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Rationale Used in Establishing the Valuation Process and Discount Rate to NPV Future Cash Flows in a Portfolio of Level 3 Assets

1 Reader Questions

Readers of our paper on *Fair Value Measurement of Level 3 Assets* have asked a good and little understood question about the role of an independent auditor. The question is "Does the auditor determine the discount rate used to arrive at the net present value (NPV) of a portfolio of Level 3 assets?" The simple answer is "not directly" because the auditor's role is to evaluate the reasonableness of the outcome based upon all available facts. The auditor does this by evaluating the process and internal controls used by company management, asking - First, is management using a process that can be consistently and repetitively employed to reach an outcome? Second, is the outcome a "reasonable basis" for the fair valuation? "If a well-documented and controlled process, supported by published research or established as an industry practice, is used to develop the entity fair value estimates, the auditor generally will "audit" the entity process, controls, and calculations rather than run alternative models that may need to be reconciled to the entity estimates[i]".

The second auditor question is definitively answered in an October 2011 published paper, *Longevity Risk in Fair Valuing Level-Three Assets in Securitized Portfolios*[ii], Lynford Graham, Eric Stallard and Peter Mazonas laid out a methodology supported by relevant published and accepted literature and established theorems. This valuation methodology has been affirmed by several major auditing firms. An audit partner from one firm and the firm's consulting actuaries published an article several months later affirming and recommending the methodology[iii].

2 Response Citing 2011 Published Paper

The final question - is whether the discount rate is reasonable? An extract from the 2011 paper uses a large life settlement portfolio to illustrate as follows:

The importance of a consistent valuation methodology can most clearly be seen in the positive impact it has on the risk premium component of the discount rate used to calculate the present value of the net future periodic portfolio cash flows that establish the portfolio's current market value. A relatively homogeneous and actuarially credible portfolio with a reduced standard deviation of life expectancy

estimates supports the argument for a lower risk premium. The discount rate is made up of the cost of funds for the underlying financial instrument, e.g. average 10-year treasury rate for a 10-year bond or similar instrument or average fund life, plus the risk premium. The risk premium component is made up of four factors:

1. The probability of a forced sale of the portfolio because of inadequate cash reserves or where a liquidity facility is not maintained;
2. The delta in the standard deviation of probable cash flows because of inadequate actuarial credibility introduced by a small number of contracts or a lumpy portfolio;
3. The delta in the standard deviation of probable cash flows introduced by a wide-ranging variance in LEs per contract that has not been challenged and mathematically tightened up by a process such as the one described in this paper and quantified below.
4. The delta in the standard deviation of probable cash flows introduced by irreducible systematic risks relating to errors in projecting average future survival rates in the respective cohorts due to various combinations of model misspecification errors, errors in estimating the model parameters, and inherent stochasticity in future mortality rates.

At this writing the average 10-year U.S. Treasury Bond coupon rate was 2.5%. A risk premium equal to an additional 9.5% would yield a portfolio current valuation approximately equal to the investment in the portfolio. However, a risk premium equal to only an additional 5% would add a 130% increase to the market value of the portfolio. Conversely, a risk premium of an additional 6% (9.5%+6%=15.5%) would discount the portfolio to 70% less than cost. This highlights the need for strict and consistent underwriting and valuation methodologies. This inability to predict future portfolio cash flows and the resultant punishment by way of a higher discount rate has been observed in life settlement portfolios since the enactment of AUC 820 in 2015. Major independent audit firms have required management to use similar discount rates and thus devalue their portfolios. Of longevity dependent assets classes only Government guaranteed Home Equity Conversion Reverse Mortgages (HECM) are permitted to value at cost because of a specific exemption in AUC 820. The portion of the HUD mortgage insurance premium pool has been running an annual deficit of $5 billion. Numerous reports suggest HUD will terminate the HECM guarantee. This would void the AUC 820 exemption and require HECMs to the Marked-to-Fair Value. This would negatively impact the value of future HECM Ginnie Mae securities.

Proposed steps at quarterly and annual fair valuation:

1. Compare the actual to expected mortality results for each of the four LE providers over the examination period. The expected survival counts will be generated by summing the survival functions (S_{it}) by LE provider for that period for each policy in the portfolio for which an LE value was provided. The change from one period to the next in the sum of S_{it} will constitute the expected number of deaths for the period as predicted by each of the four LE providers.

Table 6

Identical Actual-to-Expected Analysis Performed for Each LE Provider

	EXPECTED SURVIVAL AND DEATHS						ACTUAL SURVIVAL AND DEATHS					
	Expected Survival			Expected Deaths			Actual Survival			Actual Deaths		
Portfolio Member Code	Year-End 1	Year-End 2	Year-End 3	Year-End 1	Year-End 2	Year-End 3	Year-End 1	Year-End 2	Year-End 3	Year-End 1	Year-End 2	Year-End 3
0001-F	0.9577	0.9095	0.8564	0.0423	0.0905	0.1436	1.0000			0.0000		
0002-F	0.7824	0.6428	0.4987	0.2176	0.3572	0.5013	1.0000			0.0000		
0003-F	0.8974	0.8021	0.7895	0.1026	0.1979	0.2105	1.0000			0.0000		
0004-F	0.8547	0.7952	0.6587	0.1453	0.2048	0.3413	1.0000			0.0000		
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
1000-F	0.9211	0.9033	0.8524	0.0789	0.0967	0.1476	1.0000			0.0000		
Totals	883	811	731	117	189	269	852			148	Actual	
Less Expected Deaths										117	Expected	

2. Compare the actual number of deaths for the period against the expected number to ascertain the accuracy of each LE provider relative to their prediction.

3. The portfolio valuation for each of the four LE providers will define the bounds of the valuation. For example, assume the independently determined portfolio values are $255 million, $274 million, $316 million and $329 million[1]. Absent better precision the portfolio has a value between $255 million and $329 million.

Table 7

NPV Valuation of Portfolio at Origination

LE Provider	NPV of Cash Flows Value	Assumed Probability	Probable Weighted Cash Flows	Probable NPV of Cash Flows
LCC	$329 Million	25%	$82.3 Million +	
1	$316 Million	25%	$79.0 Million +	
2	$274 Million	25%	$68.5 Million +	
3	$255 Million	25%	$63.8 Million =	$293.6 Million

4. Use Bayesian analysis as detailed by Kass and Raftery[2] to determine the weighted average total value of the portfolio.

Table 8

Results Oriented Weighted Valuation after Portfolio Year-One

LE Provider	NPV of Cash Flows Value	Assumed Probability	Probable Weighted Cash Flows	Probable NPV of Cash Flows
LCC	$329 Million	42%	$138.2 Million +	
1	$316 Million	16%	$50.6 Million +	
2	$274 Million	28%	$76.7 Million +	
3	$255 Million	14%	$35.7 Million =	$301.2 Million

[1] Assumes a portfolio of $1.7 billion of face amount with future net cash flows to maturity discounted at 8% to an NPV.

[2] Robert E. Kass and Adrian E. Raftery, Bayes Factors, Journal of the American Statistical Association, Vol. 90, No. 430. (Jun., 1995) (Equation 18). http://links.jstor.org/sici?sici=0162-1459%28199506%2990%3A430%3C773%3ABF%3E2.0.CO%3B2-8

5. This will allow the actual versus expected values for each policy's LE's to be evaluated and the LE providers to be ranked accordingly. The LE evaluations can be conducted via standard Bayesian methods or, more simply, by using Bayesian Information Criterion (BIC) measures of goodness of fit of the actual-to-expected probabilities of death computed separately for each LE model using the same pool of policies. Kass and Raftery[3] showed how BIC values[4] can be used (1) to rank the various LE models and (2) to generate optimal weighted averages of the outputs of the various LE models, where each of the four weights is interpretable as the Bayesian posterior probability that the corresponding LE model is correct (assuming that one of them is correct). Weighted averaging can then be applied to each individual policy, and to the aggregate of all policies, in annually revaluing each portfolio. The weights can be updated each year (more frequently if the portfolio is large) as additional information on the actual number of deaths in that year becomes available. Over time, this will give greater weight to the better performing models. Disclosure of the chosen methodology at portfolio formulation and annual review will provide transparency to investors with respect to these longevity valued asset transactions.

6. Present the weighted average portfolio value as well as the individual portfolio values, and their associated weights, derived by using the LE values and survival curves from each of the four LE providers.

3 Additional Data Post Publication

Data compiled by the lead author, Mazonas, from a 2010-2011 study, where three or more commercial LEs were prepared by different underwriting firms from each insured's medical records, identified the range between the low LE and the high LE per insured, relative to the low LE, to average 31%[5]. For the same data, where the relative range between the low and the high LE was greater than 30%, the average size was 56%[16]. Therein lay the problem for individual policy pricing and portfolio valuation: the variability of the individual LEs was so large that their validity was highly suspect.

For these reasons above, Stallard asserts using arithmetic averaging of three medical records commercial LEs produces an immediate 50% increase in statistical confidence before employing the above methodology. Underwriting with the traditional two LEs infers that either could be correct. By adding a third LE, doubling the middle LE and dividing by four, the confidence interval is tighten up considerably.

4 Conclusion

What the above says on a practical basis is that if you have no statistically confident methodology for estimating future cash flows then management must accept a discount rate applied by their auditors.

[3] Kass and Raftery (1995, Eqs. 9, 16 and 18).
[4] Note that BIC values can be generated using various approaches to measuring goodness of fit, including chi-squared statistics and regression-based R^2-statistics.
[5] Results are based upon data compiled from a study by a major European bank and tabulated by the lead author. EMSI, AVS and others have conducted studies that yield similar results.

Three of the Big Four auditing firms in these circumstances have historically applied discount rates ranging from 18% to 22%. The above published methodology, before adjusting for the Bayesian outcomes, would suggest valuing the portfolio at cost would apply a discount rate of 12%.

An example of how historically big four auditing firms arrived at a 18% discount rate is rooted in accounting policy that does not apply today to Level 3 assets, but is still being used. Life settlements are a sister asset class and also Level 3 assets because pricing is based upon an unknowable future event. A life settlement is the purchase from a senior of an unneeded, unwanted life insurance policy by a third party for a lump sum of cash. The purchaser becomes the new owner and must pay the premiums until the insured's death to collect the death benefit. Purchases are priced by discounting the assumed stream of future premium payments to arrive at today's net present value (purchase price). A 16% discount rate reflects offer pricing from a buyer and an amount acceptable to a seller. Thus, this mark-to-market pricing is based upon a 16% risk premium added to a 2.5% risk free cost of capital, yielding an 18.5% discount rate. Neither party in this example have a clear idea when the maturity (unknowable future event) will take place.

A methodology that demonstrates statistical confidence in the ability to predict future cash flows commands a premium and values the NPV of cash flows in excess of cost. The better the confidence level the greater the premium. Using Bayesian Inference and establishing a high level of confidence approaching 100% allows management to establish the reasonableness and assert a risk premium near the current risk-free cost of capital (2.5%). At the time of this writing (January 2018) that would approximate a discount rate of 5% to 7.5%, (a range of 2.5% x 2 and 2.5% x 3). Such a discount rate, when applied to the NPV of future portfolio cash flows, would create accreted portfolio value in the balance sheet on a year over year basis. The accretive increase in book income would equate to the incremental additional annual balance sheet value.

Updated January 12, 2018

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[i] The testing requirements for fair value estimates are enumerated in paragraphs 23 to 42 of SAS 101 (AU 328).
[ii] http://link.springer.com/article/10.1057/gpp.2011.25
[iii] www.caymanfundsmagazine.com/article/life-settlement-valuations-a-us-perspective

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