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GUEST EDITORIAL

ON TEACHING ACTUARIAL SCIENCE

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Actuaries are involved in a multitude of practical tasks within insurance. A list of skills needed for fulfilling these tasks — many have tried to make such a list — inevitably turns out to be extremely long. None of us can seriously claim to master all the subjects on this list.

Teaching actuarial science means taking another approach. Instead of trying to convey all subjects on the above list, one has to ask the question: "Which are the fundamental concepts and basic ideas underlying our science?"

Let me take an example: *Time Value of Money*. How do we value one euro to be paid n years from now? You may feel tempted to rush and to give the answer $v^n = \frac{1}{(1+i)^n}$. But let us go slower and argue as follows: the obligation is a zero coupon bond $Z^{(n)}$ maturing at time n; v^n is then just *one* of many possibilities to assign a *money amount* to $Z^{(n)}$; others might be market value, amortised cost value, etc., etc.

It is clear that thinking of a financial obligation in this way adds a lot of additional information and understanding. The trick is to understand all financial obligations of an insurance company which involve the time value of money as *financial instruments*. If your company sells a life insurance contract it sells a *portfolio* of financial instruments. Take an endowment policy, $x = 50$, $n = 5$ for sum 1 and with annual premium P. The portfolio of the initial valuation for ℓ_{50} persons is (for one person divide by ℓ_{50}):

Instruments	Number of units
$Z^{(0)}$	$-P\ell_{50}$
$Z^{(1)}$	$-P\ell_{51} + d_{50}$
$Z^{(2)}$	$-P\ell_{52} + d_{51}$
$Z^{(3)}$	$-P\ell_{53} + d_{52}$
$Z^{(4)}$	$-P\ell_{54} + d_{53}$
$Z^{(5)}$	$+d_{54} + \ell_{55}.$

Such a *Valuation Portfolio* can be calculated for every policy; for more complicated policies you may need other instruments than just zero coupon bonds, possibly you may also need to add some (European) options. Observe that your portfolio also contains *short positions*.

What have we gained? Construction of the *valuation portfolio* is a task which has a clearly defined answer. Everybody who makes a valuation will

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come up with *the same* valuation portfolio. Opinions may diverge when we ask what money amount should be assigned to the valuation portfolio. The point is that it adds enormously to our insight if we *separate* these two steps.

The biggest advantage for the insurance company is, however, on the communicative side: assets and liabilities now speak the same language. The investment department invests in a *portfolio* of assets. The actuarial department measures the obligations of the company as a *portfolio* of liabilities, hence assets and liabilities are measured in a commensurable way. It is obvious that in this way the company has a solid basis for financial risk management. If your company only knows the *value* of the portfolio of assets and the *value* of liabilities it has two disadvantages:

— the *values* always carry the character of ambiguity; and
— the *values* reduce portfolios to a single number, an operation by which important information is lost.

My example was intended to demonstrate what I mean by teaching basic concepts. One point needs to be added. Ideas change and each cultural environment will produce its own way of interpreting basic concepts. In the times of James Dodson, Richard Price and William Morgan it was absolutely adequate to give the v^n answer to the time value of money question. I believe strongly that in our times we have to give a more sophisticated answer.

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