GH SPC Model Solutions
Fall 2018

1. **Learning Objectives:**
1. The candidate will understand pricing, risk management, and reserving for individual long duration health contracts such as Disability Income, Long Term Care, Critical Illness, and Medicare Supplement.

2. The candidate will understand how to evaluate health insurance organization risk and mitigation strategies.

Learning Outcomes:
(1a) Identify differences between short-duration contracts and long-duration contracts, from the standpoints of pricing and reserving.

(1c) Apply applicable Actuarial Standards of Practice.

(2b) Complete a capital needs assessment.

Sources:
Pricing Medicare Supplement Products, GHS-101-14

ASOP #41: Actuarial Communications

Group Insurance Chapter 39: Risk Based Capital Formulas

Commentary on Question:
Candidate results were distributed with a nice bell curve. This was fairly consistent throughout the question. Parts (c) and (e) proved to be more difficult than the remainder of the question.

Candidates that included explanations in (b) received materially more credit than those who simply listed factors.

For part (c) the question asked for general actuarial communication requirements. Many candidates listed required aspects of only a written communication.

Students had particular difficulty with the detail needed to receive full credit for (e)iii.

1. **Continued**

Solution:

(a)

      (i)   Describe the differences among pricing methodologies used for Medicare Supplement products.

      (ii)   Identify the typical reason a particular methodology will be chosen.

Part (i)

ISSUE AGE RATING
- Priced for a target loss ratio or target rate of return over lifetime of policy
- The rate an individual pays will be based upon his/her age at issue

ATTAINED AGE RATING
- Priced to be self-sustaining at each age
- Rate will be based on individual's current age, regardless of how long coverage has been in force

COMMUNITY RATING
- Community rating: Increases periodically (usually annually) to reach profit objectives
- All participants will pay the same rate and experience the same rate increase

MODIFIED COMMUNITY RATING
- This is the same as community rating although allowed are a limited number of variations that may be based on age, sex, duration or perhaps other parameters.

Part (ii)
- The methodology chosen in any instance is typically mandated by either regulation or by market dynamics.

(b)   Describe factors and data sources utilized in developing the pricing assumptions for Medicare Supplement policies.

Morbidity:
- Other than company's own experience, a primary source of claims data is from Medicare data from CMS. Possible other sources also are from the Society of Actuaries or NAIC
- It is important to trend the claim costs forward to the timeframe which the rates are intended to cover.
- Area Factors: In addition, the claim costs need to be adjusted from a national basis to a regional basis.

1. Continued

- Age/sex distributions: It is preferable to use own experience if available (otherwise a reasonable assumption must be determined).
- Smoker/non-smoker distributions: Would use company's own experience. Can also use publicly available data from CMS, Health USA, Statistical Abstract of the United States.

Mortality:
- Due to the fact it is not a significant assumption, mortality is usually considered with persistency as a single decrement.
- If a separate mortality assumption is chosen, the actuary should select a select and ultimate table or ultimate table depending on underwriting criteria.

Persistency:
- Persistency should be based on the company's experience for similar products.
- The result can either be an ultimate table or select and ultimate table.

Investment earnings:
- Typically compared to other lines of business, MS policies are not especially sensitive to cash flow assumptions so minor part of pricing.

Selection factors/underwriting:
- Most companies use limited underwriting with yes/no questions for standard issues.
- Selection factors can be used to modify the claim costs for the first one to three years (when the impact of underwriting wears off).
- Most individuals purchasing insurance at age 65 or younger qualify under pen enrollment requirements (not subject to underwriting) and hence those claim costs should exhibit anti-selection.

Expenses and taxes:
- All categories of expenses (acquisition, issue/underwriting, maintenance, premium tax, federal income tax, other) expected to be incurred by the company should be included by the pricing actuary in both rate setting and performing profit studies.
- Expenses should be established so they are reasonable and compared to the extent possible against actual experience.

1. Continued

Other considerations:
- Mode of premium: Mode of premium has impact on persistency and cash flow.
- Policy fee: Paid in addition to premium. Typically, only charged in the first year to cover issue and underwriting expenses. Part of premium income in testing acceptability of loss ratio.

(c)   Describe requirements for Actuarial Communications as identified in ASOP 41.

1. Form and Content - The actuary should take appropriate steps to ensure the form and content of each actuarial communication are appropriate to the particular circumstances, taking into account the intended users.
2. Clarity - The actuary should take appropriate steps to ensure that each actuarial communication is clear and uses language appropriate to the particular circumstances, taking into account the intended users.
3. Timing of Communication - The actuary should issue each actuarial communication within a reasonable time period taking into account the needs of the intended users.
4. Identification of Responsible Actuary - An actuarial communication should clearly identify the actuary responsible for it.

(d)

(i)   Describe different loss ratio standards that must be met for Medicare Supplement Products under the NAIC Model Regulation.

(ii)   Calculate the maximum rate increase for January 1, 2020 so that the projection satisfies the minimum loss ratio requirement. Show your work.

Part (i)
Model Regulation discusses three different loss ratio standards which must be met as part of an annual or re-rate filing.
1. Accumulated value of past claims plus the present value of future claims, divided by the accumulated value of past premiums plus the present value of future premiums, must meet or exceed the applicable loss ratio standard.
2. The PV of future claims divided by the PV of future premiums must meet o exceed the applicable loss ratio standard.
3. The expected third year loss ratio must meet or exceed the applicable standard.

1. **Continued**

Part (ii)
The loss ratio (Claims / Premium) in 2020 must be at least 75%.

Claims in 2018: $7 Million
Claims in 2019: $7 Million * 1.05 * 1.03 = $7.5705 Million
Claims in 2020: $7.5705 Million * 1.05 * 1.03 = $8.18749575 Million
Premium in 2018: $10 Million
Premium in 2019: $10 Million * 1.06 = $10.6 Million
Premium in 2020 : $10.6 Million * (1 +RINC) where RINC = amount of rate increase

$8.18749575 / [($10.6)*(1+RINC)] must be >= .75
[$10.6 * (1+RINC)] must be <= ($8.18749575) / (.75)
[1+RINC] must be <= ($8.18749575) / (.75 * $10.6)
RINC must be <= ($8.118749575) / (.75 * $10.6) – 1
RINC must be <= 2.988%

(e) Assume the only business of Company GHI is described in part (d). This business is subject to contractual arrangements such as provider fee schedules and hospital per diems. GHI is considering selling annuities starting in the near future.

    (i) Calculate the Claim Fluctuation underwriting risk for 2018. Show your work.

    (ii) Evaluate when GHI must start utilizing the Life RBC formula [Blue Blank] as opposed to the Health RBC formula [Orange Blank] for their Medical Supplement business.

    (iii) Compare and contrast the Health RBC and Life RBC formula as it relates to underwriting risk and insurance risk, respectively.

Part (i)
The risk charge is calculated as (Premium) times (ratio of incurred claims to premium) times the (risk factor) times (Managed Care Risk Adjustment Factor).
Risk Factors are: 10.5% of the first three million premium plus 6.7% of the amount above three million premium
Blended Risk Factor = 10.5% * (3/10) + 6.7% (7/10) = .0315 + .0469 = 7.84%
Discount Factor for Contractual Arrangements such as provider fee schedules, hospital per diems or case rates: 15%
= $10 Million * (.70) * (.0784) * (.85) = $466,480

1. Continued

Part (ii)
- A "Health Blank Test" that determines which blank is appropriate for an insurer to file was added in 2003.
- In this test, health insurance premiums and reserves for specified health products are compared to total premiums and reserves.
- If the ratio of Health premiums and reserves is greater than 95% for both the current and prior year, an insurer must file the Health Blank and be subject to the Health RBC formula.

Part (iii)
- We noted previously that, for a typical health insurer, the underwriting risk component called ("insurance risk" for a life insurer) tends to dominate RBC after covariance.
- In a life Insurance test, the insurance risk does not dominate RBC calculation. This implies life insurers who also write health insurance may enjoy a lower capital requirement for health insurance than monoline health insurers, thanks to the so called "diversification effect" provided by the covariance adjustment.
- The life insurance formula applies a 5% charge against all health claim reserves reported in Exhibit 6 of the Life and A&H annual statements (reserves for unaccrued benefits as opposed to liabilities for unpaid claims) whereas the Health formula only applies a factor for LTC and DI.

2. **Learning Objectives:**
2.   The candidate will understand how to evaluate health insurance organization risk and mitigation strategies.

Learning Outcomes:
(2a)   Evaluate an enterprise risk management (ERM) system.

(2e)   Apply applicable Actuarial Standards of Practice.

Sources:
GHS-123-18 ERM Parts One, Two and Three pgs. 8-12

Sweeting Chapter 7 Definition of Risk; pgs. 93-106

ASOP 46 Risk Evaluation in Enterprise Risk Management; Section 3.4.2

Commentary on Question:
In order to earn credit, candidates needed to clearly describe in greater detail and explain their thought process. Best candidates were able to elaborate the roles and risks identified as being clearly relevant to this insurance company.

Solution:
(a)
(i)   Describe the reporting structure, scope, and purpose of an ERM committee.

(ii)   Evaluate the new organizational chart in relationship to the reporting structure, scope, and purpose of an ERM committee. Justify your answer.

Commentary on Question:
Candidates were able to generally identify the scope of the ERM committee. Almost all candidates identified the responsibilities of the CRO but struggled to reference the ERM committee's responsibility.

Part (i):
- ERM committee should begin with a senior level risk group that reports to the Board
- Culture of organization will determine if a Board member is part of the ERM committee, how often it meets, and how often it reports to the Board
- ERM committee would be responsible for ongoing organization-wide identification and assessment of risk as well as development and implementation of risk reduction strategies
- Identified risk should be reported to the ERM committee which will decide whether the risk should be handled on an organizational-wide basis or managed within the business unit departments

2. Continued

Part (ii) – Not all of the below is required for full credit but the following were considered:
- Chief Risk Officer (CRO)
  - Not member of executive team
  - Not able to oversee actuarial, underwriting, legal or financial controls

- ERM Committee
  - Structure should begin with a senior level risk group that reports to the board.
  - May not have visibility for other departments. The ability to effectively report risks and catalog them could run into challenges with the CRO and risk management team reporting up through marketing.
  - The ERM Committee is meant to establish department or enterprise controls, however within this organization its unlikely effective risk controls would be put in place for marketing or underwriting

(b) For each type of risk as defined in *Financial Enterprise Risk Management; Sweeting Ch. 7:*

(i) Explain which types of risks ABC Health faces based on information presented.

(ii) Recommend one change for each of the significant risks identified in (i) that will mitigate risk. Justify your answer.

Commentary on Question:
Most candidates were able to identify structural risks more than the financial risks. Candidates need to elaborate on the rationale for their responses as there can be overlap on terminology. Responses need to be relevant to this particular insurance company, not a generic insurance company.

Part (i):
Credit risk – Significant, ABC's RBC deterioration reflects the level of capital adequacy the firm has. Since this is decreasing rapidly with no apparent turnaround, ABC is likely to suffer credit rating downgrades and a higher expectation of default.

Liquidity risk – Significant, ABC's RBC deterioration and subsequent credit deterioration will make it more difficult to raise capital. This will likely constrain ABC's liquidity as their book of business further erodes their available surplus

2. Continued

Moral Hazard – Take the position that moral hazard does exist because the CRO is subject to the Chief Marketing Officer's compensation structure/goals. Could create a situation where departments exceeding risk tolerance because they have an implied insurance from ineffectiveness of CRO.

Agency Risk - Upside is unlimited with marketing rewarded on membership and also in charge of underwriting; ensures a strong agency risk is present. Chief marketing officer able to set compensation structure and goals for underwriting creates incentive to align for agent gain and not shareholder gain.

Part (ii) – The following represents examples to respond to concerns identified in Part (i), other recommendations may be considered:

Credit risk – immediately re-rate block at renewal to sufficient price level

Agency risk – align incentive compensation with marketing, underwriting, and ERM to align with ABC's owners incentive. Remove span of control for setting terms on incentive comp.

Liquidity risk – with proof of turnaround plan; execute immediate capital liquidity program by issuing new shares, selling off business, or securing new debt.

Moral hazard – reorganize the division to remove financial and compliance services from the Chief Marketing Officer's org structure.

(c) Identify and describe the considerations related to stress and scenario tests noted in ASOP 46.

Commentary on Question:
Candidates generally performed well on this part. Those who struggled provided considerations relevant to other ASOPs rather than ASOP 46.

3.4.1 Considerations Relating to Stress and Scenario Tests—The actuary should consider the following, if appropriate to the assignment:
   a. the extent to which various stress tests reflect similar or different degrees of adversity. Using different degrees of adversity may affect the comparability of stress tests;
   b. any items in the organization's business plan that describe how the organization will function during an extreme event(s) as well as any historical organizational examples;
   c. that an extreme event scenario may be a single event or a series of events that, taken together, have catastrophic results;
   d. how actions and reactions of various stakeholders and markets during extreme events may differ from those during "normal" times;

2.   **Continued**

e. whether the assumed interdependencies are appropriate under the stress or scenario testing assumptions due to the possibility of unanticipated consequences when risks interact in ways not seen historically;
f. how to define situations that result in a non-quantifiable risk and how to show plausible financial effects on the organization; and
g. that some stress and scenario tests will be hypothetical situations for which the actuary will not need to validate the degree to which the scenario is realistic.

3. **Learning Objectives:**
3. The candidate will understand an actuarial appraisal.

Learning Outcomes:
(3a) Differentiate the components of an actuarial appraisal versus an embedded value.

(3b) Describe an approach for preparing and actuarial appraisal.

(3c) Describe risks associated with interpreting an actuarial appraisal and an embedded value.

Sources:
Embedded Value: Practice and Theory (EV: P&T)

Chapter 4, Insurance industry mergers and acquisitions (Ch 4)

Solution:
(a) Describe how discount rates might be determined when performing an Actuarial Appraisal.

Commentary on Question:
The vast majority of candidates scored fairly well in this section of the question. There were a lot of grading points available to candidates as this was a 4 point question. It is important candidates spend appropriate time on questions based on the available points in a section.

1. It is common for the seller to illustrate a range of reasonable discount rates.
   a. Avoid the notion there is one single correct rate.
2. Quote ASOP 19 – rates used for discounting should reflect risks inherent in the realization of such earnings and
3. Should represent the returns desired by the buyer, seller or owner.
4. Risks vary by product so natural to vary the discount rates by product.
5. Under CAPM, WACC is used.
   a. Fundamental CAPM $r = r_f + Beta\,(r_m - r_f)$
      i. r = expected rate of return on acquisition
      ii. r_f = risk free rate of return
      iii. r_m = expected rate of return for the market as a whole
      iv. Beta = measure of risk of a company relative to the market as a total.
   b. Reflecting Leverage $r = r^D * (D/(D+E)) + (E/(D+E)) * (r_f + Beta^E\,(r_m - r_f))$
      i. r = weighted average cost of capital (WACC)
      ii. r^D = required return on debt
      iii. $Beta^E$ = beta on a company's stock
      iv. D = market value of a company's debt
      v. E = market value of a company's equity

3. Continued

6. Most companies have internal hurdle rates that are used as minimum benchmarks for pricing internally generated new business or for pricing acquisitions.
7. Both current and long term targets may be used to establish a minimum discount rate to price an acquisition.
8. Buyer may have a specific cost of funds for a transaction and this should be used for the discount rate.
9. Enough transactions for market participants to have a sense of the discount rates currently being used by buyers.
10. Discount rates reflect Supply and Demand, nature of buyers and cost of financing, and types of business being sold.

(b)   Verify the accuracy of each of the following statements regarding Actuarial Appraisals and Embedded Value. Justify your answers.

(i)   Adjusted net worth includes the value of intangible assets.

(ii)   Embedded value is not an actuarial appraisal.

(iii)   There is no advantage from illustrating the actuarial value of future business for just one year of issue.

(iv)   Inforce Business Value (IBV) includes required capital.

Commentary on Question:
Most candidates scored well in this section and appeared to grasp the concepts being tested. There were some candidates that did not justify their response true/false and therefore received no credit. It is also important candidates clearly identify an answer "true" or "false" when responding to the statement.

(i)   This statement is false.
        Adjusted net worth is the realizable value of capital and surplus.
        Intangible assets typically have no realizable value.

(ii)   This statement is true.
        Embedded value differs from the actuarial appraisal value primarily in three ways:
        • Actuarial appraisals typically assign a value to the contribution of future new business whereas embedded value does not,
        • Actuarial appraisals are typically calculated using higher discount rates than embedded value, and
        • Expense assumptions used in calculating embedded value are typically more company specific

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3. Continued

      (iii)   This statement is false.
There are advantages of illustrating the actuarial value of future business for just one year of issue:
- It allows the user of the report to easily adjust for different growth rates, years of new business, etc.
- It provides a straightforward basis for comparison of prices paid in transactions.
- It is often used in emerging markets where growth rates may be uncertain and buyers may wish to look at a number of production scenarios and periods.

      (iv)   This statement is false.
Required capital is included in ANW.
IBV reflects the PVFP and CoC.

(c)

      (i)   Calculate the effective embedded value rate. Show your work.

Assume the risk discount rate (RDR) is 9%.

      (ii)   Explain whether the combined experience variations and prospective assumption changes added value in (i).

Commentary on Question:
Many candidates scored well in this section of the exam, however many candidates who did not complete the calculation correctly missed points by not illustrating the formula they used in the calculation. Credit was given in part C (ii) for appropriate responses consistent with part C (i) calculations.

(i)

$$\text{Eff EV Rate} = \frac{[(\text{AdjANWt} - \text{ANWt-1}) + (\text{IBVt} - \text{IBVt-1}) - \text{VNBt}]}{[(\text{IBVt-1} + \text{ANWt-1} + .5 * \text{VNBt})]}$$

Eff EV Rate = 15/215 = 6.98%

(ii)   Since the RDR was 9% and the Eff EV Rate was 6.98%, the combined experience variations and prospective assumption changes produced a net decrease in value.

4.   **Learning Objectives:**
4.   The candidate will understand how to apply risk adjustment in actuarial work.

Learning Outcomes:
(4b)   Apply risk adjustment to underwriting, pricing, claims and are management situations.

Sources:
Chapter 21, Risk Adjustment on the ACA Exchanges, pages 416, 426-430

Solution:
(a)   Describe risk adjustment issues within Massachusetts' healthcare reform

   Commentary on Question:
   Students need to provide more exact answers.

   1. Risk Adjustment operates at the state level, rather than the regional level
       a. Wide variations exist in the networks, costs, and utilization between parts of Massachusetts
   2. Risk Adjustment applies to the gross premium, not the COI or pure premium
       a. This transfers part of the expense margin in addition to excess claims
   3. Bias against zero-condition members
       a. Zero-condition members arise because a patient has a condition that is not part of HCC mapping
       b. Patient is too new to the health plan to have claims.
   4. Bias against limited network and other low cost plans
       a. Limited network plans tend to be lower cost, in turn charging lower premiums
       b. However members with conditions needing more frequent provider visits (sicker, higher risk) are less likely to choose limited network plans
       c. Revenue transfers can exceed net income with no cap in the transfer amount

(b)   Calculate the following for a low-cost network. Show your work.

   (i)   The Transfer Amount for Plan A

   (ii)   The Gain (Loss) for the State, Plan A, and Plan B

   (iii)   The Funds Transfer for Plans A and B

   (iv)   Net Income as a Percentage of Premium for Plans A and B

4. Continued

Commentary on Question:
Solutions based on PMPM, annual, and monthly were also accepted where applicable. A de minimis number of candidates used state-wide average to calculate claims using the given factors, this approach was accepted.

Transfer Amount for Plan A

$$T_i = \left[\frac{PLRS_i \text{ x } IDF_i \text{ x } GCF_i}{\sum_i (s_i \text{ x } PLRS_i \text{ x } IDF_i \text{ x } GCF_i)} - \frac{AV_i \text{ x } ARF_i \text{ x } IDF_i \text{ x } GCF_i}{\sum_i (s_i \text{ x } AV_i \text{ x } ARF_i \text{ x } IDF_i \text{ x } GCF_i)} \right] \overline{P}_s$$

Transfer Amount$_A$ = -95.29

$$\left[\frac{0.9 * 1.1 * 1}{0.5 * 0.9 * 1.1 * 1 + 0.5 * 1.1 * 1.1 * 1} - \frac{0.9 * 1.8 * 1.1 * 1}{0.5 * 0.9 * 1.8 * 1.1 * 1 + 0.5 * 0.8 * 1.8 * 1.1 * 1} \right] * 600.00$$

(ii)   Gain (Loss) for the State, Plan A, and Plan B

Plan A Total Premium => 480 * 1,500 * 12 = 8,640,000
Plan B Total Premium => 720 * 1,500 * 12 = 12,960,000
State Premium = Plan A Premium + Plan B Premium => 8,640,000 + 12,960,000 = 21,600,000

Plan A Total Claims x Risk Score => 8,640,000 * 0.9 = 7,776,000
Plan B Total Claims x Risk Score => 12,960,000 * 1.1 = 14,256,000
State Total Claims x Risk Score = Plan A Total Claims x Risk Score + Plan B Total Claims x Risk Score => 7,776,000 + 14,256,000 = 22,032,000

Gain (Loss) = Total Premium - Total Claims x Risk Score
State => 21,600,000 – 22,032,000 = -432,000
Plan A => 8,640,000 – 7,776,000 = 864,000
Plan B => 12,960,000 – 14,256,000 = -1,296,000

(iii)   Funds Transfer for Plans A and B

Funds Transfer = Transfer Amount * Members * 12
Funds Transfer for Plan A => -95.29 * 1,500 * 12 = -1,715,220
Funds Transfer for Plan B => 95.29 * 1,500 * 12 = 1,715,220

4. **Continued**

     (iv)   Net Income as a Percentage of Premium for Plans A and B

Net Income = Gain (Loss) + Transfer
Net Income for Plan A => 864,000 – 1,715,220 = -851,220
Net Income for Plan B => -1,296,000 + 1,715,220 = 419,220
Net Income as a Percentage of Premium = Net Income / Total Premiums
Net Income as a Percentage of Premium for Plan A => -851,294/8,640,000 = -9.85%
Net Income as a Percentage of Premium for Plan B = 419,220/12,960,000 = 3.23%

(c)   Describe issues and potential improvements to the ACA risk adjustment process

Commentary on Question:
Students need to provide more exact answers.

1. Partial Year Enrollment
   a. Issues
      i. New entrants part-way through year with no history and no contribution to risk scores while potentially adding cost
      ii. Problem is exacerbated if member generates expenses then disenrolls
   b. Improvements
      i. Separate models based on specific enrollment periods increases accuracy but also adds complexity
      ii. Separate models based on partial year enrollment
2. Lack of Historical Data
   a. Issue - Risk Scores depend on historical data
   b. Improvement - Use Rx data as a source of diagnosis, improves identification of health care costs of chronic diseases
3. Only a fraction of members trigger conditions
   a. Issue – Failure to code a condition
4. High Cost Cases
   a. Issues
      i. High risk (extreme) members experience costs disproportionate to their risk scores
      ii. Some high costs are excluded completely because of the structure of HCCs
   b. Improvement - Supplemental risk adjustment model separately considering (pooling) high cost cases

4. Continued

5. Prospective versus Concurrent Models
   a. Issues
      i. ACA could not use a prospective model because no data existed on insureds at inception of coverage
      ii. Predictive accuracy is more accurate with concurrent models and is felt to be more favorable to small plans
      iii. Due to churn prospective model data would not be consistently available for all plans going forward
6. Market Share
   a. Issues
      i. New and start-up (including Co-op) insurers are at a disadvantage because they have no or limited presence in the market compared with established insurers
      ii. Smaller insurers are at a disadvantage due to market share being a significant determinant of premium, dominant carriers are likely to see revenue transfers bearing no relationship to their premiums
      iii. Models could be recalibrated for drugs and partial year enrollment