Solution 1

(a) Rating agencies provide information on the financial risks of a firm including:
  - Credit risk (default)
  - Liquidity
  - Earnings adequacy
- The ratings are a benchmark for public & markets to determine
- The quality and risk of particular debt issues are reported by agencies
- The rating agencies have access to inside info and are protected by Reg FD

(b) Liquidity ratios are determined by looking at each class of assets and assigning a liquidity factor.
- Look at maturing liabilities
- Look at potential surrenderable liabilities considering features of liability
- Assess cashflows, earnings, and leverage

(c)

Category	Amount	Factor	Capital
Priv Bond (Inv Grade)	782.9	0.01	7.829
Priv Bond (Below IG)	750.8	0.075	56.31
Pub Bond (IG)	3285.5	0.002	6.571
Pub Bond (Below IG)	1737.0	0.05	86.85
CMOs	628.8	0.002	1.2576
Com Mtg (IG)	908.8	0.03	27.264
Com Mtg (Below IG)	175.5	0.06	10.53
Real Estate	842.7	0.1	84.27
Cash	36.2	0.003	.1086
Other Assets	393	0.001	0.393
Total C-1			**281.384**
Dis Reserves	640.4	0.05	32.02
Dis Prem	180	0.25	45
Life Term NAR	3000	0.002	6
Life WL NAR	1500	0.007	10.5
Total C-2			**93.52**

Solution 1 (continued)

Life Reserves	447	0.005	2.235
GIC Reserves	6658.4	0.0125	83.23
VA	379.6	0.05	18.98
Total C-3			**104.4**
L&H Prem	223.6	0.015	3.354
VAR Prod Liab	348.5	0.005	1.7425
Total C-4			**5.097**

- Required Capital $= \left(C-2^2 + (C-1+C-3)^2\right)^{0.5} + C-4$

- Required Capital $= \left(93.52^2 + (281.384 + 104.4)^2\right)^{0.5} + 5.097 = 402.098$

- Capital Ratio = (Capital / Required Capital) = 1032.6 / 402.1 = 256.8%

(d)

- S&P and Moody's are much more robust
- S&P &Moody's do on-site management assessments
- Kelly's model is not regularly updated
- Kelly's model does not factor in covariances
- Kelly only uses 4 years of data vs S&P's 5 years worth
- Kelly only reviews public information vs. others conducting onsite and accessing private information

(e)

- NRSROs must be:
  - nationally recognized
  - independent
  - have sufficiant staff
  - have systematic procedures to produce credible & accurate ratings
  - have internal procedures to protect against misuse of information

- Kelly does not meet this requirement because:
  - Not independent as fee linked to rating
  - Lack systematic procedures from using public info only and not doing on-site.

Solution 2

(a) Forms of liquidity risk
- General Definition of liquidity risk –risk of not meeting expected and unexpected cash flows at an acceptable cost
- Day-today liquidity risk – must ensures bid/ask spread is not comprised ... cash must be managed properly
- On going liquidity risk – sensitivities to rate changes in different directions making potential for liability cash flows (CFs) greater than asset CFs
- Tail risk (catastrophes) – stresses could cause large cash outflows
- rating downgrades could cause run on bank $\Rightarrow$ liquidity crisis
- if illiquid assets must be sold, will have to take a loss because cannot sell it quickly for full book value, like General American

(b)
- current position is quite poor and getting worse
- great deal of private placements and below invest grade (BIG) bonds which are quite illiquid
- Increased allocation to real estate
- no plan in place if sales of assets were needed for a run on bank

(c)
- determine time horizon – set at 1 year by management
- Get portfolio data industry par exposure, obligator data, sector/country exposure and debt class
- determine transition matrix
- transition matrix contains probability of changing credit ratings over a specified horizon
- generally use one of the rating agencies' matrices. I would recommend using Moody's or S&P's May need to adjust for current economic environment
- Get recovery assumption data (usually bonds or rating agency data)
- Get default correlation between sectors/countries, correlations must be considered. CreditMetrics used the stock price as a proxy for firm value in Merton model. Monte Carlo is used to develop the distribution of portfolio values from whence the VAR is calculated
- Generate correlated normal variables for each exposure simulate transition matrix based on random variables
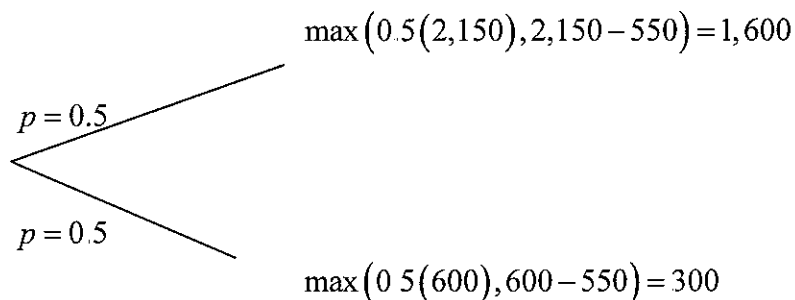- For defaulting exposures, determine recovery

Solution 2 (continued)

(d)   Zoolander has had an A- rating with negative implications two years in a row.

    (i)   Private placements are quite illiquid assets
- by securitizing them, the illiquid assets can be removed from books and replaced with more liquid assets
- Private placements are not transparent to investors
- Securitization involves packaging and selling asset or liability cash flows to investors in exchange for cash
- Cash could be invested in more liquid, high quality assets
- Zoolander's liquidity position could improve

    (ii)   Closed block of liabilities
- advantages
  - receive cash to use for other hopefully more profitable activities
  - eliminate surplus strain if present
  - perhaps get a better price than reinsuring
  - decrease cost of capital because more assets and less liabilities potentially on the block
  - capitalize expected future profit a block of business
  - allows creation of "tracking securities"
  - could protect against mortality or longevity risk

Solution 3

(a) $\quad r_{jv} = r_f + \beta_{jv}\left(r_m - r_f\right)$

$\quad\quad = 0.04 + 0.8\left(0.09 - 0.04\right) = 0.08$

(b) $\quad I_0 = 600\, mil$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad \max\left(0.5(2,150), 2,150 - 550\right) = 1,600$

$\quad p = 0.5$

$\quad p = 0.5$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad \max\left(0.5(600), 600 - 550\right) = 300$

$$\text{NPV} = \sum_{t=1}^{5} \frac{(P)CF_t}{(1+r_{jv})^t} - I_0$$

$$= \frac{0.5(1,600) + 0.5(300)}{1.08^5} - 600$$

$$= 46.55$$

(c) $\quad \pi = \dfrac{(1+r)^5\, s - s^-}{s^+ - s^-}$

r = risk free rate
s = project value
s^+ = project increasing value $\quad\quad\quad s^-$ = project decreasing value

$$\pi = \frac{(1.04)^5 (600) - 300}{1,600 - 300} = 0.3308$$

Solution 3 (continued)

$$NPV = \frac{\pi s^+ + (1-\pi)s^-}{(1+r_f)^5} - I_0$$

$$= \frac{0.3308(2150-550) + (1-0.3308)(300)}{1.04^5} - 600$$

$$= 0.04$$

If increasing value, buy Orient Life Share, entitled to whole profit; if decreasing do not exercise the option.

$$s^+ = \max(0.5 \times 2150, 2150-550)$$
$$s^- = \max(0.5 \times 600, 600-300)$$

(d) - CCA correctly takes into account management options (to expand at the end of year 5 in this case) when calculating project NPV

- NPV uses risk-adjusted discount rate; CCA adjusts the probability of each cash flow to the risk-neutral probability, then uses risk-free rate to discount

- CCA calculates expanded NPV, while NPV is just the passive NPV
  Expanded NPV = Passive NPV + Strategic value + flexibility value
  $\qquad\qquad$ = Passive NPV + option premium

- In the absence of managerial flexibility, CCA and traditional NPV would give the same results

- Traditional NPV uses a constant discount rate (from CAPM) applicable to a passive project. The option to expand changes the risk profile of the project, and the risk-adjusted discount rate is no longer correct.

NPV under both approaches is positive.

Solution 4

(a) Reserve methodologies and impact of changing assumptions:

US GAAP – Methodology:
   UL reserves follow SFAS 97
   Reserve = AV + Unearned Premium Reserve + Accrued Cost Liability +
   Premium Deficiency Liability
   Use current best estimate assumptions, with no PADs (Provision for
   Adverse Deviations)
   Replace estimates with actual experience as it unfolds
   Revenue measure is EGPs (Estimated Gross Profits)

US GAAP – Changing assumptions:
   EGPs are subject to change every accounting period
   Must be trued-up to reflect actual experience
   Can revise assumptions underlying future EGPs if shift in experience is
   believed to be long-term
   Must recalculate DAC amortization and other factors each period
   Use actual experience from issue to end of current period, and revised
   assumptions for future EGPs
   Current year's earnings are affected

Canadian GAAP – Methodology:
   Use current best estimate assumptions, PADs for all assumptions
   Policy Premium Method used for most individual life policies – gross
   premium valuation
   Reserve = Best estimate + PADs
   Include all cash flows
   UL has more complex valuation
   Can hold (AV – amount for deferred acquisition expenses), or hold (AV –
   PV future profit margins)

Canadian GAAP – Changing assumptions:
   Assumptions are only viewed prospectively
   Entire impact of changing assumptions hits the current period's earnings

Australian Margin on Services – Methodology:
   Reserve = Best Estimate of Liabilities + PV of Future Profits
   Use current best estimate assumptions, no PADS
   Spread profits as percent of profit carrier
   Recognize profits as services are performed
   Hold assets at fair value (market value if possible)

Solution 4 (continued)

Australian MoS – Changing assumptions:
Assumptions are only viewed prospectively
Effect is deferred to future period's earnings by adjusting profit driver
Current period's earnings are only affected in two cases:
1) Change to investment yield assumptions where policyholder not entitled to participate in investment experience
2) Previously recognized loss is reversed by a change in assumptions

(b) i foreign exchange risks that Global has assumed
Strategic exposures – effect of change in foreign exchange rates on firm's market value
Accounting exposures – transactional and translational
Contingent exposures – effect of changes in financial prices on expected (but not booked) transactions
Competitive exposures – effect of changes in FX rates on market share and net cash flows

ii. Reasons why Global might consider hedging those risks
If marginal tax rate ↑ as income ↑, hedging can reduce expected tax liability by smoothing profits
Hedging can increase firm's value by reducing likelihood of bankruptcy or financial distress
Hedging can lower agency costs resulting from management's risk aversion

iii. Hedging strategies and instruments that may be used for currency hedging.

Currency heading strategies:
Full hedging – Try to attain risk/return profile of local-currency investor
- Easy to implement
- Isolates local market bets from currency bets
- Neutralizes currency component of overall risk
- Doesn't consider correlations across currencies
- Requires frequent rebalancing
- No upside potential

Solution 4 (continued)

Minimum-variance (regression) hedging – Find optimal hedge ratio based on relative volatilities and historical correlation between assets and currencies
- Combines effects of asset risk and currency risk
- Minimizes overall risk of holding an asset denominated in a foreign currency
- Easy to implement when optimal hedge is found
- Need accurate forecast of volatilities and correlations

Downside (option-based) hedging
- Protect against adverse currency movements while maintaining upside potential
- Put option on individual currencies, basket of currencies, or base-currency value of portfolio

Currency hedging instruments: Hybrids
Dual-currency bond: principal and coupon in different currencies (fixed-rate bullet + long-dated forward on exchange rates)
Principal Exchange Rate-Linked (PERLs): principal paid in one currency but linked to value of another (e.g., pays dollar value of 5 million euros)
Index Currency Option Notes (ICONs): option to convert principal to foreign currency at specified exchange rate

Solution 5

(a)   Should have different strategy
-   instead of looking at asset volatility, should look at surplus
-   should minimize surplus volatility while maximizing increase in surplus, or minimizing deficit
-   can be done using tulips
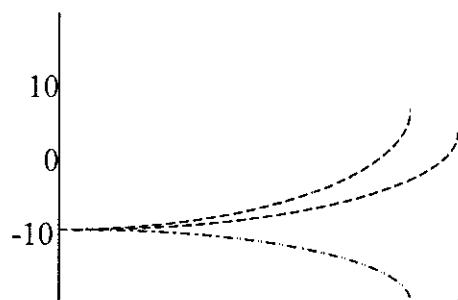
-   Different graphs can be made for different Betas showing potential returns for risk taken

-   each line represents probability of reaching that level
    -   highest line is least probable
-   liability discount rate should not be tied to return on assets
-   annual report should give an idea of the progression of surplus

-   $R_s = \dfrac{A_o}{L_o} R_a - R_L$

-   should look at volatility of both assets and liabilities
-   should maximize surplus utility function
-   should attempt to determine minimum surplus variance.

(b)   Funding levels – should be appropriate
Asset risks that are not market related are alphas
    -   a skillful manager is needed
    -   law of large numbers applies
Diversify asset holding
Use standards
Proper underwriting

Solution 6

(a)

Accounting	Fair value Prospective accounting	U S GAAP historical cost method
Acquisition expenses	n/a	deferred (DAC)
Assumptions(Life ins)	unlocked & changeable	locked – can only be charged when loss recognition event

(b)   Discount rate for liabilities under CoC approach:

*Since liability flows are risky (i.e. not guaranteed), use r_A not r_f

(o/w would substitute r_f for r_A in equation below

Then
$$r_l = r_A - \left(\frac{E}{L}\right)\left[\frac{r_e}{1-t} - r_A\right]$$
$$= 0.08 - (0.10)\left[\frac{0.15}{0.65} - 0.08\right]$$
$$= 0.0649 \quad \text{or } 6.49\%$$

Net cash flows after reinsurance

	2006	2007	2008
(a) Premiums (Gross x 50%)	250	245	243
(b) Expenses & commissions	75	74	73
(c) Death claims (Gross X 50%)	32	33	33
(d) Reinsurance Allowances (Gross prem x 50% x 10%)	25	24.5	24.3
Net Cashflow (a + d – b – c)	168	162.5	161.3

Since CFs assumed mid year,

$$FVL = \frac{168}{(1.0649)^{\frac{1}{2}}} + \frac{162.5}{(1.0649)^{\frac{3}{2}}} + \frac{161.3}{(1.0649)^{\frac{5}{2}}} = 448.50 \text{ as of Dec 31, 2005}$$

Solution 6 (continued)

(c)   An alternate measure if retained would be entity-specific value

Entity-specific vs. fair value – differences:

	Rationale	Assumption	Credit standing
Fair value	Exit price	Market-based	Reflected
Entity-specific value	Orderly settlement over life of liability	Entity specific	Not reflected

Solution 7

C-3a CF considers risk due to A/L mismatch, whereas factor-based C-3a did not

      Old C-3a favors interest rate risk over credit risk to get extra returns

      $\rightarrow$ leads to A/L mismatches

<u>Old system</u>

      factor applied to assets based on asset type and credit rating. $\rightarrow$ Gave C-3a RBC requirement. Size of factor varies w/risk categories of products

<u>New system</u>

- only for some insurers, annuity and certain single premium products
- not necessarily a bad credit thing
- forecast assets and liabilities using mandated scenarios
  look at cumulative surplus discounted
  - if use 12 scenarios, must load due to less reliability
- if use 50 scenarios, no such penalty because greater stochastic nature $\rightarrow$ reliability of results
  - take weighting of scenarios shortfall to get required capital
  - for very good match of A/L, may lower capital requirements
  - 50%-200% of old C-3A requirement range imposed

(b)   <u>CARVM</u>

- doesn't account for interest rate sensitivity of liability cash flows (e g surrenders on fixed annuities when crediting rates $\uparrow$ w/ market rates) If liabilities and assets backing them are mismatched, could lead to higher capital requirements.
- not enough focus on potential adverse tail events
- products have excessive options

Solution 8

(a)

 i. The expected policyholder deficit (EPD) is found by looking at what scenarios would produce a loss greater than the amount of the assets and multiplying each scenario by its probability of occurring. For both DH and SH, the only scenario that produces a loss is Scenario 3 with a probability of 20%. So, the EPD for DH is $2*(150-100)=10$, while for SH it is $2*(100-75)=5$.

 ii. The risk of insolvency is analyzed by computing the expected policyholder deficit ratio (EPDR). This is the ratio of the EPD to the expected losses of a company. The expected loss for DH is $(2*50+.6*100+.2*150)=100$ and for SH it is $(.2*50+.6*70+.2*100)=72$. Thus, the $EPDR_{DH}=10\%$ and $EPDH_{SH}=6.92\%$ (10/100 and 5/72, respectively.) Therefore, DH has a higher risk of insolvency.

 iii. The target for the expected policyholder deficit risk measure is 2.5% or below. This means that IOA needs to hold enough surplus and other assets to cover its expected policyholder deficit scenarios. Let x be the additional assets. Then, for DH x must satisfy the formula $.2*(150-100-x)=0.25*$ Expected losses (11)=12.5. Therefore, x, the additional assets, is 37.5 for DH. For SH the solution for x is $.2*(100-75-x)=.025*72=16$. Thus, the amount of additional assets is 16.

 iv. The capital needed is the combined existing assets and additional assets in excess of expected losses. For DH that is $100+37.5-100=37.5$. For SH it is $75+16-72=19$.

(b) Dynamic Financial Analysis (DFA) is a method of stress testing a P&C company against different economic and business cycles. The purposes of DFA are:

 i. To meet competitive and regulatory pressures
 ii. To understand the interplay between asset and liability cash flows and to measure the risks inherent in each
 iii. To study the effect of different strategies on financial results
 iv. To model the uncertainty of contingent events

 DFA is used
 v. To value a company or line of business for M&A purposes
 vi. To assess a company in changing economic, competitive and regulatory environments
 vii. For strategic planning such as for reinsurance, investment policy, claims management, ALM

Solution 8 (continued)

viii. For making tactical decisions
ix. For capital adequacy and capital allocation
x. For liquidly analysis
xi. For solvency studies
xii. For supporting discussions with rating agencies

(c) Any model developed for DFA must take into account how you want to use the model, its overall complexity, and cost The important elements to consider are:

i. Whether to use a deterministic or stochastic model
ii. The time horizon
iii. Proper reflection of feed back loops
iv. Interrelationship with external systems
v. Whether to use a generalized model or one tailor made for the company
vi. Whether assumptions are logic driven or input driven
vii. The relationship between subsidiary and parent
viii. Scenario testing and assumption selection
ix. Model verification to history and validation
x. Commitment to keep model current with business and economic conditions

Solution 9

(a)   YRT = yearly renewable term
       maybe useful because its a pretty simple structure.. Can be used to eliminate
       mortality risk. Doesn't provide sufficient surplus relief.

       Advantages: lower ongoing cost
                                low investment risks because of small amount of premium
                                low lapse risks

       Disadvantages: only good for example for protecting against mortality risk
                                will not provide sufficient surplus relief unless product
                                reinsured is also YRT
                                less financing provided due to small amount of premium
                                calculations done on a seriatim basis so transaction not
                                simplified
       Coinsurance: both reserves and assets are held with the reinsurer (2
                                methods)
            1)   Premium - Reserve plus gain required by ceding company reserve
                     premium does not take expense or gross premium into
                     account

            2)   Premium = Reserve (R_x)
                     experience refund will be provided by reinsurer if good experience

       Advantage: simple transaction especially if on a quota share basis
                      regulators unlikely to question the validity of the agreement

       Disadvantage: Asset transfer necessary to reinsurer
                     have to also transfer control to reinsurer
                     consequences for investment risk and capital gain when
                     treaty terminated
                     ceding company worried about reinsurer's insolvency risk
                     Reinsurer must be licensed in state for ceeding company to
                     get reserve credit

       Modco   Initial prem = reserve of policies reinsured
                      renewal premium = % of gross premiums
                      experience refund may occur
                      reinsurer will provide initial expense allowance
                      Both assets and reserves are held at the ceding company.
       Modco adjustment set up = Terminal R_x -Initial R_x + Investment
       if adj> 1   Reinsurer owes the ceding company

Solution 9 (continued)

if adj <1   ceding company owes the reinsurer

Advantages: Reinsurer can deduct entire reserve increase from corporate taxes
don't have to worry about reinsurer insolvency
no transfer of assets required
don't have to worry about reinsurer licensed in state
Reinsurer may not want to invest the assets
works with any kind of product (insurance)

Disadvantages: Complicated transaction due to Modco adj and death and
surrender adjustments
Reinsurer may prefer coinsurance so don't have to worry
about ceding company insolvency

(b)

i.   Because term is relatively simple product, I would recommend
coinsurance. Easy to set up → will get surplus relief that is desired
Modco would also work but would be a little too complicated for term.

ii.   For UL I would recommend Modco because it works with any product.
Assets and reserves are held and control doesn't have to be transferred to
reinsurer and you needn't worry about companies insolvency and you get
reinsurance credit for risk assumed.

(c)   tax benefits: If a company wants to offset its taxable losses with gains May want
to protect or use up loss carry forwards. Money (gains) provided by reinsurance
can be offset against losses.

Strategic uses: capital utilization
income management
assumption reinsurance when entering or leaving a unit
provide financial assurance in leveraged buyout.

Solution 10

(a)   Tangible Value (TV) = Bood Value (BV) + Premium over book

Book Value = Assets − Liabilities = 225-160 = 65 million

$$\text{P/E Ratio} = \frac{\text{Price}}{\text{Earnings}} = \frac{1}{K} \text{ with no debt} = 1/.1 = 10$$

$$\text{P/E Ratio} = \frac{\text{TV-D}}{\text{E-iD}} \quad \text{D=Debt=0, E=Earnings, i=cost of debt} = 10 = \frac{\text{TV}}{7.5}, \text{ TV=75mil}$$

(b)   New Debt = 25

Tangible Value post new developement and debt = 100

Hit to earnings = 2.25

Earnings = 7.5 + 7.5 − 2.25 = 12.75

P/E = 100/12.75 = 7.84

(c)   Using a higher tax rate will lower the franchise P/E

By inspection of the formula $\left[\dfrac{R-K}{\left[r/(1-t) - ih \right] \cdot k} \right]$

by increasing t (taxes) the denominator will get bigger thus lowering the franchise P/E

(d)   This statement is correct. Franchise investments allow for a high P/E ratio Adding debt can increase or decrease the base P/E slightly. However only high P/E's can be sustained through significant franchise investments.

M&M proposition states that the firm's value can only be changed by altering cash flows from taxes, transaction costs, or actual investment decisions. Financial Structure cannot manipulate a firm's value.

Solution 11

This question set up an operational risk situation at Zoolander along the lines of the Nick Leeson/Barings Bank saga, which led to the Group of Thirty recommendations on derivatives risk management.

(a)

Operational Risks

-John is both head derivatives trader and head of derivatives administration (front and back office): could be a conflict of interest; should be separate functions

-Will the derivatives and administration team have sufficient skills to deal with this new asset class? : increased complexity of instruments and systems create increased potential for Operational Risk; unfamiliarity w/ derivative instruments may lead to their misuse and raises the chances of mis-pricing and wrong hedging; errors in data feeds may distort the company's assessment of risk

-John's derivative pricing model: complexity, accuracy and suitability issues; relying on one model - could break down; relying on one person's expertise. Has strategy for backing GICs and ESA been properly modeled and tested?

-John's degree of autonomy: what degree of supervision and monitoring will be put in place? Will there be any controls and risk management put in place? Apparent lack of involvement of other areas (financial, legal, etc).

-Peter, John's supervisor, does not seem to understand sophisticated derivatives concepts: will he be able to monitor and manage John and the derivative desk activities properly?

-Making the derivatives desk a profit center: this may lead to excessive risk-taking, errors or fraud; conflict between hedging and risk management and risk-taking and profit focus

-This is a new area; authorities and limits need to be set before trading starts. Concern as to whether initiative is properly funded with correct size of staff, skill set

-Appears that CEO exercises minimal oversight. Needs to assure that effective policies and controls are in place.

-Buck, the new head of ERM, should have a role in developing policies and controls. He could provide independent oversight.

-Lack of auditing function within Zoolander, potential conflict with area placing limits on audit scope and objectives.

Solution 11 (continued)

(b) **Group of Thirty**

Operations and Controls
G-30 emphasized that successful implementation of systems operations and controls is important for management of derivative activities:

Recommend Zoolander first develop operations & controls process and systems before new desk becomes active
G-30 pointed out that one should account for derivatives transactions used to manage risks so as to achieve a consistency of income recognition treatment between those instruments and the risks being managed

Recommend that Zoolander take the time to model out strategy, understand risks, and develop a reporting and monitoring system for this initiative
Primary element of control lies in the allocation of responsibilities for derivatives activities, w/ segregation of authority where appropriate, should be reflected in job descriptions and org charts:
Recommend John only be Head Trader and Zoolander hires a skilled head of derivatives administration. Recommend Zoolander develop a org chart for front- and back-office derivative activities, integrated with Zoolander's org chart, w/ detailed job descriptions
G-30 identified need for risk management systems that measure the risks incurred relative to derivatives activities' nature, size and complexity.
Recommend Zoolander spend time & resources necessary to understand the complex, proposed derivative activity, and develop risk models to measure risk and outcomes under varying scenarios

People
G-30 stressed importance of hiring skilled professionals for derivatives activities, in sufficient number, w/ appropriate experience, skill level and degree of specialization:
Recommend: Zoolander hire more people with advanced derivatives skills on both the trading and administrative side, as well as in oversight, accounting, and audit
G-30 identifies the challenge of developing the right control culture for derivatives activity, demanding an integrated approach w/ people working in cross-functional teams, incl. trading, legal & accounting
Recommend Zoolander build a cross-functional team first to support its derivatives initiative, despite Peter's desire that the small team be unconstrained. This team would include Derivatives desk, derivatives back-office, legal, accounting, audit, risk management

Solution 11 (continued)

Systems

G-30 stressed importance of building adequate integrated systems for data capture, processing, settlement and management reporting.

Recommend Zoolander assess viability of existing systems and development needs to create an integrated system to encompass new model and all back-office operations.

Audit

The G-30 confirmed the important role that internal audit plays in the procedures & control framework by providing an independent, internal assessment of the effectiveness of this framework:

Recommend that Zoolander appoint an internal, impendent Audit team with appropriate skills to monitor & report on compliance w/ and the effectiveness of derivative procedure & control elements without constraints.

Solution 12

This question has the student address the requirements for internal control over financial reporting of the Sarbanes-Oxley Act and identify issues and shortcomings that may be present at Zoolander generally in their internal control processes and in complying with these requirements. Some of the many valid points for each section are presented below, with much fewer points required for full credit on each

(a)

- a statement of management's responsibility for establishing and maintaining adequate internal control over financial reporting for the company

- a statement identifying a suitable recognized framework used by management to evaluate the effectiveness of this internal control

- management's assessment of the effectiveness of this internal control as of the end of the company's most recent fiscal year

- a statement that its auditor has issued an attestation report on management's assessment

- address the adequacy of maintenance of records that accurately reflect asset transactions and dispositions.

- provide reasonable assurance that transactions are recorded as necessary to prepare statements and that transactions are approved with authorizations at appropriate management levels

- provide reasonable assurance regarding prevention or timely detection of unauthorized transactions or fraud.

(b)

- Does the company have clear objectives and have they been communicated to provide effective direction on risk assessment and control issues?

- Are significant internal and external risks identified and assessed on an ongoing basis?

Solution 12 (continued)

- Is there a clear understanding within the company what risks are acceptable?

- Does the board have strategies for dealing with risks identified?

- Does the company's culture, policies & reward systems support the business objectives, risk management & control systems?

- Are authority, responsibility & accountability defined clearly such that decisions are made and taken by appropriate people?

- Does the company communicate to its employees what is expected of them and the scope of their freedom to act?

- Do people in the company have the knowledge, skills & tools to support the achievement of the company's objectives and to effectively manage the risks?

- Do management and board receive timely, relevant & reliable reports on progress against business objectives and related risks needed for decision making?

- Are there established channels of communication for individuals to report suspected breaches of laws or regulations or other improprieties?

- Are there ongoing processes embedded within the company's overall business operations which monitor the effective application of the policies, processes, and activities?

- Is there appropriate communication to the Board of Directors on effectiveness of monitoring processes on risk and control matters?

- Are there specific arrangements for management monitoring and reporting to The Board of Directors on risk and control matters of particular importance?

Solution 12 (continued)

(c)

1. Does the company have clear objectives and have they been communicated to provide effective direction on risk assessment and control issues? **No. ROE objectives from President conflict with bonus structure and pricing goals which are based on other measures. Little emphasis placed on risk assessment and control.**

2. Does the company's culture and policies support the business objectives, risk management and control systems? **The attitude from the top down does not emphasize control. New risk manager hired, but no incentives in place to support risk management objectives. Everything is top line growth and profitability w/o respect to risk. How is the derivatives trader going to be effectively managed, controlled and compensated?**

3. Does Senior Management demonstrate the necessary commitment to competence, integrity and fostering a climate of trust within the company? - **CEO is not present, delegates important decisions, and provides no cultural direction with respect to risk management. The board itself is not independent as 3 of the 5 are currently vacationing together at the president's villa, and 2 of them are married.**

4. Are authority, responsibility, and accountability defined clearly such that decisions are made and taken by appropriate people? - **The derivative's trader hiring and role indicates that there is no understanding of authority limits and accountability. The Marketing VPs memo on ESA product seems to indicate that there is a way to circumvent the decisions of people with the appropriate knowledge. Pricing targets of 50% increase in production likely unrealistic; no accountability. On the other hand, handling of Reinsurance and Triple P project appears to be appropriate. Marketing does an end run around legal to approve ESA product.**

5. Does the company communicate to its employees what is expected of them and the scope of their freedom to act? - **To some degree as bonus plan and objectives are established but conflicting information from different sources (pricing discount rate is 9% but roe objective is 15%). Mission Value and Ethics statements have been developed, but surplus goal of 5 billion is unrealistic and not an appropriate target.**

Solution 12 (continued)

6. How are process/controls adjusted to reflect new or changing risks, or operational deficiencies? **No effort to show results of SHOC acquisition. Did not convert pre-2003 results to by line of business. Most recent projection period is 2002 - 2007. No A/E analysis. On the positive, Palomino is interested in cash disbursement controls.**

7. Do management and board receive timely, relevant and reliable reports on progress against business objectives and related risks needed for decision making? **No projections provided, PPP project breaking down, did not convert old accounting information to by line of business.**

8. Are periodic reporting procedures effective in communicating an account of the company's position and prospects? **Accounting and controls needed for transition to public company not in place. Accounting and planning woefully deficient. No effort to show results of SHOC acquisition. Mid year reporting breaking down.**

10. Are there specific arrangements for management monitoring and reporting to the board on risk and control matters of particular importance? - **Memos indicate that Board is not in control (i.e. Lyons deciding what to show them and deciding if Audit committee should meet, approval of auditors without full board discussion). The problems with a $1mm budget (Triple P) are of a magnitude that they might need to come before the board.**

Solution 13

(a)

(i) **Minimum Guarantee Calculation**
Premium = 1,000
Rate = 2%
Participation rate = 0.93
Number of Years = 5
Guaranteed Value= Premium * Participation Rate * (1 + Rate) ^ Years
$\qquad$ 1000 * 0.93 * (1.02) ^ 5 $\qquad$ = $ 1,026.80

PTP Calculation

Year	1	2	3	4	5
Returns	7%	1%	6%	10%	-18%

$= P (1 + \alpha (S_5/S_0 - 1))$
$= 1000 (1 + (0.65 \times (1.07 \times 1.01 \times 1.06 \times 1.1 \times 0.82 - 1)))$

Maximum of Guarantee Value, PTP value = Max ($1,021.63, $1,026.80)
$\qquad$ = 1,026.80

CAR Calculation

CAR Accumulation equals Previous balance times (1+.65*return) where return is floored at 2%

Year	1	2	3	4	5	
Actual Returns		7%	1%	6%	10%	-18%
CAR Returns	7%	2%	6%	10%	2%	

CAR = 1000 x (1 + .65(.07))(1 + .65(.02))(1 + .65(.06))(1 + .65(.1))(1 + .65(.02)) = $1,187.16

Maximum of Guarantee Value & CAR value = Max ($1,026.80, $1,187.16) $\qquad$ = $ 1,187.16

Solution 13 (continued)

SAR Calculation

SAR Accumulation equals sum of .65*return

Year	1	2	3	4	5
Actual Returns		7%	1%	6%	10%	-18%
SAR Returns	7%	1%	6%	10%	0%

SAR $= 1000 \times (1 + .65(.07 + .01 + .06 + .10 + 0)) = 1000 \times 1.156 =$ $1,156.00

Maximum of Guarantee Value & SAR: Max ($1,026.80, $1,156.00) = $1,156.00

HWM Calculation

HWM Formula = fund Balance $* (1 + (65\% * (\max\{ \text{HW Accumulation}\} -1) *)$

Year	1	2	3	4	5
Returns	7%	1%	6%	10%	-18%
HW Accumulation	1.07	1.08	1.15	1.26	1.03

$= 1000* (1+ (0.65 * (1.260096 -1)) = \$ 1,169.06$

Maximum of Guarantee Value & HWM: Max ($1,026.80, $1,169.06) = $ 1,169.06

(ii)   Formula= 93% x Premium x exp { (non-option cost - risk-free rate) x guarantee period }

Percent of Premium	0.93
Guarantee	0.02
Expense Margin	0.015
non-option cost = guarantee + exp =	0.035
Years	5
Risk Free Rate	0.05
Formula	0.93P*e^(.035-.05)(5)
Value	0.8628014P

Percent of Premium Available is 1-Value =   13.72%

Solution 13 (continued)

PTP - use Black-Scholes call option formula, also need dividend rate (d) and volatility (σ)

CAR - This is Life-of-Contract. Use Black-Scholes valuation I.e. expected value of discounted payoff under risk neutral

distribution using Monte Carlo method. Need additionally dividend rate (d) (continuously compounded) and volatility (σ)

OR could use trinomial lattice approach

SAR - non-analytic use Monte Carlo methods, need dividend rate (d) and volatility (σ) i.e. same as CAR

HWM - use Black-Scholes framework for look-back option formula, need dividend rate (d) and volatility (σ) -

Monte Carlo method/simulation

Calculate the cost of the option under each methodology

Prepare a table that compares the break even participation rate for a set of volatilities and interest rate spread

Break even participation rates below the proposed participation rate of 65% indicates that contract needs to be re-designed

(c)

1. HWM	Most Expensive	most exotic option
2. CAR		
3. SAR	to	
4. PTP	Cheapest	simple call option

Solution 14

(a)   Given: $n_A=1$, $S_A=10$, $V_A=10$, $n_B=2$, $S_B=5$, $V_B=10$
   $V=20$, $\rho_{AB}=0.20$

   Then: $w_A=V_A/V = 10/20 = 0.5$
           $w_B=V_B/V = 10/20 = 0.5$

   Thus the 1-day mean portfolio return is:
   $\mu_V = w_A\mu_A + w_B\mu_B = 0.5(0.1\%) + 0.5(0.05\%) = 0.075\%$

   The 1-day standard deviation of the portfolio is:
   $\sigma^2_V = w_A^2\sigma_A^2 + w_B^2\sigma_B^2 + 2\rho_{AB}w_Aw_B\sigma_A\sigma_B$
   $= (0.5)^2(2\%)^2 + (0.5)^2(1\%)^2 + 2(0.2)(0.5)(0.5)(2\%)(1\%)$
   $= .0001 + .000025 + .00002$
   $= .000145$

   $\sigma_V = 0.01204$ or 1.2%

   The 1-day portfolio VaR at 99% Confidence Level is:
   VaR = 2.33 σ_VV = 2.33 x 1.2% x \$20 million = \$559,200
   VaR(10day) = sq root(10 days) x 1-day VaR = \$1,768,345.67

(ii)   **Historic Simulation:**
        10 day return with 99% confidence of −8.9%
        or a portfolio loss of 8.9% x \$20 M or \$1,780,000

(iii)   **Monte Carlo Simulation:**
        10 day return with 99% confidence of −14.7%
        or a portfolio loss of 14.7% x \$20 M or \$2,940,000

(b)   Value at Risk is the maximum amount of loss which may occur over a specified
      time period with a 1% probability that the loss will be larger. VAR varies
      because each method uses different methodologies and assumptions. VAR may
      produce different values for the same portfolio depending on the time horizon
      selected and database selected. VAR is useful over short time horizons but may
      not be accurate over longer time horizons. The Monte Carlo method will produce
      results that vary the most from company to company as it is highly dependent on
      the random processes used in the simulation.

Solution 14 (continued)

(c)

PROS	Cons
Variance-Covariance	
computationally efficient	Assumes portfolio and risk factors are normally distributed
can be applied even if risk factors are not normal	does not cope well with fat-tail distributions
no pricing model required	requires estimation of volatilities of risk factors
easy to handle incremental VAR	cannot be used for sensitivity analysis
Historical Simulation	
	cannot be used to derive a confidence interval for VaR the danger in basing VaR estimates on
no assumption re:distribution of risk factors required	relatively short periods of direct historical observations is that history must repeat itself for the results to predict the future
volatilities and correlations are captured in data	dependence on idiosyncrasies of the historical data set
fat-tails/extreme events are captured if they are in data set	cannot accommodate changes in the market structure
allows calculation of confidence intervals for VaR	results will be less accurate when the market trend changes
Monte Carlo:	
can accommodate any distribution of risk factors	cannot be used for sensitivity analysis outliers are not incorporated int distribution
allows calculation of confidence intervals for VaR	Complex to Understand
can be used for sensitivity analysis and stress testing	computer intensive

Solution 15

(a)

F(t) = Fund value at time t; d = 0.9; u =1.1, X = $1092

Up node F(1) = u x F(0) = 1.1 x $1050 = $1,155

Down node F(1) = d x F(0) = 0.9 x $1050 = $945

f_u = value of option in up node = max{0, X - F(1)} = max(0,$1,092 - $1,155) = 0

f_d = value of option in down node = max{0, X - F(1)} = max(0,$1,092 - $945) = $147

a = stock position = $(f_u - f_d) / (u - d)$ = (0 - $147) / (1.1 - 0.9) = -$147/.2 = -$735

this means that the hedge position contains short fund position of $735

b = bond position earning risk free rate, continuously compounded

b = [exp(-r dt)] { $(f_d u - f_u d) / (u - d)$}

b = [exp(-0.05 x 1)] {($147 x 1.1 - 0 x 0.9) / (1.1 - 0.9)} = ($161.70)/0.2 =0.951229 x $808.50 = $769.07

this means that the hedge portfolio contains $769.07 in bonds earning the risk free rate

Value = a+b = $(-735) +$769.09 = $34.07

(b)

$p^* = (e^{(r-q)dt} - d)/(u - d)$, where q is annual management fee 0.01, dt=1
thus $p^* = (e^{.04} - 0.9)/(1.1 - 0.9) = (1.040811 - 0.9)/0.2 = 0.140811/.2 = 0.704054$

thus $(1 - p^*) = 0.295946$

thus $f = e^{-rdt}[p^* f_u + (1 - p^*)f_d]$
$= e^{-0.05} [0.704054($0) + 0.295946($147)] = 41.38

(c)

-even if discrete model converges to continuous one as intervals shorten, it is widely recognized that the lognormal model is an imperfect description of stock market prices
-In order for hedging to be completely effective the intervals between portfolio balancing would have to be infinitesimally small (continuous version of model)

Solution 15 (continued)

      -The model ignores transaction costs

      -It is generally not possible to short sell units in a segregated fund, as a result a hedging program would have to make use of instruments that are imperfectly correlated with the fund unit price (basis risk)

      -Interest rates are assumed to be constant over the term of the contract which is not the case in reality

      -(Discrete)Up/down model of stock prices is simple and unrealistic

      -Model does not reflect mortality and withdrawal assumptions

      -Model does not reflect recovery of Sales Expenses and Administration Expenses

      -ignores Inside and Outside model risk