G&H Specialty Sample Detailed Study Manual

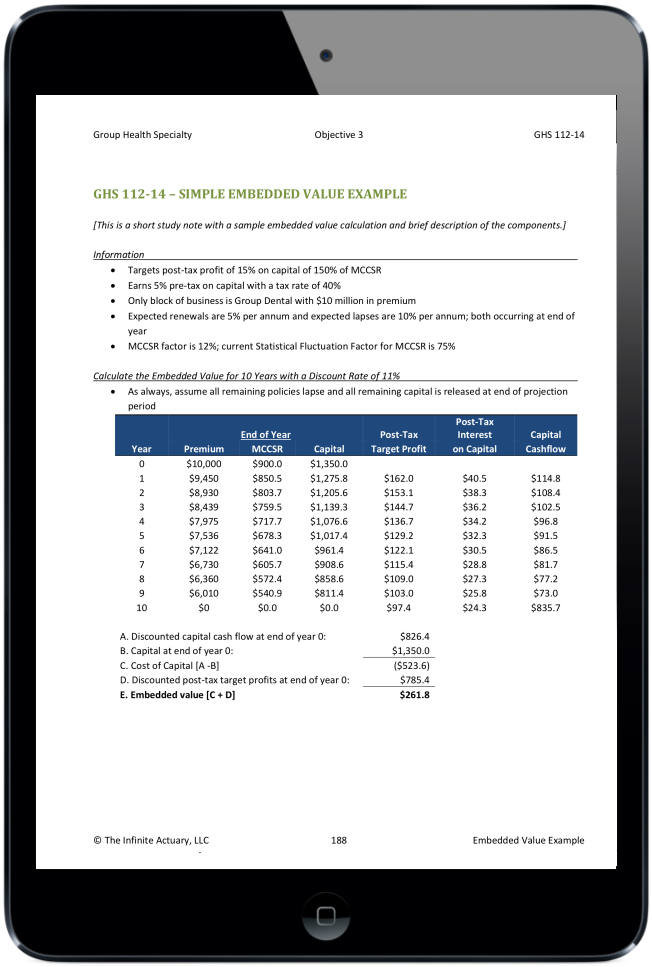
You have downloaded a sample of our Group & Health Specialty Exam detailed study manual. The full version covers the entire syllabus and is included with the online seminar.

Each portion of the detailed study manual is available in PDF with a clickable table of contents for ease of navigation in your favorite desktop, tablet, or smartphone PDF viewer.

Though not shown in the sample material, we also offer condensed versions of the detailed study manual and PDF handouts for all video lessons.

If you have additional questions about the detailed study manual or any aspect of the exam, please email me.

Derek Brace, FSA, MAAA
derek@theinfiniteactuary.com



Group Health Specialty Objective 3 GHS 112-14

GHS 112-14 – SIMPLE EMBEDDED VALUE EXAMPLE

[This is a short study note with a sample embedded value calculation and brief description of the components.]

Information

- Targets post-tax profit of 15% on capital of 150% of MCCSR
- Earns 5% pre-tax on capital with a tax rate of 40%
- Only block of business is Group Dental with $10 million in premium
- Expected renewals are 5% per annum and expected lapses are 10% per annum; both occurring at end of year
- MCCSR factor is 12%; current Statistical Fluctuation Factor for MCCSR is 75%

Calculate the Embedded Value for 10 Years with a Discount Rate of 11%

- As always, assume all remaining policies lapse and all remaining capital is released at end of projection period

Year	Premium	End of Year MCCSR	Capital	Post-Tax Target Profit	Post-Tax Interest on Capital	Capital Cashflow
0	$10,000	$900.0	$1,350.0			
1	$9,450	$850.5	$1,275.8	$162.0	$40.5	$114.8
2	$8,930	$803.7	$1,205.6	$153.1	$38.3	$108.4
3	$8,439	$759.5	$1,139.3	$144.7	$36.2	$102.5
4	$7,975	$717.7	$1,076.6	$136.7	$34.2	$96.8
5	$7,536	$678.3	$1,017.4	$129.2	$32.3	$91.5
6	$7,122	$641.0	$961.4	$122.1	$30.5	$86.5
7	$6,730	$605.7	$908.6	$115.4	$28.8	$81.7
8	$6,360	$572.4	$858.6	$109.0	$27.3	$77.2
9	$6,010	$540.9	$811.4	$103.0	$25.8	$73.0
10	$0	$0.0	$0.0	$97.4	$24.3	$835.7

A. Discounted capital cash flow at end of year 0:	$826.4
B. Capital at end of year 0:	$1,350.0
C. Cost of Capital [A -B]	($523.6)
D. Discounted post-tax target profits at end of year 0:	$785.4
E. Embedded value [C + D]	**$261.8**

© The Infinite Actuary, LLC 188 Embedded Value Example

GHS 111-14, BABBEL – COMPONENTS OF INSURANCE FIRM VALUE AND THE PRESENT VALUE OF LIABILITIES

Risk and Components of Equity Value

- Market value of insurance company owners' equity is the difference between the market value of assets and the market value of liabilities
- Major Components of Owners' Equity:
  - Franchise Value
  - Market Value of Tangible Assets
  - Present Value of Liabilities
  - Put Option Value
- Franchise Value
  - Present value of economic rents that an insurer is expected to garner because it has scarce resources, scarce capital, charter value, licenses, a distribution network, personnel, reputation, etc
  - Includes renewal business
  - Dependent on firm insolvency risk
- Market Value of Tangible Assets
  - Independent of what *kind* of assets the insurer has but dependent on the *amount* of assets it holds
    - Value is unaltered by the type of assets the firm holds
- Present Value of Liabilities
  - Also sometimes considered "liquidation value", though reduction in prices on some liquidations (fire sale) may not be an accurate depiction
- Put Option Value
  - Value to equityholders of capturing the upside earnings while not incurring all of the downside costs of default
- $Market\ Value\ of\ Equity = Market\ Value\ of\ Assets - Market\ Value\ of\ Liabilities$
- $Market\ Value\ of\ Equity = Franchise\ Value + Market\ Value\ of\ Tangible\ Assets - Present\ Value\ of\ Liabilities + Put\ Option$
- On a spectrum of firm risk, the firm's market value is high early on when there is little risk, it drops down in the middle and then is high again when there is a lot of risk because the value of the Put Option is high at that point (i.e. equityholders have a high upside with limited downside)

The Valuation of Insurance Liabilities

- Standard approaches don't work for insurance liabilities because there are neither liquid markets where prices can be disciplined by forces of arbitrage and trading, nor are there close comparables in the market
  - Helpful to focus on present value instead of market value
- Focus on "How much money would it take today to completely satisfy the obligations based on the insurance policies written?"

- Methods of Estimating Assets Needed
    - Indirect Valuation Approach
        - Tangible assets are valued and market value of owners' equity is subtracted to presumably calculate the market value of liabilities
        - This understates the value of liabilities by the amount of franchise value and the default put option
    - Direct Valuation Approach
        - Present value is computed, taking into account any interest rate sensitivities within the cash flows
        - Mortality and morbidity are factored in only an expectation basis
        - Reserves and surplus needed to cushion variations are not included
        - Present value estimates have, in essence, stripped out any C-1 (asset default) or C-3 (interest rate) risks
- Even if the insurer were to set aside reserves equal to this present value of liabilities, this would usually not be adequate because of deviations in amounts and timing of claims from expected
- Reserves are calculated on a conservative basis and a cushion is added to protect against any shortfalls if the reserves prove to be inadequate
- Net tangible value is the excess of market value of assets over present value of liabilities
    - Net tangible value provides the cushion to protect against deviations
- Objections to the Present Value of Liabilities Concept
    - May not compare well to readily observed market values of certain insurance liabilities
    - Valuation models are designed to be arbitrage-free, but insurance liabilities cannot be subject to the forces of arbitrage
- Uncertainty in lapsation, surrender, mortality, morbidit, etc can be modeled or reflected directly in the expected cash flow inputs into a model
- In life insurance, need to model the dividend and crediting rate practices of an insurer
- Benefits of the Present Value of Liabilities Concept
    - Simpler to compute for most insurance companies
    - Subject to less controversy by relegating some of the more troublesome valuation areas to the other side of the balance equation
    - Useful starting point for regulators and insurers
    - Easy to compare among other insurers
    - Helpful in firm risk assessment
    - Basis for financial performance measurement

GHS 112-14 – SIMPLE EMBEDDED VALUE EXAMPLE

[This is a short study note with a sample embedded value calculation and brief description of the components.]

Information

- Targets post-tax profit of 15% on capital of 150% of MCCSR
- Earns 5% pre-tax on capital with a tax rate of 40%
- Only block of business is Group Dental with $10 million in premium
- Expected renewals are 5% per annum and expected lapses are 10% per annum; both occurring at end of year
- MCCSR factor is 12%; current Statistical Fluctuation Factor for MCCSR is 75%

Calculate the Embedded Value for 10 Years with a Discount Rate of 11%

- As always, assume all remaining policies lapse and all remaining capital is released at end of projection period

Year	Premium	End of Year MCCSR	Capital	Post-Tax Target Profit	Post-Tax Interest on Capital	Capital Cashflow
0	$10,000	$900.0	$1,350.0			
1	$9,450	$850.5	$1,275.8	$162.0	$40.5	$114.8
2	$8,930	$803.7	$1,205.6	$153.1	$38.3	$108.4
3	$8,439	$759.5	$1,139.3	$144.7	$36.2	$102.5
4	$7,975	$717.7	$1,076.6	$136.7	$34.2	$96.8
5	$7,536	$678.3	$1,017.4	$129.2	$32.3	$91.5
6	$7,122	$641.0	$961.4	$122.1	$30.5	$86.5
7	$6,730	$605.7	$908.6	$115.4	$28.8	$81.7
8	$6,360	$572.4	$858.6	$109.0	$27.3	$77.2
9	$6,010	$540.9	$811.4	$103.0	$25.8	$73.0
10	$0	$0.0	$0.0	$97.4	$24.3	$835.7

A. Discounted capital cash flow at end of year 0:	$826.4
B. Capital at end of year 0:	$1,350.0
C. Cost of Capital [A -B]	($523.6)
D. Discounted post-tax target profits at end of year 0:	$785.4
E. Embedded value [C + D]	**$261.8**

Details of Calculations for End of Year 1

Premium	$9,450.0	= $10,000 x 1.05 x 90%	Starting premium x renewal increase x (1 - expected lapses)
MCCSR	$850.5	= $9,450 x 12% x 75%	Premium x MCCSR factor x Stat. Fluctuation Factor
Capital	$1,275.8	= $850.5 x 150%	MCCSR x company target % of MCCSR
Post-tax target profit	$162.0	= $1,350 x [15% / (1-40%) - 5%] x (1-40%)	Starting capital x [pre-tax target earnings on capital less pre-tax interest on capital] x (1-tax rate)
Interest on capital	$40.5	= $1,350 x 5% x (1-40%)	Starting capital x pre-tax interest rate on capital x (1-tax rate)
Capital Cashflow	$114.8	= $40.5 + ($1,350 - $1,275.8)	Interest on capital plus release of capital

- Post-tax target profit could be calculated on the average capital in the year
- Definition of capital needs to be consistent for post-tax target profit and interest on capital

Roll Forward from End of Year 0 to End of Year 1

	PV Post-Tax Target Profit	PV Capital Releases and Interest	Capital Employed	Embedded Value	Free Capital	
Values at end of year 0	$785.4	$826.4	$1,350.0	$261.8		
x EV discount rate	$86.4	$90.9				
Expected profits & interest on capital	-$162.0	-$40.5			$202.5	(transferred to free capital)
Expected change in capital		-$74.3	-$74.3		$74.3	(transferred to free capital)
Expected values at end of year 1	$709.8	$802.6	$1,275.8	$236.6	$276.8	

HEALTHCARE RISK ADJUSTMENT AND PREDICTIVE MODELING, DUNCAN CH. 6 – DEVELOPMENT AND CONSTRUCTION OF DRGs, DCGs, AND ETGs

History, Development and Use of Diagnosis-Related Groups (DRGs)

- DRGs were introduced for hospital reimbursement in 1983 by Medicare
    - DRGs were the first prospective payment system used by Medicare
- Created as a tool for hospital utilization review and quality improvement

Historical Background

- 1960s – Medicare inpatient services reimbursed on basis of historical costs
- Two key issues:
    - Medicare patients had relatively long average length of stay and utilization review committees were ineffective in addressing this issue
    - Hospitals experienced sharp increases in costs; hospitals had no incentive to control costs and Social Security Administration had no way to influence costs
- DRGs were created over a period of 10 years starting in the 1960s
- Created DRGs based on:
    - Principal diagnosis
    - Principal procedure
    - Age
    - Sex
    - Patient Disposition
    - Secondary diagnoses

Tree-Like Structure of DRGs

- Variables listed above were applied in a sequential fashion, reflecting the logic used to assign a patient to a DRG

Enhancement of Complications and Co-Morbidities

- Initially had 383 DRGs
- Second edition expanded this number with addition of complications or co-morbid conditions based on patient's secondary diagnoses
- Begin with tree-structure as before, but introduces whether patient is a "medical" or "surgical" case
- Assigned to Adjacent DRG
- Secondary diagnosis used to define complications or co-morbid conditions
- Adopted in 1983 – hospitals were paid a fixed amount depending on patient's DRG (along with adjustments for certain factors)
    - Introduced an incentive for hospitals to control costs and length of stay
- Biggest impact was sharp decrease in length of stay
- Increased the importance of medical record departments

Common Features of Medicare Prospective Payment Systems

- Common Features of Medicare Prospective Payment Systems:
    - System of Averages – providers can't expect to make a profit on each case, but efficient providers make a reasonable return over all patients
    - Increased Complexity – more complicated than per diem payments and complex to administer

  - Relative Weights – involve underlying patient classification system and a relative weight based on average resources used by an efficient provider
  - Conversion Factor – base price is the dollar amount for a unit of service. Each year, a base price is set for the DRG payment system
  - Outliers – recognize that unusual cases will occur that require above-average resources and hospitals receive additional payments for these cases
  - Updates – base amount and relative weights are adjusted each year to reflect new technology and practice patterns
  - Access and Quality – certain standards ensure adequate access to high quality care and that providers are adequately compensated to participate in Medicare
- Challenges with Patient Classification Systems Based on Coding Systems:
  - Need for New DRGs – new diseases and procedures must be grouped and properly assigned
  - ICD Coding – some codes may not be sufficiently precise
  - Upcoding – providers may be tempted to exaggerate a patient's secondary diagnoses to increase severity and hence increase payment
  - New Coding Systems – ICD-10 will result in a major increase in codes; "crosswalk" between ICD-9 and ICD-10 codes will be needed until new codes are fully implemented

Enhancements of Diagnosis Related Groups

- All Patient DRGs (AP-DRGs)
  - Initial idea was to create DRGs for all patients, not just Medicare or over 65
  - New York state adopted a prospective system in 1987 for all payers, but certain shortcomings were recognized
- Refined DRGs
  - Created levels of complications and co-morbidities instead of a yes/no approach
  - CMS eventually adopted a similar system to address severity with Medicare Severity DRGs (MS-DRGs)
- All Patient Refined DRGs
  - APR-DRGs greatly expanded the number of DRGs, included a mortality model and enhanced the logic used to determine the severity level based on the patient's secondary diagnoses
- DRG-Like Systems Used in Other Countries
  - Australia, France, Canada, Germany, Italy and others have applied the basic structure of DRGs using their own country data to create versions of DRGs

Payment Systems Used by Private Insurers

- Private insurers have create their own payment systems and billing software
  - Usually use a hybrid DRG system
- More often, private insurers prefer using discounted charges to pay hospitals
  - Limited research ability and relatively small datasets mean that private insurers have not been active in designing and implementing innovative prospective provider payment systems

DxCG's Clinical Classification System

- DxCG models accept both medical (diagnoses) and pharmacy (pharmacy based identification) information
- Table below shows the four levels of classification (ACC, RCC, CC and HCC)

Summary of DxCG Grouping Levels		
DxCG Grouping Level	**Number of Groups**	**Application**
Aggregated Condition Categories (ACC)	31	Population profiling, reporting
Related Condition Categories (RCC)	117	Population profiling, reporting
Condition Categories (CC)	394	Clinical screening, reporting
Hierarchical Condition Categories (HCC)	293	Making predictions, clinical screening, reporting
DxGroups	1,010	Clinical screening, reporting
ICD-9 Diagnostic Codes	15,000+	Coding and reimbursement

- DxCG's software processes all diagnoses for an individual to identify one or more of the 1,010 DxGroups which combine clinically related ICD-9-CM codes
- DxGroups then classify diagnoses into Condition Categories (CC)
    - CCs imply similar level of resource use
    - Individual may have multiple DxGroups of CCs
- CCs then further collapsed into Related Condition Categories (RCCs)
    - RCCs are helpful in reporting on specific diseases and conditions
- Highest-level clinical grouping is Aggregated Condition Category (ACC)
    - Organize condition categories into body systems
    - ACCs are not used in constructing DxCG's predictive models and relative weights
- Example of DxCG Classification System Below

Example of DxCG Classification System	
Aggregated Condition Category (ACC)	Musculoskeletal
Related Condition Category (RCC)	Hip
Condition Category (CC)	Hip Fracture/Dislocation
DxGroup	Traumatic Dislocation of Hip
ICD-9 Diagnostic Code	835.01: Closed Dislocation of Hip - Posterior Dislocation

- Imposing clinical hierarchies improves the statistical precision of the estimated parameters in the model and decreases sensitivity to coding idiosyncrasies
- Individual HCCs are associated with weights that represent the relative contribution of that HCC to the overall resource utilization of the member
- Relative risk score/overall resource utilization is then derived by adding the weights for the appropriate HCCs
    - Lower condition categories are zeroed out when more than one CC is present, to avoid double-counting

<u>Development of Relative Risk Scores</u>

- Regression model where the coefficients represent the marginal contribution of each condition category to the overall cost

- $C = \alpha + \sum_i \beta_i K_i$
  - $\alpha =$ intercept (independent of explanatory variables)
  - $K_i =$ set of independent explanatory variables (age/sex buckets and condition categories)
  - $\beta_i =$ set of coefficients (weights) that apply to the explanatory variables
  - $C =$ dependent variable (usually an expected claims cost)
- Expected marginal dollar cost of each condition category is adjusted to a relative risk score by dividing expected cost for each condition category by average claims for the entire population (including those with no claims)

Concurrent and Prospective Models

- Two major types of DxCG models:
  - Concurrent
    - Used to reproduce actual historical costs
    - Assesses relative resource use and determines compensation to providers for services rendered
  - Prospective
    - Predicts what costs will be for a group in the future, based on inherent conditions
    - Members with no claims get a relative risk score based on age/sex only

Episode Groupers: Symmetry's Episode Treatment Groups (ETGs)

- Episode is a distinct occurrence of a medical condition or disease
  - Represents all the health care services involved in diagnosing and treating the condition
  - Acute episodes usually follow a common cycle – diagnosis, treatment and recovery
  - Chronic episodes may continue on for a longer period
- Focus of this grouper is the episode, not the individual
- Grouper is applied to claims data and aggregates all costs associated with the episode
- Episodes provide a more comprehensive unit of analysis than traditional unit comparisons (hospital admissions, ER visits, etc)
- Over 450 Base Episode Classes
- Additionally measure clinical severity, treatments, complications and co-morbidities
  - Gives users ability to analyze conditions at a very detailed level
  - Leverage in the development of a risk adjustment tool
- Building block of the Episode system is the Episode Treatment Group (ETG)
  - Foundation of the record is the Anchor Record
  - Ancillary records are clustered with the appropriate anchor record
- Risk and severity levels are based on the diagnosis alone (rather than the treatment)
  - Allows ETGs to be used to assess efficiency of different providers in treating the same conditions
- Symmetry Episode Risk Groups (ERGs) – risk adjustment tool derived from ETG
  - Assigns retrospective and prospective risk based upon conditions observed for each individual
  - Mapped to 167 ERG markers
  - Based on Major Practice Category (MPC)
  - Member risk scores are the sum of weights attached to each ERG, as well as demographic characteristics
  - MPCs includes items such as Infectious Diseases, Neurology, Cardiology, Dermatology, etc
  - Weights for each ERG are estimated by applying a multiple regression model to enrollment, medical and pharmacy data

        - Prospective Risk Score = $Risk\ P_i = AgeSex_i + \sum_s \beta_s ERG_{i,s}$
        - Retrospective Risk Score = $Risk\ R_i = \sum \gamma_s ERG_{i,s}$
            - $AgeSex_i =$ weight of age/sex grouping for member i
            - β and $\gamma =$ weights attaching to the ERGs
        - Prospective model includes age/sex factor to capture unknown portion of diagnosis-based risk (retrospective model is historical, so the unknown portion doesn't exist)
    - If a certain ERG appears twice during one period, it is only adding to the total risk score once because that risk score/weight already accounts for the overall condition in the first occurrence
- Both DxCG and ERG models have predictive power
    - If the purpose is physician profiling, Episode Grouper model is probably essential

Comparison of Different Grouper Models

- DRGs, DCGs and ERG/ETGs are all constructed differently and have slightly different uses (hospital reimbursement, underwriting and provider profiling and reimbursement)
- Deciding which model is most appropriate will depend on the specific use, available data and budget