



**MUNICH RE GROUP**

## **EUROPEAN EMBEDDED VALUE 2007**

**SUPPLEMENTARY INFORMATION REGARDING LIFE AND MEDICAL  
EMBEDDED VALUE RESULTS 2007**

11 March 2008



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## 1 Introduction

### 1.1 Scope of disclosure

In May 2004 the CFO Forum, a group representing the Chief Financial Officers of major European insurers, published the European Embedded Value Principles (EEVP). The Munich Re Group has adopted the EEVP from the reporting year 2005 on.

This document includes the following:

- The European Embedded Value as at 31 December 2007
- An analysis of value added (embedded value earnings) during 2007
- A detailed description of the embedded value methodology applied
- Reconciliation of embedded value with IFRS equity
- An analysis of the sensitivities of the embedded value as at 31 December 2007 and 2007 value added by new business to changes in certain key assumptions

### 1.2 Covered business

The embedded value is reported for the following covered business:

- All business written in life reinsurance entities, excluding medical reinsurance business
- Business written in all major primary life and German medical entities

German medical primary business is long-term business similar to life business and is therefore included in the embedded value. Medical reinsurance business is short term in nature and therefore excluded from the embedded value.

The reinsurance companies writing covered life reinsurance business are listed in the following table:

|              |   |
|--------------|---|
| Australia    | Munich Reinsurance Company of Australasia Ltd                           |
| Germany      | Münchener Rückversicherungs-Gesellschaft AG                             |
| Italy        | Münchener Rück Italia S.p.A.  |
| Russia       | Munich Reinsurance Company Life Reinsurance Eastern Europe/Central Asia |
| South Africa | Munich Reinsurance Company of Africa Ltd                                |
| Switzerland  | New Reinsurance Company   |
| USA          | Munich American Reassurance Company                                     |

Life reinsurance business written by branch offices of the above companies is also included. Major branch offices writing life reinsurance business are:

|                |   |
|----------------|---|
| Canada         | Munich Reinsurance Company Canada Branch (Life)       |
| United Kingdom | Munich Reinsurance Company United Kingdom Life Branch |

Covered business represents 100% of life reinsurance business written in the Munich Re Group. The stand-alone embedded value figures are fully reflected in the embedded value figures at Munich Re Group level.



The primary insurance companies writing covered life and medical primary insurance business are listed in the following table:

|           |   |
|-----------|---|
| Austria   | VICTORIA-VOLKSBANKEN Versicherungsaktiengesellschaft  |
| Belgium   | Hamburg-Mannheimer N.V./S.A.  |
| Estonia   | ERGO Elukindlustuse AS  |
| Germany   | DKV Deutsche Krankenversicherung Aktiengesellschaft<br>Hamburg-Mannheimer Versicherungs-Aktiengesellschaft<br>KarstadtQuelle Lebensversicherung AG<br>VICTORIA Lebensversicherung Aktiengesellschaft<br>VICTORIA Krankenversicherung Aktiengesellschaft |
| Italy     | ERGO Previdenza S.p.A.  |
| Latvia    | ERGO Latvija dzīvība AAS  |
| Lithuania | ERGO Lietuva gyvybes draudimo UAB   |
| Poland    | Sopockie Towarzystwo Ubezpieczeń na Życie ERGO Hestia S.A.  |
| Portugal  | VICTORIA-Seguros de Vida S.A.   |
| Spain     | ERGO Vida Seguros y Reaseguros, Sociedad Anónima  |

Covered business includes more than 90% of total primary life and medical business written in the Munich Re Group, measured by premium income. The consolidation of the stand-alone embedded value figures into the embedded value figures at Munich Re Group level takes into account the dilution of earnings through minority shareholders and policyholders, where applicable.

### 1.3 Definition of embedded value

Embedded value is the present value of shareholders' interests in the earnings distributable from assets allocated to covered business after making sufficient allowance for the aggregate risks in the covered business.

Embedded value consists of the following components:

- Present value of future shareholder cash flows from in-force business (PVIF)
- Cost of holding capital (CoC)
- Adjusted net worth (ANW), broken down into free surplus (FS) and required capital (RC)

The embedded value methodology makes allowance for the aggregate risks in the covered business through the following measures:

- A required capital derived from internal risk capital models and additional regulatory restrictions
- A market-consistent assessment of the time value of financial options and guarantees



- A deduction for the cost of capital, which is comprised of the cost of double taxation and investment expenses on the required capital, a frictional cost of capital, and the cost of capital due to the profit sharing of investment income on shareholder funds for German primary life and medical business

The embedded value is calculated on a local statutory basis. The results are presented net of minority interests and policyholder participations.

A detailed description of the embedded value methodology is given in Section 3.

#### **1.4 Disclaimer**

This report contains forward-looking statements that are based on current assumptions and forecasts of the management of the Munich Re Group companies mentioned in Section 1.2. Known and unknown risks, uncertainties and other factors could lead to material differences between the forward-looking statements given here and the actual development, in particular the results, financial situation and performance of our company. The Munich Re Group assumes no liability to update these forward-looking statements or to conform them to future events or developments.



## 2 Embedded value results 2007

### 2.1 Reinsurance

The most important European Embedded Value components for reinsurance business as at 31 December 2006 and 31 December 2007 are shown in the following table:

| All figures in €m                       | 31.12.2007   | 31.12.2006 |
|---|--------------|------------|
| <b>European Embedded Value</b>          | <b>6,662</b> | 5,962      |
| - PVIF                                  | <b>4,926</b> | 4,479      |
| - CoC                                   | <b>-948</b>  | -901       |
| - ANW                                   | <b>2,684</b> | 2,384      |
| <b>CoC</b>                              | <b>-948</b>  | -901       |
| - Tax and investment expense CoC        | <b>-259</b>  | -281       |
| - Frictional CoC                        | <b>-689</b>  | -620       |
| <b>ANW</b>                              | <b>2,684</b> | 2,384      |
| - Required capital                      | <b>1,832</b> | 1,808      |
| - Free surplus                          | <b>852</b>   | 576        |
| <b>Financial options and guarantees</b> |              |            |
| - European EV before FOG                | <b>6,698</b> | 5,998      |
| - Value of FOG                          | <b>-36</b>   | -36        |
| - European EV                           | <b>6,662</b> | 5,962      |

The embedded value shows a strong increase of 11.7% over the year 2007. Detailed explanations follow later in this section.

The total required capital as at 31 December 2007 of €1,832m exceeds the capital required at Group level to cover all minimum local and group solvency requirements by €787m.

The change in embedded value in 2007 is shown in the following table:

| All figures in €m                     | EV           | PVIF         | CoC         | ANW          |
|---------------------------------------|--------------|--------------|-------------|--------------|
| <b>Opening embedded value</b>         | <b>5,962</b> | <b>4,479</b> | <b>-901</b> | <b>2,384</b> |
| Embedded value earnings               | <b>859</b>   | 464          | -55         | 450          |
| Currency movements                    | <b>-79</b>   | -17          | 8           | -70          |
| Value of acquired/(divested) business | <b>0</b>     | 0            | 0           | 0            |
| Capital movements                     | <b>-80</b>   |              |             | -80          |
| <b>Closing embedded value</b>         | <b>6,662</b> | <b>4,926</b> | <b>-948</b> | <b>2,684</b> |

The change in embedded value in 2007 was driven by strong embedded value earnings (14.4% of opening embedded value). The currency movements reflect the weakening of the US dollar and the pound (sterling), which is partly offset by the strengthening of the Canadian dollar.



The breakdown of the 2007 embedded value earnings is shown in the following table:

|  |           | EV         | PVIF       | CoC        | ANW        |
|--|-----------|------------|------------|------------|------------|
| Expected return                          | €m        | 336        | 221        | 39         | 76         |
| Expected transfer from PVIF to ANW       | €m        | 0          | -359       | 0          | 359        |
| Experience variances                     | €m        | 160        | 31         | -8         | 137        |
| Operating assumption changes             | €m        | -72        | -160       | 18         | 70         |
| Value added by new business              | €m        | 277        | 580        | -105       | -198       |
| <b>Operating embedded value earnings</b> | <b>€m</b> | <b>701</b> | <b>313</b> | <b>-56</b> | <b>444</b> |
| - as % of opening embedded value         | %         | 11.8       |            |            |            |
| Tax variances/assumption changes         | €m        | 148        | 138        | -1         | 11         |
| Economic variances                       | €m        | 10         | 13         | 2          | -5         |
| <b>Total embedded value earnings</b>     | <b>€m</b> | <b>859</b> | <b>464</b> | <b>-55</b> | <b>450</b> |
| - as % of opening embedded value         | %         | 14.4       |            |            |            |

The strong 2007 embedded value earnings are due to both in-force and new business results.

The expected return plus the value added by new business amount to €613m or 10.3% of the opening embedded value. The total embedded value earnings of 14.4% clearly exceed the embedded value target of 8-9%. Favourable experience variances were observed throughout all major business units. The operating assumption changes include a negative impact from the write-down of a deferred tax asset for our US life reinsurance business. The positive tax assumption changes reflect the lowering of future tax rates in various countries, mainly in Germany and Canada.

The good results for new business are reflected in the following key profitability ratios:

| <b>New business</b>                            |    | 2007  | 2006  |
|--|----|-------|-------|
| Value added by new business (VANB)             | €m | 277   | 228   |
| Present value of new business premiums (PVNBP) | €m | 5,069 | 5,349 |
| Annual premium equivalent (APE)                | €m | 522   | 571   |
| Opening embedded value (EV)                    | €m | 5,962 | 5,920 |
| New business margin (VANB/PVNBP)               | %  | 5.5   | 4.3   |
| VANB/APE                                       | %  | 53.1  | 39.9  |
| VANB/EV  | %  | 4.6   | 3.9   |

The increase in the value added by new business from €228m to €277m exceeds the 15% growth target significantly.

The development of required capital in 2007 is shown in the following table:

All figures in €m

|  |              |
|--|--------------|
| <b>Required capital as at 31 December 2006</b>   | <b>1,808</b> |
| Change in required capital for in-force business | -90          |
| Required capital for 2007 new business           | 162          |
| Currency movements                               | -48          |
| <b>Required capital as at 31 December 2007</b>   | <b>1,832</b> |





The change in required capital in 2007 is driven by two factors. Firstly, the required capital for new business (€162m) is higher than the required capital released by the run-off of existing business (€90m). Secondly, changes in foreign exchange rates decrease the required capital in the reporting currency by €48m.

Please note that these numbers may differ from the stand-alone economic capital requirements which were disclosed in the Munich Re Group analysts' conference. The figures differ mainly because the stand-alone economic capital numbers are derived on a fully economic basis, whereas the required capital numbers used in this EEV disclosure make additional allowance for regulatory restrictions.

## 2.2 Primary insurance

Covered primary insurance business consists of three business segments:

- German primary life insurance
- International primary life insurance
- German primary medical insurance

Embedded value results for all covered primary insurance business are presented in Section 2.2.1. Embedded value results for the three business segments are presented in the following sections.

### 2.2.1 Primary insurance in aggregate

The most important European Embedded Value components for primary insurance business as at 31 December 2006 and 31 December 2007 are shown in the following table:

| All figures in €m                       | 31.12.2007    | 31.12.2006    |
|---|---------------|---------------|
| <b>European Embedded Value</b>          | <b>5,406</b>  | <b>4,154</b>  |
| - PVIF                                  | 4,995         | 3,755         |
| - CoC                                   | -1,409        | -1,253        |
| - ANW                                   | 1,820         | 1,652         |
| <b>CoC</b>                              | <b>-1,409</b> | <b>-1,253</b> |
| - Tax and investment expense CoC        | -172          | -109          |
| - CoC for policyholder participation    | -645          | -639          |
| - Frictional CoC                        | -592          | -505          |
| <b>ANW</b>                              | <b>1,820</b>  | <b>1,652</b>  |
| - Required capital                      | 1,787         | 1,677         |
| - Free surplus                          | 33            | -25           |
| <b>Financial options and guarantees</b> |               |               |
| - European EV before FOG                | 5,556         | 4,244         |
| - Value of FOG                          | -150          | -90           |
| - European Embedded Value               | 5,406         | 4,154         |

The significant increase in present value of in-force business (PVIF) in 2007 is mainly due to strong operating earnings, lower tax rates in Germany and Italy, and favourable capital markets (see Section 6.4 for economic assumption).

While our extensive swaption programme protects us against the effects of decreasing interest rates, the increased volatility observed in equity markets leads to a higher time value of financial options and guarantees compared to the previous year.

The change in embedded value in 2007 is shown in the following table:

| All figures in €m                     | EV           | PVIF         | CoC           | ANW          |
|---------------------------------------|--------------|--------------|---------------|--------------|
| <b>Opening embedded value</b>         | <b>4,154</b> | <b>3,755</b> | <b>-1,253</b> | <b>1,652</b> |
| Embedded value earnings               | <b>1,206</b> | 1,072        | -127          | 261          |
| Currency movements                    | <b>1</b>     | 0            | 0             | 1            |
| Value of acquired/(divested) business | <b>219</b>   | 168          | -29           | 80           |
| Capital movements                     | <b>-174</b>  |              |               | -174         |
| <b>Closing embedded value</b>         | <b>5,406</b> | <b>4,995</b> | <b>-1,409</b> | <b>1,820</b> |

The value of acquired business stems from an internal transaction that is described in Section 2.2.3. The breakdown of embedded value earnings in 2007 is shown in the following table:

|  |           | EV           | PVIF         | CoC         | ANW        |
|--|-----------|--------------|--------------|-------------|------------|
| Expected return                          | €m        | <b>226</b>   | 172          | 37          | 17         |
| Expected transfer from PVIF to ANW       | €m        | <b>0</b>     | -347         | 0           | 347        |
| Experience variances                     | €m        | <b>-47</b>   | 25           | -24         | -48        |
| Operating assumption changes             | €m        | <b>135</b>   | 133          | -19         | 21         |
| Value added by new business              | €m        | <b>164</b>   | 346          | -53         | -129       |
| <b>Operating embedded value earnings</b> | <b>€m</b> | <b>478</b>   | <b>329</b>   | <b>-59</b>  | <b>208</b> |
| - as % of opening embedded value         | %         | <b>11.5</b>  |              |             |            |
| Tax variances/assumption changes         | €m        | <b>338</b>   | 332          | -10         | 16         |
| Economic variances                       | €m        | <b>390</b>   | 411          | -58         | 37         |
| <b>Total embedded value earnings</b>     | <b>€m</b> | <b>1,206</b> | <b>1,072</b> | <b>-127</b> | <b>261</b> |
| - as % of opening embedded value         | %         | <b>29.0</b>  |              |             |            |

The operating embedded value earnings of €478m or 11.5% of opening embedded value are due to good results in all three segments and described in the following Sections. Lower tax rates in Germany and Italy as well as higher-than-expected investment returns during the year and the higher interest rates at year-end pushed total embedded value earnings to €1,206m.

In the following table, key profitability ratios for new business are shown:

| <b>New business</b>                            |    | <b>2007</b>  | 2006  |
|--|----|--------------|-------|
| Value added by new business (VANB)             | €m | <b>164</b>   | 125   |
| Present value of new business premiums (PVNBP) | €m | <b>6,678</b> | 6,988 |
| Annual premium equivalent (APE)                | €m | <b>666</b>   | 734   |
| Opening embedded value (EV)                    | €m | <b>4,154</b> | 2,865 |
| New business margin (VANB/PVNBP)               | %  | <b>2.5</b>   | 1.8   |
| VANB/APE                                       | %  | <b>24.6</b>  | 17.0  |
| VANB/EV  | %  | <b>3.9</b>   | 4.4   |



The value added by new business increased by 31% from 2006 to 2007. This increase is mainly due to the improved overall profitability of new business, while new business volumes were lower than in the previous year.

## 2.2.2 German primary life insurance business

The most important European Embedded Value components for German primary life insurance business as at 31 December 2006 and 31 December 2007 are shown in the following table:

| All figures in €m                       | 31.12.2007   | 31.12.2006 |
|---|--------------|------------|
| <b>European Embedded Value</b>          | <b>2,882</b> | 2,211      |
| - PVIF                                  | <b>2,456</b> | 1,808      |
| - CoC                                   | <b>-586</b>  | -583       |
| - ANW                                   | <b>1,012</b> | 986        |
| <b>CoC</b>                              | <b>-586</b>  | -583       |
| - Tax and investment expense CoC        | <b>-59</b>   | -46        |
| - CoC for policyholder participation    | <b>-370</b>  | -391       |
| - Frictional CoC                        | <b>-157</b>  | -146       |
| <b>ANW</b>                              | <b>1,012</b> | 986        |
| - Required capital                      | <b>1,068</b> | 1,055      |
| - Free surplus                          | <b>-56</b>   | -69        |
| <b>Financial options and guarantees</b> |              |            |
| - European EV before FOG                | <b>3,020</b> | 2,278      |
| - Value of FOG                          | <b>-138</b>  | -67        |
| - European Embedded Value               | <b>2,882</b> | 2,211      |

The present value of in-force business (PVIF) in German primary life insurance business increased by 36% due to strong embedded value earnings whereas cost of holding capital and adjusted net worth show almost no change. Improved modelling and, to a lesser extent, increased volatility of equity markets during 2007 led to a substantial increase in the time value of options and guarantees.

The change in embedded value in 2007 is shown in the following table:

| All figures in €m                     | EV           | PVIF         | CoC         | ANW          |
|---------------------------------------|--------------|--------------|-------------|--------------|
| <b>Opening embedded value</b>         | <b>2,211</b> | <b>1,808</b> | <b>-583</b> | <b>986</b>   |
| Embedded value earnings               | <b>765</b>   | 648          | -3          | 120          |
| Currency movements                    | <b>0</b>     | 0            | 0           | 0            |
| Value of acquired/(divested) business | <b>0</b>     | 0            | 0           | 0            |
| Capital movements                     | <b>-94</b>   |              |             | -94          |
| <b>Closing embedded value</b>         | <b>2,882</b> | <b>2,456</b> | <b>-586</b> | <b>1,012</b> |

The breakdown of embedded value earnings in 2007 is shown in the following table:

|  |           | EV         | PVIF       | CoC       | ANW        |
|--|-----------|------------|------------|-----------|------------|
| Expected return                          | €m        | 135        | 107        | 21        | 7          |
| Expected transfer from PVIF to ANW       | €m        | 0          | -238       | 0         | 238        |
| Experience variances                     | €m        | -45        | -10        | 7         | -42        |
| Operating assumption changes             | €m        | 68         | 46         | 22        | 0          |
| Value added by new business              | €m        | 105        | 228        | -27       | -96        |
| <b>Operating embedded value earnings</b> | <b>€m</b> | <b>263</b> | <b>133</b> | <b>23</b> | <b>107</b> |
| - as % of opening embedded value         | %         | 11.9       |            |           |            |
| Tax variances/assumption changes         | €m        | 270        | 260        | -7        | 17         |
| Economic variances                       | €m        | 232        | 255        | -19       | -4         |
| <b>Total embedded value earnings</b>     | <b>€m</b> | <b>765</b> | <b>648</b> | <b>-3</b> | <b>120</b> |
| - as % of opening embedded value         | %         | 34.6       |            |           |            |

Although new business volumes decreased, value added by new business (VANB) increased to €105m. A combination of a lower tax rate, higher interest rates and a considerably lower guaranteed bonus rate (from 2.75% to 2.25%) lifted the new business margin to 2.8%, measured as VANB relative to the present value of new business premiums (PVNBP). The development of key profitability ratios shown in the following table highlights our commitment to sustain high profitability in respect of new business:

| <b>New business</b>                            |    | 2007  | 2006  |
|--|----|-------|-------|
| Value added by new business (VANB)             | €m | 105   | 82    |
| Present value of new business premiums (PVNBP) | €m | 3,739 | 4,070 |
| Annual premium equivalent (APE)                | €m | 458   | 498   |
| Opening embedded value (EV)                    | €m | 2,211 | 1,174 |
| New business margin (VANB/PVNBP)               | %  | 2.8   | 2.0   |
| VANB/APE                                       | %  | 22.9  | 16.5  |
| VANB/EV  | %  | 4.7   | 7.0   |

In addition to improved transparency and other consumer rights, the reform of the German Insurance Contract Act (Versicherungsvertragsgesetz, VVG) allows for policyholders of with-profits contracts to participate in unrealised capital gains. This applies on maturity as well as in the case of surrenders. These effects on embedded value were not explicitly modelled in this year's calculation. However, estimates of effects from the VVG reform show only negligible impacts on our embedded value, since this participation in unrealised capital gains is expected to be pre-dominantly paid from policyholder funds.



### 2.2.3 International primary life insurance business

The most important European Embedded Value components for international primary life insurance business as at 31 December 2006 and 31 December 2007 are shown in the following table:

| All figures in €m                       | 31.12.2007  | 31.12.2006 |
|---|-------------|------------|
| <b>European Embedded Value</b>          | <b>951</b>  | 599        |
| - PVIF                                  | 762         | 451        |
| - CoC                                   | -160        | -72        |
| - ANW                                   | 349         | 220        |
| <b>CoC</b>                              | <b>-160</b> | -72        |
| - Tax and investment expense CoC        | -66         | -26        |
| - CoC for policyholder participation    | 0           | 0          |
| - Frictional CoC                        | -94         | -46        |
| <b>ANW</b>                              | <b>349</b>  | 220        |
| - Required capital                      | 244         | 152        |
| - Free surplus                          | 105         | 68         |
| <b>Financial options and guarantees</b> |             |            |
| - European EV before FOG                | 963         | 620        |
| - Value of FOG                          | -12         | -21        |
| - European EV                           | 951         | 599        |

All components of embedded value and embedded value earnings are affected by an internal transaction that is reflected as an acquisition in the embedded value framework. At the beginning of 2007, ERGO AG increased its stake in ERGO Inter AG (and therefore in the foreign life companies) to 100%. Last year the corresponding stake belonged to ERGO's German Life & Health insurance companies. European Embedded Value increases as a result of this transaction, since the corresponding payment was made by Ergo AG which is not part of the EEV Covered Business. However, this transaction has no material impact on the value of ERGO AG in aggregate.

The embedded value grew by 59% of which 22% are due to strong embedded value earnings. Currency and capital movements were almost negligible:

| All figures in €m                     | EV         | PVIF       | CoC         | ANW        |
|---------------------------------------|------------|------------|-------------|------------|
| <b>Opening embedded value</b>         | <b>599</b> | <b>451</b> | <b>-72</b>  | <b>220</b> |
| Embedded value earnings               | 131        | 143        | -59         | 47         |
| Currency movements                    | 1          | 0          | 0           | 1          |
| Value of acquired/(divested) business | 219        | 168        | -29         | 80         |
| Capital movements                     | 1          |            |             | 1          |
| <b>Closing embedded value</b>         | <b>951</b> | <b>762</b> | <b>-160</b> | <b>349</b> |

The breakdown of embedded value earnings in 2007 is shown in the following table:

|  |           | EV         | PVIF       | CoC        | ANW       |
|--|-----------|------------|------------|------------|-----------|
| Expected return                          | €m        | 39         | 28         | 4          | 7         |
| Expected transfer from PVIF to ANW       | €m        | 0          | -60        | 0          | 60        |
| Experience variances                     | €m        | -4         | -2         | 4          | -6        |
| Operating assumption changes             | €m        | 1          | 39         | -50        | 12        |
| Value added by new business              | €m        | 29         | 75         | -12        | -34       |
| <b>Operating embedded value earnings</b> | <b>€m</b> | <b>65</b>  | <b>80</b>  | <b>-54</b> | <b>39</b> |
| - as % of opening embedded value         | %         | 10.9       |            |            |           |
| Tax variances/assumption changes         | €m        | 23         | 20         | 3          | 0         |
| Economic variances                       | €m        | 43         | 43         | -8         | 8         |
| <b>Total embedded value earnings</b>     | <b>€m</b> | <b>131</b> | <b>143</b> | <b>-59</b> | <b>47</b> |
| - as % of opening embedded value         | %         | 21.9       |            |            |           |

With low negative experience variances and small operating assumption changes, operating embedded value earnings benefit from a high value added by new business. Supported by a lower tax rate in Italy and higher interest rates, total embedded value earnings increased to €131m or 21.9% of opening embedded value.

In the following table, key profitability ratios for new business are shown:

| <b>New business</b>                            |    | 2007 | 2006 |
|--|----|------|------|
| Value added by new business (VANB)             | €m | 29   | 21   |
| Present value of new business premiums (PVNBP) | €m | 462  | 383  |
| Annual premium equivalent (APE)                | €m | 57   | 44   |
| Opening embedded value (EV)                    | €m | 599  | 560  |
| New business margin (VANB/PVNBP)               | %  | 6.3  | 5.5  |
| VANB/APE                                       | %  | 50.9 | 47.7 |
| VANB/EV  | %  | 4.8  | 3.8  |

Part of the increase in new business volume is due to growth. The strong increase in new business margin from 5.5% to 6.3% is caused by the higher share of Belgian business in the portfolio.



## 2.2.4 German primary medical insurance business

The most important European Embedded Value components for German primary medical insurance business as at 31 December 2006 and 31 December 2007 are shown in the following table:

| All figures in €m                       | 31.12.2007   | 31.12.2006 |
|---|--------------|------------|
| <b>European Embedded Value</b>          | <b>1,573</b> | 1,344      |
| - PVIF                                  | 1,777        | 1,496      |
| - CoC                                   | -663         | -598       |
| - ANW                                   | 459          | 446        |
| <b>CoC</b>                              | <b>-663</b>  | -598       |
| - Tax and investment expense CoC        | -47          | -37        |
| - CoC for policyholder participation    | -275         | -248       |
| - Frictional CoC                        | -341         | -313       |
| <b>ANW</b>                              | <b>459</b>   | 446        |
| - Required capital                      | 475          | 470        |
| - Free surplus                          | -16          | -24        |
| <b>Financial options and guarantees</b> |              |            |
| - European EV before FOG                | 1,573        | 1,344      |
| - Value of FOG                          | 0            | -2         |
| - European Embedded Value               | 1,573        | 1,344      |

The present value of in-force business (PVIF) increased by 18.8%, while cost of holding capital (CoC) grew only by 10.9% and adjusted net worth (ANW) was almost stable. The time value of financial options and guarantees was set to zero to reflect the economics of the German health business (see also Section 3.5.1).

The change in embedded value in 2007 is shown in the following table:

| All figures in €m                     | EV           | PVIF         | CoC         | ANW        |
|---------------------------------------|--------------|--------------|-------------|------------|
| <b>Opening embedded value</b>         | <b>1,344</b> | <b>1,496</b> | <b>-598</b> | <b>446</b> |
| Embedded value earnings               | 310          | 281          | -65         | 94         |
| Currency movements                    | 0            | 0            | 0           | 0          |
| Value of acquired/(divested) business | 0            | 0            | 0           | 0          |
| Capital movements                     | -81          |              |             | -81        |
| <b>Closing embedded value</b>         | <b>1,573</b> | <b>1,777</b> | <b>-663</b> | <b>459</b> |

The breakdown of the embedded value earnings in 2007 is shown in the following table:

|  |           | EV         | PVIF       | CoC        | ANW       |
|--|-----------|------------|------------|------------|-----------|
| Expected return                          | €m        | 52         | 37         | 12         | 3         |
| Expected transfer from PVIF to ANW       | €m        | 0          | -49        | 0          | 49        |
| Experience variances                     | €m        | 2          | 37         | -35        | 0         |
| Operating assumption changes             | €m        | 66         | 48         | 9          | 9         |
| Value added by new business              | €m        | 30         | 43         | -14        | 1         |
| <b>Operating embedded value earnings</b> | <b>€m</b> | <b>150</b> | <b>116</b> | <b>-28</b> | <b>62</b> |
| - as % of opening embedded value         | %         | 11.2       |            |            |           |
| Tax variances/assumption changes         | €m        | 45         | 52         | -6         | -1        |
| Economic variances                       | €m        | 115        | 113        | -31        | 33        |
| <b>Total embedded value earnings</b>     | <b>€m</b> | <b>310</b> | <b>281</b> | <b>-65</b> | <b>94</b> |
| - as % of opening embedded value         | %         | 23.1       |            |            |           |

More sophisticated modelling and expense reductions lead to positive operating assumption changes of €66m. Driven by higher profitability, the value of new business increased by 36% to €30m. Also in German primary medical business, the German tax reform had a considerable impact on earnings albeit to a lower degree than in German primary life business. Assisted by higher interest rates and good equity performance, total embedded value earnings reached €310m or 23.1% of the opening embedded value.

The same effects that led to strong total earnings increased the new business margin by one third to 1.2%, as shown in the following table:

| <b>New business</b>                            |    | 2007  | 2006  |
|--|----|-------|-------|
| Value added by new business (VANB)             | €m | 30    | 22    |
| Present value of new business premiums (PVNBP) | €m | 2,477 | 2,535 |
| Annual premium equivalent (APE)                | €m | 151   | 192   |
| Opening embedded value (EV)                    | €m | 1,344 | 1,131 |
| New business margin (VANB/PVNBP)               | %  | 1.2   | 0.9   |
| VANB/APE                                       | %  | 19.9  | 11.5  |
| VANB/EV  | %  | 2.2   | 1.9   |

The German health reform ("Gesundheitsreform") allows customers to cancel their health policy in the first half of 2009, with a partial transfer of ageing provisions to another provider; normally ageing provisions are forfeited in case of lapse. The transfer of the policies will then take place on 1 January 2010. Because implementation guidelines of this reform are not final yet, the embedded value of our German primary medical insurance business does not take into account possible effects of the German health reform. Estimates indicate a decrease in embedded value of no more than 5% from transfers out, but this might be compensated by incoming transfers from other providers. Implicitly, we account for this uncertainty by using a frictional cost parameter of 100bp compared to 50bp for German life business (see Section 3.6).





### **3 Embedded value methodology**

#### **3.1 General remarks**

The embedded value methodology adopted is in accordance with the European Embedded Value Principles as published by the CFO Forum in May 2004. We applied the market-consistent methodology as described in Sections 3.5 and 3.12, which leads in particular to a market-consistent assessment of the time value of financial options and guarantees.

#### **3.2 In-force and new business**

Reinsurance new business comprises:

- New individual cessions on either new or existing treaties
- New group schemes on either new or existing treaties
- Net increments to existing group schemes
- New and renewed annually renewable treaties

For primary insurance, new business is defined as business 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. For German primary life business, new business includes the current year's increments on existing policies.

The definition of in-force business is consistent with the definition of new business.

#### **3.3 Look-through principle**

The assets related to covered business are mainly managed by the Munich Re Group's asset management units. The costs and profits from managing these assets are included in the embedded value on a look-through basis.

Costs of other service companies, such as administration and IT, are included in the embedded value on a look-through basis.

Costs of holding companies related to covered business have been allowed for in the embedded value calculations.

#### **3.4 Adjusted net worth**

The adjusted net worth (ANW) is defined as follows:

- For pure life reinsurance entities: the local regulatory net worth adjusted to reflect the market value of assets
- For composite reinsurance entities: the allocated required capital
- For primary insurance entities: the local regulatory net worth

In accordance with the European Embedded Value look-through principle, differences between IFRS and statutory pension liabilities are included in the EEV as an adjustment to net assets.



### 3.4.1 Required capital

The required capital (RC) is defined as follows:

- For reinsurance entities, RC is derived from internal risk models and additional regulatory restrictions.
- For German primary insurers, RC is equal to statutory net worth.
- For international primary insurers, RC is equal to 100% of the EU minimum. This simplified assumption has little impact on the Munich Re Group's EEV.

### 3.4.2 Free surplus

The free surplus (FS) is defined as the difference between the adjusted net worth and the required capital.

## 3.5 Present value of in-force business

A bottom-up approach to allow for risk is adopted for the calculation of the present value of in-force business. The economic assumptions and the discount rates used are calibrated applying a market-consistent methodology to allow for financial risk. In principle, each cash flow is valued according to its inherent financial risk.

For business without significant financial options and guarantees, the certainty-equivalent technique is used. Under this valuation approach, the individual cash flows are adjusted to remove the effects of financial risks. The resulting stream of risk-adjusted profits is then discounted at the risk-free rate.

For business with significant financial options and guarantees, a stochastic model using risk-neutral scenarios is applied to determine the present value of in-force business, and the time value of financial options and guarantees. The stochastic models allow for interaction of assets and liabilities and include expected management behaviour, e.g. regarding the investment strategy, the management of unrealised capital gains, and the determination of bonus rates for participating business. In addition, dynamic policyholder behaviour with respect to lapses and surrenders has been allowed for.

In some territories where reinsurance business is written, only limited policy data is available. In such cases, projections are made on a portfolio basis to reflect expected profitability ratios and all other relevant information.

For German primary life business, it is assumed that in case of financial distress approval from the regulator is granted to cover policyholder guarantees by the free RfB and the Terminal Bonus Fund.

For German primary medical business, the development of healthcare costs are based on general inflation assumptions adjusted for higher medical inflation in some parts of the business. Premium rates are assumed to increase in line with these developments.

Stochastic models are used for all primary life and medical insurance business. The stochastic model is run using 1,000 scenarios based on the econometric model described in Section 3.12.



### 3.5.1 Time value of financial options and guarantees

The financial options and guarantees (FOG) valued in the EEV comprise all material financial options and guarantees embedded in the covered business. A key feature of FOG is that they can create asymmetric returns for shareholders.

It is predominantly primary life business that is exposed to FOG. The following FOG are of particular relevance:

- Policyholder options, such as full or partial surrender, premium discontinuance, and annuitisation, combined with policyholder guarantees, such as interest rate guarantees, guaranteed surrender values or guaranteed annuity rates
- Options for companies, such as determination of bonus policy for participating life business

As detailed analyses show, German primary medical business is not exposed to financial options and guarantees since policyholder options are counterbalanced by options of the company. The main reasons are:

- Technical interest rates are not guaranteed for the whole contract term, but can be changed through a premium adjustment process. In the event of an interest-rate reduction, this leads to higher premium rates for the policyholder.
- If future investment returns are expected to be below the guaranteed interest rate, the German Federal Financial Supervisory Authority (BaFin) demands in accordance with the "Aktuarielle Unternehmenszins-Verfahren (AUZ-Verfahren)" a reduction in the interest-rate guarantee which corresponds to premium rate increases.
- In the absence of any surrender values, policyholder options are more limited. Premium increases have been reduced depending on inflation rates to reflect potential policyholder behaviour.

The life reinsurance portfolio of Munich Re has only limited exposure to FOG.

The time value of financial options and guarantees is determined as the difference between the average present value over all stochastic scenarios and the present value for the certainty equivalent scenario as described above.

### 3.5.2 Participating business

Participating life business, predominantly German, Belgian and Italian primary business, is generally characterised by the following key features:

- A minimum interest rate or a minimum level of bonus is guaranteed to the policyholder. Hence, whenever the investment return on the allocated assets does not exceed the necessary minimum and other means of funding the guarantees are depleted, the shareholder will bear the cost of maintaining the guarantees.
- Generally, bonuses and crediting rates exceed minimum guaranteed levels. In this case, the amount credited will be based on profit-sharing rules which involve a degree of management discretion.

The participating features are usually a combination of contractual or legal constraints, and management discretion based on competitive pressure or market practice. The participating business has been modelled to reflect both contractual and regulatory constraints as well as internal management rules. Projected surrender rates depend dynamically on the difference between the risk-free rate and the credited rate.

For participating German primary medical business, minimum profit-sharing rules are set according to current legal requirements. Management discretion is relevant for the use of free policyholder means in order to reduce future premium increases necessary to cover the



assumed development of healthcare costs. Further, management decisions on how to proceed with changes of technical interest rates are taken into account.

Given the above, it is essential that the stochastic framework allows for management actions in the following areas:

- Determination of bonus policy for participating life business
- Timing of realisation of unrealised capital gains
- Dynamic asset allocation, in particular management of the equity backing ratio
- Dynamic adjustment of technical interest rates for German medical business

In addition, surrender rates dependent on the capital markets have been allowed for.

The shareholder share of unrealised capital gains at the end of the projection period is included in the present value of future profits.

### 3.6 Cost of holding capital

The cost of holding capital consists of the following components which are deducted from the embedded value:

- Cost of double taxation on the required capital (Tax CoC)
- Cost of asset management related to the assets covering required capital (Investment expense CoC)
- Cost of profit sharing of investment income on shareholder funds for German primary life and medical business (CoC for policyholder participation)
- Frictional cost on the embedded value less free surplus to allow for non-financial risks (Frictional CoC)

The frictional cost represents an allowance for non-financial risks not reflected in the market-consistent valuation of the PVIF. The frictional cost parameter is a 100bps spread on the discount rate for all businesses except primary life business in Germany, for which the spread is 50bps. The major portion of risk-based capital for primary life business in Germany is held for adverse capital market risks which are explicitly modelled in the EEV. Thus it is appropriate to reduce the spread which should mainly account for non-modelled non-financial risks and modelling error.

For hedgeable financial risks, it is not necessary to add an allowance for frictional costs where a market-consistent approach has been used. This is because the cost of hedging, as given by the market value of those instruments that the insurer would need to buy in order to fully hedge its position, already includes expected and unexpected loss costs, transaction fees, etc.

### 3.7 Change in embedded value

The change in embedded value from one valuation date to the next is comprised of the following elements:

- Embedded value earnings
- Currency movements
- Value of acquired/divested business
- Capital movements

The embedded value earnings are explained in more detail in the following section.

The currency movements represent the impact of changes in currency exchange rates on the embedded value. The embedded value is reported in euros.



The value of acquired/divested business represents the value of business acquired or divested during the reporting year. In this position, the impact of changes in participation rates at Munich Re Group's subsidiaries is included.

The capital movements are calculated as the amount of capital contributed to covered business less the amount of capital released from covered business during the reporting year.

### **3.8 Embedded value earnings**

The embedded value earnings can be split into the following components:

- Expected return on embedded value
- Experience variances
- Operating assumption changes
- Value added by new business
- Tax variances and tax assumption changes
- Economic variances

The sum of the first four components of embedded value earnings are referred to as operating embedded value earnings.

The return expectation in a market-consistent framework is based on risk-free interest rates. Therefore, the expected return on embedded value is calculated assuming a risk-free roll-forward of the embedded value at the beginning of the year plus the unwind of the frictional costs included in the embedded value.

The experience variances reflect the difference between the actual operating experience in the reporting year and the operating result assumed in the previous embedded value calculation.

The operating assumption changes reflect the aggregate impact on embedded value caused by changes in the operating assumptions within the reporting year. All operating assumptions are subject to an active review at each valuation date.

The value added by new business is explained in detail in the following section.

The tax variances and tax assumption changes reflect the aggregate impact on embedded value due to changes in tax legislation during the reporting year. All tax assumptions are subject to an active review at each valuation date.

The economic variances summarise the aggregate impact on embedded value caused by changes in the capital market during the reporting year. This includes in particular the impact of changes in interest rates on the value of both assets and liabilities.

### **3.9 Value added by new business**

Value added by new business (VANB) is the present value as at the end of the reporting year of the future regulatory after-tax profits in respect of new business written in the reporting year plus the after-tax regulatory profits in respect of this business during the reporting year, reduced by the value of financial options and guarantees and the CoC associated with new business.

The value of new business written in the reporting year is calculated consistently with the methodology outlined in Section 3.5.



For reinsurance business, the value of new business can be calculated on a stand-alone basis, as there is little or no interactions between in-force and new business. For primary insurance business, however, a marginal approach was used to calculate the time value of FOG for new business as the difference between an in-force calculation with and without new business in order to allow for the various effects of new business on the in-force business.

### **3.10 Operating assumptions**

Operating assumptions describe expected future operating experience. They refer mainly to mortality, morbidity, persistency, expenses and in primary insurance business to policyholder participation.

The operating assumptions are based on best estimate assumptions derived from company experience and/or market experience. They are in line with management expectations and reflect recent operating experience of the entities concerned.

All costs related to covered business are split into acquisition, maintenance and investment-related expenses and are fully allowed for in the embedded value. There are no expenses excluded as development costs.

Future productivity gains are not anticipated in the embedded value calculations.

### **3.11 Tax assumptions**

Taxation assumptions included in the embedded value models reflect local taxation rates and bases, including future changes that are at an advanced stage of legislative implementation. Tax modelling also includes the valuation of existing tax losses carried forward. No withholding taxes on dividends from subsidiaries have been allowed for.

### **3.12 Economic assumptions**

The economic assumptions are derived following a market-consistent valuation approach. A large number of asset classes and economic assumptions are modelled stochastically. This includes equities, bond yields, property, and inflation.

The construction of risk-neutral economic scenarios requires careful calibration to the underlying market parameters to ensure that the valuation replicates the market prices of assets. The key areas for calibration are initial yield curves, implied market-consistent volatilities of all relevant asset classes, and correlations between asset classes. The interest rate model used considers both parallel shifts and twists to the yield curve.

The economic scenarios have been calibrated to the market conditions at the valuation dates, i.e. risk-free rates, swaption prices and equity option prices. Swap rates are used as an approximation of the risk-free yield curve. The parameters used for year-end 2006 and year-end 2007 are shown in Section 6.4.

The economic scenarios are constructed using a proprietary economic scenario generator developed by Barrie & Hibbert. Barrie & Hibbert is a financial risk consultancy based in Edinburgh. The Barrie & Hibbert economic scenario generator is widely used in the insurance industry.



### **3.13 Consolidation**

The embedded value results are presented at a consolidated Munich Re Group level. The results are presented net of minority interests and policyholders' interests.

Intra-Group reinsurance ceded from primary insurers to reinsurers is shown in the reinsurance segment.

### **3.14 Valuation of pension fund liabilities**

Pension fund deficits are allowed for in the EV consistently with the valuation under IFRS. Any pension fund deficits are reflected by adjusting the ANW.

### **3.15 Foreign currency translation**

The embedded value reporting currency is Euro.

Calculations are undertaken in the original currency of the covered business and converted to euros for consolidation purposes.

In converting original currency embedded values and their components into euros, the exchange rates as at the relevant valuation dates are used. Changes in the embedded value due to changes in foreign exchange rates are disclosed as currency movements, which are excluded from embedded value earnings.

In converting original currency embedded value earnings into euros, average-of-year exchange rates are used.



#### 4 IFRS reconciliation

The embedded value of covered business as at 31 December 2007 exceeds the corresponding IFRS equity (excluding goodwill) by €5,450m. As the embedded value does not include the value of future new business, goodwill is excluded from the IFRS equity for this comparison.

##### 4.1 Reinsurance

| All figures in €m                          | 31.12.2007   | 31.12.2006 |
|--|--------------|------------|
| <b>IFRS equity</b>                         | <b>4,096</b> | 3,875      |
| - Thereof goodwill                         | 0            | 0          |
| <b>IFRS equity excluding goodwill</b>      | <b>4,096</b> | 3,875      |
| <b>Embedded value</b>                      | <b>6,662</b> | 5,962      |
| <b>Value not recognised in IFRS equity</b> | <b>2,566</b> | 2,087      |

The value not recognised in IFRS equity increased in 2007 by €479m.

##### 4.2 Primary insurance

| All figures in €m                          | 31.12.2007   | 31.12.2006 |
|--|--------------|------------|
| <b>IFRS equity</b>                         | <b>3,687</b> | 3,743      |
| - Thereof goodwill                         | 1,165        | 1,165      |
| <b>IFRS equity excluding goodwill</b>      | <b>2,522</b> | 2,578      |
| <b>Embedded value</b>                      | <b>5,406</b> | 4,154      |
| <b>Value not recognised in IFRS equity</b> | <b>2,884</b> | 1,576      |

The value not recognised in IFRS equity increased in 2007 by €1,308m. This increase was mainly driven by the increase in embedded value in 2007.



## 5 Sensitivities

Sensitivities of embedded value as at 31 December 2007 and 2007 value added by new business are presented in this section. The presentation follows the Additional Guidance on European Embedded Value Disclosures as published by the CFO Forum in October 2005.

### 5.1 Reinsurance

Sensitivities for embedded value as at 31 December 2007:

| All figures in €m                         | EV           | Difference | Change |
|---|--------------|------------|--------|
| Base case                                 | <b>6,662</b> |            |        |
| Doubled frictional cost rate              | <b>6,099</b> | -563       | -8%    |
| No frictional costs                       | <b>7,351</b> | 689        | 10%    |
| Mortality/morbidity (life business) -5%   | <b>7,500</b> | 838        | 13%    |
| Mortality (life business) -5%             | <b>7,376</b> | 714        | 11%    |
| Morbidity (life business) -5%             | <b>6,786</b> | 124        | 2%     |
| Mortality (annuity business) -5%          | <b>6,635</b> | -27        | 0%     |
| Mortality (life business) +5%             | <b>5,954</b> | -708       | -11%   |
| No mortality improvements (life business) | <b>5,179</b> | -1,483     | -22%   |
| Lapse rates -10%                          | <b>6,805</b> | 143        | 2%     |
| Maintenance expenses -10%                 | <b>6,715</b> | 53         | 1%     |
| Interest rates -100bp                     | <b>7,177</b> | 515        | 8%     |
| Interest rates +100bp                     | <b>6,219</b> | -443       | -7%    |
| Equity/property values -10%               | <b>6,659</b> | -3         | 0%     |
| Minimum solvency capital                  | <b>6,843</b> | 181        | 3%     |

Sensitivities for 2007 value of new business:

| All figures in €m                         | VANB       | Difference | Change |
|---|------------|------------|--------|
| Base case                                 | <b>277</b> |            |        |
| Doubled frictional cost rate              | <b>214</b> | -63        | -23%   |
| No frictional costs                       | <b>355</b> | 78         | 28%    |
| Mortality/morbidity (life business) -5%   | <b>371</b> | 94         | 34%    |
| Mortality (life business) -5%             | <b>355</b> | 78         | 28%    |
| Morbidity (life business) -5%             | <b>293</b> | 16         | 6%     |
| Mortality (annuity business) -5%          | <b>277</b> | 0          | 0%     |
| Mortality (life business) +5%             | <b>199</b> | -78        | -28%   |
| No mortality improvements (life business) | <b>98</b>  | -179       | -65%   |
| Lapse rates -10%                          | <b>296</b> | 19         | 7%     |
| Maintenance expenses -10%                 | <b>284</b> | 7          | 3%     |
| Interest rates -100bp                     | <b>292</b> | 15         | 5%     |
| Interest rates +100bp                     | <b>264</b> | -13        | -5%    |
| Equity/property values -10%               | <b>277</b> | 0          | 0%     |

## 5.2 Primary insurance

Sensitivities for embedded value as at 31 December 2007:

| All figures in €m                       | <b>EV</b>    | Difference | Change |
|---|--------------|------------|--------|
| Base case                               | <b>5,406</b> |            |        |
| Doubled frictional cost rate            | <b>4,935</b> | -471       | -9%    |
| No frictional costs                     | <b>5,998</b> | 592        | 11%    |
| Mortality/morbidity (life business) -5% | <b>5,468</b> | 62         | 1%     |
| Mortality (annuity business) -5%        | <b>5,376</b> | -30        | -1%    |
| Lapse rates -10%                        | <b>5,495</b> | 89         | 2%     |
| Maintenance expenses -10%               | <b>5,496</b> | 90         | 2%     |
| Interest rates -100bp                   | <b>4,511</b> | -895       | -17%   |
| Interest rates +100bp                   | <b>6,152</b> | 746        | 14%    |
| Equity/property values -10%             | <b>5,214</b> | -192       | -4%    |
| Minimum solvency capital                | <b>6,013</b> | 607        | 11%    |

Sensitivities for 2007 value of new business:

| All figures in €m                       | <b>VANB</b> | Difference | Change |
|---|-------------|------------|--------|
| Base case                               | <b>164</b>  |            |        |
| Doubled frictional cost rate            | <b>145</b>  | -19        | -12%   |
| No frictional costs                     | <b>190</b>  | 26         | 16%    |
| Mortality/morbidity (life business) -5% | <b>173</b>  | 9          | 5%     |
| Mortality (annuity business) -5%        | <b>160</b>  | -4         | -2%    |
| Lapse rates -10%                        | <b>186</b>  | 22         | 13%    |
| Maintenance expenses -10%               | <b>180</b>  | 16         | 10%    |
| Interest rates -100bp                   | <b>150</b>  | -14        | -9%    |
| Interest rates +100bp                   | <b>172</b>  | 8          | 5%     |
| Equity/property values -10%             | <b>162</b>  | -2         | -1%    |



## 6 Summary of assumptions

### 6.1 Shareholders' share

| %                 | Shareholders' share Primary insurance |            |
|-------------------|---------------------------------------|------------|
|                   | 31.12.2007                            | 31.12.2006 |
| Germany - Life    | 14*                                   | 14*        |
| Germany - Medical | 15*                                   | 15*        |
| Italy             | 18-20**                               | 18-20**    |

\* On average over the total projection time.

\*\* As a % of investment return, before the effect of guarantees.

### 6.2 Tax rates

| %       | Tax rate*   |            |                   |            |
|---------|-------------|------------|-------------------|------------|
|         | Reinsurance |            | Primary insurance |            |
|         | 31.12.2007  | 31.12.2006 | 31.12.2007        | 31.12.2006 |
| Germany | 33          | 40         | 32                | 40         |
| Italy   | 32          | 38         | 33                | 38         |
| USA     | 35          | 35         | na                | na         |
| Canada  | 28          | 32         | na                | na         |
| UK      | 28          | 30         | na                | na         |

\* Long term rates

### 6.3 Currency exchange rates

| €1 = ... foreign currency | Currency exchange rates |                      |            |
|---------------------------|-------------------------|----------------------|------------|
|                           | 31.12.2007              | Average of year 2007 | 31.12.2006 |
| USD                       | 1.46205                 | 1.37070              | 1.31865    |
| CAD                       | 1.44300                 | 1.46825              | 1.53450    |
| GBP                       | 0.73445                 | 0.68465              | 0.67375    |

## 6.4 Economic assumptions

### 6.4.1 Risk-free interest rates

The economic scenarios have been calibrated to market conditions at the valuation date. Swap rates have been used as an approximation of the risk-free yield curves.

The table below shows the swap yield curves at the relevant valuation date for the major currencies.

| Swap yield curves | 31 December 2007 |       |       |       | 31 December 2006 |       |       |       |
|-------------------|------------------|-------|-------|-------|------------------|-------|-------|-------|
|                   | EUR              | USD   | GBP   | CAD   | EUR              | USD   | GBP   | CAD   |
| 1 year            | 4.75%            | 4.22% | 5.74% | 4.89% | 4.08%            | 5.33% | 5.58% | 4.32% |
| 2 years           | 4.55%            | 3.80% | 5.22% | 4.17% | 4.12%            | 5.17% | 5.50% | 4.18% |
| 3 years           | 4.53%            | 3.90% | 5.14% | 4.29% | 4.13%            | 5.10% | 5.49% | 4.17% |
| 4 years           | 4.53%            | 4.04% | 5.12% | 4.39% | 4.13%            | 5.09% | 5.44% | 4.20% |
| 5 years           | 4.56%            | 4.18% | 5.09% | 4.45% | 4.13%            | 5.10% | 5.38% | 4.24% |
| 6 years           | 4.58%            | 4.31% | 5.08% | 4.48% | 4.13%            | 5.12% | 5.32% | 4.28% |
| 7 years           | 4.61%            | 4.42% | 5.06% | 4.51% | 4.15%            | 5.13% | 5.27% | 4.33% |
| 8 years           | 4.65%            | 4.52% | 5.04% | 4.55% | 4.16%            | 5.15% | 5.22% | 4.38% |
| 9 years           | 4.68%            | 4.59% | 5.03% | 4.58% | 4.18%            | 5.17% | 5.16% | 4.42% |
| 10 years          | 4.72%            | 4.67% | 5.01% | 4.61% | 4.20%            | 5.19% | 5.11% | 4.47% |
| 15 years          | 4.86%            | 4.89% | 4.92% | 4.74% | 4.27%            | 5.27% | 4.91% | 4.63% |
| 20 years          | 4.91%            | 4.98% | 4.83% | 4.78% | 4.31%            | 5.31% | 4.75% | 4.69% |
| 25 years          | 4.91%            | 5.02% | 4.74% | 4.76% | 4.31%            | 5.32% | 4.59% | 4.68% |
| 30 years          | 4.89%            | 5.03% | 4.67% | 4.73% | 4.29%            | 5.32% | 4.51% | 4.67% |

The one-year yield is a money market rate. Inter- and extrapolation of the yield curve is done using the Nelson-Siegel approach.

### 6.4.2 Volatilities

The interest rate scenarios have been generated so that they replicate at-the-money swaption prices with a swap tenor of 20 years. The implied volatilities for these swaptions are outlined in the following table:

| Target swaption implied volatilities* | 31 December 2007 |        | 31 December 2006 |        |
|---------------------------------------|------------------|--------|------------------|--------|
|                                       | €                | USD    | €                | USD    |
| 1 year                                | 11.80%           | 19.80% | 13.10%           | 12.70% |
| 2 years                               | 11.50%           | 18.20% | 13.20%           | 13.30% |
| 3 years                               | 11.40%           | 17.40% | 13.20%           | 13.50% |
| 4 years                               | 11.20%           | 16.60% | 13.10%           | 13.50% |
| 5 years                               | 11.10%           | 15.80% | 12.90%           | 13.30% |
| 10 years                              | 10.50%           | 13.30% | 11.80%           | 11.30% |
| 15 years                              | 10.20%           | 12.60% | 11.15%           | 10.60% |
| 20 years                              | 9.90%            | 12.40% | 10.80%           | 10.60% |
| 30 years                              | 9.50%            | 11.70% | 10.40%           | 10.40% |

\* For at-the-money swaptions with a 20-year tenor.



The equity models have been calibrated to prices of at-the-money ten-year European equity index options observed in the OTC market. The implied volatilities of these option prices are shown in the table below.

| Target equity implied volatilities | 31 December 2007 |         | 31 December 2006 |         |
|------------------------------------|------------------|---------|------------------|---------|
|                                    | EURO STOXX       | S&P 500 | EURO STOXX       | S&P 500 |
| Equity index                       | 27.3%            | 25.9%   | 22.5%            | 20.0%   |

Given the long-term nature of the financial risks embedded in life insurance contracts, the implied volatilities of swaptions and equity options of the longest available maturities have been taken as target volatilities.

#### 6.4.3 Correlation coefficients

Correlation assumptions are estimated from historic market data. The relevant correlation assumptions between the change of One-year bond yields and equity returns are displayed in the table below.

| €                   | One-year bond yield | EURO STOXX |
|---------------------|---------------------|------------|
| One-year bond yield | 1.000               | -0.145     |
| EURO STOXX          |                     | 1.000      |

  

| USD                 | One-year bond yield | S&P 500 |
|---------------------|---------------------|---------|
| One-year bond yield | 1.000               | -0.153  |
| S&P 500             |                     | 1.000   |



## 7 External opinion

The scope of Tillinghast's review covered the results of Munich Re's European Embedded Value calculations as at 31 December 2007, the 2007 embedded value earnings and the 2007 value added by new business. It included a review of the methodology and assumptions used as described in Sections 3 and 6 and of the compliance with the European Embedded Value Principles. The review covered also the sensitivities shown in Section 5.

Tillinghast has concluded that the methodology and assumptions used comply with the European Embedded Value Principles and Guidance as published by the CFO Forum on 5 May 2004 and 31 October 2005, and in particular that:

- the methodology makes allowance for the aggregate risks in the covered business through the methodology set out in Section 3, in particular by the use of
  - a level of required capital derived from internal risk models and additional regulatory restrictions,
  - a market-consistent assessment of the time value of financial options and guarantees, and
  - a deduction for cost of capital based on the cost of double taxation, investment expenses and policyholder participation on the required capital plus frictional costs on the embedded value less free surplus;
- the operating assumptions have been set with appropriate regard to past, current and expected future experience;
- the economic assumptions used are internally consistent and consistent with observable market data; and
- for the primary participating business, the assumed bonus distribution, asset allocation, allocation of profit between policyholders and shareholders, and other management actions, are consistent with the other assumptions used in the projections, and with local market practice.

Tillinghast has also performed limited high-level checks on the results of the calculations and has confirmed that any issues discovered do not have a material impact on the disclosed embedded values and new business values. Tillinghast has not, however, performed detailed checks on all the models and processes involved. Tillinghast notes that for the German primary life business, the results are dependent upon the realisation of substantially increased shareholder payout ratios compared to past experience reflecting current management planning.

In arriving at these conclusions, Tillinghast relied on data and information provided by the Munich Re Group. This opinion is made solely to Munich Re in accordance with the terms of Tillinghast's engagement letter. To the fullest extent permitted by applicable law, Tillinghast does not accept or assume any responsibility, duty of care or liability to anyone other than Munich Re for or in connection with its review work, the opinions it has formed, or for any statement set forth in this opinion.



## 8 Glossary

|   |  |
|---|--|
| <b>Acquired (divested) business</b>       | Business acquired (divested) through acquisition (sale) of stakes in insurance or reinsurance companies  |
| <b>Adjusted net worth (ANW)</b>           | Also known as shareholders' net worth or adjusted net asset value (ANAV)   |
| <b>Best estimate assumption</b>           | An assumption that represents the expected outcome from the range of possible outcomes of future experience  |
| <b>Capital movements</b>                  | Dividends and capital contributions  |
| <b>CoC</b>                                | See Cost of holding capital  |
| <b>CoC for policyholder participation</b> | Cost of profit sharing of investment income on shareholder funds for German primary business   |
| <b>Cost of holding capital (CoC)</b>      | Represents the cost of holding capital and includes an explicit allowance for non-financial risks  |
| <b>Covered business</b>                   | The business for which the embedded value is reported  |
| <b>Currency movements</b>                 | Aggregate impact of currency movements on the embedded value   |
| <b>Economic assumptions</b>               | These include risk-free interest rates, discount rates, inflation rates and assumptions on the volatility of economic parameters   |
| <b>Economic variance</b>                  | Aggregate impact of changes in capital market parameters on the embedded value   |
| <b>Embedded value</b>                     | Present value of shareholders' interests in the earnings distributable from assets allocated to covered business after sufficient allowance for the aggregate risks in covered business  |
| <b>Embedded value components</b>          | The embedded value consists of the following three components: <ul style="list-style-type: none"><li>• Present value of future shareholder cash flows from in-force covered business (PVIF)</li><li>• Cost of holding capital (CoC)</li><li>• Adjusted net worth (ANW)</li></ul> |



|   |   |
|---|---|
| <b>Embedded value earnings</b>                | <p>Operating embedded value earnings are the total of the following components:</p> <ul style="list-style-type: none"><li>• Expected return</li><li>• Experience variances</li><li>• Operating assumption changes</li><li>• Value added by new business</li></ul> <p>Total embedded value earnings are the sum of the following components:</p> <ul style="list-style-type: none"><li>• Operating embedded value earnings</li><li>• Tax variances and tax assumption changes</li><li>• Economic variances</li></ul> |
| <b>European Embedded Value Principles</b>     | <p>A set of principles for embedded value reporting developed by the CFO Forum. The CFO Forum is a high-level discussion group attended by the Chief Financial Officers of major European insurance companies. The Munich Re Group is a member of the CFO Forum.</p>  |
| <b>EV</b>                                     | <p>See Embedded value</p>   |
| <b>Expected return</b>                        | <p>The expected return on embedded value is calculated as the risk-free roll-forward of the embedded value at the beginning of the year plus the unwind of the frictional costs included in the embedded value</p>  |
| <b>Experience variances</b>                   | <p>The impact on embedded value of differences between the actual operating experience in the reporting year and the operating result assumed in the previous embedded value calculation</p>  |
| <b>Financial options and guarantees (FOG)</b> | <p>Options and guarantees whose value is impacted by the behaviour of financial variables</p>   |
| <b>Free surplus</b>                           | <p>Amount of capital allocated to the business in excess of the required capital</p>  |
| <b>Frictional CoC</b>                         | <p>Represents an allowance for non-financial risks</p>  |
| <b>Frictional cost rate</b>                   | <p>Annual cost rate applied to calculate the frictional cost of capital</p>   |
| <b>IFRS</b>                                   | <p>International Financial Reporting Standard</p>   |
| <b>Investment expense CoC</b>                 | <p>Present value of the investment expenses related to the assets covering required capital</p>   |
| <b>Look-through basis</b>                     | <p>A basis via which the impact of an item on the whole Munich Re Group is measured, rather than on a particular part</p>   |





|   |   |
|---|---|
| <b>Operating assumption changes</b>                   | Aggregate impact of changes in the operating assumptions on the embedded value  |
| <b>Operating assumptions</b>                          | Operating assumptions include: <ul style="list-style-type: none"><li>• Mortality</li><li>• Morbidity</li><li>• Persistency</li><li>• Expenses</li><li>• Policyholder participation in primary insurance</li></ul>       |
| <b>Operating embedded value earnings</b>              | See Embedded value earnings   |
| <b>Operating experience</b>                           | Experience from operating assumptions   |
| <b>Participating business</b>                         | Primary insurance business in which policyholders have the right to participate in the performance of a specified pool of assets or contracts   |
| <b>Present value</b>                                  | The value of a future cash flow at the valuation date, discounted at a discount rate applicable to that cash flow   |
| <b>Present value of in-force business (PVIF)</b>      | 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. |
| <b>Present value of new business premiums (PVNBP)</b> | Present value of future premiums from new business  |
| <b>Reporting currency</b>                             | The embedded value reporting currency is the euro.  |
| <b>Required capital</b>                               | The amount of surplus assets whose distribution to shareholders is restricted   |
| <b>RfB</b>  | The “Rückstellung für Beitragsrückerstattung (RfB)” is the provision for premium refunds in German primary insurance  |
| <b>Risk-free (interest) rates</b>                     | Prospective yields on securities considered to be free of default or credit risk  |
| <b>Statutory basis</b>                                | Valuation basis used for reporting financial statements to local regulators   |



|   |   |
|---|---|
| <b>Tax CoC</b>                                  | Cost of investment returns on assets covering required capital being taxed in the insurer's hands   |
| <b>Tax variances and tax assumption changes</b> | Aggregate impact of changes in the tax legislation on the embedded value  |
| <b>Time value</b>                               | The time value of an option represents the possibility that the option may increase in value due to volatility in the capital markets.  |
| <b>Value added by new business (VANB)</b>       | The present value of profits from new business written in the reporting year, reduced by the value of financial options and guarantees and the cost of capital associated with new business |