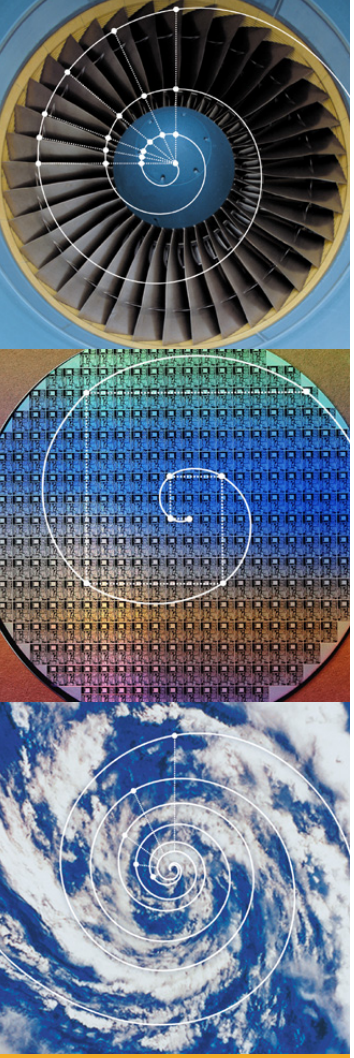
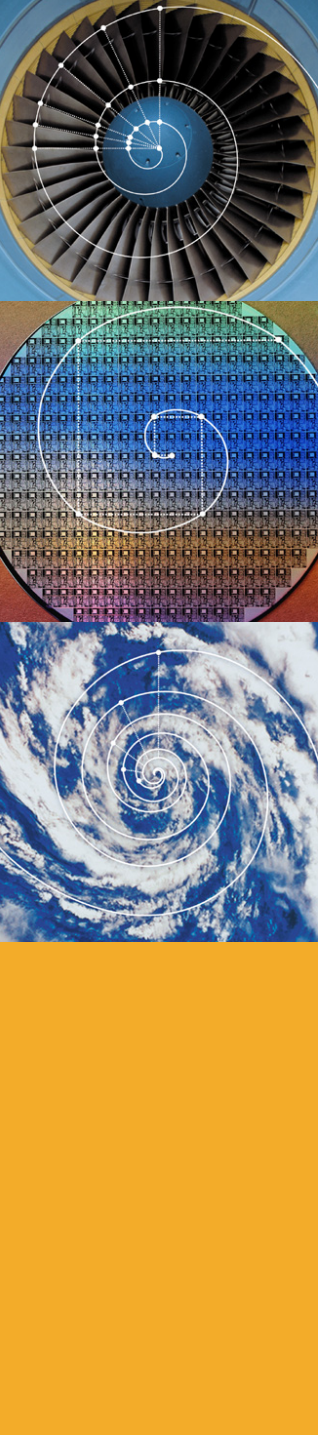


Endurance

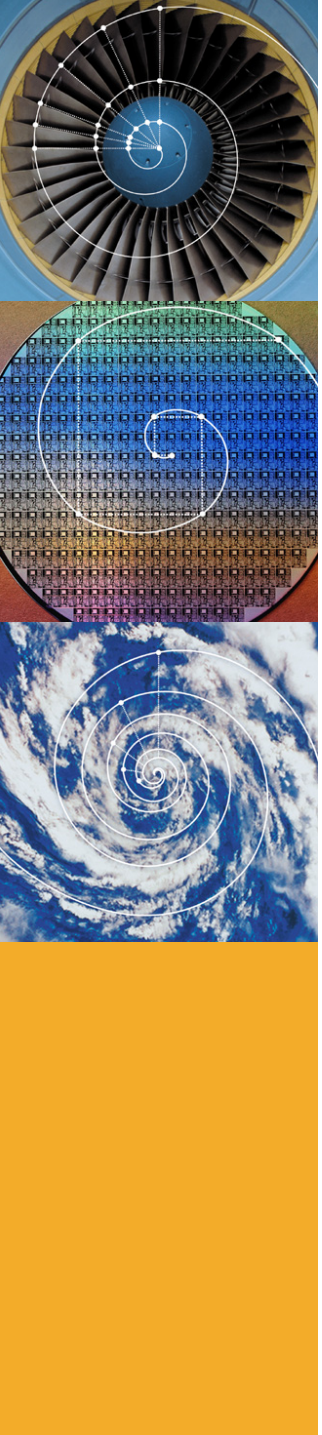
CAS Ratemaking Seminar
Call Paper
IRR, ROE, and PVI/PVE

Ira Robbin, PhD
AVP and Senior Pricing Actuary
Endurance US Insurance Operations



Ground Rules

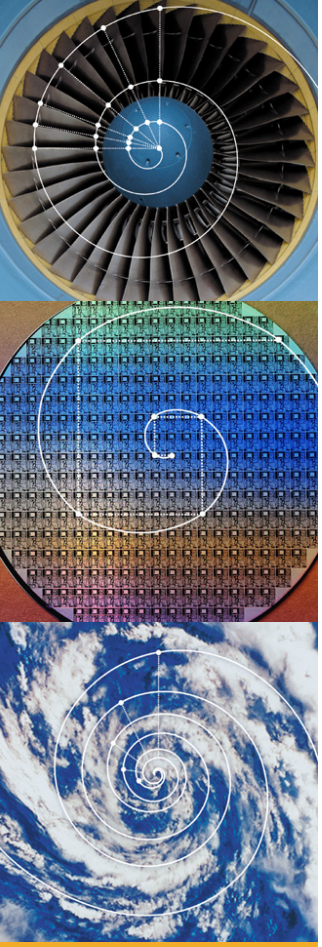
- All attendees should scrupulously follow anti-trust guidelines. There will be no discussion of what premium should be charged for any particular consumer. Violators will be flogged.
- Ask questions of understanding anytime. Wait till later to debate.
- There is at least one glaringly obvious and foolish error in this presentation – Catch me later in the bar to tell me what it is.



Disclaimers

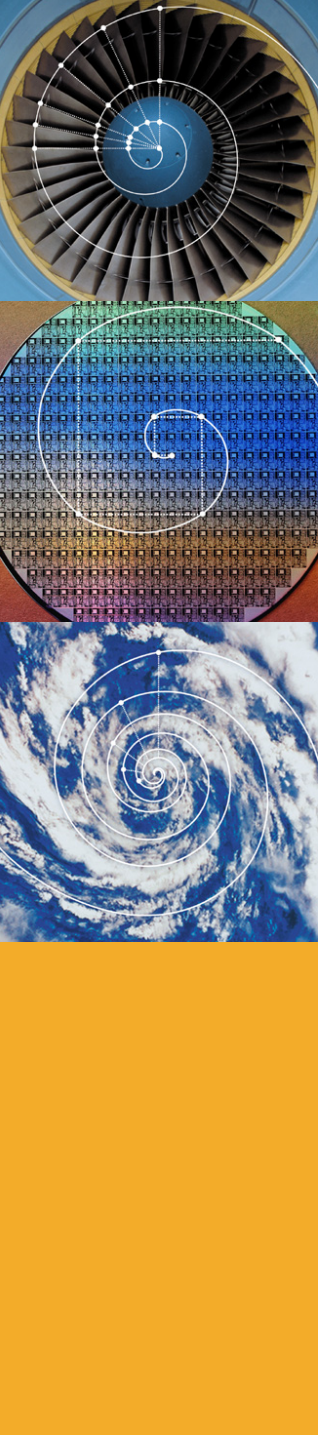
- No statements of the Endurance Insurance corporate position will be made or should be inferred.
- The methods to be discussed may or may not meet with regulatory approval.
- While some methods to be discussed are similar to methods in the Robbin Exam 9 Study Note, students should consult the Study Note for exact details.

Endurance



Cautions

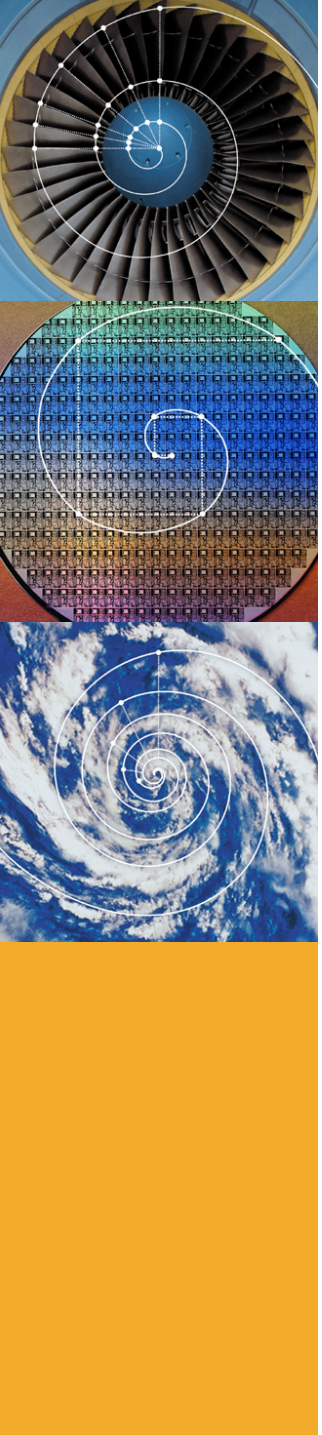
- Examples Are for Illustration Only!
  - Do not use the results from these examples in real-world applications.
- Assumptions Have Been Greatly Simplified.
  - Parameters Pulled from Thin Air.



Pricing to a Target Return

- Internal Corporate Perspective
  - Non-regulatory context
- Indicated Price To Hit the Target Return
  - RORAC: Return on Risk-Adjusted Capital
  - Common target for all policies
- Risk-sensitive Total Return Concept
  - Risk, Surplus, cash flow, taxes
- Popular Approach
  - Variants widely used

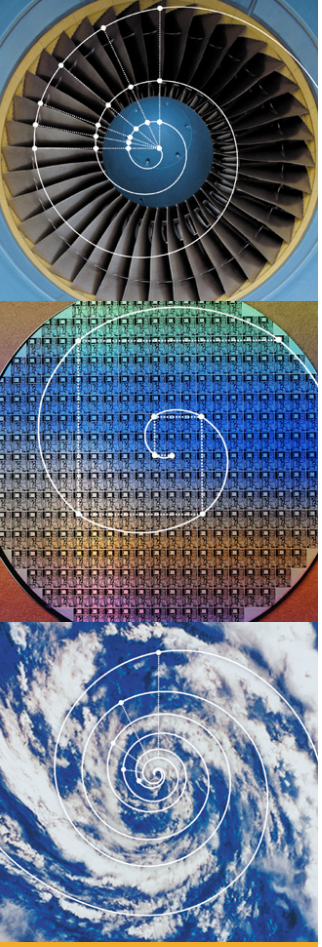
Endurance



Returns on Insurance

- Returns for Insurance Companies and Insurance Company Investors
  - GAAP ROE- Calendar Year
  - Return to Insurance Company Investors
    - Yield on Stock – Dividends and Market Value Appreciation
  - Cost of Capital
- Return on an Insurance Policy?
- No Universally Accepted Formula

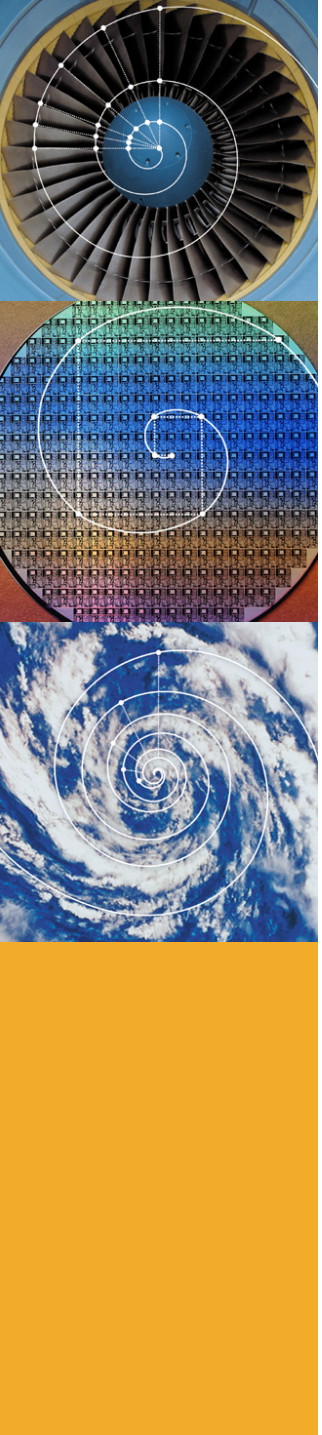
Endurance



Defining Return on a Policy

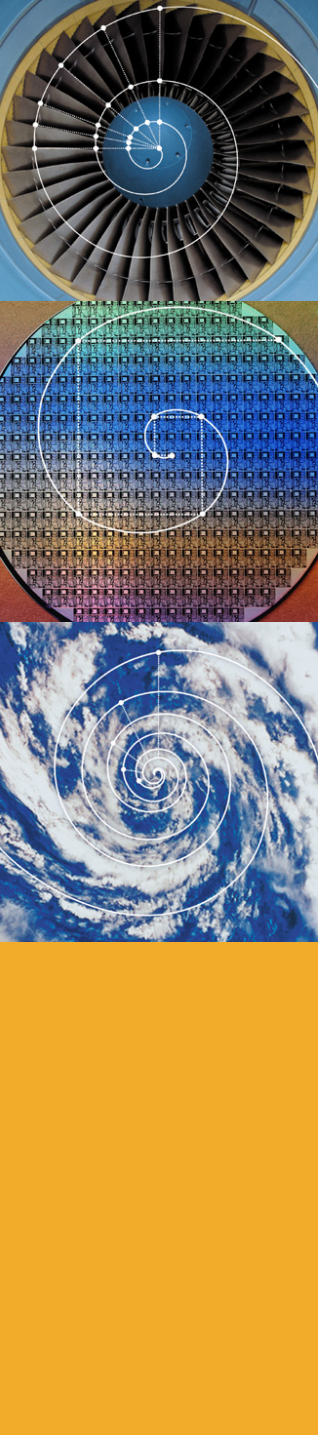
- Financial Impact Over Time on Future CYs
- Risk-Sensitive Surplus
  - Evolving requirement over time
- Accounting, Not Just Cash Flow
  - S/H dividends paid out of Income
  - Account for STAT conservatism
  - Allow analysis of reserve discounting
- Distribution of Outcomes
  - Average return over prospective scenarios

Endurance



Three Measures-Quick Description

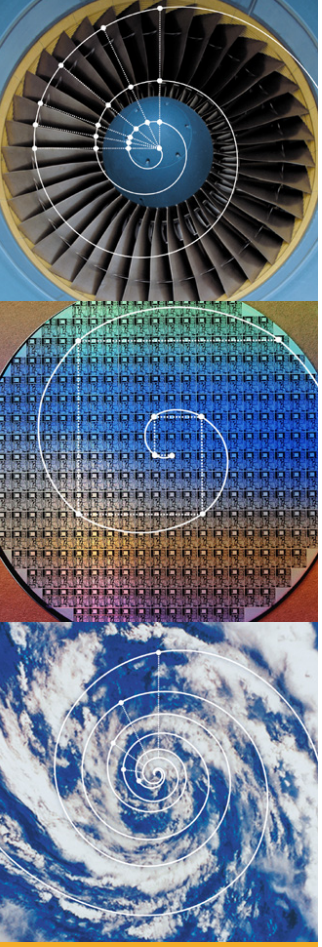
- IRR on Equity Flows
  - Model a “Single Policy Company”
  - EQ Flows = flows of money between Equity Investors and the Single Policy Company
- PVI/PVE
  - Generalize GAAP ROE
  - Take Present Values of Income and Equity
- Growth Model ROE
  - Grow a book of Single Policy business
  - After start-up phase, equilibrium is achieved
  - Growth Company ROE in equilibrium



Corporate Model – Time Indexing Conventions

B_t	Balance Sheet account at time t=0,1,2,… Use t=0 for initial balance. Balances constant during periods.
CF_t	Cash Flow at time t = 0,1,2,… Use t=0 for initial cash flow. No flows at intermediate times.
I_t	Income Statement item declared at time t = 0,1,2,… No income declared at intermediate times.

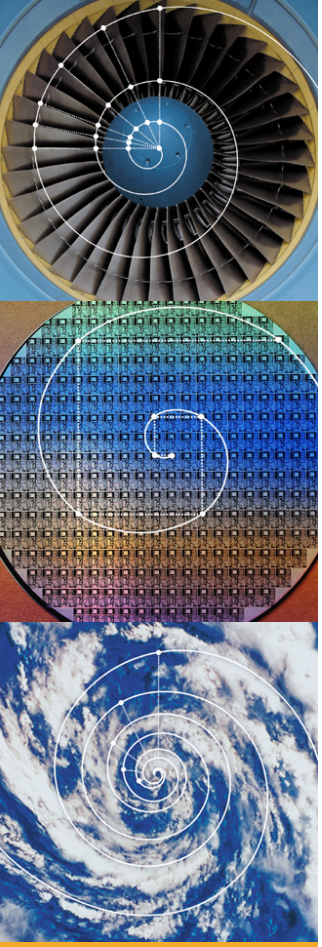
Endurance



Corporate Model – GAAP and STAT

- Start with STAT Rules and Req'd Surplus
- Make Adjustments to Arrive at GAAP
- GAAP Income is Declared Only at the End of Accounting Periods!
  - Post GAAP deferred balances
- Simplifying Assumption for Our Examples- Only GAAP Adjustment is for Deferred Acquisition

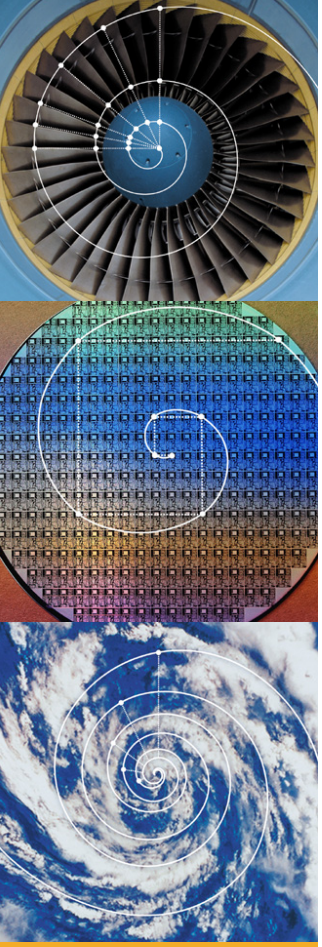
Endurance



Income

- Income = UW Inc + Inv Inc – Income Tax
- UW Income = EP –Inc'd Loss –Inc'd Exp
- Inv Income on Invested Assets
- Invested Assets
  - Assets - Recv's
- Assets = Reserves + Surplus
  - Balance sheet must balance
  - UW Cash flows impact Invested Assets
- Simplified Taxes in Examples

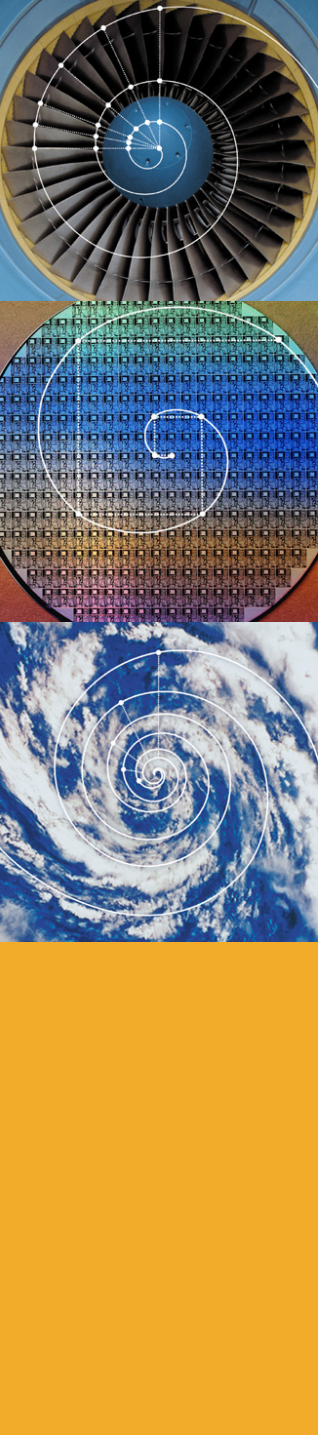
Endurance



Surplus and Leverage

- Required Surplus to Cover Risk
- Major Risk: Adverse Deviation in Amount or Timing of Loss Payments
  - Increasing Prem $ Should Not Increase Surplus
- Conclusion: A Fixed Premium-to-Surplus Ratio is Inappropriate for Total Return Risk-Sensitive Pricing Analysis

Endurance



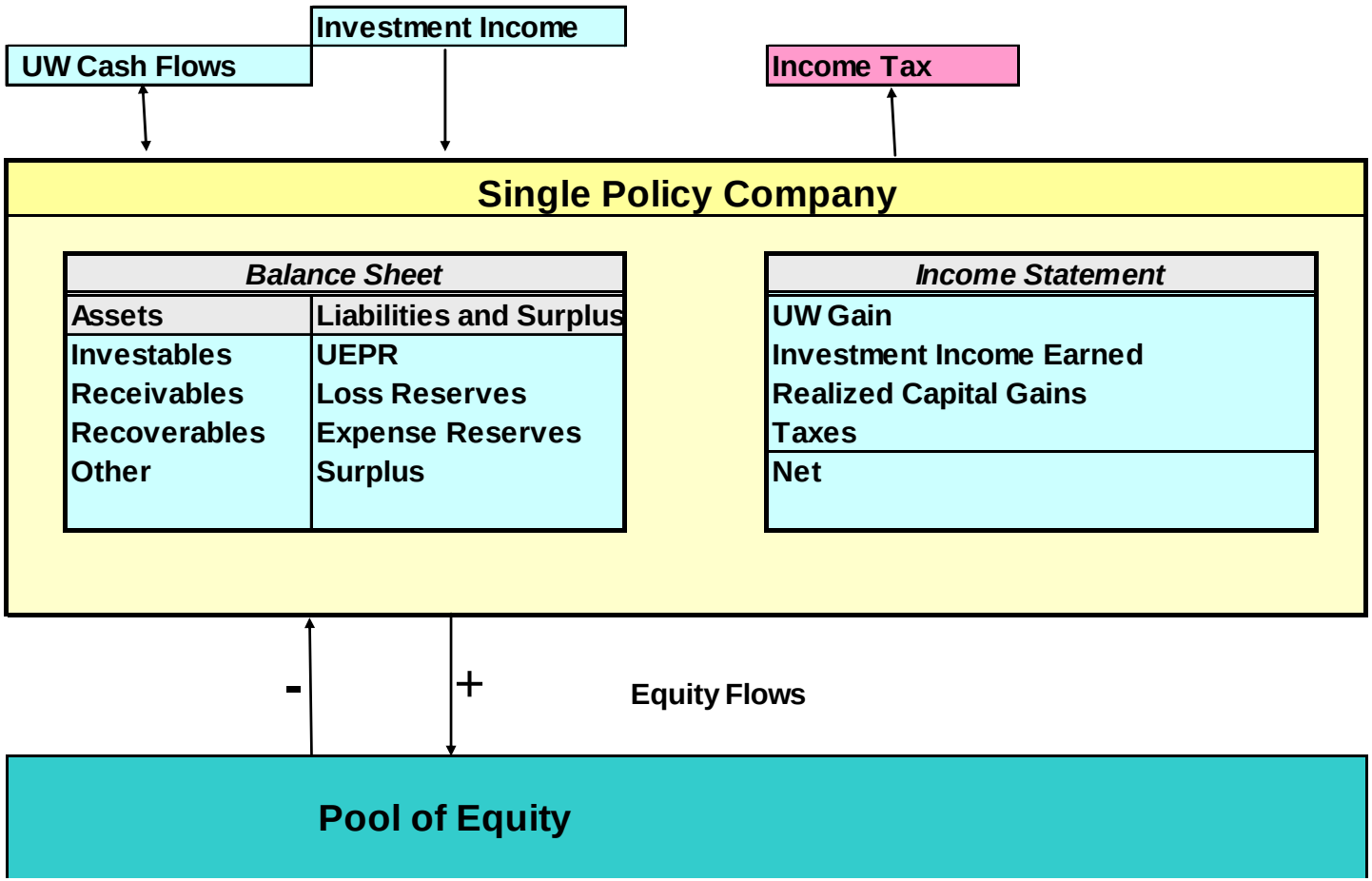
IRR on Equity Flows

- Equity Flow EQF: Flow of $ between Equity Investors and the Single Policy Co.
- Use Model to Derive Projected GAAP Income, I, and GAAP Equity, Q, each Accounting Period.
- EQF = Income - ΔEquity

$$EQF_0 = -Q_0 \qquad EQF_j = I_j - (Q_j - Q_{j-1})$$

Endurance

Equity Flow Diagram



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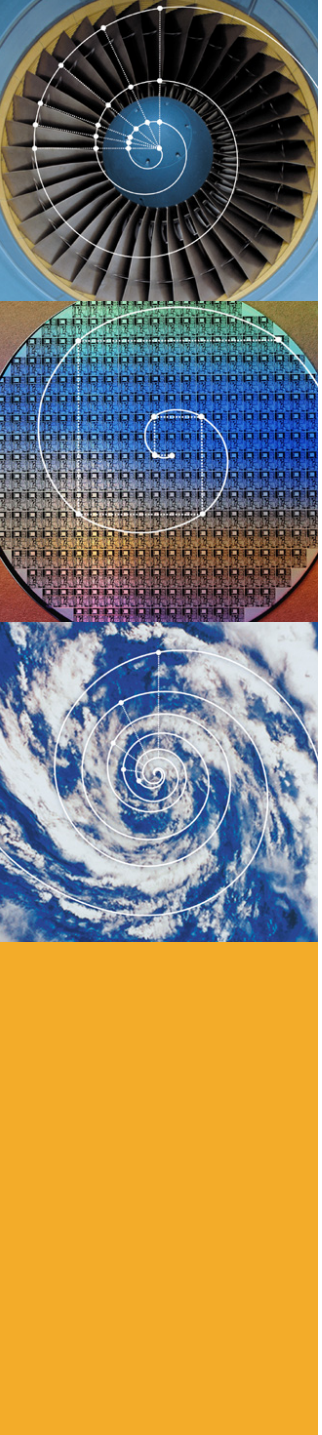


IRR

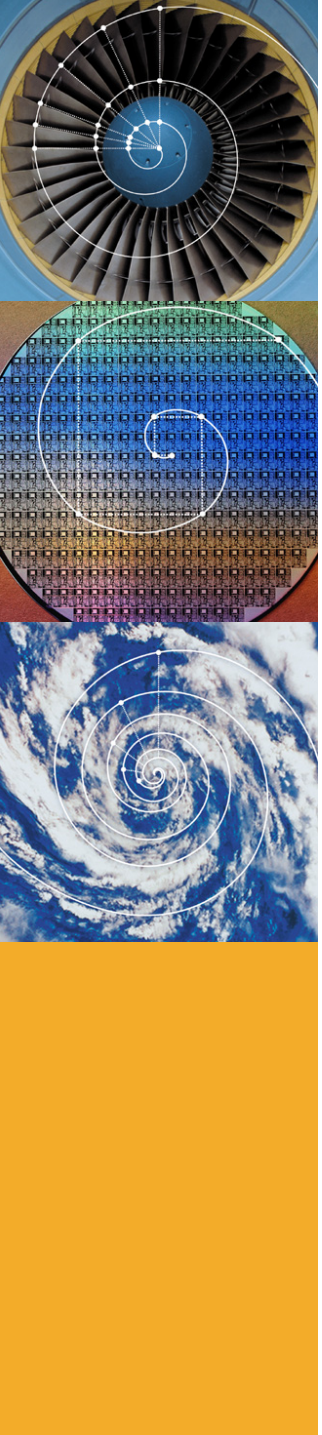
- Given flows x_t , IRR is the interest rate, y, (if it exists) which solves:

$$0 = \sum_{t=0} v^t \cdot x_t$$

$$v = (1 + y)^{-1}$$

- IRR is comparable to the rate of interest on a loan

Endurance



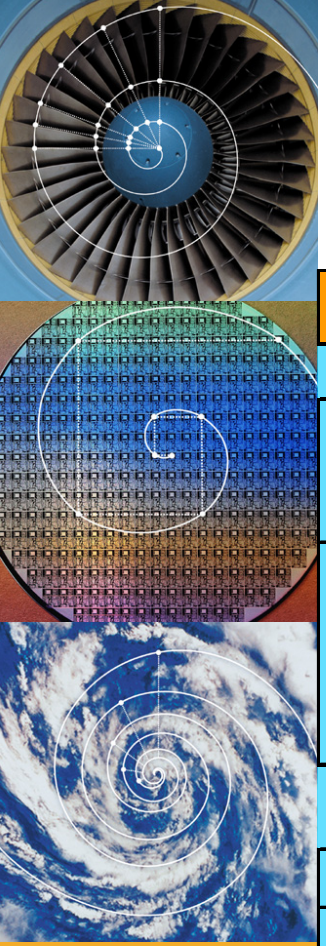
PVI/PVE

- Generalize ROE:

$$\text{PVI/PVE} = \frac{\text{PV}_1(\text{I}, \text{r}_\text{I})}{\text{PV}(\text{Q}, \text{r}_\text{Q})} = \frac{(1+r_I)\cdot\sum_{j=1}^{n} I_j \cdot (1+r_I)^{-j}}{\sum_{j=0}^{n-1} Q_j \cdot (1+r_Q)^{-j}}$$

- PV of Income at end of year 1

Endurance



Assumptions for Examples

Assumptions

Rates	
Investment Return	6.00%
Tax Rate	35.00%
PVI/PVE Discount Rate Selection	12.00%
Growth Rate Target	5.00%

Surplus Requirements	
Ratio to PV Unpaid Loss	31.5%
Rate for Discounting Unpaid Loss	6.00%

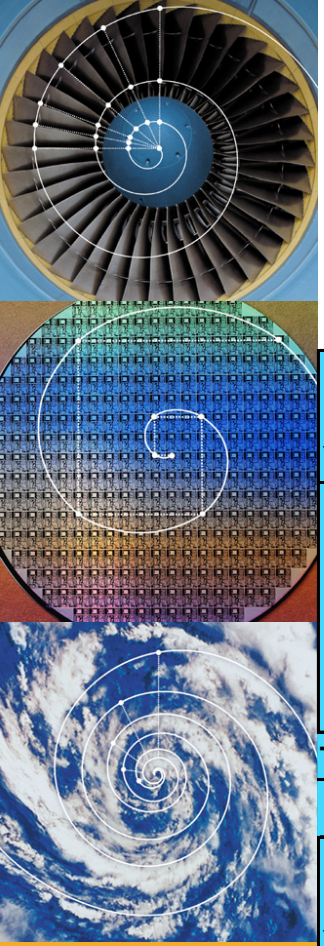
Earning and Incurral Patterns

Year	Earned Premium	Full Value Incurred Loss	Stat Incurred Expense
0	0.0%	0.0%	60.0%
1	100.0%	100.0%	40.0%
2	0.0%	0.0%	0.0%
3	0.0%	0.0%	0.0%
4	0.0%	0.0%	0.0%

Payment Patterns

Year	Premium	Loss	Expense
0	75.0%	0.0%	30.0%
1	20.0%	25.0%	45.0%
2	5.0%	50.0%	20.0%
3	0.0%	25.0%	5.0%
4	0.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

Endurance

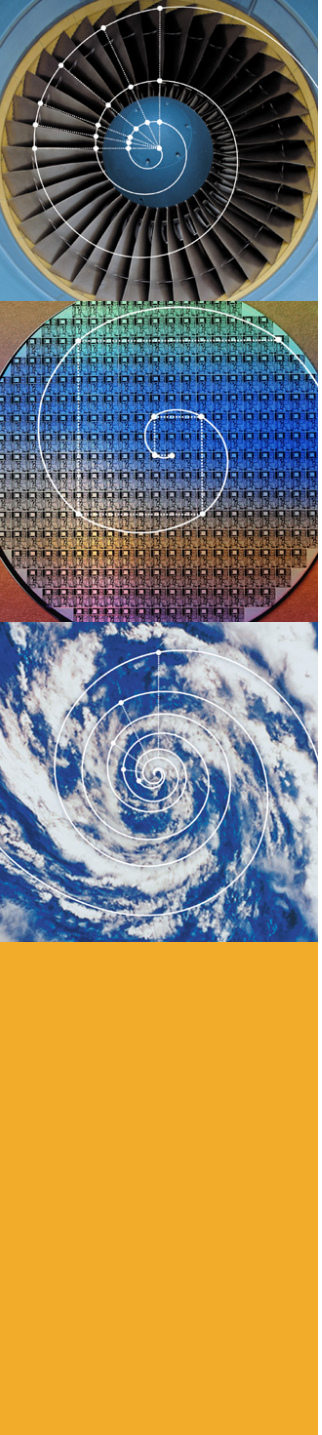


Single Policy Example –STAT Accounts

Year	Earned Prem	Incurred Loss	Stat Incurred Expense	Stat UW Income	Paid Prem	Paid Loss	Paid Expense	UW Cash Flow
0	0.0	0.0	18.0	-18.0	75.0	0.0	9.0	66.0
1	100.0	72.0	12.0	16.0	20.0	18.0	13.5	-11.5
2	0.0	0.0	0.0	0.0	5.0	36.0	6.0	-37.0
3	0.0	0.0	0.0	0.0	0.0	18.0	1.5	-19.5
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	100.0	72.0	30.0	-2.0	100.0	72.0	30.0	-2.0

Year	UEPR	Loss Reserve	PV Unpaid Loss	Stat Expense Reserve	Total Stat Reserve	Surplus	Assets	Recvs	Invested Assets	Inv Inc
0	100.0	0.0	64.1	9.0	109.0	20.2	129.2	25.0	104.2	
1	0.0	54.0	50.0	7.5	61.5	15.7	77.2	5.0	72.2	6.3
2	0.0	18.0	17.0	1.5	19.5	5.3	24.8	0.0	24.8	4.3
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Endurance

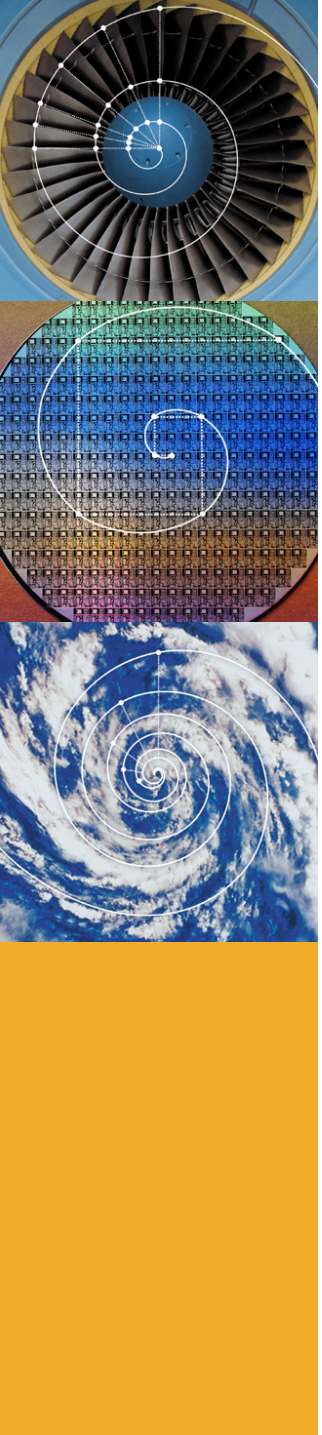


Single Policy Example –Equity Flows and IRR

UW Assumptions			Financial Assumptions		IRR Result	
	Amount	Ratio	Interest Rate	6.00%	IRR	10.74%
Premium	100.0	100.0%	Tax Rate	35.00%		
Loss	72.0	72.0%	Rsv Discount Rate	0.00%		
Expense	30.0	30.0%	S (% of PV Unpaid Loss)	31.50%		
Combined	102.0	102.0%	Discount Rate for S Calc	6.00%		

Year	Surplus	DAC	GAAP Equity	GAAP Incurred Expense	GAAP UW Income	GAAP Pre-tax Income	Inc Tax	Income	Change in Equity	Equity Flow
0	20.2	18.0	38.2	0.0	0.0	0.0	0.0	0.0	38.2	-38.2
1	15.7	0.0	15.7	30.0	-2.0	4.3	1.5	2.8	-22.5	25.2
2	5.3	0.0	5.3	0.0	0.0	4.3	1.5	2.8	-10.4	13.2
3	0.0	0.0	0.0	0.0	0.0	1.5	0.5	1.0	-5.3	6.3

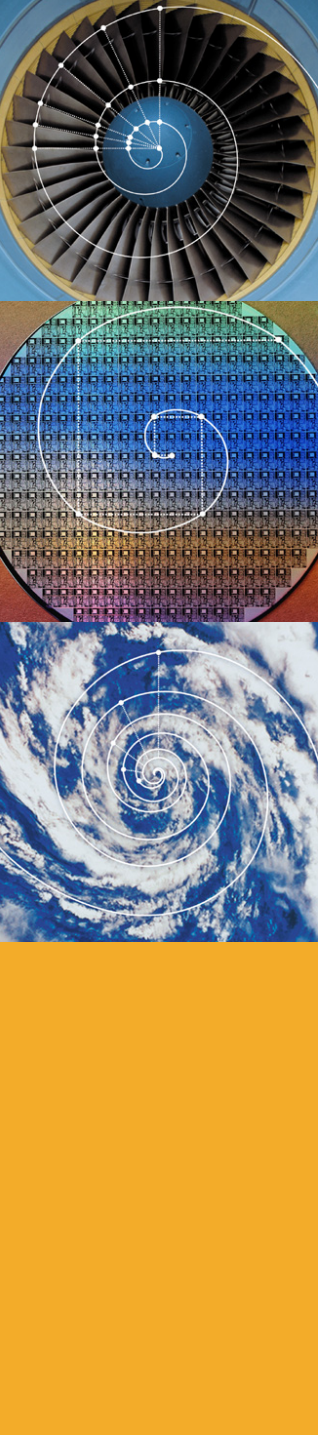
Endurance



Multiple IRR Roots?

- Multiple IRR Roots Possible in General
  - # of sign changes = # of possible roots.
- Typical EQ Flows in P/C insurance
  - First flow is negative
    - Fund initial Surplus and DAC
  - Later flows are positive
    - Return of capital and payout of profit
  - One sign change
- IRR Unique for P/C Insurance EQ flows

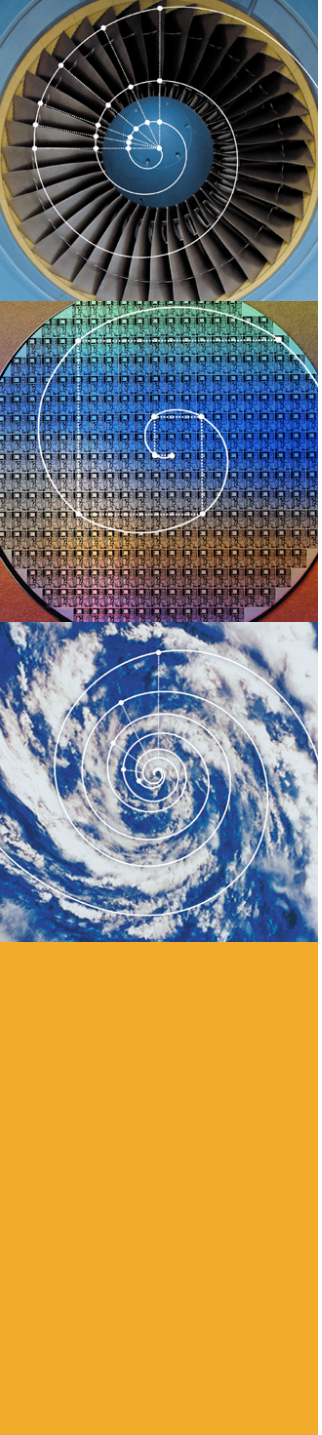
Endurance



IRR on Cash Flows

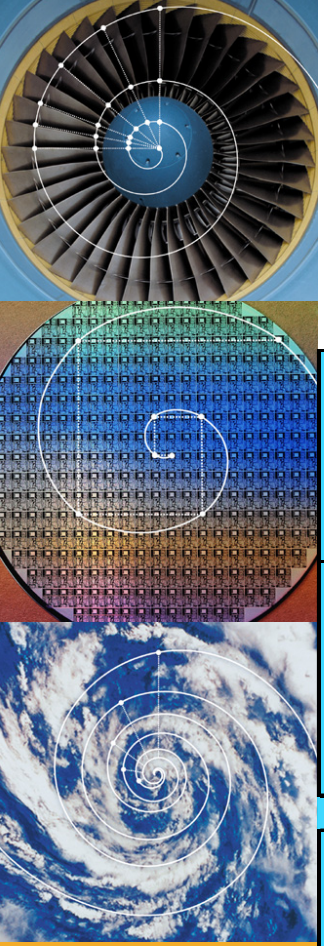
- IRR on UW Cash Flow May Have Multiple Roots
  - UW Cash Flows Can Have Multiple Sign Changes
    - Deferred premium payments
    - Salvage and Subrogation Recoveries
- UW Cash Flow vs Accounting Income
- Does Surplus Impact IRR on Cash Flows?
  - No direct leverage impact

Endurance



Corporate Model – BOP and EOP Indexing

$BBOP_t$	Balance Sheet account at beginning of period t=1,2,… Balances constant during periods.
$BEOP_t$	Balance Sheet account at end of period t=1,2,…
$IEOP_t$	Income Statement item declared at end of period t=1,2,… Assume no GAAP Income declared other than at the end of a period.

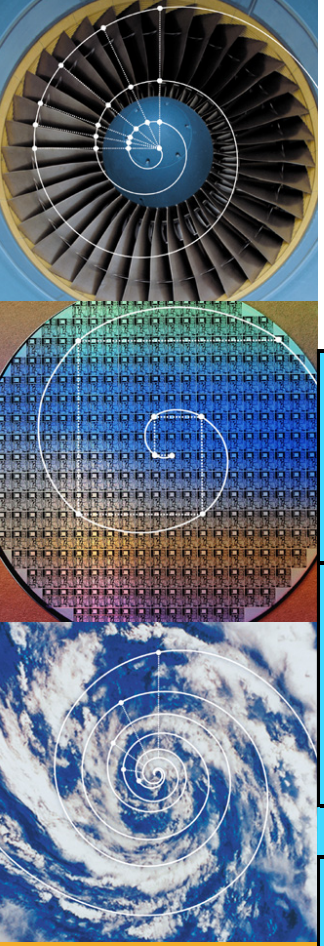


Single Policy Example BOY&EOY Accounting- UW Income and CF

Year	Earned Prem EOY	Incurred Loss EOY	STAT Incurred Expense BOY	STAT Incurred Expense EOY	GAAP Incurred Expense EOY	STAT UW Inc BOY	STAT UW Inc EOY	GAAP UW Inc EOY
1	100.0	72.0	18.0	12.0	30.0	-18.0	16.0	-2.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Year	Paid Prem BOY	Paid Prem EOY	Paid Expense BOY	Paid Expense EOY	Paid Loss EOY	UW Cash Flow BOY	UW Cash Flow EOY
1	75.0	20.0	9.0	13.5	18.0	66.0	-11.5
2	0.0	5.0	0.0	6.0	36.0	0.0	-37.0
3	0.0	0.0	0.0	1.5	18.0	0.0	-19.5
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Endurance

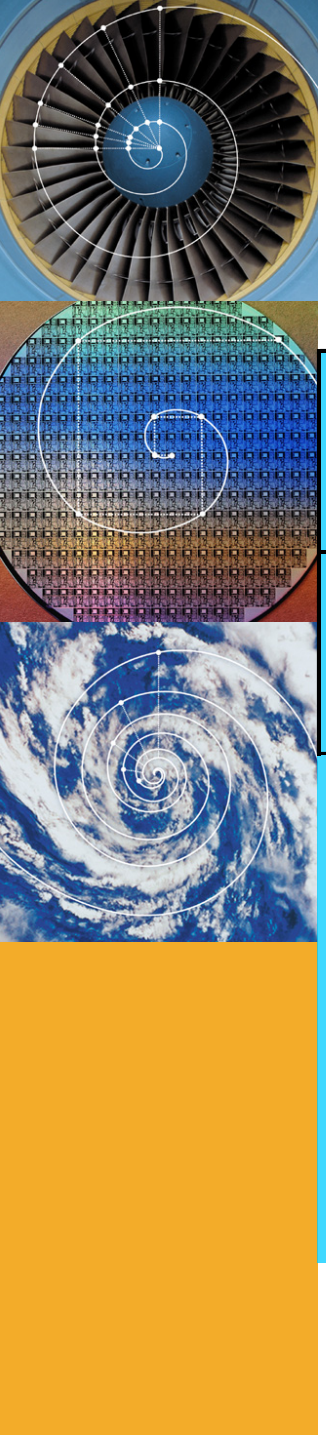


Single Policy Example BOY&EOY Accounting- Assets and Investment

Year	Unearned Premium BOY	Unearned Premium EOY	Loss Reserve BOY	Loss Reserve EOY	STAT Expense Reserve BOY	STAT Expense Reserve EOY	Total STAT Reserves BOY	Total STAT Reserves EOY
1	100.0	0.0	0.0	54.0	9.0	7.5	109.0	61.5
2	0.0	0.0	54.0	18.0	7.5	1.5	61.5	19.5
3	0.0	0.0	18.0	0.0	1.5	0.0	19.5	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Year	STAT Surplus BOY	STAT Surplus EOY	Assets BOY	Assets EOY	Recvs BOY	Recvs EOY	Invested Assets BOY	Invest Income EOY
1	20.2	15.7	129.2	77.2	25.0	5.0	104.2	6.3
2	15.7	5.3	77.2	24.8	5.0	0.0	72.2	4.3
3	5.3	0.0	24.8	0.0	0.0	0.0	24.8	1.5
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Endurance

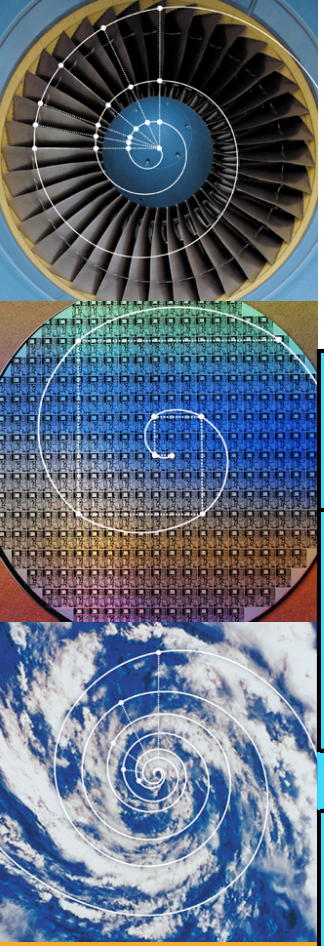


Single Policy Example BOY&EOY Accounting- GAAP and PVI/PVE

Year	DAC BOY	DAC EOY	GAAP Equity BOY	GAAP Equity EOY	GAAP Pre-tax Income EOY	Income Tax EOY	Equity for PVE Calc	GAAP Income EOY
1	18.0	0.0	38.2	15.7	4.3	1.5	38.2	2.8
2	0.0	0.0	15.7	5.3	4.3	1.5	15.7	2.8
3	0.0	0.0	5.3	0.0	1.5	0.5	5.3	1.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

PVI/PVE = 10.7%= 6.1 / 56.5	PV Equity	GAAP Income EOY
	38.2	2.8
	14.1	2.5
	4.3	0.8
	0.0	0.0
Total	56.5	6.1

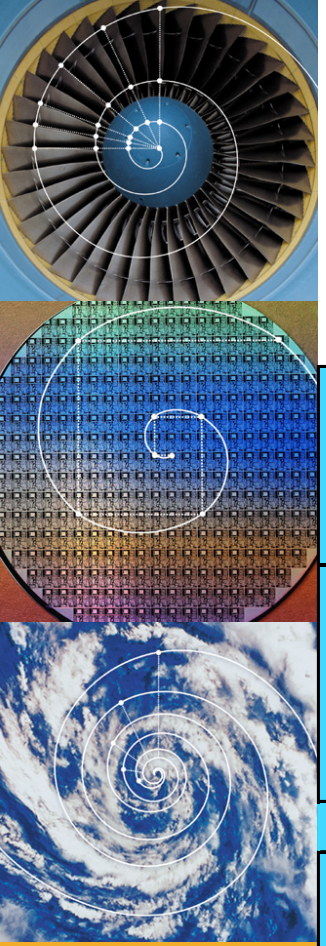
Endurance



Growth Model Company- UW Income and Cash Flow

Year	Earned Prem EOY	Inc'd Loss EOY	Inc'd Expense BOY	Inc'd Expense EOY	Inc'd Expense EOY	UW Income BOY	UW Income EOY	UW Income EOY
1	100.0	72.0	18.0	12.0	30.0	-18.0	16.0	-2.0
2	105.0	75.6	18.9	12.6	31.5	-18.9	16.8	-2.1
3	110.3	79.4	19.8	13.2	33.1	-19.8	17.6	-2.2
4	115.8	83.3	20.8	13.9	34.7	-20.8	18.5	-2.3

Year	Paid Prem BOY	Paid Prem EOY	Paid Expense BOY	Paid Expense EOY	Paid Loss EOY	UW Cash Flow BOY	UW Cash Flow EOY
1	75.0	20.0	9.0	13.5	18.0	66.0	-11.5
2	78.8	26.0	9.5	20.2	54.9	69.3	-49.1
3	82.7	27.3	9.9	22.7	75.6	72.8	-71.0
4	86.8	28.7	10.4	23.8	79.4	76.4	-74.6

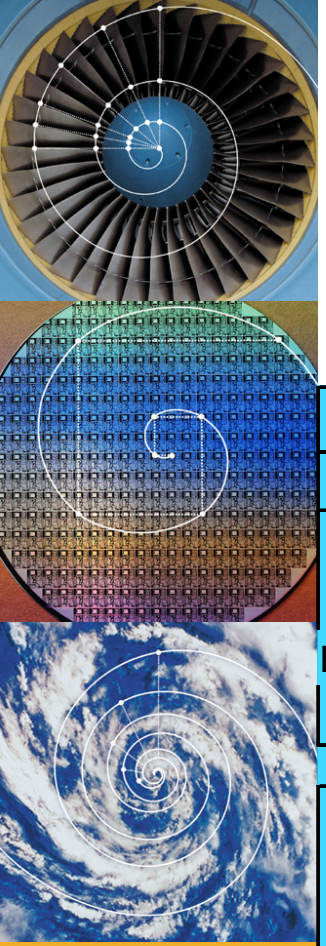


Growth Model Company
- Surplus, Inv Income and P/S Ratio

Year	UEPR BOY	UEPR EOY	Loss RSV BOY	Loss RSV EOY	STAT Expense RSV BOY	STAT Expense RSV EOY	Total STAT RSVs BOY	Total STAT RSVs EOY
1	100.0	0.0	0.0	54.0	9.0	7.5	109.0	61.5
2	105.0	0.0	54.0	74.7	17.0	9.4	176.0	84.1
3	110.3	0.0	74.7	78.4	19.3	9.8	204.2	88.3
4	115.8	0.0	78.4	82.4	20.3	10.3	214.5	92.7

Year	Surplus BOY	Surplus EOY	Assets BOY	Assets EOY	Recvs BOY	Recvs EOY	Invested Assets BOY	Inv Income EOY	P/S
1	20.2	15.7	129.2	77.2	25.0	5.0	104.2	6.3	4.95
2	37.0	21.9	212.9	106.0	31.3	5.3	181.7	10.9	2.84
3	44.2	23.0	248.4	111.3	32.8	5.5	215.6	12.9	2.50
4	46.4	24.1	260.8	116.8	34.5	5.8	226.4	13.6	2.50

Endurance

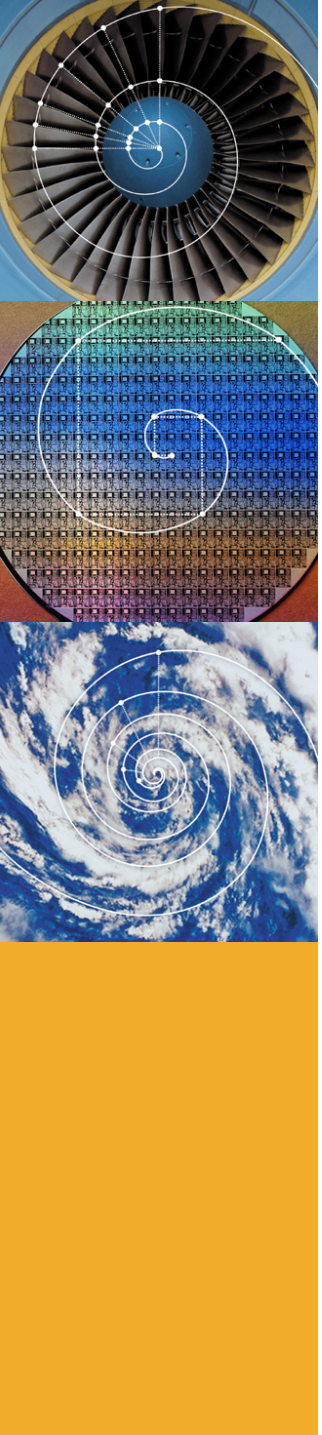


Growth Model Company - Equity and ROE

UW Assumptions			Financial Assumptions		IRR and ROE Results	
	Amount	Ratio	Interest Rate	6.00%	IRR	10.74%
Prem	100.0	100.0%	Tax Rate	35.00%	Growth ROE	10.90%
Loss	72.0	72.0%	Rsv Discount Rate	0.00%	Growth P/S	2.50
Expense	30.0	30.0%	S(% of PV Unpaid Loss)	31.50%	Growth Rate	5.00%
Comb	102.0	102.0%	Discount Rate for S Calc	6.00%		

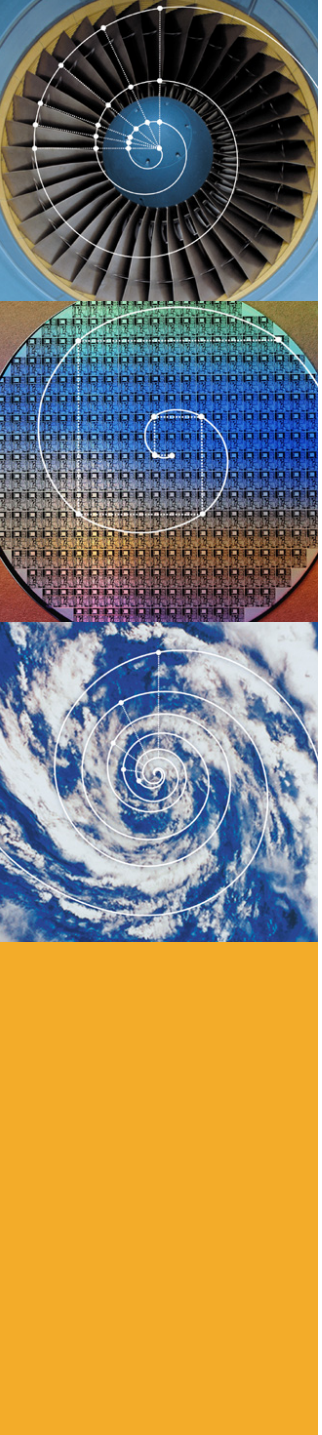
Year	DAC BOY	DAC EOY	GAAP Equity BOY	GAAP Equity EOY	GAAP Pre-tax Inc EOY	Inc Tax EOY	GAAP Inc EOY	GAAP ROE
1	18.0	0.0	38.2	15.7	4.3	1.5	2.8	7.23%
2	18.9	0.0	55.9	21.9	8.8	3.1	5.7	10.24%
3	19.8	0.0	64.0	23.0	10.7	3.8	7.0	10.90%
4	20.8	0.0	67.2	24.1	11.3	3.9	7.3	10.90%

Endurance



Equivalence Results for IRR, PVI/PVE, and ROE

- If $r_I = r_Q = IRR$, then PVI/PVE = IRR
  - Interpret IRR as PVI/PVE but with varying discount rates for income and equity
- If g=IRR, then ROE = IRR
  - When g= IRR, Growth Company in equilibrium is at the Maximal Self-Sustaining growth rate – all profits are used to fund growth
  - At lower growth rates, ROE will tend to be larger than the IRR



IRR and PVI/PVE Equivalence Result Proof -Start

Let y = IRR and w= (1+y) $^{-1}$. From the IRR equation, we have:

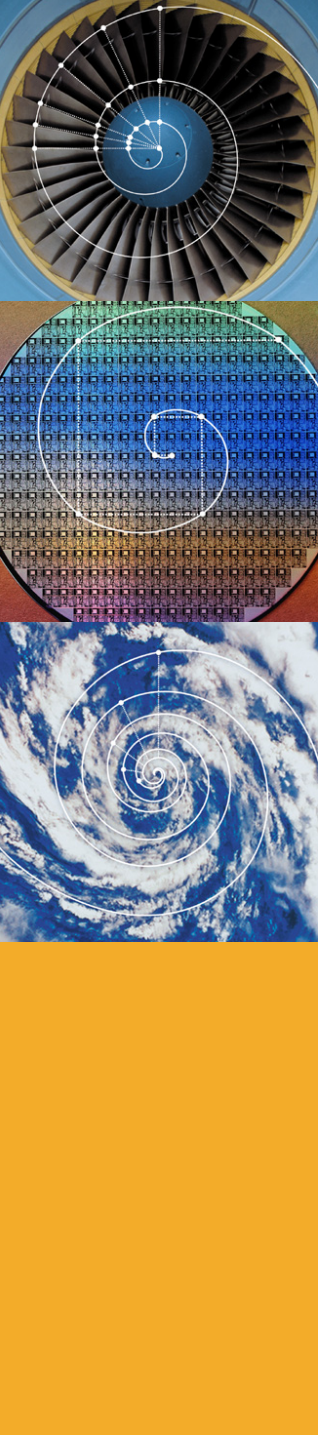
$$0 = \sum_{j=0}^{n} EQF_j \cdot w^{-j} = -Q_0 + \sum_{j=1}^{n-1} (I_j - (Q_j - Q_{j-1})) \cdot w^{-j}$$

It follows that:

$$\sum_{j=1}^{n} I_j \cdot w^{-j} = Q_0 + (Q_1 - Q_0)w + (Q_2 - Q_1)w^2 + \ldots + (Q_{n-1} - Q_{n-2})w^{n-1} - Q_{n-1}w^n$$

$$= (1-w) \cdot \sum_{j=0}^{n-1} Q_j \cdot w^{-j}$$

Endurance



IRR and PVI/PVE Equivalence Result Proof-Finish

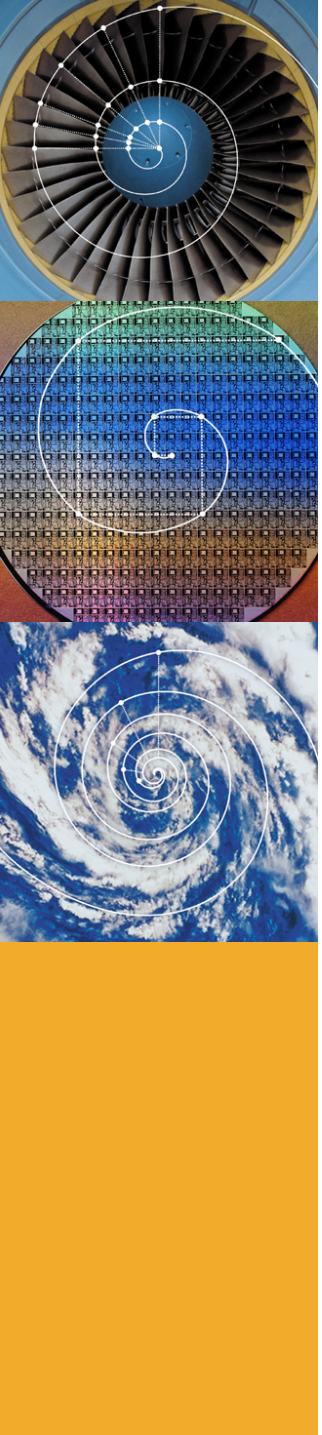
This implies:

$$1-w=\frac{\sum_{j=1}^{n} I_j \cdot w^{-j}}{\sum_{j=1}^{n} Q_j \cdot w^{-j}}$$

Multiply by (1+y) to get:

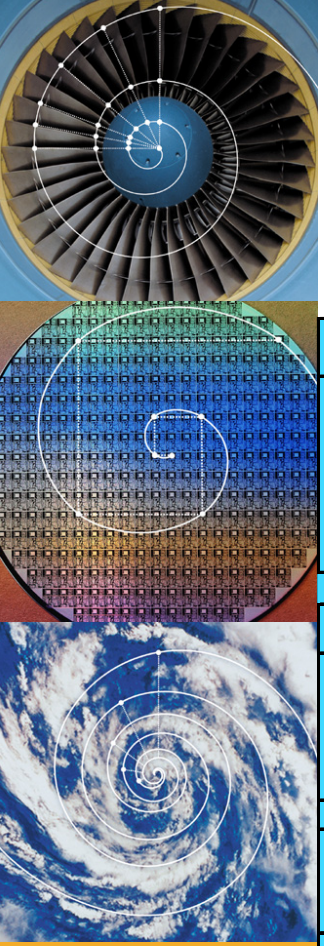
$$y=\frac{(1+y)\sum_{j=1}^{n} I_j \cdot w^{-j}}{\sum_{j=1}^{n} Q_j \cdot w^{-j}}$$

Endurance



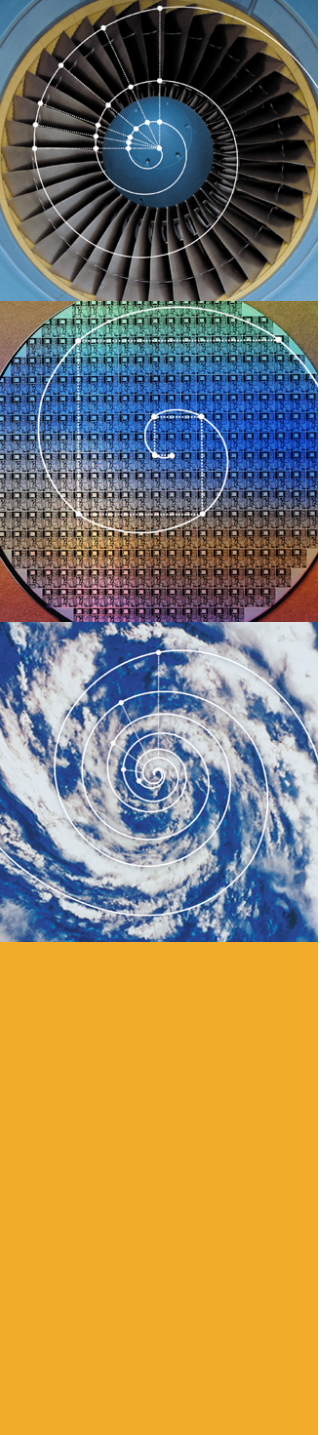
Modeling Multiple Scenarios

- Set-up: Loss Outcomes with Given Probs
- Set Surplus as a % of E[PV of Unpaid Loss]
  - Expectation over all scenarios
  - Loading % could vary over time
  - Leads to same Surplus for all scenarios
- Recognize Ult Loss at End of First Year
  - Complex recognition rules could lead to multiple sign changes in Equity Flows
- Prohibit Default Scenarios
- Compute Average Return
  - Results are conservative – avg return understated
  - Under simplifying assumptions E[IRR] = ROE(E[L])



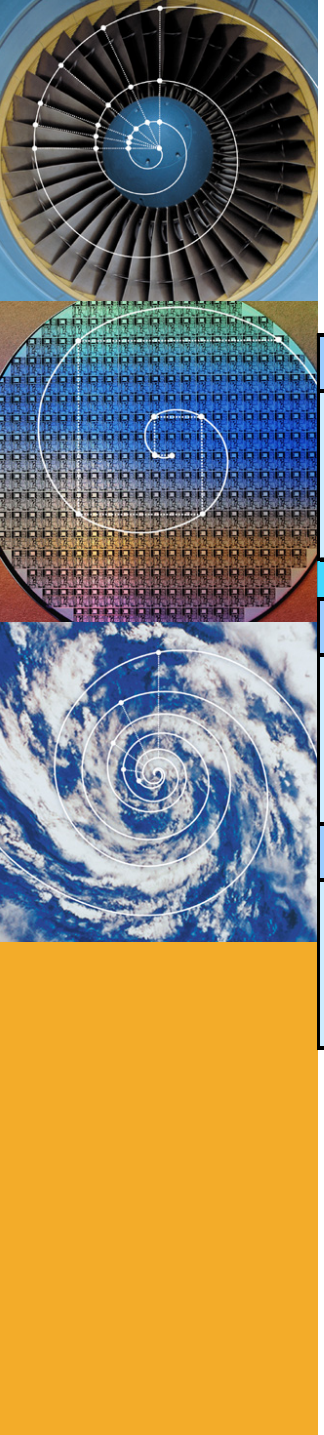
Three Point Example

Scenario	1			2			3			Average		
Prob	40.0%			40.0%			20.0%					
Prem	100.0			100.0			100.0			100.0		
Loss	60.0			72.0			96.0			72.0		
Comb	90.0%			102.0%			126.0%			102.0%		
Returns												
IRR	24.1%			10.7%			-11.6%			10.7%		
PVI/PVE	23.8%			10.7%			-15.5%			10.7%		
Year	Equity	Inc	EQ Flow	Equity	Inc	EQ Flow	Equity	Inc	EQ Flow	Equity	Inc	EQ Flow
0	38.2	0.0	-38.2	38.2	0.0	-38.2	38.2	0.0	-38.2	38.2	0.0	-38.2
1	15.7	10.6	33.0	15.7	2.8	25.2	15.7	-12.8	9.6	15.7	2.8	25.2
2	5.3	2.5	12.9	5.3	2.8	13.2	5.3	3.5	13.9	5.3	2.8	13.2
3	0.0	0.9	6.2	0.0	1.0	6.3	0.0	1.2	6.6	0.0	1.0	6.3



Sensitivity Analysis

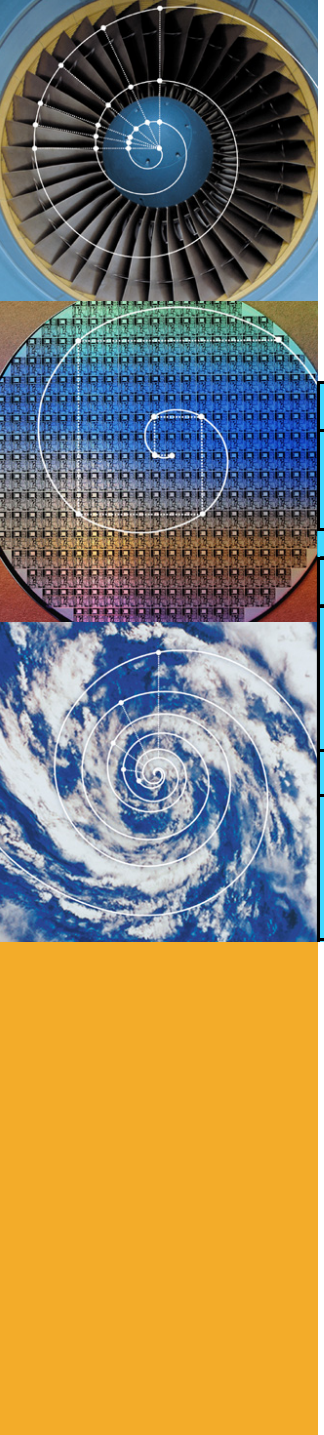
- Sensitivity of Returns
  - Premium
  - Surplus
  - Interest Rate
  - Payout Pattern
- Sensitivity of Indicated Premiums
  - Surplus
  - Interest Rate
  - Payout Pattern



Return Sensitivity to Premium

Scenario	1	2	3	4	5	6	7
Premium	80.00	85.00	90.00	95.00	100.00	105.00	110.00
Combined Ratio	122.5%	116.5%	111.1%	106.3%	102.0%	98.1%	94.5%
Growth Model P/S	2.00	2.12	2.25	2.37	2.50	2.62	2.75
Returns							
IRR	-7.00%	-2.74%	1.65%	6.15%	10.74%	15.40%	20.10%
PVI/PVE	-9.21%	-4.07%	0.96%	5.89%	10.71%	15.43%	20.05%
ROE	-8.47%	-3.47%	1.42%	6.21%	10.90%	15.49%	19.99%
Change in Returns							
IRR		4.27%	4.39%	4.50%	4.59%	4.66%	4.70%
PVI/PVE		5.14%	5.03%	4.92%	4.82%	4.72%	4.62%
ROE		5.00%	4.89%	4.79%	4.69%	4.59%	4.50%

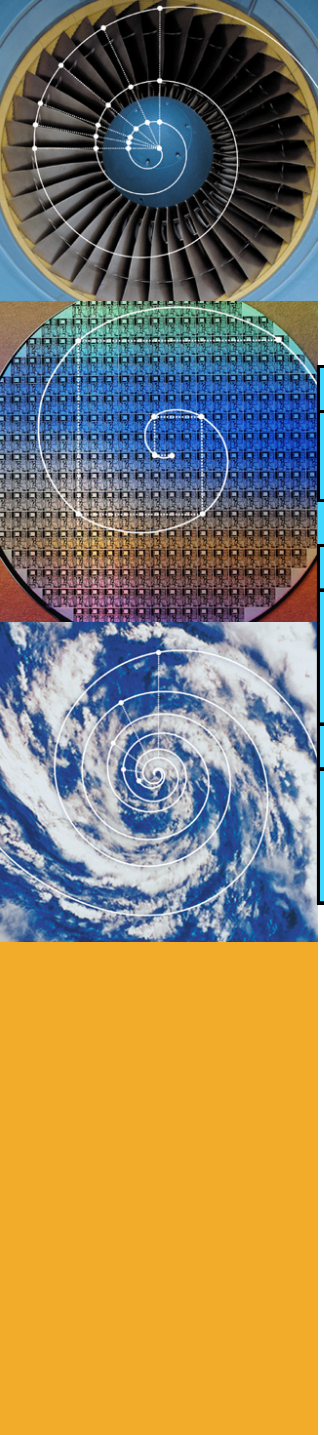
Endurance



Return Sensitivity to Surplus

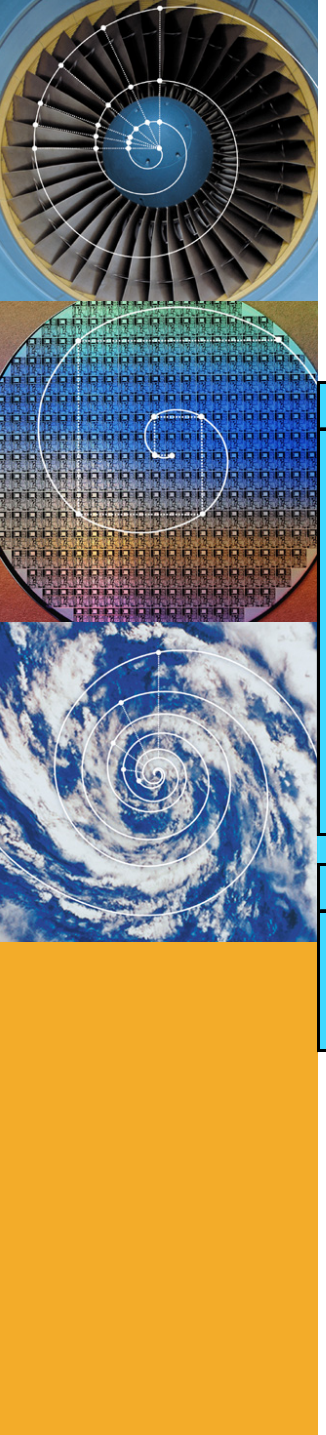
Scenario	1	2	3	4	5	6	7
Surplus Loading %	25.50%	27.50%	29.50%	31.50%	33.50%	35.50%	37.50%
Growth Model P/S	3.08	2.86	2.67	2.50	2.35	2.22	2.10
Returns							
IRR	11.73%	11.37%	11.04%	10.74%	10.46%	10.21%	9.97%
PVI/PVE	11.72%	11.35%	11.02%	10.71%	10.42%	10.16%	9.92%
ROE	11.96%	11.57%	11.22%	10.90%	10.60%	10.33%	10.09%
Changes in Returns							
IRR		-0.36%	-0.33%	-0.30%	-0.28%	-0.26%	-0.24%
PVI/PVE		-0.37%	-0.34%	-0.31%	-0.28%	-0.26%	-0.24%
ROE		-0.39%	-0.35%	-0.32%	-0.29%	-0.27%	-0.25%

Endurance



Return Sensitivity to Interest Rate

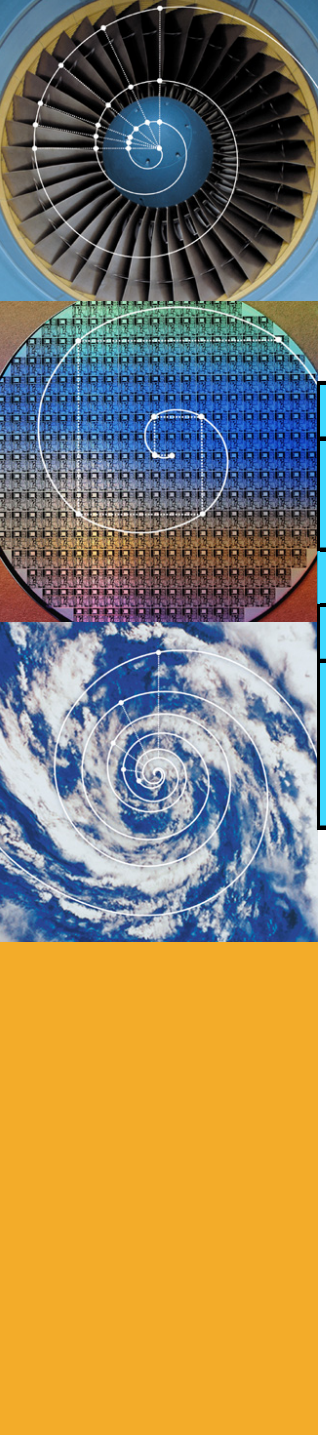
Scenario	1	2	3	4	5	6	7
Interest Rate	4.50%	5.00%	5.50%	6.00%	6.50%	7.00%	7.50%
Growth Model P/S	2.44	2.46	2.48	2.50	2.52	2.53	2.55
Returns							
IRR	7.48%	8.56%	9.65%	10.74%	11.84%	12.93%	14.04%
PVI/PVE	7.38%	8.48%	9.59%	10.71%	11.83%	12.96%	14.10%
ROE	7.54%	8.65%	9.77%	10.90%	12.03%	13.18%	14.33%
Change in Returns							
IRR		1.08%	1.09%	1.09%	1.09%	1.10%	1.10%
PVI/PVE		1.10%	1.11%	1.12%	1.12%	1.13%	1.14%
ROE		1.11%	1.12%	1.13%	1.14%	1.14%	1.15%



Return Sensitivity to Payout Pattern

Scenario		1=Base	2	3	4	5	6	7
Loss Pattern	Year							
	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	1	25.00%	100.00%	50.00%	0.00%	0.00%	0.00%	0.00%
	2	50.00%	0.00%	50.00%	100.00%	50.00%	0.00%	0.00%
	3	25.00%	0.00%	0.00%	0.00%	50.00%	100.00%	50.00%
	4	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	50.00%
Surplus Loading %		31.50%	58.96%	40.72%	31.10%	25.68%	21.87%	19.32%
Growth Model P/S		2.50	2.50	2.50	2.50	2.50	2.50	2.50
Returns								
IRR		10.74%	6.34%	8.60%	10.82%	12.85%	14.83%	16.61%
PVI/PVE		10.71%	6.33%	8.55%	10.79%	12.88%	14.97%	16.92%
ROE		10.90%	6.35%	8.65%	10.95%	13.15%	15.34%	17.43%

Endurance

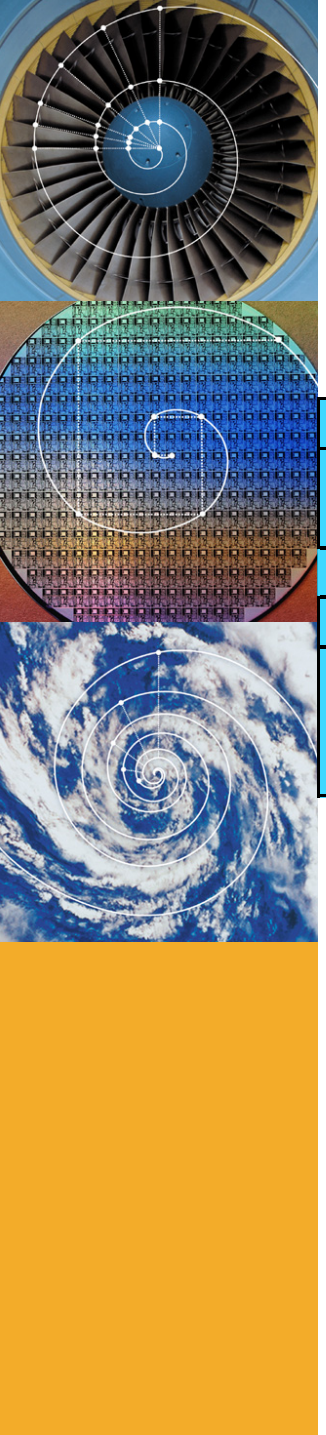


Indicated Profit
Sensitivity to Surplus

Scenario	1	2	3	4	5	6	7
Surplus Loading %	25.50%	27.50%	29.50%	31.50%	33.50%	35.50%	37.50%
Growth Model P/S	3.09	2.87	2.69	2.53	2.38	2.26	2.15
Indicated Profit Margins							
IRR Method	-1.79%	-1.49%	-1.20%	-0.90%	-0.61%	-0.32%	-0.03%
PVI/PVE Method	-1.79%	-1.49%	-1.20%	-0.90%	-0.61%	-0.32%	-0.03%
ROE Method	-1.97%	-1.65%	-1.34%	-1.04%	-0.73%	-0.43%	-0.13%

- Surplus ↑ ⇨ Indicated Profit ↑
- Surplus ↑ ⇨ P/S ↓

Endurance

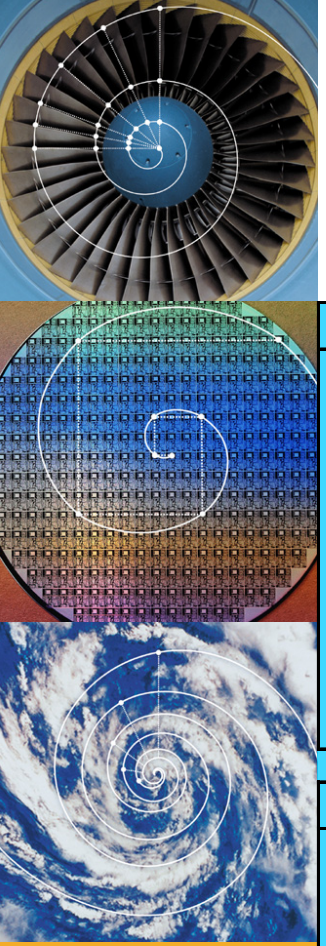


Indicated Profit
Sensitivity to Interest Rate

Scenario	1	2	3	4	5	6	7
Interest Rate	4.50%	5.00%	5.50%	6.00%	6.50%	7.00%	7.50%
Growth Model P/S	2.56	2.55	2.54	2.53	2.52	2.50	2.49
Indicated Profit Margins							
IRR Method	1.91%	0.98%	0.05%	-0.90%	-1.86%	-2.82%	-3.80%
PVI/PVE Method	1.91%	0.98%	0.05%	-0.90%	-1.86%	-2.82%	-3.80%
ROE Method	1.88%	0.92%	-0.05%	-1.04%	-2.03%	-3.03%	-4.05%

- Gap between target and investment return is key driver
- Interest ↑ ⇨Surplus ↓
- Interest ↑ ⇨Indicated Profit ↓
- Indicated Profit ↓ ⇨P/S ↑

Endurance

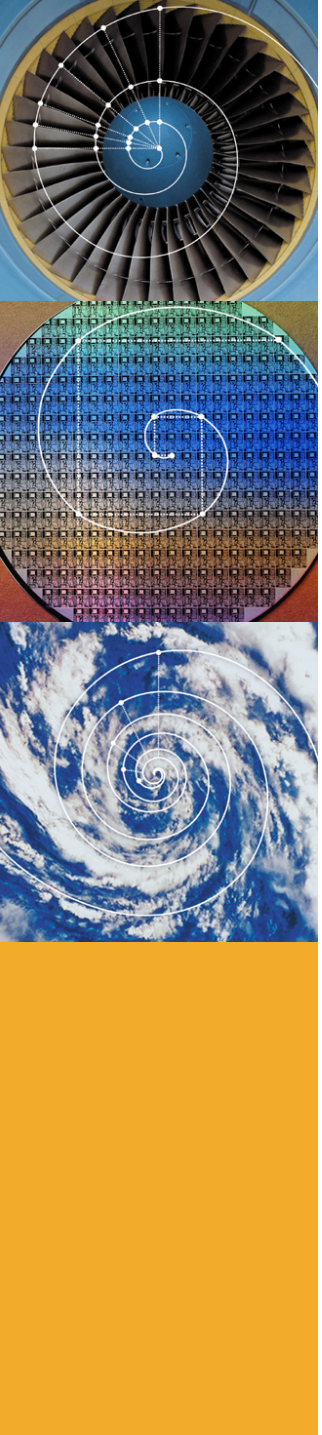


Indicated Profit
Sensitivity to Payout Pattern

Scenario		1=Base	2	3	4	5	6	7
Loss Pattern	Year							
	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	1	25.00%	100.00%	50.00%	0.00%	0.00%	0.00%	0.00%
	2	50.00%	0.00%	50.00%	100.00%	50.00%	0.00%	0.00%
	3	25.00%	0.00%	0.00%	0.00%	50.00%	100.00%	50.00%
	4	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	50.00%
Surplus Loading %		31.50%	62.00%	41.76%	31.08%	25.03%	20.77%	17.90%
Growth Model P/S		2.53	2.53	2.53	2.53	2.53	2.53	2.53
Indicated Profit Margins								
IRR Method		-0.90%	2.96%	1.02%	-0.97%	-2.88%	-4.85%	-6.72%
PVI/PVE Method		-0.90%	2.96%	1.02%	-0.97%	-2.88%	-4.85%	-6.72%
ROE Method		-1.04%	2.94%	0.98%	-1.09%	-3.16%	-5.34%	-7.52%

- Surplus Loading Set To Yield Same Growth Model P/S
- Longer Payout ⇨ Inv Inc ↑ ⇨ Indicated Profit ↓

Endurance

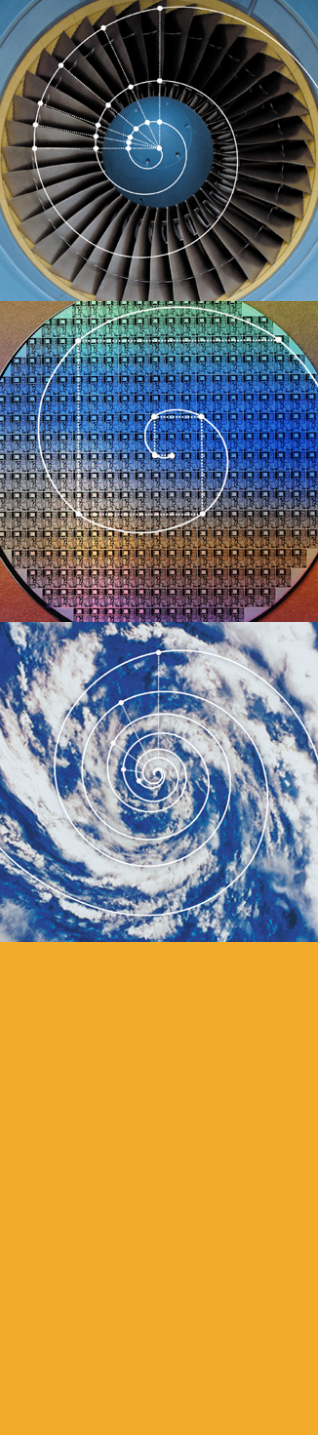


Risk-Adjusted DCF- Quick Overview

- No Computation of Policy Return
- Fair Premium is Computed Directly
  - PV of Paid Loss at risk-adjusted rate
  - PV of Tax Paid on Investment Inc on S
  - PV of Paid Expense
- Risk-adjusted Rate, r_A

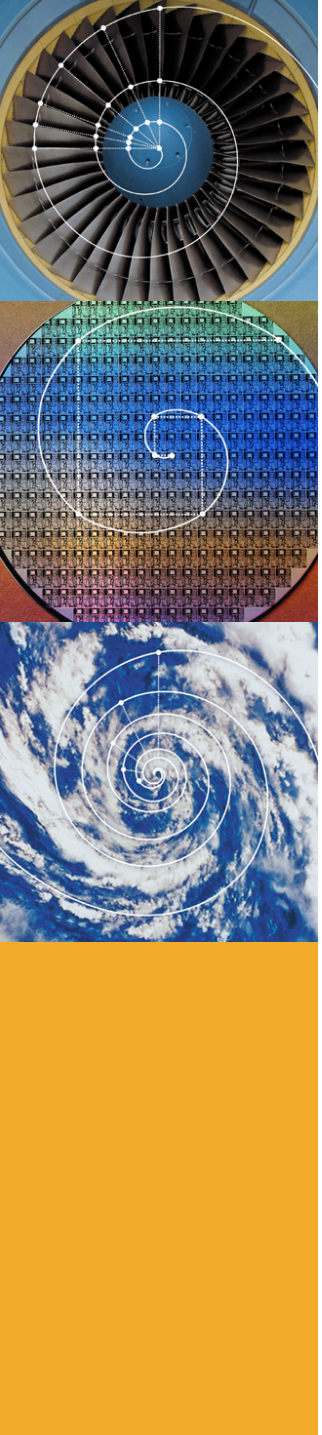
$$r_A = r_f + \beta(E(r_m) - r_f)$$

Endurance



Risk-Adjusted DCF vs Corporate Model RORAC

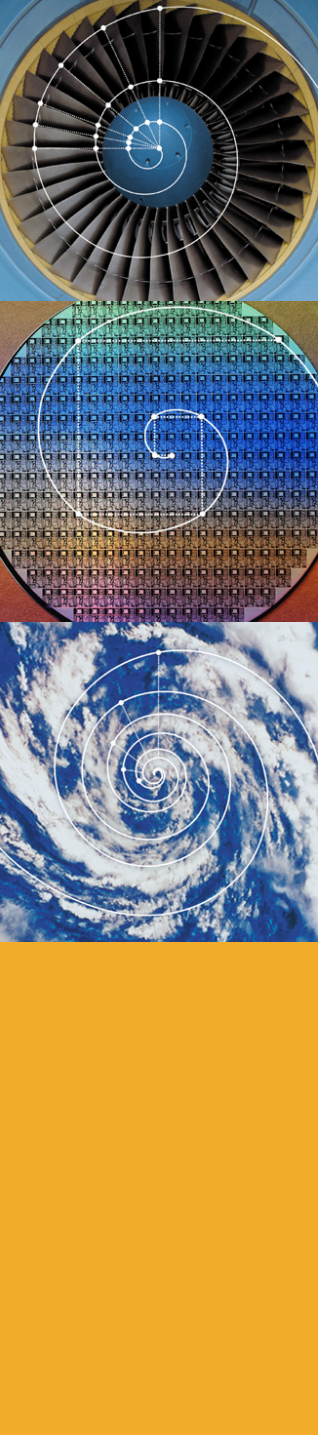
- What is β?
  - Cov of Loss with Stock market return
  - Some argue $\beta=0$ for P/C Insurance
    - If so, RA DCF = DCF
  - Even if $\beta< 0$, how does it vary by deal, by program, and by LOB?
- Discounting may not be enough!
  - Try to use RADCF for CAT Pricing
- RA DCF May be Better for Regulatory Use at LOB Level



Conclusions

- IRR, ROE and PVI/PVE All Reasonable Ways to Measure Return
  - Corporate model foundation
- Advantage of Growth Model ROE
  - Can relate to P/S and growth rate
  - Explainable to management
- RORAC Approach is OK
  - Sensitive to Risk and Payout pattern

Endurance



Questions and Comments

- Questions
  - Eg: None- It was all perfectly clear.
- Comments
  - Eg: Yes- we all agree.