525	99610	58.2420	60.2598	0.5378	0.5217	0.0092	0.0087
5	99515	99597	57.7057	59.7417	0.5420	0.5259	0.0094	0.0088
6	99507	99588	57.1640	59.2170	0.5463	0.5300	0.0096	0.0090
7	99502	99581	56.6161	58.6868	0.5507	0.5342	0.0097	0.0091
8	99498	99577	56.0633	58.1507	0.5551	0.5385	0.0099	0.0093
9	99495	99573	55.5055	57.6102	0.5595	0.5428	0.0101	0.0094
10	99493	99571	54.9426	57.0642	0.5639	0.5471	0.0103	0.0096
11	99491	99568	54.3753	56.5144	0.5685	0.5515	0.0105	0.0098
12	99489	99566	53.8033	55.9597	0.5730	0.5559	0.0106	0.0099
13	99486	99562	53.2274	55.4016	0.5776	0.5603	0.0109	0.0101
14	99480	99558	52.6484	54.8390	0.5822	0.5648	0.0111	0.0103
15	99471	99550	52.0663	54.2741	0.5868	0.5693	0.0113	0.0105
16	99454	99538	51.4836	53.7067	0.5914	0.5738	0.0115	0.0107
17	99429	99522	50.9003	53.1369	0.5960	0.5783	0.0117	0.0109
18	99397	99503	50.3157	52.5641	0.6007	0.5828	0.0119	0.0111
19	99360	99484	49.7287	51.9865	0.6053	0.5874	0.0122	0.0113
20	99321	99465	49.1378	51.4042	0.6100	0.5920	0.0124	0.0115
21	99282	99446	48.5420	50.8171	0.6147	0.5967	0.0127	0.0117
22	99242	99430	47.9416	50.2238	0.6195	0.6014	0.0129	0.0120
23	99203	99414	47.3358	49.6255	0.6243	0.6061	0.0132	0.0122
24	99164	99399	46.7248	49.0219	0.6292	0.6109	0.0135	0.0125
25	99126	99384	46.1083	48.4134	0.6341	0.6158	0.0138	0.0127
26	99086	99370	45.4875	47.7995	0.6390	0.6206	0.0140	0.0130

27	99046	99355	44.8615	47.1810	0.6440	0.6255	0.0144	0.0133
28	99005	99339	44.2307	46.5579	0.6490	0.6305	0.0147	0.0135
29	98963	99322	43.5951	45.9302	0.6540	0.6355	0.0150	0.0138
30	98919	99304	42.9549	45.2979	0.6591	0.6405	0.0153	0.0141
31	98873	99284	42.3102	44.6613	0.6642	0.6455	0.0157	0.0145
32	98824	99261	41.6614	44.0208	0.6694	0.6506	0.0161	0.0148
33	98773	99237	41.0078	43.3754	0.6745	0.6558	0.0164	0.0151
34	98720	99209	40.3495	42.7265	0.6798	0.6609	0.0168	0.0155
35	98663	99180	39.6872	42.0726	0.6850	0.6661	0.0173	0.0158
36	98603	99147	39.0205	41.4149	0.6903	0.6713	0.0177	0.0162
37	98540	99112	38.3491	40.7527	0.6956	0.6766	0.0181	0.0166
38	98474	99074	37.6732	40.0860	0.7010	0.6819	0.0186	0.0170
39	98403	99033	36.9932	39.4150	0.7064	0.6872	0.0191	0.0174
40	98328	98989	36.3088	38.7396	0.7118	0.6925	0.0196	0.0179
41	98247	98941	35.6206	38.0599	0.7173	0.6979	0.0201	0.0183
42	98161	98889	34.9282	37.3761	0.7228	0.7034	0.0207	0.0188
43	98069	98834	34.2317	36.6875	0.7283	0.7088	0.0213	0.0193
44	97969	98773	33.5317	35.9952	0.7339	0.7143	0.0219	0.0198
45	97860	98707	32.8285	35.2987	0.7395	0.7199	0.0225	0.0204
46	97741	98635	32.1222	34.5984	0.7451	0.7254	0.0232	0.0210
47	97611	98556	31.4130	33.8943	0.7507	0.7310	0.0239	0.0216
48	97468	98469	30.7012	33.1868	0.7563	0.7366	0.0246	0.0222
49	97309	98372	29.9878	32.4762	0.7620	0.7423	0.0254	0.0229
50	97134	98266	29.2723	31.7623	0.7677	0.7479	0.0262	0.0235
51	96940	98148	28.5555	31.0457	0.7734	0.7536	0.0271	0.0243
52	96724	98018	27.8380	30.3262	0.7791	0.7593	0.0280	0.0250
53	96485	97873	27.1197	29.6046	0.7848	0.7650	0.0289	0.0258
54	96219	97713	26.4015	28.8806	0.7905	0.7708	0.0299	0.0267
55	95923	97536	25.6837	28.1547	0.7962	0.7766	0.0310	0.0276
56	95595	97341	24.9665	27.4268	0.8019	0.7823	0.0321	0.0285
57	95232	97125	24.2503	26.6974	0.8075	0.7881	0.0333	0.0295
58	94829	96887	23.5359	25.9666	0.8132	0.7939	0.0346	0.0306
59	94384	96624	22.8233	25.2349	0.8189	0.7997	0.0359	0.0317
60	93892	96334	22.1132	24.5023	0.8245	0.8055	0.0373	0.0329
61	93350	96015	21.4057	23.7690	0.8301	0.8114	0.0388	0.0341
62	92754	95664	20.7011	23.0354	0.8357	0.8172	0.0404	0.0355
63	92099	95277	19.9999	22.3019	0.8413	0.8230	0.0421	0.0369
64	91382	94852	19.3022	21.5685	0.8468	0.8288	0.0439	0.0384

65	90599	94385	18.6080	20.8356	0.8523	0.8346	0.0458	0.0401
66	89745	93870	17.9178	20.1040	0.8578	0.8404	0.0479	0.0418
67	88816	93305	17.2315	19.3734	0.8632	0.8462	0.0501	0.0437
68	87807	92683	16.5494	18.6447	0.8687	0.8520	0.0525	0.0457
69	86711	91998	15.8719	17.9183	0.8740	0.8578	0.0551	0.0479
70	85522	91244	15.1993	17.1946	0.8794	0.8635	0.0579	0.0502
71	84231	90413	14.5322	16.4742	0.8847	0.8693	0.0609	0.0528
72	82830	89498	13.8712	15.7574	0.8899	0.8749	0.0642	0.0555
73	81309	88487	13.2169	15.0455	0.8951	0.8806	0.0677	0.0585
74	79655	87371	12.5703	14.3387	0.9002	0.8862	0.0716	0.0618
75	77855	86137	11.9325	13.6380	0.9053	0.8918	0.0759	0.0654
76	75895	84772	11.3046	12.9442	0.9103	0.8973	0.0805	0.0693
77	73759	83260	10.6878	12.2584	0.9152	0.9027	0.0856	0.0736
78	71433	81583	10.0833	11.5818	0.9200	0.9081	0.0912	0.0784
79	68903	79721	9.4922	10.9155	0.9247	0.9134	0.0974	0.0837
80	66153	77654	8.9160	10.2609	0.9292	0.9186	0.1042	0.0895
81	63173	75356	8.3557	9.6197	0.9337	0.9237	0.1117	0.0960
82	59954	72802	7.8126	8.9934	0.9380	0.9286	0.1201	0.1033
83	56490	69964	7.2882	8.3842	0.9422	0.9335	0.1293	0.1113
84	52784	66813	6.7836	7.7943	0.9462	0.9381	0.1395	0.1204
85	48844	63321	6.3001	7.2264	0.9500	0.9426	0.1508	0.1304
86	44692	59468	5.8388	6.6828	0.9537	0.9470	0.1633	0.1417
87	40364	55248	5.4005	6.1658	0.9571	0.9511	0.1772	0.1542
88	35910	50675	4.9859	5.6771	0.9604	0.9549	0.1926	0.1682
89	31399	45790	4.5950	5.2174	0.9635	0.9586	0.2097	0.1837
90	26915	40664	4.2275	4.7871	0.9664	0.9620	0.2286	0.2010
91	22553	35399	3.8825	4.3851	0.9692	0.9652	0.2496	0.2201
92	18415	30131	3.5585	4.0088	0.9718	0.9682	0.2731	0.2415
93	14603	25015	3.2522	3.6531	0.9742	0.9710	0.2996	0.2658
94	11205	20211	2.9586	3.3100	0.9765	0.9737	0.3301	0.2942
95	8287	15865	2.6695	2.9664	0.9788	0.9765	0.3667	0.3292
96	5883	12081	2.3705	2.6030	0.9812	0.9793	0.4139	0.3762
97	3995	8910	2.0344	2.1908	0.9839	0.9826	0.4836	0.4485
98	2586	6355	1.6107	1.6830	0.9872	0.9866	0.6129	0.5863
99	1592	4375	1.0000	1.0000	0.9921	0.9921	0.9921	0.9921

Fig. 3.3. Life table and actuarial functions of Switzerland

It can be observed that the number of survivors per age in Switzerland when comparing the number from men and women is that the number of women remains higher than men across all ages. By age 48, the difference between the two genders crosses 1,000. By age 69, the difference between the two genders crossed 5,000 and

saw the number of survivors in men diverted from the number of survivors in women greatly. However, by their early 80s, the number of survivors in women started to converge with the number of survivors in men after the difference started to cool down and closed in at the tail-end.

The expected whole life value annuity amongst Swiss women remains higher than those offered to Swiss men across all ages. However, it can be seen that the decrease in the expected whole life annuity amongst Swiss men decreases at a slightly faster rate than those amongst Austrian women. By age 4, the differences between the men and women in Switzerland stands at 2 units. There then exists a trend where the differences between the expected whole life value annuity continue to grow larger as time passes. The trend ended at age 52 as the differences began to converge in the years that followed.

For the expected value of the benefit paid at the insurer's year of death amongst Swiss men and Swiss women, the rates in German men remain higher than German women until it levelled at age 99. The rates between the men and women began to diverge by age 35 as the difference stands at 0.03. From the aforementioned age, there is an ongoing trend of the expected value of the benefit paid at the insurer's year of death having a vast difference between the two genders. The trend cooled down by their late 70s as the difference started to decrease around that time.

For the whole life benefit amongst German men and German women, the rates in German men remain higher than Swiss women until it levelled at age 99. The rates between the men and women began to completely diverge by the age 23 as the difference between the two genders began to stand at a value greater than 0.001. The increasing trend continued until the mid-70s as its difference ultimately cooled down and closed in the following years.

Overall, the lower count of the male survivors when compared to the female survivors reflects the higher price of the expected value of the benefit paid at the insurer's year of death and whole life benefit amongst Germans. However, the expected whole life value annuity amongst the males is less than the expected whole life value annuity amongst the females.

	Austria		Germany		Switzerland	
Age	Male	Female	Male	Female	Male	Female
0	100000	100000	100000	100000	100000	100000
1	99756	99755	99675	99713	99575	99672
2	99738	99734	99653	99692	99553	99645
3	99715	99724	99642	99680	99538	99626
4	99711	99708	99630	99670	99525	99610
5	99700	99701	99619	99660	99515	99597
6	99696	99688	99610	99654	99507	99588
7	99680	99685	99601	99648	99502	99581
8	99672	99674	99593	99642	99498	99577
9	99667	99667	99586	99635	99495	99573
10	99663	99660	99578	99629	99493	99571
11	99652	99648	99572	99624	99491	99568
12	99634	99638	99565	99618	99489	99566
13	99620	99636	99558	99612	99486	99562
14	99614	99619	99548	99604	99480	99558
15	99605	99612	99536	99593	99471	99550
16	99575	99593	99521	99581	99454	99538
17	99544	99572	99498	99566	99429	99522
18	99501	99540	99472	99551	99397	99503
19	99457	99519	99435	99535	99360	99484

20	99411	99496	99390	99517	99321	99465
21	99368	99461	99350	99499	99282	99446
22	99319	99444	99308	99480	99242	99430
23	99265	99415	99266	99463	99203	99414
24	99202	99389	99223	99446	99164	99399
25	99150	99376	99180	99430	99126	99384
26	99094	99358	99138	99411	99086	99370
27	99066	99340	99092	99392	99046	99355
28	99005	99307	99046	99373	99005	99339
29	98937	99273	99000	99350	98963	99322
30	98864	99252	98950	99327	98919	99304
31	98806	99221	98896	99301	98873	99284
32	98750	99203	98840	99271	98824	99261
33	98686	99165	98780	99239	98773	99237
34	98623	99139	98717	99203	98720	99209
35	98542	99091	98642	99162	98663	99180
36	98465	99056	98562	99117	98603	99147
37	98363	99006	98472	99072	98540	99112
38	98269	98955	98367	99020	98474	99074
39	98148	98919	98258	98961	98403	99033
40	98040	98872	98141	98897	98328	98989
41	97905	98820	98012	98832	98247	98941
42	97772	98774	97875	98755	98161	98889
43	97629	98713	97725	98674	98069	98834
44	97481	98634	97556	98581	97969	98773
45	97343	98548	97374	98482	97860	98707
46	97159	98449	97183	98377	97741	98635
47	96985	98334	96974	98258	97611	98556
48	96778	98227	96742	98131	97468	98469
49	96585	98108	96483	97976	97309	98372
50	96342	97972	96188	97810	97134	98266
51	96080	97824	95861	97628	96940	98148
52	95794	97662	95503	97430	96724	98018
53	95476	97486	95108	97217	96485	97873
54	95099	97300	94681	96979	96219	97713
55	94696	97092	94206	96709	95923	97536
56	94269	96859	93664	96415	95595	97341
57	93753	96569	93068	96093	95232	97125
58	93142	96292	92416	95736	94829	96887
59	92558	95977	91688	95341	94384	96624
60	91903	95628	90889	94901	93892	96334

61	91137	95243	90001	94407	93350	96015
62	90268	94728	89023	93876	92754	95664
63	89350	94193	87959	93296	92099	95277
64	88321	93606	86802	92654	91382	94852
65	87185	93037	85543	91951	90599	94385
66	85952	92377	84178	91183	89745	93870
67	84653	91594	82711	90352	88816	93305
68	83175	90854	81143	89471	87807	92683
69	81605	89937	79469	88503	86711	91998
70	80027	89012	77695	87447	85522	91244
71	78371	88012	75842	86312	84231	90413
72	76451	86936	73869	85081	82830	89498
73	74428	85745	71820	83748	81309	88487
74	72271	84377	69620	82293	79655	87371
75	69969	82831	67348	80745	77855	86137
76	67607	81101	64909	79035	75895	84772
77	64926	79174	62408	77208	73759	83260
78	62080	77141	59741	75198	71433	81583
79	59241	74956	56951	73021	68903	79721
80	56334	72648	54070	70683	66153	77654
81	53133	70133	50964	68088	63173	75356
82	49945	67383	47721	65270	59954	72802
83	46682	64186	44325	62157	56490	69964
84	43222	60886	40784	58742	52784	66813
85	39409	57128	37110	55015	48844	63321
86	35492	53071	33288	50908	44692	59468
87	31367	48523	29406	46504	40364	55248
88	27263	43726	25480	41808	35910	50675
89	23151	38800	21710	37035	31399	45790
90	19358	33828	18044	32165	26915	40664
91	15668	28805	14635	27294	22553	35399
92	12479	23841	11575	22621	18415	30131
93	9609	19155	8834	18249	14603	25015
94	7107	15000	6559	14325	11205	20211
95	5109	11466	4697	10899	8287	15865
96	3560	8462	3247	8028	5883	12081
97	2385	5854	2143	5672	3995	8910
98	1434	3819	1381	3896	2586	6355
99	843	2412	871	2565	1592	4375

Fig. 3.4. Number of survivors per age in Austria, Germany and Switzerland

From ages 1 to 27, Switzerland has the lowest number of male survivors. From ages 29 to 46, Austria had the lowest number of male survivors. From ages 47 to 98, Germany had the lowest number of male survivors. Finally, at age 99, Austria finished as the country with the lowest number of survivors. However, from ages 1 to 22, Austria had the highest number of male survivors. From ages 23 to 33, Germany held the highest number of male survivors. Finally, from ages 34 to 99, Switzerland holds the highest number of male survivors.

From ages 1 to 22, Switzerland had the lowest number of female survivors. From ages 23 to 41, Austria had the lowest number of female survivors. Finally, from ages 42 to 99, Germany had the lowest number of female survivors. From ages 1 to 17, Austria has the highest number of female survivors. From 18 to 33, Germany had the highest number of female survivors. Finally, from ages 34 to 99, Switzerland had the highest number of female survivors.

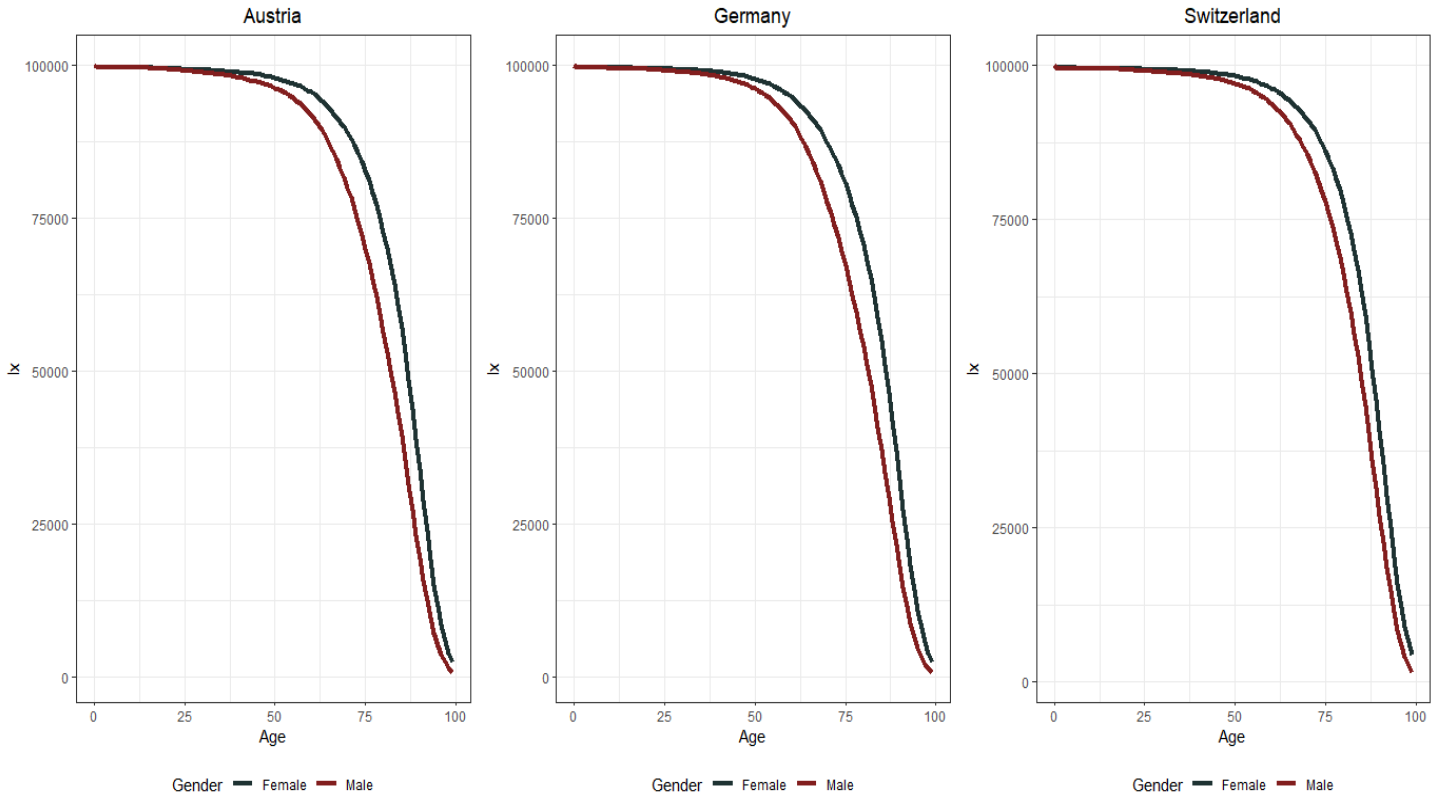

Fig. 3.5. Graphical comparison of number of survivors for each gender in Austria, Germany and Switzerland

The graphs of the number of survivors for each gender in Austria, Germany and Switzerland behave similarly. It follows the downwards exponential behavior of the graph.

For the case of Austria, the graph begins to diverge at age 32. It then peaked at age 60, indicating the greatest difference in survival between genders. It began to converge at age 85 (which the difference is 17,719 and at age 86 becomes 17,579 in which it started narrowing down) as the number of survivors for both genders decreased and their survival trajectories became more similar.

For the case of Germany, the graph begins to diverge at age 32, following a pattern similar to Austria. The peak divergence occurs at age 60, where the survival gap between males and females is the most pronounced. It began to converge at age 84 (which the difference is 17,958 and at age 85 becomes 17,905 in which it started narrowing down), as both genders approach similar survival rates in older age.

For the case of Switzerland, the graph begins to diverge at age 30, showing that males start to experience a slightly lower survival rate than females. The peak divergence happens at age 59, consistent with Austria and Germany. It began to converge at age 87 (which the difference is 14,884 and at age 88 becomes 14,765 in which it started narrowing down), where both survival curves approach each other again.

	Austria		Germany		Switzerland	
Age	Male	Female	Male	Female	Male	Female
0	20.3671	20.5057	20.3405	20.4884	60.0865	62.0841
1	20.3852	20.5313	20.3737	20.5217	59.8134	61.7753
2	20.3581	20.5122	20.3469	20.5021	59.2970	61.2781
3	20.3307	20.4898	20.3165	20.4797	58.7722	60.7720
4	20.2981	20.4676	20.2847	20.4557	58.2420	60.2598
5	20.2652	20.4424	20.2512	20.4305	57.7057	59.7417
6	20.2293	20.4172	20.2156	20.4033	57.1640	59.2170
7	20.1940	20.3887	20.1782	20.3747	56.6161	58.6868
8	20.1553	20.3604	20.1387	20.3446	56.0633	58.1507
9	20.1141	20.3298	20.0971	20.3133	55.5055	57.6102
10	20.0706	20.2977	20.0535	20.2802	54.9426	57.0642
11	20.0264	20.2650	20.0074	20.2452	54.3753	56.5144
12	19.9813	20.2303	19.9592	20.2087	53.8033	55.9597
13	19.9332	20.1923	19.9085	20.1703	53.2274	55.4016
14	19.8810	20.1553	19.8560	20.1305	52.6484	54.8390
15	19.8269	20.1145	19.8011	20.0892	52.0663	54.2741
16	19.7742	20.0740	19.7442	20.0461	51.4836	53.7067
17	19.7190	20.0320	19.6859	20.0014	50.9003	53.1369
18	19.6634	19.9900	19.6254	19.9545	50.3157	52.5641
19	19.6053	19.9437	19.5639	19.9054	49.7287	51.9865
20	19.5446	19.8955	19.5009	19.8543	49.1378	51.4042
21	19.4802	19.8472	19.4338	19.8006	48.5420	50.8171
22	19.4138	19.7930	19.3637	19.7444	47.9416	50.2238
23	19.3450	19.7384	19.2900	19.6850	47.3358	49.6255
24	19.2745	19.6804	19.2128	19.6226	46.7248	49.0219
25	19.1983	19.6170	19.1318	19.5568	46.1083	48.4134
26	19.1190	19.5514	19.0464	19.4884	45.4875	47.7995
27	19.0304	19.4825	18.9575	19.4165	44.8615	47.1810
28	18.9435	19.4131	18.8642	19.3411	44.2307	46.5579
29	18.8537	19.3404	18.7661	19.2626	43.5951	45.9302
30	18.7602	19.2615	18.6638	19.1801	42.9549	45.2979
31	18.6591	19.1805	18.5571	19.0941	42.3102	44.6613
32	18.5526	19.0930	18.4454	19.0046	41.6614	44.0208
33	18.4422	19.0050	18.3288	18.9109	41.0078	43.3754
34	18.3260	18.9102	18.2069	18.8133	40.3495	42.7265
35	18.2073	18.8148	18.0810	18.7117	39.6872	42.0726
36	18.0818	18.7121	17.9496	18.6057	39.0205	41.4149
37	17.9544	18.6071	17.8133	18.4944	38.3491	40.7527
38	17.8192	18.4970	17.6728	18.3788	37.6732	40.0860

39	17.6819	18.3785	17.5259	18.2586	36.9932	39.4150
40	17.5353	18.2561	17.3729	18.1332	36.3088	38.7396
41	17.3860	18.1285	17.2141	18.0017	35.6206	38.0599
42	17.2287	17.9933	17.0487	17.8657	34.9282	37.3761
43	17.0651	17.8540	16.8770	17.7235	34.2317	36.6875
44	16.8940	17.7108	16.6997	17.5763	33.5317	35.9952
45	16.7124	17.5617	16.5155	17.4226	32.8285	35.2987
46	16.5292	17.4073	16.3233	17.2621	32.1222	34.5984
47	16.3349	17.2478	16.1241	17.0959	31.4130	33.8943
48	16.1361	17.0788	15.9184	16.9226	30.7012	33.1868
49	15.9247	16.9032	15.7064	16.7452	29.9878	32.4762
50	15.7104	16.7215	15.4891	16.5605	29.2723	31.7623
51	15.4881	16.5326	15.2654	16.3690	28.5555	31.0457
52	15.2579	16.3362	15.0348	16.1702	27.8380	30.3262
53	15.0207	16.1321	14.7978	15.9636	27.1197	29.6046
54	14.7801	15.9191	14.5530	15.7504	26.4015	28.8806
55	14.5306	15.6986	14.3024	15.5311	25.6837	28.1547
56	14.2715	15.4707	14.0484	15.3042	24.9665	27.4268
57	14.0118	15.2398	13.7885	15.0697	24.2503	26.6974
58	13.7520	14.9948	13.5227	14.8283	23.5359	25.9666
59	13.4741	14.7428	13.2532	14.5799	22.8233	25.2349
60	13.1911	14.4826	12.9790	14.3250	22.1132	24.5023
61	12.9083	14.2140	12.7020	14.0644	21.4057	23.7690
62	12.6241	13.9501	12.4221	13.7953	20.7011	23.0354
63	12.3307	13.6748	12.1383	13.5185	19.9999	22.3019
64	12.0358	13.3920	11.8511	13.2356	19.3022	21.5685
65	11.7386	13.0912	11.5613	12.9456	18.6080	20.8356
66	11.4373	12.7865	11.2692	12.6485	17.9178	20.1040
67	11.1273	12.4816	10.9739	12.3434	17.2315	19.3734
68	10.8226	12.1539	10.6750	12.0278	16.5494	18.6447
69	10.5122	11.8310	10.3727	11.7059	15.8719	17.9183
70	10.1848	11.4907	10.0661	11.3769	15.1993	17.1946
71	9.8478	11.1404	9.7520	11.0390	14.5322	16.4742
72	9.5235	10.7792	9.4350	10.6935	13.8712	15.7574
73	9.1929	10.4108	9.1095	10.3402	13.2169	15.0455
74	8.8593	10.0416	8.7840	9.9806	12.5703	14.3387
75	8.5238	9.6708	8.4489	9.6104	11.9325	13.6380
76	8.1760	9.2986	8.1153	9.2365	11.3046	12.9442
77	7.8459	8.9256	7.7704	8.8530	10.6878	12.2584
78	7.5177	8.5412	7.4263	8.4661	10.0833	11.5818
79	7.1716	8.1491	7.0782	8.0731	9.4922	10.9155

80	6.8146	7.7450	6.7222	7.6724	8.9160	10.2609
81	6.4731	7.3362	6.3744	7.2730	8.3557	9.6197
82	6.1136	6.9245	6.0267	6.8711	7.8126	8.9934
83	5.7445	6.5306	5.6824	6.4734	7.2882	8.3842
84	5.3806	6.1219	5.3434	6.0811	6.7836	7.7943
85	5.0446	5.7318	5.0120	5.6966	6.3001	7.2264
86	4.7156	5.3481	4.6963	5.3293	5.8388	6.6828
87	4.4144	4.9935	4.3935	4.9763	5.4005	6.1658
88	4.1248	4.6532	4.1122	4.6440	4.9859	5.6771
89	3.8638	4.3228	3.8352	4.3193	4.5950	5.2174
90	3.5962	4.0018	3.5818	4.0130	4.2275	4.7871
91	3.3680	3.7015	3.3424	3.7283	3.8825	4.3851
92	3.1218	3.4271	3.1097	3.4564	3.5585	4.0088
93	2.8933	3.1720	2.9025	3.1972	3.2522	3.6531
94	2.6878	2.9123	2.6905	2.9390	2.9586	3.3100
95	2.4653	2.6267	2.4787	2.6759	2.6695	2.9664
96	2.2080	2.3144	2.2461	2.3891	2.3705	2.6030
97	1.8932	1.9950	1.9824	2.0644	2.0344	2.1908
98	1.5599	1.6015	1.6007	1.6270	1.6107	1.6830
99	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Fig. 3.6. Expected value of whole life annuity of Austria, Germany and Switzerland

For men, Germany had the cheapest expected value of whole life annuity from ages 1 to 92. From ages 93 to 98, Austria had the cheapest expected value of whole life annuity.

For women, Germany holds the cheapest expected value of whole life annuity from ages 1 to 89. From ages 90 to 98, Austria holds the cheapest expected value of whole life annuity.

For both genders, Switzerland had the highest expected value of whole life annuity amongst the three countries in the Germanosphere throughout the ages 1 to 98.

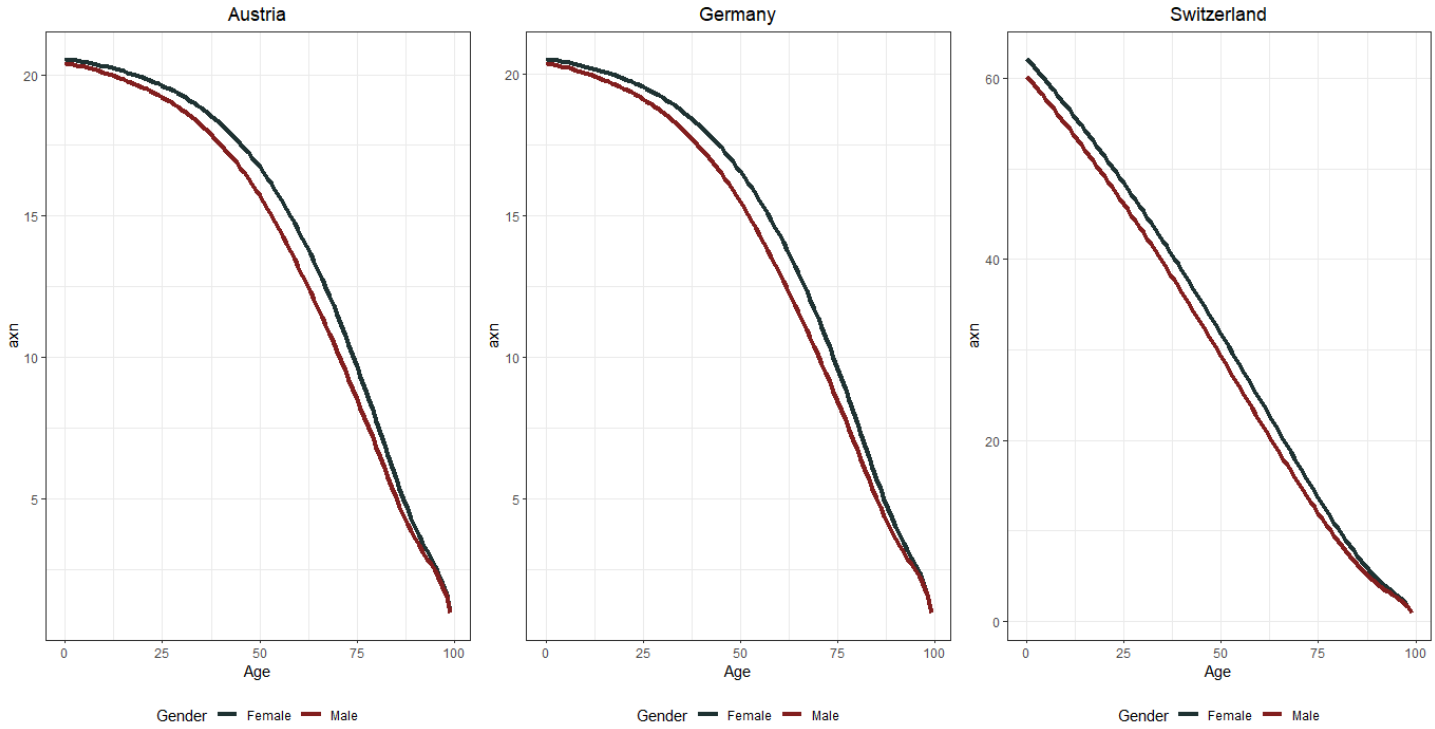

Fig. 3.7. Graphical comparison of expected value of whole life annuity of Austria, Germany and Switzerland

Austria and Germany are displaying a trend that resembles a downward exponential graph. Initially, the values rise, reach a peak, and then gradually begin to decline. In contrast, Switzerland follows a different path, showing a more linear decrease where the values steadily drop over time, eventually stabilizing at a certain age. These trends really highlight the distinct ways in which the values change over time in each of these three countries.

In Austria, the divergence between males and females begins around the early 30s, approximately at age 32, where their expected values start to separate. This gap continues to widen until it reaches its peak around the mid-50s, at approximately age 54, when the values are at their highest before beginning to decline. Eventually, the values for both males and females start to converge again in the early-60s, around age 64 (at which is 1.3562 and the following age at 65 will be 1.3526).

A similar pattern is observed in Germany, where divergence starts slightly earlier, around age 31, followed by a peak in the mid-50s at approximately age 53. As the values begin to decline, the convergence phase occurs in the early-60s, around age 64 (at which is 1.3845 and the following age at 65 will be 1.3843). This trend closely mirrors Austria's pattern, though with slight variations in the timing of divergence and peak values.

In Switzerland, however, the data suggests that the divergence is already evident from the start. The peak is reached slightly later than in Austria and Germany, around age 50, after which the values gradually decline. The convergence phase in Switzerland occurs around age 51 (at which is 2.4902 and the following age at 52 will be 2.4882), when the values for males and females come closer together again.

	Austria		Germany		Switzerland	
Age	Male	Female	Male	Female	Male	Female
0	0.0301	0.0235	0.0314	0.0244	0.5231	0.5073
1	0.0293	0.0223	0.0298	0.0228	0.5253	0.5097
2	0.0306	0.0232	0.0311	0.0237	0.5294	0.5137
3	0.0319	0.0243	0.0325	0.0248	0.5336	0.5177
4	0.0334	0.0254	0.0341	0.0259	0.5378	0.5217

5	0.0350	0.0266	0.0357	0.0271	0.5420	0.5259
6	0.0367	0.0278	0.0374	0.0284	0.5463	0.5300
7	0.0384	0.0291	0.0391	0.0298	0.5507	0.5342
8	0.0402	0.0305	0.0410	0.0312	0.5551	0.5385
9	0.0422	0.0319	0.0430	0.0327	0.5595	0.5428
10	0.0443	0.0334	0.0451	0.0343	0.5639	0.5471
11	0.0464	0.0350	0.0473	0.0359	0.5685	0.5515
12	0.0485	0.0367	0.0496	0.0377	0.5730	0.5559
13	0.0508	0.0385	0.0520	0.0395	0.5776	0.5603
14	0.0533	0.0402	0.0545	0.0414	0.5822	0.5648
15	0.0559	0.0422	0.0571	0.0434	0.5868	0.5693
16	0.0584	0.0441	0.0598	0.0454	0.5914	0.5738
17	0.0610	0.0461	0.0626	0.0476	0.5960	0.5783
18	0.0636	0.0481	0.0655	0.0498	0.6007	0.5828
19	0.0664	0.0503	0.0684	0.0521	0.6053	0.5874
20	0.0693	0.0526	0.0714	0.0546	0.6100	0.5920
21	0.0724	0.0549	0.0746	0.0571	0.6147	0.5967
22	0.0755	0.0575	0.0779	0.0598	0.6195	0.6014
23	0.0788	0.0601	0.0814	0.0626	0.6243	0.6061
24	0.0822	0.0628	0.0851	0.0656	0.6292	0.6109
25	0.0858	0.0659	0.0890	0.0687	0.6341	0.6158
26	0.0896	0.0690	0.0930	0.0720	0.6390	0.6206
27	0.0938	0.0723	0.0973	0.0754	0.6440	0.6255
28	0.0979	0.0756	0.1017	0.0790	0.6490	0.6305
29	0.1022	0.0790	0.1064	0.0827	0.6540	0.6355
30	0.1067	0.0828	0.1112	0.0867	0.6591	0.6405
31	0.1115	0.0866	0.1163	0.0908	0.6642	0.6455
32	0.1165	0.0908	0.1216	0.0950	0.6694	0.6506
33	0.1218	0.0950	0.1272	0.0995	0.6745	0.6558
34	0.1273	0.0995	0.1330	0.1041	0.6798	0.6609
35	0.1330	0.1041	0.1390	0.1090	0.6850	0.6661
36	0.1390	0.1089	0.1453	0.1140	0.6903	0.6713
37	0.1450	0.1139	0.1517	0.1193	0.6956	0.6766
38	0.1515	0.1192	0.1584	0.1248	0.7010	0.6819
39	0.1580	0.1248	0.1654	0.1305	0.7064	0.6872
40	0.1650	0.1307	0.1727	0.1365	0.7118	0.6925
41	0.1721	0.1367	0.1803	0.1428	0.7173	0.6979
42	0.1796	0.1432	0.1882	0.1493	0.7228	0.7034
43	0.1874	0.1498	0.1963	0.1560	0.7283	0.7088
44	0.1955	0.1566	0.2048	0.1630	0.7339	0.7143
45	0.2042	0.1637	0.2135	0.1704	0.7395	0.7199

46	0.2129	0.1711	0.2227	0.1780	0.7451	0.7254
47	0.2221	0.1787	0.2322	0.1859	0.7507	0.7310
48	0.2316	0.1867	0.2420	0.1942	0.7563	0.7366
49	0.2417	0.1951	0.2521	0.2026	0.7620	0.7423
50	0.2519	0.2037	0.2624	0.2114	0.7677	0.7479
51	0.2625	0.2127	0.2731	0.2205	0.7734	0.7536
52	0.2734	0.2221	0.2841	0.2300	0.7791	0.7593
53	0.2847	0.2318	0.2953	0.2398	0.7848	0.7650
54	0.2962	0.2419	0.3070	0.2500	0.7905	0.7708
55	0.3081	0.2524	0.3189	0.2604	0.7962	0.7766
56	0.3204	0.2633	0.3310	0.2712	0.8019	0.7823
57	0.3328	0.2743	0.3434	0.2824	0.8075	0.7881
58	0.3451	0.2860	0.3561	0.2939	0.8132	0.7939
59	0.3584	0.2980	0.3689	0.3057	0.8189	0.7997
60	0.3719	0.3104	0.3820	0.3179	0.8245	0.8055
61	0.3853	0.3231	0.3951	0.3303	0.8301	0.8114
62	0.3989	0.3357	0.4085	0.3431	0.8357	0.8172
63	0.4128	0.3488	0.4220	0.3563	0.8413	0.8230
64	0.4269	0.3623	0.4357	0.3697	0.8468	0.8288
65	0.4410	0.3766	0.4495	0.3835	0.8523	0.8346
66	0.4554	0.3911	0.4634	0.3977	0.8578	0.8404
67	0.4701	0.4056	0.4774	0.4122	0.8632	0.8462
68	0.4846	0.4212	0.4917	0.4272	0.8687	0.8520
69	0.4994	0.4366	0.5061	0.4426	0.8740	0.8578
70	0.5150	0.4528	0.5207	0.4582	0.8794	0.8635
71	0.5311	0.4695	0.5356	0.4743	0.8847	0.8693
72	0.5465	0.4867	0.5507	0.4908	0.8899	0.8749
73	0.5622	0.5042	0.5662	0.5076	0.8951	0.8806
74	0.5781	0.5218	0.5817	0.5247	0.9002	0.8862
75	0.5941	0.5395	0.5977	0.5424	0.9053	0.8918
76	0.6107	0.5572	0.6136	0.5602	0.9103	0.8973
77	0.6264	0.5750	0.6300	0.5784	0.9152	0.9027
78	0.6420	0.5933	0.6464	0.5969	0.9200	0.9081
79	0.6585	0.6119	0.6629	0.6156	0.9247	0.9134
80	0.6755	0.6312	0.6799	0.6346	0.9292	0.9186
81	0.6918	0.6507	0.6965	0.6537	0.9337	0.9237
82	0.7089	0.6703	0.7130	0.6728	0.9380	0.9286
83	0.7265	0.6890	0.7294	0.6917	0.9422	0.9335
84	0.7438	0.7085	0.7456	0.7104	0.9462	0.9381
85	0.7598	0.7271	0.7613	0.7287	0.9500	0.9426
86	0.7754	0.7453	0.7764	0.7462	0.9537	0.9470

87	0.7898	0.7622	0.7908	0.7630	0.9571	0.9511
88	0.8036	0.7784	0.8042	0.7789	0.9604	0.9549
89	0.8160	0.7942	0.8174	0.7943	0.9635	0.9586
90	0.8288	0.8094	0.8294	0.8089	0.9664	0.9620
91	0.8396	0.8237	0.8408	0.8225	0.9692	0.9652
92	0.8513	0.8368	0.8519	0.8354	0.9718	0.9682
93	0.8622	0.8490	0.8618	0.8478	0.9742	0.9710
94	0.8720	0.8613	0.8719	0.8600	0.9765	0.9737
95	0.8826	0.8749	0.8820	0.8726	0.9788	0.9765
96	0.8949	0.8898	0.8930	0.8862	0.9812	0.9793
97	0.9098	0.9050	0.9056	0.9017	0.9839	0.9826
98	0.9257	0.9237	0.9238	0.9225	0.9872	0.9866
99	0.9524	0.9524	0.9524	0.9524	0.9921	0.9921

Fig. 3.8. Expected value of whole life annuity where benefit is paid at the insured's end of year of death of Austria, Germany and Switzerland

The expected value of whole life annuity where benefit is paid at the insured's end of year of death for Austria, Germany and Switzerland from ages 0 to 99. It is also categorized by gender. The expected values represent the probability of surviving each age and corresponding financial implications.

The expected value of the annuity increases for all demographics as age increases. As a result, there is a greater probability of benefit payout occurring sooner as an individual ages. Austria and Germany show similar trends in expected annuity values. Germany has a slight increase in value compared to Austria at older ages. While for Switzerland it exhibits higher expected value across all age groups for both males and females compared to the two other countries. Expected value of the whole annuity is quite higher for males than females which aligns with global actuarial trends since higher immediate risk of death increases the expected present value. From ages 60 and onwards, it is seen that the increasing trend increases much faster in the older ages. This denotes higher mortality risk and payouts as an individual's age increases.

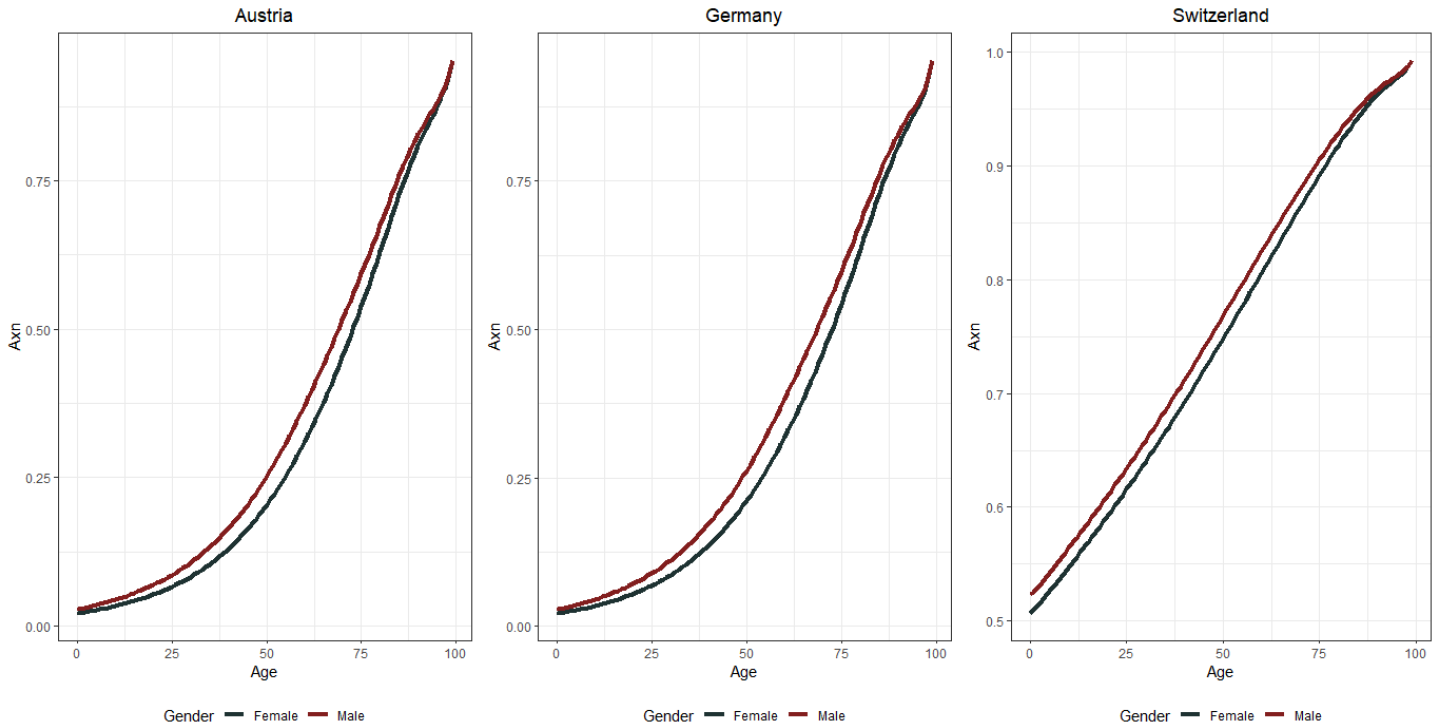

Fig. 3.9. Graphical comparison of expected value of whole life annuity where benefit is paid at the insured's end of year of death of Austria, Germany and Switzerland

Austria and Germany exhibit a curve-like trend resembling an upward exponential graph, while Switzerland follows a steadily increasing linear pattern that converges at a certain age.

For the case of Austria, the graph begins to diverge at age 10. It then peaked at age 99 (Based on Fig 3.9). It began to converge at age 64 (at 0.0646 and at age 65 is at 0.0644).

For the case of Germany, the graph begins to diverge at age 10. It then peaked at age 99. It began to converge at age 65 (at which it is 0.066 and for age 66 is at 0.0657).

For the case of Switzerland, the graph already diverged at the start. It then peaked at age 99. It began to converge at age 53 (at 0.0198 and at the next age 54 becomes 0.0197).

	Austria		Germany		Switzerland	
Age	Male	Female	Male	Female	Male	Female
0	0.0015	0.0011	0.0015	0.0012	0.0087	0.0082
1	0.0014	0.0011	0.0015	0.0011	0.0088	0.0083
2	0.0015	0.0011	0.0015	0.0012	0.0089	0.0084
3	0.0016	0.0012	0.0016	0.0012	0.0091	0.0085
4	0.0016	0.0012	0.0017	0.0013	0.0092	0.0087
5	0.0017	0.0013	0.0018	0.0013	0.0094	0.0088
6	0.0018	0.0014	0.0018	0.0014	0.0096	0.0090
7	0.0019	0.0014	0.0019	0.0015	0.0097	0.0091
8	0.0020	0.0015	0.0020	0.0015	0.0099	0.0093
9	0.0021	0.0016	0.0021	0.0016	0.0101	0.0094
10	0.0022	0.0016	0.0022	0.0017	0.0103	0.0096
11	0.0023	0.0017	0.0024	0.0018	0.0105	0.0098
12	0.0024	0.0018	0.0025	0.0019	0.0106	0.0099
13	0.0025	0.0019	0.0026	0.0020	0.0109	0.0101
14	0.0027	0.0020	0.0027	0.0021	0.0111	0.0103
15	0.0028	0.0021	0.0029	0.0022	0.0113	0.0105
16	0.0030	0.0022	0.0030	0.0023	0.0115	0.0107
17	0.0031	0.0023	0.0032	0.0024	0.0117	0.0109
18	0.0032	0.0024	0.0033	0.0025	0.0119	0.0111
19	0.0034	0.0025	0.0035	0.0026	0.0122	0.0113
20	0.0035	0.0026	0.0037	0.0027	0.0124	0.0115
21	0.0037	0.0028	0.0038	0.0029	0.0127	0.0117
22	0.0039	0.0029	0.0040	0.0030	0.0129	0.0120
23	0.0041	0.0030	0.0042	0.0032	0.0132	0.0122
24	0.0043	0.0032	0.0044	0.0033	0.0135	0.0125
25	0.0045	0.0034	0.0047	0.0035	0.0138	0.0127
26	0.0047	0.0035	0.0049	0.0037	0.0140	0.0130
27	0.0049	0.0037	0.0051	0.0039	0.0144	0.0133

28	0.0052	0.0039	0.0054	0.0041	0.0147	0.0135
29	0.0054	0.0041	0.0057	0.0043	0.0150	0.0138
30	0.0057	0.0043	0.0060	0.0045	0.0153	0.0141
31	0.0060	0.0045	0.0063	0.0048	0.0157	0.0145
32	0.0063	0.0048	0.0066	0.0050	0.0161	0.0148
33	0.0066	0.0050	0.0069	0.0053	0.0164	0.0151
34	0.0069	0.0053	0.0073	0.0055	0.0168	0.0155
35	0.0073	0.0055	0.0077	0.0058	0.0173	0.0158
36	0.0077	0.0058	0.0081	0.0061	0.0177	0.0162
37	0.0081	0.0061	0.0085	0.0065	0.0181	0.0166
38	0.0085	0.0064	0.0090	0.0068	0.0186	0.0170
39	0.0089	0.0068	0.0094	0.0071	0.0191	0.0174
40	0.0094	0.0072	0.0099	0.0075	0.0196	0.0179
41	0.0099	0.0075	0.0105	0.0079	0.0201	0.0183
42	0.0104	0.0080	0.0110	0.0084	0.0207	0.0188
43	0.0110	0.0084	0.0116	0.0088	0.0213	0.0193
44	0.0116	0.0088	0.0123	0.0093	0.0219	0.0198
45	0.0122	0.0093	0.0129	0.0098	0.0225	0.0204
46	0.0129	0.0098	0.0136	0.0103	0.0232	0.0210
47	0.0136	0.0104	0.0144	0.0109	0.0239	0.0216
48	0.0144	0.0109	0.0152	0.0115	0.0246	0.0222
49	0.0152	0.0115	0.0160	0.0121	0.0254	0.0229
50	0.0160	0.0122	0.0169	0.0128	0.0262	0.0235
51	0.0169	0.0129	0.0179	0.0135	0.0271	0.0243
52	0.0179	0.0136	0.0189	0.0142	0.0280	0.0250
53	0.0190	0.0144	0.0200	0.0150	0.0289	0.0258
54	0.0200	0.0152	0.0211	0.0159	0.0299	0.0267
55	0.0212	0.0161	0.0223	0.0168	0.0310	0.0276
56	0.0225	0.0170	0.0236	0.0177	0.0321	0.0285
57	0.0237	0.0180	0.0249	0.0187	0.0333	0.0295
58	0.0251	0.0191	0.0263	0.0198	0.0346	0.0306
59	0.0266	0.0202	0.0278	0.0210	0.0359	0.0317
60	0.0282	0.0214	0.0294	0.0222	0.0373	0.0329
61	0.0299	0.0227	0.0311	0.0235	0.0388	0.0341
62	0.0316	0.0241	0.0329	0.0249	0.0404	0.0355
63	0.0335	0.0255	0.0348	0.0264	0.0421	0.0369
64	0.0355	0.0271	0.0368	0.0279	0.0439	0.0384
65	0.0376	0.0288	0.0389	0.0296	0.0458	0.0401
66	0.0398	0.0306	0.0411	0.0314	0.0479	0.0418
67	0.0422	0.0325	0.0435	0.0334	0.0501	0.0437
68	0.0448	0.0347	0.0461	0.0355	0.0525	0.0457

69	0.0475	0.0369	0.0488	0.0378	0.0551	0.0479
70	0.0506	0.0394	0.0517	0.0403	0.0579	0.0502
71	0.0539	0.0421	0.0549	0.0430	0.0609	0.0528
72	0.0574	0.0452	0.0584	0.0459	0.0642	0.0555
73	0.0612	0.0484	0.0622	0.0491	0.0677	0.0585
74	0.0653	0.0520	0.0662	0.0526	0.0716	0.0618
75	0.0697	0.0558	0.0707	0.0564	0.0759	0.0654
76	0.0747	0.0599	0.0756	0.0606	0.0805	0.0693
77	0.0798	0.0644	0.0811	0.0653	0.0856	0.0736
78	0.0854	0.0695	0.0870	0.0705	0.0912	0.0784
79	0.0918	0.0751	0.0937	0.0762	0.0974	0.0837
80	0.0991	0.0815	0.1011	0.0827	0.1042	0.0895
81	0.1069	0.0887	0.1093	0.0899	0.1117	0.0960
82	0.1160	0.0968	0.1183	0.0979	0.1201	0.1033
83	0.1265	0.1055	0.1284	0.1069	0.1293	0.1113
84	0.1382	0.1157	0.1395	0.1168	0.1395	0.1204
85	0.1506	0.1268	0.1519	0.1279	0.1508	0.1304
86	0.1644	0.1394	0.1653	0.1400	0.1633	0.1417
87	0.1789	0.1526	0.1800	0.1533	0.1772	0.1542
88	0.1948	0.1673	0.1956	0.1677	0.1926	0.1682
89	0.2112	0.1837	0.2131	0.1839	0.2097	0.1837
90	0.2305	0.2023	0.2316	0.2016	0.2286	0.2010
91	0.2493	0.2225	0.2516	0.2206	0.2496	0.2201
92	0.2727	0.2442	0.2740	0.2417	0.2731	0.2415
93	0.2980	0.2676	0.2969	0.2652	0.2996	0.2658
94	0.3244	0.2958	0.3241	0.2926	0.3301	0.2942
95	0.3580	0.3331	0.3558	0.3261	0.3667	0.3292
96	0.4053	0.3845	0.3976	0.3710	0.4139	0.3762
97	0.4806	0.4536	0.4568	0.4368	0.4836	0.4485
98	0.5935	0.5768	0.5771	0.5670	0.6129	0.5863
99	0.9524	0.9524	0.9524	0.9524	0.9921	0.9921

Fig. 3.10. Whole Life Benefit Premium of Austria, Germany and Switzerland

The figure above presents the whole life benefit premium of Austria, Germany and Switzerland by gender from ages 0 to 99. Throughout the age range from 0 to 99, males have consistently higher premiums than females. In comparing the whole life benefit premium between the countries, it is noticeable that Switzerland has higher premium rates for both males and females when compared to Austria and Germany.

It can be concluded that there is a consistent increase of mortality probability as an individual ages. Therefore, in the younger ages, the premiums remain relatively low as this indicates there is minimal mortality risk. However, when an individual passes the age of 60 the mortality risk accelerates where premiums also start accumulating.

The figure highlights that there is a difference between the mortality risk between the three countries. When comparing the mortality risk between genders, it is evident that males have higher mortality risk.

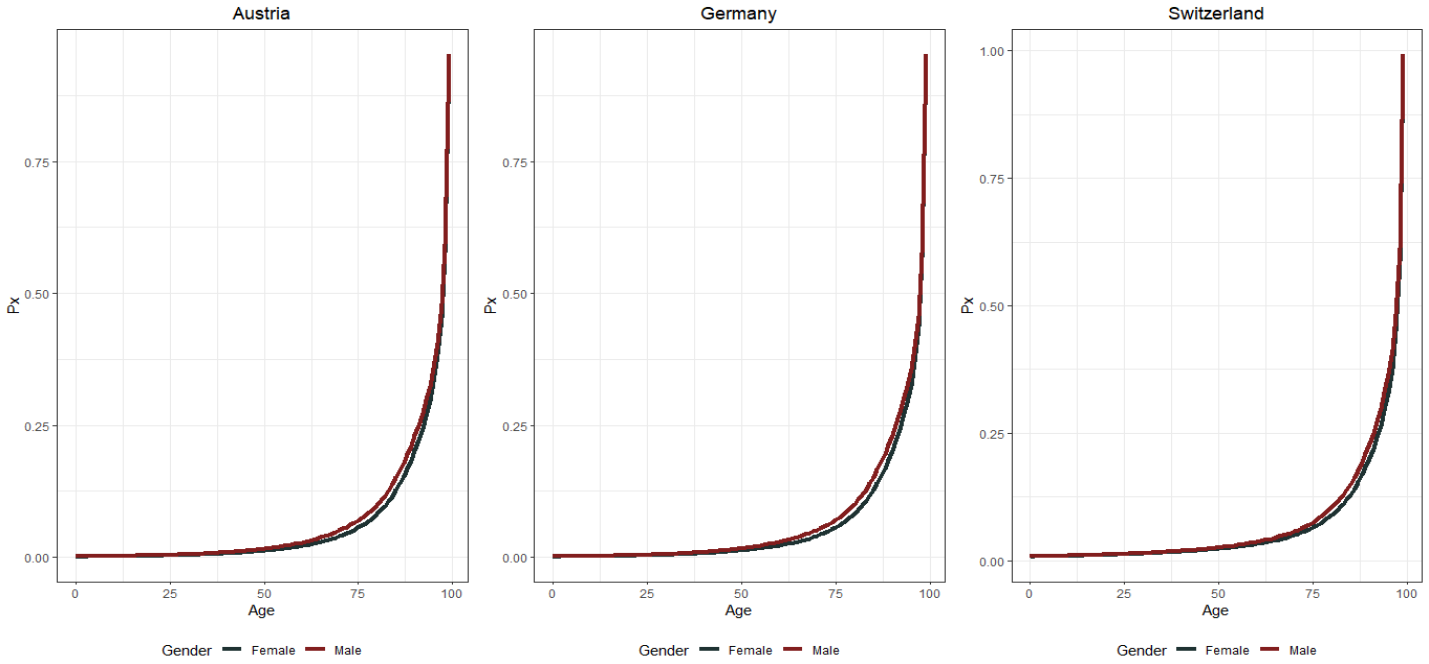

Fig. 3.11. Graphical comparison of whole life benefit premium of Austria, Germany and Switzerland

Austria, Germany, and Switzerland show a fascinating parabola-like behavior in their whole life benefit premium patterns, gradually rising over time. While they all tend to follow a similar trajectory of diverging, peaking, and then converging, the timing and intensity of these changes vary from country to country.

For the case of Austria, the graph begins to show significant divergence at late-60s which is at age 67. It then peaked in the late-90s which is age 99. It began to slightly converge at early-90s which at age 93 (at 0.0304 and at age 94 becomes 0.0286).

For the case of Germany, the graph begins to diverge in the mid-60s at age 65. It then peaked in the late-90s at age 99. It began to converge in the early-90s at age 92 (at 0.0323 then at age 93 became 0.0317).

For the case of Switzerland, the graph diverges late from the others at early-70s, at age 73. It then peaked in the late-90s at the age of 99. It began to converge at late-90s, at age 96 (at 0.0377 and at age 97 at 0.0351).

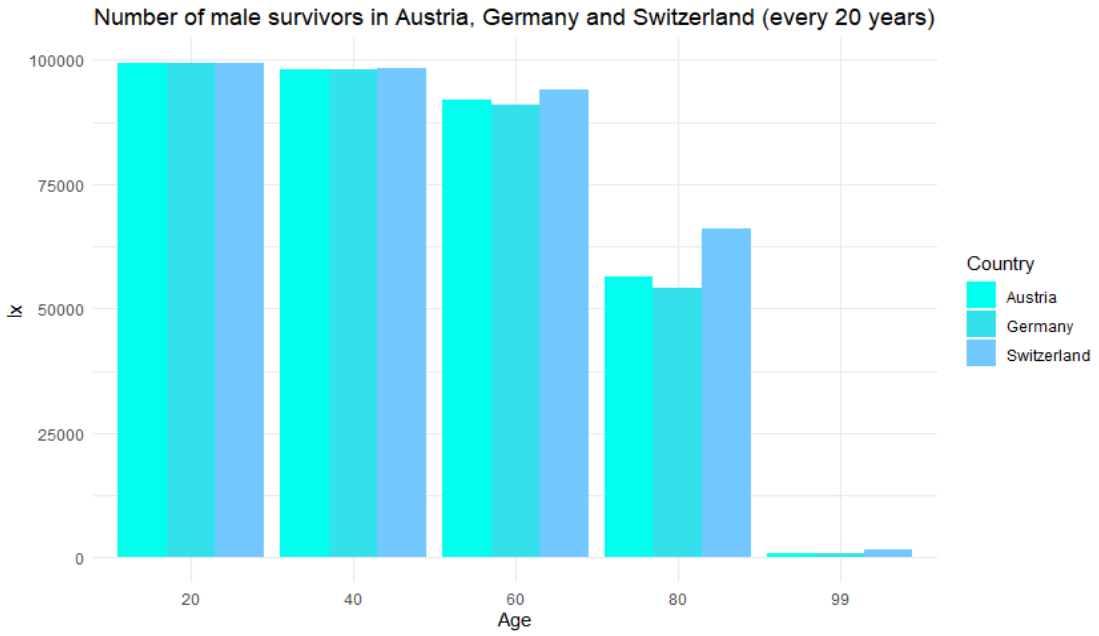

Fig. 3.12. Number of male survivors in Austria, Germany and Switzerland (every 20 years)

From the graph there is an evident declining trend on the number of male survivors in Austria, Germany and Switzerland as age increases. This graph follows typical mortality patterns. At the younger age groups (20 and 40), the number of survivors between the three countries are high and quite similar with each of the countries. Though the disparity becomes larger from the older age groups (50, 80, and 99). This suggests that there is a difference in life expectancy in Austria, Germany and Switzerland.

Furthermore, Switzerland notably has higher survival numbers in the older age groups. This indicates that the population in Switzerland has longer life longevity compared to Austria and Germany. Some possible factors that influence this is Switzerland has better quality of life, healthcare and socioeconomic conditions compared to the two other countries.

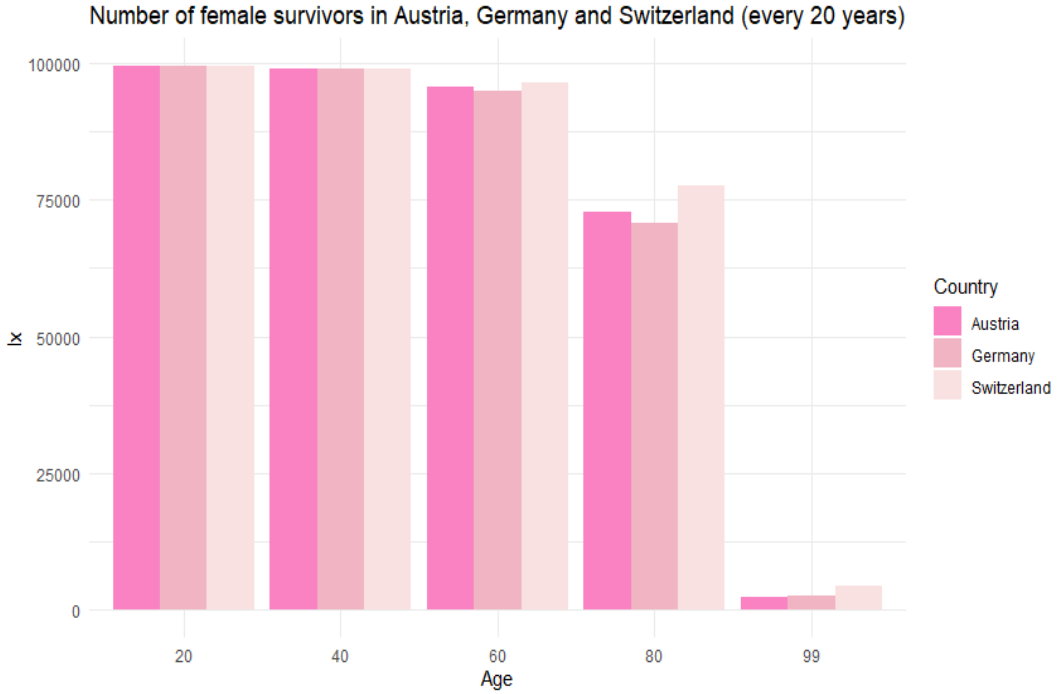

Fig. 3.13. Number of female survivors in Austria, Germany and Switzerland (every 20 years)

It is shown in the graph that there is an evident declining trend on the number of female survivors in Austria, Germany and Switzerland as age increases. Furthermore the graph follows typical mortality patterns. From ages 20-40 years, the number of female survivors between the three countries are quite similar. Though there is a larger disparity from the older age groups (50, 80, and 99). This suggests that there is a difference in life expectancy in Austria, Germany and Switzerland.

It is also important to note that Switzerland notably has higher survival numbers in the older age groups. This indicates that the population in Switzerland has longer life longevity compared to Austria and Germany. Some possible factors that influence this is Switzerland has better quality of life, healthcare and socioeconomic conditions compared to the two other countries.

Furthermore, when comparing the graph of the number of male and female survivors in Austria, Germany and Switzerland it is observed that female survivors are greater than male survivors in the older age groups (50,80 and 99) which aligns with global observed demographic trends that females typically have longer life expectancies than males.

4. SUMMARY

Looking through the graphical comparisons of life insurance metrics from Austria, Germany, and Switzerland, the researchers uncover some intriguing trends and a few similarities. These analyses shed light on how survival rates, expected whole life annuities, and whole life benefit premiums evolve over time, illustrating the differences in their divergence, peak, and convergence points. Typically, Austria and Germany are in sync, whereas Switzerland often shows a delay in divergence and converges later in several cases.

The survival trends for men and women in Austria, Germany, and Switzerland show a downwards exponential pattern. This divergence starts in the early 30s and reaches its peak around age 60. Interestingly, by the mid-80s, the survival rates for both genders began to converge, indicating that the differences in survival based on gender are consistent across these three countries but tend to lessen as people get older.

By analyzing the graphical comparison of expected whole life annuity values in Austria, Germany, and Switzerland, some clear trends emerge. Austria and Germany both display a downward exponential trend, hitting their peak in the mid-50s before tapering off and converging around age 64. In contrast, Switzerland follows a different path with a more linear decline, diverging right from the beginning, peaking around age 50, and converging much earlier at age 51. These distinct differences really emphasize how annuity values can vary across these three countries.

For whole life annuities where benefits are disbursed at the end of the insured's year of death, Austria and Germany reveal an upward exponential trend, whereas Switzerland opts for a steady linear increase. The divergence in these trends appears early, peaks at age 99, and then starts to converge in the mid-60s for Austria and Germany. Switzerland, on the other hand, experiences this convergence a bit sooner. This points to unique yet similar patterns in how annuities behave, influenced by the specific demographic factors of each country.

The whole life benefit premiums in Austria, Germany, and Switzerland follow a parabolic trend. They diverge, hit a peak at age 99, and then come back together at various points. In Austria and Germany, this divergence occurs in the mid-60s, whereas Switzerland sees it happening later, around the early 70s. These patterns showcase the distinct variations in premium structures and longevity risks that each country faces.

The graphical comparison regarding the number of survivors amongst men and women behave similarly. It is also important to note that the discrepancies in the ages where they begin to diverge and converge are roughly around the same. However, the number of male and female survivors in Switzerland at age 99 is extremely higher than the records that were shown in Austria and Germany.

The graphical comparison regarding the expected whole life value annuity of amongst men and women in Austria and Germany are strikingly similar with one another.

5. CONCLUSIONS

For all three countries, as time passes, there are less male survivors than female survivors. It is because more men in the Germanosphere partake in risky health behaviors such as alcohol consumption, poor dietary habits and ignorance in seeking preventive healthcare. Youth mortality rates are higher in Switzerland as the Swiss youth are more inclined to partake in risky behaviors that cut one's life short in addition to the expensive healthcare costs creating disparities for the Swiss youth in contrast to Austria and Germany. However, elderly mortality rates in Switzerland are lower in Switzerland as their advanced healthcare is often geared towards the elderly in addition to the high standard of living and strong social support systems that are less prevalent in Austria and Germany.

The lower count of the male survivors when compared to the female survivors reflects the higher price of the expected value of the benefit paid at the insurer's year of death and whole life benefit amongst individuals in the Germanosphere as men are inclined to receive benefits earlier than women as the life expectancy of men is shorter than the life expectancy when compared to the women that leads to higher mortality rates in the latter's earlier life and the latter's inclination of partaking in risky behaviors such as vices and poor observance of health. Furthermore, economic conditions also play a role as men are more inclined to earn more than women; hence, they have more capacity in paying off loans with regards to insurance payments. However, the expected whole life value annuity amongst the males is less than the expected whole life value annuity amongst the females. It is because women are inclined to live longer than men that gives rise to the payments being made over a longer period of time when compared to men. This eventually paved the way for the expected whole life value annuity amongst the males being less than those by the females as female insurers make payments for a longer period of time.

The expected value of the whole life annuity amongst men and women in Austria and Germany are strikingly similar with one another in contrast to Switzerland. It is because the Austrian economy is heavily reliant on the German economy that is highly evident by their shared interest rate of 5% in contrast to the 0.8% interest rate of Switzerland. The interest rates of Austria and Germany makes the present value of the whole life annuity being less than Switzerland as it is heavily discounted with respect to the present; hence, a big fraction of the future value is heavily removed when it is in the present time. Furthermore, the lesser interest rate of Switzerland contributed to its linearly graphical behavior as the present value does not change a lot, which contributed to the less pronounced look of the

graph. It contributed to the more pronounced look of the graphs in Austria and Germany as the payments are more sensitive to the extreme interest rates that were set in those countries. In other words, the lesser interest rate in Switzerland radiated less influence and impact on the behavior of the graph concerning the expected value of whole life annuity, which eventually contributed to a predictable linear decrease as opposed to an unpredictable exponential decrease.

The expected value of the whole life annuity paid at the end of the year of death amongst men and women in Austria and Germany are strikingly similar with one another in contrast to Switzerland. With the Austrian economy being heavily reliant on the German economy sharing an interest rate of 5%, in contrast to the 0.8% interest rate of Switzerland. The interest rates of Austria and Germany make the expected value of the whole life annuity of the insured paid at the end of the year of death contributes to a more pronounced rise in the graphical behavior of the annuity. It is due to the greater impact brought on long-term payouts due to the stronger multiplicative impact a high interest rate possesses when applied to an annuity. Furthermore, the lesser interest rate of Switzerland contributed to its linearly graphical behavior as the value is more consistent all throughout, which contributed to the less pronounced look of the graph. It makes one fully conclude that higher interest rates contribute to a more pronounced look of the graphs in Austria and Germany due to its heightened sensitivity with respect to its extreme interest rates.

The whole life benefit premium of Austria, Germany and Switzerland behave similarly with one another. However, Switzerland is highest out of the three for most ages, followed by Germany and Austria. It may be linked to the notion that Switzerland had the highest number of survivors out of the three countries and eventually contributed to the higher premiums that were charged as a result of their longer lifespan. It is also partly due to the stabler financial market of Switzerland that made the conservative investment strategy that is prevalently used by Swiss citizens that allowed insurance companies to charge more costly premiums to its customers for the sake of the long-term costs of the whole life benefit premium. Furthermore, insurance regulations in Austria and Germany are not as strict when compared to Switzerland due to the lesser need to meet the regulatory requirements of the former two. Lastly, Switzerland has an extremely higher cost of living when compared to Austria and Germany that ultimately triggered the expensive cost of their whole life benefit premium.

6. APPENDICES

```
library(lifecontingencies)
setwd("C:/Users/Tommy/Downloads")

#Austria
a = read.csv("AA.csv", header=TRUE)
a.male.table                                    =
      new("actuarialtable",x=a$Age,
      lx=a$lx, interest=0.05)
a.male.Axn = Axn(a.male.table, 0:99)
a.male.axn = axn(a.male.table, 0:99)
a.male.Px       =       (Axn(a.male.table,
      0:99))/(axn(a.male.table, 0:99))

b = read.csv("AB.csv", header=TRUE)
b.female.table                                  =
      new("actuarialtable",x=b$Age,
      lx=b$lx, interest=0.05)
b.female.Axn = Axn(b.female.table, 0:99)
b.female.axn = axn(b.female.table, 0:99)
b.female.Px     =     (Axn(b.female.table,
      0:99))/(axn(b.female.table, 0:99))

ab.finaltable  =  data.frame(a$Age,  a$lx,
      b$lx,    a.male.axn,    b.female.axn,
      a.male.Axn, b.female.Axn, a.male.Px,
      b.female.Px)
write.csv(ab.finaltable,
      "AustriaFinal.csv")

#Germany
c = read.csv("BA.csv", header=TRUE)
c.male.table                                    =
      new("actuarialtable",x=c$Age,
      lx=c$lx, interest=0.05)
c.male.Axn = Axn(c.male.table, 0:99)
c.male.axn = axn(c.male.table, 0:99)
c.male.Px       =       (Axn(c.male.table,
      0:99))/(axn(c.male.table, 0:99))

e = read.csv("BC.csv", header=TRUE)
e.female.table                                  =
      new("actuarialtable",x=e$Age,
      lx=e$lx, interest=0.05)
e.female.Axn = Axn(e.female.table, 0:99)
e.female.axn = axn(e.female.table, 0:99)
e.female.Px     =     (Axn(e.female.table,
      0:99))/(axn(e.female.table, 0:99))

ce.finaltable  =  data.frame(c$Age,  c$lx,
      e$lx,    c.male.axn,    e.female.axn,
      c.male.Axn, e.female.Axn, c.male.Px,
      e.female.Px)
write.csv(ce.finaltable,
      "GermanyFinal.csv")

#Switzerland
f = read.csv("CB.csv", header=TRUE)
```

```
f.male.table                                =
      new("actuarialtable",x=f$Age,
      lx=f$lx, interest=0.008)
f.male.Axn = Axn(f.male.table, 0:99)
f.male.axn = axn(f.male.table, 0:99)
f.male.Px       =       (Axn(f.male.table,
      0:99))/(axn(f.male.table, 0:99))

g = read.csv("CC.csv", header=TRUE)
g.female.table                              =
      new("actuarialtable",x=g$Age,
      lx=g$lx, interest=0.008)
g.female.Axn = Axn(g.female.table, 0:99)
g.female.axn = axn(g.female.table, 0:99)
g.female.Px     =     (Axn(g.female.table,
      0:99))/(axn(g.female.table, 0:99))

fg.finaltable  =  data.frame(f$Age,  f$lx,
      g$lx,    f.male.axn,    g.female.axn,
      f.male.Axn, g.female.Axn, f.male.Px,
      g.female.Px)
write.csv(fg.finaltable,
      "SwitzerlandFinal.csv")

abcefg.survivors = data.frame(a$Age, a$lx,
      b$lx, c$lx, e$lx, f$lx, g$lx)
write.csv(abcefg.survivors, "lx.csv")

abcefg.axn = data.frame(a$Age, a.male.axn,
      b.female.axn,            c.male.axn,
      e.female.axn,            f.male.axn,
      g.female.axn)
write.csv(abcefg.axn, "axn.csv")

abcefg.Axn = data.frame(a$Age, a.male.Axn,
      b.female.Axn,            c.male.Axn,
      e.female.Axn,            f.male.Axn,
      g.female.Axn)
write.csv(abcefg.Axn, "Bxn.csv")

abcefg.Px  =  data.frame(a$Age,  a.male.Px,
      b.female.Px, c.male.Px, e.female.Px,
      f.male.Px, g.female.Px)
write.csv(abcefg.Px, "Px.csv")
```

Fig. 6.1. Actuarial Table Codes

```
library(ggplot2)
library(gridExtra)
setwd("C:/Users/Tommy/Downloads")

#lx
h = read.csv("EC.csv", header=TRUE)
ha   =   ggplot(data=h,   aes(x=Age,   y=lx,
group=Gender))     +     theme_bw()     +
theme(plot.title = element_text(hjust=0.5))
+ geom_line(aes(color=Gender), size= 1.7) +
ggtitle("Austria")                          +
scale_color_manual(values=c("#223332",
"#822222"))                                 +
theme(legend.position="bottom")

i = read.csv("EF.csv", header=TRUE)
ib   =   ggplot(data=i,   aes(x=Age,   y=lx,
group=Gender))     +        theme_bw()     +
theme(plot.title = element_text(hjust=0.5))
+ geom_line(aes(color=Gender), size= 1.7) +
ggtitle("Germany")                          +
scale_color_manual(values=c("#223332",
"#822222"))                                 +
theme(legend.position="bottom")

j = read.csv("EG.csv", header=TRUE)
jb   =   ggplot(data=j,   aes(x=Age,   y=lx,
group=Gender))     +        theme_bw()     +
theme(plot.title = element_text(hjust=0.5))
+ geom_line(aes(color=Gender), size= 1.7) +
ggtitle("Switzerland")                      +
scale_color_manual(values=c("#223332",
"#822222"))                                 +
theme(legend.position="bottom")

grid.arrange(ha, ib, jb, ncol=3)

#axn
k = read.csv("FA.csv", header=TRUE)
ka   =   ggplot(data=k,   aes(x=Age,   y=axn,
group=Gender))     +     theme_bw()     +
theme(plot.title = element_text(hjust=0.5))
+ geom_line(aes(color=Gender), size= 1.7) +
ggtitle("Austria")                          +
scale_color_manual(values=c("#223332",
"#822222"))                                 +
theme(legend.position="bottom")

l = read.csv("FE.csv", header=TRUE)
lb   =   ggplot(data=l,   aes(x=Age,   y=axn,
group=Gender))     +     theme_bw()     +
theme(plot.title = element_text(hjust=0.5))
+ geom_line(aes(color=Gender), size= 1.7) +
ggtitle("Germany")                          +
scale_color_manual(values=c("#223332",
"#822222"))                                 +
theme(legend.position="bottom")

n = read.csv("FH.csv", header=TRUE)
nb   =   ggplot(data=n,   aes(x=Age,   y=axn,
group=Gender))     +        theme_bw()     +
theme(plot.title = element_text(hjust=0.5))
+ geom_line(aes(color=Gender), size= 1.7) +
ggtitle("Switzerland")                      +
scale_color_manual(values=c("#223332",
"#822222"))                                 +
theme(legend.position="bottom")

grid.arrange(ka, lb, nb, ncol=3)

#Axn
o = read.csv("GA.csv", header=TRUE)
oa   =   ggplot(data=o,   aes(x=Age,   y=Axn,
group=Gender))     +     theme_bw()     +
```

```
theme(plot.title = element_text(hjust=0.5))
+ geom_line(aes(color=Gender), size= 1.7) +
ggtitle("Austria")                          +
scale_color_manual(values=c("#223332",
"#822222"))                                 +
theme(legend.position="bottom")

p = read.csv("GC.csv", header=TRUE)
pa   =   ggplot(data=p,   aes(x=Age,   y=Axn,
group=Gender))      +      theme_bw()      +
theme(plot.title = element_text(hjust=0.5))
+ geom_line(aes(color=Gender), size= 1.7) +
ggtitle("Germany")                          +
scale_color_manual(values=c("#223332",
"#822222"))                                 +
theme(legend.position="bottom")

q = read.csv("GE.csv", header=TRUE)
qa   =   ggplot(data=q,   aes(x=Age,   y=Axn,
group=Gender))     +         theme_bw()     +
theme(plot.title = element_text(hjust=0.5))
+ geom_line(aes(color=Gender), size= 1.7) +
ggtitle("Switzerland")                      +
scale_color_manual(values=c("#223332",
"#822222"))                                 +
theme(legend.position="bottom")

grid.arrange(oa, pa, qa, ncol=3)

#Px
r = read.csv("HB.csv", header=TRUE)
ra   =   ggplot(data=r,   aes(x=Age,   y=Px,
group=Gender))      +      theme_bw()      +
theme(plot.title = element_text(hjust=0.5))
+ geom_line(aes(color=Gender), size= 1.7) +
ggtitle("Austria")                          +
scale_color_manual(values=c("#223332",
"#822222"))                                 +
theme(legend.position="bottom")

s = read.csv("HC.csv", header=TRUE)
sa   =   ggplot(data=s,   aes(x=Age,   y=Px,
group=Gender))      +      theme_bw()      +
theme(plot.title = element_text(hjust=0.5))
+ geom_line(aes(color=Gender), size= 1.7) +
ggtitle("Germany")                          +
scale_color_manual(values=c("#223332",
"#822222"))                                 +
theme(legend.position="bottom")

t = read.csv("HG.csv", header=TRUE)
ta   =   ggplot(data=t,   aes(x=Age,   y=Px,
group=Gender))     +         theme_bw()     +
theme(plot.title = element_text(hjust=0.5))
+ geom_line(aes(color=Gender), size= 1.7) +
ggtitle("Switzerland")                      +
scale_color_manual(values=c("#223332",
"#822222"))                                 +
theme(legend.position="bottom")

grid.arrange(ra, sa, ta, ncol=3)
```

Fig. 6.2. Graph Codes

```
library(ggplot2)
ua   =   data.frame(Country=rep(c("Austria",
      "Germany",  "Switzerland"),  each=5),
      Age=rep(c("20",   "40",   "60",   "80",
      "99"), 3), lx=c(99411, 98040, 91903,
      56334,   843,   99390,   98141,   90889,
      54070,   871,   99321,   98328,   93892,
      66153, 1592))
ggplot(data=ua,       aes(x=Age,       y=lx,
      fill=Country))                        +
      geom_bar(stat="identity",
      position=position_dodge())+
      ggtitle("Number of male survivors in
      Austria,   Germany   and   Switzerland
      (every       20       years)")       +
      theme(plot.title                      =
      element_text(hjust=0.5))              +
      scale_fill_manual(values=c("#01FFF1"
      ,     "#33E3EE",     "#77CCFF"))     +
      theme_minimal()
uc   =   data.frame(Country=rep(c("Austria",
      "Germany",  "Switzerland"),  each=5),
      Age=rep(c("20",   "40",   "60",   "80",
      "99"), 3), lx=c(99496, 98872, 95628,
      72648,   2412,   99517,   98897,   94901,
      70683,   2565,   99465,   98989,   96334,
      77654, 4375))
ggplot(data=uc,       aes(x=Age,       y=lx,
      fill=Country))                        +
      geom_bar(stat="identity",
      position=position_dodge())+
      ggtitle("Number of female survivors
      in Austria, Germany and Switzerland
      (every       20       years)")       +
      theme(plot.title                      =
      element_text(hjust=0.5))              +
      scale_fill_manual(values=c("#FA86C3"
      ,     "#F2B8C6",     "#FEE5E5"))     +
      theme_minimal()
```

Fig. 6.3. Comparison Codes

https://docs.google.com/spreadsheets/d/12FUGWVqyma4KroOjjLclgF6N6mLNfFY4wXzbRTAqd5Y/edit

Fig. 6.4. Actuarial Table Spreadsheets

https://docs.google.com/spreadsheets/d/1X12vjSKvoCp9uh3tynsbX8GdgI9OGoKbz-zN_eCEv5E/edit

Fig. 6.5. Graph Spreadsheets

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