

# Market Consistent Embedded Value 2009



## Market Consistent Embedded Value (MCEV) 2009

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## Introduction

Hannover Rückversicherung AG's (Hannover Re) 2008 Market Consistent Embedded Value (MCEV) disclosure complied with the European Insurance CFO Forum Market Consistent Embedded Value Principles® (MCEV Principles) published in June 2008. The CFO Forum published a revised version of the MCEV Principles in October 2009 which allow for the inclusion of a liquidity premium in addition to the reference rates. However, the discussion regarding the products to which the liquidity premium should be applied to is still ongoing. Hannover Re has decided to not include a liquidity premium in its calculations and has therefore also not determined a sensitivity for the liquidity premium. With the exception of the non-disclosure of the group MCEV, the 2009 MCEV results comply with MCEV Principles.

The results in the tables in this report are shown on a 'before minorities' basis, because E+S Rückversicherung AG (E+S), in which Hannover Rückversicherung AG has a 64.2% shareholding, is a core subsidiary due to its position within the group as the primary vehicle for underwriting business in Germany. Therefore, Hannover Re and E+S Rückversicherung AG are managed as one single group such that management believes it is more appropriate to show all figures before minorities. However, the key MCEV results are also shown after minorities.

All amounts in the results tables are shown in million EUR rounded to one decimal place. Small differences may therefore appear between the totals and the sum of the individual amounts.

The directors of Hannover Re acknowledge their responsibility for the preparation of the supplementary information in accordance with the MCEV Principles.

B&W Deloitte GmbH, actuaries and consultants, has been engaged to review the MCEV results. The scope and conclusions of this review are shown at the end of the document.

The MCEV disclosure should not be viewed as a substitute for Hannover Re's primary financial statements.

## 1. Covered Business

The business covered includes the business reported in the Life and Health segment of Hannover Re's (Hannover Life Re or HLR) published financial statements with the exception of a small portion of life business which has historically been assigned to companies included in the P&C segment.

This disclosure document generally shows total results as well as a breakdown for the domestic and foreign operations.

The domestic operations include the business written directly by Hannover Rückversicherung AG and E+S Rückversicherung AG in Hannover and also the business written by the branches.

### Covered business domestic operations

Hannover Rückversicherung AG, Hannover  
E+S Rückversicherung AG, Hannover  
Hannover Rückversicherung AG Succursale française, Paris  
Hannover Rückversicherung AG Tyskland filial, Stockholm  
Hannover Rückversicherung AG Malaysian Branch, Kuala Lumpur  
Hannover Rückversicherung AG Hong Kong Branch, Hong Kong  
Hannover Rückversicherung AG Korea Branch, Seoul  
Hannover Rückversicherung AG Shanghai Branch, Shanghai  
Hannover Re Takaful B.S.C. (c), Bahrain

Due to our strategic direction the business written by the life segment of the subsidiary Hannover Re Takaful in Bahrain was included also under domestic operations. Business retroceded by the foreign operations to Hannover Re is also included under domestic operations.

The foreign operations include the life reinsurance subsidiaries of Hannover Re in the UK, Ireland, the United States, South Africa, Australia and Bermuda.

### Covered business foreign operations

Hannover Life Reassurance Africa Ltd, Johannesburg  
Hannover Life Reassurance Company of America, Orlando  
Hannover Life Re of Australasia Ltd, Sydney  
Hannover Life Reassurance Bermuda Ltd, Hamilton  
Hannover Life Reassurance (Ireland) Ltd, Dublin  
Hannover Life Reassurance (UK) Ltd, Virginia Water

Hannover Life Re writes the following lines of business: individual life and group life, unit linked as well as conventional business, standard, impaired and enhanced annuities; disability income, critical illness, long-term care, medical supplement, medicare, and special (personal accident) risks.

All the values shown in the disclosure are net of intra group and external retrocessions. In the case of intra group retrocessions, this means that the retroceded business is excluded from the retroceding company's results and included in the results of the retrocessionaire. The values shown are post tax and before or after minority interests as stated. Consistent with the internal management of the business most of the results in the disclosure are shown before the deduction of the minority interests.

The consolidated results allow for the elimination of the book values for all the subsidiaries for which an MCEV has been determined.

All formulae, abbreviations and notations are provided in the appendix.

## 2. Market Consistent Embedded Value 2009 and its components

### 2.1. Highlights 2009

The following table shows the MCEV performance in 2009.

**Table 1: Highlights MCEV 2009 (before minorities)**

in m. EUR or %	2009			2008	
	Before consolidation		After consolidation <sup>1)</sup>	After consolidation <sup>1)</sup>	
	Domestic operations	Foreign operations	Total	Total	
MCEV	1,852.0	1,538.3	3,390.3	2,210.8	1,652.0
Return on MCEV <sup>2)</sup>			15.6%	21.7%	6.0%
Value of New Business	89.8	-5.9	83.9	83.9	150.5
New Business Margin	2.2%	0.0%	0.5%	0.5%	2.4%

1) The book values of the subsidiaries that have determined MCEV results have been eliminated

2) Excluding closing adjustments

The MCEV 2009 shows a strong increase influenced by several effects. The value added by new business and positive assumption changes lead to slightly increased operating MCEV earnings, which together with the development on the capital markets, and hence positive economic variances, yield to the high return on MCEV. Furthermore, favourable changes in currency exchange rates and an additional intra company bridge financing lead to the overall increase of the MCEV. The increase in additional intra company bridge financing was initially made to the domestic operations, and the funds were then used to make a capital injection to the foreign operations. This explains the increase in the difference between the MCEV before and after consolidation relative to 2008.

## 2.2. MCEV 2008 and MCEV 2009

The table below shows the elements of the MCEV as well as the MCEV before and after consolidation adjustments.

**Table 2: MCEV 2009 and MCEV 2008 (before minorities)**

in m. EUR	2009			2008		
	Domestic operations	Foreign operations	Total	Domestic operations	Foreign operations	Total
Free Surplus	404.0	389.8	793.8	280.9	244.1	525.0
Required Capital <sup>1)</sup>	646.8	652.3	1,299.1	567.4	425.0	992.4
<b>SNW</b>	<b>1,050.7</b>	<b>1,042.2</b>	<b>2,092.9</b>	<b>848.3</b>	<b>669.1</b>	<b>1,517.3</b>
PVFP	942.8	936.3	1,879.1	860.6	385.0	1,245.6
CoRNHR	116.1	374.1	490.2	120.4	131.9	252.4
FOGs	2.3	4.8	7.1	5.0	36.6	41.6
FCoRC	23.0	61.2	84.3	23.1	24.3	47.4
<b>VIF</b>	<b>801.3</b>	<b>496.1</b>	<b>1,297.5</b>	<b>712.1</b>	<b>192.2</b>	<b>904.2</b>
<b>MCEV</b>	<b>1,852.0</b>	<b>1,538.3</b>	<b>3,390.3</b>	<b>1,560.3</b>	<b>861.3</b>	<b>2,421.6</b>
Consolidation <sup>2)</sup>			-1,179.5			-769.5
<b>MCEV after consolidation</b>			<b>2,210.8</b>			<b>1,652.0</b>

1) Sum of local Required Capital before allowing for diversification between the entities of HLR

2) Book values of the subsidiaries that have determined MCEV results

The MCEV 2009 after consolidation and after minorities is EUR 2,066.2 million (EUR 1,482.1 million in 2008).

### 2.3. Value of in-force covered business 2009 breakdown

The following table shows the breakdown of the Value in-force between Life, Annuity, and Health and Personal Accident business.

**Table 3: Value in-force by type of risk covered (before minorities)**

in m. EUR	Domestic operations	Foreign operations	Total
Life	695.0	473.2	1,168.2
Annuity	61.1	26.4	87.5
Health and Personal Accident	45.2	-3.4	41.8
<b>Total</b>	<b>801.3</b>	<b>496.1</b>	<b>1,297.5</b>

The major product lines shown above include a wide variety of different reinsurance contracts.

As well as differentiating the business by the type of risk covered, it is also possible to distinguish between treaties that only provide risk cover and those that include financing to cover the ceding companies' acquisition expenses or to purchase blocks of business. The Value in-force for treaties providing risk cover and financing is shown in the following table:

**Table 4: Value in-force split in risk and financing treaties (before minorities)**

in m. EUR	Domestic operations	Foreign operations	Total
Risk treaties	231.3	429.2	660.5
Financing treaties	570.0	67.0	636.9
<b>Total</b>	<b>801.3</b>	<b>496.1</b>	<b>1,297.5</b>

The Value in-force for the risk treaties has doubled from EUR 330.4 million to EUR 660.5 million and now exceeds the Value in-force for the financing treaties.

## 2.4. Financial Options and Guarantees, Look Through and Pension Deficits

### Financial Options and Guarantees (FOGs)

The time value of Financial Options and Guarantees is still insignificant at EUR 7.1 million, as only a very small portion of our life reinsurance business written in the US and South Africa has exposure to the asymmetric capital market risk.

The time value of Financial Options and Guarantees for these few treaties has been determined using stochastic projections. The fixed interest and equity volatilities for the stochastic projections are based on market implied volatilities. A stochastic approach was not necessary in respect of other treaties with interest guarantees as the liabilities are backed by matching assets, and the remaining FOGs are not material.

**Table 5: Time Value of Financial Options and Guarantees (before minorities)**

in m. EUR	2009	2008 restated	2008
Domestic operations	2.3	0.7	5.0
Foreign operations	4.8	4.2	36.6
<b>Total</b>	<b>7.1</b>	<b>4.9</b>	<b>41.6</b>
in % of MCEV	0.3	0.3	2.5

All the significant FOGs in Hannover Life Re's are mainly due to guarantees under interest sensitive products. The value of FOGs shown for the domestic operations is due to the internal retrocessions from the US and South African subsidiaries. The other treaties with interest guarantees either have assets matching the liabilities or are not material (e.g. Italian financing treaties covering participating business).

The restatement of the 31/12/2008 MCEV FOGs for Hannover Life Re leads to a reduction of the FOGs from EUR 41.6 million to EUR 4.9 million as a result of:

- a change in the allowance for expected corporate bond defaults in the base PVFP
- an improvement in the modelling of assets based on synthetic portfolios of representative assets
- consistent with the methodology applied by many peer companies a change in the methodology used to project future defaults on corporate bonds from an approximated stochastic default approach to a constant default approach calibrated using the credit spreads at the valuation date which leads to a reduction in the FOGs
- minor modifications to the Cost of Insurance premium increases in adverse economic scenarios

- application of the 31/12/2008 interest rates instead of the 30/11/2008 interest rates used

### Participating business

Hannover Life Re has a few reinsurance treaties where the returns to the reinsurer are dependent on the policyholder profit participation in the underlying products. The gross written premium and the contribution to the Value in-force from these treaties are not material. The profit participation elements have, therefore, not been modelled explicitly.

### Look Through

The level of services provided by affiliated companies within Hannover Re is not material. Consequently, the MCEV calculations do not explicitly allow for the profits generated within such service companies.

### Pension Deficits

Pension liabilities for the majority of the pension obligations are based on defined contribution scheme or reinsured outside of the group. Pension Deficits only arise from a small part of the pension liabilities for the domestic operations and the subsidiary in Australia. They are determined as the difference between the respective IFRS and statutory pension liability and are not material for Hannover Re.

**Table 6: Pension Deficits (before minorities)**

in m. EUR	2009	2008
Pension Deficit	0.5	2.6

### 3. New Business

#### 3.1. Value of New Business

Hannover Life Re has written a diversified portfolio of new business 2009.

The Value of New Business is shown below.

**Table 7: Value of New Business (before minorities)**

in m. EUR	Domestic operations	Foreign operations	Total
Profit/Loss on New Business during year	-96.1	-204.5	-300.6
PVNB	229.3	490.4	719.7
FCoRC	4.9	24.2	29.0
CoRNHR	38.6	267.6	306.2
FOGs	0.0	0.0	0.0
<b>Value of New Business</b>	<b>89.8</b>	<b>-5.9</b>	<b>83.9</b>

The Value of New Business after minorities is EUR 78.9 million (EUR 146.2 million in 2008)

The increase in the Value of New Business for the domestic operation was supported by large block assumption transaction (retroceded new business from the US subsidiary), block deals providing longevity cover for customers in the United Kingdom as well as risk reinsurance treaties written by the French branch.

The 2009 new business for the foreign operations is dominated by reinsurance treaties covering traditional risk reinsurance business which is highly exposed to mortality risk. As a consequence the Value of New Business is negative due to the high level of the Costs of Residual Non Hedgeable Risks, although the Present Value of New Business has more than tripled compared to 2008.

### 3.2. New Business Margins

The New Business Margin and the Annual Premium Equivalent Margin are defined as the VNB in percent of the Present Value of New Business Premiums (PVNBP) resp. in percent of the Annual Premium Equivalent (APE). APE is defined as the New Business Regular Premium plus 10% of the New Business Single Premium in 2009. Table 8 shows both margins separately for domestic and foreign business.

**Table 8: New Business Margins (before minorities)**

in m. EUR and %	Domestic operations	Foreign operations	Total
<b>VNB (basic)</b>	<b>89.8</b>	<b>-5.9</b>	<b>83.9</b>
New Business Premium in 2009	1,267.0	953.5	<b>2,220.5</b>
PVNBP	2,791.9	10,775.4	<b>13,567.3</b>
New Business Regular Premium	964.3	919.9	<b>1,884.2</b>
New Business Single Premium	302.7	33.6	<b>336.3</b>
<b>New Business Margin</b>	<b>2.2%</b>	<b>0.0%</b>	<b>0.5%</b>
<b>Annual Premium Equivalent Margin</b>	<b>9.0%</b>	<b>-0.6%</b>	<b>4.4%</b>

The New Business Margin after minorities is 0.5% and the Annual Premium Equivalent Margin after minorities is 4.2%.

For the domestic operations the margins are stable in comparison to the previous year. The margins for the foreign operations have decreased due to the high risk adjustments, i.e. the Costs of Residual Non Hedgeable Risks.

## 4. Analysis of Earnings

The Analysis of Earnings of the MCEV 2008 to the MCEV 2009 consists of the following elements:

**Table 9: Analysis of Earnings (before minorities)**

in m. EUR	Earnings on MCEV analysis				
	Before consolidation				After consolidation
	Free Surplus	Required Capital	VIF	MCEV	MCEV
<b>Opening MCEV</b>	<b>525.0</b>	<b>992.4</b>	<b>904.2</b>	<b>2,421.6</b>	<b>1,652.0</b>
Opening adjustments	-4.1	-7.9	-13.1	-25.1	-25.1
Dividend payments	0.0	0.0	0.0	0.0	0.0
Change of model / principles	-4.1	-7.9	-13.1	-25.1	-25.1
<b>Adjusted opening MCEV</b>	<b>520.9</b>	<b>984.5</b>	<b>891.2</b>	<b>2,396.5</b>	<b>1,627.0</b>
New Business Value	-720.1	419.5	384.5	83.9	83.9
Expected existing business contribution (reference rate)	14.9	22.6	55.0	92.5	76.5
Expected existing business contribution (in excess of ref. rate)	7.0	15.5	0.9	23.5	11.0
Transfers from VIF and Required Capital to Free Surplus	329.0	-171.8	-157.2	0.0	0.0
Experience variance	0.6	-12.7	7.2	-4.9	-4.9
Assumption changes	-5.9	9.2	37.7	41.0	41.0
Other operating variance	-1.3	0.0	-27.8	-29.1	-29.1
<b>Operating MCEV earnings</b>	<b>-375.9</b>	<b>282.4</b>	<b>300.4</b>	<b>206.9</b>	<b>178.5</b>
Economic variances	98.7	0.0	67.3	166.0	174.4
Other non operating variances	0.0	0.0	0.0	0.0	0.0
<b>Total MCEV earnings</b>	<b>-277.2</b>	<b>282.4</b>	<b>367.7</b>	<b>372.9</b>	<b>352.9</b>
<b>Closing adjustments</b>	<b>550.1</b>	<b>32.2</b>	<b>38.6</b>	<b>620.9</b>	<b>230.9</b>
Capital injection	609.5	4.7	0.0	614.3	204.3
Dividend payments	-49.9	0.0	0.0	-49.9	-29.9
Change in currency exchange rate	-9.5	27.5	38.6	56.6	56.6
<b>Closing MCEV</b>	<b>793.8</b>	<b>1,299.1</b>	<b>1,297.5</b>	<b>3,390.3</b>	<b>2,210.8</b>

## Opening adjustments

### Change of model

The adjustment to the Free Surplus and the Required Capital includes two effects. There is a neutral shift from Required Capital to Free Surplus due to changes in the level of Required Capital for some of the subsidiaries. The second impact is a decrease in the level of Free Surplus in order to correct an error in the segmentation.

The changes to the Value in-force consist of adjustments to the modelling of the expenses for the American subsidiary and the afore mentioned modification of the FOGs calculation.

## Expected existing business contribution

### At the reference rate

This includes the unwinding for one year of the discount rates (i.e. the reference rates) in respect of the Value in-force and includes a release from risk for the FCoRC and the CoRNHR. The expected contribution on the Free Surplus and the Required Capital is equal to the reference rates less tax and investment management expenses on these amounts. As previously mentioned, the reference rate does not include any liquidity premium.

### In excess of the reference rate

This reflects the management's best estimate of the expected investment returns in the year to the valuation date.

## Experience variances

The negative experience variances are the sum of several, generally small, positive and negative effects. Most companies have experienced an increase in expense levels.

## Assumption changes

The main part of the positive assumption changes to the Value in-force arise from changes to the assumed future mortality improvements for UK life business, on the basis of analyses carried out by the Continuous Mortality Investigation (CMI) and the UK subsidiary. The main impact on Shareholder Net Worth is a neutral shift from Free Surplus to Required Capital representing an increased Company Action Level for the American subsidiary.

## Other operating variance

This includes model changes for several market categories written in the US.

## Economic variances

The main driver for the positive economic variances is the increase in interest rates. For the domestic operations this increase leads to a decrease in PVFP due to higher discount rates, because the assets backing most of the liabilities are deposited back with the ceding companies. The total impact for Hannover Re is however positive. The foreign operations benefit from the increased interest rates due to higher future investment returns, which exceed the negative impact of higher discount rates and, hence, more than compensate the negative impact of the domestic operations.

## **Closing adjustments**

### Capital injection

The capital injection includes the net increase of the intra company bridge financing as well as the allowance for surplus notes and subordinated loan in the MCEV of the US and UK subsidiaries.

### Dividend payments

The dividend payments include the external dividends paid by E+S. In addition dividends have been paid by the Irish subsidiary to Hannover Re. However, this effect is cancelled out after consolidation.

### Change in currency exchange rates

The Euro has weakened during 2009 relative to most of the important currencies with exception of the US Dollar.

## 5. Sensitivities

### 5.1. Sensitivities of MCEV

The following table shows the sensitivity of the MCEV to changes in specified economic and non-economic assumptions. The sensitivities are described in the appendix. The following table shows the absolute deviation of the basic value.

**Table 10: Sensitivities of the MCEV (before minorities)**

in m. EUR	Before consolidation			After consolidation
	Domestic operations	Foreign operations	Total	Total
<b>MCEV (basic)</b>	<b>1,852.0</b>	<b>1,538.3</b>	<b>3,390.3</b>	<b>2,210.8</b>
<b>Sensitivities to economic assumptions</b>				
Interest rate environment +100 bps	5.9	67.5	73.4	73.4
Interest rate environment -100 bps	-17.1	-58.3	-75.4	-75.4
Swaption implied volatilities +25%	0.1	-0.8	-0.7	-0.7
<b>Sensitivities to non-economic assumptions</b>				
Expenses -10%	18.3	25.6	43.9	43.9
Lapse +10%	-39.1	-148.0	-187.1	-187.1
Lapse -10%	38.2	308.6	346.8	346.8
Mortality/morbidity +5%	-108.5	-417.8	-526.3	-526.3
Life/disability business only	-141.1	-424.1	-565.2	-565.2
Annuity business only	32.6	5.7	38.3	38.3
Mortality/morbidity -5%	150.1	583.8	733.9	733.9
Life/disability business only	183.8	590.1	773.9	773.9
Annuity business only	-33.7	-6.3	-39.9	-39.9
<b>Required Capital</b>				
RC=minimum solvency capital	0.8	14.9	15.7	15.7

Only non symmetric sensitivities are shown in both directions.

The sensitivities for mortality and morbidity indicate that the business benefits from the diversification between financing and risk treaties. The impact of this sensitivity is lower within the domestic operations due to a larger proportion of financing business.

The mortality and morbidity sensitivities on annuity business have a higher impact on the domestic operations in comparison to the previous year because the New Business consists of a relatively high portion of annuity business compared to the existing business.

The increase in the mortality and morbidity sensitivities for the foreign operations is caused by the high exposure to mortality risk of the business written in 2009. The value of this business is also highly influenced by changes in lapse rates, hence the lapse sensitivities for the foreign operations have increased as well.

Due to the structure of the investment portfolio the sensitivity 'Equity/property market values +/- 10%' has no impact on the Value in-force and only an immaterial influence on the MCEV and is therefore not shown.

## 5.2. Sensitivities of Value of New Business

Sensitivities have also been calculated for the Value of New Business. The following table shows the absolute deviation of the basic value.

**Table 11: Sensitivities of Value of New Business (before minorities)**

in m. EUR	Domestic operations	Foreign operations	Total
<b>VNB (basic)</b>	<b>89.8</b>	<b>-5.9</b>	<b>83.9</b>
<b>Sensitivities to economic assumptions</b>			
Interest rate environment +100 bps	-8.8	40.4	31.6
Interest rate environment -100 bps	9.1	-37.1	-28.0
Swaption implied volatilities +25%	0.0	0.0	0.0
<b>Sensitivities to non-economic assumptions</b>			
Expenses -10%	3.3	6.9	10.3
Lapse +10%	-8.2	-134.6	-142.9
Lapse -10%	7.4	295.4	302.8
Mortality/morbidity +5%	-7.6	-315.8	-323.4
Life/disability business only	-29.7	-316.3	-346.1
Annuity business only	22.1	1.9	24.1
Mortality/morbidity -5%	16.9	442.4	459.3
Life/disability business only	33.9	439.4	473.3
Annuity business only	-17.0	0.9	-16.1
<b>Required Capital</b>			
RC=minimum solvency capital	0.2	1.8	2.0

## 6. Reconciliation of IFRS equity to MCEV / Embedded Value not Recognised

Life and Health reinsurance business is actively written by Hannover Re, E+S and the life reinsurance subsidiaries of Hannover Re. The consolidated MCEV is derived from the business written by these companies.

The Life and Health segment IFRS equity excluded from the consolidated MCEV is defined as 'IFRS equity outside'. The IFRS equity of Hannover Life Re is derived by deducting the IFRS equity outside from the IFRS equity of the Life and Health segment. The respective values are shown below in million EUR.

Hannover Life Re is specialised in writing financing reinsurance business. The acquisition of large volumes of financing business is only possible due to the financial support provided by the P&C segment of Hannover Re. Within the segmental reporting this historic financing is shown as an inter-segmental liability from the Life and Health segment to the P&C segment ('bridge financing'). The impact of bridge financing on the Hannover Re Group balance sheet is neutral as the liability for the Life and Health segment and the asset for the P&C segment cancel each other out. Bridge financing is EUR 889.5 million in 2009 compared to EUR 700.6 million in 2008.

Bridge financing is shown as an asset for the P&C segment in the IFRS segment reporting. It is however not treated as a liability within the MCEV for the Life and Health business because the MCEV is based on local statutory accounts. Table 12 shows the reconciliation of the IFRS equity for the Life and Health segment to the MCEV. The **Embedded Value not Recognised (EVNR)** quantifies the shareholder interest in the Life & Health business in excess of the IFRS equity. The 'intra company surplus notes' are the subordinated debt issued by the P&C segment to the Hannover Life Re subsidiaries. Under IFRS the P&C segment does not show this subordinated debt as an asset and therefore the subordinated debt is included in the IFRS equity for the Life and Health segment. A part of this subordinated debt is included in the SNW of the US and UK subsidiaries, and therefore in the MCEV. The subordinated debt that is not included in the SNW has to be deducted to achieve the reconciliation between the IFRS equity and the MCEV.

**Table 12: Reconciliation and EVNR (after consolidation, before minorities)**

in m. EUR	2009	2008
<b>IFRS equity</b>	<b>1,085.1</b>	<b>728.2</b>
IFRS equity outside	-14.5	-13.6
Intra company surplus notes	-54.7	-58.6
Bridge financing	889.5	700.6
<b>Adjusted IFRS equity</b>	<b>1,905.3</b>	<b>1,356.5</b>
Valuation differences	-998.5	-576.4
VIF	1,297.5	904.2
Other adjustments	6.6	-32.3
<b>EVNR</b>	<b>305.5</b>	<b>295.5</b>
<b>MCEV</b>	<b>2,210.8</b>	<b>1,652.0</b>

## 7. Assumptions

### 7.1. Economic assumptions

#### 7.1.1. Swap rates

The reference rates have been calibrated to the swap curves as shown below. A risk neutral approach has been applied and all asset classes are assumed to yield the reference rates. The reference rates do not include any liquidity premium.

**Table 13: Swap yield curves as at 31 December 2009**

in %	EUR	USD	GBP	AUD	ZAR
<b>1 Year</b>	1.31	0.66	1.00	4.74	7.14
<b>2 Years</b>	1.88	1.41	2.00	5.14	7.57
<b>3 Years</b>	2.25	2.04	2.65	5.41	8.04
<b>4 Years</b>	2.56	2.56	3.09	5.69	8.32
<b>5 Years</b>	2.81	2.97	3.39	5.85	8.51
<b>6 Years</b>	3.01	3.24	3.58	5.97	8.62
<b>7 Years</b>	3.22	3.51	3.77	6.09	8.72
<b>8 Years</b>	3.34	3.66	3.88	6.15	8.74
<b>9 Years</b>	3.46	3.81	3.99	6.20	8.77
<b>10 Years</b>	3.58	3.96	4.09	6.25	8.79
<b>20 Years</b>	4.06	4.45	4.37	6.27	8.30
<b>30 Years</b>	3.94	4.51	4.22	5.96	7.85

For the MCEV 2008 the following swap rates were used.

**Table 14: Swap yield curves as at 31 December 2008**

in %	EUR	USD	GBP	AUD	ZAR
<b>1 Year</b>	3.05	1.27	1.99	3.25	9.01
<b>2 Years</b>	2.68	1.47	2.60	3.51	8.25
<b>3 Years</b>	2.96	1.73	2.88	3.85	8.00
<b>4 Years</b>	3.12	1.96	3.06	4.18	7.93
<b>5 Years</b>	3.25	2.11	3.16	4.25	7.85
<b>6 Years</b>	3.36	2.24	3.23	4.28	7.82
<b>7 Years</b>	3.48	2.37	3.31	4.31	7.78
<b>8 Years</b>	3.57	2.45	3.36	4.32	7.75
<b>9 Years</b>	3.65	2.52	3.40	4.32	7.72
<b>10 Years</b>	3.74	2.60	3.45	4.33	7.69
<b>20 Years</b>	3.88	2.81	3.60	3.77	6.94
<b>30 Years</b>	3.57	2.77	3.32	3.05	6.59

**7.1.2. Volatilities**

Hannover Life Re's portfolio has FOGs in the US and in South Africa. The economic scenarios for calculating the FOGs were generated using the Libor Market Model with 1,000 scenarios.

The economic scenarios were calibrated using the following swaption implied volatilities, which were lower at the end of 2009 than at previous year.

**Table 15: US Dollar swaption volatilities (31 December 2009)**

in %	swap term (years)										
option period (years)	1	2	3	4	5	7	10	15	20	25	30
1	62.1	48.4	41.9	38.4	36.4	32.9	30.4	26.1	25.2	24.6	24.5
2	45.2	38.9	35.2	33.3	31.8	29.6	28.1	25.1	24.7	23.6	24.0
3	34.0	31.8	30.3	28.8	28.2	26.9	25.5	23.0	22.7	22.3	22.4
4	29.1	28.5	26.9	26.5	25.8	24.6	23.6	21.6	21.8	21.1	21.1
5	27.6	25.7	25.3	24.7	23.8	22.9	22.0	20.7	20.1	20.0	19.9
7	24.3	23.3	22.0	21.4	20.7	20.3	19.9	18.6	18.5	18.0	18.1
10	19.4	18.7	18.6	18.1	17.6	17.6	17.3	16.2	15.9	15.6	15.4
15	16.5	16.5	16.4	16.2	16.0	15.9	15.3	14.5	13.9	13.7	13.5
20	15.9	15.6	15.3	15.1	14.7	14.5	13.8	12.9	12.4	12.2	12.1
25	14.8	15.2	14.9	14.2	14.2	13.6	13.6	12.6	12.0	11.8	11.7
30	14.5	14.3	14.2	14.0	13.7	13.2	13.1	12.7	11.8	11.4	11.3

The FOGs for the MCEV 2008 were calculated based on volatilities as at 30 November 2008 as shown in the following table.

**Table 16: US Dollar swaption volatilities (30 November 2008)**

in %	swap term (years)										
option period (years)	1	2	3	4	5	7	10	15	20	25	30
1	69.5	63.3	58.1	54.4	52.7	50.1	48.8	50.0	51.2	52.4	52.4
2	53.6	49.1	46.1	44.8	44.2	43.4	43.3	44.4	45.1	45.4	45.6
3	43.3	41.0	40.4	40.2	40.3	40.2	40.7	42.0	42.6	43.1	42.9
4	36.7	36.8	37.0	37.2	37.5	37.7	38.4	39.8	39.9	40.7	40.3
5	35.0	35.2	35.3	35.5	35.6	36.1	36.9	37.8	38.0	38.1	37.9
7	31.3	31.9	32.3	32.8	33.4	34.0	34.3	34.6	34.3	34.8	34.5
10	29.1	29.8	30.4	30.7	30.8	31.6	30.9	31.1	29.9	30.1	29.8
15	30.0	30.8	30.4	30.6	31.0	30.5	29.4	28.4	27.8	27.6	29.6
20	28.3	28.1	27.6	28.1	28.2	27.4	26.8	25.9	25.6	25.6	25.8
25	25.9	25.9	26.2	26.4	26.6	26.2	25.5	24.2	24.3	24.5	22.9
30	25.1	25.1	25.2	25.4	25.6	25.3	25.9	25.8	24.3	25.2	24.6

### 7.1.3. Currency exchange rates

**Table 17: Equivalent in EUR of 1 unit of the original currency**

	USD	GBP	AUD	ZAR
<b>2009</b>	0.697569	1.105999	0.623119	0.094232
<b>2008</b>	0.715461	1.041667	0.493657	0.075931

### 7.1.4. Credit risk on assets

The credit risk on assets is reflected in the initial market value of the assets. All assets are then assumed to earn risk free returns. Credit defaults are modelled explicitly in the stochastic models and are calibrated to the spreads at 31 December 2009.

### 7.1.5. Counterparty risk

Counterparty risk under the reinsurance treaties is reflected within the Cost of Residual Non Hedgeable Risks. These risks mainly reflect the possible loss of unamortised initial financing if the ceding company becomes insolvent.

### 7.1.6. Tax

The currently applicable average tax rates are:

**Table 18: Tax rates in percentage**

<b>Australia</b>	<b>China</b>	<b>France</b>	<b>Germany</b>	<b>Hong Kong</b>	<b>Ireland</b>
30.00	25.00	34.35	31.93	16.50	12.50
<b>Korea</b>	<b>Malaysia</b>	<b>South Africa</b>	<b>Sweden</b>	<b>UK</b>	<b>US</b>
24.20	16.39	36.38	28.00	28.00	30.64

The tax rate in Bermuda is 0.00% and the tax rate used for the business written by the Bahrain subsidiary is equal to the French tax rate.

The projections allow for tax losses carried forward.

## 7.2. Non-economic assumptions

### 7.2.1. Cost of Residual Non Hedgeable Risks

The cost of capital approach is described in section 'Methodology'. The capital charge was set to 4.5% and the capital was determined at the 99.5% confidence level.

### 7.2.2. Mortality improvements

Mortality improvements under products covering death benefits have been assumed within the foreign operations mainly for certain reinsurance treaties covering UK term assurances.

### 7.3. Expenses

The total actual administration expenses for the year 2009 have been taken into account in deriving the expense assumptions. The expenses have been allocated to the treaties and projected into the future allowing for expense inflation.

## Appendix

### I. Methodology

Hannover Re has adopted the MCEV Principles. The embedded value calculations are performed using market consistent economic assumptions. Investment returns for all asset classes are assumed to be equal to the reference rates and explicit allowance is made to cover the CoRNHR.

#### General assumptions

- The group companies are going concerns, i.e. they remain in operation and continue writing new business.
- The MCEV is calculated using best estimate assumptions.
- All values are post-tax.
- Expense inflation was recognised for the MCEV calculations. For part of the business it has been assumed that efficiency gains will partly compensate expense inflation.
- Overhead expenses are included within the administrative expenses.
- No future new business is included in the calculations.
- No productivity gains are considered, except for those compensating the expense inflation.

#### New business

New business is defined as new reinsurance treaties written or new policies written under existing treaties during the year. External retrocession of new business treaties is assumed to be negative new business.

The Value of New Business is calculated at the point of sale and includes the profit or loss during the year in which the new business was sold.

#### Shareholder Net Worth

The Shareholder Net Worth (SNW) corresponds to the consolidated market value of the asset backing shareholders funds after deduction of intangible assets, subordinated debt and any other element accounted for the in-force business. The SNW is divided into the Required Capital (RC) and the Free Surplus (FS).

The Shareholder Net Worth is derived from the consolidation of the Net Asset Values of the following companies:

- Domestic operations:
  - Hannover Rück AG (Hannover Re) – Life Division
  - E+S Rück AG (E+S) – Life Division
- Foreign operations:
  - HLR Africa, Johannesburg
  - HLR Ireland, Dublin
  - HLR America, Orlando Fl.
  - HLR UK, Virginia Water/London
  - HLR Australasia, Sydney
  - HLR Bermuda, Hamilton

Hannover Re holds 100% of the shares of all life subsidiaries with the exception of the life segment of E+S in which the shareholding is 64.19%.

Hannover Re and E+S are both composite reinsurance companies writing life and non-life reinsurance business. The Net Asset Value of the companies included in the scope of the MCEV has been derived by making adjustments to the IFRS equity for the Life and Health segment.

### **Required Capital**

The Required Capital (RC) is the amount of capital required to support covered business, i.e. market value of the assets required to back liabilities for covered business, whose distribution to shareholders is restricted.

The RC is always at least equal to the local Statutory Minimum Solvency Margin. The level of the RC for each business centre is set equal to the maximum of:

- The level of capital at which the local regulators are empowered to take action
- The level of capital required by rating agencies (in order to maintain the desired rating)
- The target capital level of the business unit
- Any other level of capital to achieve internal management objectives

The Required Capital was set between 100% and 250% of the local Statutory Minimum Solvency Margin. The Required Capital for the American and UK subsidiary includes intra company surplus notes from the P&C segment to the extent that these are required to meet the target Required Capital.

### **Free Surplus**

The Free Surplus (FS) is the market value of any assets allocated to, but not required to support the covered business.

### **Present Value of in-force Business**

The Present Value of in-force Business (VIF) consists of

- Present Value of Future Profits (PVFP)
- Time Value of Financial Options and Guarantees (FOGs)
- Cost of Residual Non Hedgeable Risks (CoRNHR)
- Frictional Costs of Required Capital (FCoRC)

### **Present Value of Future Profits**

The PVFP is the present value of projected statutory shareholders' profits (net of taxes) from the covered business in force calculated on a certainty equivalent basis. The discount rates are spot rates derived from the reference rates. Pension Deficits and Look Through are included in the PVFP.

### **Time Value of Financial Options and Guarantees**

The majority of treaties either do not have significant FOGs or the assets and liabilities are well matched. The PVFP for these treaties has been calculated using deterministic projections.

Stochastic models have been used to estimate the FOGs for the US and South African business with minimum interest guarantees. The time value of the Financial Options and Guarantees is derived as the difference between PVFP on a certainty equivalent basis and the arithmetic mean of PVFPs derived from a large number of stochastic scenarios.

### Cost of Residual Non Hedgeable Risks

The MCEV Principles require an allowance for the cost of non hedgeable risks not already allowed for in FOGs or PVFP.

The CoRNHR has been determined based on a cost of capital approach using an internal economic capital model. The capital has been determined consistent with a 99.5% confidence level over a one year time horizon. Diversification benefits have been allowed within the non hedgeable risks, but not between hedgeable and non hedgeable risks. The economic capital is projected forward using appropriate risk drivers (e.g. the premiums or mathematical reserves) and the present value is calculated using the reference rates.

The CoRNHR cover the following non financial risks:

- Mortality risk
- Longevity risk
- Morbidity risk
- Disability risk
- Lapse risk
- Expense risk
- Pandemic risk
- Operational risk

as well as cedant counterparty risk and non hedgeable financial risks.

### Frictional Costs of Required Capital

The FCoRC are defined as the tax on the projected investment returns and investment costs on asset backing the Required Capital over the projected lifetime of the underlying risks.

### Sensitivities

- **Interest environment + / - 100 bps**  
Under this sensitivity a parallel shift in the risk free yield curve is assumed. As a consequence current market values of fixed interest assets and future reinvestment rates also change. This sensitivity is not performed in isolation, but there are associated impacts on most other economic assumptions.
- **Swaption implied volatilities + 25%**  
This sensitivity shows the impact of an increase in swaption implied volatilities on the cost of options and guarantees.
- **Expenses - 10%**  
This sensitivity applies to the projected level of expenses without a change in the expense inflation.
- **Lapse + / - 10%**  
Hereunder a 10% proportional increase/decrease in lapse rates is applied, i.e. a multiplicative change in lapse rates.
- **Mortality/morbidity + / - 5%**  
The sensitivity has been performed for three different situations:
  - Mortality and Morbidity are proportionately reduced for all classes of business at the same time.
  - The sensitivity is performed only for life, disability, medical insurances and related products.
  - Mortality is changed only for the annuity policies.

– **Required Capital**

For the sensitivity 'RC=minimum solvency capital' the amount of required capital is set equal to the level of solvency capital at which the supervisor is empowered to take any action.

II. Glossary

<b>CoRNHR</b>	<b>Cost of Residual Non Hedgeable Risks</b> Explicit allowance for residual non hedgeable financial and non financial risks
<b>FCoRC</b>	<b>Frictional Costs of Required Capital</b> Cost of double taxation and cost of asset management
<b>Covered business</b>	The treaties included in the MCEV calculations; in line with the MCEV principles
<b>MCEV</b>	<b>Market Consistent Embedded Value</b> Defined as the present value of future distributable earnings of the business in-force plus the portion of capital and surplus that is not needed to support the business in-force; Methodology in line with the MCEV Principles of the CFO-Forum
<b>FOGs</b>	<b>Financial Options and Guarantees</b> Time value of financial options und guarantees; determined on stochastic techniques consistent with the methodology and assumptions used in the underlying MCEV
<b>FS</b>	<b>Free Surplus</b> The market value of any capital and surplus allocated to, but not required to support, the in-force covered business at the valuation date
<b>VIF</b>	<b>Value of in-force Covered Business</b> The present value of future shareholder cash flows projected to emerge from the in-force covered business and the assets backing the associated liabilities after allowance for FOGs, CoRNHR and FCoRC
<b>PVFP</b>	<b>Present Value of Future Profits</b> The present value of future shareholder cash flows projected to emerge from the assets backing liabilities of the in-force covered business
<b>RC</b>	<b>Required Capital</b> Assets attributed to the covered business over and above that required to back liabilities for covered business whose distribution to shareholders is restricted
<b>SNW</b>	<b>Shareholder Net Worth</b> Free Surplus plus Required Capital

### III. Formulae and Abbreviations

$$\text{MCEV} = \text{SNW} + \text{VIF}$$

MCEV	Market Consistent Embedded Value
SNW	Shareholder Net Worth
VIF	Present Value of in-force covered business

$$\text{SNW} = \text{FS} + \text{RC}$$

SNW	Shareholder Net Worth
FS	Free Surplus
RC	Required Capital

$$\text{VIF} = \text{PVFP} - \text{CoRNHR} - \text{FOGs} - \text{FCoRC}$$

VIF	Present Value of in-force business
PVFP	PVFP based on a certainty equivalent approach including Pension Deficits and Look Through
CoRNHR	Cost of Residual Non Hedgeable Risks
FOGs	Time Value of Financial Options and Guarantees
FCoRC	Frictional Costs of Required Capital

$$\text{CoRNHR} = \text{F} * \text{EC}$$

CoRNHR	Cost of Residual Non Hedgeable Risks
F	Capital Charge (percentage)
EC	Economic Capital (present value) based on the 99.5% percentile confidence level

$$\text{TVFOGs} = \text{PVFP} - \text{Mean Stochastic PVFP}$$

TVFOGs	Time Value of FOGs
PVFP	PVFP based on a certainty equivalent approach including Pension Deficits and Look Through

Mean stochastic PVFP: derived from a large number of stochastic scenarios

$$\text{Return on MCEV} = \frac{\text{Closing MCEV} - \text{Closing Adjustments} - \text{Adjusted Opening MCEV}}{\text{Adjusted Opening MCEV}}$$

$$\text{VNB} = \text{P/L(NB)} + \text{PVNB} - \text{CoRNHR} - \text{FOGs} - \text{FCoRC}$$

VNB	Value of New Business
P/L(NB)	Profit or Loss on New Business during the year
PVNB	Present Value of the new business profits
CoRNHR	Cost of Residual Non Hedgeable Risks on New Business
FOGs	Value of FOGs on New Business
FCoRC	Frictional Cost of Required Capital on New Business

$$\text{NBM} = \frac{\text{VNB}}{\text{NBP} + \text{PVNBP}}$$

NBM	New Business Margin
VNB	Value of New Business
NBP	New Business Premium current year
PVNBP	Present Value of New Business Premium

$$\text{APEM} = \frac{\text{VNB}}{\text{APE}} = \frac{\text{VNB}}{\text{NBRP} + 10\% \text{NBSP}}$$

APEM	Annual Premium Equivalent Margin
VNB	Value of New Business
APE	Annual Premium Equivalent
NBRP	New Business Regular Premium
NBSP	New Business Singular Premium

#### **IV. Disclaimer**

The information provided in this report does in no way whatsoever constitute legal, accounting, tax, or other professional advice.

While Hannover Re has endeavoured to include in this report information it believes to be reliable, complete and up-to-date, the company does not make any representation or warranty, express or implied, as to the accuracy, completeness or updated status of such information.

Some of the information in this report may be forward-looking information or information on future expectations based on currently available information. Such information naturally is subject to risks and uncertainties. Factors such as the development of general economic conditions, future market conditions, unusual catastrophic loss events, changes in the capital markets and other circumstances may cause the actual events or results to be materially different from those anticipated by such information. Hannover Re assumes no obligation to update any forward-looking information contained in this report.

It should be noted that all calculations are based on data reported by the ceding companies of Hannover Re and its subsidiaries, mainly bulk data, which do not allow exact specifications on the portfolio composition.

Therefore, in no case whatsoever will Hannover Re and its affiliate companies be liable to anyone for any decision made or action taken in conjunction with the information in this report or for any related damages.

The Directors  
Hannover Rückversicherung AG  
Karl-Wiechert-Allee 50

**30625 Hannover**

4th May 2010

Dear Sirs,

**Review of the Market Consistent Embedded Value of the Life & Health segment of Hannover Rückversicherung AG as at 31st December 2009**

The Life and Health Reinsurance business of Hannover Rückversicherung AG (“Hannover Re”), as reported under the “life and health reinsurance” segment in the primary financial statements, is written by Hannover Rückversicherung AG and E+S Rückversicherung AG, together with their subsidiaries, branches and offices (together “Hannover Life Re” or “HLR”).

Hannover Re has determined the Market Consistent Embedded Value (“MCEV”) results of HLR for 2009 as set out in the Statements of Market Consistent Embedded Value (together “the Statements”) on a basis consistent with the requirements of the European Insurance CFO Forum Market Consistent Embedded Value Principles<sup>©(1)</sup> (“MCEV Principles”). These Statements, the methodologies applied and the assumptions underlying them are each the sole responsibility of the Board of Directors (“the Directors”) of Hannover Re.

The Statements have been prepared by Hannover Re as the aggregate of separate Market Consistent Embedded Values determined for each significant operating unit making due allowance for inter group transactions including retrocessions, any minority interests together with the elimination of the book values of the businesses for which an MCEV has been calculated.

The calculation of MCEVs necessarily makes numerous assumptions with respect to economic conditions, operating conditions, taxes, and other matters, many of which are beyond Hannover Re’s control. Although the assumptions used represent estimates which the Directors believe are together reasonable, actual experience in future may vary from that assumed in the calculation of MCEV and such variation may be material. Deviations from assumed experience are normal and are to be expected.

The resulting MCEV does not purport to be a market valuation of Hannover Re and should not be interpreted in that manner since it does not purport to encompass all of the many factors that may bear upon a market value.

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### Scope of B&W Deloitte's Review

We have reviewed the methodology adopted and assumptions and calculations made by the Directors to determine the MCEV for the businesses concerned and their aggregation into the consolidated MCEV of HLR.

The non hedgeable risk based capital, which is the basis for the calculation of the cost of residual non hedgeable risks, has been determined by HLR using an internal capital model. We have not reviewed the internal model or the level of non hedgeable risk based capital. Hannover Re has decided to not publish the Group Embedded Value as required by the MCEV Principles.

Our work was conducted in accordance with generally accepted actuarial practices and processes. It comprised a combination of such reasonableness checks, analytical review and checks of clerical accuracy as we considered necessary to provide reasonable assurance that the Statements have been compiled free of significant error. However, we have relied upon the completeness and accuracy of the data and information supplied by Hannover Re and its subsidiaries, including the book value of the net assets as disclosed in Hannover Re's financial statements on which the Statements are based. Accordingly, as is customary, we have not audited, verified or otherwise substantiated that data and information.

### Opinion

In our opinion, with the exceptions highlighted in the scope of the B&W Deloitte review above, the MCEV methodology as approved by the Directors of Hannover Rückversicherung AG is appropriate, the assumptions taken together are reasonable and the estimate of the Market Consistent Embedded Value have been accurately compiled consistent with the "MCEV Principles".

This report is made solely to Hannover Rückversicherung AG's Directors as a body. To the fullest extent permitted by law we do not accept or assume responsibility to anyone other than Hannover Rückversicherung AG's Directors as a body for our work in respect of this report or for the conclusions that we have reached.

Yours faithfully



Bharat Bhayani  
B&W Deloitte GmbH

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