



SOCIETY OF ACTUARIES

Article from:

The Actuary

October/November 2010 – Volume 7 Issue 5



TRENDS

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A LOOK AT 1-IN-200-YEAR EVENTS



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A RISK MANAGEMENT LESSON WAS BORN AT THIS YEAR'S WIMBLEDON MATCHES.

Those of you who are interested in tennis—and perhaps even a few of you who aren't—will be aware that history was made at Wimbledon this year, when those watching were treated to a match of quite gargantuan proportions in the first round of the Men's singles competition.

It was the kind of match to get the nerdy numbers types among us scrambling for our probability distributions. Any actuary who presumes that the past is a reliable guide to the future could have been forgiven for thinking that a tennis match could not possibly end 70 games to 68 in the final set, or that a single set of tennis could not possibly last longer than any previously recorded *match* ever had.

And who could blame them. Before John Isner of the United States walked onto court 18 with Nicolas Mahut of France, most tennis players didn't think it could happen either. But 183 games, 11 hours and five minutes of power tennis later, John Isner had limped into round two and their match had stormed into the record books.

It is a contest that cries out for a little statistical analysis, but to do that we need first to break the match down into its component parts, its base building blocks. As luck would have it, anyone

who's been following tennis for a while will know that the quality of MI (match information, in this case!) that is available to viewers and commentators has gotten much better in recent years. So courtesy of the BBC, in figure 1 are the match statistics that count for Isner vs. Mahut.

So, how likely is it that a match like this could ever happen again? Well, a lot of factors will have a bearing on that, many of them not readily quantifiable. But there are two very relevant questions we could reasonably ask that do have a very statistical flavor:

1. How exceptional is it for two players to serve this well in a match?
2. If these service and points won percentages *are* typical of Isner and Mahut, how long might we have to wait before they served up another match like this one?

Sadly even my own degree of nerdiness doesn't stretch to trawling the tennis archives for a large enough sample of past match statistics to test question 1 above.

If we assume they are characteristic of a level of performance that the two players concerned are capable of reaching regularly, then we have something to work with.

The obvious question for nerdy types is if they played each other over and over again and always performed to this level, what would be the likely outcome? Well, being a sometime nerdy type myself I built a little stochastic model to test that out. And if you're a nerdy type too, the results might make interesting reading.

Simulations show that even their average match would last three hours, 48 minutes, with the 5 percent tail of the distribution kicking in at an impressive six hours, 40 minutes. Looking at the split of their matches by number of sets, 27 percent would be straight sets victories and 19 percent would go to four sets, leaving a whopping 54 percent of matches going the distance. How unlucky was Mahut to have lost? The answer is "a bit": in practice, he could expect to win 60 percent of his matches against Isner at this level of performance.

More pertinently, how many times might they need to play each other before they broke their own record? Well, on these performance stats they could expect a match this long about once every 500 outings. So it may not happen again for a while. But on this evidence, the likelihood of that is still five times greater than either of them winning a single set 6-0!

Just games with numbers, of course. Back in the real world, sadly nothing is ever quite so simple. Complete physical exhaustion might well bring any similar game to a grinding halt or quicker conclusion if it didn't happen to be spread over three days as this one was, and I leave unanswered the question of just how likely a repeat performance of such dominant serving might be. There were, after all, only 17 break points in the entire 980-point match.



THE BIGGER PICTURE

Well, I guess that's more than enough tennis for one article in an actuarial magazine. But

Figure 1: Isner/Mahut

	ISNER	MAHUT
1ST Serves in:	74%	67%
2ND Serves in:	92%	88%
1ST Serves won:	81%	87%
2ND Serves won:	63%	63%
Total points won:	478	502
Average interval between points:	41 Seconds	

are there any lessons we might draw from this relating to matters a little closer to home?

I think there are.

Perhaps the Isner/Mahut match has something important to tell us about the management of risk. For as the financial crisis has ably demonstrated, dramatic events that many did not foresee are not confined to the tennis court.

Back in January 2009, I attended the presentation and discussion of a paper by Bernard Bergman called “Capital – It’s Over-rated!” in London. Bernard presented his paper against a backdrop of financial crisis and the forthcoming introduction of the Solvency II regime across the EU (in 2012). The capital adequacy test of the latter requires firms to maintain sufficient capital to ensure that the modelled probability of defaulting on policyholder liabilities over a one-year horizon is no more than one-half percent. In essence, this test requires the assessment of so-called 1-in-200-year events and their financial impact.

Much lively discussion followed the presentation of Bernard’s paper, but nobody mentioned the elephant in the capital requirements room: how reliable is an actuary’s—or anyone else’s—judgment as to what a 1-in-200-year event actually looks like in present circumstances, let alone what its financial impact might be?

Consider this list of significant risks that now confronts us.

- Peak oil triggering an energy crisis
- Global warming
- Population growth
- Population aging
- Growing geopolitical tensions between countries

- Growing social tensions within countries
- Overexploitation of resources leading to resource shortages
- Major terrorist incident

Consider also that, in the wake of the financial crisis, the macroeconomic outlook remains uncertain. The position of some developed economies in particular looks precarious, a combination of low interest rates and financial stimulus masking sluggish demand, structural weakness, ongoing debt issues, trade deficits and unsustainable global financial imbalances.

Witness also the trend in recent years for financial markets to become increasingly volatile, with increasingly frequent deviations from economic fundamentals. Not only are our present economic and financial systems not equipped to help us best manage the impact of some of these risks, in present form they may well contrive to make some of those impacts worse.

I would wager that, by the time we see another epic of Isner/Mahut proportions at Wimbledon the world will have had to pick up the pieces from a rather bigger global crisis than the one we’ve just witnessed. For I would suggest that all of the risks I list above fit comfortably within a 1-in-200-year risk horizon—indeed some of them are already beginning to impact. Most of the organiza-



Nicolas Mahut of France

tions we serve may take a sanguine view, but whether we are tennis fans or not, as actuaries with a strong public interest mandate it should give us considerable pause for thought.

For my own part, I’ve been pondering what I see as the gap between our own industry’s preoccupations and this wider reality for some time now. Indeed I became so concerned by it that I took a year off to write about it (see www.acturage.com/thepaper.asp).



RISKS AND OPPORTUNITIES

At the risk of stating the obvious, risk management is more about finding ways to mitigate risks than it is about finding ways to analyze them. Some risks can be mitigated without being quantified; some risks can be quantified but are impossible to mitigate; some risks—



John Isner of the United States

rather inconveniently most of the big ones—may appear stubbornly resistant to both. In the wake of the recent financial crisis, talk of risk management is not surprisingly now all the rage. But if we wish to impress our public interest credentials upon a skeptical public then attempting to second guess the frequency and financial impact of big events will not suffice. Likewise, if we wish to give profile to our risk management credentials we will need to invest proportionately more time contributing actively to the mitigation of risks that are of interest to the wider public and proportionately less time contributing to the analysis and reporting of risks that are of interest to those who employ our services.

In the context of the kind of risks I list on page 19, that might look a daunting challenge, and indeed it is. But with a bolder, more commit-

ted and more pragmatic approach there is much that as actuaries we could be doing in a range of different areas to raise the profile of our profession, more effectively represent the long-term public interest and contribute more actively to the management of high-profile risks.

To illustrate the point, here are a number of areas that I believe could benefit from our input.

BANKING REFORM

At the time of writing, in the United Kingdom alone taxpayers' collective investment in the banking system amounts to around \$250 billion,

over \$4,000 per head of population. UKFI, the company set up to look after that interest for us, has just 15 employees. Its business to date has been conducted largely behind closed doors, which is disconcerting given the scale of investment they are representing on our behalf.

Banking has become far more complex than it needs to be or needs to be to serve the interests of its customers. If it hadn't, there would not have been a banking crisis. For every actuary who might manage a bank badly there are plenty more who could bring valuable financial and risk management insight to bear in helping to ensure that banks are better managed to the benefit of all. Perhaps it is time we stopped hiding behind the notion that actuaries do not do banking and started lobbying government, regulators and the banks that employ some of us, to utilize our skills to better effect in what is evidently

a critical risk area. For as we have learned to our cost, these days we are all doing banking, whether we want to or not.

ECONOMIC AND FINANCIAL MARKET REFORM

Capitalism's failings as an economic doctrine are beginning to cost us dearly. No amount of numerical dexterity is going to make economic growth plus population growth plus resource consumption equate to a sustainable future. Instead of acquiescing when others persist in trying to defy this reality, the profession could better serve the public interest by promoting reasoned debate on the subject, with the aim of helping to develop a sustainable Plan B before it is too late.

In the wake of the latest crisis it is evident to many people that to call only for better governance and greater transparency is simply to treat symptoms rather than causes, and the profession could (and should) be making a far more effective contribution to the ideological debate about what kind of economic and financial market reforms are now needed.



PUBLIC SECTOR REFORM

Given the present fiscal situation on both sides of the Atlantic, the need for public sector efficiency has never been greater. Savings need to be found. Whatever one's political persuasion, it seems clear that the interests of individual taxpayers have not always been well-served in this area in the past. Vast sums are invested—the United Kingdom's health service alone costs around \$150 billion a year—but they are not always spent wisely, and institutions often

seem to be run in ways that would cause heads to roll in the private sector.

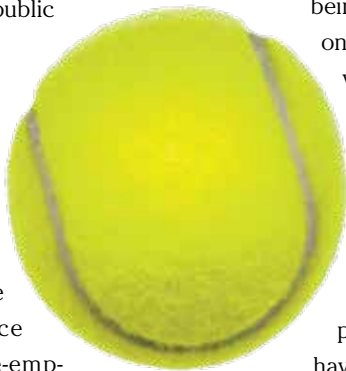
The profession's toolkit and public interest mandate equip it well to assist, and doing so would strike a populist chord. It would be a bold move, but in the present climate if the profession could find an effective mechanism by which to offer its services it would be difficult for any party of government to refuse. And we should remember that as taxpayers this is an area that we all have an interest in.

PENSIONS REFORM

Another good place to start looking for public sector savings might be in the public sector pensions provision. It would be interesting to see an analysis of that provision across the public sector in comparison with its equivalent in the private sector, with particular focus on the relative cost of each, and how this has changed over the last 20 years or so. Who better placed than our own profession to undertake such a study, in the wider public interest?

POLICY INITIATIVES

Many of the large-scale problems we presently face require pre-emptive measures to be taken now to mitigate against adverse consequences in the future. This is essentially risk management on a scale that transcends corporate boundaries in pursuit of a greater good.



Unfortunately, government has a track record of doing this poorly, and industry has a track record of doing it hardly at all. We could do much to enhance our own risk

WE COULD DO MUCH TO ENHANCE OUR OWN RISK MANAGEMENT CREDENTIALS BY BEING MORE PROACTIVE. ...

management credentials by being more proactive in promoting public debate and formulating policy initiatives in some of these areas (economic reform, the impact of continuing population growth, the management of scarce resources, etc.).

ENERGY EFFICIENCY AND RECYCLING POLICY

Investment in each of these has fallen on hard times recently. Thanks to the financial crisis and the associated collapse in oil prices, investment in renewables has taken a nosedive since early 2008, at a time when it should be being massively expanded. Similar logic (if one can call it that) explains a reduction in investment in recycling. Could the profession not bring its risk analysis and projection skills to bear in articulating a longer term business case based on a more realistic economic cost/benefit model? That oil might run out looks rather less a 1-in-200-year risk than a 1-in-50-year near-certainty, particularly if fears that key producers may have been over-estimating their reserves prove well-founded. Is it not time we dedicated more of our long-term vision and risk analysis ability to the task of painting some of the scenarios that could arise from underinvestment in these areas, given their criticality to the long-term public interest?

TRANSPORT POLICY

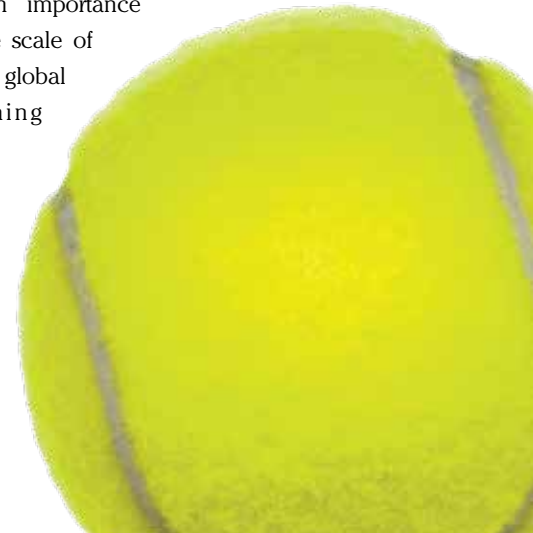
One doesn't need to look beyond the relative cost of road, rail and air travel, and how the cost of each has changed over the last 20

years, to see that transport policy is a mess. Furthermore, governments that talk green while expanding airports and building more roads do little to reassure that the issue is in safe hands.

Little short of a fundamental overhaul of travel taxes and incentives and a new financial framework for properly evaluating the respective costs and benefits of different modes of transport is needed—and when it comes to air travel, that would have to be on a global scale. The actuarial skill set is well-suited to the task of helping to build one, and the profession could also bring a much-needed independent and objective view to a subject that can be something of a political football.

CARBON COSTING

One of the largest and most topical intangibles on the World Plc balance sheet, this is becoming a big employer. The development of reliable carbon models is growing in importance as the scale of the global warming





Isner and Mahut, Wimbledon 2010

challenge becomes clearer. Actuaries are well-qualified to provide input both into modelling techniques and to support analysis and projection of long-term costs and benefits.

FOOD LABELING

We've gotten used to eating what we like when we like, but if an enforced drastic change in habits is to be avoided we are going to need to be a lot smarter about the balance between consumption and conservation than we presently are. Better labelling

and smarter pricing will be needed before, as consumers, we are able to make informed choices and pay a price more reflective of the true resource cost of what we eat and drink. That will require the modelling of many interrelated factors, for example energy invested in production versus energy value on consumption, amount of land required for production, for how long it is required and with what environmental impact, etc. Could we not assist?

As actuaries, we are well-trained professionals. Our analytical skills are peerless; we have a strong public interest mandate; we understand the nature of risk; we have intimate knowledge of the workings of our financial system; we're independent; and we're used to taking a long-term view. As the president of the Faculty of Actuaries said from the midst

of crisis, back in October 2008, "These are times when the world needs actuaries, even if the world does not yet know it."

I agree, on both counts. But if we are to change the world's mind, we must first understand the reasons for its thinking. In an age of great change it is tempting to seek comfort in tradition, but the truth is that in such times those same traditions can become barriers to progress. We should of course defend those traditions that are

serving us well, but we must also challenge those that are serving us badly.

These are exceptional times, both on and off the tennis court. There are many reasons why the world may never see another epic to match Isner vs. Mahut, not all of them relating to tennis. Clearly we do not hold all of the risk management answers, but if as a profession we wish to fulfill both our vision and our public interest obligations, we must improve our own contribution to the collective cause of ensuring that some of the worse ones do not come to pass. If they knew what we have to say about ourselves, our public would expect nothing less. **A**

John Gordon is a U.K.-based independent actuary and consultant. His book is titled *On the Role of the Actuary in a Changing World*. If you have any comments on this article, Gordon is contactable at john@acturage.com.