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Statement of Financial Accounting Standards No. 157 (SFAS 157) *Fair Value Measurements* (Including Introduction to Cost of Capital Risk Margins)

by Ken LaSorella

SFAS 157, *Fair Value Measurements*, defines fair value, establishes a framework for measuring fair value and expands disclosures. This article briefly summarizes SFAS 157 and then turns to the computation of a fair value liability (FVL) and the use of risk margins, with some expanded discussion of the cost of capital method for establishing the risk margin.

Recognition of Fair Value in US GAAP

US GAAP already requires a number of assets and liabilities to be accounted for at fair value. This typically applies to assets classified as "trading" or "available-for-sale" and SFAS 133 free standing and embedded derivatives (e.g., equity option in equity indexed annuity contracts, guaranteed accumulation benefit and withdrawal benefit in variable annuity contracts, credit derivatives in funds withheld coinsurance and modified coinsurance contracts and guaranteed minimum income benefit that is reinsured and net settled upon annuitization). Also, SFAS 141, Business Combinations, requires certain intangible assets, including the value of business acquired (VOBA), to be booked at fair value at the date of acquisition on the purchase GAAP (PGAAP) balance sheet. In addition, SFAS 142, *Goodwill and Other Intangible Assets*, requires the fair value of a reporting unit to be compared to its carrying value for the purpose of goodwill impairment testing. Although income statements and balance sheets are not affected, SFAS 107, *Disclosures About Fair Value of Financial Instruments*, requires disclosure of fair value of most financial assets (including policy loans) and liabilities for investment contracts and financial guarantees. Finally, the recent introduction of SFAS 159, *The Fair Value Option for Financial Assets and Financial Liabilities*, gives reporting entities the option of accounting for other financial assets and liabilities at fair value without having to apply complex hedge accounting.

Overview of SFAS 157

While SFAS 157 does not establish valuation standards, it does shed considerable light on concepts and principles of fair value determination. Fair value, as defined in SFAS 157,

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is based on a hypothetical transaction between market participants and represents, at the valuation date, the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction (i.e., not a forced liquidation or distress sale). Such transaction is assumed to occur in the principal market or, in the absence of a principal market, in the most advantageous market from the reporting entity's perspective. As such, SFAS 157 clarifies that fair value is an exit price from the perspective of the reporting entity. Regarding application to assets, fair value should be based on the highest and best use of the asset or group of assets used by market participants. The highest and best use can be either in-use or in-exchange, whichever maximizes value. In addition, in computing FVL, the liability is assumed to be transferred to a counterparty and to continue without being settled. Nonperformance risk is assumed to remain the same before and after the transfer. Hence, FVL should reflect nonperformance risk including, but not limited to, the reporting entity's own credit risk.

Valuation Issues

Valuation techniques are to be consistent with: the *market approach*, which uses prices and other information generated by market transactions involving identical or comparable assets or liabilities; the *income approach*, which uses valuation techniques to convert future cash flows or income into a single present value; and/or the *cost approach*, which is based on replacement cost. Reporting entities appear to have discretion regarding use of a particular valuation technique as long as it is appropriate in the circumstances and for which sufficient data are available.

Regarding inputs to valuation techniques, the objective is to use assumptions that market participants would use in pricing the asset or liability, including assumptions about risk. Inputs are categorized as observable, which are based on market data independent of the reporting entity, and unobservable, which reflect the reporting entity's own assumptions about the assumptions market participants would use. Valuation techniques should maximize the use of observable inputs and minimize the use of unobservable inputs. In addition, SFAS 157 establishes a fair value hierarchy that gives the highest priority to Level 1 inputs, which are quoted prices unadjusted in active markets for identical assets and liabilities. Level 2 inputs include quoted prices for similar assets or liabilities in active markets, quoted prices for identical or similar assets or liabilities in markets that are not active and inputs other than quoted prices that are observable for the asset or liability (e.g., observable yield curves, volatilities and default rates). Level 3 inputs are unobservable inputs for the asset or liability, which should be used only to the extent observable inputs are not available.

Regarding application to assets, fair value should be based on the highest and best use of the asset or group of assets used by market participants.

Since there is no active, complete, liquid and efficient market for the sale of in-force business, a valuation with Level 1 inputs is not possible. Consequently, a valuation technique, such as a present value technique, is often used with at least some Level 3 (unobservable) inputs. These include the reporting entity's assumptions about market participant assumptions for mortality, morbidity, persistency, expenses, risk and other unobservable inputs. To the extent possible, higher level inputs would also be incorporated into the valuation technique, such as observable yield curves and implied volatilities.

Clarification of Guidance for Using Present Value Techniques

FASB Concepts Statement No. 7, *Using Cash Flow Information and Present Value in Accounting Measurements*, provides guidance for using present value techniques to measure fair value (an application of the income approach). Appendix B of SFAS 157 clarifies that guidance. The components of a present value measurement are: a) an estimate of future cash flows; b) expectations about possible variations in the amount or timing of the cash flows, representing uncertainty; c) the time value of money, represented by the rate on risk-free monetary assets (the U.S. Treasury yield curve is mentioned); d) the price for bearing uncertainty (risk premium); e) other case-specific factors that would be considered by market participants; and f) nonperformance risk in the case of a liability, including the reporting entity's own credit risk. The Discount Rate Adjustment Technique and the Expected Present Value Technique are discussed. The former discounts conditional cash flows at an observed market rate of return. This is a typical technique applied to value bonds, where conditional or promised cash flows, assuming no defaults, are discounted at the required market rate of return. Risk is entirely reflected in the discount rate. The Expected Present Value Technique

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is presented in two methods. Method 1 adjusts expected cash flows for systematic (market) risk and discounts such risk-adjusted cash flows (certainty-equivalent cash flows) at risk-free interest rates. Method 2 adjusts for market risk by adding a risk premium to the risk-free interest rate. Consequently, expected cash flows are discounted at a risk-adjusted rate that corresponds to an expected rate associated with probability-weighted cash flows.

Risk Margins

One particular component of fair value determination, the risk premium or risk margin, has generated considerable interest, research and discussion. The International Actuarial Association (IAA) Risk Margin Working Group (RMWG) has done extensive research resulting in multiple drafts of the document: *Measurement of Liabilities for Insurance Contracts: Current Estimates and Risk Margins*. Besides discussing objectives of risk margins and desirable characteristics, the latest draft discusses a number of risk margin approaches, which include: quantile approaches, methods which use confidence limits, including the conditional tail expectation, CTE (e.g., if a reserve is derived for each stochastic scenario, the CTE60 reserve is the average of the highest 40 percent, the CTE99, average of the highest 1 percent); cost of capital method (to be more fully discussed below); discount-related risk margins, which include risk-adjusted returns and deflators; and explicit assumptions, similar to margin for adverse deviations (MfADs) and provisions for adverse deviation (PADs). The treatment of the cost of capital approach is quite thorough, but does not deliver a precise implementation approach. Consequently, there still could be some confusion regarding application of the method.

Cost of Capital Method

In its most basic form, the cost of capital method defines a risk margin as follows:

$$RM_t=(k-i_t)\times RC_{t-1}$$

where k is the cost of capital assumed to be demanded by the market and i is the rate of investment return on assets backing required capital (RC). On the surface, this appears straightforward. However, several questions arise when attempting quantification. Should k be pre-tax or after-tax; should it be the cost of equity capital or a weighted average cost of capital (WACC); finally, should it be derived from entity-specific market data (such as application of CAPM with a company's beta) or be based on a reference company or sector? Similarly, is i pre-tax or after-tax; is it the risk-free rate or asset portfolio rate: if risk-free, Treasury yield curve (as referenced in Appendix B of SFAS 157), the Libor swap curve, other swap curve, or reference portfolio? Likewise is RC based on regulatory required capital (minimum or some multiple), the amount required to maintain the current rating, or economic capital?

While the RMWG drafts are extremely useful, many of the questions have been fairly thoroughly addressed in previous papers, most notably those of Girard: "Market Value of Insurance Liabilities: Reconciling the Actuarial Appraisal and Option Pricing Methods" (*North American Actuarial Journal, NAAJ, 2000*) and "An Approach to Fair Valuation of Insurance Liabilities Using the Firm's Cost of Capital" (NAAJ 2002), Duran and Ho responses to Girard (NAAJ 2002), and the 2002 American Academy of Actuaries monograph: *Fair Value of Insurance Liabilities: Principles and Methods*. Girard has gone into extensive detail regarding leveraged cost of capital, taxes and a reporting entity's own credit risk. Duran introduced an additional direct method for computing FVL and has also addressed inclusion and exclusion of taxes in FVL. Because the early works were quite detailed and specific, a lot of time and effort can be saved by not reinventing this wheel.

Regarding questions raised, a few will be answered in what follows; the answers to others will be narrowed down; and still others will merely be identified or reformulated, deferring to experts conducting research to provide more definitive answers in the near future. To best answer some of the questions, all constraints will be temporarily removed and a simple example will be introduced that will allow us to move from the somewhat familiar actuarial appraisal method to the cost of capital method.

Assumptions for Sample Calculations

Assume the following:

- only a one-year time horizon (i.e., full settlement occurs at the end of one year);
- one expected net liability outflow, (L), equal to 910 (where expected is best-estimate without provisions for adverse deviation or market value margins);

- the cost of capital, (k), equal to 0.10;
- return on invested assets, including those backing required capital, (i), equal to 0.06;
- the tax rate, (T), equal to 0.40 (for computational ease);
- the statutory reserve and the tax value of liabilities (TVL), equal to 950;
- the statutory value of assets, the tax value of assets (TVA) and the fair (market) value of assets (FVA), all equal to 1,000;
- the above two bullets imply required capital, (RC), equal to 50.

With these extremely simplified assumptions, pre-tax statutory income and taxable income will be the same, 100, computed as investment income of 60 less net claims of 910 plus reserves released of 950. Current tax would be 0.40 times 100, or 40, resulting in statutory net income of 60.

Since the contracts expire at the end of one year, the RC of 50 can be released, resulting in distributable earnings to shareholders of 110 (i.e., net income of 60 plus capital released of 50). Since investors are assumed to demand 10 percent, discounting 110 at 10 percent gives discounted distributable earnings (DDE) of 100. This can be considered to be a type of shareholder equity on a fair value balance sheet, as will be seen more clearly.

Indirect Method of Deriving FVL

The above method, which is the actuarial appraisal method (AAM), can be used as an indirect method to derive FVL. The known total available assets, FVA, can be partitioned into an amount for shareholders, DDE, and the residual, atFVL ('at' representing after-tax, subsequently explained). Since the example covers a period of only one year, subscripts can be avoided and FVL can be defined as:

(1) $\mathrm{atFVL} = \mathrm{FVA} - \mathrm{DDE}$

So, $\mathrm{atFVL} = 1000 - 100 = 900$.

Since the 900 has been derived by subtracting a DDE that reflects taxes, we might consider it to be an after-tax FVL (hence the symbol: atFVL). If 900 is booked directly into a fair value balance sheet, and if SFAS 109 (similar to its international counterpart, IAS 12) continues to operate as is, it would attract a deferred tax liability (DTL) of 40 percent of the difference between the TVL of 950 and the FVL of 900, resulting in a DTL of 20. The fair value balance sheet would then have assets of 1,000, liabilities of *920* and equity of 80, which is not equal to DDE of 100.

This phenomenon has been encountered in practice in both US GAAP and Canadian GAAP (CGAAP).

This phenomenon has been encountered in practice in both US GAAP and Canadian GAAP (CGAAP). The starting point for VOBA is often the present value of after-tax statutory book profits less the net cost of capital (similar to in-force business value in embedded value reporting). Likewise, CGAAP reserves are often computed including the present value of future taxes. Such after-tax values are often adjusted algebraically for deferred taxes before being booked (to the PGAAP and CGAAP balance sheets, respectively). The same deferred tax algebra can be applied to FVA–DDE. In essence, a tentative DTL is computed, which is then grossed-up to a pre-tax basis and subtracted from the after-tax liability. The adjustment follows:

Tentative
$$\mathrm{DTL} = T \times (\mathrm{TVL} - \mathrm{atFVL}) = 0.40 \times (950 - 900) = 20$$

$$\mathrm{DTL} = (\text{Tentative DTL of } 20)/(1 - 0.40) = 33.33$$

$$\mathrm{FVL} = \mathrm{atFVL} - \mathrm{DTL} = 900 - 33.33 = 866.67$$

To test the result, $\mathrm{DTL} = 0.40 \times (950 - 866.67) = 33.33$ (test passed).

Entering an FVL of 866.67 and a DTL of 33.33 into a fair value balance sheet gives liabilities of 900 against FVA of 1,000, resulting in fair value equity of 100, matching DDE. The fair value income statement would show investment income of 60 less net claims of 910 plus FVL released of 866.67, giving pre-tax income of 16.67. Current tax (unchanged) of 40 less released DTL of 33.33 gives net tax of 6.67. The resulting after-tax income is 10.00 (i.e., 16.67–6.67). With opening equity of 100, an ROE of exactly 10 percent emerges, a most desirable result (consistent with assumed shareholder demand).

Development of the Cost of Capital Risk Margin

With the indirect method DDE as a starting point,

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However, it can also be reasoned that it is good for investors to have a DTL.

we can proceed to develop an appropriate risk margin that can be used with a direct method (which would be preferred by most accounting systems). From (1), DDE=FVA–atFVL.

Adding and subtracting DTL on the right side of the equation gives: DDE=FVA–(atFVL–DTL)–DTL, where the amount in parentheses is FVL. Therefore,

(2) DDE=(FVA–FVL)–DTL

This is an important equation because it will lead to a standard cost of capital formula.

Assuming investors require k on their investment, DDE, the required return is:

(3) k×DDE=k×(FVA–FVL)–k×DTL

When asked if k is a pre-tax or after-tax rate, the answer is often yes. From the investor's perspective, it is a pre-tax rate. Hence, CAPM computes k as a pre-tax risk-free rate plus beta times the market risk premium. However, from the reporting entity's (company's) perspective, distributable earnings and k are after corporate taxes, hence k is an after-tax rate. Proceeding from the company's perspective, the change in FVL (release at the end of the year) plus investment income should be exactly enough to pay the net liability cash outflow and provide investors with some profit. The question is how much profit. Since assets in excess of those needed for FVL (i.e., FVA–FVL) are assumed to earn i×(1–T), the after-tax required profit (RP) that must ultimately result from releases of FVL is that shown in Formula (3) less i×(1–T)×(FVA–FVL), leading to:

(4) atRP=[k–i×(1–T)]×(FVA–FVL)–k×DTL

Substituting the full formula for net DTL, T×[(FVA–TVA)–(FVL–TVL)], into (4) and dividing by (1–T) gives the pre-tax RP:

(5)

$$RP_t = [\frac{k}{(1-T)} - i_t] \times (FVA_{t-1} - FVL_{t-1})$$

$$-\frac{k \times T}{(1-T)} \times [(FVA_{t-1} - TVA_{t-1}) -$$

$$-(FVL_{t-1} - TVL_{t-1})]$$

However, a further simplification has typically been made that pulls out k/(1–T)×T×(FVA–FVL) from the last term and combines it with k/(1–T)×(FVA–FVL) in the first term, giving the RP shown by Girard, Duran and others:

(6)

$$RP_t = (k - i_t) \times (FVA_{t-1} - FVL_{t-1})$$

$$+\frac{k \times T}{(1-T)} \times (TVA_{t-1} - TVL_{t-1})$$

Direct Method of Deriving FVL

At this point, it is worth revisiting our simple example to check if FVL by the direct method, discounting liability cash outflows and RP, produces the same FVL derived by the indirect method. Using subscripts of 0 and 1 for values at the valuation date and beyond, respectively:

$FVL_0=(L_1+RP_1+FVL_1)/(1+i_1)$. Since $FVL_1=0$,
$FVL_0=(910+RP_1)/(1.06)$, and, using (6),
$RP_1=(0.10–0.06)\times(1000–FVL_0)+(0.10/0.60)\times0.40\times(1000–950)$
Or, $RP_1=43.33–0.04\times FVL_0$. Substituting gives:
$FVL_0=(910+43.33–0.04\times FVL_0)/(1.06)$,
Solving for FVL_0 gives 866.67, the same FVL previously derived via AAM.

A couple of comments about (5) and (6) might help clarify some issues. Encountering Formula (5) without seeing its full derivation has caused some confusion as to why the deferred tax component is multiplied by k/(1–T), implying an after-tax rate of return of k on net DTL. However, as demonstrated in the development of after-tax RP, k times the net DTL term arises merely as an algebraic consequence caused by adding DTL (allowing –atFVL to become –FVL), subtracting DTL to offset the addition, and multiplying both sides of the equation by k. However, it can also be reasoned that it is good for investors to have a DTL. This means that taxes are not based on the timing of fair value income. Hence, until such money is eventually paid to tax authorities, investors will have benefited. This is the opposite of the RC situation. While investors have funds tied up in RC that cannot be distributed, they demand a risk rate of return of k on such funds. The flip side is that funds that are released to investors rather than being paid to tax authorities should be worth the same k rate of return to investors. The second area of confusion comes from whether k or k/(1–T) should be compared to i. As can be seen in (5), k/(1–T) is matched with i. However, if (6) is used, an unadjusted k is matched with i. As long as deferred taxes are reflected in RP, it makes no difference which form is used. However, if the objective of the FASB (and the IASB) is to produce a risk margin in FVL that removes the appearance of taxes, then truncating the deferred tax components in (5) and (6) will lead to completely different risk margins. Assuming a positive net DTL, truncation in (5) overstates RP, since the truncated term is a negative in RP; truncation in (6) understates RP. Assuming the FASB's (and IASB's) position is that tax effects should not be reflected in FVL, the path of least resistance is the use of a truncated form of risk margin. If a truncated form is used, some actuaries believe it is appropriate to adjust the cost of capital assumption to compensate for lost precision.

Addressing Some Initial Questions

Getting back to some initial questions, in the above formulae, k reflects the cost of equity capital. However, it can also be based on a WACC, in which case RC would represent all capital, not just equity capital. A problem with using a constant WACC in a cost of capital approach is the implicit assumption that debt remains at a constant percentage of DDE. Otherwise, WACC must vary with time. It may be easier to directly reflect the cost of debt in the cost of capital. Assuming the amount of debt and the pre-tax cost of debt service are represented by D and d, respectively, RPt can be increased by $(d_t - i_t) \times D_{t-1}$. The same logic may be applied to other debt-like capital such as preferred stock, surplus notes and capital notes. For simplicity, k was assumed to be constant. While a constant k is typical in practice, such k usually varies by country of operation and might further vary by product line within a reporting entity. In addition, k may be allowed to be time-dependent, reflecting the term structure of interest rates. It may also be time- and state-dependent, allowing a risk premium to be added to scenario-specific risk-free rates in stochastic approaches to FVL, which are usually applied to value financial options and guarantees on a market consistent basis. However, the farther removed from basic market data, the more difficult is reconciliation with market prices. Finally, an entity-specific k derived from actual market data would probably be inappropriate. It is better to derive a starting point for k from a reference company (or market sector average) reflecting the same credit rating. The starting k might have to be adjusted to eliminate the effects of franchise value (value of future new business capacity) inherent in a market-derived k (if deemed material). The objective is to derive a k applicable to only in-force business. Regardless, entity-specific market data would be useful to properly reflect the company's nonperformance risk in the final k.

> The objective is to derive a k applicable to only in-force business.

Appendix B of SFAS 157 presumes certainty-equivalent cash flows are discounted at risk-free rates, as would be achieved by a replicating portfolio of risk-free assets. Hence, i should be a risk-free rate. Despite reference to the Treasury yield curve, some would argue that a spread should be added to offset the liquidity premium inherent in Treasury yields. Liquidity is not required or desired to match some liability cash flows. In addition, certain options are actually valued in the market using the swap curve along with implied volatilities. Consequently, some believe the swap curve or some variant thereof is a better surrogate for a truly risk-free yield curve. Finally, as with k, i may also be time- and state-dependent for use in stochastic approaches, which are typically used to value financial options and guarantees on a market consistent basis.

Regarding the amount of RC, the RMWG appears to favor economic capital as opposed to a multiple of regulatory capital. However, the difference may be more apparent than real. As technology evolves and more companies employ enterprise risk management techniques, it will become more common to hold economic capital. Consequently, a company's rating and its distributable earnings will be impacted by its level of economic capital. The same is true of a company holding a multiple of regulatory capital. As a practical matter, however, it may currently be easier to project a multiple of regulatory capital than economic capital, which might require a quantile method projection to determine future total required assets. While RC allocation methods are beyond the scope of this article, whether based on economic capital, regulatory capital, or other metric, the method employed will influence product-specific FVL.

Finally, an overriding principle is that of internal consistency. For example, the market k for a company that invests in risky assets already reflects the riskiness of that portfolio, offsetting any additional expected return from such risk-taking (theoretically). Consequently, such k should not be used with an assumption that all invested assets earn risk-free rates of return. By the same token, if all assets were invested in risk-free instruments, the amount of economic

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capital, or multiple of regulatory capital necessary to maintain a rating, would be reduced. Likewise, it would be inappropriate to assign economic or required capital to cover C-3 (asset-liability mismatch) risk when a replicating portfolio of risk-free assets is assumed. Consequently, it is important for assumptions about k, i and RC to remain internally consistent. Although not recommended, it is possible that an entity-specific cost of capital based on the company's beta, asset portfolio and RC, might deliver a more accurate cost of capital than one based on a reference company, risk-free rates and economic capital, if the latter assumptions are not internally consistent.

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Summary

In summation, any of the direct methods of FVL valuation are capable of producing the same value as determined via an indirect method if consistent assumptions are used (Girard certainly drove this point home). However, the cost of capital method has the most direct linkage to shareholder expected return. Also, if risk is to be reflected in explicit assumptions, it may be difficult to obtain market data to derive margins to be added to expected cash flows. In addition, it is unlikely that release of such margins would deliver a desirable pattern of ROE. The same is true of quantile methods.

Finally, actuaries reflect taxes in actuarial appraisals, pricing, management targets and embedded value. It is unlikely that the current accounting systems will allow tax timing effects to be reflected in FVL. For now, it appears a compromise has to be made that defines cost of capital without regard to taxes. Regardless, SFAS 157 has greatly clarified the principles of fair value determination and allows the principles to be applied with considerable flexibility. In this regard, SFAS 157 represents substantial progress for fair value determination.

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