Market Consistent Embedded Values

March 2011

American Academy of Actuaries
Members of the Life Financial Reporting Committee

American Academy *of* Actuaries

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Market Consistent Embedded Values

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Developed by Members of the Life Financial Reporting Committee
of the American Academy of Actuaries

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TABLE OF CONTENTS

Section A: Introduction to Market Consistent Embedded Value

Background

"Embedded value" (EV) is a financial measurement basis applied primarily to long-duration insurance business. EV provides a means of measuring the value of such business at any point in time and of assessing the financial performance of the business over time. EV is a measurement of the value that shareholders own in an insurance enterprise, comprised of capital, surplus, and the present value of earnings to be generated from the existing business. More formally, EV has been described as the "consolidated value of the shareholders' interests in the covered business."[1]

The history of EV in the insurance industry dates back at least to the 1980s, when companies in the United Kingdom started routinely to disclose EV. In December 2001 the Association of British Insurers (ABI) developed guidelines for the calculation of EV for long-term insurance business. EV calculated under these guidelines was referred to as the "achieved profits method" (APM). These guidelines covered key aspects of calculating EV, including the setting of assumptions, determination of discount rates, and treatment of encumbered capital. Although not formally required, it is believed that all U.K. companies abided by these rules until they were superseded by the publication in May 2004 of guidelines for calculating "European embedded value" (EEV).

As mentioned above, EEV is the name given to EV calculated pursuant to guidance contained in a paper titled *European Embedded Value Principles* (EEV Principles) issued in May 2004 by the CFO Forum, a discussion group composed of the CFOs of the major European insurance companies. The intent of these principles was to improve the allowance for risk in reported financial results, to increase the transparency and consistency of EV reporting in Europe, and to improve disclosures around the degree of risk inherent in the business. In addition to covering some of the same ground as defined in the APM, the EEV principles cover such topics as the application of EV to embedded options and guarantees as well as sensitivity testing and disclosure. The CFO Forum's work on EEV was fully endorsed by the ABI. Further guidance was published by the CFO Forum for application to year-end 2006 EEV reporting.

In June 2008 the CFO Forum published *Market Consistent Embedded Value Principles* (MCEV Principles) and the associated document *Market Consistent Embedded Value Principles and Basis for Conclusions* (MCEV Basis for Conclusions). The MCEV Principles paper promulgated market consistent embedded value (MCEV) as the generally accepted standard form of EV [, effectively replacing EEV. MCEV places EV in a market consistent, risk neutral framework. Many feel that MCEV marks the natural evolution of EV to a basis that provides great comparability across companies and greater consistency with concepts applied by other financial institutions and the capital markets. Even before the publication of the MCEV Principles, many companies had been applying EEV using market consistent assumptions, approximating closely the methodologies that would become formalized by the CFO Forum as MCEV.

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[1] CFO Forum, *European Embedded Value Principles,* May 2004, p. 1.

The focus of this practice note is MCEV. A 2009 practice note entitled *Embedded Value (EV) Reporting* covered practices related primarily to EEV. While this practice note is intended to be relatively self-contained, readers may want to review the 2009 practice note to gain additional background on EV as constituted previously.

Throughout this practice note, "MCEV" will be used to denote EV as defined in the June 2008 CFO Forum paper, *Market Consistent Embedded Value Principles*. "EEV" will be used to denote EV as defined in the May 2004 CFO Forum paper, *European Embedded Value Principles*. "TEV" will be used to denote "traditional" EV or EV as typically calculated prior to the publication of the May 2004 paper, and generally consistent with APM. Finally, "EV" will be used as a generic term to denote embedded value under any or all of the defined applications described above.

Q1: What is market consistent embedded value?

A: In its June 2008 paper, *Market Consistent Embedded Value Principles,* the CFO Forum, describes the market consistent embedded value ("MCEV") of an insurance company as the "consolidated value of the shareholders' interests" in the company. An alternative description of the MCEV is the present value of all future shareholder cash flows from the covered inforce business and capital and surplus. MCEV does not include any values attributable to future sales. As its name implies, MCEV is EV calculated using market consistent assumptions.

Q2: What are the principal ways in which MCEV differs from TEV and EEV?

A: Both MCEV and EEV differ from TEV in that they incorporate a specific reflection of the values of embedded options and guarantees. MCEV differs from both TEV and EEV in that MCEV is calculated using risk neutral, market consistent economic assumptions. While EEV and TEV could be calculated this way as well, the use of such assumptions is required for MCEV.

MCEV was introduced as a replacement to EEV mainly to address criticisms that the ability to select company-specific economic assumptions rendered EEV results largely uncomparable across companies. In addition, MCEV provides a means of calculating the value of embedded options and guarantees within long-duration insurance contracts consistent with the methods used to calculate the fair value of traded derivative investments.

Q3: What is a risk-neutral valuation?

A: A risk-neutral valuation is a tool to produce a market-consistent valuation. In a risk-neutral world, all invested assets (securities) are assumed to earn the same expected rate of return, the risk-free rate, regardless of the risks inherent in the specific invested asset. For example, U.S. Treasury Bonds, corporate bonds, stocks, and stock options are all

assumed to deliver the same expected gross rate of return to the investor—the risk-free rate—even though the relative riskiness of such assets clearly varies significantly.

To illustrate the concept, assume a 1-year zero-coupon risk-free bond pays 5%, and a relative risky 1-year zero-coupon corporate bond pays 7%. Then, ignoring defaults, $100 invested in the corporate bond is expected to payoff $107 at the end of year-1. Such a bond is typically valued by discounting the conditional cash flow of $107 at the market discount rate, 7% in this example, which includes the market price of risk. The result is $100. However, this same bond can be valued in a risk-neutral world by assuming the payoff at the end of year-1 is $105 (the same payoff that would be expected from a risk-free bond). This might imply that the market assumes defaults would be in the neighborhood of 2%. However, the spread demanded by the market over and above the risk-free rate comprises both a spread for default risk and a spread for liquidity risk. In practice, it is difficult to separate the two. For illustrative purposes, assume the market spread for default risk is 1.5% and the market spread for liquidity risk is 0.5%. This does not mean that Investors expect defaults to be in the neighborhood of 1.5%, but, instead want to be compensated as if expected defaults were 1.5%, i.e., want to be rewarded for assuming default risk. In addition, investors want to be compensated for other risks, such as liquidity risk, which, in this example, would require another 0.5%. Consequently, the expected payoff of $105 is a certainty equivalent amount, which is then discounted at the risk-free rate of 5% to obtain the same market value of $100. [Note: Discounting certainty equivalent cash flows at the risk-free rate is Method 1 of the *Expected Present Value Technique* discussed in SFAS 157.]

[Note: Since the deterministic formulas of Section B assume all assets earn the reference rate, or RR (a proxy for the risk-free rate of interest) and discounting is performed at the same rate, then, assuming a proper calibration to market prices has been performed, it can be concluded that risk-neutral principles have been applied to produce a market-consistent result.]

Q4: What is MCEV used for?

A: Internal uses of EV may include justification for stock prices, incentive compensation of senior executives, analysis of product/line of business profitability and capital allocation.

External uses of EV may include evaluation of mergers or acquisitions, estimates of available capital and comparison of companies across reporting jurisdictions. External parties such as investment analysts or rating agencies might use the estimated EV of a company or a business sector in order to assist in their evaluations of company performance or financial strength.

Q5: What type of business is usually covered by MCEV?

A: The CFO Forum June 2008 paper states that MCEV should cover, at a minimum, all business that is "regarded by local insurance supervisors as long-term life insurance business."[2] MCEV is typically used by life insurance companies. In particular, it is used with long-term business such as life insurance and annuities. As a practical matter, certain short-term business may be excluded because the EV associated with such business may be immaterial.

Q6: How does MCEV relate to the actuarial appraisal value of a company that is often encountered in mergers and acquisitions?

A: The actuarial appraisal method of valuing a company is similar to EV and is calculated using similar concepts (e.g., discounted cash flow). However, actuarial appraisals will typically include a value for future sales, while the MCEV does not. In addition, the actuarial appraisal value will differ from MCEV to the extent that the assumptions entering the calculations differ. For example, actuarial appraisals are typically performed using discount rates that are higher than the risk neutral assumptions used for MCEV. In addition, MCEV assumptions typically use company-specific non-economic assumptions, whereas actuarial appraisals typically reflect a mixture of industry-wide expectations and company-specific assumptions. For example, MCEV is typically calculated using a company's specific expenses, while appraisals may use industry averages or include expected synergies. Further guidance on actuarial appraisals is provided in Actuarial Standard of Practice No. ("ASOP") 19 – Appraisals of Casualty, Health and Life Insurance Businesses.

Q7: What information is needed in order to calculate MCEV?

A: In order to calculate MCEV, a company would ordinarily have a complete inventory of its in-force policies as well as a balance sheet on the valuation date identifying assets, liabilities and capital. The company would also have a complete set of assumptions to calculate MCEV. The company uses these assumptions to project future cash flows as well as the development and release of reserves and capital. These include economic assumptions (including reference rates, which are proxies to risk-free rates appropriately adjusted for liquidity premiums, and market consistent volatility parameters), policyholder behavior assumptions (including lapse rates, deposit rates, and election rates), non-elective assumptions (including mortality and morbidity), as well as entity-specific assumptions for expenses and taxes.

Q8: Who publishes EV and MCEV?

A: Companies in the UK were the first to routinely disclose EV beginning in the 1980s. Today, virtually all insurance companies domiciled in Europe report EV in their Annual Reports as do most companies in Australia, South Africa and, to a large extent, Japan. Most of these companies have reported EV on an EEV basis in the past and some of these

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[2] Principle G2.1

companies have reported on an MCEV basis. It is expected that companies reporting EV will do so under MCEV beginning with the year ending 2011 as EEV and TEV are effectively deemed obsolete with the publication of the June 2008 CFO Forum paper. Canadian companies started publicly disclosing EV results in 2001 at the encouragement of the Office of the Superintendent of Financial Institutions (the Canadian regulatory body). Several insurance companies in the U.S. calculate EV as well, though there is no disclosure requirement for U.S. companies at this time. The reporting of MCEV results in North America does not appear to be moving to widespread practice at the time of the publication of this Practice Note.

Section B: MCEV - Mechanics and Formulas

Q9: What are the basic components of MCEV?

A: EEV is typically determined as the sum of adjusted net worth (ANW) and in-force business value (IBV). MCEV is similarly defined with ANW and IBV computed on a market consistent basis. To avoid confusion, market consistent IBV will be represented by the value of in-force business (VIF), which is consistent with CFO Forum terminology. In formula form:

(1) MCEV = ANW + VIF

Q10: What is Adjusted Net Worth (ANW)?

A: ANW is the realizable value of capital and surplus. Statutory capital and surplus is adjusted to include certain liabilities that are, in essence, allocations of surplus (e.g., Asset Valuation Reserve in the U.S.) and non-admitted assets that have realizable value. This process automatically excludes the value of intangible assets identified in other accounting bases, such as U.S. GAAP goodwill, because such intangibles typically have no realizable value, i.e., could not be readily converted into a shareholder dividend. Finally, assets supporting ANW are marked to market and tax-effected (subsequently discussed). ANW includes both required capital (RC), subsequently discussed, and any free surplus (FS).

Since ANW comprises both RC and FS, MCEV can also be defined as:

(2) MCEV = FS + RC + VIF

Formula 2 is consistent with the June 2008 CFO Forum paper.

Q11: How are assets supporting ANW tax-affected?

A: Three common approaches to reflect taxes in ANW that are currently used in practice are briefly discussed:

Under one approach, all invested assets supporting ANW are marked to market and tax-affected as if all unrealized gains/losses were immediately realized and all tax consequences immediately recognized. In essence, a notional sale of all supporting assets is assumed. The primary advantage of this approach is modeling simplicity. Investment income on assets supporting RC can be assumed to earn market rates of return with taxes based solely on such projected investment income without regard to any existing unrealized gains and losses at the valuation date.

Under a second approach, assets supporting ANW are marked to market, but are not tax-affected, i.e., an immediate notional sale is not assumed. With this approach, the computation of VIF (subsequently discussed) will involve the projection of taxable

investment income from assets supporting RC (on a best-estimate basis), including the projection of realized gains and losses from such supporting assets. Hence, the timing of taxes (on a best-estimate basis) is directly reflected in the resulting VIF. Likewise, taxable investment income from assets supporting FS is similarly projected on a best-estimate basis, and FS is adjusted to reflect the present value of such taxes. This second approach more accurately reflects timing of taxes. Although theoretically more accurate than the first approach, modeling and tax algorithms can become considerably more complex.

A variant of this second approach treats assets supporting FS as in the first approach (i.e., such assets are marked to market and assumed to be immediately sold, allowing resulting assumed tax consequences to be immediately recognized). The logic for treating FS and RC differently is that FS is immediately distributable, but RC is not. Hence, the more complex treatment (a best-estimate projection of taxable income from supporting assets) is given only to assets supporting RC.

A case can be made for any of the above approaches.

Q12: How is the value of in-force business (VIF) defined?

A: Principle 6 of the MCEV Principles states that VIF consists of:
- Present value of future profits (PVFP)
- Time value of financial options and guarantees (TVFOG)
- Frictional costs of required capital (FCRC), and
- Cost of residual nonhedgeable risks (CRNHR).

In formula form:

(3) VIF = PVFP-TVFOG-FCRC-CRNHR

There are multiple ways of combining the components of VIF. In (3) above, PVFP would typically include the intrinsic value of financial options and guarantees, but not the time value, which is a separate component, TVFOG. Consequently, an alternative presentation might include TVFOG in PVFP. Likewise, frictional costs of RC and residual nonhedgeable costs are shown as separate components, even though both might be computed as the present value of cost of capital charges (subsequently discussed). Consequently, an alternative presentation might combine CRNHR with FCRC, resulting in a more inclusive cost of capital component.

To more clearly introduce basic MCEV formulas in this section that are similar in form to their EEV counterparts, temporarily assume TVFOG and CRNFR are zero. Both TVFOG and CRNHR are thoroughly discussed in subsequent sections.

With the above simplification, the basic VIF can be defined as the present value of future after-tax future profits (PVFP) less the frictional costs of required capital (FCRC). The projection of after-tax profits is based on best-estimate assumptions, with the exception

of investment income, which is based on risk-free rates of return (to be discussed). The risk discount rate used to compute PVFP and cost of capital (to be discussed) is based in part on the risk-free yield curve at the valuation date (swap curve plus a liquidity premium where appropriate, depending on the liquidity of underlying liabilities – subsequently discussed). In formula form:

(4) VIF = PVFP - FCRC

Q13: What Yield Curve Represents Risk-Free Rates?

A: In recent literature, several candidates for risk-free rates have emerged. In SFAS 157, *Fair Value Measurements,* Appendix B makes reference to the U.S. Treasury yield curve. However, actively traded financial options are often in practice valued based on the swap curve and implied volatilities. In addition, the June 2008 CFO Forum paper first specifies that reference rates should be used as risk free rates and then goes on to define the reference rate (RR) as follows:

"The *reference rate* is a proxy for the risk free rate appropriate to the currency, term and liquidity of the liability cash flows.

- Where the liabilities are *liquid*, the reference rate should, wherever possible, be the swap yield curve appropriate to the currency of the cash flows.
- Where the liabilities are not *liquid* the reference rate should be the swap yield curve plus a liquidity premium, where appropriate."

For further clarification of the RR see Question 39.

Q14: For a market consistent valuation, how is the discount rate, the RR, selected in practice?

A: In a market consistent valuation, the expected rate of return to investors is the risk-free rate of return. As mentioned, the RR is a proxy for the risk-free rate. Hence, discounting is performed at the gross RR (without reduction for investment expenses or taxes). As previously mentioned, the RR has been interpreted by the CFO Forum to generally mean the swap curve plus a liquidity premium, where appropriate. Although the RR may be allowed to vary with time (consistent with the term structure of interest rates), a constant RR based on some average duration is sometimes encountered in practice. For reporting entities with multi-national operations, the RR will typically also vary by country. That is, because government risk-free yield curves, if available, will differ by country of operation, corresponding swap curves or equivalents are also likely to vary by country. Consequently, a multi-national entity, for example, might use one RR yield curve for its U.S. business, another for its Canadian, and yet another for its Hong Kong business.

For further clarification of the RR see Question 39.

Q15: How is profit defined for computing PVFP in MCEV?

A: Profit (P) for computing PVFP is defined by the MCEV Principles as "post-taxation cash flows from the inforce covered business and the assets backing the associated liabilities." In the U.S. this is consistent with the accepted definition of after-tax statutory book profits (statutory net income), with one key difference. Because the objective of MCEV is to obtain a market consistent valuation, it is assumed that the assets backing the liabilities earn a market consistent return (i.e., the reference rate), rather than a book yield.

To achieve market consistency in projecting the investment income component of P, it is commonly assumed that the supporting assets have been marked to market and will earn the RR in effect at the valuation date. However, there is no definitive guidance on determining the volume, or quantum, of assets supporting the liabilities. A common approach is to compute PVFP using assets with market value equal to the liabilities, irrespective of the book value of assets.

A second approach, preferred by some actuaries, is to compute PVFP using a quantum of assets with book value, rather than market value, equal to the liabilities. Under this approach, unrealized gains and losses on assets supporting liabilities are classified as VIF, while in the first approach, these gains and losses are classified as ANW. In the U.S., one may consider that this second approach reflects the existence of the Interest Maintenance Reserve (IMR), which precludes immediate distribution of interest rate gains (see the note at the end of this question for additional discussion of circumstances when this approach might be preferred). If this approach is used, one might consider projecting a notional liability/asset (analogous to the real-world IMR) to capture the unrealized gain/loss on the valuation date and allow its gradual release into income. Since the unrealized gain/loss is not captured in ANW under this method, a mechanism is needed to release the gain/loss into P, and a notional IMR provides such a mechanism. Without such a mechanism, the unrealized gain/loss may not be captured in MCEV.

A simple example might further clarify these two approaches and the purpose of the notional IMR in the second approach:

Assume: 1) a zero-tax environment; 2) asset book value = statutory reserve = 100; and 3) asset market value = 110 at the valuation date (i.e., an unrealized gain of 10). Under the first approach, a notional sale is assumed and 100 of assets are allocated to the book of in-force business, with a projected return equal to the RR and with the gain of 10 being added to ANW. In the second approach, the full 110 of assets is retained by the book of in-force business, with a projected return also equal to the RR. A notional IMR of 10 is established to keep asset market value in balance with the liabilities. The release of the notional IMR into P over the projection period is the mechanism by which the unrealized gain is captured in MCEV.

These are only two possible approaches. Other approaches may be appropriate as well. The choice of approach will impact the allocation of MCEV between ANW and VIF.

However, this choice may have an impact on total MCEV as well. The second approach may generate frictional costs associated with the unrealized gains which are not generated under the first approach.

[Note: PVFP is based on management's best estimate of all elements of P, including those driven by credited rates of interest. For spread-managed business, management's best estimate of credited rates might be based on an asset portfolio's book rates of return, an estimate of competitor rates, prior or current market rates of return, a formula for grading into ultimate market rates of return or some combination thereof. Depending on the assumed crediting rate methodology for spread-managed business, one method of defining P might be chosen over another in order to better align projected earned rates with projected credited rates, thereby enhancing modeling efficiency. For additional discussion of crediting rate philosophies in a market-consistent valuation, see questions 35, 36, and 39.]

Q16: Can future profits be derived from models that project accumulated surplus?

A: Yes. Some actuarial models, especially pricing models, do not internally reset assets to equal statutory reserves at the start of each accounting period in the projection. Instead, such models project undistributed (self-generated) assets, allowing surplus to accumulate. As long as the investment return in such models is based on the RR yield curve at the valuation date, P for a particular accounting period in the projection can be derived by assuming any excess of surplus at the end of an accounting period over surplus at the beginning of the accounting period accumulated at an after-tax, after investment expenses, RR for the period (i_t) has been contributed by the business being valued. One possible formula is:

$$(5) \quad P_t = Surplus_t - Surplus_{t-1} \times (1 + i_t)$$

The above formula assumes there have been no distributions to shareholders (shareholder dividends) or amounts of paid-in capital during the accounting period. If amounts have been paid to or from surplus during the accounting period, P must be adjusted to reflect the timing and amount of such cash flows.

Q17: How is Required Capital (RC) defined in the MCEV Principles?

A: Required capital means the capital the company has allocated to the business and has assumed to be required to support the business, and whose distribution to shareholders is considered to be restricted. Definitions of required capital are context-specific, and vary across companies and geographies. For United States and Canadian business, one definition is the minimum capital required to avoid regulator actions, e.g., 200% of NAIC authorized control level risk-based capital (RBC) in the U.S., or 150% of minimum continuing capital and surplus requirement (MCCSR) in Canada. Other percentages or capital levels are also used, e.g., a percentage (varies by company) of risk based capital formulae of rating agencies. The underlying percentages are usually tied to the organization's desired financial strength ratings.

The June 2008 CFO Forum paper defines a minimum, but states RC should be based on amounts to meet internal objectives, which could be based on internal risk management measures or an amount of capital to obtain a targeted credit rating.

Q18: How is the term 'frictional costs of required capital (FCRC)' defined?

A: For simplicity, first assume no debt. The cost of capital for a given period assumes investors wish to earn a risk rate of return on capital that cannot be distributed. Since a market consistent valuation is being performed, investors are assumed to be risk-neutral, which implies the required risk rate of return on assets that cannot be distributed is the RR. Since assets supporting RC are expected to earn an after-tax, after-investment expense, investment rate of return, the cost of capital (CoC) for the period is defined as RC at the beginning of the period multiplied by the excess of the RR over the net after-tax investment rate of return (i). In formula form:

$$(6) \quad CoC_t = RC_{t-1} \times (RR_t - i_t)$$

The frictional costs of required capital is simply the present value of each period's cost of capital in the projection, discounted to the valuation date at the RR.

Q19: Is it appropriate for debt to be reflected in MCEV?

A: In support of acquisitions in North America, actuarial appraisals usually use risk discount rates that represent a blend of the cost of equity capital and the cost of debt. Such weighted average cost of capital (WACC) is that typically found in finance textbooks. In the U.K., however, where traditional EV first originated, debt was not considered. The risk discount rate represented the cost of equity capital, not a WACC. The logic may have been that borrowing money could not increase surplus. This is also true under U.S. statutory accounting where borrowed money simply increases both assets and liabilities by the same amount and does not increase surplus. Hence, conventional debt cannot be used directly to fund RC requirements.

However, in other jurisdictions, such as Canada, certain qualifying long-term debt could, at times, be used to meet minimum capital requirements. In addition, even where conventional debt cannot be used to fund RC, there are forms of pseudo debt, such as preferred stock, surplus notes, capital notes, and reinsurance that accomplish the same objective. In addition, even though a U.S insurance company cannot simply borrow money (i.e., use conventional debt) to meet capital requirements, a holding company can certainly borrow money or issue shares to fund an insurance subsidiary.

Based on the foregoing, debt in its various forms is important enough in North America and other jurisdictions to be considered in MCEV.

Q20: How might debt be reflected in MCEV?

A: Principle 3 of the MCEV Principles states that financing types of reinsurance and debt should normally be marked to market and deducted from free surplus or VIF. In most accounting systems, conventional debt might have already been included in free surplus, but not normally at market value. In accordance with the guidance in Principle 3, debt should be marked to market. Further guidance is contained in Principle 5, which states that the amount of RC should be presented from a shareholders' perspective and should be net of other funding sources such as subordinated debt. This gives some actuaries the impression that FCRC should be based on only that RC funded by shareholders, but no guidance is given as to the treatment of other funding sources.

Finally, the CFO Forum MCEV Basis for Conclusions document, in its discussion of Principle 4 (free surplus), states that some forms of reinsurance and debt restrict shareholder access to cash flows from the covered business, increasing volatility of shareholder cash flows and increasing risk. It mentions that this type of risk would be appropriate to be recognized in valuation, but states that further guidance was not included in the MCEV Principles due to the unique nature of such loan and reinsurance arrangements. It concludes that the most appropriate treatment is left to the company, with sufficient disclosure being emphasized.

While there are multiple ways to reflect debt in MCEV, due to the current lack of authoritative guidance, further discussion of the treatment of debt is beyond the scope of this practice note. As more companies disclose their treatment of debt and other funding sources, a more consistent practice might emerge.

Q21: For valuing in-force business, how does VIF compare with the present value of distributable earnings often encountered in acquisitions?

A: The key difference is the fact that the present value of distributable earnings (DE) is typically calculated using a starting level of capital, distributions of which are included in DE; whereas VIF is calculated without capital distributions (with a separate adjustment for the frictional costs of capital). For simplicity, assume no debt and that RC equals economic capital. DE can then be defined as after-tax net income, which includes the after-tax statutory book profit (BP), plus investment income on assets supporting RC, plus any release of RC (positive or negative). In short, DE for a period represents the maximum dividends that can be distributed to shareholders while maintaining minimum capital requirements. In formula form:

$$(7) \quad DE_t = BP_t + (i_t \times RC_{t-1}) + (RC_{t-1} - RC_t)$$

Subtracting and adding $RR_t \times RC_{t-1}$ to the right side of the equation gives:

$$(8) \quad DE_t = BP_t - (RR_t - i_t) \times RC_{t-1} + (1 + RR_t) \times RC_{t-1} - RC_t$$

By assuming investment income in BP is based on the RR, BP above becomes equivalent to P (see question 15). Working with the first line of the DE formula, projecting the terms on the right hand side to the end of the projection period and taking the present value at the RR gives the standard definition of MCEV VIF (still excluding TVFOG and CRNHR), i.e., the present value of future profits less the frictional costs of required capital. Projecting and taking the present value of the terms of the second line gives RC_{t-1}, i.e., starting capital (since both implied investment income on RC and discounting are based on the same interest rates, the RR yield curve). Dropping subscripts for convenience, in formula form:

(9) $PVDE = VIF + RC$

[Note: The relationships illustrated above are dependent upon PVDE being based on the same assumptions as VIF. More specifically, all invested assets are assumed to earn the RR, all other elements of projected book profits are assumed to be based on best-estimate assumptions, and all discounting is performed at the RR.

Q22: Is VIF the same as the value of business acquired (VOBA) encountered in purchase GAAP (PGAAP)?

A: Generally no. Although at least one approach to VOBA takes the form of a VIF computation, there are typically differences in accounting bases, assumptions, and the definition of the risk discount rate. For example, if U.S. GAAP reserves were greater than statutory reserves, greater profits would be expected to emerge as such excess reserves release into GAAP income. Consequently, if VOBA is derived from VIF, an adjustment must be made for statutory/GAAP reserve differences. In addition, MCEV best-estimate assumptions (discussed further in the next section) assume a going concern and are mostly company-specific. Since VOBA involves consideration of fair value requirements, assumptions tend to be more market-based. For example, a selling company's assumed maintenance expenses of $80 per policy (based on experience and deemed appropriate for MCEV) might be supplanted with more typical market expenses of $60 per policy, reflecting economies of scale obtained by a potential purchaser. In addition, as previously discussed, the risk discount rate used to compute VIF is based on the RR yield curve, a surrogate for the cost of equity capital (since all investments are assumed to earn the RR rates of return). In contrast, the risk discount rate used in the computation of VOBA is almost invariably a weighted average cost of capital (WACC), reflecting the capital structure (blend of debt and equity capital) of the acquirer (or the cost of that capital structure typically encountered in the market place).

Q23: How is the value of new business (VNB) defined in the MCEV Principles?

A: For a block of new business, the basic definition is the same as VIF, i.e., the present value of future profits (PVFP) less the time value of financial options and guarantees (TVFOG) less the frictional costs of required capital (FCRC) less the costs of residual nonhedgeable risks (CRNHR). VNB may be valued at the point of sale. In some

disclosures (discussed in a subsequent section), VNB for the reporting period is accumulated at the risk discount rate (RDR) to the end of the reporting period. VNB is typically reported net of actual acquisition expenses. As is typical with VIF, non-market assumptions underlying VNB are best-estimate assumptions. In addition, as is typical with VIF, discounting is performed at the RR.

Q24: How does VNB differ from the value of future new business (or franchise value) valued in actuarial appraisals?

A: VNB is the value of new business sold in the particular reporting period (e.g., calendar year for annual reporting). It does not reflect the value of future new business to be sold in future accounting (reporting) periods. The value of future new business capacity valued in actuarial appraisals represents the value of a certain number of years of future new business as opposed to just one period's worth in MCEV. In addition, as previously mentioned, assumptions in actuarial appraisals are not typically based on entity-specific best-estimate assumptions and investment rates of return equal to the RR. Also, the risk discount rate for an appraisal is generally based on a WACC.

Q25: Can MCEV be used to support an actuarial appraisal or place a value on a company's stock?

A: In general, this is not directly done. As previously mentioned, MCEV is <u>not</u> an actuarial appraisal. In addition to ANW and VIF, an actuarial appraisal includes the value of future new business capacity, a critical component of any actuarial appraisal. Also, VNB only reflects the value of business sold in the recent reporting period; it does not reflect future performance, either with respect to sales volumes, product mix, or profit margins. In addition, an actuarial appraisal would be unlikely to use exactly the same assumptions used for MCEV (i.e., in actuarial appraisals, assumptions would be more market-based and less entity-specific than in MCEV). Finally, a prospective buyer's interpretation of risk and uncertainty, and the desire to achieve a fairly high risk adjusted potential return, would likely lead to selection of a risk discount rate well above the RR used in MCEV, but internally consistent with other assumptions that might not be risk neutral.

While MCEV analysis does not attempt to deliver an actuarial appraisal or attempt to place a value on the company's stock, a major purpose of MCEV disclosure is still to provide analysts with additional information that can be used to better value the company's stock. Given ANW, VIF, VNB, and some sensitivity analysis, an analyst might examine historical financial data, make assumptions about future growth, modify VIF and VNB based on independent assumptions and modeling, and finally, select a multiple of modified VNB to be added to modified MCEV. The result would be a somewhat independent valuation of the company's market value.

Section C: Assumptions

Q26: What assumptions are required for MCEV calculations?

A: The assumptions can broadly be split into two categories; economic and non-economic assumptions, though these two categories are interrelated and some assumptions cross both categories.

Economic assumptions generally relate to the existing and expected future economic environment. Examples of economic assumptions include future gross reinvestment rates and inflation and default rates.

Non-economic assumptions generally relate to the existing and expected future operating environment. Examples of non-economic assumptions include future mortality and morbidity rates, future expense rates (excluding inflation) and future interest crediting strategies.

While this framework of separating assumptions is often useful, the categories are not necessarily clear-cut. For example, persistency may be either non-economic or economic, depending on the product design under consideration.

Q27: Which assumptions are appropriate to be stochastic, which assumptions are appropriate to be dynamic, which assumptions are appropriate to be static?

A: Stochastic assumptions are generally used for interest rates and equity returns. Mortality rates and defaults could be generated stochastically as well.

The June 2008 CFO Forum paper states "Where stochastic variation in financial markets forms a part of the valuation, its impact on lapses, option take-up or bonus (dividend) participation should be consistent." Therefore, material policyholder behavior that is closely tied to economic behavior is often expressed dynamically as a function of the economic scenario. For example, partial withdrawals, annuitization election under Guaranteed Minimum Withdrawal Benefits (GMWB), etc. could be tied to the economic scenario.

For other assumptions, such as unit expenses, mortality rates, morbidity rates, lapse rates on term policies, etc. using static assumptions that are not tied to the economic scenario could be appropriate.

Q28: Which assumptions should be entity specific assumptions?

A: For non-economic assumptions, Principal 11 of the MCEV Principles states: "The assessment of appropriate assumptions for future experience should have regard to past, current and expected future experience and to any other relevant data. The assumptions should be best estimate and entity specific rather than being based on the assumptions a market participant would use."

Therefore according to the CFO Forum, certain assumptions, like expenses, should be entity specific. In addition, anytime an actuary has specific studies, or knows of specific policy provisions that create entity specific differences in assumptions, use of those entity specific assumptions would typically be considered. To the extent that these differences are credible and create a material difference in the MCEV calculation they are typically considered in the calculations.

Q29: Do assumptions used include Provisions for Adverse Deviation (PADs)?

A: The June 2008 CFO Forum states "Some companies incorporate margins in assumptions, particularly where there is little reliable evidence on which to base expectations for future experience. Such uncertainty is a risk to shareholders that should be considered and to the extent it is appropriate should be reflected in the Cost of Residual Non-Hedgeable Risk. Introducing such implicit or explicit margins in some assumptions and not in others is potentially confusing. The requirement that assumptions should be 'best estimate' removes this possibility and reduces scope for arbitrary changes in assumptions." Therefore, each assumption should be a best estimate of future experience, without allowance for any margins or PADs.

Q30: How often are assumptions updated?

A: According to the CFO Forum, the assumptions are generally reviewed each time MCEV is calculated, but at least on an annual basis. They should be updated as credible experience dictates. The assumptions are expected to be consistent with best estimate assumptions used in other areas including valuation and pricing.

Q31: Who is involved in the setting of the assumptions?

A: Management is responsible for the assumptions. In practice, actuaries typically play a key role in the development and monitoring of assumptions. However, there are many other key parties involved in assumption development (for example the investment department and accounting as necessary).

Q32: What is typically considered when setting mortality or morbidity assumptions?

A: The mortality and morbidity assumptions used are expected to reflect a combination of credible company experience and market experience. Companies will often compare actual experience to established mortality and morbidity tables to determine the applicable percentages of the standard tables.

Companies might set their assumptions based on the established tables with adjustments made to reflect their past experience, current pricing experience and underwriting philosophies. The granularity of mortality and morbidity assumptions differs by company. Some might set their mortality at a product and era level while others might

use an aggregate table to apply across lines of business. Mortality assumptions usually include an assumption concerning the expected future trend in mortality improvement.

As part of the analysis of change in MCEV, the company validates the assumptions against current experience. This provides both a basis for updating assumptions and allows the company to determine the component of the distributable earnings attributed to experience variances.

Q33: What is typically considered when setting mortality improvements?

A: Future mortality improvements are generally assumed in valuation where there is significant mortality risk or where the product is long duration. The improvements reflect published studies and relevant and credible past experience of mortality improvements in a company's own experience. When developing the improvement factors, consideration is usually made for the change in the mix of business over time. Often, this is considered by developing mortality improvements at a granular enough level to allow for emerging business.

Where the business has renewable terms, consideration is typically given to the potential anti-selection occurring from policyholder behavior at the end of the level term period.

Q34: What is typically considered when setting persistency rates?

A: Persistency rates are generally set based on a combination of credible actual company experience, pricing assumptions, market data, future trends, and analysis of customer behavior. The rates typically consider the relationship between customer behavior, the product design and the investment performance of the products.

For flexible-premium products, premium persistency rates may reflect both the distribution channel and the economic environment.

Generally, lapse rates are set by product type and by duration. For business with renewable terms or surrender periods, allowance for selection can be made by using shock lapse rates at the end of the surrender period.

To maintain consistency with the MCEV Principles, dynamic policyholder behavior is often explicitly considered in the allowance for the time value of financial options and guarantees.

Q35: How would the crediting assumptions, marketplace assumptions, and policyowner behavior be reflected in the environment where only risk free rates are earned?

A: Assumptions need to be both internally consistent and consistent with the assumptions about the marketplace. Although the economic environment in the modeling is market consistent, crediting formulas and dynamic persistency formulas that are normally used in

pricing or other valuation efforts are often the foundation of the market consistent modeling effort. The ultimate test is that the formulas used lead to profitability and behavior appropriate for the environment being tested.

Often in practice, formulas used to determine crediting rates contain a risk spread. In the market consistent world, risk spreads may not be available. In practice the modeler may use swap rates or an estimate of gross investment rates (swap rates plus a spread) to project the competitive rate environment. Either way, the determination of the company crediting rate should be based on an assessment of the competitive environment under which both their company and competitors are operating. In addition, the crediting rate should be based on other characteristics of the actual underlying asset portfolio to the extent they would impact management's crediting strategy, such as call and prepayment provisions, unrealized gain and loss positions, and the risk free returns that existed at the time the assets were purchased. For example, if the underlying asset portfolio was purchased when risk free rates were much higher (or lower) than the risk free rates at the valuation date, the crediting strategy may reflect this higher (or lower) return. Dynamic behavior will then be evaluated within this consistent environment.

In looking at dynamic persistency (or other dynamic behavior assumptions), the modeler will first need to assess whether the current formula contains parameters directly observable within the market consistent environment projection. For example, dynamic persistency formulas that compare account values to a guaranteed benefit base should be fully observable since both parameters are readily available within a market consistent projection. If parameters are not available, then the modeler will need to assess how best to adapt the formula. There is a range of practice in adapting formulas to the market consistent world. For example, for a dynamic persistency formula that utilizes a competitor rate based on a risky rate, the modeler could change the spread to the competitor rate assumption in the excess lapse formula, or alter the competitor rate formula.

Additionally, the modeler would typically review the distribution of behaviors created when dynamic formulas are applied inside stochastic scenarios. This will likely require professional judgment as oftentimes stochastic scenarios will create untested market conditions, such that the modeler will need to assess how the competitive environment would operate and how their own company would react in such an environment.

Q36: What management behavior would likely be included in the assumptions?

Where management action is documented in company policy, such a policy is often reflected in the modeling. For example, if management documents that in stressed market conditions, crediting rates may be gradually reduced rather than being immediately adjusted in order to reduce the impact on lapse rates, such clear direction is usually reflected in the calculations.

Q37: What other policyowner behavior may one typically consider in setting assumptions?

Where material, consideration is typically given to explicit reflection of any contract provision where the policyowner has a financial option or choice. As was stated before, partial withdrawals and annuitization rates under GMWB are two examples of assumptions that are often explicitly modeled. In particular, under GMWB policies these two assumptions are often tied to the economic scenario dynamically.

Q38: What is typically considered when setting expense assumptions?

A: According to the CFO Forum, fully allocated expenses for the covered business are included in an MCEV calculation. The actuary usually considers the allocation of total actual expenses incurred between acquisition, overhead, and maintenance. Overhead expenses are to include any holding company expense allocations. Considerations are typically given to items which are one-off in nature but likely to occur periodically in the future. Costs of system overhaul, while occurring in the current year, might be expected to occur only periodically (e.g., every 10 years). Future expense improvement is not reflected beyond productivity gains that have already occurred (i.e., since the last expense study). However, it may be appropriate to assume a period of time before start-up operations achieve the long term unit expense levels. According to the CFO Forum, any assumed grading to ultimate unit expense levels must be disclosed. Consistency of assumptions with internal business plans is typically considered. The CFO Forum states that "overhead should be allocated between new business, existing business and development projects in an appropriate way consistent with past allocation, current business plans and future expectations."

Q39: What is the assumption for investment returns and discount rates?

A: According to the CFO Forum, for the purposes of MCEV it is assumed that all assets will earn the RR. To project net investment income, the RR is reduced for investment expenses; for discounting, the gross (unreduced) RR is used. As previously mentioned, the RR yield curve is a proxy for the risk-free rate.

The assumption that invested assets earn the RR does not imply that all assets have been exchanged for risk-free assets. In this regard, the CFO Forum specifically addressed the case where a company invests in fixed income assets that have a yield that differs from the RR. The CFO Forum guidance was to adjust the asset cash flows such that their present value at the RR would equal the market value of the assets. This implies that the market value of such assets is assumed to earn the RR for projection purposes. While it often would be expected that these assets actually earn more than the risk-free rate over time, that expected extra return cannot be taken into account in an MCEV calculation, since in a market consistent framework any additional return is assumed to be offset by additional risk, such as default risk (and /or liquidity risk). Over time, actual investment performance will determine if any extra return is to be realized and recognized, but only as it is earned.

As a matter of practicality, the CFO Forum defined the reference rate (RR) as follows:

"The reference rate is a proxy for the risk-free rate appropriate to the currency, term and liquidity of the liability cash flows.

- Where the liabilities are *liquid* the reference rate should, wherever possible, be the swap yield curve appropriate to the currency of the cash flows.
- Where the liabilities are not *liquid* the reference rate should be the swap yield curve with the inclusion of a liquidity premium, where appropriate."

Where swap curves do not exist then it is necessary to use some other bases, such as the local government yield curve.

The CFO Forum also stated "In evaluating the appropriateness of the inclusion of a liquidity premium (where liabilities are not liquid) consideration may be given to regulatory restrictions, internal constraints or investment policies which may limit the ability of a company to access the liquidity premium."

[Note: One way to project the RR is to project yearly credit losses equal to the asset spread assumption on each asset as of the valuation date (such RR would not contain a liquidity premium). Another option is to dynamically model credit losses such that the overall average return on assets is the RR (with or without a liquidity premium as appropriate). In addition, where a balance sheet approach is taken for MCEV, both the best-estimate liability and the risk margin valuation would be computed with the RR used as the risk-free rate.]

The RR is also discussed in questions 13 and 15.

Q40: What liabilities are defined as non-liquid liabilities?

A: A clear example of a liability that is not liquid is an annuity certain with no life contingencies and no surrender provision. Proceeds from a lottery distribution often fall into this category. An example of a liquid liability is a universal life insurance product with no market value adjustment upon surrender. In practice many contracts do not perfectly fall into either category and actuaries must use judgment in categorizing such liabilities as liquid or not liquid.

Q41: How is the liquidity premium determined?

A: This is an emerging area of practice and actuaries have proposed several alternative methods of determining the liquidity premium associated with an asset portfolio.

One alternative utilizes the actual portfolio held by the company. For example, the expected long-term return on a bond is determined and then reduced by the cost of purchasing a credit default swap (CDS) on that asset. This return is then compared to the

risk-free rate to estimate the liquidity premium. This approach has some difficulties. For example, CDSs are not widely traded on all investment names. Also, an actual bond and its CDS may not be heavily traded, resulting in skewed prices. Finally, even if prices are thought to be reasonable in small volume trading, actual market participants may not be willing to complete such trades in any reasonable volume at those prices.

Another alternative is to create a portfolio of assets that replicates the cash flows of the liabilities in all circumstances. The value of the liabilities becomes the market value of the replicating portfolio. A variety of portfolios could be created. The portfolio that produces the minimum market value is generally used as the market value of liabilities. The return expected from the replicating portfolio is then compared to market indices that reflect CDS premiums to estimate the liquidity premium. This proposed alternative has some difficulties. The market indices that reflect CDS premiums are not available in all countries and are not always possible to find for all liability points. Again, the replicating portfolio and CDS index prices may be reasonable in small volume trading, but actual market participants may not be willing to complete such trades in any reasonable volume at those prices.

Others have advocated the use of historical studies of interest rates and default rates in setting the current liquidity premium. Some have advocated a survey of experts in setting the liquidity premium.

Again, this is an emerging area of practice. Actuaries should be careful to consider methodologies in light of their own assets and liabilities, as well as their country of domicile and the financial instruments available to them.

Q42: How does the assumption of the investment returns impact the projection of management actions?

A: In particular, the assumption of RR returns on investments impacts products where policy crediting rates are determined by management based on past or expected future investment returns. On non-participating products, the projections most often reflect a reasonable progression of the steps management would take if the investments return only the RR. Management may not immediately decrease crediting rates to fully reflect these lower rates. Minimum crediting rate floors would be reflected as those product guarantees are encountered.

Q43: Is an inflation assumption required?

A: According to the CFO Forum, inflationary increases on expenses are to be applied to the business. Inflationary increases typically reflect both general retail inflation, salary inflation, and the weighting of the costs in the business. The inflation is usually consistent with other economic assumptions. If it is reasonable, based on company specific data, recognition of improving economies of scale due to the impact of new business could be used as well. Some companies use expenses as a proportion of premiums to implicitly

allow for future expense increases. In other words, they use the impact of new business as a direct offset to the impact of inflation through the use of a constant unit cost.

Q44: Is it appropriate for an assumption of a company's nonperformance risk to be included in the valuation of financial options and guarantees?

A: Some liabilities, such as TVFOG (discussed in Section D), are computed on a market consistent basis. However, unlike FAS 157, *Fair Value Measurements,* the CFO Forum Principles do not allow for a provision for nonperformance risk based on a company's own credit standing. The implication is that shareholders will always meet policyholder claims even if supporting assets are exhausted.

Q45: How do you make the stochastic models internally consistent and appropriate for the business that is being valued?

A: According to the CFO Forum, stochastic modeling should cover all material asset classes. Calibration of the model should be based on observable market data, such as initial swap rate yield curves, implied volatilities, and correlations, that are as similar to the options and guarantees contained in the liabilities as possible. Volatility assumptions should be based on the most recently available information. The duration to maturity and the "in-the-moneyness" effect on the market implied volatilities should be taken into account where material and practical. Correlations of asset returns and yields should be based on an analysis of data covering a sufficient number of years that is considered to be relevant for setting current expectations.

Q46: What level of tax rate is typically applied?

A: The tax rate is typically set to be consistent with the local accounting regime and reflects the location of the emergence of profits. Taxes would typically reflect all taxes incurred, including federal and local taxes. All calculations are completed on an after tax basis. According to the CFO Forum, taxes should also reflect the entity's specific tax position. This is usually interpreted to include tax assets and liabilities.

Q47: How are future dividend rates (bonus rates) and profit allocations determined for projecting participating business?

A: According to the CFO Forum, dividend rates should be consistent with projected future investment returns, any established company dividend philosophy, the ability of management to reflect realized and unrealized capital gains, and the regulatory or contractual restrictions that apply to the block of participating business.
It is assumed that any surpluses that remain at the end of the projection period should not be negative and that any positive surpluses are distributed as a final dividend to existing business or as dividends to both existing and future new business. Any shareholder participation in the distribution of the final dividend should be valued at the appropriate discounted value.

Where investment income on assets backing required capital is subject to profit participation with policyholders, this may lead to an additional source of frictional cost of required capital.

Q48: Are there other assumptions that are typically considered?

A: Generally the actuary is expected to consider all the assumptions used in the calculation of the business that are likely to make a material impact on the overall calculation. The actuary might consider assumptions for its long term care, group risk business, disability business, general insurance lines as well as those mentioned above.

Section D: TVFOG

Q49: What is Time Value of Financial Options and Guarantees (TVFOG)?

A: The value of the option embedded in a financial instrument can be deconstructed into two components: intrinsic value and time value. The time value is the difference between the market value (or market consistent price) and the intrinsic value. In an embedded value valuation, it is assumed that the intrinsic value is captured in the PVFP as the PVFP is quantified from a base deterministic scenario. As such, there is an additional component of the option value (the time value) which is quantified to recognize the stochastic nature of the option.

As was noted in the 2009 Embedded Value practice note, TVFOG is gaining popularity primarily due to its reference in the CFO Forum's EEV Principles. TVFOG is often reported under a different name, such as time value of options and guarantees (TVOG), future options and guarantees (FOG), cost of future options and guarantees (CFOG), or another similar name.

Q50: How is TVFOG calculated?

A: In theory TVFOG is quantified as the market price less the intrinsic value of the option or guarantee being considered. As market prices are not available for insurance contracts, risk neutral valuation techniques (See Question 3 for information regarding risk neutral valuations) are employed to calculate the TVFOG.

The common approach to quantifying the TVFOG in an embedded value valuation is as follows:

1. Calculate the PVFP for a set of stochastic risk neutral scenarios
2. Average the PVFPs calculated from the stochastic risk neutral scenarios
3. The TVFOG is then the PVFP from the deterministic scenario (discussed in section B of this practice note) less the average PVFP from the stochastic risk neutral scenarios.

Other methods may be used. The resulting TVFOG is a reduction in MCEV.

Q51: Is stochastic analysis required to calculate TVFOG?

A: Stochastic analysis is not always required to calculate TVFOG but methods other than what is described in the previous question are uncommon. TVFOG can be calculated using a closed form solution such as Black-Scholes for simple options (e.g., a simple GMAB rider with a short duration on a variable annuity). For more complex life insurance policies or annuities, stochastic modeling is typically used.

While not as theoretically desirable, approximations based on other stochastic runs or shortcuts are common in TVFOG valuations. As with other financial reporting

methodologies, the accuracy and materiality of any such estimations should be carefully considered.

Q52: What type of business is TVFOG important for?

A: TVFOG is important for the following combinations of U.S. products and features, such as:

- Variable annuities and variable universal life policies with secondary guarantees, such as Guaranteed Minimum Death Benefits (GMDBs), Guaranteed Minimum Income Benefits (GMIBs), Guaranteed Minimum Accumulation Benefits (GMABs), and GMWBs
- Universal life policies and deferred annuities with fixed interest options that guarantee minimum crediting rates, including periodic guaranteed rates and long-term floors
- Options and crediting floors found in equity indexed and other fixed annuities
- Universal life policies with no-lapse guarantees

While those listed above are the most common products and benefits that have TVFOGs, each product should be reviewed and any options and guarantees should be captured.

Q53: What assumptions are needed to calculate TVFOG?

A: Please see "Section C – Assumptions" for more information on the assumptions required for MCEV. The general assumptions required to calculate TVFOG should be consistent with the assumptions used in other MCEV calculations, e.g., mortality, lapses, etc. Also, methodologies and the approach to modeling should be consistent with the rest of MCEV, e.g., the RR approach should remain consistent across stochastic and deterministic runs.

A few assumptions and modeling issues are of particular interest in the stochastic scenarios commonly utilized in the calculation of TVFOG. The first of these are the stochastic asset return simulations themselves. A set of stochastic simulations dictate asset returns and discount rates for the set of stochastic scenarios. These simulations often include expected returns for various asset classes and currencies as necessary.

Other major assumptions utilized during stochastic runs are policyholder behavior algorithms. For example, the utilization of GMWB provisions in variable annuities should vary depending upon how far contracts are in-the-money. A policyholder with a significant benefit is much more likely to access those benefits than one with little to gain.

Finally, management actions should be given consideration in developing the stochastic models utilized to generate TVFOG. EV is designed to generate realistic results, and management's propensity for modifying contract features should be taken into account whenever appropriate. For instance, during times of low interest rates and where contract

provisions allow, fixed interest options may be limited within variable annuities to reduce a company's exposure to guaranteed minimum crediting floors. These types of management actions should be modeled, especially in cases where action plans are documented or historically demonstrable.

Q54: Does TVFOG capture the risk of non-economic assumption variance, e.g., risk of mortality deviating from the mean?

A: TVFOG is meant to capture risks from financial options and guarantees. The value of risks from non-economic assumption deviations should be captured in the cost of residual non-hedgeable risk component of the VIF (subsequently discussed).

Q55: Does TVFOG capture non-economic options, e.g., conversion options in term life?

A: The value of these options should be reflected in TVFOG if considered material. Although conversion options are clearly options with associated value, the value cannot be estimated through observing prices in the financial markets alone. Most companies do not capture value of these types of options as they consider their value to be insignificant.

Q56: Does the calculation of TVFOG require the use of dynamic policyholder behavior algorithms?

A: Generally, if it is reasonable to assume that policyholders' behavior will change with the changing economic environment, the TVFOG model should capture these likely changes. Dynamic policyholder behavior algorithms are not new and have been used in numerous other valuation applications, such as EEV, regulatory cash flow testing, and U.S. GAAP valuation. A robust discussion of the methodologies used to generate them is beyond the scope of this document.

Dynamic lapse formulae developed for real world applications such as cash flow testing cannot be simply copied to risk neutral applications without serious consideration. A general rule of thumb is that as the value of the financial option or guarantee increases, the dynamic lapse formula should produce increasingly economically rational behavior.

Q57: Should projections for TVFOG use real world or risk neutral assumptions?

A: Principle 7 states, "All projected cash flows should be valued using economic assumptions such that they are valued in line with the price of similar cash flows that are traded in the capital markets." This means that the economic assumptions used for valuation must be calibrated so that they reproduce market prices, and that requires capturing the market price of risk in some way. The most common approach to accomplishing this is to quantify TVFOG using risk neutral assumptions both when projecting future cash flows and when computing their present value. However, there are techniques (not commonly used in the U.S.) whereby cash flows are projected using real-

world assumptions and then valued in a way that adjusts for the market price of risk. One example is the use of *Deflators*, as discussed further in Q58.

Q58: Can the concept of a risk-neutral valuation be extended to a stochastic valuation, which might be required to value more complex options?

A: Yes. However, stochastic modeling is a complex topic. In its simplest form, a basic model is assumed, such as the lognormal, and using a market implied volatility assumption, scenarios are generated stochastically about the RR in effect at the valuation date. Such a model is generally calibrated to re-price existing traded securities in the market, including key derivatives (e.g., puts, calls, swaps, etc.). Discussion of economic scenario generators and calibration processes, both of which can be extremely complex, is beyond the scope of this practice note. Hence, only a very rudimentary discussion of some common stochastic modeling approaches follows.

One example of risk-neutral valuation using stochastic techniques is in the valuation of equity options. In valuing equity options, it is common to assume stock prices are stochastic and the RR is constant (or a fixed yield curve). Consequently, as has been discussed, expected cash flows are discounted at the RR in effect at the valuation date. However, to value interest rate derivatives and more complex derivatives, where cash flows are dependent upon the path followed by interest rates, the RR might be assumed to be stochastic as well. While the valuation in such an environment is similar to what has been described, the approach to discounting is slightly different. In a traditional risk-neutral world where the risk-free rate is stochastic, expected cash flows in a particular stochastically generated scenario are discounted at the scenario-specific interest rate applicable to that particular scenario. The result is a present value or price of a derivative for that particular scenario. The same process is applied to every stochastically generated scenario. The final value of the derivative is derived as the expected value of the present values. [Note: This technique is equivalent to discounting along each path in a lattice and taking the expected value by probability-weighting the results with risk-neutral probabilities.]

Progressing in model complexity, valuing benefit features (options) in variable annuity contracts might involve the projection of multiple underlying funds, e.g., a large-cap stock fund, a growth-stock fund, a bond fund, a blended fund (e.g., a blend of stocks, bonds, and money market investments), each with its own volatility. In addition, the covariance between funds must also be captured by the model. However, the same general principles of risk-neutral stochastic valuation still apply.

Finally, since the concept of *Deflators* has been applied in Europe, a very brief description is merited. Without going into specifics, deflators are derived from an array of market prices (usually by means of proprietary software) to be used with certain real-world probability models. Companies routinely use real-world (best-estimate) probability models for a variety of management purposes, such as: planning, cash flow testing, economic capital and risk management. By multiplying cash flows generated by such models by deflators, real-world probabilities are supplanted with risk-neutral probabilities

and discounting occurs at risk-free interest rates. The advantage is that models do not have to be run on two sets of assumptions; one set for management purposes and another to obtain a market-consistent valuation. Regardless of perceived advantages, the derivation and use of deflators (a somewhat esoteric practice) has not yet caught on in North America.

Q59: What approaches are used to capture the impact of future default costs on TVFOG?

A: As described above, it is common to assume that all assets are at market value and earn the RR in the determination of PVFP, rather than model book values and portfolio yields on inforce assets offset by a corresponding future default rate. However, for purposes of TVFOG, using such an approach may understate the TVFOG, since there is tail risk associated with future defaults. In other words, the impact of defaults is non-proportional since high default scenarios may result in an inability for the insurer to pass the risk through to the policyholder for contracts with minimum interest rate guarantees.

In light of this, some companies make an adjustment to TVFOG to consider the impact of defaults. Approaches commonly used in practice include:

- Ignoring the impact of defaults in TVFOG, based on the argument that it is not material
- Making an aggregate, approximate adjustment to the TVFOG to reflect the additional cost associated with severe default scenarios
- Modeling defaults stochastically, similar to the approach used for interest rates

Q60: The CFO Forum's paper states: "G7.1 The valuation of *financial options and guarantees* **should take as a starting assumption the actual asset mix at the valuation date." Why does that matter?**

A: Financial theory's conjecture is that the price of a liability is completely independent of the assets backing it because, in theory, assets are fungible and a purchaser could choose to back a liability with any asset mix. So, again, in theory, the TVFOG will not depend upon the actual asset mix of the company; however, MCEV is a reflection of a specific entity's value. Specifically, whenever there is a "par" element to the business such that policyholder crediting is determined using emerging asset yields measured on a book value basis, the duration and makeup of assets will affect the projected cash flows on the liabilities. As such, the market consistent price of a liability will reflect management's policies.

Q61: Does hedging impact TVFOG?

A: MCEV should reflect all material elements of the company's actual investment strategy. In practice, a common method for modeling the hedge strategy impact is to make an assumption as to the cost and effectiveness of the hedge strategy.

It is important to ensure that the value of the hedge assets captured in the TVFOG does not double count any of the intrinsic value captured in the PVFP. In addition, care must be taken to ensure hedge assets are allocated appropriately between VIF and ANW. Care must be taken to ensure that hedging programs are valued consistent with financial markets. No hedging program should be modeled in a way that creates an arbitrage opportunity/value.

Section E: Non-Hedgeable Risks

Q62: What are non-hedgeable risks?

A: Non-hedgeable risks are risks that cannot be hedged using instruments available in financial markets. It includes non-financial risks typically included in C2 and C4 for risk-based capital, such as mortality, longevity, morbidity, persistency, expense and operational risks. It also includes some financial risks that may be included in C1 and C3 if there are no instruments available with which to hedge those risks. These can include risks related to long-term equity market volatility, beyond the term at which options are typically traded in the financial markets. This would affect benefits such as guaranteed minimum death benefits and guaranteed minimum withdrawal benefits. Such risks may also include risk related to liabilities with very long-tailed cash flows, beyond the maturity of typical assets sold in financial markets. Products that may be subject to this risk include long term care, universal life with secondary guarantees and long-tailed payout annuities. Principle 9 of the CFO Forum's Market Consistent Embedded Value Principles notes that "allowance should be made for the fact that profits arising from insurance business are not certain. The valuation techniques used in calculating the PVFP and TVFOG include an allowance for hedgeable financial risks. Additional allowance should therefore be made for non-hedgeable financial risks and non financial risks."

Q63: Why are these costs included in MCEV?

A: Principle 3 states that MCEV requires "sufficient allowance for the aggregate risks in the covered business." The allowance for non-hedgeable risks is required to ensure that any risks not captured in the PVFP and FRCRC and the TVFOG are considered in the MCEV.

Much of the risk inherent in the underlying business held within insurance companies is not captured within a valuation using traditional financial market techniques.   Therefore, an explicit consideration needs to be made around the cost of other elements of risk inherent in the business.

Q64: What are the considerations in determining the MCEV allowance for the residual cost of non-hedgeable risk?

A: All non-hedgeable risks that would be considered by a market participant should be included in establishing the allowance, including both financial and non-financial risks. This includes asymmetric risks, where the mean expected shareholder cash flows differ from the best-estimate cash flows used to compute PVFP and TVFOG. An example of such an asymmetric risk is mortality risk on participating business, where mortality gains may be distributed to policyholders, but mortality losses are borne by shareholders. In addition, risks that are not allowed for in TVFOG or PVFP (e.g., operational risk or data risks that might contribute to errors in best-estimate assumptions) should also be included in establishing the allowance.

When it comes to the cost for uncertainty in the best estimate of shareholder cash flows (for both symmetric and asymmetric risks), the Principles stop short of requiring such costs to be included, but indicate they should be considered.

To support the Principles, the CFO Forum also published "Market Consistent Embedded Value Basis for Conclusions" (The Basis for Conclusions), which acknowledges that "Valuing the allowance for non-hedgeable risks from the perspective of a theoretical market which allows full diversification would suggest that no additional allowance is required." This position is consistent with CAPM, which requires no additional return to investors for assuming risks that are not correlated with market returns (a.k.a. diversifiable risks). However, the next sentence in the Basis for Conclusions addresses the practicality of this position and states: "However, valuing the allowance…. from the perspective of a practical market participant may recognize that full diversification of some insurance risks is not possible and investors generally do not have a zero risk aversion to these variables." This latter position is consistent with SFAS 157, *Fair Value Measurements,* which requires a risk premium for uncertainty in the valuation of fair-value liabilities. Nevertheless, the Principles merely require that due consideration be given as to whether it is appropriate for no charge for uncertainty in the computation of the cost of residual non-hedgeable risks (CRNHR).

Finally, the Principles do not prescribe a calculation method for quantifying the CRNHR, but Paragraph G9.4 of the Principles states that "[it] should be presented as an equivalent cost of capital charge," using economic capital consistent with a 99.5% confidence interval over a one-year time horizon.

Note that TVFOG and/or PVFP may include some provision for non-hedgeable risks, depending on the choice of valuation methods and assumptions. Therefore, it is important to ensure that there are no omissions or double-counting in establishing the allowance for the CRNHR.

Q65: How are the costs of these risks quantified?

A: The Basis for Conclusions states that "different companies will approach the cost of the calculation of the cost of residual non-hedgeable risk from different perspectives, depending on how they internally determine risk based capital and how much non-hedgeable risk is allowed for in the PVFP and FCRC and TVFOG. The approach to allowing for the cost of non-hedgeable risks is therefore not prescribed by the Principles."

Further, paragraph 9.4 of the Principles indicates that the costs "should be presented as an equivalent cost of capital charge."

In practice, many companies use the cost of capital method to determine the allowance for non-hedgeable risks. However, other methods are acceptable, including a granular approach to quantifying risks as long as costs are converted to a cost of capital charge for disclosure requirements.

Q66: What information is needed to calculate these costs?
A: To apply the cost of capital approach, the information needed to calculate these costs include:

- an initial measure of required capital
- a method for projecting future required capital
- a cost of capital rate
- a vector of RRs

For alternative methods, other information may be required.

Q67: What is a cost of capital approach for calculating values?

A: The cost of capital approach is a common method for determining the allowance for non-hedgeable risk. The cost of capital approach involves the following three steps:

- projection of the required capital related to the non-hedgeable risks over the lifetime of the liabilities
- calculation of the annual cost of capital charge (defined in the question 69), by applying a cost of capital rate to the annual non-hedgeable required capital amount
- calculation of the allowance for non-hedgeable risk as the present value of the annual cost of capital charges, discounted at the RRs

A simple example is shown below:

Year	RC	NHRC	CoC Charge	Annual Cost	Ref Rates
1	5000	1000	6%	60	4%
2	4000	800	6%	48	4%
3	3000	500	6%	30	4%

CRNHR is defined as the present value of the annual cost of capital discounted at the RRs. For this example it is equal to 129.

It should be noted that this is the same calculation approach that is used for FCRC, so it is important that costs related to RC not be double-counted through inclusion in both CRNHR and FCRC.

Q68: How is the required capital for non-hedgeable risk determined?

A: Guidance 9.5 states that "The [capital] should be determined using an internal economic capital model." Further, it indicates that the capital amount should include an allowance for diversification benefits within non-hedgeable risk categories.

Many companies develop the capital using a stress-testing approach. The guidance indicates that the capital should be determined based on a 99.5% confidence level over a

one-year time horizon. In order to incorporate diversification, the stand-alone risk capital is often combined via a correlation matrix.

Q69: How is the cost of capital charge determined?

A: Paragraph 88 of the MCEV Basis for Conclusions states "Where a cost of capital approach is followed the charges levied on the projected non-hedgeable risk based capital should be developed by management with reference to the risk measure, the level of diversification, the nature of risk in different sub divisions of the business and where identifiable the level that represents the return above the RRs that the market would require for providing this capital."

In practice, many companies use additional guidance to determine the cost. One relevant paper on risk margins was prepared by the Chief Risk Officers' Forum. This paper discussed alternative methods for determining the cost of capital charge, and suggests a possible range.

Q70: Do these costs capture non-economic options, e.g., term conversion?

A: Yes. The cost of all risks, specifically non-economic, should be considered in determining this provision. If an option generates a risk to the earnings generated by the covered business, a cost for that risk should be considered here. This is true of both non-economic options or risks and even economic options which are not evaluated elsewhere in the MCEV valuation.

Q71: Is stochastic analysis required?

A: The short answer is no. Depending on the nature of the risk, it may be desirable to perform stochastic analysis and there is no prohibition against it; however, there is no specific requirement that it be performed.

Q72: How consistent are approaches across companies?

A: Practice continues to evolve across companies. Some companies have applied the cost of capital approach, and used guidance related to sources outside of the CFO Forum Principles (e.g., Solvency II). However, debate remains about key elements of the approach, including the appropriate level of the cost of capital rate. Other companies have applied alternative approaches to determine the allowance for non-hedgeable risk, including granular analysis of the risks covered or discount rate adjustments.

Section F: Analysis of Movement

Q73: What is the analysis of movement?

A: The analysis of movement is a reconciliation between the opening and closing embedded values, with the difference between the two allocated to various explanatory categories. Generally, the analysis of movement answers the question – why did EV change over the reporting period? Many actuaries and investment analysts believe that the analysis of movement provides actionable management information.

Q74: What business should be included in the analysis?

A: The CFO Forum Principles state that the analysis of movement should include "only covered business." As a result, the analysis should reconcile the movement in the covered MCEV only, and not include non-covered elements included in Group MCEV.

Q75: What are the components of the analysis of movement?

A: The CFO Forum Principles present a movement analysis template for covered business. This template includes the following components:

- New business value
- Expected existing business contribution (reference rate)
- Expected existing business contribution (in excess of reference rate)
- Experience variances
- Assumption changes
- Other operating variance
- Economic variances
- Other non-operating variance

These items are discussed in further detail below.

The sum of the first six items above is referred to as the Operating MCEV Earnings, and is viewed by some as a measure of management's performance.

Q76: How is the analysis of movement presented?

A: As noted above, the CFO Forum Principles present a template to be used in the disclosure of the analysis of movement. In addition to the categories above, the Principles also require that the movement be analyzed separately for Free Surplus, Required Capital and VIF. The table below shows the required disclosure template.

	Earnings on MCEV analysis			
	Free Surplus	Required Capital	VIF	MCEV
Opening MCEV				
Opening Adjustments				
Adjusted Opening MCEV				
New business value				
Expected existing business contribution (reference rate)				
Expected existing business contribution (in excess of reference rate)				
Transfers from VIF and required capital to free surplus				
Experience variances				
Assumption changes				
Other operating variance				
Operating MCEV earnings				
Economic variances				
Other non operating variance				
Total MCEV earnings				
Closing adjustments				
Closing MCEV				

Q77: What is included in "opening adjustments" and "closing adjustments"?

A: Opening and closing adjustments include "movement items not part of MCEV earnings," which, according to the CFO Forum Basis for Conclusions, should consist of "only capital and dividend flows, foreign exchange variance and acquired/divested business." Such items may be presented as either opening or closing adjustments, or both, as best reflects the return earned by the company over the period.

Capital and dividend flows represent capital transfers to/from the parent. Foreign exchange variances represent changes in value due to movements in exchange rates during the reporting period. Acquired/divested business represents any transferred business moving into or out of the entity during the period.

Q78: How is the VNB presented in the analysis of movement?

A: The VNB presented in the analysis of movement should reflect the contribution to embedded value obtained as a result of writing new business over the period. The value is then a value as of the valuation date.
Some companies calculate the VNB using beginning of period or point-of-sale assumptions, and report any variance over the period combined with variances from other in-force business. Other companies calculate the VNB using end-of-period assumptions, and assume there is no variance on new business. The CFO Forum Principles indicate that "the contribution from new business ideally would be valued using point of sale assumptions." However, the guidance further allows for assumptions as of a different date, with clear disclosure. We note that the use of ending assumptions for the calculation of the VNB simplifies the movement analysis.

The CFO Forum Principles do not specify a particular method for developing the VNB. Some companies calculate VNB by running a separate model containing only new issues. Other companies calculate the VNB using a "marginal" approach, where the value is calculated for all business, and all business excluding the most recent period's issues. The VNB is then calculated as the difference between the two.

Q79: What does the expected existing business contribution represent?

A: The expected existing business contribution represents the expected earnings under management's best estimate expectations about future experience. In the absence of new business and any distributions or other such adjustments, it is the expected change in the MCEV over the period.

It is worth noting that the expected contribution is not simply the unwind of a risk discount rate as it is in traditional EV. This is because the expected contribution represents value added by the release from risk over time, and in MCEV there are several provisions of risk outside of the discount rate.

The expected existing business contribution is presented in two pieces in the analysis of movement – the expected contribution due to reference rates, and the expected contribution from returns in excess of the reference rate. The excess return arises from management's best-estimate real-world expectations. For example, if the reference rate is 3%, and management expects assets to return 5% based on best-estimate real-world expectations, then the expected excess return is 2%.

Q80: How is the expected existing business contribution calculated?

The expected contribution is separated into two pieces – expected contribution at the RR and expected contribution due to expected investment income in excess of the RR.

Conceptually, the expected contribution has two components: 1) expected interest on beginning of period MCEV (reflective of all MCEV components); and 2) expected

release of margins, including expected release from provisions for TVFOG and FCRC and CRNHR. The expected contribution at the RR computes the interest component using the beginning of period RR, gross of investment expenses and taxes because that is consistent with the discount rate. The expected contribution in excess of the RR reflects additional income expected based on management's best estimate of expected return, net of investment expenses and taxes.

In practice, the expected contribution is generally calculated as the difference between the results from additional "bridge" runs.

The expected contribution at the RR is determined using a run where the liability data is rolled forward to the end of the period using best estimate assumptions, and with the asset returns equal to the expected reference rates. The expected contribution is calculated as the difference between the MCEV computed using the revised run (valued at the end of the period) and the MCEV computed using the initial run valued at the beginning of the period.

The expected contribution due to the excess over the reference rate is determined using a run with the same liabilities as above, but using asset returns equal to management's best estimate over the first period. The expected contribution from this excess return is calculated as the difference between the MCEV computed using this run and the MCEV computed using the revised run described above (both valued at the end of the period).

While there is no explicit guidance on how to determine management's best estimate of the expected return, the Principles state that it "may consider real world earned rates of return." Therefore, many practitioners believe that this return is intended to be a real-world return consistent with management's internal plans, i.e., an expected portfolio yield net of defaults.

Q81: What are the operating experience variances?

The operating variances reflect differences in the ending value due to the deviation of actual experience from expected experience for operating assumptions over the reporting period. Operating assumptions are intended to include items that are ostensibly under management control. Assumptions typically classified as operating assumptions are:

■ Mortality
■ Morbidity
■ Persistency
■ Maintenance expenses

This is conceptually the same as with traditional EV.

Q82: How are operating experience variances calculated?

Operating variances can be calculated by running a model with the beginning of year in-force data and assumed operating experience, and then replacing the assumed experience

in the first year with the actual experience. The operating experience variance is the difference between the results from these two runs.

Q83: What are the operating assumption changes?

A: As discussed above, the calculation of MCEV requires actuaries to make assumptions so they can estimate uncertain elements of future cash flows. Where such assumptions are ostensibly under management control, they are often referred to as "operating assumptions" or "experience assumptions." See Q81 above for assumptions typically classified as operating assumptions.

Changes in operating assumptions cause changes in MCEV as they alter the estimates of future cash flows included in the underlying actuarial projections. Therefore, when analyzing the movement in MCEV over a given period, one of the components that must be considered is the change in MCEV resulting from changes in the operating assumptions between the start and end of the period.

Q84: How is the impact of operating assumption changes calculated?

A: The impact from changes in operating assumptions can be calculated by running the end-of-period data through the end-of-period model using (i) start-of-period assumptions; and (ii) end-of-period assumptions. The difference between the two results will represent the impact from changes in operating assumptions over the period. In order to present the analysis of movement in the required format, the impact must be reported separately between changes in the VIF and changes in the required capital. This breakdown can usually be obtained directly from the underlying variables within the valuation model.

In order to better understand the impact from operating assumption changes, actuaries typically perform the above calculation in multiple steps, changing one assumption at a time. For example, they would run the end-of-period data through the end-of-period model using (i) start-of-period assumptions; (ii) start-of-period assumptions for all items except mortality and end-of period mortality assumptions; (iii) start-of-period assumptions for all items except mortality and morbidity, and end-of period mortality and morbidity assumptions; …; and (x) end-of-period assumptions for all items. The order in which assumptions are changed will vary based on considerations such as the materiality of the assumption, and other practical issues (such as model run times and data availability). The order will only impact the allocation of second-order components within the analysis, not the overall impact from operating assumption changes.

From a practical perspective, stochastic elements of the valuation model are sometimes turned off or based on fewer scenarios when calculating the impact from operating assumption changes.

Since operating assumption changes are typically considered to occur at the end of a period rather than the start (otherwise the new assumptions would have been used at the start of the period), the approach described above is generally adopted. However, it would be possible to calculate the impact from changes in operating assumptions using a

similar approach based on the start-of-period data and/or the start-of-period model. This would simply result in a different allocation of second-order components within the analysis of movement as discussed above.

Q85: What is included in "other operating variances" and "other non-operating variances"?

A: In addition to experience variances and operating assumption changes, companies are required to disclose the impact from "other operating variances." Similarly, in addition to economic variances, companies must disclose the impact from "other non operating variances." The primary drivers of "other operating variances" and "other non operating variances" should be disclosed where material.

In most circumstances, the impact of a variation in experience compared to the opening projection assumptions used for that area of experience would be included under "experience variances." However, in some instances, there will be changes in MCEV that are not attributable to such experience variances or to changes in operating assumptions, but which can be considered within the control of management. Such impacts should be categorized as "other operating variances." Examples of such "other operating variances" could include:

- Changes to models to reflect improvements or rectify errors (where no restatement is made). There may be times when judgment is required regarding whether something is an assumption change or a model change, which could create differences between individual line items within the analysis of movement. However, in both cases MCEV Operating Earnings will be impacted.
- As noted above, the expected impact from management actions taken in response to changes in economic conditions should be included in the "other operating variances." For example, if management made changes to crediting strategies, the expected impact of these changes should be included in "other operating variances."

Examples of "other non operating variances" could include mandatory local regulatory changes (including taxation) and fundamental business reorganizations such as in a court-approved scheme of reorganization. The impact of management actions in these areas (e.g., taxation planning actions) could be reflected in "other operating variances."

Q86: What are economic variances?

A: Economic variances (or "investment variances") reflect the impact on MCEV from deviations between actual and expected investment returns over the period. This is conceptually similar to the operating experience variance as described in Question 76, and is calculated similarly. However, economic variances are reported separately from operating experience variances as it is often felt that changes in MCEV due to changes in economic conditions are beyond the control of management. Some actuaries believe that this may not be true, as a well-hedged portfolio would show smaller variances due to

changes in investment returns. In this case, it is often still desirable to separate the impact of economic and underwriting variances to help determine the respective performance of investment and insurance managers.

The presentation of economic variances within the analysis of movement should also include the impact of changes in economic assumptions over the period (see next question).

Q87: Where are economic assumption changes reported?

A: As discussed above, the MCEV Principles require investment return assumptions and discount rates to be based on prescribed market-based RRs. As such, changes in economic assumptions are typically directly related to, and only caused by, changes in observable economic variables. The MCEV Principles therefore implicitly incorporate an allowance for the impact from changes in economic assumptions over time, and an explicit split between the impact from economic assumption changes and economic variances (as defined above) was not considered a natural subdivision by the CFO Forum.

There is therefore no requirement to separately disclose economic variances and changes in economic assumptions. The two items are instead calculated and presented together under "economic variances." As such, the "economic variances" analysis item should represent the total impact from financial market conditions being different than assumed at the start of the reporting period, net of the expected impact from management actions taken in response to the changes in economic conditions. The expected impact from such management actions should be included in the "other operating variances" (see below), although any difference between the expected impact and the actual impact of these actions (resulting from different than expected financial market conditions) should form part of the economic variance.

Q88: How are taxes reflected in the analysis of movement?

A: The analysis required by the CFO Forum Principles is performed and presented on a net of taxation basis.

Companies are permitted, however, to disclose supplementary information presenting the movement in MCEV as part of pre-tax profits. In this case, the after-tax movement must be grossed up by attributable shareholder tax, which should then be added to other tax in the income statement. The MCEV Principles do not prescribe a specific approach for determining the attributable shareholder tax. However, they require the approaches used to be disclosed and applied consistently from period-to-period unless a change in approach can be justified.

Two possible approaches are described in the MCEV Basis for Conclusions document published by the CFO Forum. One method is for companies to project after-tax amounts, and then adjust to pre-tax amounts by grossing up the amounts using the expected applicable tax rate (e.g., dividing by 1-tax rate). An alternative approach is for companies

to project pre-tax amounts and tax cash flows separately, and then present the corresponding movements separately. This accounts for possible changes in effective tax rates over time, and may be more applicable in a U.S. context.

Q89: How are currency movements reflected in the analysis of movement?

A: Under the CFO Forum Principles, currency movements (or "foreign exchange variance") should be shown as either an opening or closing adjustment to the MCEV in a manner designed to best reflect the economic return the company has achieved in the period.

Q90: How are transfers to/from free surplus treated?

A: Transfers to/from free surplus (such as capital and dividend flows) should be shown as either an opening or closing adjustment (or if merited, both opening and closing adjustments) to the MCEV in a manner designed to best reflect the economic return the company has achieved in the period. In calculating a percentage return on MCEV, it may be necessary to use a more exact cash flow timing in calculating the return (e.g., where there is a significant capital flow in the middle of the reporting period).

Q91: How are changes in reserve methodology treated in the analysis of movement?

A: Changes in reserve methodology would typically be shown in either "other operating variances" or "other non operating variances," depending on the reason for the change. For example, changes to reflect improvements in the modeling methodology or to rectify errors (where no restatement is made) would typically be included within "other operating variances." However, changes resulting from mandatory local regulatory changes would typically be considered "other non operating variances."

The impact from changes in reserving assumptions would typically be considered as either operating assumption changes (e.g., where the changes are made to reflect an updated expectation of future experience) or "other non operating variances" (e.g., where the changes are a result of mandatory changes in prescribed regulatory valuation assumptions).

Q92: How are changes in capital framework treated in the analysis of movement?

A: Changes in the capital framework would typically be treated in a manner similar to changes in reserve methodology (see above). Of course, within an MCEV framework, there would not be any "direct impact" from changes in the capital framework (since capital is both assumed to earn and is discounted at the RR). However, there would be second-order impacts on the frictional costs of holding capital (e.g., investment expenses and taxation).

Section G: Disclosure of Embedded Values

Q93: What requirements are provided by regulatory authorities related to MCEV disclosures?

A: For external disclosure, any information required by any body that regulates the publication of MCEV should be disclosed as required. For U.S. and Canadian companies, there is currently no regulatory body that requires publication of MCEV and, consequently, no disclosure requirements.

Outside of North America, there are also currently no specific regulatory requirements for disclosing MCEV. In Europe, guidance related to MCEV disclosures exists through the CFO Forum's Market Consistent Embedded Values Principles. Although the CFO Forum is not a regulatory body, per se, member companies agree to publish MCEV results in accordance with its principles, including disclosures.

Q94: What specific requirements related to disclosure exist for reporting MCEV in conformity with the principles established by the CFO Forum?

A: Although the CFO Forum is not a regulatory body, member companies are required to disclose MCEV results in accordance with the MCEV principles beginning at year-end 2011. The MCEV principles include specific disclosure requirements. MCEV must be disclosed at a group, or enterprise, level. A statement of compliance with the MCEV principles must be disclosed, including specific disclosure of any areas of material non-compliance. MCEV disclosures must be published at least annually, but may be published more frequently.

Specific minimum disclosure requirements are included within the core MCEV paper, *Market Consistent Embedded Value Principles*. Following are the disclosure items addressed in the MCEV principles. The disclosure requirements for many of these items are defined in considerable detail within the MCEV principles, and one should refer to the MCEV principles document for the detailed requirements:

- Key Assumptions – Specific disclosure requirements address how key assumptions were determined, including method to derive volatilities and correlation; basis of market RRs, and particularly discussion of any rates not based on an observable swap curve; foreign exchange rate assumptions, where relevant.
- Methodology – Specific disclosure requirements address description of covered business; treatment of consolidation adjustments; treatment of participating business; required capital methodology; methods used to value financial options and guarantees, including assumed management actions; basis used to determine frictional cost and residual non-hedgeable risk allowances; VNB method; new business premium volume; basis of any disclosed comparisons of prior year and current year assumptions; one-time expenses excluded from unit cost assumptions; any productivity gains assumed; basis for tax allowances;

> translation basis used for foreign exchange; treatment of financial reinsurance and debt.

- Analysis of MCEV earnings and reconciliation of opening to closing MCEV by source, split between required capital, free surplus and VIF – presentation format is detailed in the MCEV principles, including a presentation template. See Section E of this practice note for more discussion of the analysis of movement.
- Implied discount rate and new business internal rate of return – are not required to be disclosed, but disclosure requirements are provided for companies that choose to disclose them.
- Reconciliation of closing MCEV to IFRS net asset value.
- Group (or consolidated) MCEV results – requirements include the treatment of covered and non-covered business, and presentation format for group analysis of movement.
- Sensitivities to key assumptions. See additional detail below.
- Statement by directors of compliance with MCEV Principles.

Sensitivity results must be disclosed at least annually. Sensitivities should be disclosed for covered business only. Sensitivities need not be updated more frequently than annually, even if a company discloses MCEV more frequently, unless a change in circumstances significantly changes the sensitivity results. The prescribed sensitivities to be disclosed include the effect of the following (all sensitivities are applied multiplicatively, unless otherwise noted):

- 100 basis point change in the interest rate environment
- 10% decrease in equity or property values
- 25% increase in equity/property implied volatilities
- 25% increase in interest rate swaption implied volatilities
- 10% decrease in maintenance expenses
- 10% decrease in lapse rates
- 5% decrease in mortality and morbidity rates
- Required capital set to minimum regulatory solvency capital

Q95: What practices related to MCEV disclosure are prescribed or suggested in the U.S.?

A: To our knowledge, neither the FASB nor the SEC, nor any other regulatory body in the United States provides any formal guidance with respect to the disclosure of information related to MCEV. Because MCEV is an unregulated valuation concept in the U.S., some believe that reporting MCEV within public financial statements is not appropriate. This would not seem to prevent companies from disclosing MCEV within the section of their GAAP financial statements devoted to management's discussion and analysis ("MD&A"), though the practice is currently not widespread in the U.S. If a company does disclose MCEV externally, it may be considered a "non-GAAP" measure and is subject to FASB disclosure requirements for non-GAAP measures; such determination is an accounting question which is outside the scope of this practice note.

Currently, U.S. MCEV disclosure is not common enough to determine prevailing practice.

Q96: What items are typically disclosed (i.e., which items will prove most useful to the readers of the MCEV numbers)?

A: Different observers will find different disclosure items more or less valuable in understanding the MCEV figures. In part, the issue is one of personal preference. However, as a general rule, it is the authors' view that the most important items to disclose are: 1) the assumptions and other calculation elements that have the greatest impact on the level of the MCEV and/or changes in MCEV; and 2) analytic items which enable the reader to interpret the MCEV value and changes in the value. These could include any key methodologies or assumptions that enter into the MCEV calculations and the sensitivity of MCEV values to changes in these key assumptions. These might also include analysis of changes in MCEV and reconciliation of MCEV to external reporting bases (e.g., IFRS or U.S. Statutory or GAAP values). Items where there is substantial subjectivity on the part of the company or where company practice differs from commonly observed industry practice are particularly important to disclose. That is because an understanding of the sources of these items and how sensitive the company's results are to them can help the reader who is trying to compare MCEV across companies on a consistent basis.

As discussed previously in Question 94, the CFO Forum provides an extensive list of required disclosures for MCEV reporting applicable to European insurance companies.

Q97: Where can one go to find a summary of the information disclosed by companies related to their MCEV calculations and assumptions?

A: MCEV information related to an individual company can typically be found in the company's annual report, if the company calculates MCEV and chooses to disclose the results. Every member of the CFO Forum is required to disclose MCEV information in these reports beginning year end 2011, with early adoption allowed.

Abbreviations

The following abbreviations are used in this document:

Abbreviation	Full Term	Defined
EV	Embedded Value	Section A – Background
ABI	Association of British Insurers	Section A – Background
APM	Achieved Profits Method	Section A – Background
EEV	European Embedded Value	Section A – Background
MCEV	Market Consistent Embedded Value	Section A – Background
TEV	Traditional Embedded Value	Section A – Background
ANW	Adjusted Net Worth	Section B – Q9
IBV	Inforce Business Value	Section B – Q9
VIF	Value of Inforce Business	Section B – Q9
RC	Required Capital	Section B – Q10
FS	Free Surplus	Section B – Q10
PVFP	Present Value of Future Profits	Section B – Q12
TVFOG	Time Value of Financial Options and Guarantees	Section B – Q12
FCRC	Frictional Costs of Required Capital	Section B – Q12
CRNHR	Cost of residual Nonhedgeable Risks	Section B – Q12
RR	Reference Rate	Section B – Q13
RBC	Risk Based Capital	Section B – Q17
MCCSR	Minimum Continuing Capital and Surplus Requirement	Section B – Q17
CoC	Cost of Capital	Section B – Q18
WACC	Weighted Average Cost of Capital	Section B – Q19
DE	Distributable Earnings	Section B – Q21
BP	Book Profit	Section B – Q21
VOBA	Value of Business Acquired	Section B – Q22
PGAAP	Purchase GAAP	Section B – Q22
VNB	Value of New Business	Section B – Q23
RDR	Risk Discount Rate	Section B – Q23
GMWB	Guaranteed Minimum Withdrawal Benefit	Section C – Q27
PAD	Provision for Adverse Deviation	Section C – Q29
GMAB	Guaranteed Minimum Accumulation Benefit	Section D – Q52
GMDB	Guaranteed Minimum Death Benefit	Section D – Q52
GMIB	Guaranteed Minimum Income Benefit	Section D – Q52