

## **Death and the salesmen**

*Gillian Tett and Joanna Chung*

In a frosted-glass cubicle in the Cass Business School on the edge of the City of London, David Blake, an earnest, greying professor of pensions economics, is waving a chart. It looks similar to the graphs that economists often use to estimate asset prices or currency movements: a fan of colours depicts probabilities of events occurring until 2050. "We modelled this on the Bank of England's inflation graphs," explains Blake, with pride.

But these statistics do not relate to anything as mundane as prices. Rather, they are about the more gruesome topic of death. Specifically, Blake is predicting how long our children, and children's children, will live - and his conclusions are striking: over the past century, life expectancy in the western world has not only risen, but the rate of increase has accelerated. While someone in the 1840s lived, on average, to 40, today's generation can expect to hit 80, "and for our grandchildren, it could be 160," says Blake, stabbing a pale green corner of his fan chart.

Until recently, such morbid number-crunching was of interest only to actuaries, the pensions industry, scientists and doctors. After all, death is not a topic that many of us want to discuss - except in the most abstract terms. And the pensions world was such a slow-moving, sleepy backwater that it rarely attracted the interest of high-flying bankers.

But behind the scenes in the City of London - or, more accurately, deep within its computers - something is afoot. A couple of months ago, one of the world's biggest financial groups quietly hired Blake to conduct some brainstorming on death rates and their economic impact.

Blake says he cannot reveal the name of his employer: the financiers he is advising are apparently so worried about trade secrets they have placed a gagging order on him. Still, what is clear is that the City's financial titans have every reason to look at what men like Blake are doing. While the idea of lengthening life spans might sound wonderful to individuals, it creates a problem for society. Who is going to pay for our upkeep when we get old? In centuries past, the answer was clear: you either worked until you dropped, or relied on children. As this model began to fray, company pension funds or the state stepped into the void - both of which essentially relied on income produced by younger workers, or a form of inter-generational transfer. These days, responsibility for old age is shifting to the ageing individual, with governments encouraging citizens to save money to protect themselves.

In theory, that might sound fairer than forcing the younger generation to support the old, but there is a catch: before anyone can save effectively, they need to guess how long they might live. People tend to underestimate how long they will survive. After all, if you expect to live to 70, but then reach 110, even the most fastidious saver might run out of funds.

And this is where Blake - and his fan charts - comes in. In recent decades, bankers have become adept at using the financial markets to trade all manner of risks, such as the oil price, inflation or currency swings. Now companies such as Goldman Sachs, Deutsche Bank and ABN Amro are trying to devise ways of making money from the new "risk" facing modern humanity - that of living too long.

The uncertainty about life span has existed since the start of modern finance. The very first time that the British state issued a bond - back in the 17th century to fund a war against France - it did so using a longevity gamble. Tucked in a glass case in the corridors of the Debt Management Office, the branch of the British government that sells national bonds, stacks of old leather files detail these bonds, known as "tontines" after a Lorenzo Tonti, a Neapolitan economist who first devised the scheme. "These were the first government bonds issued anywhere in the world," says a senior DMO official, who has spent hours reading these dusty files, with all the passion of an amateur historian.

By modern standards, the structure of these tontines was macabre. The government raised money by selling a bond, and then paid bondholders a lump sum each year, divided among the investor pool. So far, this looks similar to how modern bonds work. However, there was a crucial catch: tontines had to be held by a single, named investor - and these instruments expired when that person died. So bond payments were divided each year among the remaining tontine holders, ceasing when the last tontine holder died. Whoever lived longest collected most money - subsidised by the dead.

The government issued the first tontine in 1693, and it proved so popular that they were soon being sold across Europe. Geneva had a particularly lively tontine market. However, as the tontines piled up, they became more controversial. One problem was that they provided an incentive for murder or fraud. And while historians have not found any tangible cases of this happening, the theme permeated 18th- and 19th-century literature and lore - even providing the plot for Robert Louis Stevenson's *The Wrong Box*.

A second, more important, problem was that the government kept getting its estimates of longevity wrong. When it sold the first issue of tontines in 1693, it apparently expected tontine holders to live just a few decades. That seemed a reasonable bet at the time, and the dusty leather-bound files show that the early tontine holders included men and women of all ages. But by the middle of the 18th century, investors had become more canny, with the record showing most tontines being bought in the name of girls, usually around five years old. That was because girls lived longer than boys, and because there was a high level of infant mortality until about age four.

This produced great results for the tontine holders, some of whom kept collecting money until their nineties. But it was disastrous for government finances. And eventually, the tontine scheme became so costly that the government abandoned it.

In the 19th century, the word tontine vanished from popular use. But the issue of longevity and mortality risk did not die away. Nor did some of the principles behind the first tontines. They resurfaced in the new concept of life insurance, which paid out a lump sum when policyholders died.

From the 1850s onwards, "mutual assurance" companies started offering "penny policies" to working adults, sold by a network of door-to-door agents. These were subsequently extended to children under 10, which proved wildly popular (a move not driven by sentimentality alone, since at the time your "pension" effectively came from having children to support you in your old age). In the early-20th century, new schemes such as pensions, saving plans and annuities appeared. By the 1960s, the sales of these products had become a multi-billion-pound business.

As the life assurance business expanded in the 20th century, the principle was that if somebody died young, activating a policy, the payout would be met by drawing on the income from premiums paid by living policyholders. Conversely, if an annuity holder, who was receiving an annual fixed income for life, survived for a long time, this was balanced out by other pensioner deaths. Any company running these schemes presumed that early and late deaths would subsidise each other - just as the issuers of the tontines had.

While this pattern worked well for the life insurance world during most of the 20th century, in the late 1990s something started to go wrong. One of the first to spot the problem was Thomas Boardman, a policy development director for Prudential, one of the largest UK pensions and life assurance groups. Boardman spent the early part of his career working as an actuary, which made him an expert at understanding death rates. ("I don't think my friends think I am ghoulish," he explains. "More that I am a geek.")

This analysis has left him with an intriguing tale to tell. Back in the 1950s and 1960s, as he tells the story, the life assurance and annuity sector was a great business to be in. "You had a lot of people with a culture of thrift saving back then.

These people, who saved hard for their retirement in the 1960s, often assisted by good company pension schemes, are now reaching retirement, and insurance companies and pension schemes are seeing a significant rise in annuity and pension payments." Companies such as Prudential had prepared for that change because actuaries knew the population was ageing. But just before 2000, they noticed something odd: not only was longevity rising, it was doing so at an accelerating pace. "What we are seeing is that anyone born between 1925 and 1940, for example, is experiencing a much lighter mortality rate," says Boardman, who - like almost everybody else in this business - can discuss his research at length without ever enunciating the distasteful word "death".

Baffled, actuaries looked for explanations. When tontines had first been issued in the 17th century, there had initially been little data available on death trends, partly because parts of the Church considered counting bodies to be a religious affront. However, these days, Prudential, like its rivals, has turned death analysis into a highly scientific game, with a small team in Stirling and Reading now employed to crunch the data. "We used to just look back at historical trends and project them forward - but in the past five years we have started to look more at the medical profession, and the trends behind why people die," explains Boardman.

This is throwing up several possible explanations for the rising life-expectancy rate. One theory is that the 1918 influenza epidemic raised longevity rates for people born a few years later; another is that the austere food rations imposed during the second world war reduced obesity rates. "But this is also the first generation to understand that smoking is not good, and they have also benefited from medical developments in the cardiovascular area, which affects the figures, too," says Boardman.

The really crucial question, however, is whether this acceleration of longevity will continue - and how this might affect our financial futures. The life assurance and annuity sector has until now assumed that risks can be shared within a single generation, but this only works if the overall death rate is relatively stable; if any entire generation lives longer, then "early" and "late" deaths no longer balance out.

For a company such as Prudential, this problem can be partly solved by the fact that it runs both life assurance operations and pension plans. If people live longer, they pay more into their life assurance policies, and their families do not need to be paid out; if they die young, their pensions no longer need to be paid. It's a natural "hedge". But most pension funds are in a far worse position since they do not run life assurance schemes. "The big question now is how to handle this risk," says Boardman. "That is what we are all trying to work out."

Earlier this decade, the British government demanded that pensions companies start measuring the value of their investment pools more accurately - and, above all, come clean about whether they had enough funds to pay pensions in the future. This change has made the UK a pioneer in rethinking pensions - and made the City of London the natural innovator in devising new ways of handling the associated risk.

Because this new government rule was introduced at a time when equity markets were falling and bond yields were low - thus lowering the value of investments - the changes left many pension schemes looking short of funds. Some companies are trying to fix the problem by paying more money into their pension funds, or buying financial instruments that might protect them from future inflation rises. Meanwhile, behind the scenes, many pension schemes are anxiously turning to investment banks asking if they can help them "handle" longevity risk.

Financial theory suggests there should be plenty of scope for bankers to help. Financiers have succeeded in slicing and dicing numerous other risks: in the capital markets today you can buy derivatives that allow you to place bets on the future of inflation, commodity prices, exchange rates or interest rates. Investors are able to bet on the chance of natural catastrophes. Can these techniques be applied to death rates?

One avenue for thinking about the problem might come from seeing how bankers handle catastrophe risk.

A few years ago, financiers at banks such as Goldman Sachs invented an instrument known as a "catastrophe bond" - or "cat bond", where an insurance company writes out policies to customers wanting to protect themselves against a catastrophe - for example, farmers worried about hurricanes destroying their crops - and then issues a bond. The money collected from policyholders is then used to pay the bondholders' income. But if a hurricane hits, and the farmers claim their insurance, the bondholders stop receiving payments. Thus, by issuing the bonds, the insurance company is sharing hurricane risk - and the value of the bonds depends on how many hurricanes occur.

In the past year, some financiers have taken the idea further, creating derivatives of cat bonds. Insurance companies have followed suit, launching "mortality bonds" that bet on whether death rates will rise - usually due to something such as bird flu. Axa, the French insurance group, issued one of these last year where investors purchased bonds, and received a cash flow with a value that fell if the level of deaths among Axa policy holders rose. The price of a mortality bond is thus tied into the chance of a pandemic.

Now people in the capital markets are wondering whether this idea can be applied further. If bond purchasers are willing to bet against catastrophe or mortality, why not longevity? A couple of years ago, the European Investment Bank and BNP Paribas made one attempt to do just that. The EIB marketed a 25-year bond, worth £540m, which produced cashflows that were designed to be a mirror image of a pension fund's liabilities for a hypothetical pool of 65-year-olds. The details of the scheme were complex, but the essential idea was that the payout to bondholders would fall each year, according to the rate of deaths. In other words, the higher the death rate, the less money the bondholders would receive. The investors were expected to be pension funds looking for a way to balance their risks.

However, unlike Axa's mortality bond, the scheme withered and died. One reason was that the instruments were so novel that baffled pension funds did not know what to make of them. And another problem was data: the scheme was based on mortality rates of a group of 65 year olds, which some potential investors thought unrepresentative because it did not capture a broad enough section of the population. But arguably the biggest problem dogging the BNP Paribas experiment was a mismatch of buyers and sellers. Markets only flourish when there are investors willing to stand on both sides of a trade, betting whether prices will go up and down. Most people believed longevity would carry on rising. There weren't enough prepared to bet on the trend slowing or going into reverse.

Back in the City, in the Swiss Re building, known as the Gherkin, two men are going against the trend. Rob Procter and Espen Nordhus used to work at Morgan Stanley as insurance analysts. Eighteen months ago, they became so convinced that the questions of insurance, annuity and longevity were on the verge of big changes that they left the investment bank to launch a hedge fund to benefit from them.

"We think there are inefficiencies here, that funds like us can invest in," says Nordhus, whose office walls are hung with a striking array of maps - to help him and his colleagues locate disasters around the world, he says.

With about \$250m under management, the fund, Securis, spends most of its time trading established insurance instruments, such "cat" bonds. It also dabbles in the new-look mortality bonds. "We think there are probably \$1bn-\$2bn of mortality bonds in the market now, and another \$20bn of [similar instruments]," says Nordhus.

However, Nordhus and Procter suspect that if longevity bonds ever appear, this will be the real game in town. And their existence - and that of other funds - might help to bring this about. After all, one factor that tripped up the BNP Paribas bond in 2004 was a lack of sophisticated investors willing to hold these new-fangled instruments.

With the hedge fund sector holding some \$1,300bn of cash that needs to be invested by traders accustomed to handling risks nobody else wants to touch, why not persuade hedge funds to jump in and breathe life into this market?

One problem is that the attention span of the average hedge funds runs to days or months - not decades. Another is price. As Nordhus points out, hedge funds will only start to trade longevity "if we feel that we are being properly compensated for all the uncertainties". In plain English, that means pension companies could pay dearly to "insure" against longevity risk.

The government could also step in and take some of the risk. Back in the 1980s, the UK government helped to develop the market for trading inflation risk, and some economists think it could now help again, perhaps by buying the most extreme types of risk (such as the chance that a cure for cancer is found that enables us all to live even longer). However, the DMO is wary of this idea.

One of the problems worrying Securis and other potential investors is the poor quality of data on death. At present, the UK's Office for National Statistics issues annual figures on death rates, but these are calculated only in a relatively rudimentary form. Separately, an institute known as Continuous Mortality Investigation compiles detailed data from insurance companies about mortality rates for different age groups. This second set of statistics is precisely what a banker needs to create the sophisticated financial instruments, such as derivatives, to enable the longevity market to take off. But unfortunately it only emerges publicly every four years - and with a long time lag.

Investment banks are pushing the CMI to improve this data. Dave Grimshaw, the secretary of the CMI, says that this is not easy to do, since it collects the figures from the insurance industry (and these figures may not be representative, as they cover only people rich enough to buy life assurance in the first place). "There is not reliable, frequently updated data which could be used for the basis of such trades in the market. People think that we have better and more up-to-date data than everyone else, but that is not necessarily correct."

Moreover, British pensioners are increasingly retiring to countries such as Spain, which makes it harder to track them when they die. "I wouldn't even attempt to collect 2005 data until the middle of 2006," says Grimshaw. "We want to miss as few deaths as possible."

In other words, the biggest impediment for the financial whiz-kids who are now so eager to create esoteric new longevity instruments may revolve around the grubby, real-world issue of how to count dead bodies.

Given these obstacles, some are cynical about whether the longevity market will ever come to life - or at least on a meaningful scale. Prudential's Boardman argues that it is likely to happen in stages. He foresees pension providers asking insurance companies to take on some of the risks arising from increased longevity. Insurance companies will then find ways of passing on some of the risk to the wider capital markets.

Indeed some banks are already testing schemes: Deutsche Bank is considering creating bonds using the cash flows from life insurance portfolios. It believes that it will receive a credit rating for these instruments soon, which should allow trading to start this year. Several other banks are experimenting with bonds and derivatives linked to longevity risk.

As Professor Blake perfects his mortality models, he remains convinced that we are on the verge of a financial revolution. Sooner or later, the City of London will find a better way to count deaths: the financial incentives to get this right are huge. And once a timely death index emerges, the first fully-fledged longevity bond will appear, "almost certainly over the next year", Blake predicts.

That should trigger a wave of copycat products. And while the pattern of buyers and sellers looks imbalanced right now, this will change. One reason is that not everybody expects longevity to keep rising indefinitely. "There is a camp of pessimists who say that there is a limit to how long the human frame can support life. And things like poor diet or global warming could limit longevity, too," Blake points out. In 2005, the New England Journal of Medicine carried a report saying that the increase in obesity could end two centuries of rising life spans.

Moreover, some will benefit if pensioners live longer: companies running care homes or producing drugs, for example. These businesses may be prepared to pay to protect themselves against the risk of longevity slowing or reversing, and could form the counter- parties to pension providers, which suffer financially when life expectancy rises.

"People like this have not yet been approached... but you show them what is possible, they should be natural [investors]," Blake says. If so, that should enable a proper market to appear. In a few years, it could be as easy for individuals to invest in a longevity bond as it is now to buy shares.

**Fonte: Financial Times, USA, February. 25 2007. Weekend, p. 8.**