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ARE YOU AS SMART AS A NEW FELLOW?

BY STUART KLUGMAN

IF YOU ARE AN ACTUARY of a certain age you are likely to proclaim that you don't understand the current pathway to fellowship as it has changed dramatically since your day. In the June/July 2011 issue of *The Actuary*, Dan Cassidy described the current system and outlined many of the features of how we now deliver education and assess learning. But that is only part of the story. Regardless of the system employed, the critical question must always be, "What does a new fellow know and what can a new fellow do?"

There are (at least) three ways this question might be answered. We could round up a random set of new fellows and present them each with a relatively easy actuarial assignment. Those who complete it successfully get a more challenging assignment and so on, until we have a good feeling for what they can accomplish. This could all be filmed and sold to a cable network. That approach is unlikely to generate enough income to offset the cost and the small sample size may not yield a significant result.

A second approach is much cheaper, but significantly less entertaining. I could walk you through the syllabus for each exam, seminar and module and offer commentary on how each item contributes to the education of a high-quality actuary. But at the end there is no assurance that new fellows have actually learned that stuff.

So I've adopted a third option, one that is relatively short, inexpensive and I hope you find enjoyable (and, if not, revealing). For your entertainment, I present questions from throughout the fellowship exam pathway. All of them have appeared on previous exams and where possible I have selected questions that turned out to be of average difficulty for that examination (using the delta measure, a standard in educational measurement).

To keep you honest, the solutions are not here, but are available on the SOA website at <http://www.soa.org/multiple-choice>. Also recall from Dan's article that there has been a concerted attempt to raise the cognitive level of our questions. A look at the sidebar by Brian Louth expands on this concept by showing how various verbs relate to cognitive levels. You will see those high-level verbs in many of the questions.

Note that for U.S. candidates on the retirement benefits track the fellowship requirements include the enrolled actuary exams. As a result, the SOA's exams cover topics not tested in those exams.

In order to highlight the difference in questions we now ask, I begin with two questions from 1978, which by no coincidence is the year I last had to take an exam.

1978 EXAMS—FROM PART 6

Discuss provisions included in a group life insurance contract in order to minimize anti-selection.

Describe the approaches used by Blue Shield Plans in the U.S. for physician reimbursement.

Discuss the considerations in underwriting group dental insurance.

Define peripheral vascular disease, describe its various forms, and briefly discuss the significance of each form for life insurance underwriting.



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1978 EXAMS—FROM PART 8

Describe the assumptions that are generally used in pricing group survivor income benefits. As part of your answer, indicate which of these assumptions could appropriately be used for pricing group term life insurance.

In the 1975 and 1976 Reports of the Society of Actuaries Committee on Group Life and Health, data relating to experience by sex are presented for group life, group weekly indemnity, and group long-term disability coverages. For each of these coverages described in the reports:

- (a) Identify the types of statistics relation to experience by sex.
- (b) Describe the difference in experience by year.

And now on to some recent questions. The following five questions appeared on fellowship exams in either fall 2010 or spring 2011. In order to highlight the cognitive level implied, the key verbs have been set in bold type.

INDIVIDUAL LIFE AND ANNUITIES CSP, U.S.—SPRING 2011—QUESTION 15

(6 points, 18 minutes) CBA Life, a U.S. insurance company, is acquiring a block of nonparticipating, two-year term life policies from ZYX Life.

(a) You are given the following information about a sample policy from this block:

Face amount: 100,000

Gross annual premium: 500

Best Estimate Assumptions	Year 1	Year 2	Assumptions that Include Provision for Adverse Deviation	Year 1	Year 2
Mortality Rates	0.45%	0.59%	Mortality Rates	0.46%	0.60%
Lapse Rates	10%	n/a	Lapse Rates	5%	n/a
Interest Rates	5%	5%	Interest Rates	5%	5%

Assume:

- The Best Estimate lapse assumption is based on ZYX's company experience studies which are fully credible.
- The Best Estimate mortality assumption is based on industry experience.

- Lapses and deaths are assumed to occur at the end of the year.
 - There are no expenses on this product.
- (i) **Calculate** the GAAP Net Level Premium for the policy using the Best Estimate Assumptions. Show all work.
- (ii) **Evaluate** the appropriateness of the provisions for adverse deviation, taking into consideration guidance outlined in ASOP 10 (Financial Statements under GAAP). **Justify** your answer.

RETIREMENT BENEFITS CSP, U.S.—SPRING 2011—QUESTION 15

(10 points, 30 minutes) The CFO of ABC Company wishes to adopt an asset allocation policy, including an asset allocation policy for its defined benefit pension plan, which maximizes shareholders' value. Shareholders who have a combined \$20 billion invested in their individual portfolios own the company. Pension investments are transparent to shareholders and they rebalance their portfolios to maintain a 50% Equity / 50% Fixed Income mix. The shareholders have determined that their current total after-tax income, using the Augmented Balance Sheet approach, is \$910 million.

ABC is considering a new investment policy for the defined benefit pension plan which it sponsors.

New Policy: 80% of the plan assets in equity investments, 20% of the plan assets in fixed income investments.

You are given the following data and assumptions:

- Pension plan assets: \$3.0 billion
- Gross investment return assumptions:
 - ⇒ Equity investments: 7% per annum
 - ⇒ Fixed income investments: 4% per annum
- Corporate income tax rate: 30%
- Individual tax rates on investment income:
 - ⇒ Equity investments: 10% per annum
 - ⇒ Fixed income investments: 30% per annum

Changes in shareholders' equity, including returns on plan assets, flow through to investors and are taxed at 10%.

Using the Augmented Balance Sheet approach, **calculate** the total after-tax income for the new policy and make a **recommendation** whether the proposed policy supports the CFO's goal. Show all work.

Exam Creation

BY BRIAN LOUTH

IN MY ROLE as Examination chair, I have overall responsibility for the creation and grading of SOA exams. One aspect of that is ensuring that all the examination committees follow the policies and procedures that we have established for exam creation. One of them is to ensure that a significant number of the points on each exam are at the three highest cognitive levels and about half are at the two highest levels. The following list is the definitions we use along with a sampling of the verbs that often accompany such questions.

Retrieval—This usually requires a list derived from a single source and mostly relies on memorization (define, list).

Comprehension—This requires distilling or summarizing knowledge from a source (synthesis) or re-presenting information in a different form or in your own words (apply, calculate, derive, describe, explain).

Analysis—This requires an evaluation of information and a subsequent explanation based on that evaluation. For example, comparison of whether items are alike or different, identifying strengths and weaknesses, generalization of the previous two levels to a new situation or an error analysis (assess, compare/contrast, evaluate, interpret).

Knowledge utilization—This requires an analysis and comparison of information, drawing a conclusion, and the subsequent explanation/justification of one or more facets of that evaluation/comparison/conclusion. It often expects a solution, decision or recommendation, with justification (construct, develop, justify, recommend).

Individual questions may cover more than one level. For example, a question may begin by asking for a list (retrieval) but then ask you to indicate how each item in the list relates to a specific situation (analysis). Finally, the question may ask for a recommendation with respect to a specific issue (knowledge utilization).

As you look at the questions, the verbs used in each question provide a guide (though may not completely determine) the cognitive level. More about verb lists and other elements of exam construction are available in our recently published guide for exam candidates (<http://www.soa.org/written-exams-guide>). **A**

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GROUP AND HEALTH CSP—SPRING 2011— QUESTION 17

(7 points, 21 minutes) You are the consulting actuary for the pension plan of Motor Engines (ME), a large US based automobile manufacturing company subject to Financial Accounting Standard Number 106 (FAS 106). Due to financial problems resulting directly from the credit crisis, you have been asked by the senior management of ME to peer review the work of the internal actuary pertaining to a large settlement affecting employee benefits.

You have been given the following about the settlement:

- The plan has an unrecognized loss of \$60,000,000 prior to the settlement.
- The plan does not have any unrecognized transition obligation.
- The unrecognized loss is amortized over a 20 year period.
- As a result of the purchase of individual annuities:
 - ◊ Half of the plan's Defined Benefit Obligation is settled.
 - ◊ The plan incurs an additional \$15,000,000 loss due to the annuity purchase.

- (a) **Differentiate** settlements from curtailments.
- (b) **Calculate** the settlement loss recognized immediately into earnings along with the remaining unrecognized loss. Show your work.
- (c) (i) **List** the actuarial assumptions for Life and Health post-retirement plans.
(ii) **Describe** the considerations in selecting the assumptions in part (i) above.
- (d) **Identify** the problems associated with using the premium rates or claim costs for valuations.

FINANCIAL ECONOMIC THEORY AND ENGINEERING—FALL 2010—QUESTION 14

(7 points, 21 minutes) Petit Verdote Inc., an all-equity financed viticulture company, expects to earn \$10 million before interest and tax (EBIT) per year in perpetuity. You are given the following:

Petit Verdote's current systematic risk	2
Risk free rate, annual	4%
Market risk premium	3%
Corporate income tax rate	35%

The Chief Financial Officer wants to explore the effects on the capital structure under various levels of debt financing, with business disruption costs and lost interest tax shields taken into account. The following

financial information for the various debt financing scenarios is provided:

Value of debt	Cost of debt	Present value of \$1 contingent on future business disruption	Business disruption cost
\$6,500,000	6.00%	0.20	\$275,000
\$8,500,000	6.25%	0.25	\$300,000
\$10,500,000	6.50%	0.30	\$325,000
\$12,500,000	6.75%	0.35	\$400,000

- (a) **Determine** the value of Petit Verdor Inc.
- (b) **Calculate** under the four different debt scenarios:
 - (i) Expected value of the tax benefit from the deductibility of interest payments
 - (ii) Expected present value of the business disruption costs
 - (iii) Petit Verdor's weighted average cost of capital.
- (c) **Evaluate** the benefits of the four debt scenarios in terms of optimal capital structure and recommend the best alternative for Petit Verdor.

ADVANCED FINANCE/ERM—FALL 2010—QUESTION 12

(10 points, 30 minutes) Wier Green (WG) is a widely held, well capitalized, debt-free publicly traded paper producer. Recently, WG has experienced large income volatility attributed to the following two factors:

- Significant fluctuations in the price of pulpwood, a main input to the paper production process;
- An inability to pass along cost increases to its customers.

- (a) **Describe** five considerations companies should take into account when deciding whether to hedge risk or manage risk.
- (b) **Explain** the advantages and disadvantages of managing versus hedging WG's exposure to pulpwood price volatility.
- (c) The CFO of WG has proposed acquiring TreeToppler, a primary producer/wholesaler of pulpwood, to hedge their exposure to pulpwood price volatility. The proposed acquisition price is \$55/share. TreeToppler is currently trading at \$50. **Evaluate** the CFO's rationale for the acquisition from the perspective of WG's shareholders.
- (d) WG is considering modernizing its production process by investing heavily in a new and costlier technology. The new

technology is much more environmentally friendly than the prevailing technology because it uses less pulpwood.

- e. (i) **Describe** the five steps of the process through which this disruptive technology can displace currently prevalent technology.
- f. (ii) **Explain** the strategic implications for WG of investing in the new technology.

SUMMARY

Over the years, much of the exam-related discussion has centered on structure, such as the number of tracks, many small exams versus a small number of large exams, ways to incorporate professionalism and nontechnical skills. Lost in those discussions is the process of continually improving the exams (and other assessments) themselves. This article has shown how the written-answer fellowship exams have changed to expect candidates to demonstrate higher-level skills than in the past.

You probably are as smart as a new fellow, but may also be relieved to not have had to demonstrate it with questions such as those above. **A**

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