Visualizing Variability

2012 CAS Annual Meeting

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GROSS CONSULTING

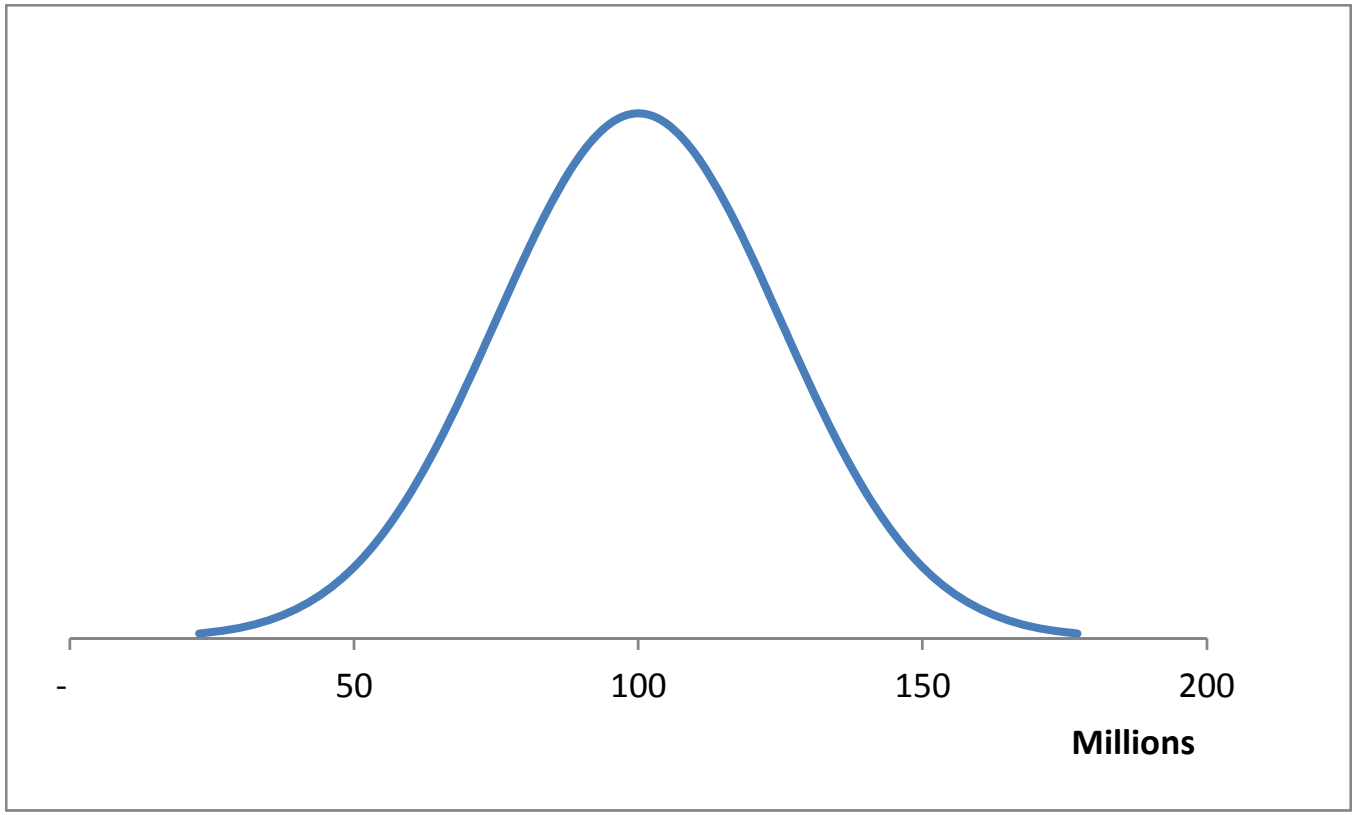
The Power of Visualization

- Ability to understand scale of key relationships quickly.
- Not just important for explanation to management.
- Important for our own understanding as well.

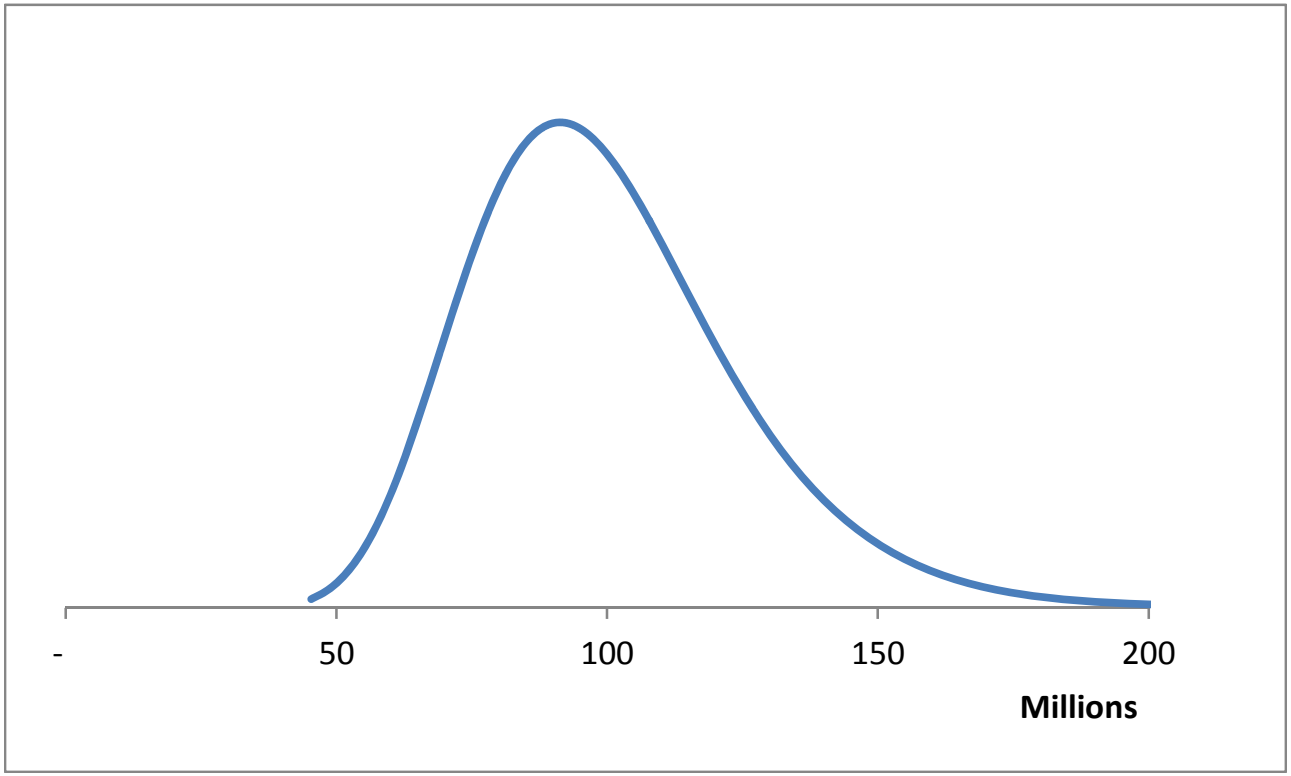
The Challenge with Visualizing Variability

- The type of variability we deal with is, by its nature, two dimensional (amount and probability).
- Additional dimensions (strategy alternatives, for example) become difficult to “see”
- Particular interest in tails, but the rest matters too.
- Skewness can be extreme and makes it more challenging to see both the tail
- Often interested in marginal impact- lost in scale
- Non-additivity of components (i.e. diversification)

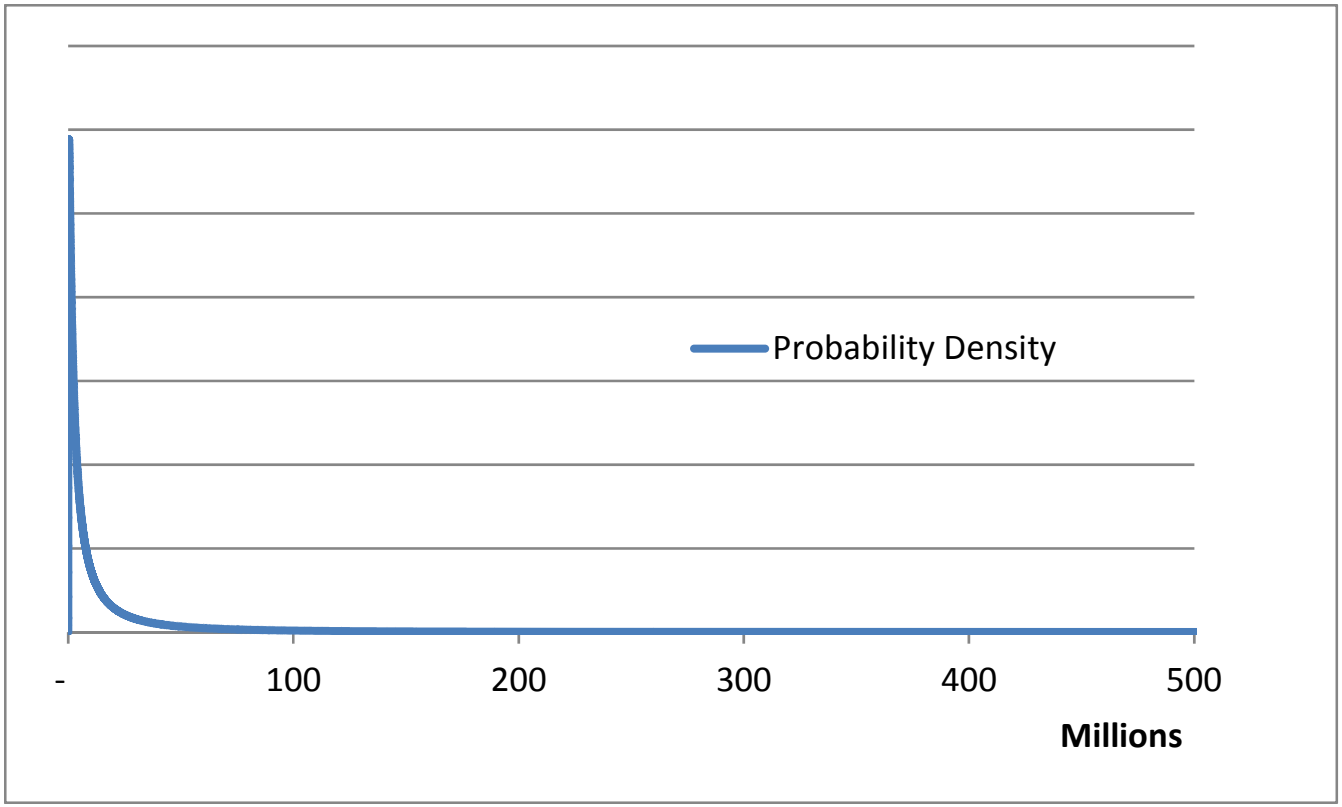
Nice and Normal



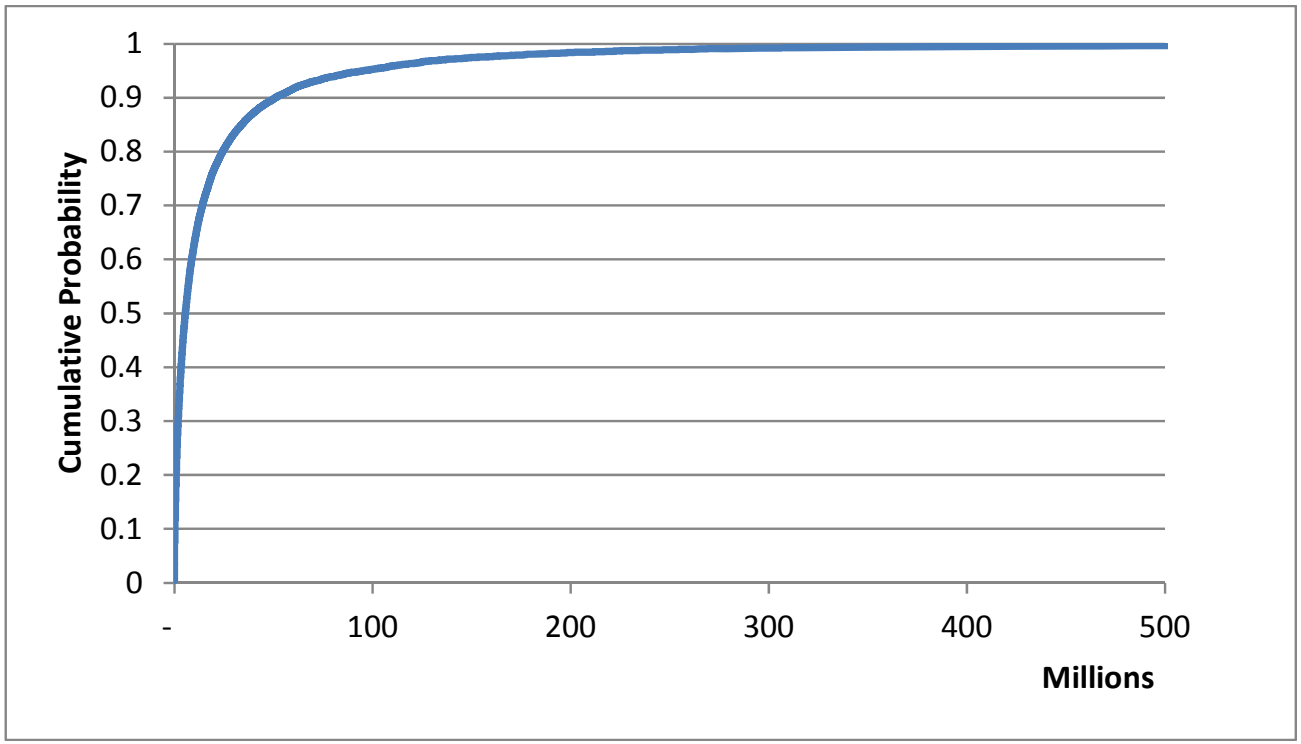
Introduce Skewness



More Skewness - Cat



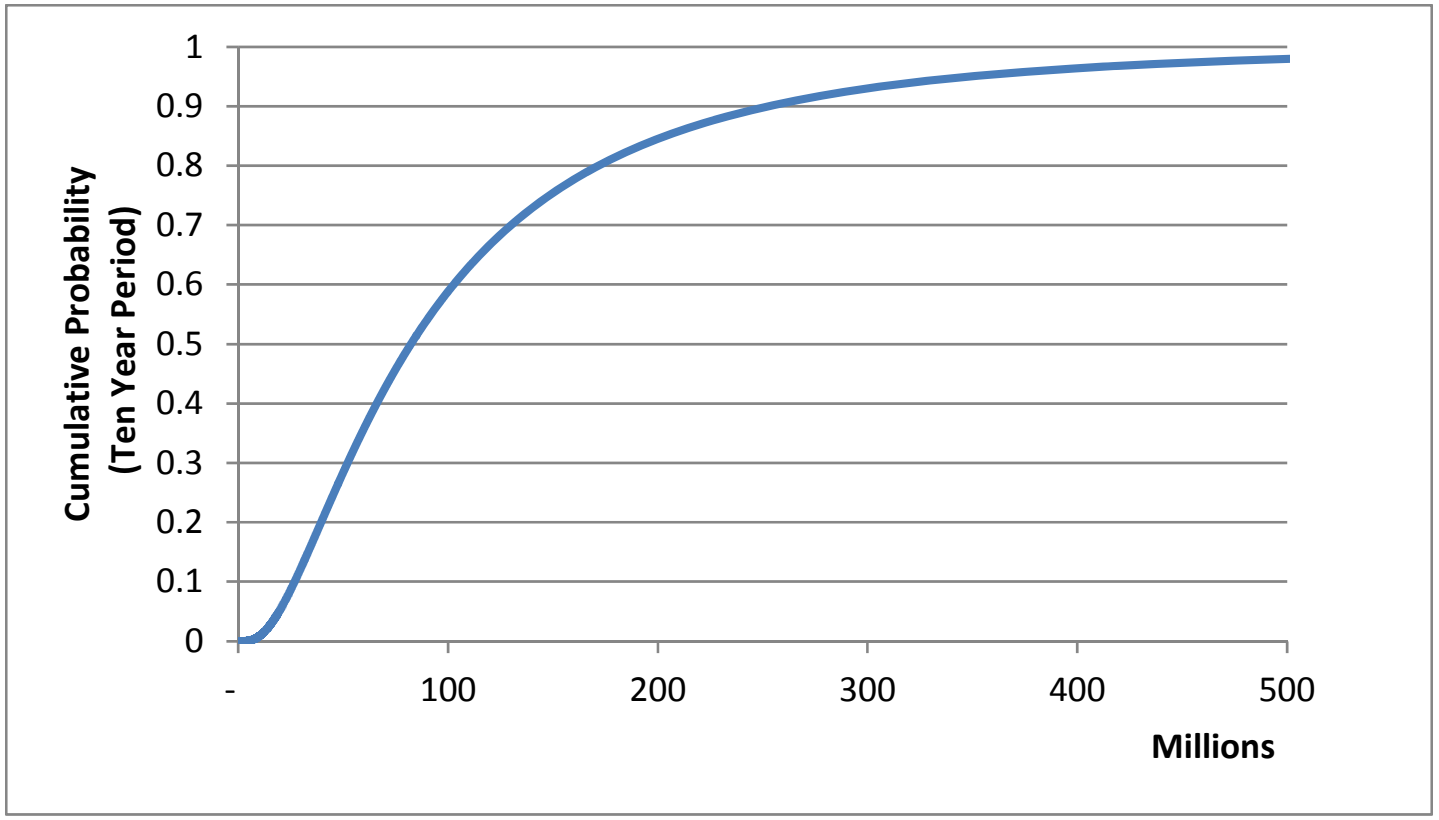
Cumulative Distribution Function



Problem: Skewness

- Log scale – pro and con
- Cat convention – Return period
- Point is not just to see the numbers, but to understand the numbers
- Time is on our side
- CDF of maximum event over an N year period = $F(X)^N$, where F(X) is the CDF of the maximum event for a 1 year period (assuming independence across years).

Problem 1: Skewness



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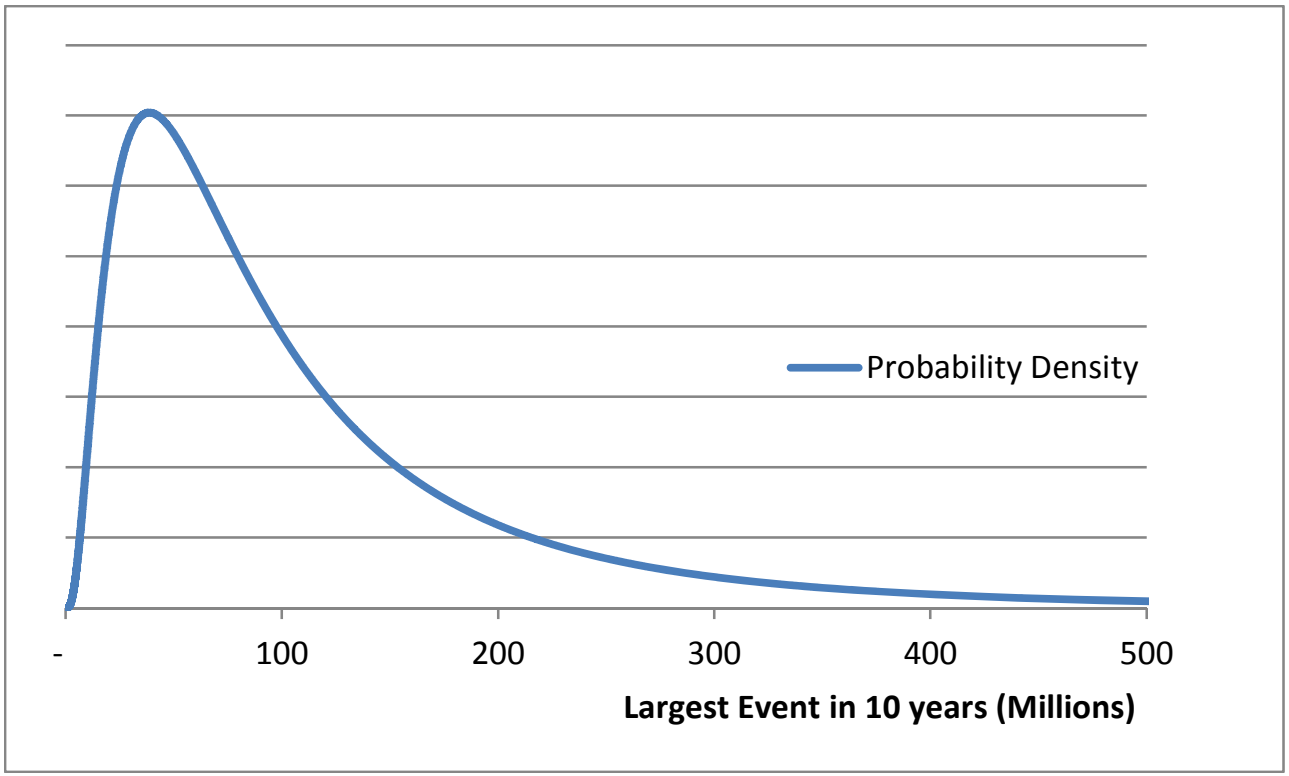
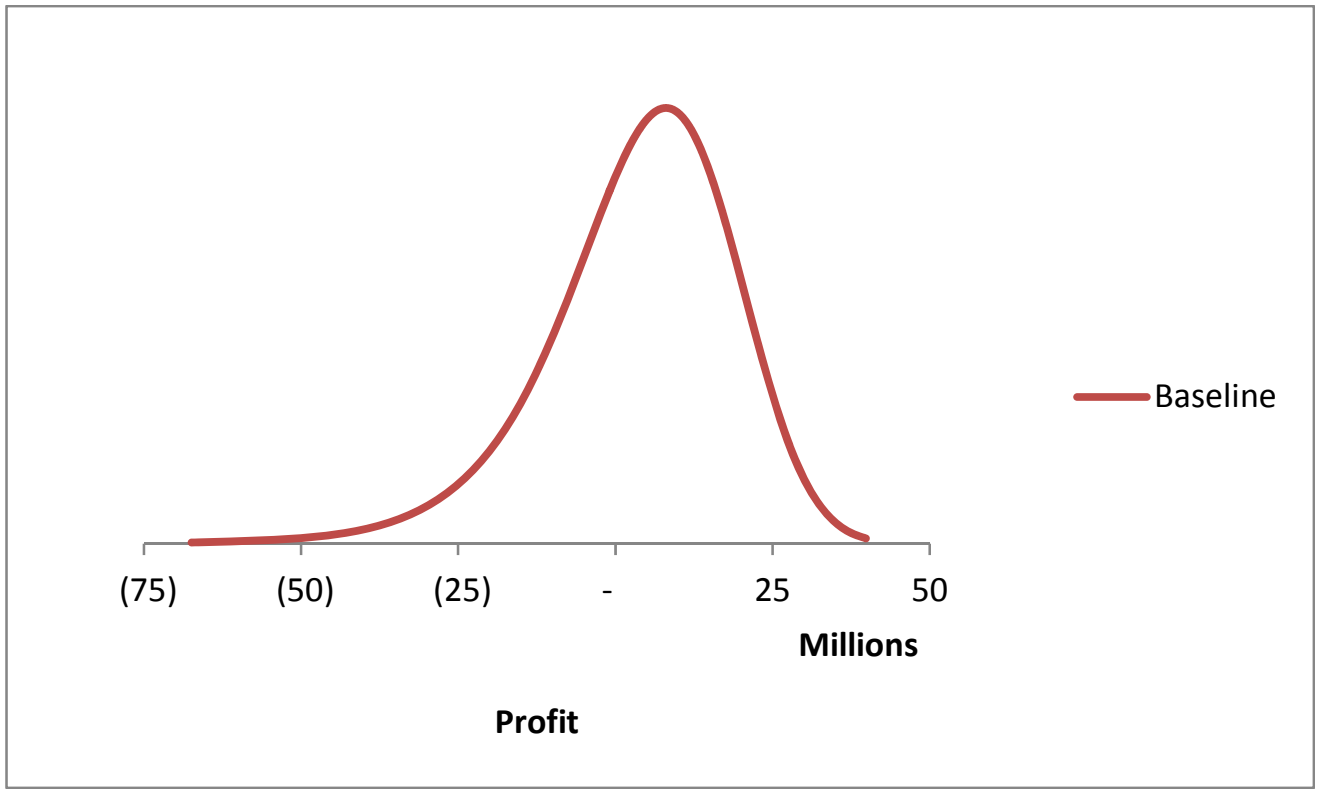


Problem 1: Skewness

- Central Limit Theorem at work
- Aggregation over time is not the only type of aggregation that works to help with skewness.
- For example, visualizing the stand-alone loss variability for a specific insurance account is typically pointless.
- Aggregated risk is much more visible and understandable.
- Highlights the importance of what really matters – **marginal impact to aggregated risk…**

Problem 2: Marginal Impact



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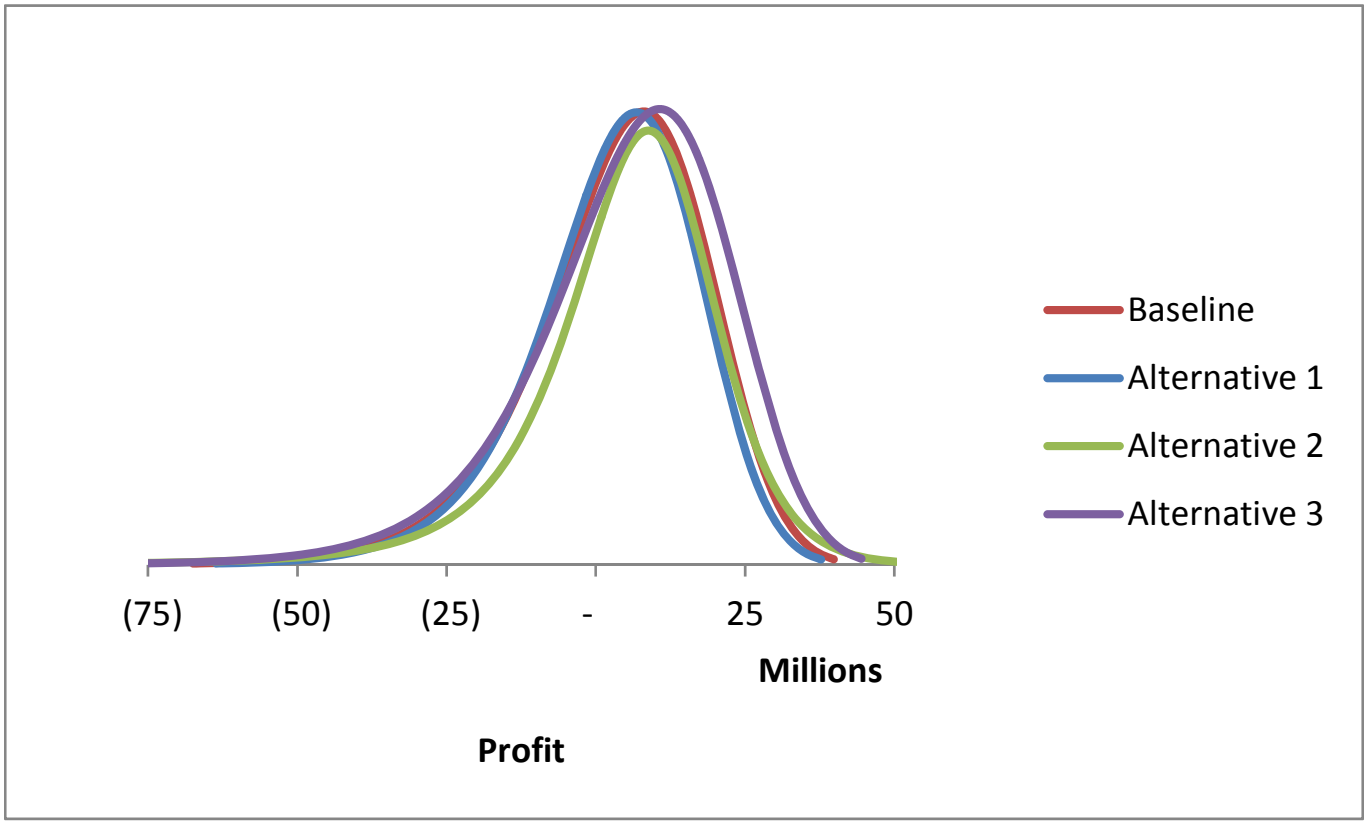

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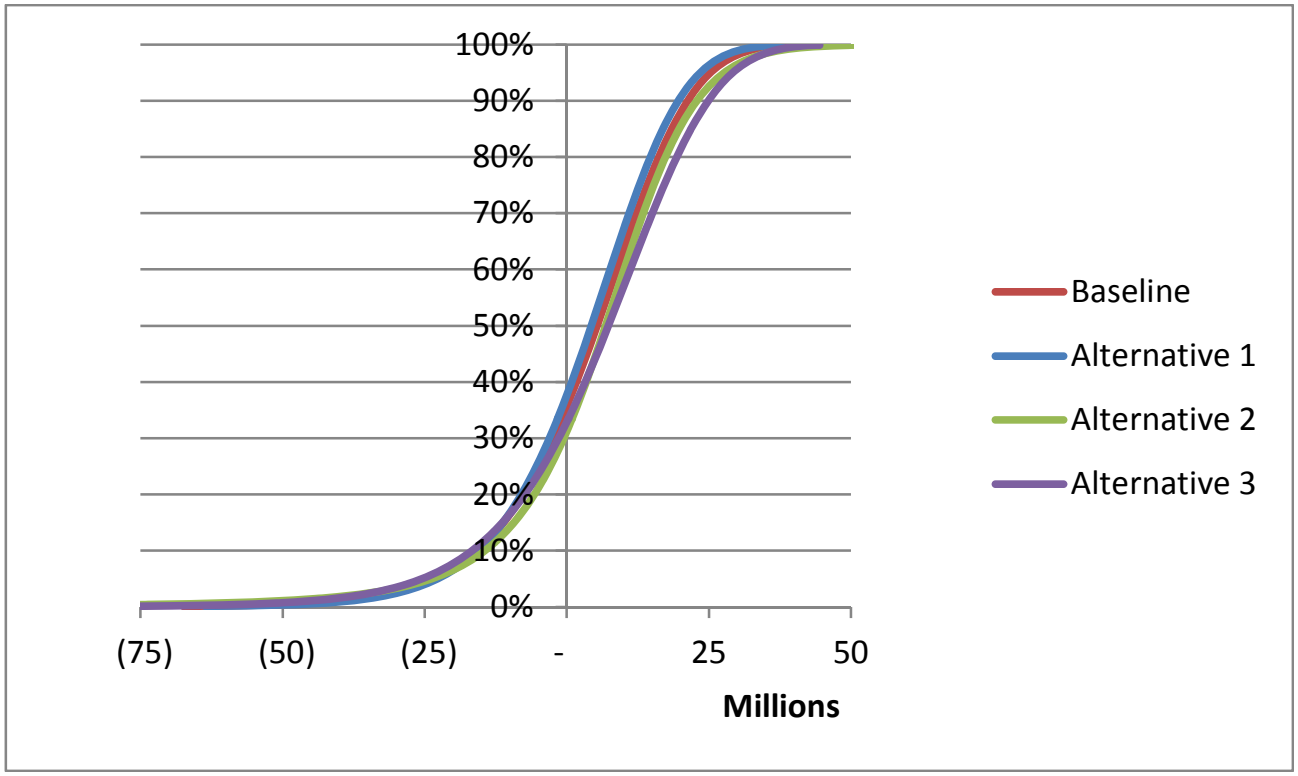

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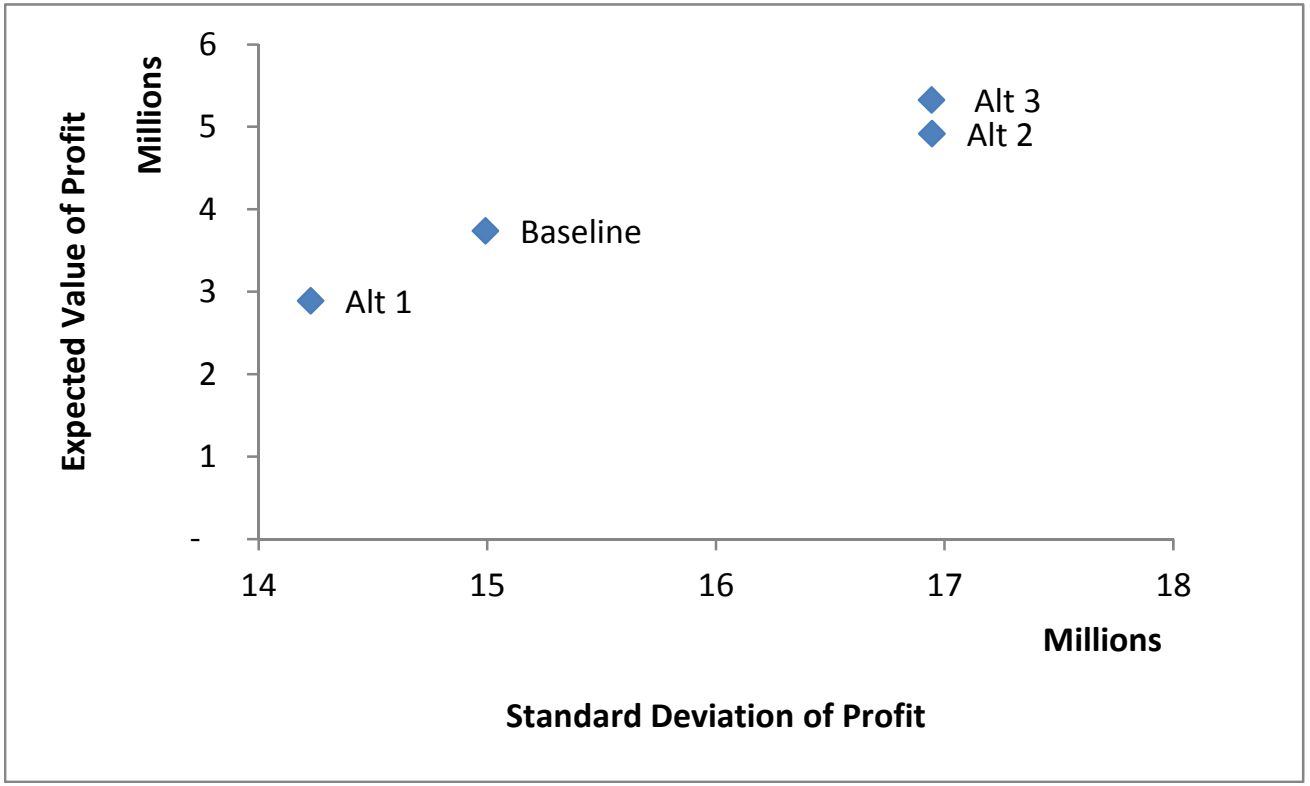

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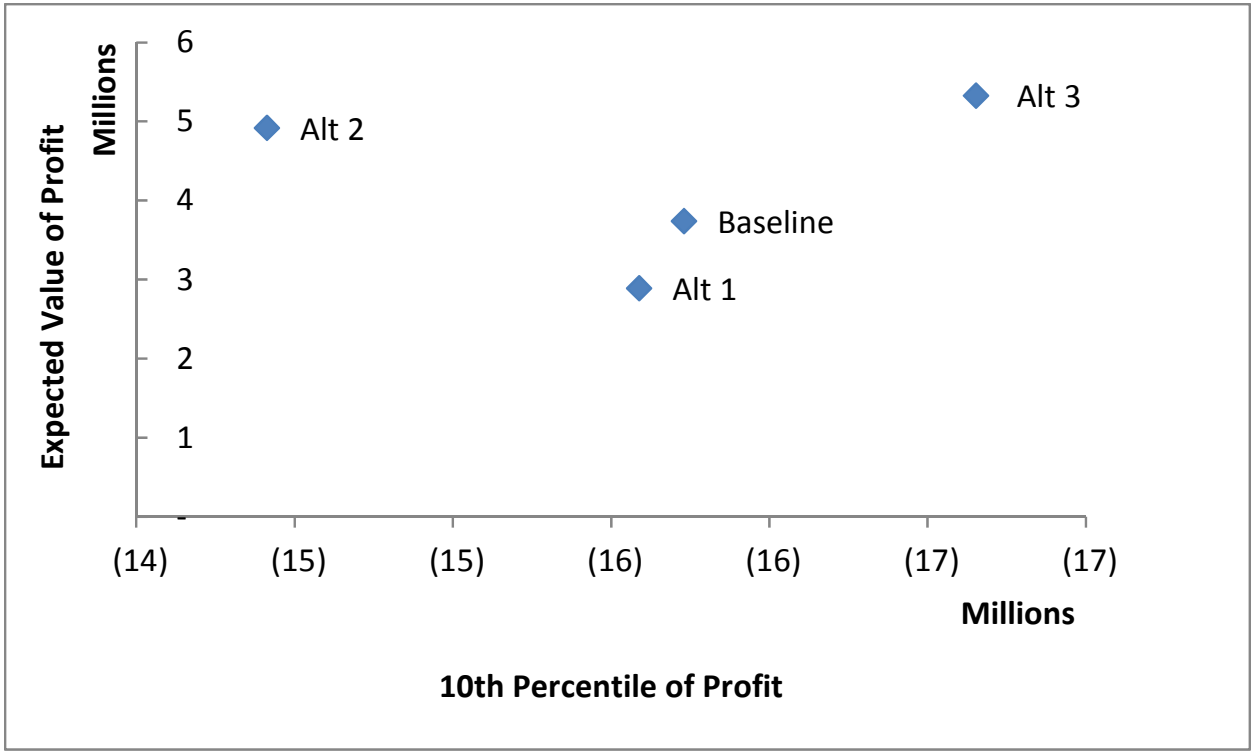

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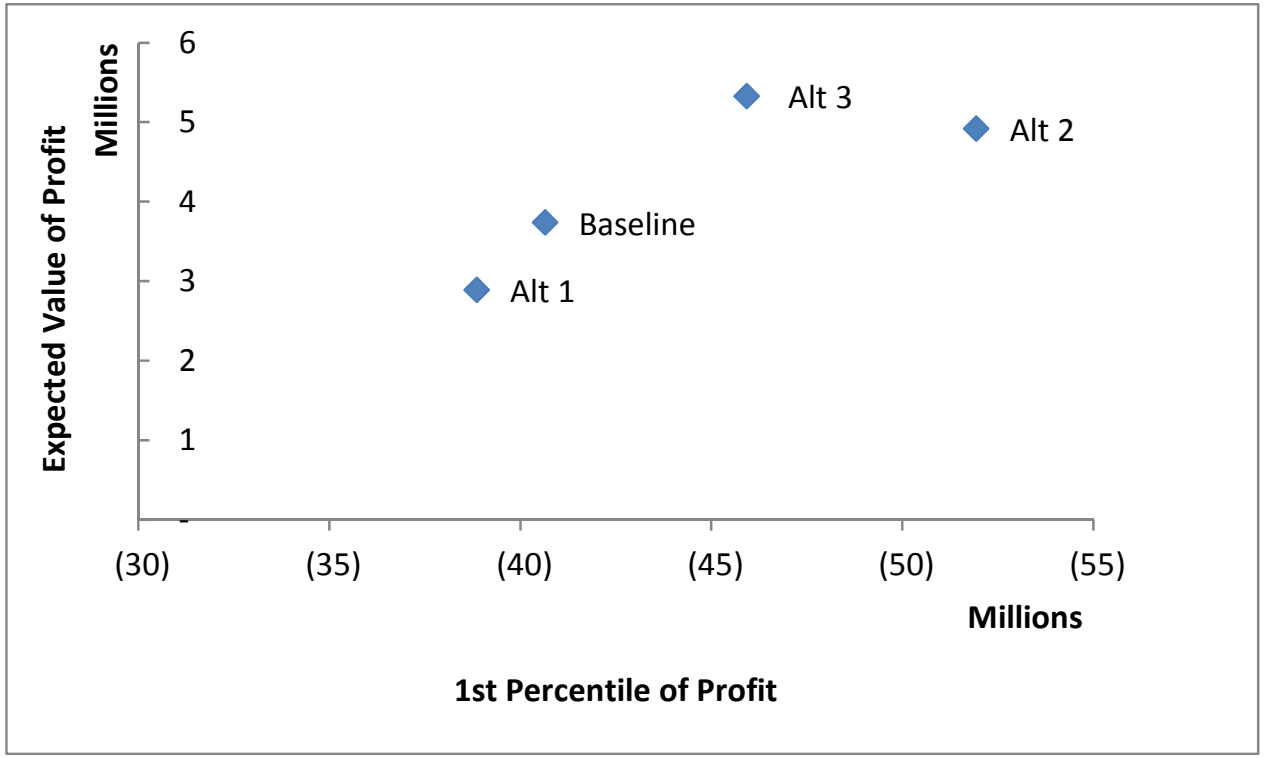

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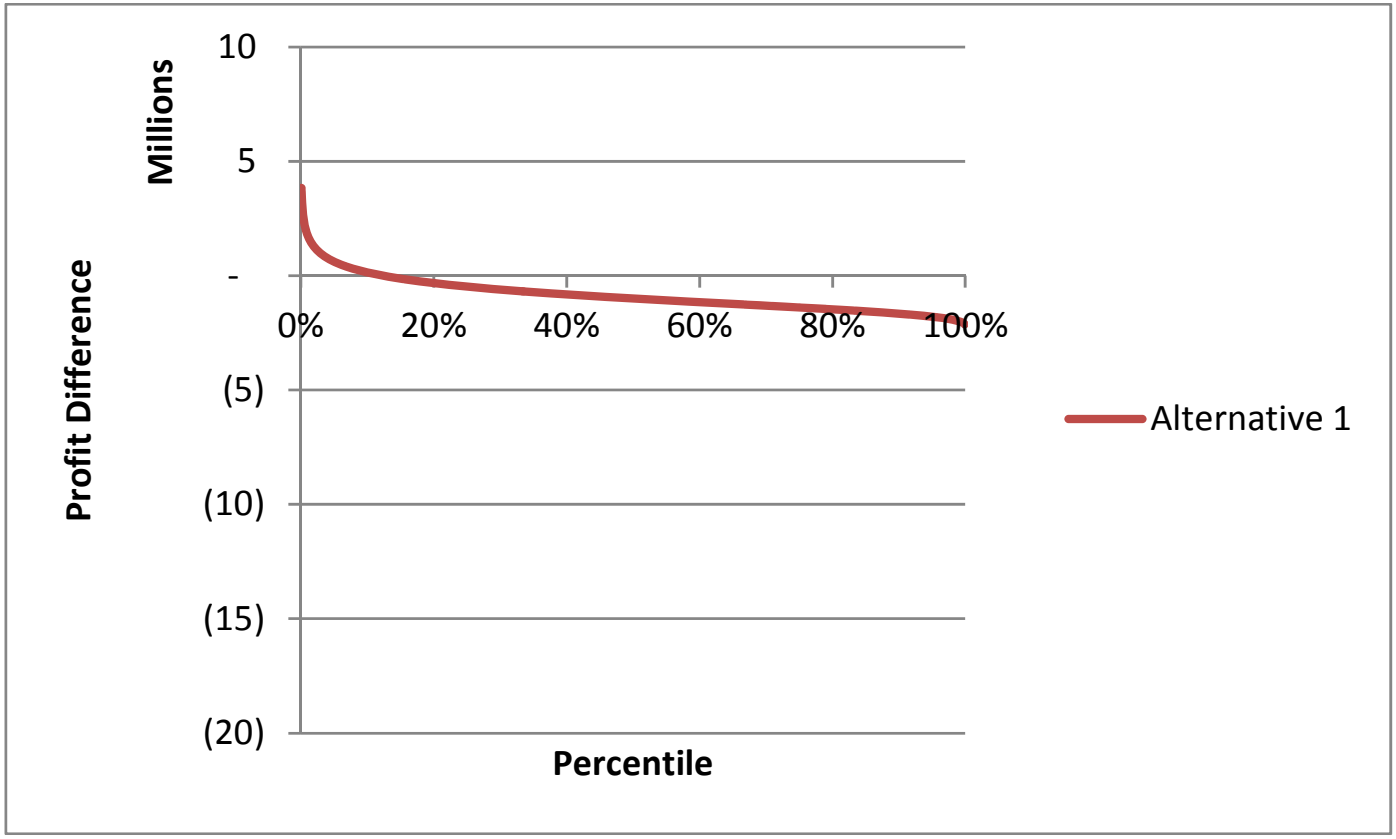

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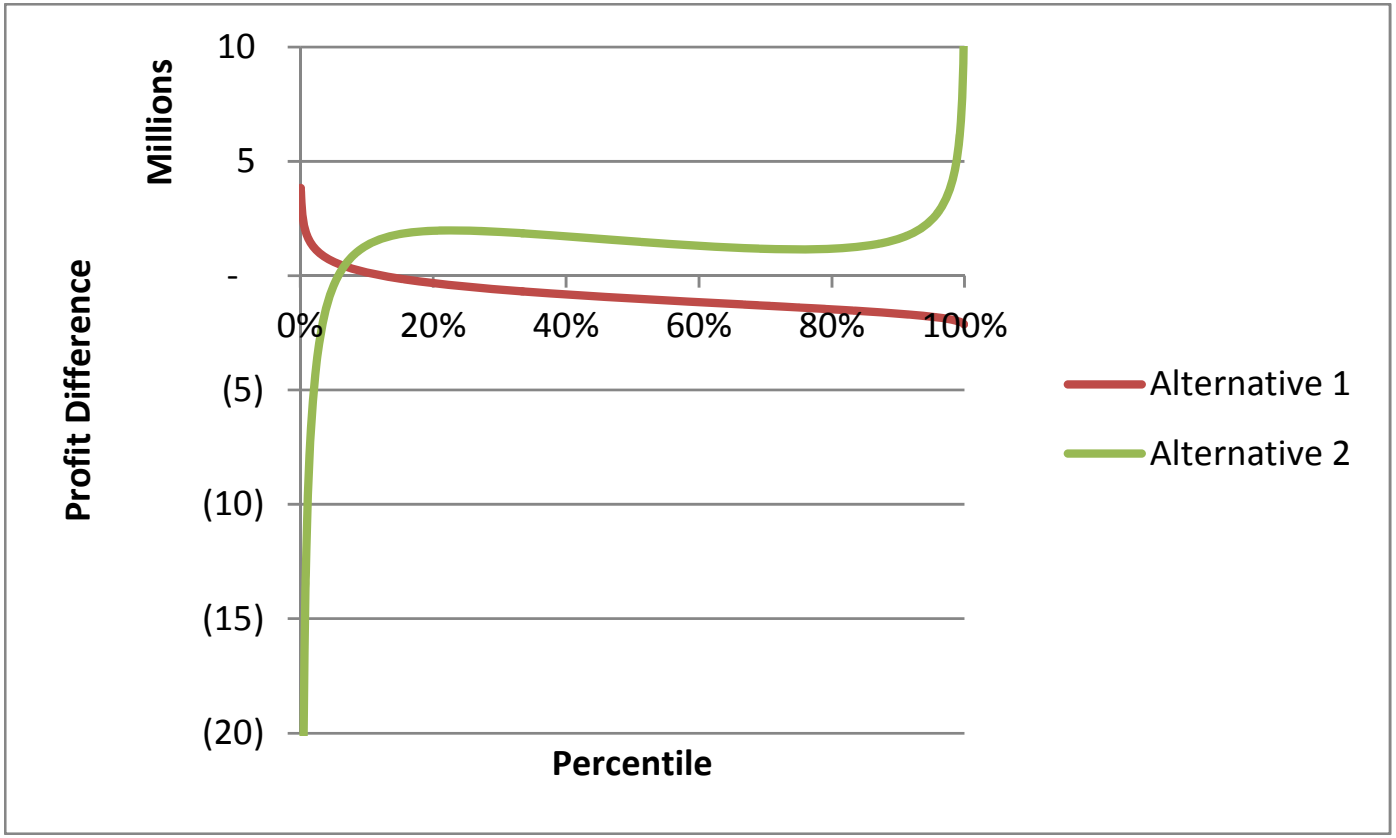

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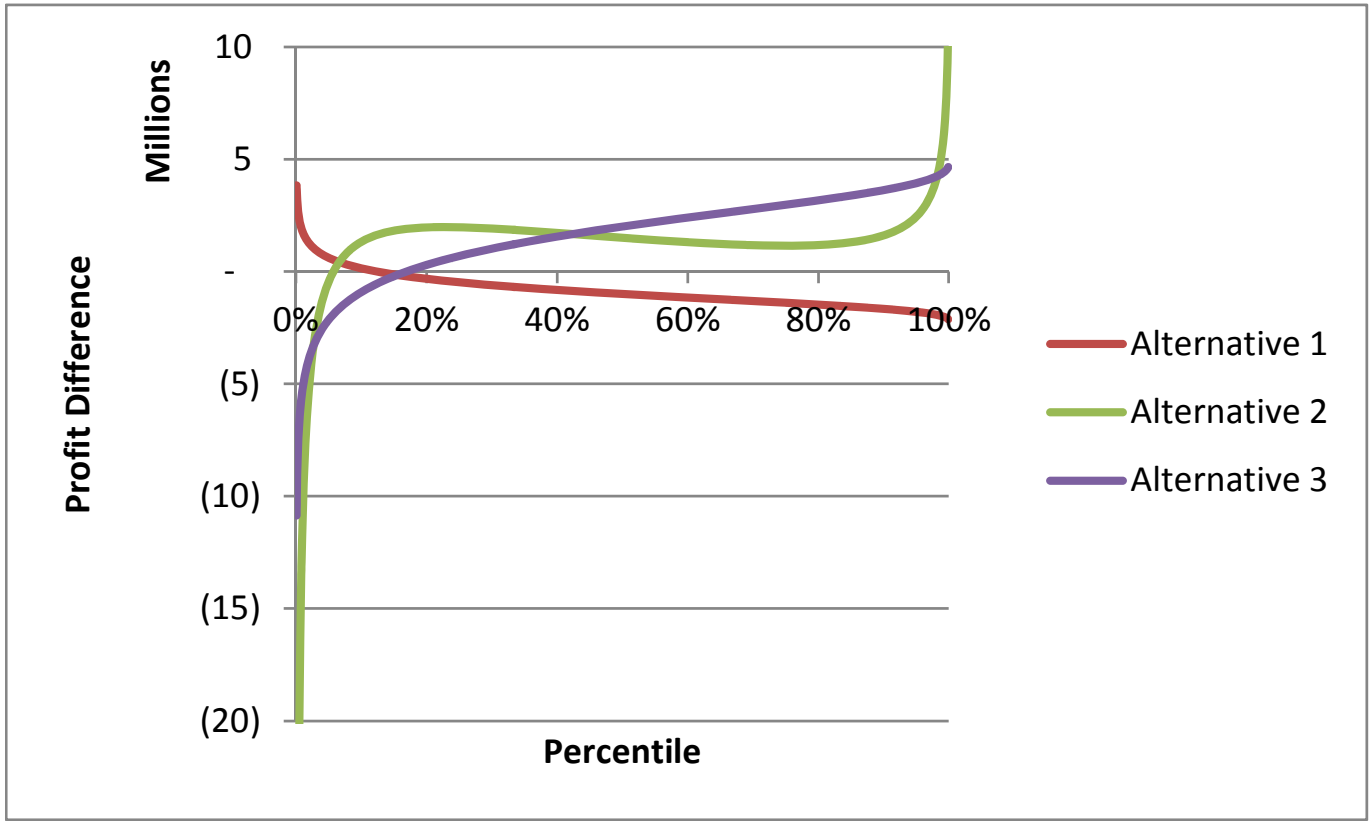


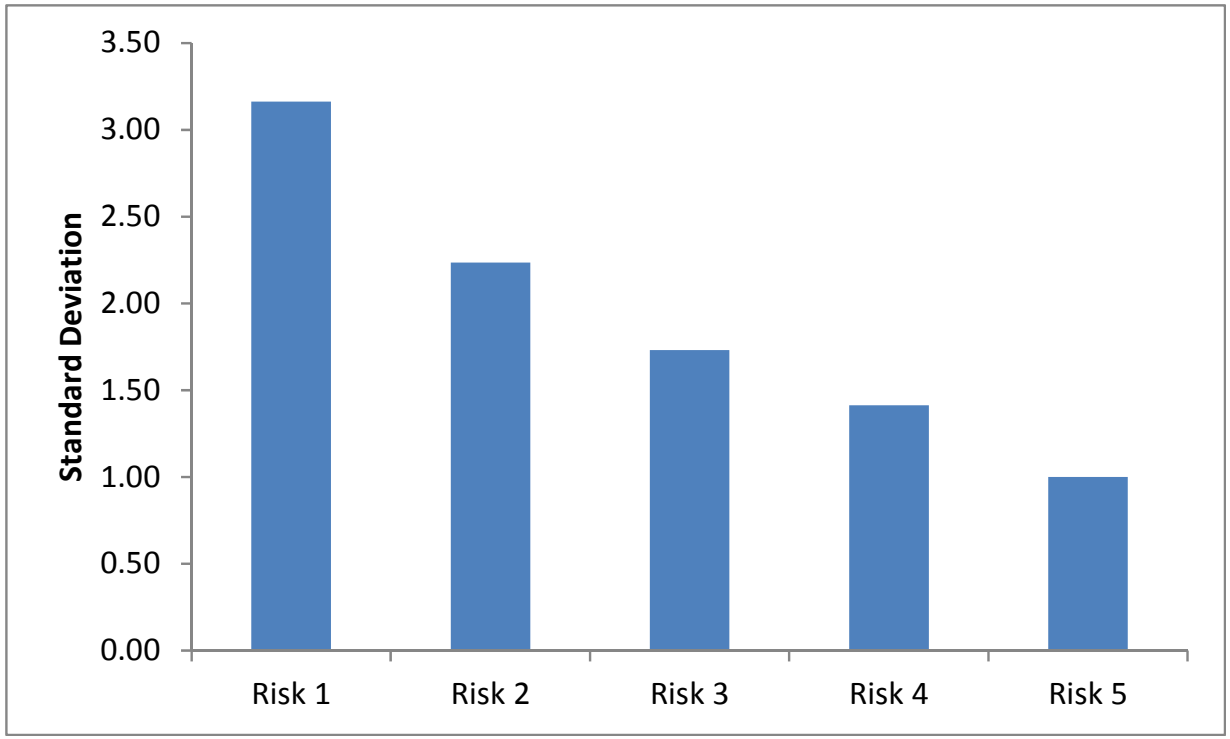
Problem 3: Diversification

	Standard Deviation
Risk 1	3.16
Risk 2	2.24
Risk 3	1.73
Risk 4	1.41
Risk 5	1.00
Combined	5.92

Correlation Matrix

	Risk 1	Risk 2	Risk 3	Risk 4	Risk 5
Risk 1	1.00	0.00	0.73	0.22	0.32
Risk 2	0.00	1.00	0.00	0.00	0.00
Risk 3	0.73	0.00	1.00	0.00	0.58
Risk 4	0.22	0.00	0.00	1.00	0.00
Risk 5	0.32	0.00	0.58	0.00	1.00

Problem 3: Diversification



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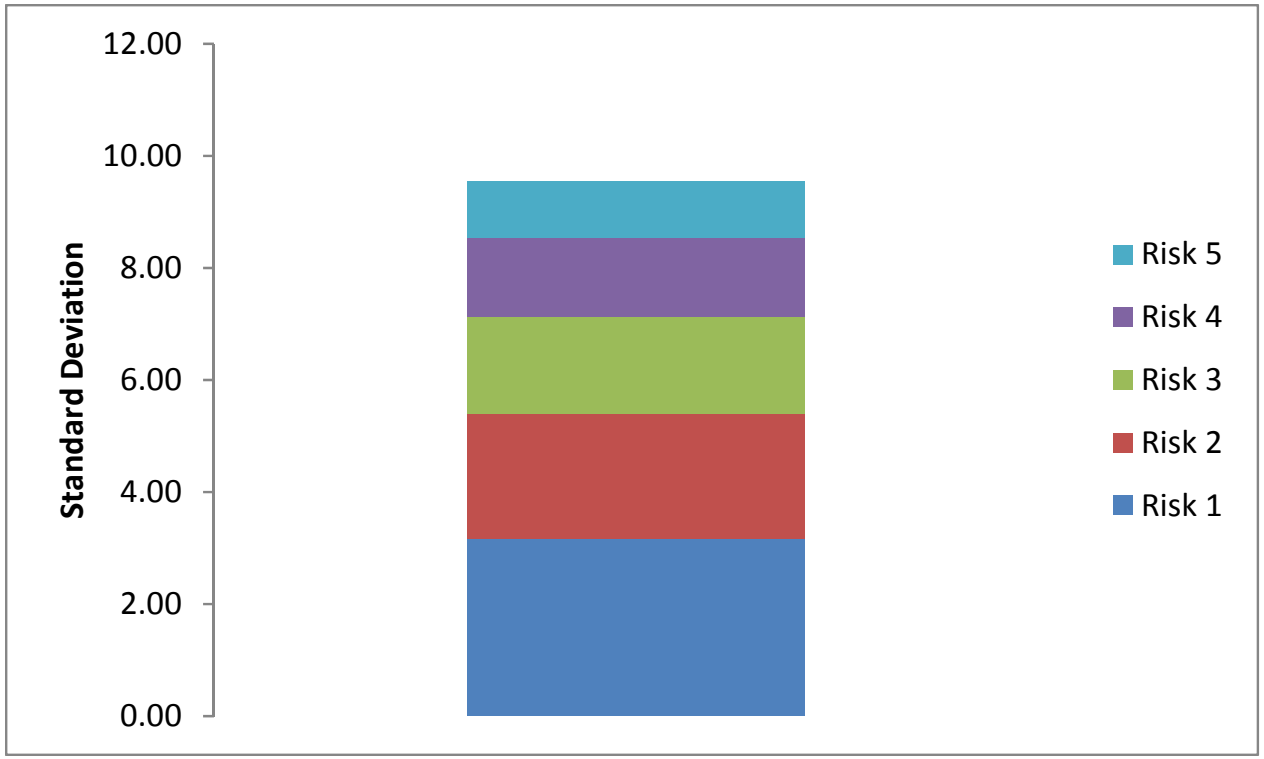

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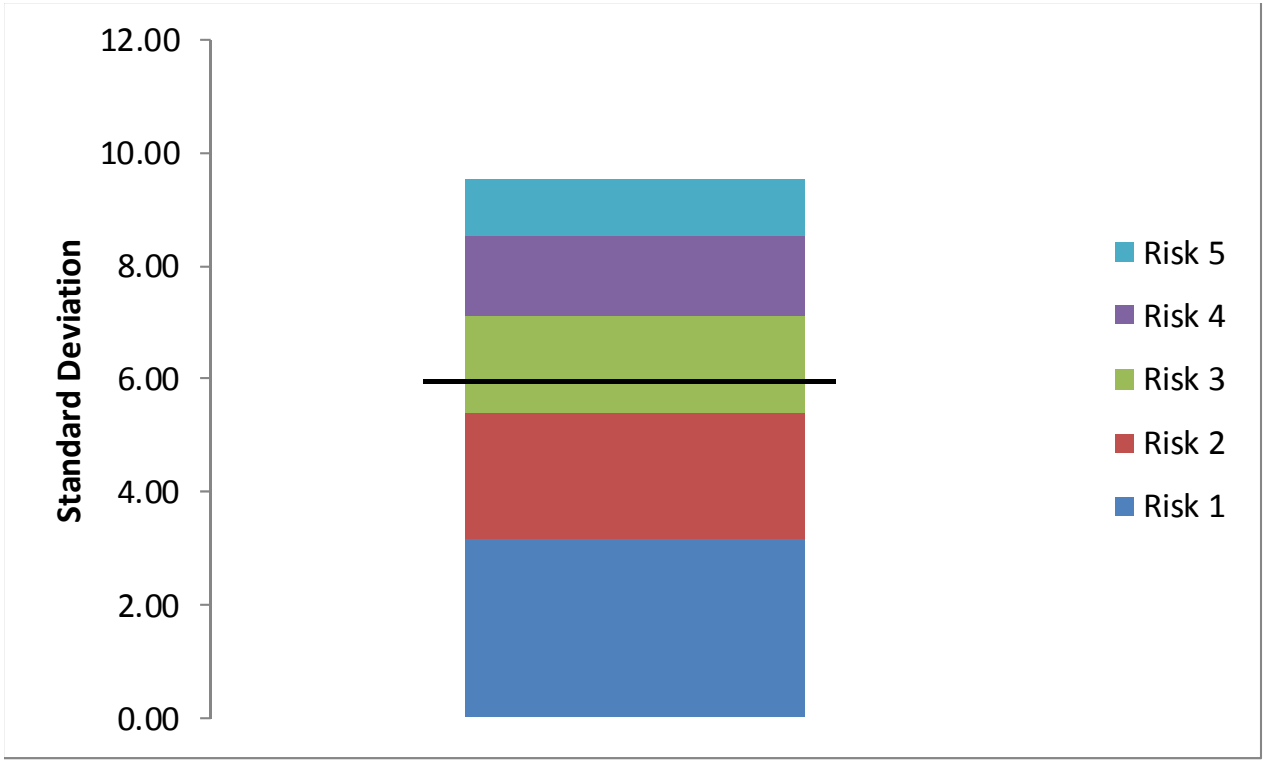

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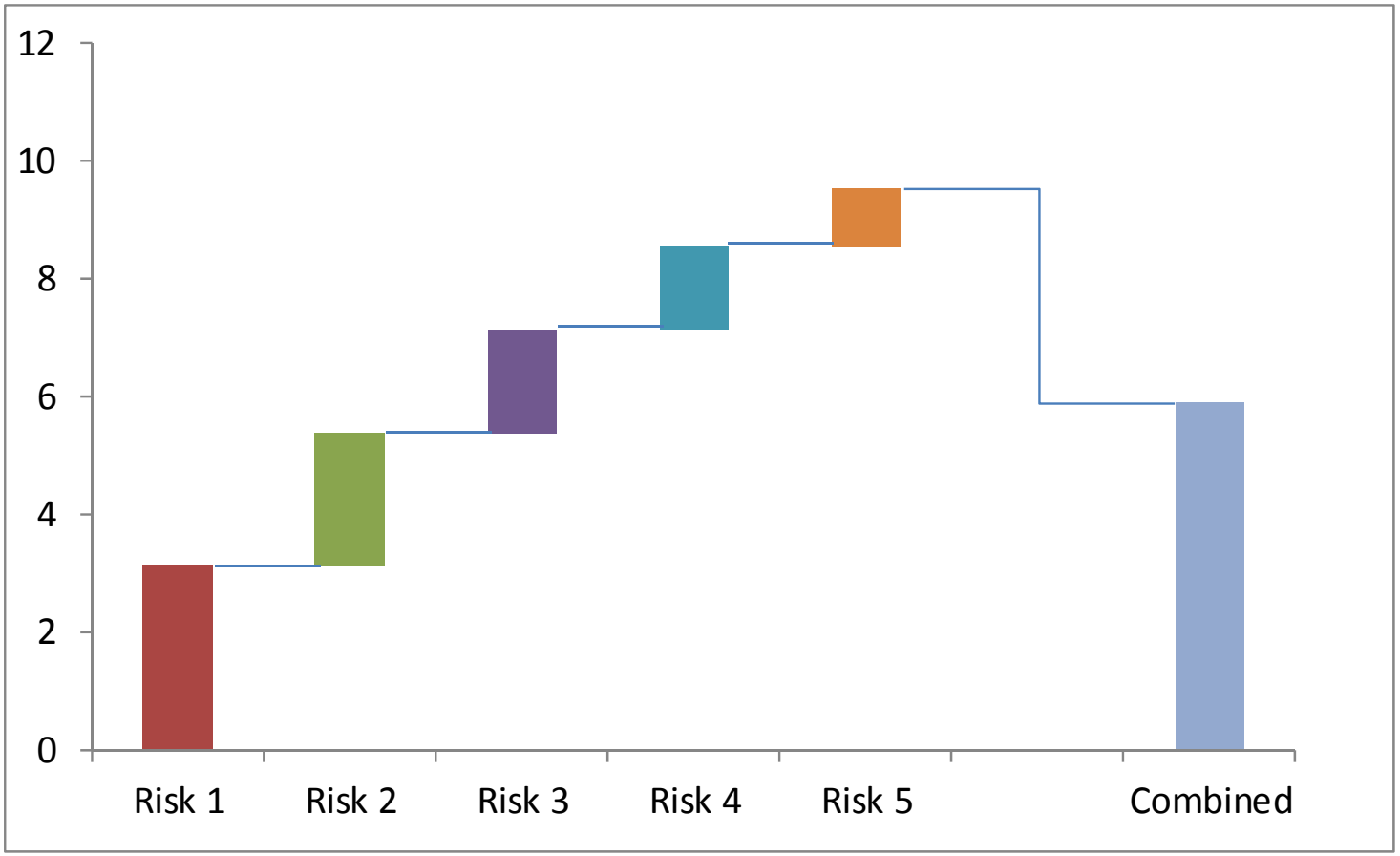
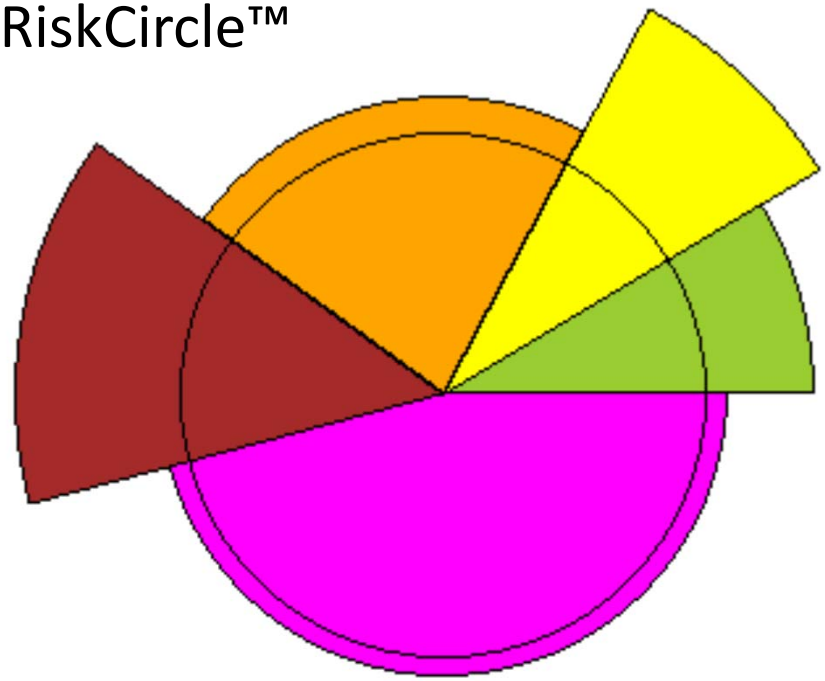


Problem 3: Diversification

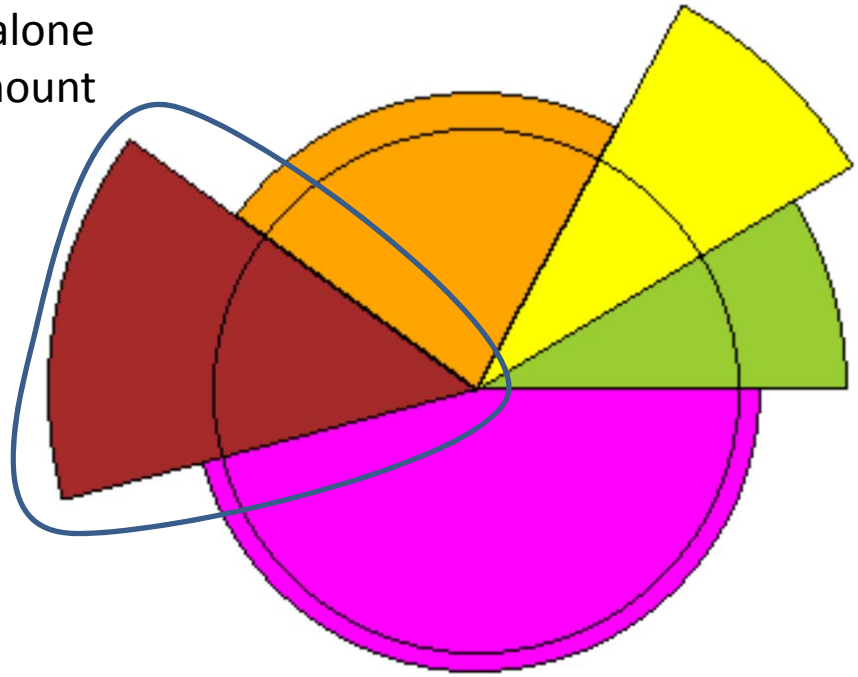
RiskCircle™



Risk 1
Risk 2
Risk 3
Risk 4
Risk 5

RiskCircle™

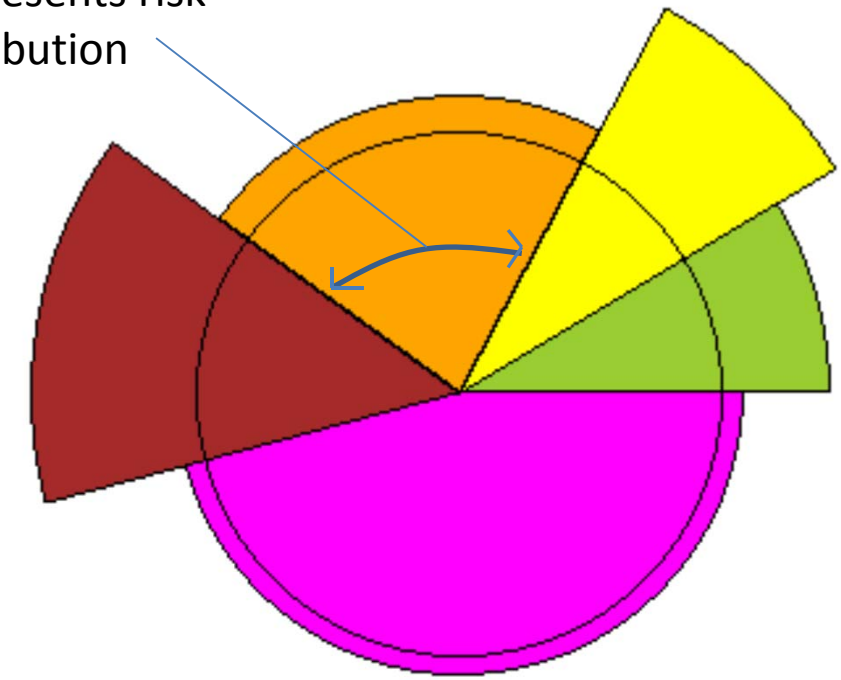
Area of wedge represents stand-alone risk amount



Risk 1
Risk 2
Risk 3
Risk 4
Risk 5

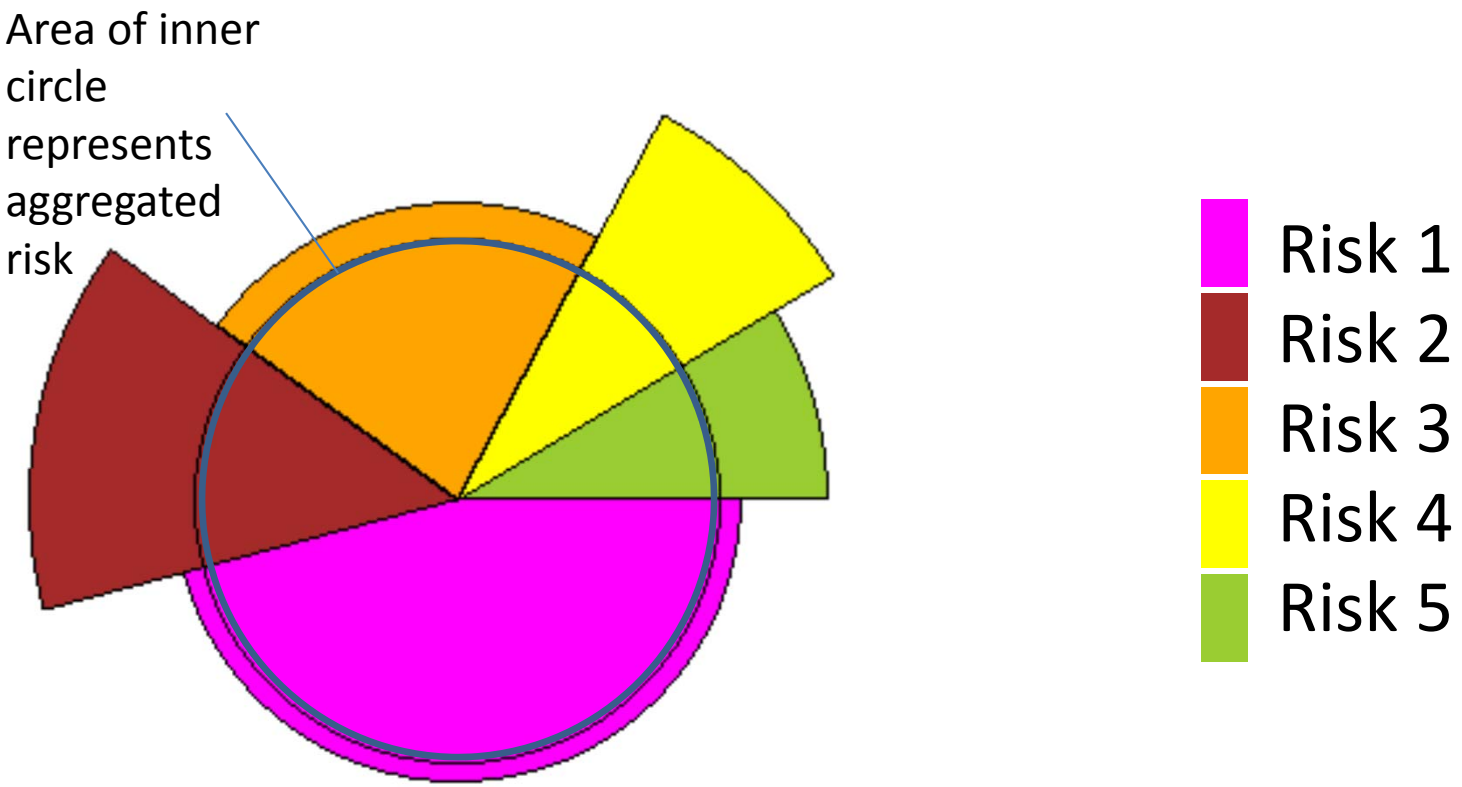
RiskCircle™

Angle
represents risk
attribution

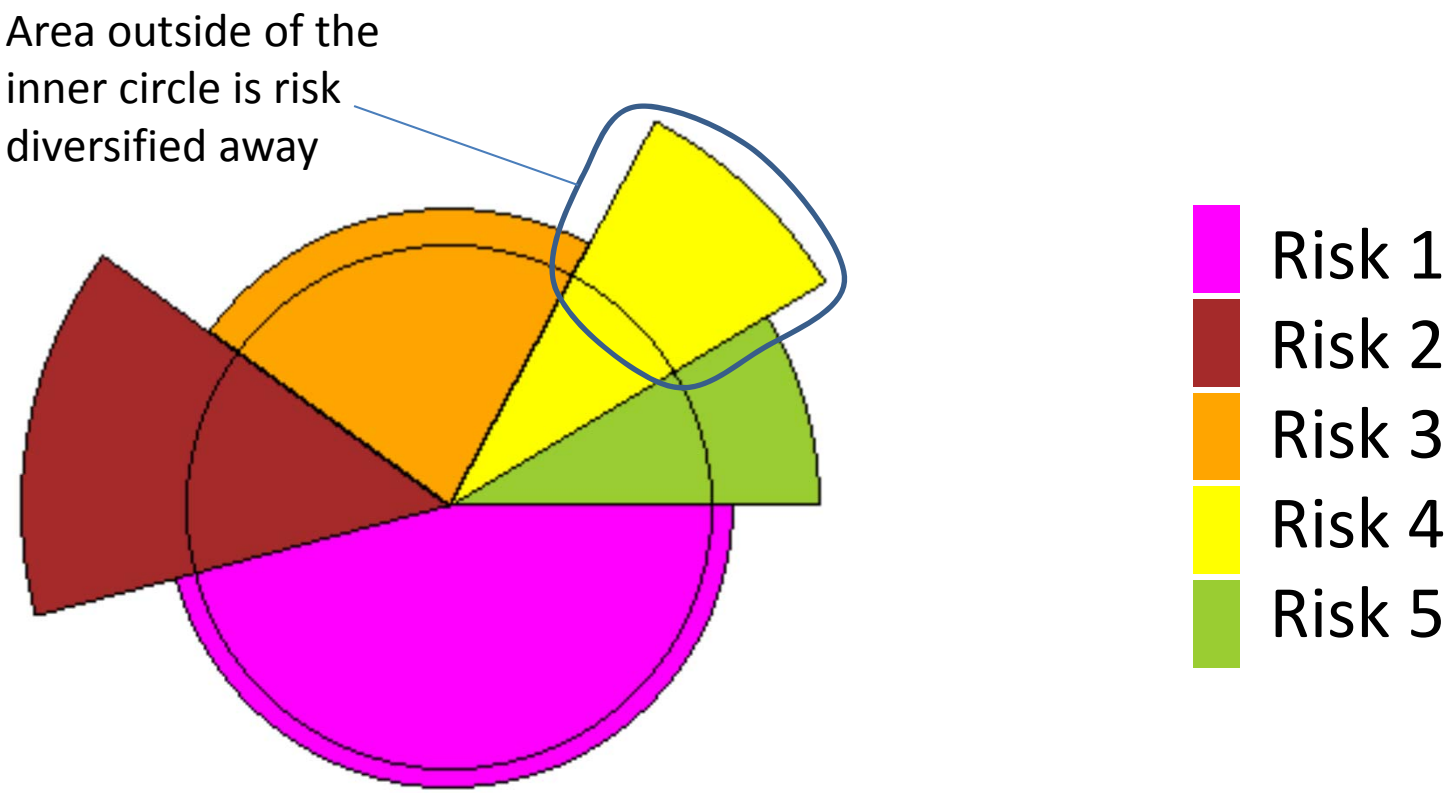


Risk 1
Risk 2
Risk 3
Risk 4
Risk 5

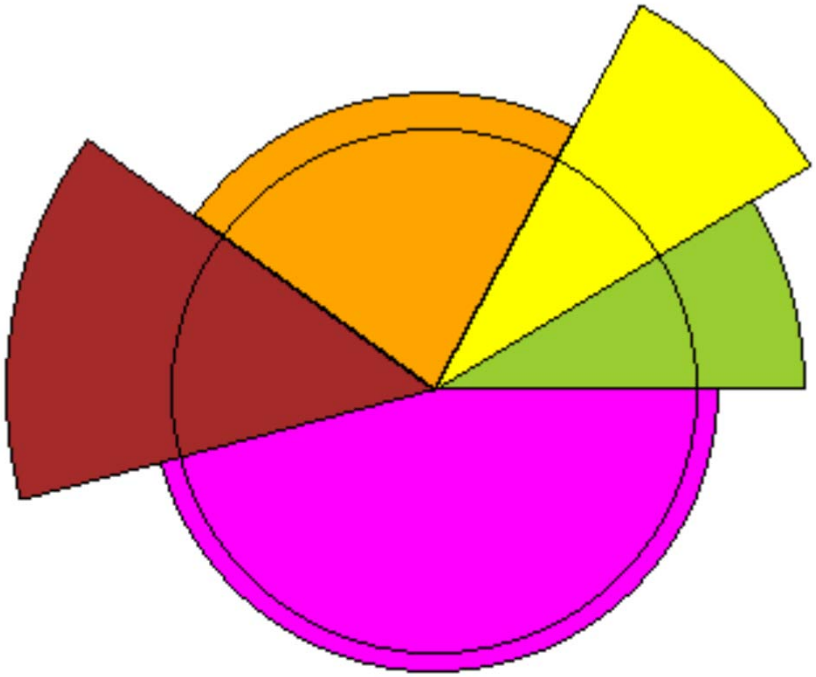
RiskCircle™


Area of inner circle represents aggregated risk
Risk 1
Risk 2
Risk 3
Risk 4
Risk 5

RiskCircle™


Area outside of the inner circle is risk diversified away
Risk 1
Risk 2
Risk 3
Risk 4
Risk 5

RiskCircle™



Risk 1
Risk 2
Risk 3
Risk 4
Risk 5

Create your own at www.riskcircle.com

Questions?