

# EXPECTED ADVERSE DEVIATION AS MEASURE OF RISK DISTRIBUTION

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CAYMAN  
CAPTIVE  
FORUM  
2018

# ABOUT THE SPEAKER – JOSEPH A. HERBERS

- Managing Principal at Pinnacle
- Member of CAS, AAA and CERA
- Have worked with captives over 30+ years both of all types, off-shore and onshore
- Extensive interaction with captive managers, auditors, brokers, TPAs, regulators, lawyers and company management
- Frequent speaker at CAS, captive domicile meetings

# ABOUT THE SPEAKER – MELANIE SNYMAN

- Director at PwC in the Cayman Islands
- Specializing in captive insurance
- Over 15 years experience in the insurance industry, of which all the time spent working for PwC
- Frequent speaker at the Cayman Captive Forum and other Cayman insurance events
- Member of the IMAC Laws and Regulations committee

# OVERVIEW

Introduction

Background – Risk Transfer vs Risk Distribution

Potential Risk Distribution Measures

Criteria for evaluating tests

Potential methods (and drawbacks)

Solution – EAD Ratio

Simple Example

When is a test necessary?

What is the correct threshold?

Additional Examples

Additional Considerations

Conclusions



# INTRODUCTION

**Risk Distribution - Prerequisite for “insurance” or an “insurance contract” for U.S. Tax Purposes**

**Growth of Captive Insurers (ties between insured & insurer)**

**How much risk distribution is enough to qualify as insurance for U.S. Tax Purposes?**

**Qualitative View vs Quantitative View**

Risk distribution is at its core a statistical and therefore actuarial issue

# BACKGROUND

## Requirements to be an insurance company for accounting and tax purposes

Insurance Risk - must have underwriting risk and timing risk

### *Risk Transfer (from an accounting perspective)*

- ASC 944: Company must face significant insurance risk and a reasonably possible chance of a significant loss.

### *Risk Distribution (from a tax perspective)*

- Looks to the insurer to see if the risks acquired by the insurer are distributed among a pool of risks such that no one claim can have an extraordinary effect on the insurer
  - Mass (Law of Large Numbers)
  - Homogeneity (Similar in nature)
  - Independence
  - Predictable
- “The (actuarially credible) premiums of the many pay the (expected) losses of the few. This is the essence of insurance.”

## Commonly Accepted Notions of Insurance

- “Duck Theory”



# BACKGROUND - RISK TRANSFER

Reinsurance risk transfer has been codified in accounting standards (ASC 944 and SSAP 62)

## Risk Transfer

- “the risk arising from **uncertainties** about both a) the **ultimate amount** of net cash flows from premiums, commissions, claims, and claim settlement expenses paid under a contract (i.e. underwriting risk) and b) the **timing** of the receipt and payment of those cash flows (i.e. timing risk). Insurance risk is fortuitous - the possibility of adverse events occurring is outside the control of the insured.”
- Looks at the arrangement from the perspective of the insured (i.e., has a risk faced by the insured been transferred)
- Must involve shifting of “insurance risk” (timing and amount)
- Did the contract shift a real risk that the enterprise faced?
- Must involve a reasonable chance of a significant loss to the insurer



# BACKGROUND - RISK DISTRIBUTION

## Risk Distribution

### IRS Position:

- Revenue Ruling 2005-40
- Premium payment from a single (100%) or substantial (90%) insured is not insurance because
  - The insured is substantially funding its own risks, and
  - Risk distribution is not present
- Creates an insured “entity” requirement versus an insured “risk” requirement for risk distribution

### **“Bad Facts” include:**

- Parent only risks (with no 3<sup>rd</sup> party risk)
- Concentration of risk (eg, single insured entity, location)
- Excess loan backs
- Parental guarantees / hold harmless agreements
- Premiums are not **paid**





# BACKGROUND - CASE LAW

## How has the US Tax Courts/IRS Defined Risk Distribution?

- **Le Gierse** – in 1941 the Supreme Court in LeGierse determined insurance did not exist where two linked insurance contracts failed to shift risk of loss away from insured - focused on the number of insured parties
- **Humana** - It is certainly possible for a captive to distribute risk by insuring only its brother-sister businesses
- **Gulf Oil/Malone & Hyde** - Stated in dicta that “risk transfer and risk distribution occur only when there are sufficient unrelated risks in the pool for the law of large numbers to operate”
- **Harper** – Defined 4-Prong Test – risk considered to be distributed if more than a certain % of premiums from unrelated insureds
- **Kidde** – Relates risk distribution to the law of large numbers
- **Rent-a-Center** – More than 64% of risk coming from one subsidiary, but sufficient number of statistically independent risks
- **Securitas** – Reinforced the concepts presented in Rent-a-Center, specifically citing the number of employees and insured vehicles
- **Avrahami** – Reinsurance was not bona fide insurance



# BACKGROUND –CASE LAW (KIDDE)

**Kidde discusses risk distribution and the law of large numbers by stating:**

“Risk distribution addresses the risk that over a shorter period of time claims will vary from the average. Risk distribution occurs when particular risks are combined in a pool with other, independently insured risks. By increasing the total number of independent, randomly occurring risks that a corporation faces (i.e., by placing risks into a larger pool), the corporation benefits from the mathematical concept of the law of large numbers in that the ratio of actual to expected losses tends to approach one. In other words, through risk distribution, insurance companies gain greater confidence that for any particular short-term period, the total amount of claims paid will correlate with the expected cost of those claims and hence correlate with the total amount of premiums collected.”

# BACKGROUND - CASE LAW (RENT-A-CENTER AND SECURITAS)

## Rent-a-Center

- More than 64% of risk coming from one subsidiary but sufficient number of statistically independent risks
- 14,000 Employees, 7,100 Vehicles 2,600 Stores
- The insurer achieves risk distribution when it pools enough collection of unrelated risks, those that are not affected by the same circumstance or event

## Securitas

“As a result of the large number of employees, offices, vehicles, and services provided by the U.S. and non-U.S. operating subsidiaries, (Securitas) was exposed to a large pool of statistically independent risk exposures.”

- Shift to exposures, not corporate structure – focus on risk exposure unit, not number of entities
- Exposures must produce claims to distribute risk!
- Resulted in a designation as a “memo” (TCM) – court adopted the risk exposure approach as its baseline
- It’s also an actuarial issue...



# BACKGROUND – CASE LAW (AVRAHAMI)

## KEY – Insurance deductions were disallowed:

“The absence of risk distribution is enough to sink (the captive).”

Because the captive insurance company failed to have risk distribution

Premiums charged were excessive and had a low chance of being triggered

Because the reinsurance company providing unrelated risk failed to be a bona fide insurance company

Lots of additional concerns

## Discussion of risk distribution

Both sides had experts opine on number of entities necessary – taxpayer failed to meet either standard

“We also want to emphasize that it isn’t just the number of brother-sister entities that one should look at in deciding whether an arrangement is distributing risk. It’s even more important to figure out the number of independent risk exposures.”

# BACKGROUND

How much risk distribution is enough to qualify as insurance for tax purposes?

“To be deductible as an insurance premium, a payment must relate to some shifting and pooling of risk ... This requirement can be met even if the insurance is within an affiliated group, so it’s possible for a captive insurance company (“captive”) to distribute risk by insuring only its brother-sister businesses. But the captive must still have a large enough pool of unrelated risks, so the question is whether a risk pool is large enough. It isn’t just the number of brother-sister entities that are considered in deciding whether an arrangement is distributing risk. It’s even more important to figure out the number of independent risk exposures.” RISK-SHIFTING AND RISK-DISTRIBUTION BY CAPTIVE INSURANCE COMPANIES IN AN AFFILIATED GROUP, Fed. Tax Coordinator ¶ L-3521 (2d.)

But, really –

Risk distribution is at its core a statistical and therefore actuarial issue.



# BACKGROUND - PROBLEM

**Problem: No single, objective way to determine risk distribution**

Some IRS Guidance – Mostly corporate structure

Tax Court Decisions – Sometimes inconsistent findings

Subjective in Nature

**An actuarial measure of risk distribution created by an insurance vehicle should focus on:**

Pool of statistically independent risk exposures

The reduction in the variability between expected losses and actual losses as a result of aggregating these risks



# POTENTIAL RISK DISTRIBUTION MEASURES

## Criteria for Evaluating Metrics and Tests

One-sided Tests Preferable (Exclude Speculative Risk)

Transparency - Easy to Explain

- Lawyers, Accountants, Tax consultants, Judges, Regulators, Captive Owners

Acceptability

- Actuaries, Accountants, Tax consultants, Lawyers, Judges, Regulators

Less Open to Manipulation

# POTENTIAL RISK DISTRIBUTION MEASURES (CONT.)

## Measures considered:

Value at Risk (VaR)

Tail Value at Risk (TVaR)

- Rigorous one-sided tests
- Tests improvement in potential loss at a given percentile through risk distribution
- Underlying math not easily explained
- Reliance on loss distribution could lead to manipulation

Coefficient of Variation (CV)

- Easy to explain measure of volatility
- Reduces as the amount of independent exposures increases
- More easily manipulated than other tests
- Reflects all risk – not one-sided

Expected Policyholder Deficit (EPD) Ratio

- One-sided and transparent
- Focuses on NPV of underwriting loss
- Reliance on premiums leads to issues





# SOLUTION: EXPECTED ADVERSE DEVIATION (EAD)

EAD represents the average amount of loss that the insurance company incurs in excess of the expected losses or the expected amount of adverse deviation an insurer is exposed to

## Similar to EPD

One-sided and transparent

No premiums – not as easily manipulated

## Definition:

$$EAD = E[\max(X - E(X), 0)]$$



# MORE SPECIFICALLY: EAD RATIO

Definition:

$$EAD \text{ Ratio} = \frac{EAD(X)}{E(X)}$$

To test for risk distribution we need to normalize the EAD value by dividing by the expected losses.

This EAD ratio measures how much volatility or risk an insurance company is taking on relative to their expected losses.

The higher the EAD ratio is, the more risk the insurance company is facing

As an insurance company diversifies its risk we should expect to see the EAD ratio decrease  
The EAD ratio has a max value of 100% and a minimum value of 0% so it is easier to compare different types of insurance and exposures

# EAD SIMPLE EXAMPLE

How much of the adverse loss potential of one risk unit needs to be diversified away by the overall insurance program?

Consider a trucking insurance product with a 10% chance of a \$1M loss per truck

Expected losses are \$100,000 per truck

**BUT 10% of the time the losses are \$1M (10 times the expected losses)**

If it insures 100 trucks, is this enough risk distribution?



# EAD SIMPLE EXAMPLE

**A liability policy with a 90% chance of no loss and a 10% chance of a \$1M loss.**

$$E(X) = 10\% \times \$1M = \$100K.$$

$$EAD(X) = 10\% \times (\$1M - \$100K) = \$90K.$$

$$EAD \text{ ratio} = \$90K / \$100K = 90\%$$

**Insurance company writes two policies**

$$E(X) = \$200K.$$

$$EAD(X) = \$162K.$$

$$EAD \text{ ratio} = \$162K / \$200K = 81\%$$

**Consider Multiple Policies**

Polices	E(X)	EAD(X)	EAD Ratio
1	100,000	90,000	90.0%
2	200,000	162,000	81.0%
10	1,000,000	350,600	35.1%
50	5,000,000	827,300	16.5%
100	10,000,000	1,203,100	12.0%
1000	100,000,000	3,785,600	3.8%



# WHEN IS A TEST NECESSARY?

Current “safe harbors” require no further testing

Risk distribution is not readily apparent

Not feasible to have a bright line indicator test that works for all situations

For situations where EAD Ratio Test fails, further testing and documentation is needed and may still demonstrate risk distribution

Risk units assessments from tax consultants/lawyers are valuable parts of an overall approach

# WHAT IS THE CORRECT THRESHOLD

Focused on how well an insurance company can reduce their risk through the increase of independent exposures

Range:  $0\% < \text{EAD Ratio} < 100\%$

In testing, base exposure EAD ratio usually  $> 90\%$

Increased exposure to satisfy risk distribution

- Found EAD ratio typically reduced by  $2/3$

**Threshold - EAD ratio of 30%**



# WHAT IS THE CORRECT THRESHOLD

Coverage	Exposure Type	Exposures	Claim Frequency	Expected Claims	Claim Severity	EAD Ratio	EAD Reduction
Homeowners	# of Homes	1	3.0%	0.03	\$12,000	96.9%	
		100	3.0%	3.00	\$12,000	48.6%	49.8%
		500	3.0%	15.00	\$12,000	27.5%	71.6%
		1,000	3.0%	30.00	\$12,000	20.7%	78.7%
Auto Liability	# of Cars	1	2.0%	0.02	\$15,000	98.2%	
		100	2.0%	2.00	\$15,000	48.0%	51.1%
		500	2.0%	10.00	\$15,000	25.7%	73.8%
		1,000	2.0%	20.00	\$15,000	18.7%	81.0%
Workers Compensation	# of Employees	1	3.0%	0.03	\$13,000	97.1%	
		100	3.0%	3.00	\$13,000	52.1%	46.3%
		500	3.0%	15.00	\$13,000	30.9%	68.2%
		1,000	3.0%	30.00	\$13,000	23.6%	75.7%
Professional Liability	# of Employees	1	1.0%	0.01	\$300,000	98.9%	
		100	1.0%	1.00	\$300,000	64.0%	35.3%
		500	1.0%	5.00	\$300,000	33.6%	66.0%
		1,000	1.0%	10.00	\$300,000	23.6%	76.1%



# HOMEOWNERS EXAMPLE INCL. CATASTROPHE

Index	Input								
	Example 1 - No Reinsurance			Example 2 - Reinsurance			Example 3 - Reinsurance		
	1	2	3	1	2	3	1	2	3
Coverage	Homeowners	Homeowners	Homeowners	Homeowners	Homeowners	Homeowners	Homeowners	Homeowners	Homeowners
Loss Type	Non-Hurricane	Hurricane	Combined	Non-Hurricane	Hurricane	Combined	Non-Hurricane	Hurricane	Combined
Exposure	10,000			10,000			10,000		
Frequency Distribution	Poisson	Discrete *		Poisson	Discrete *		Poisson	Discrete *	
Frequency	3.0%			3.0%			3.0%		
Claim Count	300.00			300.00			300.00		
Severity Distribution	LogNormal	Discrete *		LogNormal	Discrete *		LogNormal	Discrete *	
Expected Value	12,000			12,000			12,000		
Standard Deviation	48,000			48,000			48,000		
Deductible	0			0			0		
Limit	500,000			500,000			500,000		
Retention					5,000,000			10,000,000	
Quota Share				50.0%	50.0%		50.0%	50.0%	
Simulated Output									
Frequency	300.00								
Standard Deviation	17.32								
Limited Mean	3,464,523	1,400,000	4,864,523	1,732,261	150,000	1,882,261	1,732,261	275,000	2,007,261
Standard Deviation	608,631	8,752,009	8,777,581	304,316	550,028	629,583	304,316	1,089,492	1,132,619
EAD	241,738	1,280,000	1,290,629	120,869	135,000	193,855	120,869	247,500	281,341
Standard Deviation	387,685	8,554,935	8,559,535	193,842	513,859	526,925	193,842	1,028,427	1,031,273
EAD Ratio	7.0%	91.4%	26.5%	7.0%	90.0%	10.3%	7.0%	90.0%	14.0%





# WORKERS' COMPENSATION EXAMPLE

Coverage Example	Workers Compensation - Unlimited			Workers Compensation - Limited			Workers Compensation - Excess		
	1	2	3	1	2	3	1	2	3
Loss Type	Unlimited	Unlimited	Unlimited	Limited	Limited	Limited	Excess	Excess	Excess
Payroll	25,000,000	50,000,000	100,000,000	25,000,000	50,000,000	100,000,000	25,000,000	50,000,000	100,000,000
Number of Employees	500	1,000	2,000	500	1,000	2,000	500	1,000	2,000
Frequency Distribution	Poisson	Poisson	Poisson	Poisson	Poisson	Poisson	Poisson	Poisson	Poisson
Frequency (\$100 of payroll)	0.0060%	0.0060%	0.0060%	0.0060%	0.0060%	0.0060%	0.0060%	0.0060%	0.0060%
Claim Count	15.00	30.00	60.00	15.00	30.00	60.00	15.00	30.00	60.00
Severity Distribution	LogNormal	LogNormal	LogNormal	LogNormal	LogNormal	LogNormal	LogNormal	LogNormal	LogNormal
Mean	13,000	13,000	13,000	13,000	13,000	13,000	13,000	13,000	13,000
CV	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Standard Deviation	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000
Limit				250,000	250,000	250,000	250,000	250,000	250,000
Simulated Output									
Frequency	15.00	30.00	60.00						
Standard Deviation	3.87	5.48	7.75						
Limited Mean	194,883	390,376	780,406	170,464	341,702	682,648	24,419	48,674	97,758
Standard Deviation	253,730	352,207	514,321	120,930	171,574	241,569	193,413	265,179	396,863
EAD	62,695	98,423	148,499	46,604	68,078	95,862	22,649	42,295	75,307
Standard Deviation	231,026	309,705	441,006	89,225	118,522	159,025	190,709	258,132	379,695
EAD Ratio	32.2%	25.2%	19.0%	27.3%	19.9%	14.0%	92.8%	86.9%	77.0%



# CAPTIVE EXAMPLE 1

	Input								
	LogNorm	LogNorm	LogNorm	Bernoulli	Bernoulli	Bernoulli	Discrete 1	Discrete 2	Total Captive
Coverage	1	2	3	4	5	6	7	8	
Exposure	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	
Frequency Distribution	Poisson	Poisson	Poisson	Bernoulli	Bernoulli	Bernoulli	Poisson	Poisson	
Frequency	0.00700%	0.00500%	0.00250%	0.00020%	0.00025%	0.00050%	0.00250%	0.00500%	
Claim Counts	1.40	1.00	0.50	0.04	0.05	0.10	0.50	1.00	4.59
Severity Distribution	LogNormal	LogNormal	LogNormal	Fixed	Fixed	Fixed	Discrete 1 *	Discrete 2 *	
Mean	100,000	90,000	100,000	1,000,000	1,000,000	1,000,000	79,750	132,500	
Standard Deviation	400,000	270,000	600,000				138,356	187,100	
Aggregate	1,000,000	1,000,000	1,000,000						

## (A) Simulated Output - Single Captive

Frequency	1.40	1.00	0.50	0.04	0.05	0.10	0.50	1.00	4.59
Mean	114,923	80,059	37,025	40,000	50,000	100,000	39,407	130,703	592,117
EAD	66,325	48,922	28,710	38,400	47,500	90,000	23,720	66,120	233,066
EAD Ratio	57.7%	61.1%	77.5%	96.0%	95.0%	90.0%	60.2%	50.6%	39.4%

## (B) Pooled Captive (Assumes 51.0% of 8 Single Captives)

Mean	465,236	327,778	153,597	163,200	204,000	408,000	161,372	538,582	2,421,764
EAD	115,246	93,723	71,625	118,010	135,884	174,257	59,503	130,798	326,917
EAD Ratio	24.8%	28.6%	46.6%	72.3%	66.6%	42.7%	36.9%	24.3%	13.5%

$$\text{Adjusted Single Captive} = [49.0\% \times (A) + (B) / 8]$$

Mean									592,858
EAD									132,884
EAD Ratio									22.4%



# CAPTIVE EXAMPLE 2

	Input								
	1	2	3	4	5	6	7	8	Captive
Coverage Exposure	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	
Frequency Distribution	Poisson	Poisson	Poisson	Bernoulli	Bernoulli	Bernoulli	Poisson	Poisson	
Frequency	0.05000%	0.02000%	0.00250%	0.00020%	0.00025%	0.00050%	0.00250%	0.00500%	
Claim Counts	25.00	10.00	1.25	0.10	0.13	0.25	1.25	2.50	40.48
Severity Distribution	LogNormal	LogNormal	LogNormal	Fixed	Fixed	Fixed	Discrete 1 *	Discrete 2 *	
Mean	10,000	15,000	100,000	1,000,000	1,000,000	1,000,000	79,750	132,500	
Standard Deviation	40,000	45,000	600,000				138,356	187,100	
Aggregate	1,000,000	1,000,000	1,000,000						

## (A) Simulated Output - Single Captive

Frequency	25.00	10.00	1.25	0.10	0.13	0.25	1.25	2.50	40.47
Mean	245,525	148,889	90,767	100,000	125,000	250,000	98,699	329,305	1,388,185
EAD	57,278	43,654	55,980	90,000	109,375	187,500	50,637	129,497	317,645
EAD Ratio	23.3%	29.3%	61.7%	90.0%	87.5%	75.0%	51.3%	39.3%	22.9%

## (B) Pooled Captive (Assumes 51.0% of 8 Single Captives)

Mean	1,000,337	605,208	379,612	408,000	510,000	1,020,000	403,225	1,351,458	5,677,839
EAD	92,086	71,370	108,080	173,849	175,899	237,864	100,453	208,701	447,757
EAD Ratio	9.2%	11.8%	28.5%	42.6%	34.5%	23.3%	24.9%	15.4%	7.9%

## Single Captive - Net of Reinsurance

Mean	1,389,940
EAD	182,333
EAD Ratio	13.1%



# ADDITIONAL CONSIDERATIONS

Counterintuitive Results

Positive Correlation Between Coverages

Reinsurance Companies

EAD ratio depends directly on the number of expected claims

Evaluating the claims on a present value basis???



# PRACTICAL APPLICATION OF EAD



# A COMPREHENSIVE APPROACH TO RISK DISTRIBUTION

Deciding Whether a Pure Captive has Sufficient Internal Risk Distribution (or Statistically Independent Risk Units) Involves:

- Captive Owners
- Captive Managers
- Attorneys
- Financial/Tax Accountants
- Actuaries
- More recently – Independent Tax Advisors



# OTHER APPROACHES TO RISK DISTRIBUTION

**Risk pools – provide between 30% and 80% outside risk**

Safe harbor – 50% of premiums from unrelated 3<sup>rd</sup> party risks

Analysis similar to Avrahami

- Does the pool look like a “real insurance company?”
- Risks being insured – insurance risks?
- Actuary involved in pricing
- Periodic review of pricing model

## **Stand Alone**

Safe harbor – 12 brother/sister entities – no entity accounts for more than 15% (Rule of 12)



# STAND ALONE – APARTMENT BUILDINGS

110 entities purchasing various coverages

1,008 apartment buildings

More than 18,000 individual apartments

15.7 million square feet

Clearly meets Rule of 12

Should meet Avrahami





# FUTURE TRENDS

More Tax Court Rulings (Reserve Mechanical, Caylor, Wilson, Syzygy)

Dynamic State/Domicile Environments (e.g. P.R., Native Amer.)

Ongoing Scrutiny of Pricing Models & Actuaries

Ongoing Scrutiny of Reinsurance Pools

Path Act

Tax Reform

Flight to Quality/Best Practices

Shift from Pools to Internal Risk Distribution

Addition of High Frequency-Low Severity Coverages

Medical Stop Loss

WC, Property, APD Deductibles

Ongoing Innovation



# CONCLUSIONS

- Risk distribution is an essential component in establishing a transaction as bona fide insurance for tax purposes.
- A rigorous actuarial approach is needed as part of a comprehensive assessment of risk distribution
- EAD ratio is a straight-forward, understandable, one-tailed statistic for assessing risk distribution
- 30% threshold for the EAD ratio should demonstrate sufficient risk distribution for most applications
- EAD is being used as part of an approach for large commercial enterprises with captives to demonstrate internal risk distribution



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# THANK YOU

