Liite 1

Asetuksen 4 §:ssä tarkoitettu pääomakerroin lasketaan kaavalla:

(1) $$P_{x+\frac{1}{2}} = \frac{1}{m}\sum_{k\geq 0}\sum_{l=0}^{m-1} d_{x+\frac{1}{2}}(k+\tfrac{l}{m})$$

missä $x+\frac{1}{2}$ on pääomakertoimen laskennassa käytettävä ikä asetuksen 4 §:n mukaisesti, $m = 12$, indeksi k viittaa kokonaisten vuosien ja l vuoden murto-osien määrään (eli kuukausiin) pääomakertoimen laskentaiästä eteenpäin.

Sekä kuolevuuden että koron vaikutukset sisältävät diskonttauskertoimet laskentaiälle $x+\frac{1}{2}$ hetkellä $k+\frac{l}{m}$ lasketaan tulona

(2) $$d_{x+\frac{1}{2}}(k+\tfrac{l}{m}) = p_{x+\frac{1}{2}}(k+\tfrac{l}{m})\cdot v(k+\tfrac{l}{m}) = [1-q_{x+\frac{1}{2}}(k+\tfrac{l}{m})]\cdot v(k+\tfrac{l}{m}),$$

missä $p_{x+\frac{1}{2}}(k+\frac{l}{m})$ tarkoittaa todennäköisyyttä sille, että $x+\frac{1}{2}$-ikäinen henkilö elää vielä iässä $x+\frac{1}{2}+k+\frac{l}{m}$ ja vastaavasti $q_{x+\frac{1}{2}}(k+\frac{l}{m})$ tarkoittaa todennäköisyyttä sille, että jos henkilö on elossa iässä $x+\frac{1}{2}$, hän kuolee ikään $x+\frac{1}{2}+k+\frac{l}{m}$ mennessä.

Termi $v(k+\frac{l}{m})$ on korkoon liittyvä diskonttaustekijä tulevaisuudessa hetkellä $k+\frac{l}{m}$ maksettavalle suoritukselle, ja vakiokorolla i pätee:

(3) $$v(k+\tfrac{l}{m}) = (\frac{1}{1+i})^{k+\frac{l}{m}}.$$

Todennäköisyydet $p_{x+\frac{1}{2}}(k+\frac{l}{m})$ perustuvat diskreettiin referenssikuolevuusmalliin, jossa kuolevuudet määritellään kullekin syntymävuosikymmenkohortille ja iälle x, ja lasketaan estimaatilla, joka perustuu oletukseen kuolinhetkien tasajakaumasta ikävuoden sisällä:

(4) $$q_x(1) = \min\{\frac{\tilde{m}_x}{1+\frac{1}{2}\tilde{m}_x}, 1\},$$
$$p_x(\tfrac{l}{m}) = 1-(\tfrac{l}{m})\cdot q_x(1),$$
$$p_x(k+\tfrac{l}{m}) = p_x(k)\cdot p_{x+k}(\tfrac{l}{m}) = (\prod_{u=0}^{k-1} p_{x+u}(1))\cdot p_{x+k}(\tfrac{l}{m}),$$
$$p_{x+\frac{1}{2}}(k+\tfrac{l}{m}) = \frac{p_x(\frac{1}{2}+k+\frac{l}{m})}{p_x(\frac{1}{2})} = \frac{p_x(k)\cdot p_{x+k}(\frac{1}{2}+\frac{l}{m})}{p_x(\frac{1}{2})}.$$

Kuolevuusennuste $\tilde{m}_x$ kokonaisluvuille x saadaan referenssikuolevuusmallista. Referenssikuolevuusmallin kuolevuusennusteen $\tilde{m}_x$ arvot esitetään taulukossa 1.

Taulukko 1: Kuolevuusennusteet referenssikuolevuusmalli K2016

Ikä	Syntymävuodet	Syntymävuodet	Syntymävuodet	Syntymävuodet	Syntymävuodet	Syntymävuodet	Syntymävuodet	Syntymävuodet	Syntymävuodet	Syntymävuodet
x	< 1940	1940-1949	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019	≥ 2020
0									0.00384575149	0.00236402452
1									0.00028744350	0.00017658661
2									0.00024098288	0.00014737554
3									0.00017978166	0.00011698577
4									0.00014271317	0.00008840097
5									0.00002303620	0.00001443470
6									0.00015350129	0.00009480854
7									0.00020127334	0.00013501790
8									0.00012851824	0.00008516791
9									0.00010701087	0.00007316512
10								0.00027762513	0.00019055305	0.00013261326
11								0.00002988288	0.00001936764	0.00001268469
12								0.00014626215	0.00010163751	0.00007122580
13								0.00014247175	0.00010470021	0.00007748414
14								0.00016329863	0.00011951291	0.00008799092
15								0.00013524692	0.00010346308	0.00007955765
16								0.00050813861	0.00040615488	0.00032610624
17								0.00030061800	0.00023713240	0.00018780032
18								0.00077082146	0.00066780226	0.00058060690
19								0.00052988095	0.00045211501	0.00038699083
20							0.00100375677	0.00088219718	0.00078617056	0.00070260910
21							0.00067207409	0.00057783996	0.00050204989	0.00043733667
22							0.00080489688	0.00068089876	0.00058087957	0.00049672813
23							0.00081796364	0.00070009006	0.00060342079	0.00052122817
24							0.00099913510	0.00083944358	0.00070949545	0.00060085795
25							0.00123721219	0.00104652455	0.00088980157	0.00075793651
26							0.00107896635	0.00090112711	0.00075600066	0.00063532160
27							0.00104791367	0.00087348743	0.00073099990	0.00061271600
28							0.00092276408	0.00075947218	0.00062729709	0.00051888059
29							0.00119659282	0.00099799802	0.00083501467	0.00069959651
30						0.00113111815	0.00092554762	0.00076789793	0.00063893121	0.00053229743
31						0.00124977224	0.00103659144	0.00086882689	0.00073011051	0.00061426795
32						0.00135084817	0.00110783229	0.00091622633	0.00075955740	0.00063037622
33						0.00149402940	0.00120043202	0.00097132024	0.00078764146	0.00063936144
34						0.00118528282	0.00096874519	0.00079650395	0.00065619121	0.00054112488
35						0.00127745618	0.00103646060	0.00084527516	0.00069062027	0.00056478129
36						0.00156797278	0.00127075236	0.00103452572	0.00084363966	0.00068857238
37						0.00152412152	0.00123599971	0.00100634443	0.00082064659	0.00066976364
38						0.00170216701	0.00139895047	0.00115383239	0.00095305039	0.00078781719
39						0.00112746364	0.00090903795	0.00073526285	0.00059551448	0.00048268136
40					0.00172714023	0.00140255671	0.00115485429	0.00095362984	0.00078846448	0.00065235844
41					0.00221968455	0.00181553884	0.00150061305	0.00124354529	0.00103173556	0.00085656751
42					0.00240224506	0.00193375871	0.00156981517	0.00127739097	0.00104059218	0.00084822158
43					0.00195643540	0.00158523483	0.00129350510	0.00105775221	0.00086586758	0.00070921463
44					0.00259701948	0.00209548334	0.00170092051	0.00138340049	0.00112625428	0.00091742629
45					0.00280087757	0.00228154541	0.00186811079	0.00153239967	0.00125817553	0.00103358207
46					0.00303794450	0.00249808244	0.00206343911	0.00170730801	0.00141386848	0.00117146630

47						0.00332356833	0.00271575933	0.00222796035	0.00183064814	0.00150542170	0.00123858244
48						0.00359945881	0.00294396744	0.00241640104	0.00198626769	0.00163396591	0.00134478262
49						0.00324313015	0.00263743474	0.00215169250	0.00175779324	0.00143705656	0.00117537064
50					0.00410218285	0.00330899549	0.00270639555	0.00221989403	0.00182315199	0.00149835720	0.00123195345
51					0.00484956305	0.00394451786	0.00324215768	0.00267180065	0.00220438718	0.00181994433	0.00150316566
52					0.00530536129	0.00431533738	0.00353977626	0.00291048893	0.00239572787	0.00197324523	0.00162590688
53					0.00543541000	0.00437938067	0.00355336262	0.00288939968	0.00235194657	0.00191560496	0.00156080421
54					0.00568235333	0.00459581867	0.00373928301	0.00304844166	0.00248766596	0.00203119882	0.00165909067
55					0.00516535409	0.00417824068	0.00339723295	0.00276728005	0.00225621592	0.00184052939	0.00150195138
56					0.00553060092	0.00449480678	0.00366950678	0.00300081822	0.00245611444	0.00201131995	0.00164762660
57					0.00603354464	0.00487419756	0.00395333150	0.00321147527	0.00261096954	0.00212379443	0.00172807500
58					0.00693291314	0.00560964446	0.00455507078	0.00370414241	0.00301450960	0.00245442379	0.00199901720
59					0.00634808000	0.00508448242	0.00408537804	0.00328705408	0.00264667087	0.00213200358	0.00171792801
60				0.00803033427	0.00638530592	0.00514806153	0.00416247490	0.00336983926	0.00273003738	0.00221265885	0.00179384356
61				0.00882147039	0.00701026492	0.00562959004	0.00453261489	0.00365371593	0.00294718325	0.00237825279	0.00191967881
62				0.00884123906	0.00700724329	0.00560070276	0.00448711227	0.00359892454	0.00288835512	0.00231899315	0.00186236025
63				0.00989615135	0.00785427040	0.00627757358	0.00502827515	0.00403179087	0.00323471208	0.00259619457	0.00208425126
64				0.01022668618	0.00810292155	0.00645861118	0.00515823051	0.00412369918	0.00329852214	0.00263942390	0.00211254609
65				0.00884814051	0.00703364793	0.00562014810	0.00449894626	0.00360473723	0.00288982117	0.00231749788	0.00185896536
66				0.00933384168	0.00737883380	0.00585966770	0.00466115532	0.00371100105	0.00295605312	0.00235547479	0.00187734764
67				0.01049491652	0.00824534125	0.00650380915	0.00513816666	0.00406260368	0.00321376546	0.00254309941	0.00201283937
68				0.01199691228	0.00944422563	0.00746110997	0.00590300675	0.00467390164	0.00370245461	0.00293382372	0.00232526082
69				0.01048734043	0.00823034982	0.00647966219	0.00510828988	0.00403011272	0.00318092738	0.00251142004	0.00198323990
70			0.01648471389	0.01277881091	0.01004415505	0.00791739389	0.00624885942	0.00493538578	0.00389967053	0.00308218688	0.00243656139
71			0.01610334745	0.01247816671	0.00977089381	0.00767092109	0.00602940759	0.00474229071	0.00373147228	0.00293691885	0.00231200192
72			0.01690512918	0.01310705365	0.01024832584	0.00803211388	0.00630214197	0.00494787307	0.00388615348	0.00305306954	0.00239902769
73			0.01785080633	0.01397464825	0.01101717823	0.00870444579	0.00688436068	0.00544809629	0.00431310379	0.00341543695	0.00270509094
74			0.02197212598	0.01717266813	0.01350188093	0.01063689498	0.00838803227	0.00661837714	0.00522396482	0.00412435732	0.00325678497
75			0.02204630960	0.01727802719	0.01361102787	0.01074196182	0.00848547284	0.00670660981	0.00530250459	0.00419336475	0.00331679491
76			0.02410851441	0.01889111278	0.01486971321	0.01172419336	0.00925209891	0.00730501676	0.00576962033	0.00455798896	0.00360140052
77			0.02633848196	0.02074057713	0.01639760579	0.01298438218	0.01029006246	0.00815883563	0.00647109525	0.00513362361	0.00407324185
78			0.03002116317	0.02382831497	0.01898013799	0.01514042794	0.01208685706	0.00965367127	0.00771268734	0.00616328614	0.00492591358
79			0.03144794435	0.02490323898	0.01978338264	0.01573745006	0.01252814205	0.00997777886	0.00794895651	0.00633397961	0.00504788031
80		0.04588084313	0.03615716568	0.02889158068	0.02315229808	0.01857661443	0.01491560514	0.01198123668	0.00962690436	0.00773675791	0.00621863805
81		0.04996368023	0.03994232046	0.03226718307	0.02613476060	0.02119287643	0.01719680189	0.01395995394	0.01133548127	0.00920620115	0.00747795811
82		0.05286852135	0.04246119313	0.03439129169	0.02792118625	0.02269345584	0.01845607942	0.01501582834	0.01222009237	0.00994675681	0.00809745991
83		0.05880601251	0.04760276678	0.03880512638	0.03170204431	0.02592609902	0.02121513266	0.01736674000	0.01422008140	0.01164568654	0.00953864522
84		0.06835850103	0.05579047806	0.04580558508	0.03768260239	0.03103044217	0.02556708634	0.02107326486	0.01737359613	0.01432598122	0.01181451711
85		0.07526062718	0.06194079227	0.05124177884	0.04246856150	0.03522983960	0.02924073804	0.02427822963	0.02016272718	0.01674772894	0.01391290862
86		0.08568306132	0.07103395877	0.05915548558	0.04934684103	0.04120032141	0.03441640521	0.02875911238	0.02403728790	0.02009405433	0.01679977696
87		0.09701939290	0.08111595238	0.06809002577	0.05724558127	0.04816774476	0.04054936969	0.03414690443	0.02876174243	0.02422975309	0.02041433111
88		0.11088067382	0.09381082650	0.07965082606	0.06772676906	0.05763242347	0.04906561997	0.04178513401	0.03559259826	0.03032253032	0.02583581359
89		0.12401311870	0.10578022723	0.09051540578	0.07755853713	0.06650513895	0.05705263446	0.04895817744	0.04202087333	0.03607204419	0.03096891782
90		0.14005734218	0.12057203014	0.10409578500	0.08998484558	0.07784082950	0.06736464013	0.05831506621	0.05049133947	0.04372370281	0.03786737998
91		0.15376496081	0.13392490101	0.11694859210	0.10224511511	0.08944921656	0.07828688786	0.06853638572	0.06001197015	0.05255531505	0.04603015307
92		0.17673028906	0.15636269551	0.13867059953	0.12311671836	0.10937591797	0.09720697360	0.08641487033	0.07683540069	0.06832734308	0.06076779817
93		0.19885482189	0.17482227885	0.15402764936	0.13584771523	0.11988494794	0.10583783658	0.09346058133	0.08254584849	0.07291562117	0.06441552326
94		0.22759770251	0.20262167766	0.18074572789	0.16138932252	0.14418754706	0.12886590331	0.11520082768	0.10300301488	0.09210881939	0.08237510319
95		0.22567033343	0.20422481115	0.18515628011	0.16802277493	0.15255709420	0.13856312952	0.12588284028	0.11438254986	0.10394614178	0.09447118254
96		0.26117089371	0.23641290638	0.21436452547	0.19454118940	0.17664195848	0.16044317400	0.14576344848	0.13244883525	0.12036535178	0.10939466699
97		0.30226768137	0.27367853969	0.24818242115	0.22524603901	0.20452987817	0.18577864591	0.16878406763	0.15336880969	0.13937825248	0.12667568806

98	0.34984334737	0.31682300539	0.28733765998	0.26079835191	0.23682144065	0.21511529725	0.19544067590	0.17759325605	0.16139457804	0.14668668983
99	0.40491983868	0.36677408785	0.33267283217	0.30196354487	0.27421208852	0.24908508255	0.22630759769	0.20564416822	0.18688879196	0.16985895684
100	0.46868038438	0.42460603259	0.38516356934	0.34962790975	0.31750710201	0.28841977553	0.26204987999	0.23812600077	0.21641031321	0.19669191016
101	0.54249495323	0.49156267114	0.44593955400	0.40481770409	0.36763894784	0.33396673676	0.30343762385	0.27573869602	0.25059535807	0.22776387224
102	0.62794973107	0.56908419756	0.51630884703	0.46872125692	0.42568736861	0.38670717206	0.35136258002	0.31929276899	0.29018065270	0.26374453245
103	0.72688125243	0.65883817337	0.59778605746	0.54271456627	0.49290264547	0.44777727523	0.40685736624	0.36972677570	0.33601931224	0.30540938215
104	0.84141592161	0.76275542868	0.69212496113	0.62839093971	0.57073253541	0.51849271076	0.47111772044	0.42812754103	0.38909922856	0.35365643033
105	0.97401577385	0.88307163289	0.80135627121	0.72759531677	0.66085346372	0.60037696400	0.54552826952	0.49575358234	0.45056436313	0.40952556023
106	1.12753146232	1.02237543021	0.92783137405	0.84246401264	0.76520664361	0.69519416997	0.63169236901	0.57406223366	0.52173940388	0.47422094426
107	1.30526361181	1.18366417693	1.07427297280	0.97547073955	0.88603990154	0.80498712824	0.73146665683	0.66474105514	0.60415831768	0.54913700017
108	1.51103386038	1.37040848106	1.24383372976	1.12947989757	1.02595610953	0.93212132309	0.84700106590	0.76974420466	0.69959741377	0.63588844834
109	1.74926711890	1.58662693450	1.44016417094	1.30780828294	1.18796926811	1.07933589781	0.98078515788	0.89133455576	0.81011363094	0.73634511780
110	2.02508682020	1.83697264766	1.66749131588	1.51429654375	1.37556944859	1.24980268170	1.13570177694	1.03213246962	0.93808887375	0.85267225152
111	2.34442520885	2.12683345054	1.93070972669	1.75339192270	1.59279799413	1.44719454186	1.31508917977	1.19517227235	1.08628135350	0.98737717971
112	2.71415104737	2.46244791885	2.23548693821	2.03024406989	1.84433460032	1.67576453299	1.52281298108	1.38396765509	1.25788504066	1.14336336731
113	3.14221748899	2.85103972469	2.58838554080	2.35081599027	2.13559815184	1.94043755112	1.76334946536	1.60258740650	1.45659851037	1.32399300074
114	3.63783330217	3.30097320608	2.99700454605	2.72201251658	2.47286348837	2.24691646656	2.04188206046	1.85574311018	1.68670466495	1.53315946313
115	4.21166113482	3.82193350673	3.47014308171	3.15182907626	2.86339661622	2.60180502361	2.36441305258	2.14889069725	1.95316305213	1.77537126043
116	4.87604708863	4.42513516707	4.01798994254	3.64952395814	3.31561127973	3.01275015594	2.73789295049	2.48834804334	2.26171676889	2.05584920748
117	5.64528654865	5.12356366030	4.65234308168	4.22581779124	3.83925026664	3.48860678482	3.17037028749	2.88143114452	2.61901625550	2.38063896933
118	6.53593199409	5.93225507724	5.38686377184	4.89312453441	4.44559535506	4.03962865243	3.67116508985	3.33661180798	3.03276264824	2.75674138368
119	7.56714942094	6.86861998572	6.23737091294	5.66581895455	5.14771042676	4.67768930308	4.25106975108	3.86370025617	3.51187378117	3.19226337407
120	8.76113105405	7.95281844205	7.22218182798	6.56054635781	5.96072298629	5.41653797554	4.92258164158	4.47405658094	4.06667641525	3.69659270698

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