Valuing a Life Insurer:
Developments in embedded value reporting
Subject Code: Life Insurance

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Abstract

The paper discusses the concept of traditional embedded value and its components and also contrasts embedded value profits with statutory profits. It also discusses the assumptions required for an embedded value calculation, as well as the concept of goodwill. The paper then discusses European embedded value, with a focus on the derivation of the risk discount rate. Case studies of some European insurers who have published their European embedded value results are discussed.

Keywords

Traditional embedded value, European embedded value, Risk discount rate, Weighted average cost of capital

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1. Introduction

Life insurance contracts are written over long terms and typically involve an annual mismatch between income and outgo, although not over the entire duration of the contract. A term insurance product, for instance, provides the customer a monetary benefit on death, and the value of this benefit typically increases with duration. The premium charged for this service, the income for the insurer, is typically levelised and does not increase with duration.

Along with this timing difference of income and outgo, insurance involves a contract to meet a promise in the future. Insurance regulators instil confidence in the customers of insurance contracts by establishing a regime that increases the likelihood of this promise being met. The published statutory results of an insurer therefore do not represent a realistic view of the underlying economic worth and profitability of its business. Statutory profits are affected by the need to establish statutory reserves that defer the recognition of income.

The true underlying profit generated by an insurance contract is only known with certainty when the contract goes off the books. The total profit is unaffected by the reserve held during the period of the contract. However since the timing of income recognition over the contract differs, the present value of future profits are affected by the statutory reserves.

The earnings of an insurer in any year are affected, amongst other factors, by the statutory regime it operates under, the mix of new and in-force business and its actual experience in relation to claims, expenses and persistency. This makes analysis of an insurance company's economic worth more complex, rendering ratios such as price/earnings less meaningful.

An embedded value ("EV") approach overcomes such deficiencies by quantifying the economic value of an insurer as the sum of:

- balance sheet strength and
- the present value of the in-force business

The latter component of EV is largely dependant on the methodology and assumptions used. As knowledge of the financial and non-financial risks that an insurer is exposed to has advanced, alternate methods have been proposed to evaluate the inherent value of business already sold. A major portion of this paper is devoted to the methodology commonly used to value this in-force business.

In Section 2, an overview of the traditional approach to calculating EV is presented. This involves some subjective assumptions regarding future experience. The rate at which future profits are discounted to the valuation date has been a topic of much discussion and is covered in some detail. This section also discusses the appraisal

value of an insurance enterprise. This considers the additional element of goodwill as the third component of an insurance enterprise's economic value.

In Section 3, I discuss an alternate to the traditional EV approach that has been developed over the last few years known as European Embedded Value ("EEV"). This approach has emerged due to several factors, including advances in financial economics and its application to insurance; as well as growing financial convergence between the areas of banking, insurance and asset management.

Financial economics is broadly based on the principle that two portfolios with identical cashflows under all future scenarios have the same current value. Although this may be seem obvious to many readers, the implications of this principle are far reaching and are influencing the current thinking around EEV.

2. Traditional embedded value

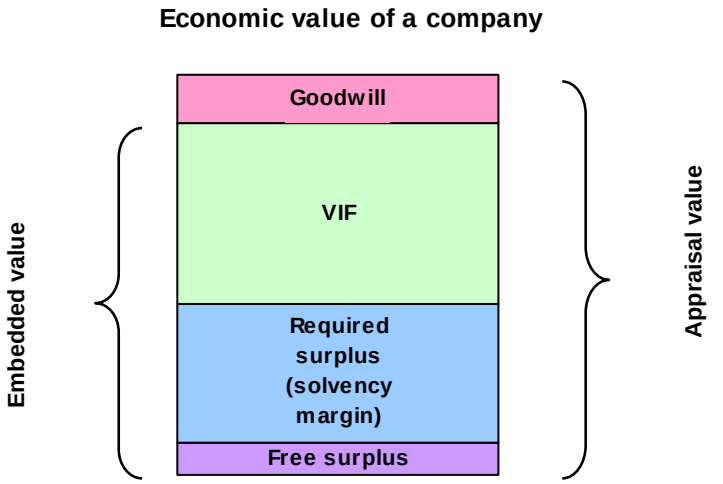
Components of embedded value

EV has become a popular tool to value a life insurer due to the increased focus on earnings and the need for transparency in the assessment of an insurer's performance. EV can be used for many purposes including:

- internal profit reporting;
- as a key management tool;
- financial planning;
- mergers and acquisitions; and,
- inter-company analysis.

Since EV makes no allowance for the value of future new business or goodwill, it only represents a part of the full economic value of the business (the "appraisal value"). The movement in EV from one year to the next represents the EV profit that has emerged in that year and is akin to the economic value added over the year.

The economic value of a life insurer can be summarised as below:



EV comprises of two components, adjusted net worth and value of in-force business.

Adjusted net worth ("ANW")

ANW represents the value to shareholders of their share of the surplus, which is not required to support the in-force business. It comprises of free surplus, which can be used to finance new business, as well as the required surplus, the capital tied up in the run-off of the business.

Another way to look at the ANW is that it is composed of the following:

- The value of the shareholder's equity, or the market value of the free assets in the shareholders fund (net of tax)
- The amount of surplus attributable to shareholders in the participating, non-participating and unit-linked funds
- Any adjustment to reflect the market value of assets

Value of in-force business ("VIF")

The value of in-force business is the present value of shareholder transfers arising from the business that is on the books of the company as at the valuation date, allowing for the need to hold statutory reserves. The projected profits are calculated using the best estimate assumptions of the future experience. There is typically an adjustment made to reflect cost of holding the statutory solvency margin. For start-up companies an adjustment may also be required for the expense overrun.

The present value of future profits ("PVFP") can be defined very simply as

PVFP = PV(Profits (t)) 0 to term-t

Where Profit (t) =

Income received in year, less

Expenditure incurred over the year, less

Increase in statutory reserves and required solvency margin over the year

Each year profits may emerge due to the following reasons:

- Release of profit margins - The profit loading in the premiums will result in profit being released over the policy term. The timing of profit recognition (ie the year t in which it is recognized) depends on the regulatory regime. In India for instance, the gross premium valuation method typically allows for the release of the profit margins at policy issue.
- Margins in the reserves - Profits will be released each year from the reserves due to the margins for adverse deviations ("MADs") included in the calculation of the statutory reserves. These margins are included for prudence so that the insurer is able to meet its obligations with a higher likelihood in case actual experience turns out to be worse than expected.
- Experience profit - Any variation in actual experience as compared to expected experience will lead to emergence of profits/losses.
- Any change in reserving basis may cause profit/loss to emerge.

Participating business

In India transfers to shareholders for participating business are restricted to the minimum of:

- 1/9th of the cost of bonus on the statutory basis
- 10% of surplus arising in the year

Since the cost of bonus is calculated on the statutory valuation basis, a more conservative valuation basis will increase the shareholder transfers, subject to 10% of the surplus arising in the year.

In an EV calculation, the future bonus rates and the split between reversionary and terminal bonus will affect the timing of distributions to shareholders. It is also necessary to consider how the shareholders' share in any undistributed surplus in the participating fund should be valued.

The bonus rates may be set with the aim of paying out benefits equal in value to smoothed asset shares. For traditional participating business, asset shares may be determined by accumulating premiums paid less expenses, tax, shareholder transfers (if any) and other costs (including mortality costs) at the actual rate of return earned on the assets backing the business. However, the company may pay US-style cash bonuses, where the participating business is managed on a contributory principle that typically splits surplus into interest, mortality and expense components.

Projected bonuses should take into account the insurer's historic levels and mix of bonuses, or in the Indian context the bonus levels assumed while illustrating the product, so as to meet policyholders' reasonable expectations. Future bonus rate assumptions must be consistent with the investment return assumption, and the mix of assets backing the liabilities.

Due to the regulatory restrictions, the shareholder transfers will generally not exhaust the total surplus, net of declared bonus, emerging each year in the participating fund. The insurer may also set aside a part of the surplus to fund future terminal bonuses. As such a residual surplus builds up in the participating fund and this may be referred to as the "estate".

The treatment of the estate in an EV calculation is a rather contentious issue. One approach is to calculate a bonus sequence (mix of reversionary and terminal bonus) which exactly extinguishes the estate in the participating fund at the end of the projection period. The EV then increases as per the increased shareholder transfers resulting from the increased bonuses.

Another approach to account for the estate in the EV calculation is to increase the amount of shareholder transfers by 10% (assumed to be the shareholders' interest in the estate) of the present value of the accumulated residual surplus at the end of the projection period.

In India, given the start-up nature of insurers, an "actuarial surplus" may not initially be generated in the participating fund. Insurers are thus required to transfer money into the participating fund equivalent to the cost of the bonus to be declared (grossed up for tax and shareholder transfers). This capital transfer then gets locked in the participating fund and shareholders can only get their money out through the "minimum of 1/9 of cost of bonus or 10% surplus" route.

Expense overruns

A newly established life insurer incurs initial expenses on purchasing fixed assets, hiring its employee force, building up its infrastructure and distribution network. The number of in-force policies at this stage will be small and the effective per policy expense loadings (expressed as per policy or percentage of premium etc) will be unreasonably high. Charging such high expense loadings for the first generation of policyholders at the stage of start up will also cause inequity against the future generations of policyholders.

In such a situation, the usual approach is to use the expected "steady state" expense loadings while pricing products. The actual maintenance expenses will exceed the per policy loadings until the steady state levels are reached and an expense overrun will exist.

Once the expense loadings exceed the actual expenses, the insurer will be in an expense underrun phase. Typically insurers do not take credit for these underruns in an EV calculation. It is assumed that insurers will instead re-price products to reflect the reduced the per policy expense loadings.

Cost of capital

The shareholders net assets are not immediately available for distribution, as they are required to back the regulatory solvency margin. Investment income will be earned on the solvency margin. Since the net of tax investment income will be lower than the shareholder's required rate of return (as represented by the risk discount rate),

there is a cost of holding the solvency margin in the life insurance company. This cost reduces over time as business goes off the books and the solvency margin reduces. The cost of capital can be quantified as the amount of required solvency margin minus the present value of future releases of capital, allowing for the net of tax investment income earned on the solvency margin.

For participating business, as the estate builds up, it will be available to back the solvency margin, leading to further release of shareholders net assets.

Profits emerging on statutory basis vs embedded value basis

The main difference between statutory and EV profit relates to the timing of profit recognition rather than in the amount of profit that ultimately arises.

Statutory profit refers to the shareholders' share of the statutory surplus arising in a year. EV profit is defined as the change in the EV, ie the change in adjusted net worth and the present value of future profits in each year.

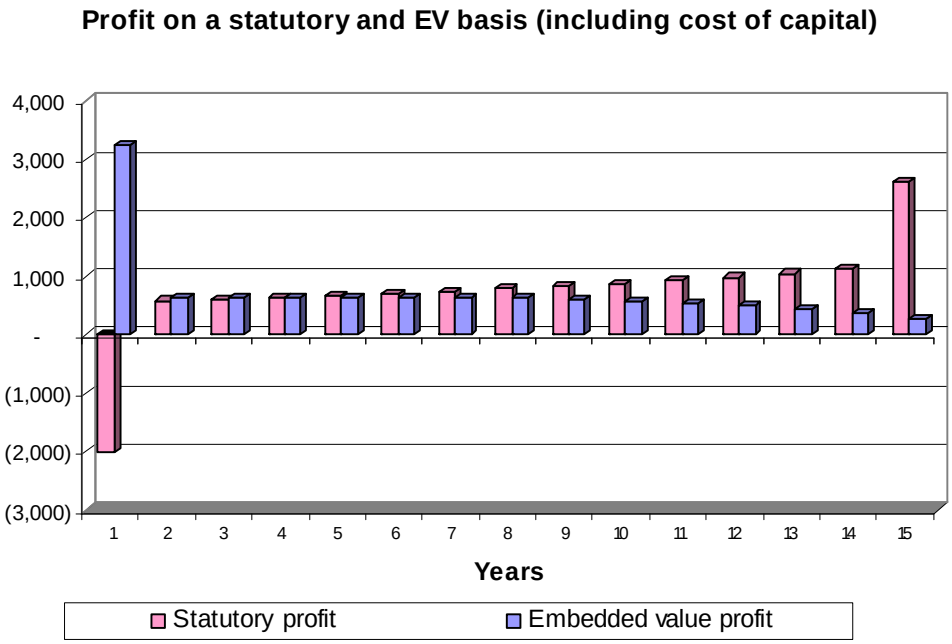
Case study 1: Profit on a statutory and embedded value basis

The profit emerging on a statutory and EV basis for a 15 year single premium unit-linked endowment is shown below. The assumptions for this product are given in Appendix A.

For the purpose of this example the adjusted net worth ("ANW") will just be the accumulated statutory profit. The PVFP is calculated at a risk discount rate of 12%.

Yr	Statutory profit	ANW	PVFP	EV	EV profit
1	(2,023)	(2,023)	5,265	3,242	3,242
2	582	(1,441)	5,314	3,874	632
3	598	(843)	5,355	4,511	638
4	621	(222)	5,376	5,154	643
5	656	434	5,365	5,799	645
6	697	1,131	5,311	6,443	644
7	741	1,873	5,207	7,080	637
8	787	2,659	5,046	7,705	625
9	821	3,480	4,831	8,310	605
10	867	4,347	4,543	8,890	580
11	920	5,267	4,169	9,435	545
12	980	6,247	3,689	9,936	500
13	1,047	7,294	3,084	10,378	443
14	1,122	8,416	2,332	10,748	370
15	2,612	11,028	-	11,028	280
Total	**11,028**				**11,028**

The total statutory profit and EV profit arising over the 15 year time period is identical. But the emergence of this profit over time varies, as is illustrated graphically in the below graph.



The total profit arising on both a statutory and EV basis over the 15 year time period is identical. The statutory profit profile shows a large initial loss in the year that the policy is sold, due to the high acquisition expenses and the solvency margin requirement. The statutory profit increases throughout the projection period as the fund management charges increase in line with the growing unit fund.

For a rapidly growing insurer there will be large statutory losses in initial years, even though it may be writing profitable business. Hence statutory profits may not represent the true economic performance of an insurer.

The EV method takes into account future projected profits and so a large profit arises in the year that the policy is sold. Over the projection period, EV profits arise from the unwinding of the risk discount rate on the EV at the start of the period.

When a policy lapses, it may lead to a statutory profit due to the release of reserves being greater than the surrender value paid out. This reflects the recognition of surrender charge. For example, surrender values in India on traditional business are quite low compared to the statutory reserves held. This excess amount will be released at the time of lapse. On the other hand, unit-linked products, which are more transparent, have lower surrender charges.

On an EV basis, a policy lapse has two effects: the release of surrender charges as well as the loss of future profit margins. The combined effect on EV profit depends on the relative magnitude of the two quantities, but it is likely that the EV basis reflects a loss on policy lapsation. Another effect of policy lapsation is to reduce the number of policies in-force which leads to an increase in the per policy maintenance expense loading for the remaining policies. This will further reduce the EV.

For a start up, as discussed in Section 2.19 there are expense overruns which are reflected at the company level. These expense overruns will reduce the ANW at the company level, but are not typically not appropriated at the product level. Thus, the EV example shown above is before any expense overrun.

Goodwill of a life insurer

The actuarial appraisal value is calculated as the EV plus goodwill. It is indicative of the price that would be paid for the company in case of a merger or acquisition. The goodwill comprises the value placed on new business, economies of scale, sharing of skills and strategic fit. It is quantified as the present value of future profits arising from the business that is projected to be written subsequent to the valuation date. Like VIF they reflect best estimate assumptions and opportunity cost of capital associated with the business.

It can be calculated in several ways:

- For a listed company, by reference to its market capitalisation
- As a multiple of ANW: This is a crude measure which may be used by analysts who have no access to internal company information. Another rough measure is to use the price earnings ratio or dividend yield and apply it to the ANW
- New business multiplier: The most common method is to take a multiple of one year's new business. It will depend on the expected growth and volatility of new business, the distribution channels and expected post acquisition cost savings (in case of a merger). It will also depend on the risk discount rate assumption. It should also be considered whether a squeeze in margins is expected while considering the new business profitability.

Companies can use a wide range of new business multipliers ranging from 3 years to 20 years of new business. One line of thinking is that 20 years of new business is mathematically close to assuming that business continues indefinitely in the future. It can be quite high for start-up companies due to the small value of new business to which it is applied; the number of years of future new business assumed and the premium growth rate assumed. The new business multipliers can change quite dramatically between time periods as is illustrated below:

Sample new business multipliers					
Company	**Fall 2000**	**Fall 2001**	**Feb-02**	**Oct-02**	**Dec-03**
Aviva					
UK	18.00	17.80	18.00	14.90	9.10
Non UK	16.00	24.70	16.00	14.90	9.10
Prudential					
UK	15.80	12	18	12.4	9.7
US	21.7	12	13	12.4	9.7
Asia	45.5	26	22	12.4	9.7
Europe	26.7	19	16	12.4	9.7
Aegon	40	32	32	9.4	9.2
ING	30	20	20	14.6	12.7

Source: Insurance Industry Mergers & Acquisitions, SOA

Chinese insurer, China Life launched its IPO in 2003 for listing in New York and Hong Kong. The insurer's listing document gave the EV at a discount rate of 12.5% as HK$2.22 per share (the listing document illustrated EVs for three different discount rates -10%, 12.5% and 15%). It also gave the value of one year's new business (discounted at 12.5%) as HK$0.158 per share. The IPO price was HK$3.59 per share, which worked out to a new business multiplier of 8.7. China Life's share price rose in the weeks following the IPO, and touched a price of HK$7 which works out to a multiplier of almost 30.

Some other issues to be considered while deciding future new business volumes are given below:

- Is the past data indicative of future sales growth
- Insurer's business plan and premium targets
- Number of agents and productivity per agent
- Existing distribution channels and any new sales channels
- Expected increase in the company's market share
- Product range
- Competition in the market
- Expected GDP growth and the increase in the insurance penetration levels

A bottom approach can be used to estimate the future sales growth – based on number of agents/ branches, productivity and the average policy size etc. Alternatively a top down approach can be adopted using the expected GDP, the expected life insurance growth and the company's market share.

Assumptions

Best estimate assumptions are typically used while calculating the future profit streams in an EV calculation.

Investment return

The investment return assumption must be consistent with the asset mix, the assumed inflation rate and the risk discount rate. For investment based products like money backs and endowments, this is a more critical assumption than for protection products like term insurance.

The rate of investment return may be derived in the following manner:

- Derive an investment rate of return for each category of assets held (e.g. bonds, cash, equities, overseas equities, property etc)
- Apply an appropriate rate of tax to each asset class
- Derive an investment return assumption for homogenous blocks of business by taking a weighted average of returns based on the mix of the assets backing the business

There may be different investment return assumptions within an EV calculation. For example, while calculating VIF for unit-linked business, there may be different assumptions for unit growth rates, returns on non-linked reserves and returns on the assets backing the solvency margin.

Mortality

The importance of the mortality assumption largely depends on the product type, and is more relevant for protection products as compared to savings products. The assumption may allow for future changes in the claims experience, which may arise due to alterations in underwriting methodology and in the mortality and morbidity trends. The quantity and quality of reinsurance should be taken into account, as well as the reinsurer's mortality rates.

Surrender and lapses

The level and timing of lapses can have a significant effect on profitability of an insurer. For example, high early lapses on term assurances generally have a negative impact on the EV, but a high level of lapses for participating products may lead to a profit due to low surrender values. The lapse experience can vary considerably between insurers, by policy duration in force, by product types, by distribution channels and by premium payment frequency. An insurer's lapse experience may be compared for credibility with industry averages.

Expenses and inflation

The expense assumptions will be based on the "stable state" expenses. The inflation rate should be consistent with the investment return assumption. Separate assumptions for price and salary inflation may be used, and a weighted average rate of inflation may be applied to per policy expenses. Expense assumptions will be required for initial expenses, renewal expenses, claim expenses and investment expenses.

In order to calculate an expense overrun the expense loadings expected to emerge from in-force and future new business will be projected forward. The expense loadings are then compared with expected maintenance expenses to derive the expected expense overrun in each future year. These expense overruns are then discounted at the risk discount rate to obtain the present value of the expense overrun.

Reserving Basis

The statutory reserving basis used will determine the speed at which projected statutory profits emerge. The stronger the basis, the slower will be the emergence of profits, and greater will be the cost of solvency margin (which is linked to the statutory reserves). However, for participating business, a stronger reserving basis may lead to a higher cost of bonus factor and a greater distribution of surplus to shareholders.

Reinsurance

The effect of existing reinsurance arrangements and their cost (including any service tax which may be payable on reinsurance premiums) will need to be considered in an EV calculation. The extent of reinsurance may have a material impact on the solvency margin projected forward. The financial strength of the reinsurer will determine the extent to which credit for reinsurance can be taken.

Tax

The tax assumption is very significant when calculating the EV. For start up insurers, future volumes and mix of new business will have a material impact on how the tax position develops. Hence, the future development of an insurer's tax position is often uncertain and cannot be known in advance.

Bonus rates

The paper discusses the setting of bonus rates in a previous section. The bonus rates should be consistent with the investment return assumption.

Risk discount rate

One of the common areas of subjectivity in EV calculations is the choice of the risk discount rate used. It represents the shareholders required rate of return from the capital invested in the company. It should be commensurate with the risk that the insurer takes on. For example a company which enters into a high risk and volatile area of business like sickness and disability insurance and with a high level of equity investments should use a higher risk discount rate as compared to a company with more secure mortality risks.

Historically, risk discount rates have been derived either "in line with everyone else" or calculated top down based on the company's cost of capital. The latter has most commonly been done by using the Capital Asset Pricing Model ("CAPM") approach.

In CAPM, the level of total risk is measured by the variance of returns on the asset. Total risk is split into two components:

- Systematic risk which relates to the variability of movements in an index of market returns.
- Unsystematic risk which is specific to the company itself and can be reduced to zero for a diversified portfolio. As per CAPM there should be no investment reward for unsystematic risk as it can be diversified away.

The cost of equity can be set as the risk free rate plus a risk margin, where the risk margin is derived using a CAPM approach. As per CAPM, an asset's expected return is linearly related to its systematic risk only, measured as the covariance of its returns with the markets, which is called the asset's beta.

Cost of equity = Risk free rate + β *(Market rate of return - Risk free rate)

where β = Covariance of return of company and market returns/ variance of returns of the company

For the risk free rate the common practice is to use the risk discount rate as the ten year government bond yield. However some important considerations while choosing the risk free rate are:

- Keeping the risk free rate consistent with other economic assumptions eg the investment rate assumption
- Whether the government bond yield at the valuation date or some other date be used

The beta reflects the company's/ a particular portfolio's exposure to market risk. A company with no market risk will have a beta of 0. A beta of 1 implies that the company has the same risk as the entire market. The listed life sector in the UK reportedly has an historic average beta of around 1.0-1.2.

As per reports, historically for a participating portfolio in the UK, the volatility of a life insurer's earnings tends to be driven by equity returns and thus risk discount rates tend to be close to assumed equity returns. In a unit-linked portfolio, profit flows directly to the shareholder. The investment risk is largely borne by the policyholder and the lapse, mortality/morbidity experience and expenses have a significant effect. The amount of capital required to back the business tends to be lower, which reduces the dependence of profit on the performance of the underlying assets. Risk discount rates tend to be higher than participating business and may correspond to a beta in the range of 1.6-1.8.

Using the CAPM approach companies can calculate the return on their equity required by the market, based upon the market's view of the risk characteristics of the insurer. If companies are partially debt financed, the required return on equity is combined with the company's cost of debt to calculate the weighted average cost of capital ("WACC") for the company. This WACC is the "risk discount rate

theoretically appropriate for valuing business with a similar risk profile to the company as a whole".

Risk discount rate = (Debt capital/Total capital)* Cost of debt + (Equity capital/Total capital)* Cost of equity

Other characteristics of the business may cause the risk discount rate to be higher than the WACC, such as

- Product range – how diversified is the product range; any product guarantees; is the investment risk passed on to policyholders or retained by the company
- Distribution channels – strength and quality of the agency force; alternate distribution tie-ups and brand image.
- Other factors like expense overrun, economies of scale, etc

The VIF tends to be very sensitive to the choice of discount rate. The insurer may choose to illustrate EV using three different interest rate /risk discount rates scenarios - an optimistic sceanario; a central estimate; and a pessimistic scenario.

Some other considerations for determining assumptions

The EV assumptions may vary for the purposes of publication and internal reporting purposes. The assumptions will also vary if the EV calculation is for the purpose of a merger/acquisition.

The company will need to consider how often to revise the assumptions used. It may adopt a passive or active approach to setting assumptions. It may smooth EV results by using assumptions based on a long term outlook which do not change significantly from year to year. However this may not present a realistic picture of the company's profitability. EV profits/ losses may arise artificially due to frequent change in basis.

3. European embedded value ("EEV")

In 2004, the CFO Forum, a group of Chief Financial Officers drawn from 20 major European insurers, set down the EEV principles. The objective of introducing the EEV principles was to improve the consistency and transparency of life insurance supplementary financial reporting. The 12 EEV principles are set out in Appendix B.

EEV is a move towards a more "market consistent" valuation. In a market consistent valuation all liabilities are valued in line with the prices of similar assets that are traded in the open market. Asset cashflows, like any cashflows arising from a bond, are valued as per the current market price of the bond. Liability cashflows, which are not usually traded in the market, are valued in line with the traded assets that they most closely resemble. For example, a fixed liability due in ten years may be valued in line with a ten year zero coupon bond.

As per financial economic theory, no allowances should be made for non-market diversifiable or specific risks. If assets exhibiting diversifiable risks required a higher risk discount rate than the risk-free rate, investors could purchase a large

number of such assets and make an arbitrage profit. In the context of insurance companies, the risk should be considered from the point of view of an individual investor, who can hold a whole range of assets. For such an investor, mortality risk may be diversifiable even if it is not so for an individual insurance company. Even if it is not possible for an investor to cost effectively diversify all such risks, the risk premium for this residual risk will be much smaller than the market risk he faces. This is an important consideration when setting the risk discount rate.

Some of the main differences between traditional EV techniques and EEV are in the areas of:

- Setting the risk discount rates to reflect the inherent risk in individual cashflows and asset liability mismatches. This can be done through the top down WACC approach or the bottom up approach. The results of both methods should be broadly similar.
- Time value of options and guarantees is calculated explicitly, using either of the two methods below:
  - Market consistent: Option valuation calibrated to produce market traded option prices
  - Real world: Option valuation calibrated to reflect management views of the expected level of future asset values and returns.
- In traditional EV, the cost of capital arises due to the use of a single risk discount rate to discount cashflows with different risks. This cost would disappear if the in-force and capital cashflows are discounted at an appropriate risk adjusted rate. In EEV, the cost of capital reflects the imperfections in the capital market and the frictional costs relating to tax, investment expenses, cost of financial distress and agency costs. These are discussed in more detail later in the paper.

The market consistent approach to EV involves calculating EV as below:

Market value of assets
Less Market consistent value of liabilities
Less Frictional cost of capital

Setting the risk discount rates

The EEV principles advocate a market consistent approach to calculating the risk discount rate. Companies with published EEV results have calculated risk discount rates using one of two methods, the top down WACC approach or the bottom up approach. The former is an evolution of traditional EV techniques, which has been discussed earlier in the paper, whereas the latter approach is more influenced by financial economic theory.

Top down Weighted Average Cost of Capital approach

This approach derives a single discount rate which is the weighted average of the cost of equity and debt for the insurer. It can be adjusted to allow for the risks allowed

elsewhere in valuation eg explicit allowance for the value of options and guarantees.

The main shortcoming of this approach of setting risk discount rates is that it reflects the average risk for all businesses within the company, and may be unsuitable for the particular purpose of an EV calculation due to the following reasons:

- For large conglomerates, the entire group's WACC may not be suitable for calculating the EV of its life insurance subsidiary.
- Also WACC allows for the risk of writing new business as well, if no future capital infusions are expected, while EV only covers in-force business.
- Another consideration is that WACC allows for all the capital held in the company, whereas EV generally incorporates a cost associated only with the capital required by an internal risk based capital assessment or statutory regulations.

In theory, appropriate adjustments can be made for obtaining a more suitable risk discount rate. As suggested in the Tillinghast paper (Market consistent embedded values – Dispelling the myths), the WACC can be adjusted to obtain the risk discount rate that allows for the capital actually included in the VIF. This adjusted risk discount rate can be applied to the release of statutory capital and solvency margin. The excess shareholder capital is often invested in less risky assets (as compared to the life insurance operation).

An adjusted WACC can be calculated as follows:

$$WACC_{adj} = \frac{WACC_{life} * Capital_{life} - WACC_{excess} * Capital_{excess}}{Capital_{life} - Capital_{excess}}$$

In the above calculation, the $WACC_{life}$ and $Capital_{life}$ are the WACC and market values of the life insurer before any adjustment. The $WACC_{excess}$ is the required return on the excess shareholder capital (based on CAPM) which will usually have a beta of one. The $Capital_{excess}$ is the market value of the assets backing the excess capital. Since insurance companies will generally have a beta of greater than one, the $WACC_{life}$ will be greater than the $WACC_{excess}$. This implies that adjusting for excess capital will lead to an increase in the relevant risk discount rate for EV calculations.

When companies calculate the top down risk discount rate, the calculated betas are likely to be based on historical market data. So the risk discount rates may lag behind the true risk profile of the insurers. Due to factors like the long projection period, high levels of leverage and small margins in insurance business this inconsistency may have a significant impact on EVs.

The top down risk discount rate cannot be broken down further for individual lines of business or products, due to lack of data. It may be inappropriate for purposes like

pricing new business or valuing the impact of a change in investment or bonus strategies.

Many insurers like AEGON, Allianz, ING, Legal & General and Swiss Re seem to have opted for a top down approach. The WACC approach of three insurers is compared below, whose risk discount rates seems broadly consistent with each other:

Comparison of WACC Approach			
	Aviva	**ING Dutch**	**Legal & General**
Risk free rate	4.6%	4.6%	4.5%
Equity risk premium	3.0%	3.6%	3.0%
Beta	1.41	1.20	1.35
Cost of equity	8.8%	8.9%	8.6%
Cost of debt (post tax)	4.10%	4.50%	3.90%
Equity %	70%	70%	80%
Debt %	30%	30%	20%
WACC	7.4%	7.6%	7.6%
Adjusted WACC	7.3%	7.5%	7.5%
Implied risk margin	2.7%	2.9%	3.0%

Source: Analysis of EEV Developments, Milliman, January 2006

Bottom up or market consistent approach

The bottom up approach is the exact reverse of the top down approach. Rather than looking at betas of insurers, "a market consistent valuation looks to the market to provide an appropriate risk discount rate for each individual cashflow in a company and then aggregates upwards". It ensures that each cashflow is valued consistently with similar traded market instruments, which is consistent with financial economic theory.

Many companies like Old Mutual, Prudential, AXA and RAS have used a bottom up approach to calculating their risk discount rate.

There are two modelling processes which can be used to implement the bottom up approach.

- Discounting individual cashflows at different risk rates
- The certainty equivalent technique

Individual cashflow risk discount rates

Under this approach, instead of discounting net cashflows at a single risk discount rate, each individual cashflow is discounted at a rate which reflects the risk associated with the cashflow. For example, an equity linked cashflow would be discounted at the assumed equity return rate. An aggregate risk discount rate is not

required, but could be calculated from the individual risk discount rates. This is illustrated with the below example.

A company borrows 80 at a fixed rate of 5% pa and invests the proceeds, along with capital of 20, in equities which are expected to yield 7% pa.

	T=0	T=1
Assets	100	107
Liabilities	(80)	(84)
Capital	20	23

Using a market consistent approach, the discount rate should reflect the market's required rate of return. The asset cashflows must be discounted at 7% and the liability cashflows at 5%. The effective aggregate discount rate for the net cashflow is 15%, calculated as (100* 7% - 80* 5%)/(100-80) = 15%

Source: The above example is taken from the Tillinghast paper titled "Market consistent embedded values – Dispelling the myths"

This method is subject to a large number of practical difficulties. It may be difficult to incorporate into the liability models, and it may be unclear as to what discount rate should be applied to complex cashflows like tax payments.

The certainty equivalent or risk neutral technique

This method involves risk adjusting the individual cashflows, instead of calculating the cashflow risk discount rates. The risk adjusted cashflows can then be discounted at the risk free rate, which allows only for time value and not market risk.

The following approach can be adopted for risk adjusting the cashflows:

- Cashflows that have no market risk and are fully diversifiable (at least in theory) eg only pure insurance risk like claim costs can be discounted at the risk free rate.
- The return on asset-linked cashflows is taken to be the risk free rate rather than the asset return, and these cashflows are also discounted at the risk free rate. In theory, the asset risk premium (the return in excess of the risk free rate) is irrelevant as it cancels out between projection and discounting. Asset linked cashflows can include investment returns on assets, returns on unit-linked funds and fund management charges.

Using this approach leads to appropriate adjustments for risk being made to all related cashflows like tax. In its simplest form, it can be summarized as "setting the risk discount rate and all asset returns equal to the appropriate risk free rate".

Companies have implemented the bottom up approach by two different methods which are discussed below.

Direct approach

Using the bottom up models directly to value each product, and separately for new and in-force business, and presenting these as the EEV results.

Indirect approach

This involves calculating the bottom up value of in-force business, and then solving for the risk discount rate in a traditional EV calculation such that it equates the two EVs. The results of the traditional EV model are then re-presented as the EEV results using the solved for discount rate.

Case study 2: The bottom up EEV approach

This approach can be illustrated by the example below of a 5 year immediate annuity.

The assumptions are:

- Reserves are set based on the future annuity payments incorporating a margin for adverse deviation
- The assets backing the reserve are invested in corporate bonds yielding 8.5%
- The risk discount rate is taken as 14%
- Risk free rate is 7.5%

Cashflows relating to the immediate annuity						
Yr	**Expected annuity payments**	**Reserve Start of year**	**Release of reserve**	**Interest on reserve at 8.5%**	**Release reserve + Interest**	**Profit**
1	200	660	220	56.1	276.1	76.1
2	160	440	176	37.4	213.4	53.4
3	120	264	132	22.4	154.4	34.4
4	80	132	88	11.2	99.2	19.2
5	40	44	44	3.7	47.7	7.7

Traditional EV approach
PV profit at 14% = 146.49

Individual cashflow risk discount rates
Market value of assets = PV of release of reserve and interest discounted at 8.5%
= 660
Market value of liabilities = PV annuity payments discounted at 7.5% = 508.86

PV profit = Market value of assets backing policy reserves, less market value of liabilities
= 151.14

Certainty equivalent approach

Under this approach the assets backing the reserves earn the risk-free rate of return and are discounted at the risk-free rate.

Cashflows relating to the immediate annuity						
Yr	Expected annuity payments	Reserve Start of yr	Release of reserve	Interest on reserve at 7.5%	Release reserve + Interest	Profit
1	200	660	220	49.5	269.5	69.5
2	160	440	176	33.0	209.0	49.0
3	120	264	132	19.8	151.8	31.8
4	80	132	88	9.9	97.9	17.9
5	40	44	44	3.3	47.3	7.3

Market value of assets = PV of release of reserve and interest discounted at 7.5% = 660
Market value of liabilities = PV annuity payments discounted at 7.5% = 508.86

PV profit = Market value of assets backing policy reserves, less market value of liabilities
= 151.14

Bottom up indirect approach

Under the bottom up approach, we compare the traditional EV and the market consistent EV and equate the two by solving for a risk discount rate under the traditional EV.

At a risk discount rate of 14% we have seen above that the traditional EV is lower than the EEV. The risk discount rate which equates the traditional EV to EEV is 12.2%.

PV profit at 12.2% = 151.11

The EEV VIF is higher than the traditional VIF at 14% due to the higher present value of the release of margins in the reserve. This increase is partially offset by no longer taking credit for the risk premium on the return on bonds backing the reserves. The components of the VIF are shown below.

	Traditional approach			Market consistent approach		
Yr	Release of reserve margins	Interest	Total profit	Release of reserve margins	Interest	Total profit
1	20	56.1	76.1	20	49.5	69.5
2	16	37.4	53.4	16	33	49.0
3	12	22.4	34.4	12	19.8	31.8
4	8	11.2	19.2	8	9.9	17.9
5	4	3.7	7.7	4	3.3	7.3
PV at 14%	44.8	101.7	146.5			
PV at 12.2%	46.3	104.8	151.1			

PV at 7.5%	50.9	100.3	151.1

Other issues in EEV

The top-down WACC and the bottom-up approaches for setting the risk discount rate allow for market risks, but additional adjustments may be required to allow for non-market risks. Some companies have included an allowance for non-market risks (even if in theory they are diversifiable) as explicit margins in the risk discount rate or the cost of capital. Fortis, Prudential and Swiss Re have included an additional margin in the risk discount rate to allow for cost of capital. Munich Re have included an additional cost of capital charge of 1% pa on the value of in-force and required capital. Winterthur included a charge of 3% pa on its required capital.

Some companies in the 2004 EEV results used their own view of how risk free rates would develop over time rather than the market's view of the risk-free rates. In 2005 year end reporting there was a move towards using the risk free rates at valuation date. Also there is discretion on the choice of the risk-free rates, as companies have disclosed using the government bond yield curve, the swap rate yield curve or somewhere in between.

The EEV principles require that capital be split between required capital where the distribution to shareholders is restricted and the free surplus. The majority of companies seem to have based the required capital on the higher of an internal assessment of required capital and the regulatory minimum.

Cost of capital

The EEV principles require an allowance to be made for the cost of capital locked in. Two main methodologies have been adopted by companies.

Traditional approach

The traditional method calculates the cost of capital as the face value of capital less the discounted value of the projected release of capital plus investment returns. This is equivalent to a cost of capital emerging each year, due to the difference between the net earned rate and the risk discount rate. It is consistent with using a top-down approach to setting the risk discount rate.

Frictional cost approach

The "frictional costs" method calculates the cost of capital as the present value of the tax and investment expenses payable on the capital over the lifetime of the business. These costs may also include a charge for non-market risks, financial distress costs and agency costs. This is more consistent with using a bottom up market consistent EEV approach. It has been adopted by AXA, Friends Provident and Winterthur, among others.

Financial distress costs include costs like a transfer of goodwill to competitors (due to lost business), payments like redundancy costs to employees, payments to

consultancy/ legal professional and payments to investment banks for raising capital.

Shareholders tend to mark down the value of the capital invested in a company to reflect the natural tension between the interests of the management and the shareholders. This mark-down is known as "agency cost". Agency costs may include items like management remuneration and misguided acquisition decisions. The mark-down tends to be greater the less transparency there is over how the company is run. Insurance companies may sometimes appear particularly opaque compared to companies in other sectors and so are likely to be impacted more by such agency costs. Agency costs are particularly difficult to model and assess.

Case studies

The next section of the paper includes three case studies of insurers who have published their EEV results, and have provided details of the adopted EEV methodology. It is not a comprehensive summary of the approach adopted by these insurers, and only certain sections of the methodology have been included.

Case Study 3: Approach adopted by Prudential in Annual report 2005

Prudential has adopted a "bottom-up" approach to calculating its risk discount rates. The risk discount rates vary by major product groups and region and are derived using the formula:

Risk discount rate = risk free rate + (product specific beta*equity premium) + 50bps

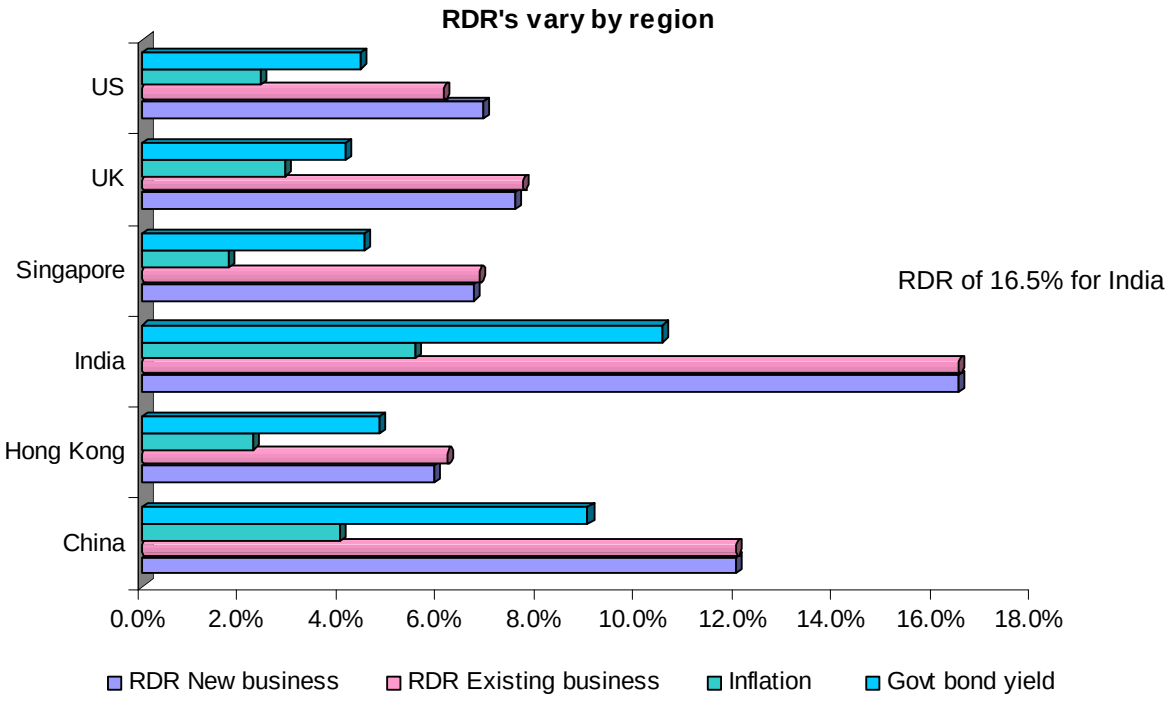
The risk discount rates have been calculated for each product group taking into account the volatility of product cashflows. Prudential has not disclosed the value of the betas used for each product line although it has stated that the betas are calculated by analysing the sensitivities of product cashflows to +/- 1% changes in equity returns.

As per the Research report by Milliman, 2006, the derivation of Prudential's beta (excluding the 50bps margin) can be interpreted as follows:

- RDR(0) = Risk free + Beta(0) * Equity Premium, where Beta (0) is set to 1
- Calculate PV cashflow based on RDR(0)
- Calculate cash flow when a shock (e.g., a +/- 1% one-off change) is applied to the asset yield and then solve IRR(0) to equate this PV to the NPV calculated above
- Beta(1)=Change in the IRR / Change in the asset yield
- RDR(1) = Risk free + Beta(1) * Equity Premium
- Apply the shock again using RDR (1). Recalculate Beta (2) to give RDR (2).
- Iterate this process until beta converges.

CAPM does not make any allowance for non-market risks since these are assumed to be fully diversifiable. For EEV purposes, however, a risk margin of 50bp has been added by Prudential to the risk discount rates for non-market risks and to cover group level risks.

Prudential has calculated different risk discount rates for each area in which it has operations, some of which are shown below.



It is interesting to note that the risk discount rate used for India is 16.5%. The equity risk premium for India (taken as the difference between the risk discount rate and the government bond yield) is 6%.

Case Study 4: Approach adopted by Italian insurer RAS in Annual Report 2005

Italian insurer, RAS has chosen the bottom-up approach in defining its risk discount rate for its Italian business. The calculated risk discount rates are company specific, business specific, and valuation dependent (i.e., the risk discount rates would change at every valuation). RAS split the business into traditional, unit-linked and asset management business in Italy.

The risk discount rate has been derived as the sum of the risk free rate and risk margins. The risk margins comprise of margins for financial and non-financial risk. Financial risk margin is further broken down into a financial margin (excluding the time value of options and guarantees) and a time value margin of the options and guarantees. This is akin to breaking down the value of an option into its intrinsic value and time value. The time value may be defined as the difference between the price of the option and the intrinsic value.

Each of these items is briefly explained below:

- *Financial Margin*: Project cashflows based on real world assumptions, and then solve for a "financial margin" to equate net present value to the certainty

equivalent value. The certainty equivalent value is derived by adjusting each cashflow such that these do not have any financial risk. These risk adjusted cashflows are then discounted at the risk free rate.

- *Time value margin:* Calculate cashflows based on stochastic scenarios and solve for a "time value margin" to equate net present value to the certainty equivalent value. The stochastic scenarios are market consistent, i.e. they product market prices of assets at the valuation date.
- *Non-financial margin*: The non-financial margin was derived using the Company's internal risk based capital measure. A cost of capital was derived by applying a 4% spread on the risk based capital less the capital required only for financial risk. The spread of 4% represents the excess of the shareholders' required return over the risk free rate. The non-financial margin includes an allowance for non-financial risks such as lapse, mortality and expense inflation risk.
- *Risk discount rate = risk free rate + financial margin + time value margin + non-financial margin*

The derived risk discount rates for Italy are given below

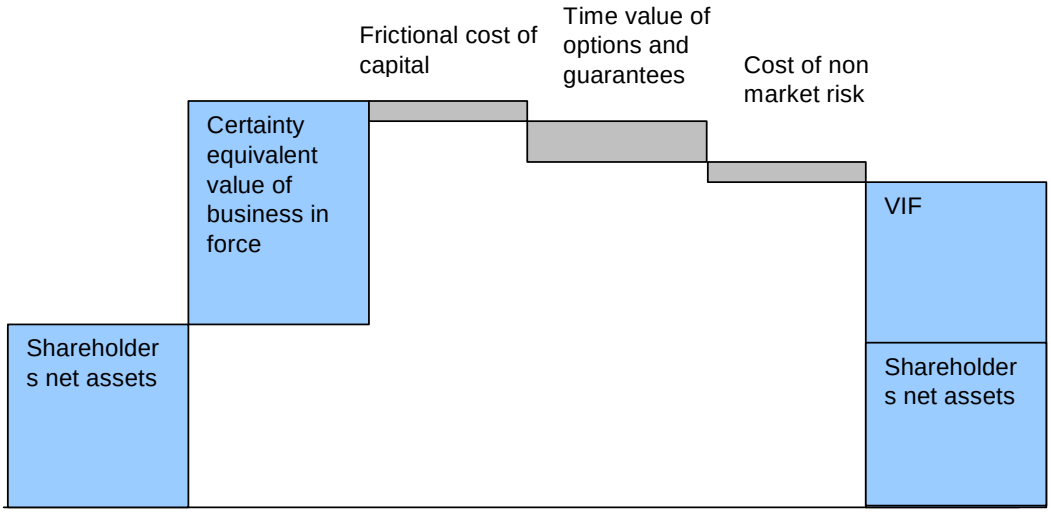
	Traditional	**Unit linked**
Risk free rate	3.45%	3.45%
Margins		
Financial risk	0.83%	0.74%
Time value	0.54%	
Non financial risk	1.34%	2.01%
Total margins	**2.70%**	**2.75%**
Risk discount rate	6.15%	6.20%

Note: The totals may not add up due to rounding.

As a reasonableness check RAS derived a top-down WACC for its Italian business, using the CAPM which came to 6.25%. For its non-Italian business, RAS adopted the top-down WACC approach for setting risk discount rates.

Case study 5: The approach adopted by Zurich in Annual report 2005

The components of the EEV calculated by Zurich are illustrated below:

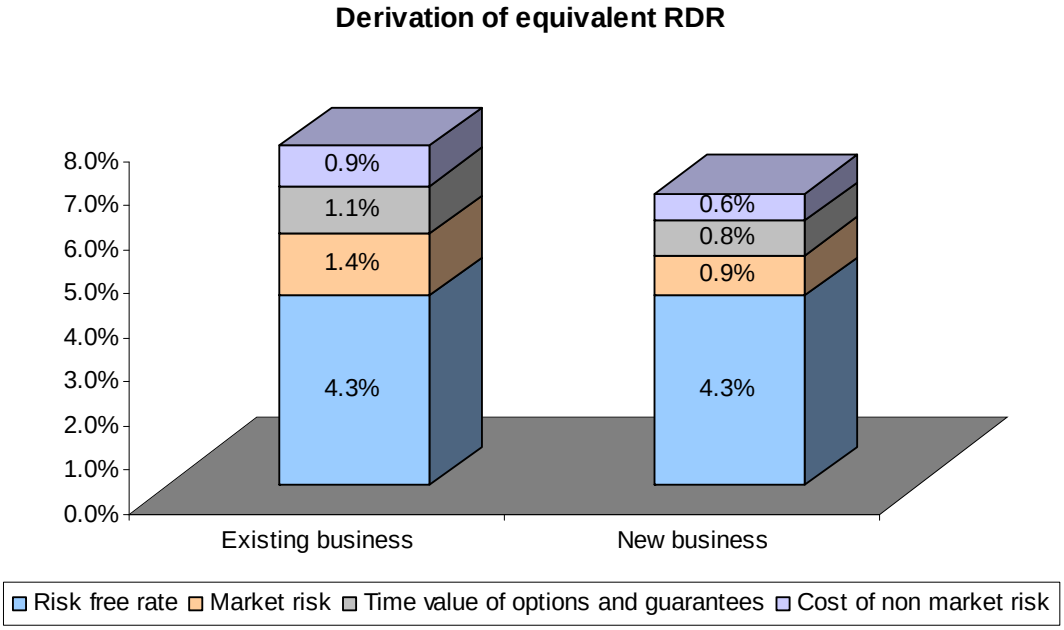


The certainty equivalent value is calculated such that the future investment returns on all assets are based on risk free rates (derived from the swap yield curves). It includes the intrinsic value of options and guarantees, but not their time value (related to variability of investment returns). The time value of options and guarantees is calibrated to market prices and implied volatilities with policyholder behaviour modelled dynamically with respect to interest rate scenarios.

The frictional cost of capital allows for tax on future investment income and investment management cost on shareholders net assets (including not only its minimum solvency margin but also free surplus). The frictional cost for new business applies only to the minimum solvency margin. Under its traditional EV, the cost of locking in some of the shareholders free reserves reduces the net worth. Under EEV, all frictional costs of capital are included in the VIF.

As per Zurich, non-market risks like insurance, business and operational risks are in theory diversifiable, but in practice this may not be possible. The cost of such non-market risks is allowed for through an explicit deduction, over and above the frictional cost of capital. This had been quantified by stress testing the shareholder value.

The equivalent risk discount rate is derived such that the traditional EV based on this rate would be equal to the EEV. The risk discount rate used to calculate the TEV was 7.5%. The equivalent risk discount rates vary for new and existing business due to their varying risk profiles, and are broken into the various components below:



The recalculated EEV is higher than the TEV as at 31 December 2005 due to the move to market consistent valuation and increased value of new business profit.

EEV reporting norms

It is important to analyse the change in EV between one time period to the other. This can arise due to many factors:

- Unwinding of the risk discount rate.
- Value added by new sales in the intermediate time period
- Difference between expected and actual experience for the period (interest rate, mortality, lapse, expenses etc.)
- Change in EV/reserving assumptions;
- Capital injection
- Shareholder dividends paid

The EEV guidance states that the disclosures should include an analysis of movement of change in EV over the reporting period. This provides additional information as the sources of EV profit over the reporting period. Many companies are showing the movement analysis of the VIF and net assets separately. This highlights the capital generation of the VIF business and the capital requirements of new business.

The EEV principles also require a sensitivity analysis. In 2005, the CFO Forum provided guidance on the minimum sensitivities to the EV results and the value of new business that should be included in a company's EV disclosure.

Economic sensitivities

- 100 bp reduction in risk discount rate
- 100 bp reduction in the interest rate environment

- 10% decrease in equity/ property values at valuation date
- 100 bp p.a. increase in equity/property yield
- Required capital equal to the statutory minimum capital (if using another measure of required capital)

Non-economic sensitivities

- 10% decrease in maintenance expenses
- 10% fall in lapse rates
- 5% decrease in base mortality and morbidity rates

Appendix A: Product specification of 15 year unit linked endowment

- Single premium Rs 100,000, Sum Assured Rs 150,000

Charges

- Annual fund management charge of 1% pa
- Allocation rate of 97%
- Annual policy fee of Rs150
- Mortality charges based on 110% LIC 94-96 Ult

Assumptions

- Mortality rate of LIC 94-96 Ult
- Investment return of 7.5%
- Inflation rate of 5%
- Risk discount rate of 12%
- Initial expenses Rs4,000 and commission of 2%
- Renewal expenses of Rs150
- Investment expenses of 0.15%
- Tax rate of 37.5%

Appendix B: EEV principles by the CFO Forum

- Principle 1: Embedded Value (EV) is a measure of the consolidated value of shareholders' interests in the covered business.
- Principle 2: The business covered by the EV methodology should be clearly identified and disclosed.
- Principle 3: EV is the present value of shareholders' interests in the earnings distributable from assets allocated to the covered business after sufficient allowance for the aggregate risks in the covered business. The EV consists of the following components:
    - free surplus allocated to the covered business
    - required capital, less the cost of holding required capita
    - present value of future shareholder cash flows from in-force covered business (PVIF).The value of future new business is excluded from the EV.
- Principle 4: The free surplus is the market value of any capital and surplus allocated to, but not required to support, the in-force covered business at the valuation date.
- Principle 5: Required capital should include any amount of assets attributed to the covered business over and above that required to back liabilities for covered business whose distribution to shareholders is restricted. The EV should allow for the cost of holding the required capital.
- Principle 6: The value of future cash flows from in-force covered business is the present value of future shareholder cash flows projected to emerge from the assets backing liabilities of the in-force covered business ("PVIF"). This value is reduced by the value of financial options and guarantees as defined in Principle 7.
- Principle 7: Allowance must be made in the EV for the potential impact on future shareholder cash flows of all financial options and guarantees within the in-force covered business. This allowance must include the time value of financial options and guarantees based on stochastic techniques consistent with the methodology and assumptions used in the underlying embedded value.
- Principle 8: New business is defined as that arising from the sale of new contracts during the reporting period. The value of new business includes the value of expected renewals on those new contracts and expected future contractual alterations to those new contracts. The EV should only reflect in-force business, which excludes future new business.
- Principle 9: The assessment of appropriate assumptions for future experience should have regard to past, current and expected future experience and to any other relevant data. Changes in future experience should be allowed for in the value of in-force when sufficient evidence exists and the changes are reasonably certain. The assumptions should be actively reviewed.
- Principle 10: Economic assumptions must be internally consistent and should be consistent with observable, reliable market data. No smoothing of market or account balance values, unrealised gains or investment return is permitted.
- Principle 11: For participating business the method must make assumptions about future bonus rates and the determination of profit allocation between

policyholders and shareholders. These assumptions should be made on a basis consistent with the projection assumptions, established company practice and local market practice.

- Principle 12: Embedded value results should be disclosed at consolidated group level using a business classification consistent with the primary statements.

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Amrita joined Watson Wyatt Insurance Consulting in September 2003. She was involved in product pricing, preparation of market reports and financial projections for new entrants into the Indian market, involving projecting forward capital requirements and embedded value. Other projects include monthly embedded value reporting, UK statutory valuation jobs and ICA calculations.

Amrita graduated in commerce from Delhi University in 2003. She is currently pursuing the final series of exams of the Institute of Actuaries, UK.