The Irish Tontine (1777) and Fifty Genevans; An Essay on Comparative Mortality

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More than three centuries have elapsed since an effusive Italian promoter named Lorenzo Tonti proposed to the French crown a speculative instrument that bears his name. Although very little is known about Tonti, it is clear that he was one of many *donneurs d'avis*, men who hoped to persuade the French monarchy to adopt financial panaceas calculated to enrich a royal treasury perennially short of cash and to reward the promoter as well. The plan Tonti introduced around 1650 promised income for many purchasers plus vast riches for those few who would live till age 90 or 100. Eventually various European governments, national or local, would take up this scheme to borrow money. A tontine floated by the Irish Parliament in the late 1770s is of particular interest, less for its terms than for the novel twist given it by Genevan bankers. The latter selected candidates who seemed likely to achieve great longevity and placed tontines on their lives; by pooling risks they turned what was ordinarily a gamble into a foolproof investment — providing, that is, that the issuing government did not suspend payments. Eventually the selected Genevans would attain, on the average, ages well beyond those shown by contemporary mortality data. The longevity they achieved is roughly comparable to that recorded in tables used not long ago by life insurance companies in the United States.

Although the tontine admits numerous variations and combinations, the basic scheme followed by governments in the seventeenth and eighteenth centuries is rather simple: the tontine is a life annuity purchased by members of a society — which is often divided into classes (age groups) — who collect annual (or semiannual) interest and inherit income from other members. There are certain features common to both tontines and simple life annuities. The life annuity on which French governments depended heavily in the eighteenth

century offers an annuitant annual interest until the death of a nominee in exchange for a principal which is not returned. The annuitant is owner of the annuity; the nominee is the " insured " on whose life the annuity is placed. Frequently these were the same person; or a parent could select a son or daughter as nominee and collect the annuity. In any case, the principal was lost from the start and payments ceased at a nominee's death. When the French monarchy paid 9 or 10 percent for life annuities, a very young nominee might well reap several times the principal for himself or his sponsor.

The tontine observes these same rules but differs in this respect: at the nominee's death his annual income goes not to the state but to other members of the tontine or age group therein. Suppose that a parent entered a child in the class aged 5 to 10. If the child survived eventually he was bound to inherit others' income; if he became the last survivor around age 90 to 95, he acquired the entire income for that class. At his death annual payments ceased; the class was extinct. Once all classes had died, the tontine ended. All sorts of variations were possible, notably the combination of the tontine with a lottery — a double gamble must have seemed particularly timely in the eighteenth century, when state-sponsored lotteries were the fashion. Another possibility was the " composite " tontine, a portion of whose income reverts to the state as each member dies, while the rest goes to survivors within the proper class. Both of these devices show up in French tontines issued in 1743: losers of the lottery consoled themselves with tontines but were forced to cede one-half of inherited survivors' shares to the state. These tontines were sold rapidly. Still another variation was to freeze annual income once it reached a given peak, usually at some point far in the distant future. Any saving to the state was likely to be minimal because of the impact of present values. Perhaps someone wished, by reducing the grand prize, to minimize the temptation to eliminate one's fellow members.[1]

Tonti's original scheme anticipated the basic tontine plan but unrealistically projected only 5 percent interest for all of ten classes. Although some issuers in the future would offer flat rates to all classes, French officials would demonstrate greater sophistication in devising plans for graduating interest according to age. As for Tonti himself, the crown soon lost interest in him and his projects and his original scheme remained a dead letter. Not till 1689, thirty-six years after publication of Tonti's plan, did a French administration actually issue a tontine.[2]

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[1] Actually we lack evidence that the authorities worried about the possibility of murder. But the edict establishing the French tontine of 1689 is concerned about fraud. *Recueil général des anciennes lois francaises*, ed. Isambert *et al* (Paris, 1821-33), XX, 87-96.

[2] For Tonti's plan, see edict of 1653, Archives nationales (AN), Paris, AD + 318; JULIEN COUDY, " La ' Tontine Royalle ' sous le règne de Louis XIV," *Revue historique de droit francais et étranger* 4th series., XXXIV (1957), 133.

Meanwhile the municipality of Kampen in the United Provinces (Dutch Netherlands) was the first government actually to float a tontine -- a small (400 shares) single-class venture paying 4 percent. Everyone should have known that it would enroll largely among children.[3] Within the following century and a quarter, local or regional governments in the United Provinces issued tontines profusely for small sums, the English and Danish monarchies experimented with them, and a few of the German states attempted tontines. In France the first tontines were dated 1689 and 1696 and designed to finance the War of the League of Augsburg. The 1696 tontine offered around 7 percent for the youngest nominees (0-5) and 14 percent for the eldest (above age 70), and enrolled 4100 persons, a number far short of expectations. If the results seems poor, it is because projections were too high. Enrolment and sums expended would increase considerably in future tontines. In all, the French crown issued ten of them within the seventy years beginning in 1689; finally in 1720, converted all tontines to life annuities, at a loss to many owners. Shortly thereafter the Irish Parliament offered three tontines in close succession, dated 1773, 1775, and 1777; the third was not subscribed until the years 1779-81.

We know next to nothing about the first two of these. One wonders whether the second tontine, scheduled to pay 6 percent, could have succeeded. (By comparison, French tontines in the 1740s had offered an average of almost 10 percent interest). For the third tontine the Irish Parliament raised the interest rate to 7½ across the board while hoping to raise 300,000 Irish pounds (£ 277,000 English) through a loan divided among three classes: the first, including persons above 40; the second, ages 20-40; the third, those less than 20. If the provision for uniform interest renders the class distinctions almost pointless, nevertheless a three-class system allows speedier liquidation of the tontine debt than a single class would.[4] It is hardly surprising that the youngest class subscribed more than three-fourths of the loan, a sum of 228,600; the second contributed 50,300; the oldest, only 21,100. Most subscriptions came from abroad, English participation amounting to almost 42 percent. Irish purchasers furnished only 16 percent of the funds and fully one-third of subscriptions came from the independent city-state of Geneva. If the Swiss city had a rather small population — one

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[3] FREDERICK HENDRIKS, "Contributions to the History of Insurance," *Assurance Magazine and Journal of the Institute of Actuaries*, III (1853), 114; H. WAGENVOORT, *Tontines* (Utrecht, 1961), p. 116. The inclusion of King Charles II of Spain (b. 1661) in the list of nominees seems like a macabre joke. With one foot in the grave, this ruler nonetheless survived till 1700. He may well have been chosen simply because it was easy to certify that a ruler was alive and the income on his life collectable. For the 1696 French tontine, see AN, G7 1602. By 1745 a French tontine could enroll some 22,600 nominees; see *Listes des rentes viagères dites Tontines* (Paris) for years 1738, 1769.

[4] The Irish tontine is well described by CHARLES GAUTIER, "Un Investissement genevois: La Tontine d'Irlande de 1777," *Bulletin de la Société d'histoire et d'archéologie de Genève*, X (1951), 53-67.

estimate says 18,000 to 24,000 — it had more than enough funds to invest in foreign governments and bankers and medical men bent on exploiting every opportunity to gamble on human longevity. Occasionally the results were bizarre.

" Rococo finance ", it has been called. The term that should bring to mind that the elaborate curvilinear decoration of the mid-eighteenth century, from Paris to Vienna, lends itself well to a mode of finance in which gambling, mathematics, experimental science, and "ingenious abstraction" meet.[5] Gambling is prevalent in a great many financial schemes within that century, notably state lotteries held regularly in England. " Rococo" might well characterize a lottery-tontine proposed by the German principality of Gotha in 1752. Bettors received a fixed annual income plus a variable annuity decided by lot. Higher lottery numbers inherited from lower, one class inherited from another; normal rules for tontines rarely apply. The bettor could hardly have known the odds in this game of roulette. But what for him was a financial labyrinth was quite ingenious from the prince's standpoint: the ruler's costs could not exceed 5.7 percent annually and might be as little as 3 percent![6] The correct adjective is yet to be found for those small Genevan tontines in which members bet on the longevity of candidates above age 77. Or a handful of speculators might bet on the survival of unborn children; if fortune dealt twins and these survived a given time, that meant " doubles ".

Much more in vogue, however, was a " formula " devised in the Genevan banking community for speculation in French life annuities. Once France had converted tontines to life annuities in 1770, a Genevan banker seems to have bought up a number of them cheaply, transferred them to Genevan lives, and sold them to a syndicate of shareholders. Thus he launched the " Geneva formula ".[7]

During the 1770s and 1780s Genevan bankers continued to speculate in French life annuities and exploited their formula. The profitability of the enterprise depended on the gullibility or rashness of French officials who issued single-rate life annuities. Earlier, these annuities had carried interest rates graduated according to age; the very first issue, in 1693, had specified 7 percent for the youngest class.[8] But as wars and deficits impoverished French govern-

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[5] HERBERT LÜTHY, *La Banque protestante en France de la révocation de l'édit de Nantes à la Révolution* (Paris, 1959-61), II, 469.

[6] L. GUSTAV DU PASQUIER, " Die Entwicklung der Tontinen bis auf die Gegenwart," *Zeitschrift für schweizerische Statistik* (1910), 498-99 — often unreliable but, for the Gotha tontine, internally consistent.

[7] LÜTHY, II, *passim*, abounds in detail about the Geneva formula, life annuities, selected nominees, etc.; see also Marc Cramer, " Les Trente Demoiselles de Geneve et les billets solidaires," *Schweizerische Zeitschrift fur Volkswirtschaft und Statistik*, LXXXII (1946), 109-38.

[8] To be exact, 7.14 percent (ages 0-25) through 14.28 percent (above 70) — six

ments, they searched desperately for money. From the time of the Seven Years War (1756-63) the crown continually sold life annuities with no distinction of age at 9 or 10 percent. Genevan bankers purchased the annuities from the French treasury and selected thirty to sixty nominees in collaboration with medical experts, notably Dr. Louis Odier, an authority on mortality with access to Geneva's rich store of vital statistics. Odier knew whose ancestors had a reputation for longevity and that females were the safest risk. Besides, they were less likely to migrate to foreign lands, where identification — to prove the nominee and the annuity still survived — every six months might present difficulties. Thirty affluent Genevans were likely to remain at home, not far from excellent medical care.

Once he had acquired the annuities, the banker sold them to share-holders. Ordinarily the purchaser of a life annuity suffered loss of all income if his nominee died. In this case the holder simply owned one or more shares in the lives of thirty persons; if one died, his income diminished only one-thirtieth. Often the banker sold these shares on the instalment plan. A sort of general partnership (*société solidaire*) earmarked annuity instalments directly to the banker until the debt to him was liquidated. No matter what became of the thrity Genevans, the syndicate member owed the banker the same amount. It seemed that no one could lose — other than the French royal treasury (and hence the taxpayer), which issued annuities in vague anticipation of a twenty-year timespan for insured lives; the Genevans would eventually prove that by carefully selecting nominees, one could triple that expectation.[9]

Many names that appear on life annuity lists were enrolled also in the Irish tontine. Genevan bankers subscribed £ 60,000 Irish at £ 100 a share and spread it over fifty lives. This application of the Geneva formula accounted for one-fifth of the entire tontine. While shareholders in a Genevan life annuity scheme expected their annual income to decrease, those who bought Irish tontines could expect some increase. Annual interest in fact rose from 7½ percent at the inception of the tontine to around 10 percent by 1837. Members of the syndicate had discovered a tontine virtually without risk.

Much is known about the fifty Genevans in the Irish tontine — names, dates of birth and death, married or single status. We know that at least half of them eventually married. These nominees entered at ages from 2 through 9 as of 1780, when for the sake of convenience we presume the tontine to have begun. By 1837 fifty-seven years had elapsed and, of the original 1091 nominees in the youngest class, only 461 remained. Of the original fifty Genevans in that class, fully thirty-two survived. At that date, comparisons of these two groups

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classes altogether. GEORGES CHARRA, *Des Emprunts publics émis sous forme de rentes viagères* (Paris, 1909), pp. 15-17.

[9] LÜTHY, II, 467.

show that the selected Genevans experienced longevity significantly better statistically than their class as a whole.[10]

Genevans entered the tontine at an average age of 4.84 years. After the fact, then, they had an average life expectancy of slightly over 59 years. Comparisons with other contemporary mortality data are relevant. For example, a study of mortality at Carlisle, England, beginning around 1780 shows at age 5 an average life expectancy of 51.25 for a group of males and females. Out of a base group of 6676 the Carlisle study shows 500 deaths from ages 6 to 17 — a mortality rate of 7½ percent. No Genevans died within a comparable time: if the Carlisle rate had applied to the selected nominees, four deaths would have been anticipated. The Genevan death rate is noticeably lower.

More interesting yet is a contemporary study of Sweden and Finland, where females of age 5 had a projected average life expectancy of 49.11 years. This group, numbering 330,009 lives at age 5 — fifty times larger than the Carlisle sample — was expected to decrease to 62,614 by age 55.[11] If so, this would mean a survival rate of 19 percent. Fifty-one years after the Irish tontine had begun, fully 74 percent (thirty-seven persons) of the Genevans survived. The difference between the Swedish-Finnish and the Geneva groups is significant statistically; the Genevans were very well chosen indeed.

Over the decades, the Geneva syndicate's income appreciated gradually. However, one Swiss banker, Charles Hentsch-Chevrier, suspected that that income was bound to increase much faster if only the Irish treasury would properly certify all deaths. He imagined that seafarers were disappearing halfway around the world and that, since the Irish government received neither a death certificate nor a semiannual notice that the nominee was alive, it simply held funds without asking questions. Hentsch thought someone should go to Ireland to nudge the authorities, who had no interest in taking the initiative.[12]

Hentsch certainly was correct in assuming that identification was a central problem in tontine administration. How to establish periodically that one's nominee is alive? As far as the Genevan girls were concerned, it was simply a matter of identifying fifty local celebrities unlikely to be mistaken for anyone else. Others had solved the problem by nominating Louis XVI or Marie Antoinette, whose lives or deaths were easily certifiable. But is there any truth to the banker's suspicions? We doubt it.

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10. See our Appendix. Also Gautier, pp. 57-60, 65-67. There was Genevan participation outside of the syndicate but we are not concerned with it. One should note that £ 100 was a large sum, much larger than the 300 livres paid for a French tontine.

11 For mortality in Carlisle and Sweden-Finland, see JOSHUA MILNE, *A Treatise on the Valuation of Annuities and Assurances on Lives and Survivorships* (London, 1815), II, 564, 566. Dr. Odier's table for Geneva in the eighteenth century (till 1760) seems to say that females had an average life expectancy of 45.33 years. "Tableau général de la mortalité... depuis 1560," *La Medicine éclairée par les sciences physiques* (1791), p. 153.

12 GAUTIER, pp. 60-62.

By 1847 the tontine had run sixty-seven years and was paying syndicate members around 25 percent interest annually. Even though shareholders owned varying amounts, it is possible to draw solid conjectures from the few indications we have of interest paid in certain years. We may infer that by 1847 there must have been around 267 survivors from the youngest class and that it had suffered 73 percent mortality. (This class, recall, included the Genevans, whose performance was much better). Now the suspicious banker was saying that actual mortality was considerably higher. It is pertinent that one hundred years earlier (1746) Antoine Deparcieux's table of mortality among tontine holders had predicted that 1000 persons would suffer only 64 percent mortality; moreover, Deparcieux reprints a table by William Kerseboom suggesting 75 percent mortality among Dutch annuitants beginning at age one.[13] Even that seems low by Hentsch's standards. It appears that he was merely repeating the familiar error of overestimating human mortality; this the Dutch had done almost two centuries earlier when they attached to the Kampen tontine some projection that proved highly erroneous. Besides, his assumption that seafarers, actual or potential, were likely nominees for tontines implies a low opinion of the intelligence of the buying public; our impression is that investors as a class were quick to grasp the implications of tontines.

The story of Genevan speculation and Irish tontines is not lacking in the ironic and the unexpected. To begin with, when the French converted tontines to life annuities in 1770, we presume they intended to save the treasury a great sum of money, even at the cost of partial repudiation. This ploy served as the occasion for the Geneva speculation; a Geneva syndicate bought former tontines. Once the Genevans had tasted success, they exploited their formula with gusto. For its part, the French government after abandoning the tontine continued to rely on life annuities paying 9 or 10 percent regardless of age. These turned out to be almost as expensive as the tontine. The French had traded, so to speak, one dangerous expedient for another.

Financial insolvency proved to be the occasion for the French Revolution of 1789. Genevans who thought they were outwitting the French authorities were contributing their small part to that budgetary chaos and, ultimately, their own ruin. For in the 1790s the revolutionary authorities in their fury wiped out the annuities through conversions and catastrophic inflation. Genevans could hardly have emerged unscathed unless their money was tied up in Irish tontines. Ireland proved solvent and its currency actually appreciated in value 8 percent (1817). Hentsch's words reveal no awareness of how fortunate the holders of Irish tontines were.

As for the fifty girls, the first to die at (age 18) bore a famous name. Could Jacqueline Vieusseux have been the daughter of Gaspard Vieusseux, the pro-

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[13] DEPARCIEUX, *Essai sur les probabilités de la durée de la vie humaine* (Paris, 1746), Table XIII. Deparcieux's own data stem from the 1689 and 1696 tontines in France.

minent Genevan physician and also a share-holder in the Irish venture? Gaspard had already entered a daughter in an absurd tontine whose object was simply to bet on the longevity of a small group of youngsters, and the child had died.

As for the last two survivors of the Irish tontine, they were sisters, Catherine and Philippine Jolivet, deceased in 1863. The record for longevity was set by a lady who died at age 90 in 1862. If the terms of the Irish tontine were observed, these hardy survivors never acquired the windfall that normally went with tontine ownership. Their shares were frozen once the interest equalled principal paid; their income could multiply by no more than 13 1/3. For the Irish government this was no great boon; measured by present values, the saving resulting from such a reversion so late in the course of a tontine is minimal.

At first glance it appears strange that mortality among the fifty Genevans is comparable to that portrayed in the Commissioners Standard Ordinary Mortality Table (1958), based on death rates in the years 1950-54 and used fairly recently by American life insurance companies. The reason for the similarity is that the CSO is "loaded" or "enriched", to use the words of authorities on insurance. They say the CSO death statistics are inflated to protect companies from "unpredicted increases in the death rate and ... temporarily adverse mortality fluctuations" and to allow all companies to use them safely.[14] In exaggerating mortality the table pursues what seems to be a long tradition; obvious examples include the faulty Kampen projections, the suppositions of the issuers of French life annuities — who if they had read Deparcieux, should have known better — and the interesting but improbable theories of Charles Hentsch-Chevrier, who failed to recognize what a bargain the Irish tontine really was.

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[14] ROBERT I. MEHR AND ROBERT W. OSLER, *Modern Life Insurance*, 3d ed. (New York, 1961), p. 509. MARK R. GREENE, *Risk Insurance*, 3d ed. (Cincinnati, 1973), p. 464.