Market Value Margin versus Economic Capital

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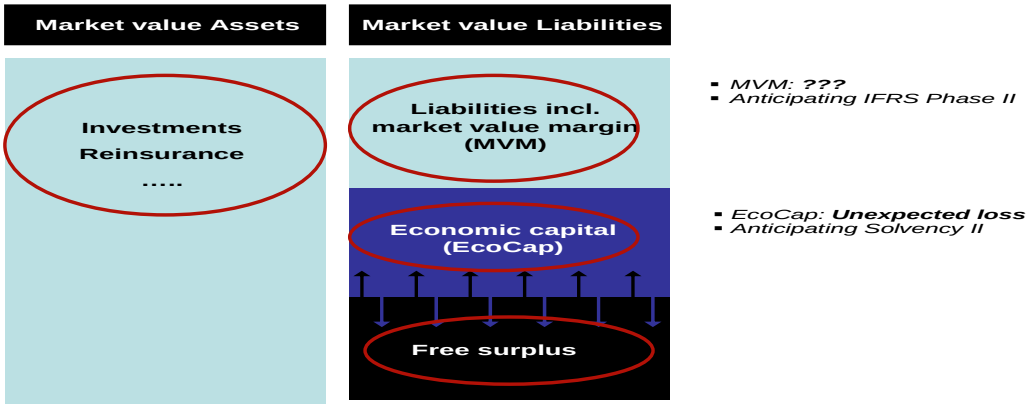
1. Introduction

Considering the developments in insurance accounting and solvency regulation, the following balance sheet will become dominant for the financial steering of insurance companies:



The main characteristic of this balance sheet is that assets will have to be valued 'mark-to-market' and (insurance) liabilities, because of the lack of liquid markets, 'mark-to-model'. Part of the 'market' (or 'fair') value of the liabilities will be the so-called Market Value Margin (MVM), which serves as a risk margin as would be required by another party to whom the liabilities could be transferred. The principles for determining the market value of insurance liabilities are still to be developed by the Insurance Accounting Standards Board (IASB) in what is called Phase 2 of their Insurance Project. Additionally, the resulting surplus will have to be split between the so-called Economic capital (EcoCap), i.e. the capital that is required as cover for unexpected losses, and the Free surplus.

The Commission of European Insurance and Occupational Pensions Supervisors (CEIOPS) has adopted the same principles for the development of a new solvency regime called Solvency II. Insurers that already agree with them, should not only prepare themselves for these future changes, they should also try to start applying them in the context of their risk and capital management, with risk-adjusted performance management being the necessary link and value based management the encompassing vehicle for the steering of the company.

Up to now, however, there is no full clarity yet on the meaning of the MVM and an acceptable level for it. In particular, considering their (draft) answers to the so-called second wave of Calls for Advice by the European Commission (EC), CEIOPS has not shown a clear vision yet on the issue whether MVM and EcoCap are complementary and/or related. This paper is therefore about the distinction between MVM and EcoCap and their meanings (sections 2 and 3), and the way they could be calculated (section 4)[1]. It also proposes a possible supervisory approach for MVM (section 5) and ends with conclusions (section 6).

[1] We ignore taxes.

2. MVMs for systematic insurance risks?

The main reason why MVMs and EcoCap should be considered conceptually different is that MVMs are part of the 'fair value' of the liabilities and should therefore be acceptable for third parties, while EcoCap is an 'internal' capital requirement that corresponds to the risks up to an assumed transfer of the liabilities to such a third party, which is generally assumed to be possible at the end of the first following year. This distinction particularly shows that MVMs and EcoCap must be distinguished in three different perspectives:

1. Firstly, of course, MVMs relate to the liabilities and therefore only to insurance/underwriting risks, while EcoCap relates to other types of risks as well, such as market risk, credit risk and operational risk.
2. Secondly, MVMs relate to all liability cash flows, i.e. to the full remaining term of the insurance contracts, while EcoCap only relates to the risks within a short time horizon, generally only one year.
3. Thirdly, this distinction in timing and role of a third party strongly suggests that MVMs and EcoCap should relate to risks with a different character, in particular to the so-called 'systematic' and 'diversifiable' risks respectively. Therefore, from this perspective, it looks sensible to try distinguishing systematic and diversifiable risks within the class of insurance risks.

The IAA 'blue book'[2] suggests that each type of risk - market risk, credit risk, insurance risk and operational risk - can be split into three different types of sub-risks, namely:

a. model and parameter uncertainty
b. volatility risk
c. catastrophe risk

To me, this subdivision especially makes sense for insurance risks. In particular, because the best estimate value of the insurance liabilities is the basis of the fair value of the liability cash flows, an MVM is needed in case there is uncertainty about the mean/best estimate value of these cash flows, i.e. when there is model and parameter uncertainty. The critical issue here is that this type of risk is basically 'systematic'/undiversifiable, because it is caused by a lack of insight into the risks - e.g. because of the lack of historical experience and/or incomplete knowledge of the characteristics of the policyholders - and another party would have the same lack of knowledge.

It looks therefore logical and justified to require some prudence by means of an MVM on top of something that may be considered as a kind of 'generic' best estimate, e.g. based on the total population instead of those that are actually insured. In other words: the fair value of the liabilities is equal to the 'expected loss', but should contain an MVM for uncertainty about its level, i.e. about the first moment of the distribution in stead of the loss itself[3]. As the law of large numbers does not apply to model and parameter uncertainty, this MVM is proportional to the size of the insurance portfolio.

(The higher the uncertainty about the expected loss (required MVM), the less insurable the insurance risk is. This is because premiums are also based on expected loss, and the higher this uncertainty, the more difficult it is to determine a fair premium).

On the other hand, EcoCap should relate to the risks that are associated with unexpected losses, i.e. to the risks that have to do with the second (and higher) moment(s) of the asset and liability cash flows. Basically these are the following types of 'deviation' risks:

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[2] IAA, *A Global Framework for Insurer Solvency Assessment*, 2004.

[3] The equivalence of model and parameter uncertainty for assets is the credit spread and liquidity premium that is reflected in the market value of the assets.

a. the possible unexpected losses related to the mismatches between cash flows from fixed interest securities on the one hand and liability cash flows on the other = ALM risks (including volatility and catastrophe risks within interest risks)
b. the possible unexpected losses related to other types of assets, in particular equity investments = volatility and catastrophe risks of equity, etc.
c. the possible unexpected losses related to possible changes in the creditworthiness of counterparties = credit risks
d. the possible unexpected losses related to the liabilities (including premium or claims-related expenses) = insurance volatility plus catastrophe risks
e. the possible unexpected losses related to expenses that are not premium or claims-related = operational risks.

Because these risks are less relevant for a third party to whom the portfolio (assets and/or liabilities) or company as a whole may be transferred in say a one-year period, these risks only have to be considered for this short term period.

(The law of large numbers clearly applies to volatility risks as part of insurance risks. This is not necessarily true for catastrophe risks, unless the risks are sufficiently spread. The latter condition should also be met in order to make the risk insurable.)

3. An additional motivation for MVMs: cost of capital

In my opinion, however, model and parameter uncertainty cannot be the only reason for introducing/having an MVM as part of the fair value of the insurance liabilities. More importantly, on top of a margin for model and parameter uncertainty, an MVM is necessary as a reward to the shareholders for taking the risks that are associated with the assets and liabilities, i.e. the risks that should be covered by the EcoCap. This reward can be expressed as a margin on top of the Best estimate, including margin for model and parameter uncertainty, that is at least equal to the cost of capital as defined by the difference between required and investment return multiplied by the EcoCap.

- ***Links between MVM, RAROC and cost of holing Economic capital***

This link between MVM and cost of capital also follows clearly from the common formula of expected RAROC over the first following year (before taxes):

$$E(RAROC) = E(Income_1 - Claims_1 - Costs_1 - \Delta MVL) / EcoCap_0$$

with

$E(X)$ = Best estimate value of X

$E(Income_1) = E(Premiums_1) + E(\text{Investment income on } MVL_0 + EcoCap_0)$

MVL = BE + MVM = market value of liabilities = Best estimate plus MVM, so that

$$MVL_0 = \sum_{t=1}^{-} E(Claims_t + Costs_t - Premiums_t) / \prod_{j=1}^{t} (1 + r_{j-1,j}^{fw(rf)}) + MVM_0$$

$$E(\Delta MVL) = E(MVL_1) - MVL_0 =$$

$$= r_{0,1}^{fw(rf)} * BE_0 - E(Claims_1 + Costs_1 - Premiums_1) + (E(MVM_1) - MVM_0)^4$$

[4] For ease of simplicity we assume that all cash flows always occur at the end of the year.

Assuming[5] E(Investment income on X) = $r_{0,1}^{fw(rf)} * X$, we get

$$E(RAROC) = (r_{0,1}^{fw(rf)} * (MVM_0 + EcoCap_0) - (E(MVM_1) - MVM_0)) / EcoCap_0$$

Therefore, requiring E(RAROC) to be at least equal to the hurdle rate[6][7],

$$E(RAROC) >= \text{hurdle rate}$$

implies

$$r_{0,1}^{fw(rf)} * MVM_0 - (E(MVM_1) - MVM_0) >= (\text{hurdle rate} - r_{0,1}^{fw(rf)}) * EcoCap_0$$

$$= \text{Cost of capital for first next year} \qquad (1)$$

Consequently, the (expected) annual benefits of having an MVM (apart from a margin for model and parameter uncertainty) as part of the valuation of the liabilities at 'fair value' in the balance sheet, i.e. the (expected) annual investment return on it plus the (expected) release during the year, should at least be equal to the annual costs of holding Economic capital in order to provide sufficient profit margin to the shareholders as a compensation for the risks that they are taking.

Condition (1) only relates to a one year period. By discounting the (expected) variables on both sides of this condition for all future years on the basis of the risk-free forward rates, condition (1) transforms into a condition for the full remaining term of the contracts. In particular, we then find the following condition:

$$MVM_0 >= \sum_{t=1}^{\infty} (\text{Cost of capital for year } (t-1, t)) / \prod_{j=1}^{t} (1 + r_{j-1,j}^{fw(rf)})$$

$$= \sum_{t=1}^{\infty} (\text{hurdle rate} - r_{j-1,j}^{fw(rf)}) * EcoCap_{t-1} / \prod_{j=1}^{t} (1 + r_{j-1,j}^{fw(rf)}) \qquad (2)$$

- ***Links with Embedded value***

In an Embedded-value context, this condition is equivalent to requiring that the so-called Value of Business in Force (before taxes) is positive, if we assume[8]

- all assets and liabilities, including embedded options and guarantees as well as profit sharing obligations, are valued at market value,
- the annual future solvency requirement is equal to the EcoCap (for a one-year period),
- all risks are accounted for through MVM and EcoCap; therefore, cash flows are discounted at risk free rates (instead of the hurdle rate).

[5] If actual assets held are not risk-free, not only the corresponding return but also $EcoCap_0$ will be higher.
[6] As is well-know, this requirement is equivalent to requiring that the so-called Economic Value Added (EVA) is positive (with EVA being a registered trademark of Stern Stewart & Co).
[7] We could also distinguish different hurdle rates for different risks. In that case, the hurdle rate in the formula should be considered as a weighted average of the hurdle rates of the corresponding components of EcoCap, with the weights equal to the percentage contributions of these weights to the total EcoCap.
[8] In my opinion, these are the differences in approach that change the 'Embedded value' into the 'Economic value' (without necessarily changing the outcome).

- ***Links with Value Based Management***

Condition (2) shows that MVM should at least be equal to the present value of the future annual costs of having an EcoCap 'locked in'. In my opinion, this is a key condition from a business perspective. In particular, also considering the fact that many insurance contracts have a duration of more than one year, condition (2) should be regarded as the driving force behind risk-adjusted value based management in a market values (/fair values) environment. Why is that?
I think it is fair to say that policyholders should pay in total at least for best estimate liabilities based on industry data plus a certain margin $MVM^{(A)}$ in case there is also model and parameter uncertainty (all defined as at the issue date of the policy). However, it seems less fair to say that policyholders should also pay a certain margin ('buffer') for future deviation risks (EcoCap), since these risks are diversifiable for the insurer. However, there will always be 'some' diversifiable risks associated with running an insurance company. Hence, shareholders always have to invest some amount of capital as cover for these risks. They will be willing to do so if they are compensated for the corresponding cost of capital, i.e. if they receive an appropriate $MVM^{(B)}$. This compensation must also be paid by the policyholders as a 'profit margin'.

Condition (2) therefore clearly confirms a few basic thoughts such as

a. Legal entities/business lines/(new) product groups(s)/product(s) only create value for the shareholders if the profit margin that is/can be earned is at least equal to the cost of holding the corresponding required amount of EcoCap.
b. Condition (2) must be read on a 'net' basis, i.e. including the expected costs and benefits of risk mitigation strategies (like reinsurance). Therefore, improving risk management at low cost should be stimulated, not only from the policyholders'/supervisors' perspective, but also from the shareholders' perspective, since this will create additional value for the shareholders through the resulting lower level of EcoCap. However, risk management at a higher cost may destroy value for the shareholders, since the associated 'price', reflected in a lower $MVM^{(B)}$, may be too high compared to the decrease of EcoCap that is achieved.
c. Increasing tolerance levels and/or hurdle rates at a given $MVM^{(B)}$ may result in failure of meeting condition (2) and therefore loss of value for the shareholders. Consequently, supervisors must be aware of the fact that the tolerance that they may require for the EcoCap related to in-force business should not be too high. NB: Shareholders may lower their hurdle rate(s) at the same time because of the higher EcoCap. See also section 5.

Finally, as a typical characteristic of insurance (risks):

d. For a given level of risk mitigation and $MVM^{(B)}$, there is a certain 'critical mass' for the size of the insurance portfolio in the sense that for smaller/larger sizes the portfolio will destroy/create value to the shareholders. The reason for this is that the level of $MVM^{(B)}$ is proportional, while the level of EcoCap, through its component for insurance volatility risk, is less than proportional to the size of the portfolio due to the law of large numbers. Therefore, in case of a run-off of the portfolio, it will become more and more difficult to meet condition (2), unless the level of reinsurance is increased at the same time assuming that this is not too expensive; see also b above.

- **The so-called 'cost of capital' approach**

The Swiss insurance supervisor has recently introduced the so-called Swiss Solvency Test ('SST'). Within this framework, a similar type of definition of MVM as part of the 'market consistent' value of the insurance liabilities is adopted[9]:

[9] Swiss Federal Office of Private Insurance, *White paper of the Swiss Solvency Test*, November 2004.

The risk margin is defined such that a second insurer would be compensated for the risk – or more precisely for the capital cost due to having to hold regulatory capital – when taking over the first insurer's assets and liabilities ….(TM: paragraph 2.5)

The risk margin is calculated as being the discounted value of the future costs of maintaining the SST target capital level if the insurance portfolio was being run off by a third party.
(TM: paragraph 4.2)

Considering this, the Swiss insurance supervisor obviously assumes that a third party will need a similar amount of EcoCap as the holding company. However, I believe this is not necessarily true. For instance, a third party may not really bother about the insurance volatility risk that is associated with the portfolio, because the third party is already holding a very large portfolio of similar risks. Also, a third party may prefer a different investment strategy for the assets covering the liabilities. Therefore, I believe MVM will be defined in the market place, at least to a large extent. However, the Swiss supervisory approach for MVM, which is also know a the 'cost of capital approach', may result in a reasonable estimate for the 'true' MVM.

4. How to calculate MVMs and EcoCap

The preceding two sections suggested two different types of MVMs, namely:

1. $MVM^{(A)}$: cover for model and parameter uncertainty regarding insurance risks, and
2. $MVM^{(B)}$: a profit margin that is linked to the cost of holding EcoCap for all other types of risk

In this section we make a few comments on how to define $MVM^{(A)}$ and $MVM^{(B)}$ (with MVM = $MVM^{(A)}$ + $MVM^{(B)}$). Additionally, we make a few comments on the calculation of the EcoCap.

For defining $MVM^{(A)}$, it makes sense to consider model and parameter uncertainty for Life and Non-Life business separately, since there are important differences between these two major types of insurance.

- *Life business*

In Life, the main types of insurance risk is mortality/longevity and, but to a far lesser extent, morbidity. There is generally no 'model' uncertainty about the loss distribution, since annual mortality on an individual policyholder level follows a Bernoulli($q_t^{(X)}$) process, with $q_t^{(X)}$) equal to the mortality rate of individual X in year t. Considering the full remaining term of the policy at t, this process changes into a Multinomial(T-t+1, $q_t^{(X)}$, $q_{t+1}^{(X)}$, ..., $q_T^{(X)}$) process with T equal to the end of the policy term. At a portfolio level, the individual processes can generally be aggregated easily as correlations between mortality of different individuals can generally be ignored (zero). Therefore, model and parameter uncertainty in Life business particularly relates to uncertainty about the level of the parameters $q_t^{(X)}$, $q_{t+1}^{(X)}$, ..., i.e. to the current level of the mortality rates ('level uncertainty') as well as to the trend that will occur in the future levels ('trend uncertainty').

Level uncertainty is 'entity-specific' by definition, since it relates to the level of anti-selection within the population that is insured by the company (relative to the country's population, or the market-wide insured population, or the market-wide population that has insured itself against similar risks, or ...). Furthermore, assuming that this level of anti-selection is relatively stable in time per product group covering similar insurance risks, it is a type of parameter uncertainty that is relatively lower the more historic information is available. On the other hand, mortality trend uncertainty is much less entity-specific than level uncertainty, since all members of the country's population generally benefit similarly from improvements in medical science. Therefore, it would make sense if the MVM component for mortality trend is somehow calculated at country level on the basis of total population data.

- *Non-Life business*

In Non-Life, there is generally not only parameter uncertainty (as in Life), but also, and maybe even primarily, model uncertainty. Consequently, not only because of the wide range of different branches within Non-Life, it is generally much more difficult to estimate an appropriate level of $MVM^{(A)}$ for Non-Life than for Life.

In 2001, the Australian insurance supervisor (APRA) introduced the '75%' tolerance level as an MVM for provisioning in Non-Life. This same rule has been suggested by CEIOPS in their draft answers to the second wave of calls for Advice regarding Solvency II[10]. In my opinion, this approach is acceptable for measuring model and parameter uncertainty as long as there is no alternative approach available. However, I have two points of criticism on such an approach:

1. It suggests that we know the level of the best estimate, since this would be the reference point. However, of course, $MVM^{(A)}$ is explicitly needed because of uncertainty about this reference point. Therefore, what to choose for that?
2. Applying the '75%' rule to a certain reference point means that it is actually volatility risk instead of model and parameter uncertainty that is measured. However, volatility risk is a typical type of risk that should be covered by the EcoCap but only for a one-year time horizon, not for the full remaining term, which is the subject of MVM!

Of course, model and parameter uncertainty is very hard to distinguish from volatility (and catastrophe) risk if there is substantial model uncertainty. Therefore, it will be very difficult not only to make this distinction consistently in relation to defining MVM and EcoCap, but also to avoid some way of double counting through both MVM and EcoCap. Furthermore, model and parameter uncertainty in Non-Life should be basically considered as entity-specific.

With respect to calculating $MVM^{(B)}$, section 3 clearly states that its minimum level should be considered as entity-specific, since this is defined by the risk appetite of the company/shareholders (through the level of the hurdle rate(s)) as well as level of the company-specific risks (through the level of EcoCap). There is therefore no need for prescribing a certain level of $MVM^{(B)}$; see also the next section. However, to get a rough idea of the possible appropriate level of $MVM^{(B)}$ for a traditional Life portfolio, assume for instance

- $BE + MVM^{(A)}$ is (approximately) equal to the current technical provision,
- the current solvency requirement according to Solvency I is (approximately) equal to 5% of the technical provision,
- EcoCap = (approximately) 2 * the current solvency requirement according to Solvency I
  = 10% of $(BE + MVM^{(A)})$,
- hurdle rate - 1y risk-free forward rate = 8%, and
- present value factor = 12

then $MVM^{(B)}$ will be equal to 0.10 * 0.08 * 12 = 9.6% of $BE + MVM^{(A)}$. I believe this is a conservative (high) estimate for the 'average' $MVM^{(B)}$ in Life business[11].

NB: In current Dutch practice the Value of Business In Force net of taxes for traditional term assurance (no profit sharing) is generally 10-40% of the provision. This will be much lower in case mortality trends would be taken into account in provisioning (and pricing). For pure endowments and annuities (including profit sharing, longevity risk) the corresponding figure is generally somewhere between -5% and 10%.

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[10] The main purpose of the first stage of the so-called Quantitative Impact Studies (QIS) will be the testing of its use in practice.

[11] For instance, the difference between the assumed discount rate and investment return for new money is generally set at around 3% in Embedded value calculations for Dutch Life insurance portfolios (instead of 8%); for the field test 2004 that was performed by the Swiss insurance supervisor in relation to the Swiss Solvency Test companies had to assume 6% as the cost of capital margin.

Summarising the above with respect to MVM = $MVM^{(A)}$ + $MVM^{(B)}$, defining the MVM on a basis of a 75% (or 90%, ...) confidence interval as prescribed/suggested by APRA (/CEIOPS) does not make a lot of sense because:

1. For Life, the level of MVM is partly dependent on available information. In particular: the more information is available on the level of anti-selection, the lower the level of $MVM^{(A)}$ for level uncertainty can be.
2. For Non-Life, it is much more difficult to determine the appropriate 'reference point' as a basis for the 75% confidence interval; moreover, following this approach may result in some double-counting of volatility risks as this risk should also be covered by the EcoCap (at least for the first next year).
3. For both Life and Non-Life, the $MVM^{(B)}$ component has a lower bound that is entity-specific from the company's perspective but should actually be determined by the level of competition in the insurance market place, being some 'average' reflection of the diversifiable risks through the level of the EcoCap as required by the shareholders. This reflection not only means a much higher level of confidence (let's say 99.5% instead of 75%), but also a transformation of risks into the corresponding costs of capital. The latter implies an additional entity-specific element, namely the level of the hurdle rate(s) of the company[12].

With respect to calculating EcoCap, finally, it is obvious that this amount of capital is entity-specific by definition as it relates to diversifiable risks. The different types of risks that should be covered by the EcoCap are listed at the end of section 2. As also stated there, these risks only have to be considered for a short period of say one year.

Theoretically, there are basically two possible approaches for calculating EcoCap:

1. by using a stochastic model that captures all risks in an integrated way, or
2. by modelling all risks individually and then aggregating the outcomes assuming certain dependencies between the risks (resulting in certain 'diversification benefits') [13].

The first approach is preferable, but the second one is the most common in practice. The main reason for this is the fact that many types of risks are still difficult to model stochastically, let alone in an integrated way, because of lack of insight in the underlying loss distributions.

5. A possible supervisory approach for MVMs

The EC as well as CEIOPS have decided that the future solvency regime, to be named Solvency II, will be built upon a market value based assessment of all assets and liabilities. However, the IASB has only just started Phase II of their Insurance Project, which is directed to developing principles for defining the market value of insurance liabilities. Consequently, CEIOPS not only needs to define rules for calculating EcoCap for supervisory purposes - in particular for calculating the so-called Solvency Capital Requirement (SCR) -, it also needs to provide guidance for defining the market value of insurance liabilities, i.e. its best estimate value (BE) including a margin for uncertainty around that ($MVM^{(A)}$) as well as a profit margin ($MVM^{(B)}$).

In section 4 it has already been suggested that, for Life business, guidance is needed with respect to mortality trend uncertainty. In particular, there is a need for reaching consensus within local markets (countries) on what could be considered as the best estimate trend and what as an acceptable conservative alternative. Moreover, since there is not much justification for allowing different insurers to use different mortality trend assumptions, it looks fair to me to prescribe, or at least strongly recommend, the uniform application of this conservative trend. Local actuarial

[12] Personally, I believe that $MVM^{(B)}$, i.e. the required minimum profit margin, could be the much bigger than $MVM^{(A)}$, particularly for Life business.
[13] In my opinion, diversification is not an issue in relation to model and parameter uncertainty ($MVM^{(A)}$'s).

organisations, insurance industry organisations and/or national census bureaus could be asked to investigate and provide the necessary information on this issue. This trend must be applied to all Life policies. However, 'conservative' has a different meaning for policies with mortality or longevity risk. In particular, apart from a best estimate, we need estimates of a 'slow' mortality trend for term assurance and a 'fast' mortality trend for annuities[14].

On the other hand, less guidance is needed or even sensible for 'level uncertainty' in Life business and model and parameter uncertainty in Non-Life business in general, since these uncertainties are basically 'too' entity-specific for that. Instead, insurers should be allowed to derive conservative estimates for these uncertainties from historical data.

Finally, with respect to BE + $MVM^{(A)}$, guidance is needed in selecting the risk-free rates for discounting. As with mortality trend in Life including the corresponding uncertainty margin $MVM^{(A)}$, there is no rationale for allowing different insurers within the same country to make different choices for that[15].

With respect to $MVM^{(B)}$, guidance by the supervisors on $MVM^{(B)}$ means guidance on the profit margin that insurers should impose. There is no need for such guidance, since supervisors do not have to defend the interests of the shareholders. Instead, they should primarily focus on the policyholders. In other words, when anticipating IFRS Phase 2, supervisors should set $MVM^{(B)} = 0$ within the context of defining quantitative solvency requirements, i.e. implicitly assume hurdle rate = 1yr risk-free forward rate. Moreover, from a company's perspective, setting $MVM^{(B)}$ at a standardised level or on the basis of a methodology that prescribes a link with the holding company's Economic capital (or a regulatory requirement, as in the Swiss Solvency Test) would conflict with the idea that this margin should be determined in the market place instead of by the supervisory authorities.

However, this does not mean that supervisors should fully ignore the concept of an $MVM^{(B)}$ on top of BE + $MVM^{(A)}$. Earning positive profit margins is a necessary condition for keeping in business, because, at least in the longer run, also the interests of the shareholders have to be satisfied. In my opinion, therefore, it looks fair to consider $MVM^{(B)}$ only within the context of the supervisory review process (Pillar II). Furthermore, this looks logical because of the fact that shareholders are particularly important for maintaining the going concern status, including the capacity of selling new business, and new business is basically only assessed qualitatively within Pillar II[16]. Finally, the risk of not earning an $MVM^{(B)}$ that satisfies condition (2) (or (1)) is basically a 'strategic' risk; such a risk is/should be a typical concern within Pillar II.

Of course, assuming $MVM^{(B)} = 0$ in the context of the Pillar I requirements implies that the expected future profitability is considered part of 'available capital', i.e. free surplus, instead of additional surplus that is however still locked in in the fair value of the liabilities. Consequently, such an approach in Pillar I will result in a higher solvency ratio - available capital as a percentage of required EcoCap/SCR - than in case $MVM^{(B)}$ is considered part of the fair value of the liabilities as in accounting. However, in the context of Pillar II, available capital and therefore the solvency ratio could be adjusted downward by subtracting $MVM^{(B)}$ from available capital.

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[14] This data is already available in the Netherlands (provided by the Dutch Census Bureau) and used by the Dutch insurance supervisor (DNB) within their so-called Financial Assessment Framework.

[15] For this reason, the Dutch insurance supervisor has decided to publish risk-free rates on a monthly basis.

[16] At least, this is the case in the Dutch Financial Assessment Framework, in which new business is only considered in the Pillar II 'Continuity analysis'. Furthermore, moving the assessment of $MVM^{(B)}$, and in particular the supervisory review of the profitability of new business, to Pillar II would also be in line with current Dutch practice for Life business since 1994, because since then Dutch life insurance companies are strongly recommended to report profit testing results to the Dutch insurance supervisor. As is well known, a positive profit testing result in an Embedded value approach implies that the internal rate of return is higher than the assumed risk discount rate (= hurdle rate), i.e. that the interest of shareholders are satisfied (I refer back to the end of section 3).

It must be stressed that I am not recommending setting $MVM^{(B)}$ at zero in practice. Instead, I am only suggesting that supervisors should ignore it in Pillar I as long as it is non-negative. Of course, if $MVM^{(B)}$ would really be (close to) zero in practice, then supervisors may question whether the liabilities can be transferred to another party and raise this issue in Pillar II. In that case, however, I point to the fact that mutual companies may still be willing to accept a liability portfolio with $MVM^{(B)}$ equal to zero, since they are not looking for profit. Furthermore, I believe the so-called Minimum Capital Requirement (MCR) could also be considered as a buffer for covering the risk of $MVM^{(B)}$ being too low.

6. Conclusions

In this paper I have argued that the MVM should consist of the following two components:

1. a margin to cover model and parameter uncertainty regarding insurance risks (relative to a more generic estimate of the first moment of the distribution based on general population or industry data), plus
2. a profit margin that is at least equal to the present value of the costs of keeping EcoCap as cover for unexpected losses.

The first type of margin ('$MVM^{(A)}$') typically relates to a systematic risk, in the sense that a third party would require basically the same margin for it. Apart from mortality trend uncertainty in Life business, this type of risk is entity-specific. Contrary to EcoCap, which only relates to diversifiable risks within a short period (say one year), the $MVM^{(A)}$ component should reflect the full remaining term of the insurance contracts.

On top of $MVM^{(A)}$ a profit margin ('$MVM^{(B)}$') is required that meets the requirements of the shareholders. Such a margin, that should also cover the full remaining term of the contracts, should (and will?) be determined in the market place, i.e. not by the supervisory authorities. Therefore, $MVM^{(B)}$ will probably turn out to be reasonably 'entity-independent'. Basically, this is because $MVM^{(B)}$ should be considered as a locked-in profit margin that should make it attractive for other parties to accept the portfolio in case of a transfer. However, from the perspective of the holding company, there is a minimal required level of profitability for each individual portfolio that is very entity-specific, namely dependent both on the hurdle rate and the level of the EcoCap that the holding company considers necessary (given the level and quality of its risk management).

Finally, I have argued that it does not make much sense if supervisors would define minimum levels for $MVM^{(A)}$ and/or $MVM^{(B)}$, with a possible exception for $MVM^{(A)}$ regarding mortality trend uncertainty in Life. In this respect, I also believe that model and parameter uncertainty should not be covered by applying a 75% (or 90%, or ...) confidence interval since this would basically cover volatility risk. Instead, its level should be higher the less information is available on the character of the risks.

Additionally, $MVM^{(B)}$ should not be prescribed, because that would imply defining a minimal required level of profitability. Instead, supervisors should assume $MVM^{(B)}$ to be zero within the context of the future quantitative Pillar I requirements of Solvency II. As a result, available capital (free surplus) as defined within Pillar I should include $MVM^{(B)}$. However, of course, supervisors are fully entitled to assess $MVM^{(B)}$ more qualitatively within Pillar II, since, in a going concern including new business, the interests of shareholders also need to be satisfied. Therefore, available capital could be adjusted downward by $MVM^{(B)}$ within Pillar II.