Is One Euro of Actuaries Worth the Same as One Euro of Financial Economists?

Jan Dhaene, Luc Henrard, and Steven Vanduffel

Recently, actuaries and actuarial techniques have been subjected to frequent criticism. A UBS Investment Bank report, "Should Pension Funds Invest in Equities?," published in September 2003, states that "traditional actuarial practice has arguably failed to incorporate many of the lessons from financial economics developed over the past 50 years."

Another example of actuary bashing was the Standard & Poor's report, "Insurance Actuaries — a Crisis of Credibility," published in November 2003. Just two quotes from this report — "Relatively simplistic models are more reliable than legions of actuaries" and "many actuaries continue to question the relevance of market values, preferring their own (variously described and calculated) actuarial values" — tell you all you need to know about the author's opinion of actuaries.

If it's à la mode to attack the actuarial profession, something must be going on. We hope to clarify part of the ongoing discussion by pointing out a major error that's often made: the fundamental difference between (financial) pricing and (actuarial) reserving.

Consider the following simple example. We sell a contract in which we commit to pay 1.05 Euro to the buyer of the contract after a period of one year. In exchange, we receive now one Euro, which is the price (or the market value) of this contract. To maintain simplicity, we assume there is no bankruptcy risk during the coming year. Hence, it's 100 percent sure that after one year the buyer of the contract will receive from us the amount of 1.05 Euro. The main question we have to answer now is which investment strategy will best enable us to meet our obligations within one year.

Assuming that the market is free of arbitrage, the financial economist will immediately realize that the risk-free interest rate in the market must be 5 percent. He'll tell us that we can hedge our future liabilities by buying exactly the same contract as the one we've just sold. Hence, his strategy consists of investing our 1 Euro in the risk-free account. One year later, we'll be able to fulfil our obligations with 100 percent certainty. This means that by hedging, we've changed the risky situation to one without any risk at all. We can even go on holiday in the meantime.

But there's a major disadvantage to this strategy: We make no money on selling the contract, so we'll have to pay for our holiday ourselves.

The actuary, on the other hand, will tell us there's another possible solution for this investment problem. We can set up a provision now in order to be able to pay our liabilities within one year's time. More precisely, we can use part of the income from the sale of the contract as a reserve (provision) and invest this amount according to some particular (risky) investment strategy with a given drift factor and volatility. The exact amount of money to invest will depend on the probability that at the end of the year the value of the reserve will exceed the obligation by a large enough margin.

This is where our attitude toward risk comes in: Can we live with a "ruin probability" of 5 percent, or do we want to be 99.95 percent sure? The lower our risk aversion, the lower the required initial provision and the larger the remaining part of the amount we received by selling the contract.

The actuarial approach means we let somebody else pay for our holidays. The other side of the coin is that there always remains a (small) possibility that in the end we'll have to pay for our holidays ourselves, maybe even at a higher cost than that of the full-hedging approach.

Why would someone be willing to choose the riskier actuarial strategy over the safer financial economics strategy?

The answer is simple: It depends on our goals. We'll opt for the financial strategy if we want to be 100 percent sure we'll meet our future liabilities. If we're not comfortable with less than 100 percent certainty, the only feasible choice is to set up a 100 percent hedging strategy.

In our simple example, this implies that we invest the amount of 1 Euro in the risk-free asset. Note that the current price of a contract with a payoff of 1.05 in one year is exactly equal to 1. It can't be lower or higher, or else obvious arbitrage opportunities would exist.

So, the financial economics approach leads not only to a hedging strategy, it also helps us to determine the price of the contract by looking for the so-called replication portfolio. Hedging and (financial) pricing are on the same side of the coin. Theoretically, it means that if we can hedge, the price is uniquely determined.

All right, so why would someone be willing to take the actuarial approach? Because the essence of doing business is to run risks. If the decision-maker hedges the risks completely, he hedges the benefits too. By taking chances, he hopes that somebody else will pay for his holidays. The second approach is an actuarial approach in the sense that it sets up provisions. Gambling on a free holiday has nothing to do with the concept of having a free lunch. The first one is the risky business approach, the second one is the no-arbitrage principle.

If we want a 100 percent probability that we'll be able to meet our future obligations, the actuarial approach will reserve the total amount received from selling the contract and the optimal investment strategy will be the risk-free investment. In all other cases, when less than 100 percent certainty is required, less than the total amount needs to be put into the provision.

It's important to note that not all situations can be hedged so that the contract price is *not* uniquely determined and will depend on the buyer's risk-appetite. This is exactly where actuarial pricing comes in: where financial pricing ends.

The UBS report states that "1 Euro of equities is worth the same as 1 Euro of bonds." Of course this is true — one Euro of whatever is worth one Euro of whatever else. Well educated actuaries know that. But the focus in this statement is on the price of something at the current time. Thereby this price is given by the market and has

nothing to do with the risk aversion of the individual who's buying or selling the contract.

To conclude, pricing and provisioning are completely different but complementary techniques. Each of them needs to be used in the appropriate situation. Financial pricing is certainly not the only valid approach, as some consultants seem to believe.

———————————

Jan Dhaene is professor at K.U.Leuven and University of Amsterdam, jan.dhaene@econ.kuleuven.ac.be.

Luc Henrard is chief risk officer at Fortis and professor at U.C.L. and Université Notre Dame de la Paix (Namur), luc.henrard@fortis.com.

Steven Vanduffel is a researcher at the K.U.Leuven and consultant at Fortis Central Risk Management, steven.vanduffel@econ.kuleuven.ac.be

.