Course 8
Finance and Enterprise Risk Management Core Segment Solutions

Solution 1

a)

LIABILITIES

Non-Par Whole Life

Whole life has "savings element" in early years due to deposits being larger than claims. Must invest those reserves
Interest rate is locked in at policy inception
Withdrawal features contribute to lapses and are integral to product pricing
May have flexible premium option which permits additional deposits at the option of the policyholder
A policy loan option may allow policyholder to withdrawal funds early and borrow against cash value at a predetermined interest rate (or formula)

SPDA

Interest rate risk is the number one risk during the accumulation phase of the liability
May have very liberal withdrawal features
A "Put Option" is given to policyholder allowing for early surrender at accumulated value less surrender charge
Disintermediation risk can result in liquidity issues due to ability to cash out at a surrender value
Renewal rate is important as high renewals dampen "surrender activity" and low renewals appear to elevate it
May have a settlement option in terms of taking an annuity or lump sum at the end of the accumulation phase

ASSETS

Many bonds have call options which can be exercised by the issuer against the bondholder if rates fall materially. For insurers this is bad as cash would then need to be reinvested at then current interest rates
Mortgages have prepayment risk. Principal can be returned early. Option typically exercised when rates fall.
Maturity mismatch risk is a risk embedded here in that the duration of assets may exceed liabilities by up to 2.0 years

Solution 1 **(continued)**

b)

Maturity mismatch risk is one that is present from the investment policy. Investment policy permits that assets to be longer than liabilities by up to 2.0 years
Longer assets than liabilities can lead to liquidation of assets at depressed values in times of higher than expected interest rates
Due to option risk embedded with assets and liabilities the rate of change of the duration due to changes in interest rate (convexity) is not being measured or managed
Segmentation can be a valuable tool to separate liabilities and good asset management but Retro Life shows no signs of this
Convexity is 2nd order measurement and can lead to frequent rebalancing if not monitored
Key rate durations can be used to deal with non-parallel shifts of the yield curve which more closely matches real-world experience, but Retro does not use that
Option pricing is not used at Retro which allows multiple paths to be projected and associated cash flows
Retro ignores VaR analysis
Not using holistic techniques which try to capture the synergies of different products within the life insurance company
Cashflow testing not used at Retro. It can flag problems before they arise by building into the interest rate scenarios, lapses and asset/liability values.
By measuring duration at 12/31, there is no limit on durational mismatch at other points throughout year. This may allow gaming of the system.

c)

DFA considers entire financial position of insurance company over time and inter-dependencies due to stochastic nature of the analysis.
DFA not only projects what is expected to happen but also what other outcomes are as well
DFA considers product design as part of the analysis
DFA considers Holism when looking at the "big picture". Holism can focus around risk or return

Solution 1 (continued)

DFA can develop an efficient frontier to optimize risk vs. reward with particular products, etc.
DFA will consider change in shape of yield curves as well by bringing in convexity
DFA is utilized as a going concern analysis
DFA can create results on different measures such as Stat, GAAP, tax, etc.
DFA results in multiple path outcomes vs. a single answer

d)

DFA is very complex compared to traditional asset liability matching
Model sophistication can lead to widely varying results.
Simple interest rate models may overlook many plausible outcomes and not provide insight to managing key risks
Complex models can be expensive to run in terms of understanding and the technology used to run such models
Admittedly costs are coming down now for technology.
There is no representative case but rather a continuum of outcomes
There is a chance that it could come down to "garbage in, garbage out" if careful monitoring of inputs and assumptions is not done
Can not help where risks are not identified and therefore not quantified
No model can be 100% accurate but being aware of strengths and weaknesses will be key to implementing
Consider model and it's output as support for decision making and not the sole piece
Must decide whether or not do analysis in house as outsourcing implies less control
Communicating the output can be as complicated as creating the model in the first place so much attention must be paid here
No standardization exists for ALM or DFA within life insurance industry so cross company comparisons may be difficult.

Solution 2

a)

Use CAPM $E(r_j) = r_f + Beta_j\,[E(r_m)-r_f]$

$E(r_j) = .06 + 1.5[.12 - .06] = .15 = 15\%$

b)

Expected cash flow = 0.55 * \$8,121,500 + 0.45*\$3,827,000 = \$6,188,975

Discount factor = 1.15^(-4) = 0.5718

$$\text{NPV} = -3{,}500{,}000 + \frac{0.55*8{,}121{,}500 + 0.45*3{,}827{,}000}{2{,}000{,}000}$$

$$= -1{,}104{,}940$$

c)

Need risk-neutral probabilities

$$p = \frac{S(1 - r_f)^4 - S^-}{S^+ - S^-}$$

$$p = \frac{100.00(1.06)^4 - 52.20}{174.90 - 52.20} = 0.6035$$

$1 - p = 0.3965$

Cash flow in up market = max of the following:

2*8,121,500 - 7,000,000 = **9,243,000** (expansion)

8,121,500 - 2,000,000 = 6,121,500 (neither option)

(0.5)*8,121,500 - 1,400,000 = 2,660,750 (contraction)

Cash flow in down market = max of the following:

2*3,827,000 - 7,000,000 = 654,000 (expansion)

3,827,000 - 2,000,000 = **1,827,000** (neither option)

(0.5)*3,827,000 - 1,400,000 = 513,500 (contraction)

Discount factor = 1.06^(-4) = 0.7921

$$\text{NPV (CCA)} = -3{,}500{,}000 + \frac{0.6035*9{,}243{,}000 + 0.3965*1{,}827{,}000}{1.06^4}$$

$$= 1{,}492{,}215$$

Solution 3

a) **Securitization of assets:**

- Borrower received funding upon initiation of transaction, repays principal and interest over time.
- Originator (issuer) is exposed to borrower (investor)'s credit risk, but not vice versa
- Sale of loans to another financial institution does not have material effect on borrower's economic position; thus a true sale of assets is allowed, extinguishing originator's financial interest entirely.

Securitzation of liabilities:

- Policyholder is exposed to financial institution's credit risk. Thus selling policy obligation to another party can significantly affect buyer's economic position because it could increase his exposure to default risk.
- This reversal of credit risk exposure is a barrier to a true sale of liabilities. Regulators usually will not allow insurers to enter transactions that wipe out their liability to policyholders.
- Thus liability "securitizations" are really monetizations as there is not a true sale of the liability.
- An ongoing direct relationship continues between the policy holder and the insurer.
- These transactions are typically "on balance sheet."

b) **Income statement**

- Insurer passes on cash flows to investors
- Mortality, longevity, and persistency risk are also passed on to the investors.

Balance Sheet

- Free up capital which can be used for other investment
- The insurer passes on insurance risk to the capital markets
- Might improve RBC ratio because capital intensive products are removed

c) **XXX securitization**

- Need to be at certain size to be economically worth while
- Securitization is costly: (incl. Legal fees, investment banking fees)
- Model cash flows may be complex and time-consuming
- Free up the capital for other use
- Insurer passes on all insurance risks: mortality, lapse, investment risk

Solution 3 (continued)

YRT reinsurance

- More straightforward and less costly than securitization
- Only reinsures mortality risk (remaining risks are still held by direct insurer)
- No surplus relief is given, thus capital is still tied up

Solution 4

a) For cash flows that involve zero risk, discount at risk-free rate.

Risk affects the interest rate

Risk-free rate refers to risk-free spot curve

PV taken at the risk-free rate is useful as a dividing line

For risky cash flows, PV estimate should include a risk adjustment to reflect market price of risk.

Three approaches to include risk adjustment:

1. Adjust the discount rate

   If discount rate > risk-free rate, implies negative risk adjustment to reflect adjustment and vice versa.

2. Use option-pricing techniques to weight the results under various scenarios

   Discount PV of future CFs by averaging diff scenarios for interest rates

3. Adjust the cash flows being discounted

   Preferred method; use a market value margin (MVM)

Must include all cash flows.

Future CFs that could occur under the contract

Costs to be incurred in carrying out the obligation

Disclose that the accounting situation differs from fair value to prevent misinterpretation

b) Expected Net Cash Flow = Premiums – Expenses – Expected Claims

$$CF_1 = 1500 - 225 - 1050 = 225$$

$$CF_2 = 1350 - 210 - 940 = 200$$

$$CF_3 = 1275 - 200 - 900 = 175$$

$$r_L = r_A - e\left(\frac{r_E}{(1-t)} - r_A\right)$$

Assets to Liability = (E + L) / L

So E/L = 125% - 1 = 25% = e

Solution 4 (continued)

After-tax cost of debt $= 8\% \times (1 - 40\%) = 4.8\%$

Cost of equity $= r_f + \beta(r_M - r_f) = 4.5\% + 1.1 * 6.5\% = 11.65\%$

Cost of capital $= r_E = (\%\ \text{debt} * \text{ after-tax cost of debt}) + (\%\ \text{equity} * \text{cost of equity}) = 0.15 \times 0.048 + 0.85 \times 0.1165 = 10.6225\%$

$$r_L = 7.5\% - \left[25\% \times (10.6225\% / (1 - 40\%) - 7.5\%)\right] = 4.949\%$$

$$\text{PV of CFs} = \frac{CV_1}{(1+r_L)} + \frac{CV_2}{(1+r_L)^2} + \frac{CV_3}{(1+r_L)^3}$$

$$= 225/(1.04949) + 200/(1.04949)^2 + 175/(1.04949)^3 = 547.36$$

c)

$$\frac{MVM_{2009} + C_{2009}}{1+r_f} = \frac{C_{2009}}{1+r_L}$$

$$MVM_{2009} = C_{2009}\left(\frac{1+r_f}{1+r_L} - 1\right)$$

$$MVM_{2009} = C_{2009}\left(\frac{r_f - r_L}{1+r_L}\right) = 175 * (4.5\% - 4.949\%)/(1.04949 = -.075)$$

$$L_{2008} = \frac{C_{2009} + MVM_{2009}}{1+r_f} = (175 - 0.75)/(1.04949) = 166.75$$

$$MVM_{2008} = (L_{2008} + C_{2008})\left(\frac{r_f - r_L}{1+r_L}\right) = (466.75 + 200) * (4.5\% - 4.949\%)/(4.04949) = -1.57$$

$$L_{2008} = \left(\frac{L_{2008} + C_{2008} + MVM_{2008}}{1+r_f}\right) = (166.75 + 200 - 1.57)/(1.04949) = 349.45$$

$$MVM_{2007} = (L_{2007} + C_{2007})\left(\frac{r_f - r_L}{1+r_L}\right) = (349.45 + 225) * (4.5\% - 4.949\%)/(1.04949) = -2.46$$

Solution 5

a)

1. "info" costs:
   - arise from outsiders' inability to monitor risk-taking inside the firm
   - financial firms tend to depend on proprietary financial technology, and their balance sheet tends to be relatively liquid (can be subject to change)
   - these firms cannot be operated transparently
   - because financial firms are difficult to monitor, guarantors face costs related to adverse selection and moral hazard
   - such costs can be reduced thru greater reliance on equity capital

2. higher taxes and the "agency costs of free cash flow"
   - agency costs is the tendency of companies to waste excess capital on low-return projects because they have too much equity capital.
   - agency costs can be reduced by having debt holders and external guarantors provide more of the firm's risk capital.

b)

AL: Risk Cap = $100, Expected Profit = $40, Dead Weight Cost=(20), Net Profit 20
NA: Risk Cap = $100, Expected Profit = $10, Dead Weight Cost=(20), Net Profit (10)

i) AL + NA: Expected Profit = $50
ii) AL + NA: standard deviation of combined earnings is square root of Risk Capital =100x(2)^0.5 = $141.4
iii) AL + NA: Dead Weight Cost = (0.2) x 141.4 = $(28)

c)

- on a stand-alone basis, AL is profitable, but NA loses money
- Increased Expected Profit = $10, Increased Dead Weight Cost = $(8); Increased Net Profit = $2
- combined, AL+NA makes $2M more in profits net of dead weight capital costs than AL alone
- thus, acquiring NA is a good decision for AL

Solution 5 **(continued)**

d) stand-alone: VUL Exp PM =$40, VUL S-A Cap = $100, VUL S-A RoC = 40%
stand-alone: DA Exp PM =$10, DA S-A Cap = $100, DA S-A RoC = 10%
stand-alone: Combo Exp PM =$50, Combo S-A Cap = $141.4, Combo S-A RoC = 35%

fully allocated: VUL Exp PM =$40, VUL F-A Cap = $70.7, VUL S-A RoC = 57%
fully allocated: DA Exp PM =$10, DA F-A Cap = $70.7, DA S-A RoC = 14%
fully allocated: Combo Exp PM =$50, Combo F-A Cap = $141.4, Combo S-A RoC = 35%

marginal: VUL Exp PM =$40, VUL Marginal Cap = $41.4, VUL Marginal RoC = 121%
marginal: DA Exp PM =$10, DA Marginal Cap = $41.4, DA Marginal RoC = 24%
marginal: Combo Exp PM =$50, Combo Marginal Cap = $82.8, Combo Marginal RoC = 60%

- "standard" RAROC evaluates projects according to their required returns on risk capital
- RAROC allocates an amt of risk capital proportional to a project's VaR
- for normally distributed profits, risk capital is proportional to the standard deviation of profits -> similar to this model
- RAROC then calculates the ratio of expected future profits to allocated risk capital and then compares this ratio to a hurdle rate
- this model is similar to RAROC in that it relates the ratio of profits to risk capital to a hurdle rate
- however for this model, the numerator is the economic value of profits - the value of profits calculated using market-based required return
- the denominator is the project's marginal rather than its stand-alone risk capital
- this model is more consistent w/ economic criteria: it is the price of insuring against losses
- finally, the hurdle rate measures the firm's deadweight cost of risk capital
- if there are no deadweight costs, this rule reduces to the standard NPV criterion
- under RAROC the stand-alone ROC for NA is only 10%, and would reject it as being below the 15% hurdle rate

Solution 6

a)

i) X = expected one-year forward value assuming BB credit rating at year end
$X = 5 + 5v_1 + 5v_2^2 + 105v_3^3$
$v_i = (1+s_i)$
$(1+s_i) = (1+{}_1f_0)\ldots..(1+{}_if_{i-1})\text{^}(1/i)$
X = $101.26

ii) Y = expected one-year forward value assuming the bond is in default at year end
Y = recovery rate * face value
Recovery rate for senior subordinated corporate bond = 39.71%
Y = $39.71

b)

Mean value = summation $[EV_i * w_i]$ where i = each year end credit rating
Mean = $104.87
Variance = summation $[w_i * (EV_i - \text{Mean})^2]$
Variance = $10.70
Standard Deviation = square root of variance
Standard Deviation = $3.27

c)

A. Shape of distribution

- equity returns are relatively symmetric (normal distribution)
- mean & standard deviation are sufficient to understand market risk and quantify percentile levels for equity portfolios
- credit returns are highly skewed and fat-tailed
- require more than mean & std deviation to fully understand credit portfolio's distribution

B. Modeling correlations

- for equities, correlation can be directly estimated by observing high-frequency liquid market prices
- for credit quality, lack of data makes it difficult to estimate credit correlation directly from history

Solution 6 (continued)

d)

- Earnings - can be measured by interest coverage (EBIT or EBITDA divided by interest expense)
- Cash Flows
- Asset Values
- Liquidity
- Leverage - can be measure by current ratio or debt-to-net worth ratios
- Financial size
- Flexibility
- Debt capacity

e)

- Account Operations - quality & timeliness of reporting? Does the company honor its obligations?
- Assess Management - sufficient management skills? Track record? Depth?
- Environmental assessment - management awareness and compliance with all relevant environmental regulations and practices
- Contingent liabilities - litigation and warranty claims

Solution 7

a)

Economically, this transaction results in a predictable and stable profit stream

FAS 133 dictates that all derivatives are held on the balance sheet at fair value.
FAS 133 dictates that changes in FV for derivatives run through the income statement barring any hedge accounting.
Bond and MTN are not being marked to market through the income statement.
FAS 133 takes an economically stable profit stream and creates income volatility on a GAAP basis as derivatives are marked to market with no offset.

Over time, GAAP and economic profits will be equal

b)

Net result of pay fixed swap and fixed rate bond is a net variable rate bond.
Future value is not sensitive to changes in interest rates.
Fair Value hedge relationship could be set up.
All documentation, disclosure, and testing requirements need to be met.
Changes in Bond market values due to changes in interest rates would also run through the income statement to provide an offset to the derivative.
Given the offset, income statement volatility would be reduced.

Net result of pay fixed swap and variable rate MTN is a net fixed rate MTN.
Cash flow not sensitive to changes in interest rates.
Cash Flow hedge relationship could be set up.
All documentation, disclosure, and testing requirements need to be met.
For cash flow hedge relationships, change in derivative fair value can be placed in other comprehensive income instead of run through the income statement.
Taking the marked to market aspect of the derivative out of the income statement will reduce the income statement volatility.

c)

At inception of hedge, create formal documentation of the hedging relationship and the entity's risk management objective and strategy for undertaking the hedge including:

- identification of the hedging instrument
- identification of the hedged item
- nature of the risk being hedged
- how the hedging instrument's effectiveness in offsetting the exposure to changes in the hedged item's fair value of cashflows will be assessed

Solution 7 **(continued)**

Other General Disclosures in financial statements include:

- the entity's objectives and strategies for holding or issuing derivatives
- a description of the entity's risk management policy
- the net gain or loss recognized in earnings during the period which represent the total amount of the hedge's ineffectiveness
- events resulting in the recognition of earnings from gains/losses derived in accumulated other comprehensive income
- an estimate of earnings that will be released from accumulated other comprehensive income over the next 12 months

Solution 8

a) Beantown should examine the following elements to assess its liquidity risk which may be broadly defined as the ability to meet all expected and unexpected cash needs at a reasonable cost.

- Day-to-day liquidity, a Treasury function to manage cash needs
- Ongoing liquidity in the future 6-24 months trying to avoid surprises and any large restructuring costs
- Ability to handle any short term catastrophic cash needs

In this analysis one has to consider a number of items such as surrender provisions, impact of distribution channels, target markets, competing products, operational cash flows, debt obligations of the company, potential contingent claims, dividend needs, and asset concentrations.

b) The Universal Life product will have liquidity needs primarily dictated by the design of its surrender provisions. Buyers may be more oriented to the investment aspects than the insurance components and lapse the policy to obtain a better yield. S&P assigns the liquidity needs of this product as 30% immediate and 50% ongoing.

A Major Medical policy has no surrender provision other than the return of any unearned premium. Therefore, S&P assigns a 50% factor to the unearned premium reserve and 100% to the claim reserve.

c) Standard and Poor's analysis of assets would rank them in the following order:

1. Cash and other short term assets – 100% liquid
2. US Government bonds – 100% liquid
3. Canadian Bonds – 100% liquid
4. AA+ Bonds – 100% liquid
5. Agency pass-throughs – 100% liquid
6. B-rated bonds – reduced values, smaller market
7. Russian government bonds – subject to market uncertainties
8. Unaffiliated common stock – usually liquid but price very volatile
9. CMO – Z tranches – small aftermarket means hard to sell
10. Funds withheld – no market at all

Where the liquidity is the same, the rankings show the impact of market value variability.

Solution 8 (continued)

d) We have 6 month problem here and this dictates what should be done. First off Beantown Life and Health should assess its asset maturities and consider asset repurchases or the issuance of commercial paper if projected cash flow will not cover the extent of the extra claims.

Longer term Beantown should consider implementing the S&P or Moody liquidity models, implement an ALM approach if not already in place, establish a liquidation plan, work with a bank to get a line of credit. As a last resort, the company could consider securitizing some its assets or entering into reinsurance.

Solution 9

a)

Claims Dilution Problem

- Management increases shareholder value at the expense of the bondholder by
  - Increasing debt, therefore reducing the value of outstanding bonds
  - Adding debt senior to that in question

Reducing the claims dilution Problem

- Putable Bonds
  - Put bond back to issuer if interest rates rise or issuers credit standing falls
  - Call option on interest rates and an option on the credit spread of the issuer

Or

- Floating rate, rating sensitive notes
  - Explicit option on issuer's credit standing
  - May Increase probability of default because increases debt burden

Asset Substitution Problem

- Management invests in risky projects to save the firm

Reducing the asset substitution problem

- Convertible Bonds
- Bondholders participate in increase in shareholder value
- Reduce the probability that companies forgo valuable investment opportunities

b)

Economic Reasons

- Provide Investors with a "play"
- "Arbitrage" tax and/or regulatory authorities
- Obtain accrual accounting treatment for risk management (hedge accounting)

Solution 9 **(continued)**

How Hybrid can help

"Play"

- Forward contract (dual currency bond)
- More commonly is an option embedded in the bond, longer maturity

or "Arbitrage"

- Take advantage of asymmetries in tax treatment or regulation in different countries or markets
- US Firms issued zero coupon yen bonds for tax arbitrage and hedge yen exposure with dual currency bond for regulatory arbitrage

or "Accrual Accounting"

- Obtain accrual accounting instead of marked to market (usually used for hedge)
- Reduce volatility of reported income

c)

Strategic Exposure

A firm has strategic exposure if changes in interest rates affect the firm's market value

Measures

- Duration
  - change in V / % change in (1+ r)
  - Used by financial institutions
- Maturity Gap
  - Sensitivity of net interest income to changes in interest rates
  - Used by financial institutions
- Flow Measures
  - Sensitivity of income flows to changes in financial prices
  - Simulation models
  - Used by non financial institutions
- Stock Measures
  - Market Valuation
  - Sensitivity of a firm<s stock price movements to changes in the general market (beta)
  - Can expand model to measure diversiable risk

Solution 9 (continued)

d)

(Candidates could select from a number of instruments including forwards, futures, swaps, etc.) Some possibilities include:

- ✓ Forward, Future or Swap to neutralize the risk
- ✓ At the money option to minimize adverse outcome
- ✓ Out-of-the-money option to get lower cost insurance
- ✓ Buy and sell options to eliminate out of pocket costs
- ✓ Use a forward/future/swap with options to provide customized solutions
- ✓ Forward or delayed start swap
- ✓ Floating floor-ceiling swap
- ✓ Fixed floor ceiling swap
- ✓ Combining financial instruments with a debt instrument to create a hybrid security

Solution 10

a)

- marketing driven organization
- aggressive pricing
- regulatory drivers appear to be a low priority
- sloppy information and data management
- poor corporate governance standards driven by Chairman/CEO

Determinants of Organizational Architecture

1. Technology that affects products, methods of production and information systems
    - Zoolander's information technology is unacceptable
    - Poor data pre demutualization which has not been converted
    - Only one year's reporting by business segment
    - Spotty projection information which have not been updated regularly nor monitored

2. Market structure affecting customers, competitors, suppliers
    - Price competition in all products
    - Marketing appears to drive decision making rather than actuarial/accounting
    - Board practices too informal with too much decision making in hands of closely knit group of execs
    - 3P project overrun – poor management of external supplier

3. Regulation (taxes, antitrust, international etc)
    - senior management is not focused on regulatory inquiries (ex. delegation to marketing manager)
    - aggressive accounting & tax avoidance being encouraged by CEO (ex. JV)
    - lax/poor process for appointing accountants
    - very poor governance of investment department
        - no meetings last year
        - establishment of derivatives profit center without supervision

Solution 10 (continued)

b)

1. Assignment of Decision Rights within the firm
    - Maximum vacation time for key employees (CEO should not be out for over 2 months!)
    - Increased focus on management accounting information
        - projections
        - product line and business segment reporting
        - clear internal deadlines, regular reporting
    - Board level changes
        - increased formality required
        - need to break up "clubby" executives
        - need for more independent scrutiny (ex. by having more independent members)
    - Need to have a robust process to decide on whether auditors should be retained
    - robust process should be implemented for any derivatives. Also they should be used for hedge purposes rather than as a profit center
    - should implement more rigorous oversight of relationship with regulators
    - Eagle Joint Venture should be a board level decision
    - various committees should be required to meet more than once a year
    - Chairman/CEO role split in order to limit control

2. Structure of Systems to evaluate performance
    - each executive position should have its own clear benchmarks for success identified in advance
    - need to implement a more robust computer/information system before it can be used as a management tool
    - too much decision making authority in the hands of too few execs/board needs to take the lead on key issues
    - unclear what experience Mrs. Holstein-Palomino could possibly have which could be relevant to the board

3. Methods of Rewarding Individuals
    - need to tie performance to pay more clearly
    - management compensation appears excessive, particularly post IPO
    - unclear decision making function/governance structures to be clarified

Solution 10 **(continued)**

Potential Risks each of the above

- Disruption as the above are implemented
- Alienation of the existing board members/senior management
- Lack of management talent within the organization as all meaningful decisions are taken by Chairman/CEO often without the board's knowledge
- Increased costs (i.e. audit, systems, etc)

Solution 11

a)

Under US GAAP, acquisition costs are capitalized. GAAP follows the matching principle (revenues are matched with expenses). In traditional policies, DAC is amortized against premiums Current assumption policies (e.g. UL) amortize DAC as gross profits emerge over the life of the policy. As the expenses are charged, the value of the deferred capital asset is reduced accordingly.

Expenses that are directly related to and varying with sales are deferrable.

A k factor, k = PV(deferrals)/PV(revenue) is used to amortize DAC.

b)

The 0.50% first year commission is deferrable. Initial deferrable expenses for ’06, ’07, and ’08 are $250,000, $300,000, and $350,000.

For 2006 sales the DAC balance is $50 M x .5% x 61% x (38% / 55%) = $105 K

For 2007 sales the DAC balance is $60 M x .5% x 82% x (55% / 75%) = $180 K

For 2008 sales the DAC balance is $70 M x .5% x 75% = $263 K

Total DAC as of 12/31/08 $548 K

GICs are treated as investment contracts under SFAS 97, with DAC amortized against gross profits. The k factor is revised as actual profits emerge. DAC may be written off under loss recognition.

c)

GAAP and Fair Value differ in timing of recognition of gains and losses on the sale of new business and from asset/liability mismatches. Fair value accounting: recognizes all gains and losses in the period which they arise. US GAAP: recognizes the gains and losses over the life of the liability. Under fair value accounting system, income statement volatility is higher.

Solution 11 (continued)

A major benefit of fair value accounting is the ability to identify problems much earlier. GAAP is based on historical costs while fair value is based on prospective (market-based) values. GAAP assumptions often include provisions for adverse deviation (PADs) while fair value assumptions are current best estimates. GAAP assumptions are locked in at issue under SFAS60 (unless loss recognition occurs) while fair value assumptions are not locked in. GAAP provides for deferral of acquisition costs (DAC) while fair value expenses these costs in the period in which they occur.

If assets are not matched to its liabilities, the earnings reported on the fair value income statement will differ significant from those shown on the US GAAP income statement, especially under changing interest rate scenarios. The full impact of any mismatch is reported immediately in the earnings under fair value accounting, while under US GAAP accounting, the effects of any mismatch will be recognized only slowly in income over the remaining life of the liabilities. It will be costly to implement a new accounting system, but Industry convergence to fair-value reporting may be one reason to switch.

I'd recommend a switch to fair value accounting as a means to improve asset-liability management, and to allow management to identify and act on problems on a more timely manner.

Solution 12

a)

a) Option 1

$\left[95.0 - .2356^{*}\left(95 - 50\right)\right]/10 = 8.4398$

From the table, the return earned seems to be about 18%

Option 2

Determine after tax return on bond interest or 10% (1-30%)=7%

Option 3

7 (5 year annuity)* $\left(1+i\right)^{5} = 100\left(1-30\%\right) = 70$

5 year annuity $*\left(1+i\right)^{5} = 10$

From the table above, the return earned seems to be approximately 24%.

Recommend structure C based on the computed after tax return.

b)

Portfolio	A	B	C
Pre-Tax Return	6.30%	5.50%	3.00%
Risk Premium	2.01%	1.84%	0.00%
Risk Adjusted Pre Tax (Rx)	4.29%	3.66%	3.00%
Fraction g	100.00%	60.00%	0.00%
Post Tax Return	4.41%	4.51%	3.00%
Taxes Explicit	1.89%	0.99%	0.00%

i)

$r^{*} = 3\%$

Explicit Tax Rate	52%	39.68%	0%
Implicit Tax Rate	0%	12.70%	52%
Total Tax	52%	52%	52%

ii)

Implicit Tax Rate	30.07%	15.38%	0.00%
Total Tax	0.00%	14.69%	30.07%
Total Tax	30.07%	30.07%	30.07%

Solution 12 (continued)

iii) The risk adjusted after tax return on all assets will be equal in markets that are in equilibrium.

iv) Based on risk adjusted after tax returns, one is indifferent to the three options.

c)

a) Instead of investing pension monies in stock, BT strategy would involve:
- invest pension monies in bonds (yielding 6%)
- borrow on corporate account
- buy stock on corporate account with borrowed funds
- earn additional return by arbitrage (tax deductibility of interest cost on borrowed funds)

b) Option A: Zoolander Invests Pension Funds in Equity Portfolio
- return earned on funds invested in pension portfolio = 15%
- No taxes paid on pension fund assets so post tax return = pre tax return = 15%

Option B: Zoolander Utilized Black Tepper arbitrage strategy
- Pension assets used to purchase bonds
- Pension assets yielding 6% both pre and post tax
- Raise debt at pre-tax cost of 8%, post tax cost of 8%
- Post tax cost of debt = 8%(1-30%)=5.6%
- Purchase stock outside pension fund with borrowed funds
- Stock return is 15% pre-tax
- Stock return after tax = $3\%\left[1-\left(1-80\%\right)30\%\right]+12\%=14.82\%$
- Post tax return earned = $6\%-5.6\%+14.82\%=15.22\%$

Additional return to be earned utilizing black Tepper arbitrage = 22bp.

c) Non Tax costs of implementing BT arbitrage strategy:
Bond holders may charge higher interest rate on loaned funds to offset monitoring costs/increased cost of borrowing.

Solution 12 **(continued)**

d) Advantages:
If marginal tax rates are expected to decrease, advantage to over fund in current period to gain increased benefit of deduction.
Being able to accrue funds at before tax rate of return.

Disadvantages:
High demand on funds for a start up and high cost of funds
Additional funds used to over fund could be used to fund increased salary

Solution 13

a)
i)

ROE = [ROA – h*i*(1-t)]/[1-h]

Current ROE = [12 – 100/500*6*(1-.35)]/[1-100/500] = 14.025%

Option 1 ROE = [11 – 200/600*5*(1-.35)]/[1-200/600] = 14.875%

Option 2 ROE = [11 – 200/600*6*(1-.35)]/[1-200/600] = 14.55%

Option 3 ROE = [11 – 200/600*5.5*(1-.35)]/[1-200/600] = 14.7125%

Option 4 ROE = [11 – 100/600*6*(1-.35)]/[1-100/600] = 12.42%

ii)
Standard Deviation ROE = Standard Deviation ROA/(1-h)

Lower 97.5% confidence level for ROE

Current 14.025 – 6/(1-.2)*1.96 = -.675%

The current capital structure does not meet existing debt covenant provisions with a probability greater than 2.5%.

Option 1 14.875 – 4/(1-1/3)*1.96 = 3.115%

Option 2 14.55 – 4/(1-1/3)*1.96 = 2.79%

Option 3 14.7125 – 4/(1-1/3)*1.96 = 2.9525%

Option 4 12.42 – 4/(1-1/6)*1.96 = 3.012%

Options 1-4 do meet existing debt covenant provisions with a probability greater than 2.5%.

iii)

Variable rate debt has highest ROE at current LIBOR levels.
Debt costs could rise through as interest rates change. Increasing debts costs could put pressure on ROE potentially violating covenant provisions. The tax advantage of debt increases or decreases with rates too.

Solution 13 (continued)

Convertible debt has the second highest ROE
Convertible option on bonds may avert the need for creditors for restrictive covenants (like on previous issue)
Conversion will cause dilution and reduction in ROE

Fixed rate debt has third highest ROE
No issues about changing debts costs or conversions however

Equity offering has the lowest expected ROE
Also has higher ROE in scenarios where ROA falls below after-tax cost of debt. But not by much

Increases in leverage generally send positive signal to market and increases share prices due to agency costs and the perception that management has more inside information about prospects of the acquisition. Debt financing increase incentives for managers to be efficient and usually has tax advantages over equity financing

Given acquisition is decreasing overall risk of ROA, it is more than compensating for the increased financial risk. The company is able to absorb the debt and not increase probability of hitting covenants or bankruptcy.

b)
The following are assumptions used in the Modigliani and Miller model that do not apply to this acquisition:

- All physical assets are owned by corporations
- Capital markets are frictionless. There are no corporate or personal income taxes, securities can be purchased or sold costlessly and instantaneously, and there are no bankruptcy costs.
- Corporations can issue only two types of securities, risky equity and risk-free debt.
- Both individuals and corporations can borrow or lend at the risk-free rate.
- Investors have homogeneous expectations about the future stream of corporate profits.
- There is no growth, so all cash flow streams are perpetuities
- All corporations can be classified into one of several "equivalent return classes" such that the returns on shares of all firms in that class are proportional to, and perfectly correlated with all other firms in that class.

Solution 14

a) Discount rate calculation

r = .06 * .25 + .75 * (.05 + 1.1*(.09 - .05))

8.55% 0.015 0.0705

Calculation of Distributable Cashflow

	0	1	2	3	4	5
Premium		5,000	6,000	7,200	8,640	10,368
Investment Income		2,968	3,326	3,748	4,248	4,841
Benefits		400	448	505	573	652
Expenses		740	740	740	740	740
Commissions		150	180	216	259	311
Stat Reserve	40,000	44,824	50,519	57,256	65,240	74,719
Increase in Stat Reserve		4,824	5,695	6,737	7,984	9,479
Taxes		500	500	500	500	500
Req Capital	2,400	2,689	3,031	3,435	3,914	4,483
Increase in Req Capital		289	342	404	479	569
Distributable Cashflow (DCF)		1,065	1,421	1,846	2,353	2,958

Formula for Distributable Cashflow: Premium + Inv Income - Benefits - Expenses - Comm - change in Stat Rsv - taxes - change in req cap

Disc Rate	8.55%					
Present Value of DCF		981	1,206	1,443	1,695	1,963
Actuarial Appraisal Value	**7,288**					

b) There are a number of reasonable discount rates
A range often showed when valuing a company.
Should reasonably reflect risks inherent in projections.
Should be weighted by debt/equity.

Methods
Use CAPM to determine the WACC and use as a discount rate.
Use internal company target-hurdle rate.
M&A market place discount rates.

Solution 14 **(continued)**

Use a risk-adjusted ROR with 4 parts:

1. risk free interest rate
2. market equity risk premium
3. additional risk premium to reflect any additional uncertainty
4. tax adjustment

May want to use different rates for different blocks of business.
May want to look at sensitivities: optimistic, pessimistic, and realistic.

c) Pre-Marketing
Prepare teaser, confidentiality agreement

Marketing
Initial contact with prospective buyers, follow up with interested parties

Review Preliminary Bids/Evaluating Opportunity on the Buy Side
Seller should consider all available options, possibly re-approach parties that chose not to bid.

Due Diligence of Seller
Involves a presentation by management of seller, needed to formulate a meaningful bid.

Final Bids & Negotiating the Definitive Agreement
Formal Letter of Intent (LOI) and negotiate in good faith to reach a final agreement

Execute Definitive Agreement & Regulatory Filings
Analysis of negotiated terms, also known as purchase agreement

Closing
Presentation to Board of Directors, state regulatory issues

Solution 15

a) Debt/equity ratio can influence financial performance
- Highly leveraged firms limit agency costs.
- High debt requires management to focus on cash flow.
- Debt is tax advantageous
- Limits company from investing in negative RPV projects
- Also higher debt signals to the market that company is secure and able to make debt payments.
- Encourages investors to monitor their investment
- Debt payments are tax shields which reduce after tax cashflows, debt is cheaper than equity
- Debt financed recapitalization concentrates equity ownership
- Flexible financial commitment
- Concentrates ownership

1. Share Repurchase Program
   - voluntary repurchase of shares on open market
   - represents a gradual restructuring

2. Leverage Share Repurchase program would
   - increase leverage of company/trade equity for debt.
   - Can be gradual or immediate
   - Concentration of ownership effect depends on size

3. Conversion to a Partnership
   - single taxation
   - high concentration of ownership
   - reduces access to capital and may be difficult to liquidate

b) Leveraged Acquisition
- Debt financed mergers
- Need to have merger targets available
- Increases leverage
- Combined must take advantage of merger synergies.

Dividend Program
- return profits to shareholder
- double taxation of earnings
- dividends are sticky
- if change dividend – increase- positive signal, increase in stock price
  - decrease- negative impact
- signal that management is confident in dividend rate
- Can expect an increase in stock price

Solution 15 **(continued)**

c) Compensation program

Short term bonus Plan (can be EVA Bonus)

- can be self financing
- bonus paid partially other banked and put at risk
- keeps good managers, increase long-term outlook

Profit Sharing

- gives manager incentive to run business profitably
- savings plan where contributions based on profitability

Leverage Equity Purchase Plan

- key management given shares in significant portion of firm
- manager borrows to buy shares
  if price goes up – tender shares to and pay back loan
  if shares go down – return shares to pay off loan

  Share holders do not lose and give incentive to managers

Leverage Cash Out

- Old shares exchanged for cash and new shares
- Dramatic increase in managers' ownership in company
- Highly leveraged manage after tax cash flows
- Represents a self imposed leveraged buy out.
- Radical change in the financial structure of company

Solution 16

a)

Securitization

Advantages

· Securitization can have cost advantages to the issuer over straight debt and equity capital.
· It allows the transfer of risk on lower quality assets or assets with irregular cash flows.
· Rating agencies tend to view arrangements favorably when there is a strong economic rationale behind them.
· Rights to repurchase assets and roll over arrangements offer the issuer a large amount of financial flexibility.

Disadvantages

· The cost of issuing and maintaining the securitization deal can be significant, making it impractical for issues less than $25 million.
· Regulators must approve the deal.
· Although many admitted assets or future revenues can be securitized, transactions that enhance surplus are limited.
· May be slow if Patriot has to form a marketing company for the transaction.

Surplus Notes

Advantages

· They are relatively straightforward compared to other alternatives.
· Interest paid on surplus notes is deductible for tax purposes
· In a holding company structure, surplus notes can be easily issued to the parent by the life company, providing a mechanism for injecting capital back into the life company and pulling capital back out.
· Surplus produced by surplus notes is not subject to mutual company equity tax.

Disadvantages

· The market for lower rated issues is limited.
· The cost may be high for small issues.
· While the potential market for issues is large, surplus notes are not familiar to many institutional investors. This may impact pricing and liquidity.
· Surplus notes are a temporary form of additional capital and must be refinanced or repaid at maturity.
· There is little flexibility in terms.
· Rating agencies may look closely into the use of surplus notes and limit the amount they will count as equity.
· Must get insurance department approval.

Solution 16 (continued)

Reinsurance

Advantages

- Surplus provided will be repaid only if and when there are earnings available on the block.
- Terms are flexible.
- Reinsurance reduces future losses.
- Reinsurers are typically in the same business as the ceding company and can offer added value through additional expertise.
- Cost of reinsurance may be less than other options.
- Reinsurance can reduce the ceding company's capital requirements.

Disadvantages

- Using reinsurance to raise surplus is heavily regulated.
- Financial reinsurance is generally not recognized for GAAP accounting purposes.
- Rating agencies have differing view on the effects of reinsurance. They may not recognize some of the surplus reinsurance generates.
- The reinsurer's ability to meet the obligations of the treaty must be considered.
- The cost of some indemnity arrangements can be high.

Downstream Company

Advantages

- Large amounts of capital can be raised and immediately increase surplus.
- Rating agencies will view favorably

Disadvantages

- Very slow
- Costly

Demutualization

Advantages

- Enhanced structural flexibility.
- Easier acquisition financing.
- Improved management incentives

Disadvantages

- Slow, complicated, and costly
- Management has to answer to shareholders who will probably more demanding than policyholders.
- There are a limited number of companies for which demutualization is desirable and realistic.
- Additional reporting requirements, investor relations demands, and regulation.

Solution 16 **(continued)**

b)
Demutualization, downstream companies, and securitization will be too slow to meet Olson's timeline.
Demutualization, downstream companies, and reinsurance will reduce the control Patriot has over the business.

Patriot should issue surplus notes.
Surplus notes are relatively straightforward. This option can be done within Olson's timeframe, and it allows Patriot to maintain control over product management. There also may be tax benefits for Patriot. Although companies with financial troubles used to be the main issuers of surplus notes, the view of surplus notes has improved and recently highly rated companies have issued surplus notes.