

CS F1
Making ERM Operational
A Case Study from the Real World

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Discussion Outline

- Background on Implementation
- Examples of Real World Issues and Uses
 - Financial Planning
 - Capital Management
 - Reinsurance Analysis
 - Investment – Asset allocation and Risk/Return Analysis
 - Analysis of Incentive Compensation Goals
 - Accounting / Reporting Issue – Fin. 46

Background Information

- Tool used “Advise” from DFA Capital Management
- Purchased, installed, trained, constructed data and created baseline model during 2003.
- Operational in six months. Keys to success were:
 - Obtained executive sponsorship
 - Managed project scope
 - Proper dedicated resources
 - Hard date on deliverables – Deliver financial model by Dec. 2003
- 2004 and 2005 years of continued enhancements
 - More acceptance and understanding in quantifying the risk.
 - More appreciation of value added to the decision making process

Example of Financial / Operational Planning

Underwriting Profitability – Direct Business
Accident Year Basis
Combined Ratio Components

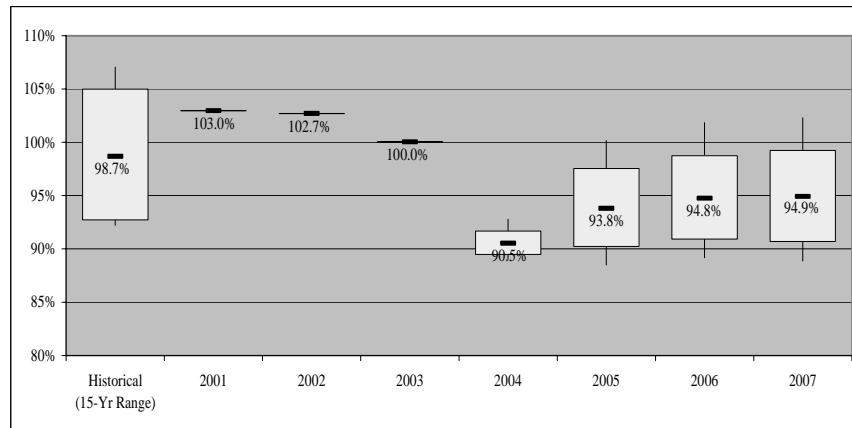
Combined Ratio Components

- Claim Severity (non-catastrophe)
- Claim Frequency (non-catastrophe)
- Pure Premium (non-catastrophe)
- Average Price per Exposure
- Catastrophe impact
- Operating Expense Ratio (includes A&O claim expense ratio)

Historical and Projected Trends

- 15 year trend (long-term trend)
- 5 year and 3 year trends (short-term trends)
- Individual historical years 2001 to 2003
- Projected years 2004 to 2007

Aggregate Direct Business
Historical And Projected Accident Year
Combined Ratios



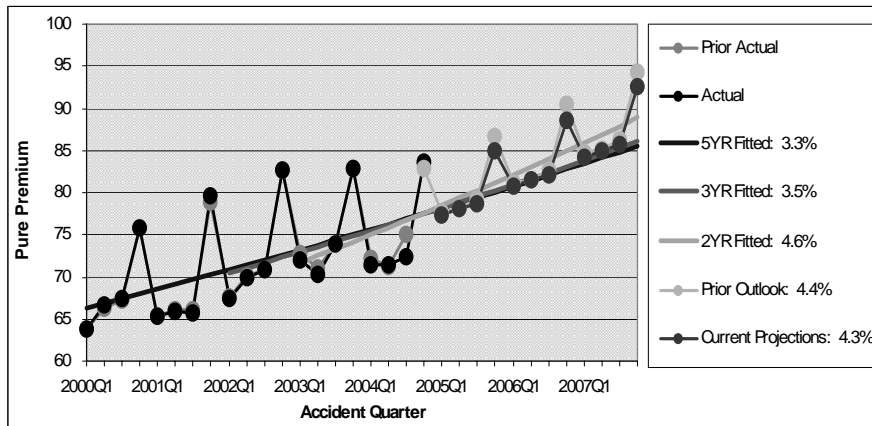
Aggregate Direct Business

Historical And Projected Accident Year Underlying Combined Ratio Components

	2001 (Actual)	2002 (Actual)	2003 (Actual)	2004 (Projected)	2005 (Projected)	2006 (Projected)	2007 (Projected)
Non-Cat Severity	\$2,751	\$2,956	\$3,275	\$3,517	\$3,721	\$3,935	\$4,168
% Change		7.4%	10.8%	7.4%	5.8%	5.7%	5.9%
Non-Cat Frequency per 1,000 Exposures	31.45	30.50	29.40	27.72	28.47	28.31	28.17
% Change		-3.0%	-3.6%	-5.7%	2.7%	-0.5%	-0.5%
Non-Cat Loss Costs per Exposure	\$86.53	\$90.16	\$96.28	\$97.51	\$105.93	\$111.40	\$117.40
% Change		4.2%	6.8%	1.3%	8.6%	5.2%	5.4%
Average Earned Price per Exposure	\$122.39	\$132.25	\$144.92	\$158.77	\$168.53	\$174.77	\$183.58
% Change		8.1%	9.6%	9.6%	6.1%	3.7%	5.0%
Non-Cat Loss Ratio	70.7%	68.2%	66.4%	61.4%	62.9%	63.7%	64.0%
Catastrophe Ratio	2.7%	4.7%	5.4%	2.1%	3.3%	3.5%	3.7%
Expense Ratio	29.6%	29.8%	28.2%	27.0%	27.6%	27.5%	27.3%
Combined Ratio	103.0%	102.7%	100.0%	90.5%	93.8%	94.8%	94.9%
% Change		-0.3%	-2.6%	-9.5%	3.6%	1.0%	0.2%

Voluntary Private Passenger Auto – Non-Cat

Historical And Projected Accident Quarters Underlying Loss Costs trends and Forecast Selection



Examples of Capital Management Issue

Capital Adequacy
Capital Efficiency
Stress Testing Capital

Stochastic Analysis

Combined Property and Casualty Insurance Operations

- **Capital Adequacy**
 - Capital Adequacy = having enough capital, identifying the excess
 - How much capital do we require?
 - What is our tolerance for falling below our required capital level?
 - Given an appropriate probability of falling below our required capital level, is there an excess or deficit of capital?

Capital Adequacy (Cont'd)
Combined Property and Casualty Insurance Operations

- **How much capital do we require?**
 - Maintain A+ Benchmark Capital Levels
 - Equal to 2 times the NAIC Company Action Risk Based Capital Level
 - Qualifies for an A++/A+ superior rating from A.M. Best
 - NAIC Company Action Risk Based Capital Level
 - At beginning of simulation = \$851 million
 - Assumed at end of simulation = \$1.035 billion
 - A+ Benchmark Capital Level
 - At beginning of simulation = \$1.702 billion
 - Assumed at end of simulation = \$2.072 billion

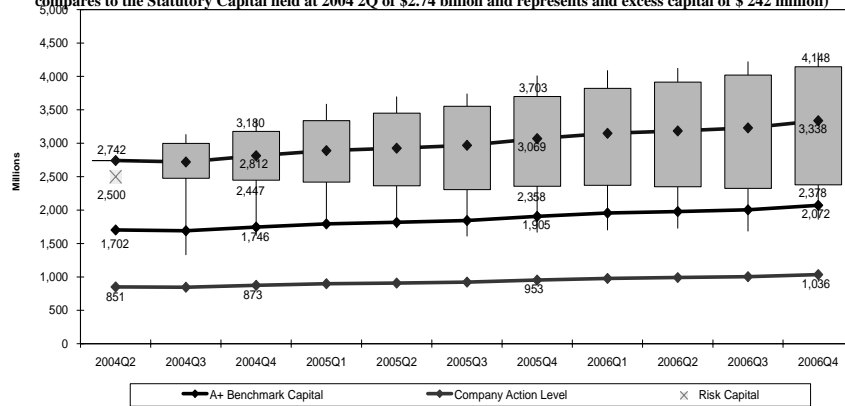
Capital Adequacy (Cont'd)
Combined Property and Casualty Insurance Operations

- **What is our tolerance for falling below our required A+ Benchmark Capital Level?**
 - Simulation Assumption – 1 in 400 year event = 12,000 paths
 - ✓ 99.5% overall certainty
 - ✓ 99.75% certainty of downside
 - ✓ Time Horizon – 2½ years
 - Current catastrophe reinsurance agreement in force
 - Includes variability of underwriting and investment risks

Capital Adequacy Combined Property and Casualty Insurance Operations

Based on simulation results (1 in 400 year event) how much risk adjusted capital do we need today within a tolerance of 99.75% such that we do not fall below A+ Benchmark Capital Level?

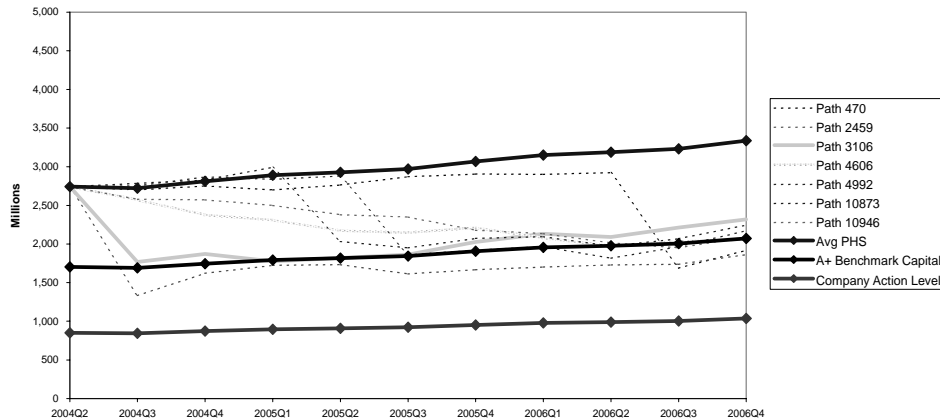
Ranges of Policyholders Surplus
(Risk capital required at 2004 Q2 is \$2.50 billion given a risk tolerance of .0025% during a time horizon of 2 1/2 years. That compares to the Statutory Capital held at 2004 2Q of \$2.74 billion and represents and excess capital of \$ 242 million)



Capital Adequacy (Cont'd) Combined Property and Casualty Insurance Operations

Based on simulation results (1 in 400 year event) how often do we fall below A+ Benchmark Capital Level?

Paths that Fail to Maintain Benchmark Capital
(7 paths out of 12,000 paths that fall below the A+ benchmark capital level during the simulated 2 1/2 year time horizon)



Specific Paths below A+ Benchmark Capital Level Combined Property and Casualty Insurance Operations

- **470**-Large Cat event much higher than our reinsurance limits
- **2,459**-Large Cat event much higher than our reinsurance limits
- **3,106**-Large Cat event much higher than our reinsurance limit, several other sizable cat events below reinsurance attachment point
- **4,606**-Several sizable cat events below reinsurance attachment point, worse than average UW results on some large lines, poor performance of stock market
- **4,992**-Large Cat event much higher than our reinsurance limits, poor performance of stock market
- **10,873**-Large Cat event much higher than our reinsurance limit, several other sizable cat events below reinsurance attachment point, poor performance of stock market
- **10,946**-Several sizable cat events below reinsurance attachment point, worse than average UW results on some large lines, poor performance of stock market

Stochastic Analysis Combined Property and Casualty Insurance Operations

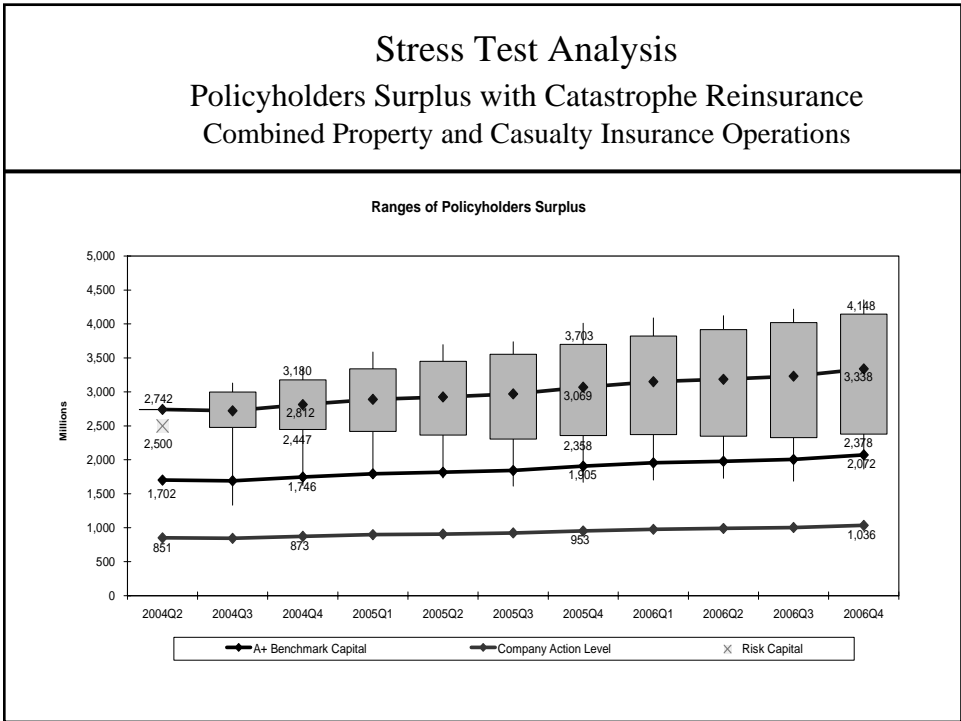
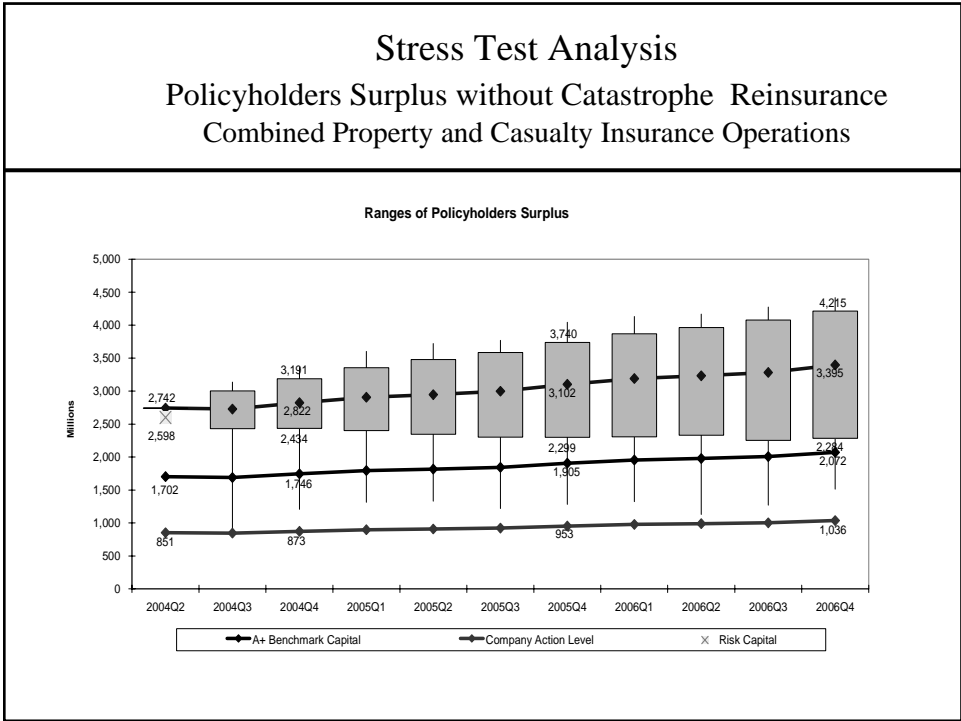
- **Capital Efficiency**
 - Capital Efficiency = producing an acceptable return on the capital we hold
 - How do we measure capital efficiency?
 - $ROE = \text{expected return} / \text{capital held}$
 - $EVA = \text{expected return} (\text{hurdle rate} \times \text{capital held})$
 - Identify
 - Economic vs. Statutory capital and surplus
 - Annualized Average Return on Surplus – Economic basis: simulation period of two and half years ended December 31, 2006
 - Risk adjusted value added

Capital Efficiency – Summary
Stochastic Analysis
Combined Property and Casualty Insurance Operations

	<i>Simulation Period</i>	
	<u>@ June 30, 2004</u>	<u>@ Dec 31, 2006</u>
<i>(Dollars in millions)</i>		
Economic vs. Statutory Capital & Surplus		
Statutory Capital & Surplus Held	\$2,742	\$3,337
Marking Investments to Market	82	(58)
Discounting Reserves	351	511
Change in Tax Recoverable/Payable	(117)	(97)
Economic Capital Held	<u>\$3,058</u>	<u>\$3,693</u>
Risk Adjusted Value Added (EVA)		
PV ending Economic Capital		\$3,445
PV change in Economic Capital		\$386
PV Cost of Economic Capital		\$355
PV Economic Value Added		\$31
Annualized Average Return on Surplus		
Economic value - Simulation to date		7.74%
Assumed Cost of Capital is 4.5% over risk free rate of 2.7%		7.32%

Stress Test Analysis
Policyholders Surplus without Catastrophe Reinsurance
Combined Property and Casualty Insurance Operations

- Given the assumption of excess capital of \$242 million at 2004 Q2 under the constraint of a tolerance of risk of .0025% and a 2 ½ year time horizon ended 2006 Q4, should the Combined P&C operation self insure against catastrophes?
 - Test
 - How many catastrophe events fall outside of the tolerance level and cause the surplus level to fall below the A+ benchmark?
 - How much additional Risk Capital is required to self insure (with a tolerance level of .0025% over a 2 ½ year period) such that we do not fall below the A+ benchmark during the simulation period?
 - What is the average statutory capital level at the end of the simulation period without a catastrophe reinsurance in place?



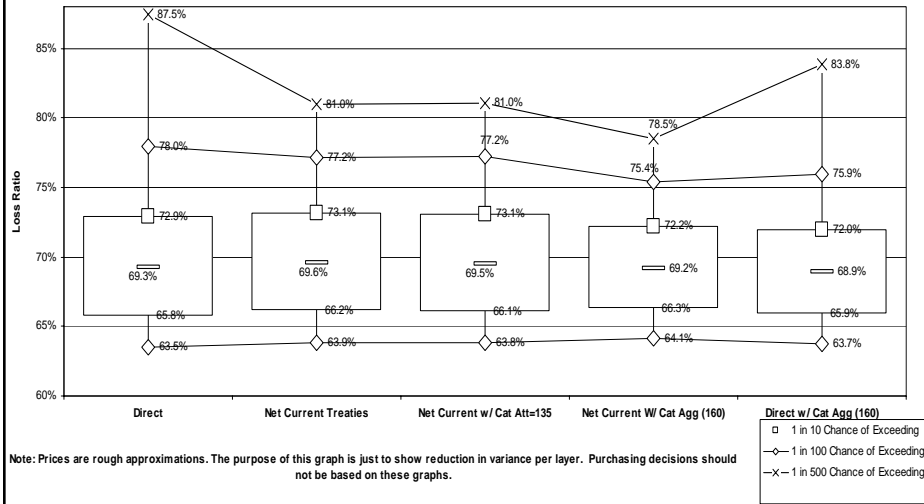
Stress Test Analysis - Summary
Risk Assessment of Catastrophe Reinsurance
Property and Casualty Insurance Operations

- Risk assessment of the purchase of Catastrophe Reinsurance over the next 2½ years
 - Risk Capital
 - With Cat Reinsurance \$2,500 mil
 - Without Cat Reinsurance \$2,598 mil
 - Impact of Cat Reinsurance \$98 mil
 - Average PHS at the end of simulation period
 - With Cat Reinsurance \$3,338 mil
 - Without Cat Reinsurance \$3,395 mil
 - Impact of Cat Reinsurance \$57 mil
 - Conclusion
 - Combined P&C operations has enough capital to self insure against catastrophes given a risk tolerance of .0025% and a time horizon of 2 ½ years

Analysis of Reinsurance Buying Options

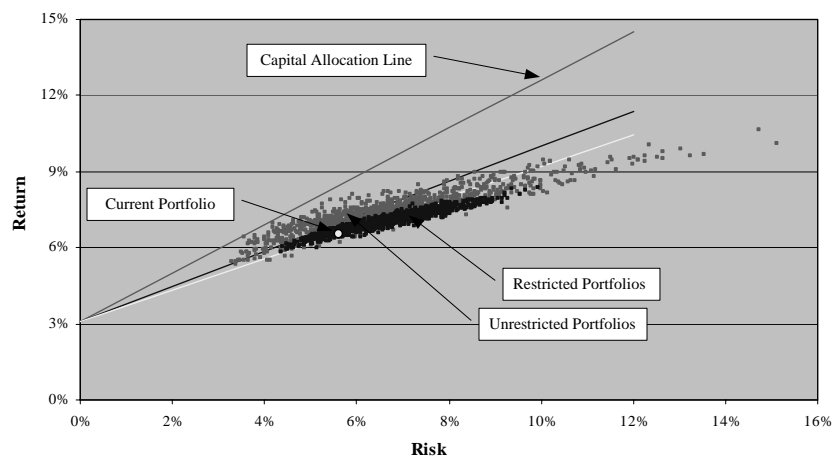
Analysis of Alternative Layers of Cat Reinsurance

Cat Treaty- Variance of Loss Ratios

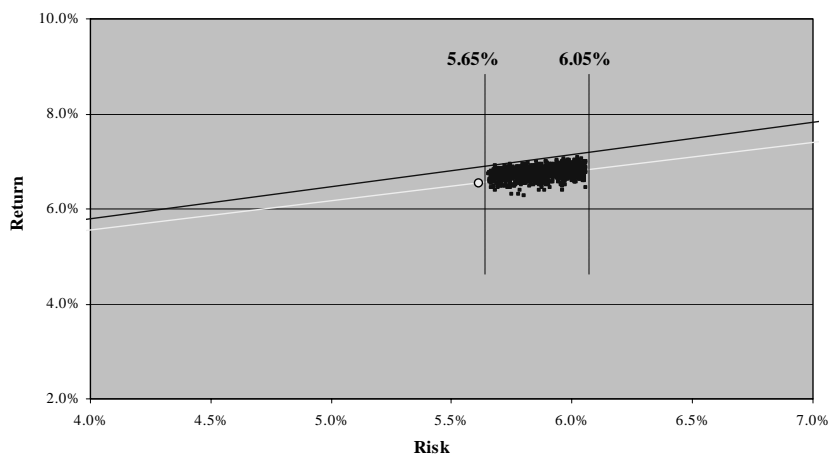


Example of Analysis of Capital Allocation and Risk / Reward Alternatives

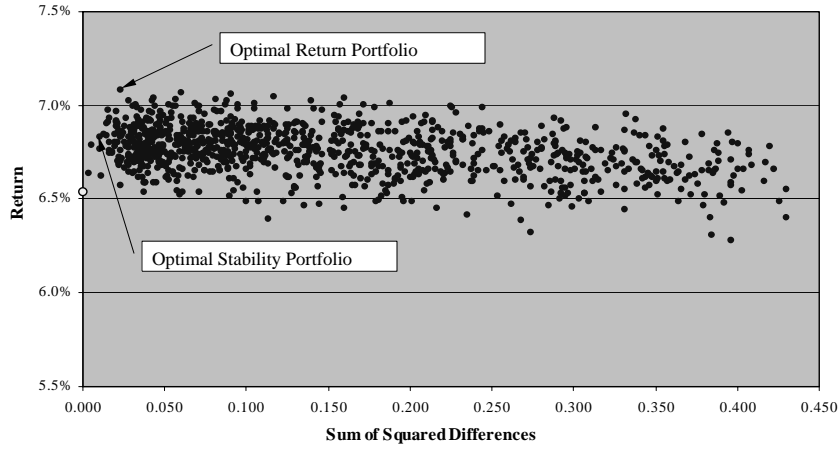
Optimal Portfolio Analysis Efficient Frontier Graph



Optimal Portfolio Analysis Efficient Frontier Graph



Optimal Portfolio Analysis Return vs. Stability



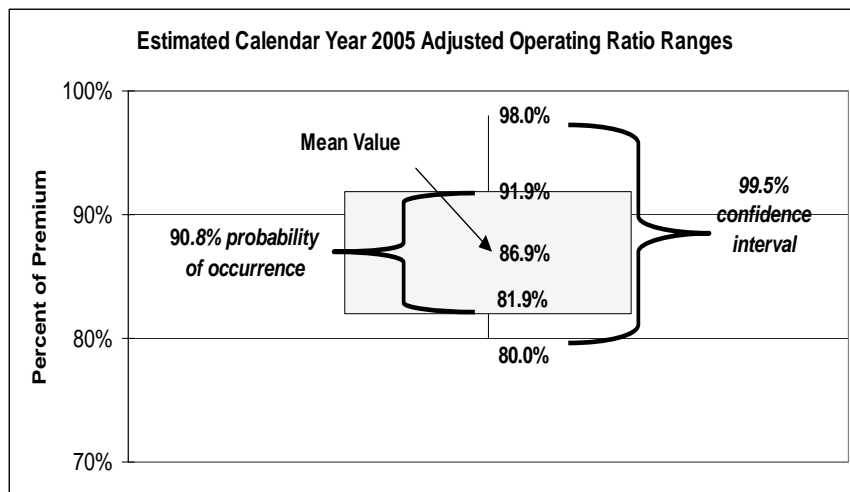
Optimal Portfolio Analysis Investment Possibilities

	Industry Data*		Optimal Risky										
	Return	Risk	Current Portfolio	Portfolio	Optimal Return Portfolios					Optimal Stable Portfolios			
Cash/Money Market	3.1%	0.6%	3.0%	9.2%	1.8%	1.4%	1.8%	3.8%	1.5%	3.4%	5.0%	7.2%	
Government Bonds	3.6%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Taxable Bonds	5.1%	4.7%	49.9%	26.6%	45.8%	45.8%	32.7%	25.4%	49.0%	47.2%	41.5%	41.7%	
MBS/ABS Bonds	5.1%	2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Tax-Exempt Bonds	4.7%	5.4%	13.8%	28.7%	4.2%	4.2%	7.3%	14.6%	16.0%	10.6%	13.5%	13.3%	
Preferred Stock	7.3%	8.6%	9.3%	3.2%	14.9%	24.6%	29.6%	28.9%	7.5%	12.2%	8.3%	8.0%	
Mezzanine Funds	7.3%	8.6%	0.0%	1.6%	0.7%	0.1%	0.1%	1.2%	0.8%	1.5%	0.2%	0.8%	
Public Common Stock	9.9%	14.8%	18.2%	12.3%	13.3%	4.5%	8.8%	7.4%	15.0%	15.2%	16.0%	16.1%	
Hedge Funds (Cons)	7.0%	4.0%	0.0%	0.6%	0.3%	0.2%	0.3%	0.2%	1.6%	0.2%	1.0%	0.0%	
Hedge Funds (Mod)	8.1%	5.7%	0.0%	0.3%	0.4%	0.0%	2.5%	0.2%	0.0%	0.3%	1.3%	0.2%	
Hedge Funds (Agg)	9.4%	7.8%	0.0%	0.3%	2.1%	0.2%	2.0%	1.8%	1.3%	1.9%	0.8%	1.2%	
Leveraged Buyouts	12.7%	18.4%	3.0%	1.7%	5.3%	6.5%	4.8%	4.8%	3.8%	2.9%	4.6%	5.7%	
Venture Capital	17.7%	43.7%	0.4%	5.5%	1.2%	3.0%	0.3%	1.8%	2.5%	3.2%	2.1%	2.1%	
Real Estate	9.0%	9.9%	2.5%	10.0%	10.0%	9.5%	9.8%	9.9%	1.0%	1.4%	5.7%	3.7%	
Portfolio Return (r_p):			6.54%	6.74%	7.08%	7.07%	7.06%	7.05%	6.64%	6.79%	6.83%	6.77%	
Portfolio Risk (σ_p):			5.61%	5.89%	6.02%	6.03%	5.96%	6.02%	5.80%	6.04%	5.92%	5.93%	
Sum of squared differences:				0.0961	0.0231	0.0599	0.0905	0.1165	0.0033	0.0050	0.0098	0.0104	

*Industry Data Source: Citibank

Analysis of Incentive Compensation Goals

Example of Incentive Compensation Goals



Analysis of Accounting Reporting Issue

FASB Interpretation No. 46
*Consolidation of Variable Interest Entities, an Interpretation of
Accounting Research Bulletin No. 51 (the Interpretation)*

FASB Interpretation No. 46
*Consolidation of Variable Interest Entities, an
Interpretation of Accounting Research Bulletin No. 51)*

What is a Variable Interest Entity (VIE)?

- FIN 46 requires an enterprise to consolidate a VIE if that enterprise has a variable interest (or combination of variable interests) that will absorb a majority of the entity's expected losses, receive a majority of the entity's expected residual returns, or both.
- VIEs are designed so that some of the entity's assets, liabilities, and other contracts create variability and some of the same items absorb or receive that variability. Assets, liabilities, or other contracts that absorb or receive variability are variable interests.
- A reciprocal's expected losses and expected residual returns are created primarily from variability in its (1) assets and (2) underwriting results. A managing company's absorbs the reciprocal's variability through (1) management contract and/or Insurance Pooling arrangements.

Analysis of Accounting Reporting Issue Fin 46 – Variable Interest Entity

PV of Cash Flow to Company A from Company B*						
Present Value of Cash Flow	Estimated Probability of PV[CF]	Probability Weighted PV[CF]	Residual	Expected Residual Losses	Expected Residual Returns	Absolute Residual
3,167,102,581	0.3%	9,501,308	(569,899,968)	(1,709,700)	-	1,709,700
3,261,238,684	1.8%	58,702,296	(475,763,865)	(8,563,750)	-	8,563,750
3,355,374,787	4.4%	147,636,491	(381,627,762)	(16,791,622)	-	16,791,622
3,449,510,890	8.8%	303,556,958	(287,491,659)	(25,299,266)	-	25,299,266
3,543,646,993	13.9%	492,566,932	(193,355,556)	(26,876,422)	-	26,876,422
3,637,783,096	14.5%	527,478,549	(99,219,453)	(14,386,821)	-	14,386,821
3,731,919,200	16.0%	597,107,072	(5,083,350)	(813,336)	-	813,336
3,826,055,303	14.8%	566,256,185	89,052,754	-	13,179,808	13,179,808
3,920,191,406	8.5%	333,216,269	183,188,857	-	15,571,053	15,571,053
4,014,327,509	6.7%	268,959,943	277,324,960	-	18,580,772	18,580,772
4,108,463,612	5.3%	217,748,571	371,461,063	-	19,687,436	19,687,436
4,202,599,715	3.1%	130,280,591	465,597,166	-	14,433,512	14,433,512
4,296,735,818	1.0%	42,967,358	559,733,269	-	5,597,333	5,597,333
4,390,871,921	0.3%	13,172,616	653,869,372	-	1,961,608	1,961,608
4,485,008,024	0.2%	8,970,016	748,005,475	-	1,496,011	1,496,011
4,579,144,128	0.2%	9,158,288	842,141,578	-	1,684,283	1,684,283
4,673,280,231	0.0%	0	936,277,681	-	-	-
4,767,416,334	0.1%	4,767,416	1,030,413,785	-	1,030,414	1,030,414
4,861,552,437	0.0%	0	1,124,549,888	-	-	-
4,955,688,540	0.1%	4,955,689	1,218,685,991	-	1,218,686	1,218,686
	100.0%	3,737,002,549		(94,440,916)	94,440,916	188,881,832

Analysis of Accounting Reporting Issue Fin 46 – Variable Interest Entity

PV Total Cash Flow from company B Ops (including Capital Gains)**						
Present Value of Cash Flow	Estimated Probability of PV[CF]	Probability Weighted PV[CF]	Residual	Expected Residual Losses	Expected Residual Returns	Absolute Residual
9,773,138,296	0.1%	9,773,138	(1,966,199,911)	(1,966,200)	-	1,966,200
10,019,745,584	0.5%	50,098,728	(1,719,592,623)	(8,597,963)	-	8,597,963
10,266,352,873	1.1%	112,929,882	(1,472,985,334)	(16,202,839)	-	16,202,839
10,512,960,161	2.1%	220,772,163	(1,226,378,046)	(25,753,939)	-	25,753,939
10,759,567,450	4.9%	527,218,805	(979,770,757)	(48,008,767)	-	48,008,767
11,006,174,738	8.2%	902,506,329	(733,163,469)	(60,119,404)	-	60,119,404
11,252,782,027	12.8%	1,440,356,099	(486,556,180)	(62,279,191)	-	62,279,191
11,499,389,315	14.1%	1,621,413,893	(239,948,892)	(33,832,794)	-	33,832,794
11,745,996,603	15.8%	1,855,867,463	6,658,397	-	1,052,027	1,052,027
11,992,603,892	12.0%	1,439,112,467	253,265,685	-	30,391,882	30,391,882
12,239,211,180	11.3%	1,383,030,863	499,872,974	-	56,485,646	56,485,646
12,485,818,469	8.5%	1,061,294,570	746,480,262	-	63,450,822	63,450,822
12,732,425,757	4.2%	534,761,882	993,087,551	-	41,709,677	41,709,677
12,979,033,046	2.6%	337,454,859	1,239,694,839	-	32,232,066	32,232,066
13,225,640,334	1.0%	132,256,403	1,486,302,128	-	14,863,021	14,863,021
13,472,247,623	0.3%	40,416,743	1,732,909,416	-	5,198,728	5,198,728
13,718,854,911	0.2%	27,437,710	1,979,516,705	-	3,959,033	3,959,033
13,965,462,200	0.1%	13,965,462	2,226,123,993	-	2,226,124	2,226,124
14,212,069,488	0.1%	14,212,069	2,472,731,282	-	2,472,731	2,472,731
14,458,676,777	0.1%	14,458,677	2,719,338,570	-	2,719,339	2,719,339
	100.00%	11,739,338,207		(256,761,097)	256,761,097	513,522,194

Analysis of Accounting Reporting Issue
Fin 46 – Variable Interest Entity

						Expected Residual Losses	Expected Residual Returns	Total Expected Residual
Residual of Company A Cash Flows from Company B						94,440,916	94,440,916	188,881,832
Residual of Company B Cash Flows						256,761,097	256,761,097	513,522,194
Company A Percent Interest of Residuals of Company B Operations						36.78%	36.78%	36.78%