Evaluating Business Unit Profits: Capital Consumption, Financial Guarantees and Firm Value

The capital consumption method derives from the paper of Merton and Perold[1], which says that the company provides a financial guarantee to the clients of the business segment. You can use option pricing to determine the value of this financial guarantee. The value of this option would then become the cost of capital allocated to this segment. This method does not divide profit by capital to get a return on capital by business segment. Rather it subtracts the cost of capital from the profit to get the value added by the segment. Merton and Perold's point is that the segment should make at least as much money as the implicit market value of the financial guarantee the company is providing – which can be considered the cost of the capital consumed by the business segment.

The business segment collects premiums and before the losses pay out there is some investment income on those premiums. If the premium and investment income together are enough to pay all the losses, then the segment makes a profit. But if they are not enough, the segment has to ask the company for more money to pay the losses. Customers know this, so they buy the insurance with the understanding that the company is providing a financial guarantee to them. The guarantee is that the company will pay the customers if the segment itself runs out of money. A guarantee like this is a kind of option – a put option actually. In informal vocabulary you can say that the customers have the option to put the extra losses to the company. It is more complicated than most put options in that it doesn't have a pre-determined payment date. Whenever the segment runs out of money the company has to take over payments, and then it has to pay all future amounts due. You can think of there being a separate guarantee provided on each policy year, so you can compare the cost of that guarantee to the profits for the year. The cost (or value) of the guarantee is what it would cost in financial markets to buy an option that would provide the funds to cover the payouts in case they are necessary. This can be estimated by options pricing methods, and that is the value of the financial guarantee.

Now you could look at the profit each year and see if it is greater than the cost of the guarantee that the company is providing. But the usual case is that some years will be higher and some years will be lower. You could look at the average over several years,

---

[1] Merton, Robert and Perold, Andre(1993) "Theory of Risk Capital in Financial Firms," *Journal of Applied Corporate Finance,* Fall

but another way to measure the profit is to also use options pricing methods on it. There would not necessarily be a profit in every year, so the profit is a contingent value, and options pricing is used to put a price on contingent values. Options pricing would try to compute the probability distribution of the profits for the next year, which have some probability of being zero. The company has a call option on the profits of the business segment. If the profits are positive, the company gets all of them, otherwise it gets nothing. The value added by the segment is the value of this call option minus the value of the financial guarantee.

Options are not traded on their pure expected values. There has to be a profit provision for taking the risk. The way the profit is built into options prices is to find an altered probability distribution that has a higher expected value for the option than its real expected value under true probabilities. If the altered probabilities are chosen right, the altered expected value will be the true expected value plus a loading for risk, and the loading will give the market price of the option. In that case, the altered probabilities are called "the risk-neutral measure" as you can price options with just the mean value from these probabilities, with no additional loading for risk.

Now apply this to the value added of the segment, i.e., the value of the call option the company has on the profits of the business segment minus the value of the put option the company is providing to guarantee payment to the customers. If you combine those options, they just say that the company gets all the profits and pays all the losses. You can also price that deal with a risk-neutral measure, and it would be the same answer as the call option minus the put option. That price would be the net present value of the results of the business segment taken according to the risk-neutral measure. In general, net present value is the expected value of the cash flows discounted at an appropriate interest rate. All of the calculations discussed above could be done on a discounted basis. If the expected value is taken with the risk-neutral measure, then the net present value is the market value of the business segment's profits.

But there is an issue of how you create the risk-neutral measure. Usually you increase the probability of large losses and decrease the probability of small losses so that the mean comes out higher. But the company is less interested in what are large losses for the business segment and more interested in what are large losses for the company as a whole. So when you create the risk-neutral measure you are better to base the probability transforms on the losses for the whole company. If you then use this measure to take the net present value of the segment, you are back into co-measure methodology. The net present value of the entire company can be computed using the risk neutral measure for the whole company, and when you use this same measure to calculate the net present value of the business segment, the result can be regarded as the segment's co-net present value with the entire firm. If you do this calculation for each business segment, they will add up to the net present value of the whole firm.