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Agenda item 7: Household projections

A NEW TECHNIQUE FOR STOCHASTIC POPULATION PROJECTIONS

Invited Paper

Submitted by "Sapienza" University of Rome [1]

Summary

The evolution of a population structure is determined by a sequence of birth, death, immigration and migration phenomenon. Such a sequence of events can be seen as the realisation of a stochastic point process. It is difficult to study such a stochastic process analytically. On the contrary, it is possible to simulate the realisations of the process and hence the evolution of the studied population.

The basic hypothesis is that the sequence of events that determine the population's evolution is generated by a point process that is the combination of several independent Poisson processes, i.e. the birth, death, immigration and emigration processes.

Every Poisson process is characterised by its own instantaneous rate. It is known that by assembling more independent Poisson processes we obtain another Poisson process that has the sum of the rates of the components as a rate. On the other hand, in a Poisson process the waiting time for an event, beginning from an initial time or from the time when the latest event has occurred, is distributed following a negative exponential law.

These and other theoretical results allow us to simulate, for each year of study, the instance where the events occur and the type of event happening in each instant. Hence, year after year, the population's evolution.

[1] Prepared by Salvatore Bertino, Dipartimento di Statistica, Probabilità e Statistiche Applicate (e-mail: salvatore.bertino@uniroma1.it) and Eugenio Sonnino: Dipartimento di Scienze Demografiche (e-mail: eugenio.sonnino@uniroma1.it).

The suggested simulation procedure gives us the estimates of the median values and of the standard deviation of all the parameters that characterise the population in each year of the studied period of time. In such a way we obtain important information on the accuracy of the projections and interval estimate techniques can be utilised.

Key words
Poisson process, simulation, waiting time, combination of point processes, *instantaneous rate of the realisation of the events, quotient of fertility, mortality quotients, migratory quotients.*

Introduction and formulation of models

The methodological aspect of the proposal is based on the properties of the stochastic point processes of the Poisson type.

A point process is called Poisson if:
-*The events occur singularly*
-*Prob{One event in [t,t+Dt)} = n(t) Dt + o(Dt)*
-*The events that occur in separate intervals are independent*

The ν(t) function is called the instantaneous rate of the realisation of the events.
One population in evolution can be thought of as a point process built up from combinations of independent Poisson processes.

Every individual present within the population generates one or more independent processes such as: birth, death, migration. For example, a male of 35 years of age generates events such as death and emigration whereas a 27 year old woman generates events such as birth, death and emigration. We will suppose that each of such events derives from a particular Poisson process characterised by its own realisation rate that depends on age.

By assembling all the death processes related to single individuals we obtain the process of deaths. By assembling all the birth processes, we obtain the process of births. By assembling all the processes of emigration the process of emigrations. The immigration process, which does not depend on the population composition and whose rate constitutes an input for the entire procedure, is also considered.

The given model used to study the population's evolution is the one referred to the process of events obtained by assembling all the elementary processes occurring within the population.
It is difficult to study such a stochastic process analytically. On the contrary, it is possible to simulate some realisations of the process and, therefore, the evolution of the studied population.

The simulation procedure

We will study the population's evolution by simulating all the events that occur in each year of the studied period in the combined process. In order to do so we will remind you of some theorems concerning the Poisson processes.

Theorem 1: The process obtained through the combination of several independent Poisson processes is still a Poisson process.

Theorem 2: The realisation rate of a Poisson process made out of more independent Poisson processes equals the sum of the rates of the component processes.

The simulation procedure consists of the simulation of **when, which and how many** events arise within the combined process in each year.

When does an event arise?

Theorem 3: In a Poisson process the waiting time for an event, starting from an initial time or from the time when the latest event took place, is distributed according to a negative exponential law. That is, that it has a distribution function: $F(t) = 1 - e^{-nt}$ *when ? is the realisation rate of the events.*

It is known that if a number y arises from a uniform distribution (0,1), the value $t = F^{-1}(y)$ is distributed following a negative exponential law. Hence if y_i (i=1,2,3,…) is a sequence of values generated by a uniform distribution (0,1) $t_i = (-\log(1-y_i))/n_i$ will constitute the sequence of the time that separates the events (?$_i$ is the sequence of the realisation rates that change due to the events that may have occurred before). Hence the events will occur at the times:
$T_i = t_1 + t_2 + \cdots + t_i$

Which event will occur?

Theorem 4: If in an instant T_i an event in the combined process occurs the probability that such an event would derive from an assigned component process is given by the quotient between the realisation rate of the component process and the combined process realisation rate.

Hence, given the time T_i of an event in the combined process, we may simulate the type of event that occurred in T_i through a random trial on the distribution of the types of event which is defined by:

$$\Pr\{\text{One birth in } T_i\} = l_i / n_i$$
$$\Pr\{\text{One death in } T_i\} = m_i / n_i$$
$$\Pr\{\text{One immigration in } T_i\} = a_i / n_i$$
$$\Pr\{\text{One emigration in } T_i\} = b_i / n_i$$

where l_i, m_i, a_i, b_i are respectively the rates of the processes of birth, death, immigration, emigration evaluated before the event in T_i and $n_i = l_i + m_i + a_i + b_i$ is the realisation rate of the combined process.
After having simulated the type of event using analogous procedures and using the same properties of the Poisson processes, we can establish:
- for a birth, the sex of the newborn and the age of the mother when delivering
- for a death, the age and the sex of the deceased

- for an immigration, the age and the sex of the immigrant
- for a migration, the age and the sex of the migrant

therefore obtaining a detailed description of the event.

Which events must we simulate?

The process of the generation of the events in one year ends when the time T_i in which the latest event should happen overtakes the value 1, that is the end of the year.

The update of the population structure at the end of the year

The recording of the obtained data allows for the updating of the population structure to be taken into consideration at the beginning of the following period.

Calculation of the parameters

The new population structure and the evolution that occurred during the year, may be described as a set of parameters that may be calculated on the basis of the events that happened during the same year. With the recorded data we may then determine for each year:

- the population distribution per five year age groups by sex .
- the average population age by sex
- the number of births by sex
- the average age of the mothers at the delivering
- the number of deaths by sex
- the average age of the deceased by sex
- the average age of the immigrants by sex
- the number of migrants by sex
- the average age of migrants by sex
- ageing indexes
- economic dependence indexes
- replacement indexes
- other .. e. g. the maximum age of the living by sex

Definition dynamic and calculation of the instantaneous realisation rates of the different types of events

The hypothesis that all the processes generating the events within the population are of the Poisson type allows us to characterise them through the instantaneous realisation rates of the events. The process is subsequently simplified by the ulterior hypothesis that the rates remain constant during the year.

Hence, for example, the instantaneous mortality rate for a man aged x, $\mu_m(x)$, supposedly constant for the whole x age, will be defined by the relationship:

$$m_m(x)\Delta u = Pr\{\text{A male aged } x \text{ dies within time interval } (x+u, x+u+\Delta u)\} \quad (0 \le u < 1)$$

The rate $\mu_m(x)$ may be calculated, as it is known, from a table of mortality quotients considering the relationship: $q_m(x) = 1 - exp(-m_m(x))$, from which: $m_m(x) = -log(1 - q_m(x))$ Likewise $m_f(x) = -log(1 - q_f(x))$ will be the realisation rate of the event of death in a female aged x.

In the same way the following may be calculated:
- the realisation rates of birth events of a child of a mother aged x starting from fertility quotient table: $l(x) = -log(1 - f(x))$;
- the realisation rates of migratory events of an individual aged x starting from migratory quotients tables $g_m(x) = -log(1 - u_m(x))$ and $g_f(x) = -log(1 - u_f(x))$

In the case of immigration the realisation rate is supposed to be constant during each year and equals the average number of yearly immigrants by sex evaluated initially: say e_m and e_f.
In order to consider the mortality, fertility, and immigration evolution after the initial time, a further scenario is taken into consideration to represent the situation at the end of the period. The values of the parameters during the period are calculated through linear interpolation.
The realisation rates of the events referred to a population are easily obtained through the hypothesis of independence of the Poisson processes that generate events, summing up the realisation rates of all the individuals present in the population within a fixed time (Th. 2), hence:

- $m(t) = \sum_x [(p_m(x,t) \cdot m_m(x) + (p_f(x,t) \cdot m_f(x)]$
- $l(t) = \sum_{x=15}^{49} p_f(x,t) \cdot l(x)$
- $g(t) = \sum_x [(p_m(x,t) \cdot g_m(x) + (p_f(x,t) \cdot g_f(x)]$
- $b(t) = e_m + e_f$

A simulation

The procedure of simulation foresees the generation of events related to a given number of years and therefore the estimate of the population structures year by year for a given number of years.

More simulations

The whole procedure is repeated for an assigned period of time generating, for each year of study, many estimates of the population structure. In such a way for every year of study and for each population characteristic we may calculate the respective average values and the standard deviations that give a precise estimate of the variability of the characteristic measures.

The data

The necessary data for the application of the procedure consists of:

A) mortality quotients by sex
B) fertility quotients
C) migratory quotients by sex
D) average number of immigrants by sex
E) immigrants age distribution by sex

With the aim of being able to catch the dynamic of such data and be allowed to explore the whole spread of possible scenarios of the data, two versions may be given. The first refers to the beginning of the studied period of time and the second refers to the end of the same period. Please note that the entire simulation procedure, being forced to simulate all the events occurring in each year of the studied period and for several times, requires a relevant quantity of processing that may be undertaken only through the utilisation of the modern means of calculating that we have at our disposal. For this purpose a processing program called PRODEST has been developed. Such a program allows us to obtain the desired results.

Simultaneous study of more populations

The procedure we just illustrated can be generally applied to the simultaneous study of several populations belonging to the same geographical area. As an example we may want to study the populations of Rome, distinguishing the district's populations that constitute Rome. Or we may want to study the population of Italy as a combination of the Italian regions populations.

Also in such cases the simulation procedure foresees the generation of all the events that occur in the whole geographical area studied which are characterised as described in the case of just one population. The only difference concerns the events related to the migratory movements that may occur both within the geographical area and in respect to the outside of the geographical area. Migratory movements towards populations within the same geographical area will correspond, as is evident, to immigration movements in other units of the area. Whereas the migratory movements towards and away from the geographical area must be considered separately.

A migratory probability matrix, as an input data, is introduced to deal with such possibility. The rows of such a matrix are constituted by the migratory probability distribution from one unit of the area to another unit or away from the area.
In the simultaneous study of more populations the problem of the amount of calculations to be carried out becomes relevant. The MULTIPRODEST program helps in solving such a problem but as for populations of great dimension the processing time may be rather long.

An example of demographic estimates with PRODEST

In the following pages we will show the results of demographic estimates regarding a small town close to Rome: San Cesareo. The period studied is from 2007 to 2050.

The average values of the estimate data are based on 21 simulations.
Figure 1 shows the average values for the total population of males (E(TM)) and of females (E(TF)) and ± 3 standard deviation intervals.
Tables I and II show the average values for both sexes by five year age groups.
Tables III and IV show the standard deviations of the estimate values for the joint population by five year age groups.
Tables V and VI show the average values for a combined population.
Tables VII and VIII show the standard deviations of the estimate values for a combined population.
For lack of space separate results for male and female populations are not shown.

Legenda:

E(P): average age of population
ETAMAX: maximum age of the living population
I.V.: old age index
I.R: replacement index
NATI(E): number of male births (female) within the year
MORTI: number of male deaths (female) within the year
E(Q): average age of the deceased within the year
IMMIG: number of male immigrants (female) within the year
E(IM): average age of the male immigrants (female) within the year
EMIG: number of male migrants (female) within the year
E(EM): average age of the male migrants (female) within the year

For the women:
Figli: number of children had in the population within the year
EMP: average age of the delivering females who have had children within the year

For the joint population:
I.D.G.: index of dependents in the youth population
I.D.A.: index of dependents within the elderly population
I.D.P.: index of total dependents (youth and elderly)

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FIGURE 1

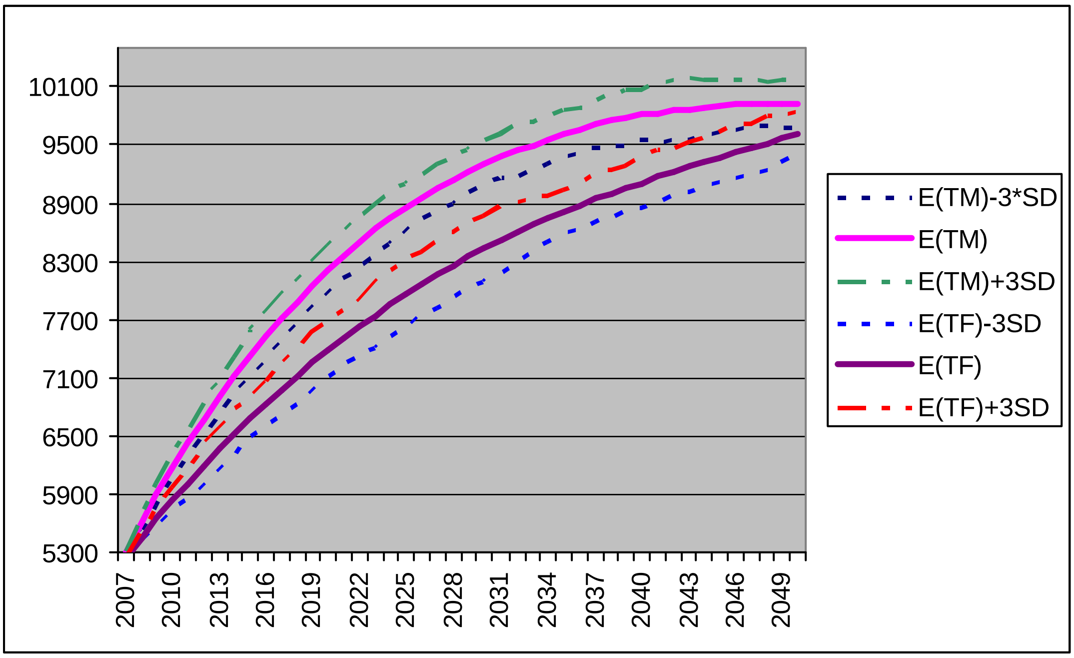
10100
9500
8900
8300
7700
7100
6500
5900
5300
2007
2010
2013
2016
2019
2022
2025
2028
2031
2034
2037
2040
2043
2046
2049
E(TM)-3*SD
E(TM)
E(TM)+3SD
E(TF)-3SD
E(TF)
E(TF)+3SD

Table I
Average values for both sexes by five years age groups

Year	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54
2007	517.0	589.0	600.0	606.0	672.0	738.0	878.0	949.0	901.0	712.0	661.0
2008	552.2	579.8	615.3	635.7	696.7	774.6	926.9	993.0	975.9	753.4	682.6
2009	565.9	589.1	631.6	656.8	699.8	826.3	956.2	1035.6	1030.4	812.8	719.1
2010	597.0	597.6	630.3	656.0	746.4	842.1	1014.5	1040.7	1106.3	859.2	757.1
2011	613.6	600.2	652.8	668.8	751.1	870.9	1058.8	1095.0	1128.2	930.8	784.9
2012	605.8	627.5	681.0	680.9	735.2	919.8	1067.5	1165.4	1137.5	1001.5	806.7
2013	615.4	648.1	673.8	701.6	758.1	932.4	1095.5	1199.2	1165.9	1069.0	838.3
2014	626.7	655.1	676.9	719.5	776.9	935.2	1129.8	1220.5	1195.2	1117.6	884.8
2015	632.4	681.0	686.0	718.2	786.5	965.8	1140.2	1255.1	1203.3	1175.0	928.6
2016	637.5	696.7	686.2	734.1	798.8	963.9	1158.4	1289.5	1244.4	1195.1	989.0
2017	651.1	687.5	706.0	755.5	807.5	957.0	1187.0	1292.0	1295.5	1198.9	1052.8
2018	658.9	695.3	726.8	748.3	815.2	977.1	1189.9	1313.0	1322.7	1214.3	1111.3
2019	662.6	702.1	735.8	753.3	831.6	985.0	1203.1	1338.3	1339.9	1236.3	1151.3
2020	668.8	705.7	756.8	759.3	827.9	992.0	1218.7	1346.5	1366.2	1245.6	1195.9
2021	675.6	709.4	766.5	762.1	842.6	1001.3	1221.8	1356.3	1392.2	1277.4	1211.3
2022	680.1	722.0	758.4	778.9	856.3	1003.7	1221.1	1378.8	1392.0	1319.1	1210.5
2023	689.6	729.9	761.9	795.0	848.9	1016.2	1222.6	1378.0	1407.5	1343.5	1225.1
2024	698.5	729.7	761.6	807.2	852.3	1020.8	1222.2	1380.8	1422.5	1356.7	1245.6
2025	698.3	731.3	767.6	821.2	859.5	1012.0	1232.9	1387.0	1428.2	1377.1	1248.1
2026	700.0	734.4	772.0	824.9	858.1	1017.7	1234.7	1388.5	1428.0	1406.3	1269.2
2027	702.7	731.3	779.5	814.4	868.6	1033.2	1232.2	1389.1	1443.7	1403.3	1306.6
2028	700.0	739.4	780.6	810.6	883.4	1030.9	1224.6	1385.2	1445.7	1408.0	1328.7
2029	701.6	750.1	779.2	812.0	894.0	1026.4	1232.2	1385.9	1441.0	1424.3	1344.0
2030	697.1	750.7	779.7	821.7	905.4	1027.7	1223.1	1382.8	1444.8	1431.0	1361.9
2031	701.5	748.4	782.8	823.1	904.2	1026.0	1237.9	1382.3	1444.1	1429.2	1383.1
2032	699.3	748.1	783.0	828.4	898.8	1030.1	1243.2	1379.4	1448.2	1431.8	1380.4
2033	703.5	743.7	787.9	832.3	892.8	1037.2	1234.4	1372.3	1445.2	1435.9	1385.8
2034	708.9	743.3	798.0	827.7	892.2	1045.5	1224.2	1365.2	1441.5	1434.3	1396.7
2035	708.0	744.1	798.0	827.1	891.8	1052.4	1220.3	1359.2	1435.7	1433.9	1403.1
2036	713.4	741.4	799.2	833.8	895.4	1048.2	1215.9	1364.8	1432.3	1432.1	1400.0
2037	723.9	740.5	795.4	828.5	901.9	1043.4	1213.0	1368.6	1426.0	1436.0	1405.3
2038	718.8	744.5	785.5	834.1	901.5	1034.8	1219.1	1358.3	1414.8	1438.0	1405.6
2039	719.0	744.0	786.6	841.0	896.0	1028.0	1222.3	1348.2	1413.0	1429.5	1406.7
2040	715.3	747.6	779.5	842.1	897.0	1019.1	1220.9	1340.0	1412.9	1425.5	1405.0
2041	716.7	746.1	781.0	837.4	898.8	1028.7	1210.1	1331.8	1412.8	1420.1	1404.0
2042	712.5	751.1	778.9	830.9	895.7	1026.4	1201.2	1335.8	1409.1	1409.3	1409.9
2043	714.0	745.3	782.9	823.2	899.0	1024.2	1197.2	1335.9	1399.1	1404.9	1406.1
2044	708.6	751.9	779.2	826.1	898.9	1015.8	1188.3	1336.3	1391.0	1399.0	1401.8
2045	708.1	751.0	781.6	823.0	895.1	1021.1	1182.0	1334.7	1385.0	1394.9	1395.0
2046	707.0	750.3	784.8	822.8	894.2	1021.9	1177.7	1323.8	1374.6	1391.8	1391.6
2047	706.1	740.1	791.9	822.1	889.8	1019.8	1173.8	1313.3	1379.2	1381.7	1376.4
2048	704.4	741.6	788.6	823.0	884.9	1018.9	1173.9	1314.6	1376.8	1371.9	1369.0
2049	707.0	741.3	786.3	819.4	887.5	1022.5	1168.4	1300.0	1369.4	1371.7	1358.7
2050	711.6	737.9	782.0	821.0	881.4	1013.9	1177.0	1290.2	1357.8	1372.1	1355.6

Table II
Average values for both sexes by five years age groups

Year	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	>99	TOTAL
2007	630.0	588.0	529.0	426.0	283.0	180.0	61.0	20.0	5.0	0.0	10545.0
2008	682.6	579.9	556.0	439.5	316.4	207.3	60.0	27.9	5.4	0.0	11061.0
2009	709.0	575.8	600.8	436.6	363.1	211.1	79.7	37.4	6.6	0.0	11543.8
2010	720.8	583.8	633.1	477.2	366.0	225.3	100.8	43.0	5.7	0.4	12003.3
2011	713.3	632.4	620.0	499.5	386.2	254.8	125.5	39.7	7.5	0.2	12434.2
2012	731.3	679.8	622.5	532.8	409.9	263.0	143.0	40.3	9.3	0.3	12861.2
2013	747.0	727.8	616.3	557.5	415.5	290.2	159.1	41.2	12.0	0.7	13264.5
2014	780.1	752.3	607.0	595.1	415.6	326.8	163.3	52.8	13.8	0.9	13645.8
2015	807.9	762.2	615.7	622.4	451.9	326.0	176.2	62.4	15.0	0.9	14012.8
2016	835.2	753.0	659.6	612.7	472.9	343.4	200.1	74.0	13.1	1.5	14359.1
2017	851.1	768.2	701.7	611.8	497.1	363.5	205.0	83.9	14.8	1.6	14689.6
2018	881.2	780.3	742.0	606.0	511.8	373.0	221.9	94.7	16.9	1.8	15002.3
2019	920.6	805.2	763.9	601.0	541.5	373.9	244.9	96.7	23.5	2.3	15312.7
2020	956.0	831.4	772.2	609.5	564.0	399.0	243.9	105.9	25.7	2.6	15593.4
2021	1005.0	854.4	759.2	647.9	559.8	415.8	259.1	116.8	29.0	2.1	15865.9
2022	1058.4	869.5	771.9	682.5	565.1	429.7	274.2	119.7	31.8	2.6	16126.2
2023	1110.3	892.4	782.5	717.4	562.5	444.1	280.7	129.4	35.7	3.0	16376.2
2024	1143.3	926.5	804.1	737.9	555.5	471.9	283.2	143.3	37.2	4.3	16605.1
2025	1185.9	954.3	827.3	739.5	565.0	490.6	301.2	143.4	42.1	5.1	16818.0
2026	1204.3	997.8	849.3	730.0	597.7	487.7	315.3	153.8	48.3	5.3	17023.2
2027	1204.3	1046.0	862.3	741.4	629.1	495.8	327.9	162.1	48.6	5.9	17228.0
2028	1209.7	1094.0	877.7	753.8	656.0	494.8	338.9	167.9	52.0	6.3	17388.2
2029	1223.3	1116.9	906.8	772.1	668.5	489.8	360.2	173.1	56.4	8.3	17566.4
2030	1227.9	1160.5	928.5	794.3	667.8	497.7	376.8	183.8	56.0	9.6	17728.7
2031	1248.8	1175.1	967.4	812.6	661.2	524.2	378.4	193.6	63.8	10.4	17898.2
2032	1283.9	1174.9	1008.9	824.1	667.1	551.4	383.9	201.1	66.0	10.6	18042.8
2033	1299.3	1177.6	1053.5	831.1	681.0	576.6	382.6	209.7	71.2	10.9	18164.5
2034	1311.2	1187.5	1074.6	857.9	702.2	585.0	382.5	224.3	75.3	12.8	18290.8
2035	1323.9	1191.8	1117.5	872.5	724.0	585.6	390.9	238.6	78.7	13.9	18410.9
2036	1342.4	1205.2	1129.2	907.5	737.6	578.5	415.4	238.7	86.0	16.2	18533.2
2037	1341.6	1231.6	1127.5	945.9	748.9	587.9	442.0	242.3	90.0	17.0	18657.0
2038	1341.9	1249.8	1129.6	991.7	756.4	601.3	459.0	246.2	95.4	19.1	18745.4
2039	1347.7	1259.1	1134.4	1012.5	784.0	619.5	469.9	249.2	103.8	21.3	18835.5
2040	1352.7	1270.5	1132.9	1051.8	791.0	645.0	471.8	261.4	110.0	24.5	18916.5
2041	1350.5	1287.3	1147.2	1057.6	824.0	658.6	470.4	281.0	112.6	25.7	19002.4
2042	1354.1	1283.5	1171.6	1057.2	855.0	667.6	482.7	297.5	116.8	28.0	19074.8
2043	1358.5	1282.4	1190.1	1052.9	894.4	674.5	497.9	312.6	117.6	29.5	19142.4
2044	1357.5	1287.5	1195.0	1055.8	914.3	696.7	513.7	326.5	122.4	33.3	19199.4
2045	1359.1	1296.5	1206.2	1054.1	949.0	701.7	535.4	331.7	132.5	36.9	19274.6
2046	1359.8	1294.2	1226.0	1068.9	952.8	732.7	547.9	332.3	145.6	38.7	19339.1
2047	1364.7	1299.7	1218.8	1094.9	952.6	762.0	556.7	346.4	157.1	42.0	19389.1
2048	1362.9	1303.7	1220.0	1110.0	953.6	796.5	562.9	357.9	166.9	43.0	19444.7
2049	1357.6	1297.7	1226.8	1119.7	963.4	816.0	584.9	373.9	173.0	46.7	19491.8
2050	1350.6	1300.2	1233.8	1127.0	964.1	846.9	594.0	396.3	180.0	52.3	19545.6

Table III
Standard deviations for both sexes by five years age groups

ANNO	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54
2007	0	0	0	0	0	0	0	0	0	0	0
2008	11.4	8.2	6.9	5.2	6.9	11.3	11.1	12.6	9.3	8.4	9
2009	17.9	13.4	8.3	10.5	11.3	19.3	20	18.2	12	11.7	13.5
2010	17.6	16.6	9.8	12.6	15.3	17.5	24.2	21.3	20.2	12.5	15.6
2011	23.5	15.4	12.9	12.6	16.7	24.8	31.9	23.1	22.6	16.9	13.7
2012	27.1	15.8	17.4	12.2	18.6	25.8	28.7	25.5	26.7	18.2	11.8
2013	26.4	21	20	11	17.8	28.3	21.9	25.5	21.1	16.2	17.3
2014	26.5	20.9	21.1	15.2	15.8	28.8	29.5	23.5	25.2	16.2	20.4
2015	29.7	21.4	23.6	17.6	14	30.3	33.1	27.3	22.9	23.9	20
2016	29.8	23.8	17.6	21.2	17.6	28	38.4	27.2	25.2	28.1	24.4
2017	26.8	30.9	15.1	25.7	17.8	25.4	36.9	31.4	25.4	27.5	26.4
2018	26.2	33	15.8	25.2	20.8	24.9	45.1	33.8	27.6	26.1	21.3
2019	25.4	33.9	18	31.7	16.4	21.5	40.3	33.1	26.5	31.8	19
2020	29.7	33.1	25.3	32	14.6	26.2	39	27.1	30.6	31.8	24.7
2021	26.1	31.4	30.1	29.4	22.8	34.3	31.2	25.9	30.9	32.5	25.8
2022	23.1	27.9	36.3	22.3	26.2	37.7	29.6	35.3	32.1	30.2	31.2
2023	28.1	25.4	37.2	16.6	29	33.3	33.3	49.5	32.1	29.9	29.5
2024	26.4	24.9	36.3	22	29	28.8	34.6	38.5	30.3	24.9	26.9
2025	22.5	24.1	32.8	29.2	25.9	25.3	31.7	46.8	23.3	31.1	22.4
2026	25.5	24	29.4	31.1	28.9	30.9	37.6	39.7	25.9	32.2	27.8
2027	27.1	24.3	26.3	35.3	25	30	40.2	34.5	36.4	29.4	29.4
2028	21.1	29.3	22.6	39.7	23	26.6	36.6	37.1	43.8	29.6	34.7
2029	20.9	24.6	28.3	35.5	26.1	32.9	33.4	31.4	41.3	29.9	35
2030	21.4	23.6	27	33.2	31.9	28.3	28.7	32.1	37.3	32.1	38.8
2031	24	23.3	24	29.6	32.9	26.3	33.7	38.4	30.9	22.1	35.8
2032	24.1	24	20.3	27.9	37.6	27.9	37.5	36.4	27.2	24.8	35.5
2033	20	23.4	29.2	25.1	41.5	25.7	31.4	32.4	27.9	37.3	35.3
2034	22.5	19.1	27.9	23.1	33.1	31.1	37.7	36.9	32.6	36.8	26.9
2035	15.7	21.7	22.2	30.7	26.5	35.1	35.8	33.9	30.7	33.8	30.1
2036	24.1	26.3	22.2	24.5	25.4	37.2	33	41.2	28.8	31.7	21.8
2037	25.3	26.3	19.9	24.3	26.2	38.5	35.5	45.2	30.8	31.1	27.4
2038	31.9	20.1	25	30.8	26	44	37.7	46.3	28.7	32	37.3
2039	27.4	23.1	24.5	31.5	24.7	39.7	37.1	40.9	33.6	31.7	37.5
2040	27.6	21	19.9	27.2	36.2	34.8	31.4	36.1	36.5	27.9	44
2041	27.5	23.4	29.2	23.4	28.3	29.4	39.4	35.3	43.1	25.3	40.1
2042	23.1	23.6	31.1	24.8	27.5	28.1	36.5	35.3	44.3	34.1	29.4
2043	29.4	29.5	28.3	23.7	28.8	34.2	43.5	40	40.8	31.7	34
2044	26.2	25.4	25.6	25.8	29.4	32.8	38.9	38.7	26.7	34.8	34.6
2045	27.5	22.9	23	27.4	23	30.3	35.5	31.5	29.1	32.3	27.4
2046	22.9	22	26.4	34.2	26.8	30.7	27.9	37	29.9	36.5	26.3
2047	17.4	23	27.9	30.7	23.6	29.4	34	30.3	34.6	37.7	27.4
2048	19	27.6	24.1	27.9	25.2	24.3	42.7	36.9	42.8	36.1	27.9
2049	21.6	22.1	23	26.4	28	26.2	36.3	30.4	35.2	26.5	30.3
2050	25.8	28.2	24.2	26.6	27.3	27	39.9	33.5	31.5	32.2	34.7

Table IV
Standard deviations for both sexes by five years age groups

YEAR	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	>=100	TOTAL
2007	0	0	0	0	0	0	0	0	0	0	0
2008	7	7	6	5.7	4.4	4.8	2.8	2.1	1.6	0	32.2
2009	7.2	10	7.3	8.1	6.8	7.3	4.1	3.7	2	0	52.3
2010	10.5	11.3	13	10.7	9.5	9.4	4.9	4.3	2.7	0.7	64.6
2011	16.7	12.1	10.6	13.3	11.4	9.6	7.1	3.9	2.3	0.5	76
2012	22.5	12.2	14.5	14.4	12.2	9.9	7.6	3.9	2.2	0.5	106.3
2013	19.2	16.1	17.2	14.4	14.3	12.1	7.6	4.9	2.7	0.8	110.7
2014	22.4	18	14.3	12	13.6	10.3	8.2	6.2	3.2	0.8	114.7
2015	21.6	18.3	17.1	15.6	15	13	6.4	6.5	3.7	1	122.9
2016	23.2	19.8	14.8	18.8	14.8	16.9	10.6	7.5	3.7	1.4	121.6
2017	18.3	21.3	16.6	22.4	14.8	16.1	12.7	7	3.2	1.2	134.4
2018	19.1	18.6	18.2	22.9	15.5	16.4	12.1	5.5	4.5	1.5	137.4
2019	21.9	21.8	18.7	18.2	16.8	13.9	12.7	6.8	4.3	1.5	155
2020	23.3	23.1	22.3	15.9	22.6	14.3	11.9	8.5	4.9	1	151.8
2021	27.4	23.6	22.3	17.7	23.4	13.8	11.9	10	4.5	1.2	154.3
2022	24.5	19.7	22.2	19.4	21.3	15.2	12.2	11.9	4.4	1.4	165.2
2023	22.7	21.6	24	21.7	18.9	15.3	14.7	9.3	4.8	1.8	181.7
2024	21.1	29.7	27.2	21.1	21.6	15	12.7	9.4	4.9	2	177
2025	29.2	24.2	26.1	20.2	20.5	17.1	17.6	8.7	5.2	2.5	172.8
2026	29.7	27.6	28.2	17.8	19.9	16.4	14	9.9	6.8	2.5	165.8
2027	28.7	26.9	27.6	18.8	20.5	16.8	14.3	12.3	7.4	2.8	172.3
2028	26.7	25.1	28.7	24.2	25.8	18.3	11.5	10.6	6.4	2.4	175.2
2029	27.5	22.4	29.9	26.5	19.3	17.5	12.3	7.9	5.4	3.8	161.9
2030	26.5	25.2	27.6	33.3	15.9	22.2	17.5	10.7	6.9	3.6	164.8
2031	30.3	25.1	28.3	32.7	22.5	27.4	17.3	8.9	7.8	2.8	158.8
2032	31.6	27.5	24	28.8	24.4	21.6	16.4	8.2	6.5	3.3	161.8
2033	36.9	22.3	21.9	27.3	27.6	19.9	20.1	11.8	6.6	3.5	142.2
2034	38	24	22.3	23.2	29.1	14	19.1	13.9	6.1	3.8	117.8
2035	40.3	25.3	22.1	23.1	34.6	15.2	22.5	16.4	9.7	5.1	112
2036	36.8	29.1	27.2	22.3	28.8	21.5	23.5	16	8.1	3.9	107.2
2037	37.8	34	23.7	22.9	24.8	22.4	17.9	15.2	9.3	3.4	119.1
2038	26.8	37.5	23.8	25.1	22.5	27.1	15.1	14.5	10.2	4.3	118.8
2039	22.4	34	29.6	24.1	21.1	31.5	13.2	15	13.4	4.9	129
2040	29.7	30.8	22.3	24.3	24.5	36.8	16	14	14	5.5	131.4
2041	22.4	33.7	31.4	27.8	28.4	28.4	20.4	16	11.8	5.5	136.4
2042	33.8	33.7	37.3	22.3	24.8	22.8	20.7	11.4	12	5.7	134.3
2043	42.6	29.2	37.5	27.1	28.1	15.9	25.9	11.9	11.6	6.7	143.1
2044	37.6	21.9	32.5	29.9	30	18	27.7	14.2	12.6	5.8	133.7
2045	42.7	27.5	29.6	25.5	25.4	22.6	30.5	15.1	10.8	6	128.9
2046	41.2	24	33.1	31.6	31	23	26.2	18.4	9.6	6.5	126.2
2047	34.4	39.3	37	39.7	23.6	25.3	19.2	16.6	8.1	6.7	118.4
2048	33.2	47.2	28.6	37.2	30.5	28.6	16.1	22.9	9.9	6.1	121.3
2049	35.1	43.5	19.8	31.1	29	30.2	19	23.9	10.1	6.1	109.1
2050	31.1	42.7	30.2	31.1	26.6	29.2	22.1	24.7	11	6	105.7

Table V
Average values for the combined population

YEAR	0-4	5-14	15-24	25-49	50-64	65-79	80-99	>99	TOTAL	E(P)	I.V.
2007	517.0	1189.0	1278.0	4178.0	1879.0	1238.0	266.0	0.0	10545.0	39.3	88.2
2008	552.2	1195.1	1332.4	4423.7	1945.1	1311.9	300.6	0.0	11061.0	39.5	92.3
2009	565.9	1220.7	1356.6	4661.3	2004.0	1400.6	334.9	0.0	11543.8	39.8	97.2
2010	597.0	1227.9	1402.3	4862.9	2061.7	1476.3	374.7	0.4	12003.3	40.0	101.5
2011	613.6	1253.0	1419.9	5083.7	2130.6	1505.7	427.5	0.2	12434.2	40.2	103.6
2012	605.8	1308.5	1416.1	5291.8	2217.8	1565.2	455.8	0.3	12861.2	40.5	105.6
2013	615.4	1321.9	1459.7	5462.0	2313.0	1589.2	502.5	0.7	13264.5	40.7	108.1
2014	626.7	1332.0	1496.4	5598.3	2417.2	1617.6	556.7	0.9	13645.8	41.0	111.1
2015	632.4	1367.0	1504.7	5739.4	2498.7	1690.0	579.7	0.9	14012.8	41.2	113.6
2016	637.5	1382.9	1532.9	5851.4	2577.2	1745.2	630.6	1.5	14359.1	41.4	117.7
2017	651.1	1393.6	1563.0	5930.3	2672.1	1810.6	667.2	1.6	14689.6	41.6	121.3
2018	658.9	1422.0	1563.6	6017.0	2772.8	1859.8	706.5	1.8	15002.3	41.9	123.5
2019	662.6	1437.9	1584.9	6102.7	2877.1	1906.3	739.0	2.3	15312.7	42.1	126.1
2020	668.8	1462.5	1587.2	6169.0	2983.2	1945.7	774.4	2.6	15593.4	42.3	127.8
2021	675.6	1475.9	1604.8	6249.0	3070.7	1967.0	820.8	2.1	15865.9	42.5	129.7
2022	680.1	1480.3	1635.1	6314.8	3138.4	2019.5	855.4	2.6	16126.2	42.7	133.3
2023	689.6	1491.8	1643.8	6367.8	3227.9	2062.4	889.9	3.0	16376.2	42.9	135.6
2024	698.5	1491.2	1659.5	6403.0	3315.5	2097.4	935.6	4.3	16605.1	43.1	138.8
2025	698.3	1498.9	1680.8	6437.3	3388.3	2131.8	977.4	5.1	16818.0	43.3	141.8
2026	700.0	1506.3	1683.0	6475.2	3471.3	2177.0	1005.1	5.3	17023.2	43.5	144.5
2027	702.7	1510.8	1683.0	6501.6	3556.9	2232.8	1034.4	5.9	17228.0	43.7	147.9
2028	700.0	1520.0	1694.0	6494.4	3632.3	2287.5	1053.6	6.3	17388.2	43.9	150.9
2029	701.6	1529.4	1706.0	6509.9	3684.2	2347.5	1079.6	8.3	17566.4	44.1	154.1
2030	697.1	1530.4	1727.1	6509.2	3750.3	2390.6	1114.3	9.6	17728.7	44.3	157.9
2031	701.5	1531.2	1727.3	6519.6	3807.0	2441.2	1160.0	10.4	17898.2	44.5	161.9
2032	699.3	1531.1	1727.2	6532.8	3839.2	2500.1	1202.5	10.6	18042.8	44.7	166.6
2033	703.5	1531.6	1725.1	6525.0	3862.8	2565.6	1240.0	10.9	18164.5	44.9	170.8
2034	708.9	1541.3	1719.9	6510.7	3895.4	2634.6	1267.1	12.8	18290.8	45.0	174.0
2035	708.0	1542.2	1718.9	6501.5	3918.8	2714.0	1293.7	13.9	18410.9	45.2	178.8
2036	713.4	1540.6	1729.2	6493.3	3947.6	2774.2	1318.6	16.2	18533.2	45.4	182.3
2037	723.9	1535.9	1730.4	6487.0	3978.5	2822.2	1362.2	17.0	18657.0	45.6	186.0
2038	718.8	1530.0	1735.6	6465.1	3997.2	2877.7	1401.9	19.1	18745.4	45.8	191.2
2039	719.0	1530.5	1736.9	6441.0	4013.5	2930.9	1442.4	21.3	18835.5	46.0	195.4
2040	715.3	1527.1	1739.0	6418.3	4028.2	2975.6	1488.2	24.5	18916.5	46.2	200.2
2041	716.7	1527.2	1736.2	6403.5	4041.8	3028.8	1522.5	25.7	19002.4	46.4	204.1
2042	712.5	1530.0	1726.6	6381.8	4047.5	3083.8	1564.6	28.0	19074.8	46.6	208.6
2043	714.0	1528.1	1722.3	6361.4	4047.0	3137.4	1602.6	29.5	19142.4	46.8	212.8
2044	708.6	1531.1	1725.0	6330.3	4046.8	3165.1	1659.3	33.3	19199.4	47.0	216.9
2045	708.1	1532.6	1718.1	6317.7	4050.6	3209.3	1701.3	36.9	19274.6	47.2	220.9
2046	707.0	1535.1	1717.0	6289.7	4045.6	3247.7	1758.4	38.7	19339.1	47.3	225.1
2047	706.1	1532.0	1712.0	6267.8	4040.8	3266.2	1822.2	42.0	19389.1	47.5	229.3
2048	704.4	1530.1	1707.9	6256.0	4035.6	3283.5	1884.2	43.0	19444.7	47.7	233.2
2049	707.0	1527.7	1706.9	6232.0	4014.0	3309.9	1947.7	46.7	19491.8	47.9	237.4
2050	711.6	1519.9	1702.3	6211.0	4006.4	3324.9	2017.2	52.3	19545.6	48.1	241.8

Table VI
Average values for the combined population dynamic

YEAR	I.D.G.	I.D.A.	I.D.P.	I.R.	NATI	MORTI	E(Q)	IMMIG	E(IMM)	EMIGR
2007	23.3	20.5	43.8	97.0	110.3	73.5	72.5	850.3	34.2	371.1
2008	22.7	20.9	43.6	91.2	109.3	73.2	72.5	836.9	34.1	390.1
2009	22.3	21.6	43.9	87.7	121.0	82.2	73.2	828.9	34.3	408.1
2010	21.9	22.2	44.2	89.0	118.4	91.5	73.5	826.7	34.2	422.6
2011	21.6	22.4	44.0	94.6	121.4	92.4	74.5	837.1	34.3	439.1
2012	21.4	22.6	44.1	99.9	122.2	100.1	74.5	827.2	34.1	446.0
2013	21.0	22.7	43.6	103.8	124.0	104.4	75.2	825.0	34.3	463.3
2014	20.6	22.9	43.5	104.6	128.7	110.0	75.2	822.7	34.2	474.3
2015	20.5	23.3	43.8	106.2	126.7	113.0	75.3	811.0	34.4	478.4
2016	20.3	23.9	44.1	102.7	134.3	115.5	75.6	803.2	34.1	491.6
2017	20.1	24.4	44.5	101.8	132.1	121.7	76.1	800.5	34.3	498.1
2018	20.1	24.8	44.9	104.4	129.8	130.1	76.6	811.0	34.2	500.3
2019	19.9	25.1	44.9	107.0	135.7	132.7	77.2	792.7	34.1	515.0
2020	19.8	25.4	45.2	109.6	135.0	133.6	77.7	789.7	33.9	518.6
2021	19.7	25.5	45.2	112.2	141.2	140.0	77.5	785.3	34.3	526.1
2022	19.5	26.0	45.4	111.7	142.5	141.3	78.0	795.6	34.2	546.8
2023	19.4	26.3	45.7	112.3	139.2	147.3	78.1	780.3	34.3	543.4
2024	19.2	26.7	45.9	114.8	143.3	143.0	78.4	763.2	34.1	550.7
2025	19.1	27.1	46.2	116.3	140.0	151.3	78.6	765.4	34.5	548.8
2026	19.0	27.4	46.4	121.1	143.1	152.3	78.8	773.5	34.7	559.5
2027	18.9	27.9	46.7	128.7	137.3	160.8	78.6	743.0	34.3	559.5
2028	18.8	28.3	47.1	135.3	145.0	162.8	78.8	756.5	34.2	560.6
2029	18.7	28.9	47.6	137.7	140.4	164.2	79.3	750.4	34.4	564.2
2030	18.6	29.3	47.9	141.4	145.6	160.3	79.5	738.2	34.5	554.0
2031	18.5	30.0	48.5	142.9	142.7	170.0	79.7	732.5	34.4	560.7
2032	18.4	30.7	49.1	142.0	142.7	164.9	79.7	721.3	34.0	577.4
2033	18.5	31.5	50.0	141.6	146.3	171.3	79.8	723.0	33.9	571.8
2034	18.6	32.3	50.8	143.5	143.3	167.9	80.5	718.1	34.0	573.4
2035	18.5	33.1	51.7	144.3	147.0	172.2	80.2	717.4	34.2	569.8
2036	18.5	33.8	52.3	144.7	150.4	168.3	80.6	711.8	34.2	570.0
2037	18.5	34.5	53.0	148.9	143.0	170.7	80.7	704.4	34.4	588.3
2038	18.4	35.2	53.7	150.1	145.2	175.4	80.9	699.9	34.2	579.6
2039	18.5	36.0	54.5	149.9	141.6	170.4	81.0	690.5	34.2	580.8
2040	18.4	36.8	55.2	151.0	148.4	179.5	81.3	692.4	34.3	575.4
2041	18.4	37.6	56.0	153.8	145.9	176.0	81.4	681.5	34.3	579.0
2042	18.4	38.5	56.9	154.6	147.9	181.1	81.5	680.7	34.4	579.8
2043	18.5	39.3	57.8	155.9	142.9	179.2	81.7	677.7	34.2	584.3
2044	18.5	40.1	58.6	156.0	145.2	177.0	82.3	676.6	34.3	569.6
2045	18.5	40.9	59.5	157.7	145.6	180.1	82.7	666.3	34.3	567.2
2046	18.6	41.9	60.5	157.6	142.1	178.7	82.6	667.5	34.3	581.0
2047	18.6	42.7	61.3	158.3	146.0	182.1	83.6	669.7	34.3	578.0
2048	18.6	43.4	62.0	158.6	150.3	180.1	83.3	655.0	34.2	578.2
2049	18.7	44.4	63.1	158.6	150.0	179.0	83.0	649.2	34.6	566.5
2050	18.7	45.3	64.0	158.5						

Table VII
Standard deviation for the combined population dynamic per age groups

YEAR	0-4	5-14	15-24	25-49	50-64	65-79	80-99	100^+	TOTAL	E(P)	I.V.
2007	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2008	11.4	9.0	8.5	20.3	13.1	8.0	6.1	0.0	32.2	0.1	0.8
2009	17.9	15.3	13.9	36.7	16.8	12.4	11.1	0.0	52.3	0.2	1.6
2010	17.6	16.0	18.3	43.3	20.1	17.9	13.4	0.7	64.6	0.2	1.8
2011	23.5	19.9	21.3	51.7	27.4	20.6	14.7	0.5	76.0	0.3	2.3
2012	27.1	23.0	21.5	60.1	31.0	24.5	15.1	0.5	106.3	0.3	2.5
2013	26.4	26.8	20.6	61.9	29.1	26.0	15.5	0.8	110.7	0.3	2.8
2014	26.5	32.6	27.0	57.8	31.7	22.2	14.0	0.8	114.7	0.2	2.3
2015	29.7	32.7	25.1	65.6	33.1	23.4	19.2	1.0	122.9	0.2	2.3
2016	29.8	28.4	26.2	75.9	37.7	26.7	23.6	1.4	121.6	0.2	2.2
2017	26.8	29.4	30.3	85.4	43.1	31.9	19.2	1.2	134.4	0.2	2.3
2018	26.2	35.4	32.2	87.2	35.8	32.9	19.6	1.5	137.4	0.3	2.8
2019	25.4	38.9	37.0	93.0	27.1	34.6	20.5	1.5	155.0	0.3	3.2
2020	29.7	46.3	38.5	90.7	31.2	43.4	17.2	1.0	151.8	0.3	3.4
2021	26.1	50.1	38.3	90.0	26.2	45.6	14.2	1.2	154.3	0.3	3.6
2022	23.1	45.3	33.5	86.1	32.7	38.4	18.1	1.4	165.2	0.3	3.6
2023	28.1	42.4	35.0	92.8	42.2	36.9	21.1	1.8	181.7	0.4	4.0
2024	26.4	43.7	40.6	83.2	48.4	35.4	22.3	2.0	177.0	0.3	3.4
2025	22.5	42.4	40.2	88.5	45.2	34.4	23.0	2.5	172.8	0.4	3.8
2026	25.5	39.7	46.9	75.1	49.1	38.8	20.7	2.5	165.8	0.3	4.0
2027	27.1	38.2	47.3	86.3	48.5	42.5	24.9	2.8	172.3	0.4	4.2
2028	21.1	39.3	51.8	86.5	61.1	44.8	23.3	2.4	175.2	0.4	4.3
2029	20.9	32.4	51.9	86.4	62.3	42.2	24.7	3.8	161.9	0.4	4.3
2030	21.4	38.8	48.4	82.0	57.9	44.5	29.6	3.6	164.8	0.4	4.7
2031	24.0	38.6	48.4	76.8	53.6	47.3	34.4	2.8	158.8	0.4	5.2
2032	24.1	36.4	43.2	71.4	58.7	39.5	33.0	3.3	161.8	0.4	5.0
2033	20.0	41.7	46.8	67.4	57.4	36.4	32.6	3.5	142.2	0.4	4.2
2034	22.5	32.3	41.2	62.1	55.6	36.7	34.5	3.8	117.8	0.3	3.4
2035	15.7	31.6	41.8	64.8	57.7	34.0	33.3	5.1	112.0	0.3	3.5
2036	24.1	37.5	35.8	63.1	51.5	34.0	33.5	3.9	107.2	0.4	3.9
2037	25.3	36.1	33.3	64.2	56.3	24.7	32.3	3.4	119.1	0.3	3.0
2038	31.9	35.8	41.3	67.4	58.1	32.7	36.0	4.3	118.8	0.3	3.7
2039	27.4	39.6	42.6	72.0	61.2	40.2	40.9	4.9	129.0	0.3	3.9
2040	27.6	33.4	48.6	65.9	63.9	40.2	49.1	5.5	131.4	0.3	4.2
2041	27.5	35.6	43.6	64.6	61.3	50.4	46.1	5.5	136.4	0.3	4.1
2042	23.1	37.3	43.0	67.4	66.6	51.9	38.6	5.7	134.3	0.3	3.8
2043	29.4	38.1	38.7	72.0	67.5	60.9	33.1	6.7	143.1	0.3	4.2
2044	26.2	34.4	28.1	85.0	65.1	56.0	29.3	5.8	133.7	0.3	4.3
2045	27.5	31.2	32.2	78.2	60.8	55.7	32.8	6.0	128.9	0.3	4.7
2046	22.9	34.3	39.3	80.1	54.8	52.2	27.0	6.5	126.2	0.3	4.5
2047	17.4	36.2	37.9	65.4	64.8	55.8	26.9	6.7	118.4	0.3	4.2
2048	19.0	33.1	37.5	76.0	65.5	50.9	28.8	6.1	121.3	0.3	4.7
2049	21.6	28.7	40.0	70.6	56.3	44.6	32.6	6.1	109.1	0.3	4.7
2050	25.8	35.6	35.4	71.4	58.3	54.5	34.5	6.0	105.7	0.3	4.9

Table VIII
Standard deviation for the combined population dynamic

YEAR	I.D.G.	I.D.A.	I.D.P.	I.R.	NATI	MORT I	E(Q)	IMMI G	E(IMM)	EMIGR
2007	0.0	0.0	0.0	0.0	9.0	7.3	3.4	26.5	1.0	12.1
2008	0.2	0.1	0.3	1.5	11.3	7.7	2.9	25.9	1.3	20.2
2009	0.3	0.2	0.4	1.6	8.5	7.8	3.0	34.3	1.5	17.4
2010	0.3	0.3	0.3	2.5	14.1	10.1	3.2	26.7	1.6	17.5
2011	0.3	0.3	0.3	2.8	9.1	12.3	2.8	33.3	2.1	20.5
2012	0.3	0.4	0.5	2.4	11.5	9.6	4.0	34.7	1.4	18.5
2013	0.4	0.4	0.5	2.9	12.0	10.9	2.8	24.5	1.5	19.8
2014	0.4	0.3	0.6	3.4	10.0	11.4	2.3	21.6	1.5	17.4
2015	0.4	0.3	0.6	3.7	11.0	10.3	2.4	24.8	1.3	21.6
2016	0.4	0.3	0.6	4.4	12.2	12.5	3.0	34.5	1.5	21.0
2017	0.4	0.3	0.6	4.9	9.7	9.9	2.3	28.4	0.9	27.7
2018	0.4	0.3	0.6	4.4	10.6	13.2	2.5	17.7	1.4	22.2
2019	0.5	0.3	0.6	4.7	11.2	11.6	3.1	19.5	1.7	28.4
2020	0.5	0.4	0.7	4.6	11.7	14.9	3.0	23.6	1.2	19.6
2021	0.5	0.4	0.6	4.3	8.9	8.4	1.7	24.5	1.5	19.1
2022	0.4	0.3	0.5	3.8	11.7	11.6	2.1	33.9	1.2	26.4
2023	0.5	0.4	0.6	3.1	9.9	14.5	2.0	26.0	1.4	19.9
2024	0.4	0.4	0.6	4.3	11.4	10.2	2.4	22.5	1.4	23.1
2025	0.4	0.4	0.6	4.1	10.7	9.0	2.2	27.7	1.5	29.4
2026	0.5	0.4	0.7	5.4	11.3	11.8	3.1	24.5	1.5	19.1
2027	0.5	0.5	0.7	6.4	10.4	14.2	2.3	28.1	1.3	26.4
2028	0.4	0.4	0.6	7.2	9.7	15.1	2.9	36.9	1.4	24.0
2029	0.4	0.4	0.6	5.7	9.7	11.2	2.2	28.9	1.5	21.8
2030	0.5	0.4	0.6	4.9	10.5	10.8	2.1	28.7	0.9	19.8
2031	0.5	0.4	0.6	4.4	12.3	13.3	2.7	29.3	1.6	22.0
2032	0.4	0.4	0.5	5.0	11.5	12.6	1.5	31.3	1.9	28.1
2033	0.3	0.4	0.5	3.4	10.0	12.8	2.2	21.0	1.8	22.1
2034	0.3	0.4	0.5	3.3	9.4	11.0	2.6	32.6	1.1	26.4
2035	0.3	0.5	0.5	6.3	12.2	16.2	2.2	28.7	1.1	19.6
2036	0.3	0.5	0.6	6.2	10.9	13.9	2.6	21.8	1.5	23.6
2037	0.2	0.4	0.5	7.7	12.3	13.9	1.7	27.4	1.1	23.8
2038	0.3	0.4	0.5	7.7	8.8	16.4	2.4	23.3	1.4	26.5
2039	0.3	0.5	0.7	7.2	11.0	13.5	1.9	32.4	1.7	19.7
2040	0.4	0.5	0.7	6.6	13.0	13.3	2.6	26.6	1.6	20.2
2041	0.4	0.5	0.8	5.6	11.9	12.7	2.1	28.2	1.5	18.0
2042	0.4	0.5	0.8	5.4	14.1	9.3	1.9	23.7	1.4	19.6
2043	0.4	0.5	0.8	4.8	9.2	13.3	2.1	22.1	1.4	25.2
2044	0.4	0.5	0.7	5.3	10.5	10.4	2.5	25.6	1.7	21.5
2045	0.4	0.5	0.7	5.8	14.2	12.7	2.5	26.0	1.6	25.9
2046	0.3	0.5	0.7	7.7	10.5	14.6	2.0	25.8	1.4	24.6
2047	0.4	0.6	0.8	8.3	9.7	15.1	2.0	24.4	1.6	24.3
2048	0.3	0.5	0.7	9.3	12.7	16.2	2.2	24.3	1.5	22.8
2049	0.3	0.5	0.6	8.5	11.1	15.8	2.2	28.4	1.7	21.9

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