

## Corporate Finance, Module 4, "Net Present Value vs Other Valuation Models"

### *Application to Actuarial Pricing*

(The attached PDF file has better formatting.)

*Question:* Brealey and Myers say that pricing depends on cash flows, not accounting income. The actuarial syllabus uses statutory income for ratemaking and pricing, not cash flows. The Atkinson and Dallas text for pricing life insurance products on the SOA syllabus uses an internal rate of return model, but everything is based on statutory income, not cash flows. The readings on internal rate of return pricing for the CAS syllabus use statutory income, not cash flows. Are the actuaries making an error?

*Answer:* Net present value for insurance products differs from net present value for other products. The relevant cash flows for *any product* are the flows to and from the owners of the company (investors, shareholders, equityholders). For non-insurance products, these are the same as the cash flows to and from the company. For insurance products, these are *not* the same; they depend on statutory income, not cash flows. The *cash flow analyses* you study on the later exams, such as the Atkinson and Dallas textbook on the SOA syllabus and the IRR study notes on the CAS syllabus, *use statutory income*, not cash flows and not GAAP income. This is consistent with Brealey and Myers, since statutory income is a proxy for distributable income, which is the cash flows to and from shareholders.

*Question:* Why are the flows to and from the owners of the firm the same as the cash flows to and from the firm for other industries but the statutory accounting entries for insurance?

*Answer:* If a firm in another industry gets sales revenue of \$1,000 for a product, it may give the cash to its owners as stockholder dividends. If it needs cash to buy supplies or raw goods, it asks its owners for a contribution. It doesn't do this day by day, which would be inefficient, but cash received by the firm is cash available to its owners. When an insurer gets \$1,000 for an insurance policy, it can *not* give the cash to its owners. It needs the cash to fund an unearned premium reserve (for property-casualty products) or policy reserves (for life insurance products); instead of giving cash to its owners, it must borrow cash from them to pay acquisition expenses and for risk-based capital requirements. Stockholder dividends for insurers are constrained by statutory income, not by cash flows or GAAP income. The distributable income, or the income available to be paid to the owners, is the insurance analogue to cash flows.

*Question:* Does the final exam test the applications to pricing insurance products?

*Answer:* The final exam for this course tests the material in the Brealey and Myers textbook. Some candidates read Brealey and Myers and conclude that actuaries are not correctly pricing their products, since they don't focus on future cash flows. Do not make hasty conclusions.

*Question:* Are you saying that we won't improve our pricing procedures by reading this text?

*Answer:* On the contrary; there are dozens of potential improvements that you will learn from this text, from NPV pricing, capital structure, and options pricing. But don't jump to conclusions that actuaries are making errors; sometimes they are, sometimes they aren't, and sometimes financial analysts are not sure what is a proper pricing method.

### *Future Cash Flows and Sunk Costs: Application to Insurance Pricing*

*Question:* Brealey and Myers differentiate between future cash flows and sunk costs. How does this affect the pricing of insurance products?

*Answer:* Policy pricing has three stages, or three points in time:

- Ratemaking before rates are filed or any expenses are paid.
- Underwriting date, after rates are filed and some expenses have been paid.
- Renewal pricing, after losses of initial policy year.

For ratemaking, before rates are filed, all expenses are future cash flows. Ratemaking correctly uses the allocated portion of fixed overhead expenses, since the insurer could decide not to continue selling policies, fire its personnel, and not pay future fixed expenses. A workers' compensation policy, with an expected life of ten years, premium of \$100,000 per annum, and a present value of future losses and expenses of \$1.1 million, would have a net present value of  $-\$100,000$ .

Suppose the insurer spends \$35,000 in unrecoverable costs soliciting this policy, and \$20,000 of the expenses included in ratemaking are fixed overhead expenses. At underwriting, the net present value of the policy is  $-\$45,000$ .

Expected losses and expenses the first year are generally higher than in renewal years. If the first year's expected losses and expenses are \$150,000 and the premium is \$100,000, the net present value after the first year is  $+\$5,000$ . A rapidly growing insurer with negative statutory and GAAP income, may have declining statutory surplus and GAAP equity but a rising value of its expected renewal book.

### *Payback*

*Question:* Do actuaries ever use payback?

*Answer:* Payback is a common profitability measure used by reinsurance underwriters and actuaries, particularly for excess-of-loss treaties and catastrophe treaties.

*Question:* Payback does not reflect the time value of money and does not measure cash flows after the payback period; why do reinsurance actuaries use this method?

*Answer:* These drawbacks do not affect property excess-of-loss and catastrophe treaties, since the lag from premium payment to loss payment is short and the expected losses do not vary by underwriting year. Accurate estimates of cash flows are critical; the discount rate for one year projects is less important.

*Question:* I don't understand; property catastrophe treaties cover rare events, such as a 1 in 50 year event, such as a severe hurricane in a Gulf Coast state or an earthquake in California. The lag between premium collection and loss payment may be 50 years. Shouldn't the premium be the estimated ultimate loss discounted for 50 years?

*Answer:* These are 50 separate policies, each of which has a 2% chance of a loss payment. If a catastrophe does occur, the loss payment is made quickly. The lag from premium collection and loss payment is about 6 months, not 50 years.