The Actuarial Advantage, Inc.
TAA

Kyle Mrotek, FCAS, MAAA: KMrotek@taa-inc.com
Michael Solomon, FCAS, MAAA, CERA: MSolomon@taa-inc.com

Maximum Captive Premiums: a Black-Scholes approach

The Problem

The IRS is scrutinizing the premiums for enterprise risk captive insurance companies. One issue is whether premiums are reasonable. Excessive premium are seen as a signal that the insured's motivation is not to fulfil an insurance need, but tax avoidance. One captive regulator[i] has written: "If a captive regulator receives an application in which the "cost" of coverage by that captive is, say, 10% to 12% or more of the revenue of the insured, alarm bells should go off."

So what premium to revenue ratio is reasonable? One simple approach would be to investigate how much companies currently pay for insurance from private carriers, compared to their revenues. However private carriers will not cover certain risks: companies would like to buy coverage, but no carrier is willing to sell. Indeed many captives are formed with the intent of providing coverages not easily found in the private market. So an indication based on premiums paid to the private market would be too low. Additionally, premiums swing up to 75% between hard and soft markets, making the ratio at any point in time less credible as a guide to what is reasonable.

A Solution

This article presents a benchmark supported by universally accepted financial pricing theory. An American put option allows the option owner to sell an asset at a specified price by a predetermined date. Conveniently, the mathematics of pricing American put options is universally accepted by academics and practitioners. The Nobel Prize for Economics in 1997 was awarded to the authors of the paper introducing the model often referred to as the Black-Scholes model.

According to Wikipedia the most obvious use of a put option is as a type of insurance. Companies seek to insure against losses to their business. While coverage for some losses is not available in the private market, the price of a put option should capture all the risk to which a company is exposed.

Black-Scholes

The Black-Scholes model is the standard model for pricing options. The underlying mathematics of the Black-Scholes model is beyond the scope here but covered in depth by many other authors. An American put option pricing model is available at http://www.optionspricevaluation.com/
Select Put for option type and American for style.

Select the value of the insured firm for the Strike Price corresponding to first dollar insurance coverage. In this case assume the value of the insured is $10 million.

Enter the risk-free rate. For the sake of simplicity select 1%.

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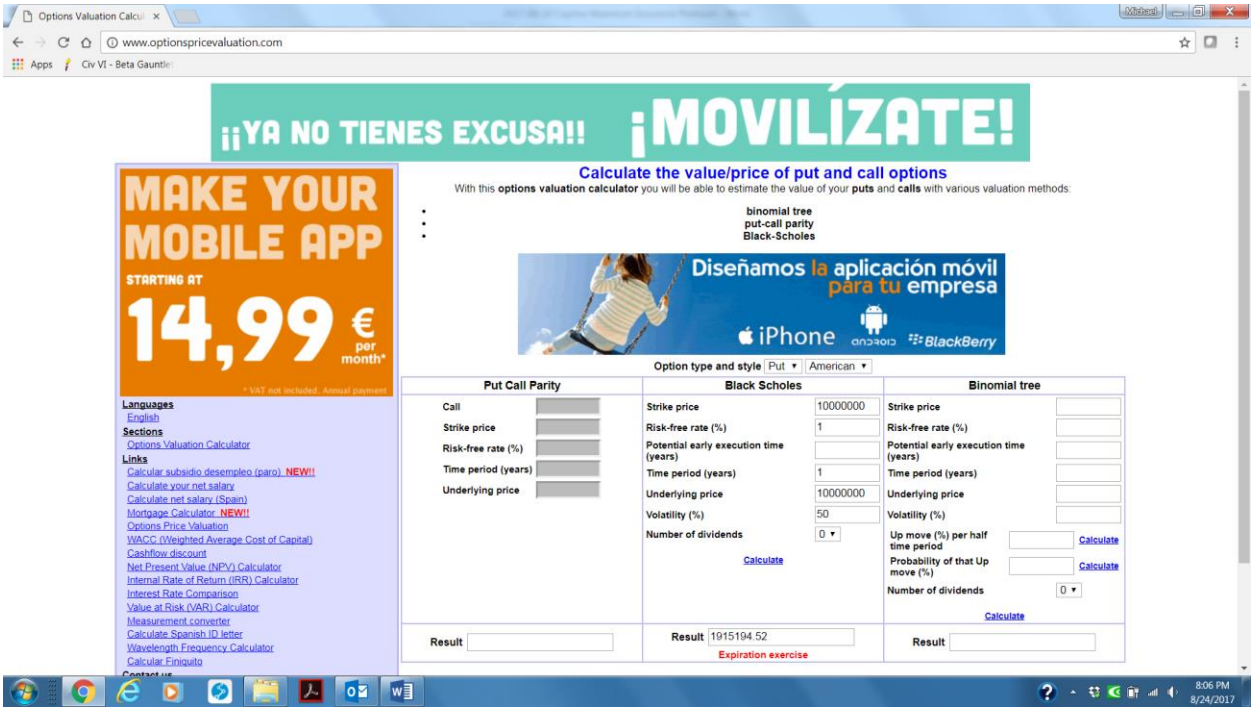
Potential early execution time (years) indicates a loss and claim can occur upon policy inception but before the policy expires.

Time period (years) 1 corresponds to a one year policy term.
Underlying price 10000000 corresponds to the value of the firm in this case $10 million.

Volatility (%) 50% based on articles by Radford[ii] and Reitter[iii]



The indicated value of the corresponding American put is $1.915 million for a firm valued at $10 million. Assuming a loss ratio of 65%, the corresponding insurance premium figure is $2.95 million or 30% of the firm value.

Enterprise Value to Revenue ratio

To express as a function of revenue, we need to estimate a value to revenue ratio. This will vary from company to company, depending on their industry and stage in the business life cycle. Companies in new, growing sectors such as internet software have higher Enterprise Value to Revenue ratios that mature sectors such as steel. The total market value is 2.65[iv], which we will assume for the purposes of this paper. So a company with a revenue of $3.77 million would be expected to have an Enterprise value of $10 million.

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Premium to Revenue ratio

The indicated Premium/Revenue ratio would therefore be:

Premium/Revenue = Premium/ Enterprise Value * Enterprise Value/ Revenue
Premium/Revenue = 29.5% * 2.65
Premium/Revenue = 78.1%

Conclusion

The average company would maximally spend 78% of its revenue on insurance premiums. This is significantly higher than metrics currently being mentioned within the captive and insurance industries. A company with $3.77 million of revenue plausibly pay a maximum of $2.95 million for insurance.

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[i] James Landis, Delaware Captive Insurance Association board member, "How to prevent IRS Issues for Captives", InsuranceThoughtLeadership.com, published June 14, 2015. Retrieved 2016-12-26: http://insurancethoughtleadership.com/how-to-prevent-irs-issues-for-captives/

[ii] https://www.radford.com/home/ccg/valuation_services/Radford_Brief_Calculation_Historical_Volatility.pdf

[iii] "Long-Term Volatility Forecasting", Nicolas Reitter, PriceWaterhouse Coopers (PWC) LLP, April 25 2012, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2046192, retrieved 2016-12-26

[iv] Dr. Aswath Damodaran, data of as 2016-01-05, http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/psdata.html, retrieved 2016-12-27