



**MUNICH RE GROUP**

## **EUROPEAN EMBEDDED VALUE 2005**

**SUPPLEMENTARY INFORMATION REGARDING LIFE AND HEALTH  
EMBEDDED VALUE RESULTS 2005**

9 May 2006\*

\* This document was amended at 07 June 2006 on page 23. See footnotes on page 23.



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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) on its website [www.cfoforum.nl](http://www.cfoforum.nl). The Munich Re Group is adopting the EEVP from the reporting year 2005 on.

This document includes the following:

- A reconciliation of the traditional embedded value to the European Embedded Value (EEV) as at 31 December 2004
- The European Embedded Value as at 31 December 2005
- An analysis of the value added (embedded value earnings) during 2005
- A detailed description of the embedded value methodology applied
- A reconciliation of the embedded value with the IFRS equity
- An analysis of the sensitivities of the 2005 embedded value and 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 health 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 the 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.
South Africa	Munich Reinsurance Company of Africa Ltd
Switzerland	New Reinsurance Company
U.S.A.	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

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

The primary insurance companies writing the covered life and health 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
	Hamburg-Mannheimer Versicherungs-Aktiengesellschaft
	KarstadtQuelle Lebensversicherung AG
	VICTORIA Lebensversicherung Aktiengesellschaft
	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

The covered business includes more than 90% of the total primary life and health 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 the segment level takes into account the dilution of earnings through minority shareholders and policyholders, where applicable.

### 1.3 Definition of embedded value

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

The embedded value consists of the following components:

- Present value of future shareholder cash flows from in-force business (PVIF)
- Cost of holding required 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 comprises the cost of double taxation and investment expenses on the required capital, a 1% p.a. frictional cost, and the cost of capital due to the profit sharing of investment income on shareholder funds for German primary life and health 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 4.

#### **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 Restatement of the embedded value as at 31 December 2004

### 2.1 Traditional embedded value as at 31 December 2004

The embedded value as at 31 December 2004 based on the traditional embedded value methodology was reported on 9 May 2005. It is shown in the following table:

All figures in €m	Total*	Reinsurance	Primary insurance*
<b>Traditional EV as at 31.12.2004</b>	<b>6,898</b>	3,971	2,927
- VIF	<b>4,877</b>	2,511	2,366
- CoC	<b>-1,803</b>	-526	-1,277
- ANW	<b>3,824</b>	1,986	1,838

\* Including Karlsruher Lebensversicherung and Nieuwe Hollandse Lloyd Verzekeringsgroep.

To reflect Munich Re's sale of stakes in Karlsruher Lebensversicherung (KL) in Germany and Nieuwe Hollandse Lloyd Verzekeringsgroep (NHL) in the Netherlands in 2005, the embedded value of these businesses is excluded from the primary insurance embedded value figures on the traditional embedded value basis as shown in the following table:

All figures in €m	Primary insurance
<b>Traditional EV as at 31.12.2004 including KL and NHL</b>	<b>2,927</b>
Value of divested business of KL and NHL	-200
<b>Traditional EV as at 31.12.2004 excluding KL and NHL</b>	<b>2,727</b>

There is no effect on the reinsurance embedded value from these transactions.

The embedded value as at 31 December 2004 based on the traditional embedded value methodology excluding KL and NHL is shown in the following table:

All figures in €m	Total*	Reinsurance	Primary insurance*
<b>Traditional EV as at 31.12.2004</b>	<b>6,698</b>	3,971	2,727
- VIF	<b>4,735</b>	2,511	2,224
- CoC	<b>-1,695</b>	-526	-1,169
- ANW	<b>3,658</b>	1,986	1,672

\* Excluding Karlsruher Lebensversicherung and Nieuwe Hollandse Lloyd Verzekeringsgroep.

In the remainder of this document, the embedded value figures are presented excluding KL and NHL, unless otherwise stated.

### 2.2 Reconciliation of traditional embedded value and European Embedded Value as at 31 December 2004

The traditional embedded value and the European Embedded Value as at 31 December 2004 can be reconciled as follows:

All figures in €m	Total	Reinsurance	Primary insurance
<b>Traditional EV as at 31.12.2004</b>	<b>6,698</b>	3,971	2,727
Change of risk discount rates	1,753	962	791
Include frictional cost of capital	-852	-489	-363
Change of asset return assumptions	89	128	-39
Explicit valuation of financial options and guarantees (FOG)	-241	-16	-225
Other	59	-30	89
<b>European EV as at 31.12.2004</b>	<b>7,506</b>	4,526	2,980

The European Embedded Value for reinsurance business is 14% higher than the embedded value determined on a traditional embedded value basis. This effect is a consequence of the fact that the risk spreads implicitly included in the risk discount rates used in the traditional embedded value are higher than the frictional cost rate under the European Embedded Value methodology.

The European Embedded Value for primary insurance business is 9% higher than the embedded value determined on a traditional embedded value basis. This effect is a consequence of the fact that the risk spreads for FOG implicitly included in the risk discount rates used in the traditional embedded value lead to a prudent valuation of FOG in the traditional embedded value. The restatement also includes changes to the required capital for German primary business.

For reinsurance and primary insurance business in total, the European Embedded Value is 12% higher than the embedded value determined on a traditional basis.

### 2.3 European Embedded Value as at 31 December 2004

The embedded value as at 31 December 2004, restated according to the European Embedded Value methodology, is shown in the following table:

All figures in €m	Total	Reinsurance	Primary insurance
<b>European EV as at 31.12.2004</b>	<b>7,506</b>	4,526	2,980
- PVIF	5,922	3,262	2,660
- CoC	-2,028	-744	-1,284
- ANW	3,612	2,008	1,604
<b>CoC</b>	<b>-2,028</b>	-744	-1,284
- Tax and investment expense CoC	-364	-284	-80
- CoC for policyholder participation	-645	na	-645
- Other frictional CoC	-1,019	-460	-559
<b>ANW</b>	<b>3,612</b>	2,008	1,604
- Required capital	3,272	1,630	1,642
- Free surplus	340	378	-38
<b>Financial options and guarantees</b>			
- European EV before FOG	7,761	4,556	3,205
- Value of FOG	-255	-30	-225
- European EV	7,506	4,526	2,980



### 3 Embedded value results 2005

#### 3.1 Reinsurance

The most important European Embedded Value components for reinsurance business as at 31 December 2004 and 31 December 2005 are shown in the following table:

All figures in €m	31.12.2005	31.12.2004
<b>European Embedded Value</b>	<b>5,920</b>	4,526
- PVIF	<b>4,342</b>	3,262
- CoC	<b>-960</b>	-744
- ANW	<b>2,538</b>	2,008
<b>CoC</b>	<b>-960</b>	-744
- Tax and investment expense CoC	<b>-324</b>	-284
- Other frictional CoC	<b>-636</b>	-460
<b>ANW</b>	<b>2,538</b>	2,008
- Required capital	<b>1,889</b>	1,630
- Free surplus	<b>649</b>	378
<b>Financial options and guarantees</b>		
- European EV before FOG	<b>5,968</b>	4,556
- Value of FOG	<b>-48</b>	-30
- European EV	<b>5,920</b>	4,526

The embedded value shows a strong increase of 31% over the year 2005. Detailed explanations follow later in this section.

The total required capital as at 31 December 2005 of EUR 1,889m exceeds the capital required at the group level to cover all minimum local and group solvency requirements by EUR 607m.

The change in embedded value in 2005 is shown in the following table:

All figures in €m	EV	PVIF	CoC	ANW
<b>Opening embedded value</b>	<b>4,526</b>	<b>3,262</b>	<b>-744</b>	<b>2,008</b>
Embedded value earnings	<b>753</b>	628	-111	236
Currency movements	<b>573</b>	452	-105	226
Value of acquired / (divested) business	<b>0</b>	0	0	0
Capital movements	<b>68</b>			68
<b>Closing embedded value</b>	<b>5,920</b>	<b>4,342</b>	<b>-960</b>	<b>2,538</b>

The embedded value increase in 2005 was driven by very strong embedded value earnings (16.6% of opening embedded value) and positive currency movements (12.7% of opening embedded value). The currency movements are mainly due to the strengthening of the US and Canadian dollars versus the euro in 2005.

The breakdown of the 2005 embedded value earnings is shown in the following table:



		EV	PVIF	CoC	ANW
Expected return	€m	198	-166	36	328
Experience variances	€m	127	25	-9	111
Operating assumption changes	€m	-61	-2	13	-72
Value added by new business	€m	247	616	-134	-235
<b>Operating embedded value earnings</b>	€m	<b>511</b>	<b>473</b>	<b>-94</b>	<b>132</b>
- as % of embedded value	%	11.3			
Tax variances/assumption changes	€m	13	5	0	8
Investment variances	€m	64	-33	2	95
Economic assumption changes	€m	165	183	-19	1
<b>Total embedded value earnings</b>	€m	<b>753</b>	<b>628</b>	<b>-111</b>	<b>236</b>

The very strong 2005 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 EUR 445m or 9.8% of the opening embedded value, which is close to the upper end of the operating embedded value target of 8–10%. Including experience variances and operating assumption changes, the operating embedded value earnings of 11.3% exceed the target range.

The economic assumption changes include the positive impact of the reduction of discount rates in line with falling market interest rates, mainly from our Canadian business.

The favourable results from new and in-force business are reflected in the following key profitability ratios:

#### **New business**

Value added by new business (VANB)	€m	247
Present value of new business premiums (PVNBP)	€m	5,185
Annual premium equivalent (APE)	€m	625
Opening embedded value (EV)	€m	4,526
VANB / PVNBP	%	4.8
VANB / APE	%	39.5
VANB / EV	%	5.5

#### **Total business**

Operating embedded value earnings / Opening embedded value	%	11.3
Total embedded value earnings / Opening embedded value	%	16.6

The development of required capital in 2005 is shown in the following table:

All figures in €m

<b>Required capital as at 31 December 2004</b>	<b>1,630</b>
Change in required capital for in-force business	-173
Required capital for 2005 new business	261
Currency movements	171
<b>Required capital as at 31 December 2005</b>	<b>1,889</b>

The increase in required capital in 2005 is driven by two factors. Firstly, the required capital for new business (EUR 261m) is higher than the required capital released by the run-off of existing business (EUR 173m). Secondly, changes in foreign exchange rates increase the required capital in the reporting currency by EUR 171m.

Please note that these numbers differ from the standalone economic capital requirements disclosed in the Munich Re Group Analysts' conference 2006 presentation of 15 March 2006 for three main reasons. Unlike the required capital numbers used in this EEV disclosure, the stand-alone economic capital numbers include requirements for medical reinsurance business, do not include the allocation of Group diversification benefits and also make no allowance for regulatory restrictions.

### 3.2 Primary insurance

The most important European Embedded Value components for primary insurance business as at 31 December 2004 and 31 December 2005 are shown in the following table:

All figures in €m	31.12.2005	31.12.2004
<b>European Embedded Value</b>	<b>2,865</b>	2,980
- PVIF	<b>2,504</b>	2,660
- CoC	<b>-1,253</b>	-1,284
- ANW	<b>1,614</b>	1,604
<b>CoC</b>	<b>-1,253</b>	-1,284
- Tax and investment expense CoC	<b>-70</b>	-80
- CoC for policyholder participation	<b>-596</b>	-645
- Other frictional CoC	<b>-587</b>	-559
<b>ANW</b>	<b>1,614</b>	1,604
- Required capital	<b>1,673</b>	1,642
- Free surplus	<b>-59</b>	-38
<b>Financial options and guarantees</b>		
- European EV before FOG	<b>3,201</b>	3,205
- Value of FOG	<b>-336</b>	-225
- European EV	<b>2,865</b>	2,980

The embedded value shows a decrease of 4% over 2005. Detailed explanations follow later in this section.

The total required capital as at 31 December 2005 of EUR 1,673m exceeds the capital required to cover all minimum solvency requirements by EUR 1,171m.

The change in embedded value in 2005 is shown in the following table:



All figures in €m	EV	PVIF	CoC	ANW
<b>Opening embedded value</b>	<b>2,980</b>	<b>2,660</b>	<b>-1,284</b>	<b>1,604</b>
Embedded value earnings	12	-183	44	151
Currency movements	1	1	1	-1
Value of acquired / (divested) business*	30	26	-14	18
Capital movements	-158			-158
<b>Closing embedded value</b>	<b>2,865</b>	<b>2,504</b>	<b>-1,253</b>	<b>1,614</b>

\* Increase in participation rate in ERGO. Sale of stakes in KL and NHL is shown in section 2.1.

The decrease of embedded value in 2005 is mainly caused by a net release of capital of EUR 158m.

The breakdown of the embedded value earnings in 2005 is shown in the following table:

		EV	PVIF	CoC	ANW
Expected return	€m	115	-136	75	176
Experience variances	€m	62	184	-74	-48
Operating assumption changes	€m	188	243	-34	-21
Value added by new business	€m	72	177	-59	-46
<b>Operating embedded value earnings</b>	€m	<b>437</b>	<b>468</b>	<b>-92</b>	<b>61</b>
- as % of embedded value	%	<b>14.7</b>			
Tax variances/assumption changes	€m	-9	0	0	-9
Investment variances	€m	168	70	-1	99
Economic assumption changes	€m	-584	-721	137	0
<b>Total embedded value earnings</b>	€m	<b>12</b>	<b>-183</b>	<b>44</b>	<b>151</b>

The operating embedded value earnings amount to EUR 437m or 14.7% of the opening embedded value, exceeding the target range of 8–10%. The operating assumption changes include the increase of the shareholder participation rate for German primary life business.

The main drivers of the economic assumption changes are the decline in interest rates in 2005 and a simultaneous increase in market implied volatilities. Their effect on the embedded value is mitigated by management actions including the purchase of swaptions.

In the following table key profitability ratios are shown:



<b>New business</b>		
Value added by new business (VANB)	€m	<b>72</b>
Present value of new business premiums (PVNBP)	€m	<b>5,721</b>
Annual premium equivalent (APE)	€m	<b>649</b>
Opening embedded value (EV)	€m	<b>2,980</b>
VANB / PVNBP	%	<b>1.3</b>
VANB / APE	%	<b>11.1</b>
VANB / EV	%	<b>2.4</b>
<b>Total business</b>		
Operating embedded value earnings / Opening embedded value	%	<b>14.7</b>
Total embedded value earnings / Opening embedded value	%	<b>0.4</b>

The development of required capital in 2005 is shown in the following table:

All figures in €m

<b>Required capital as at 31 December 2004</b>	<b>1,642</b>
Change in required capital for in-force business	27
Required capital for 2005 new business	4
Currency movements	0
<b>Required capital as at 31 December 2005</b>	<b>1,673</b>

## **4 Embedded value methodology**

### **4.1 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 4.5 and 4.12, which leads in particular to a market-consistent assessment of the time value of financial options and guarantees.

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

Reinsurance new business is comprised of:

- 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 the 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, the new business includes current year's increments on existing treaties.

The in-force business definition corresponds to the definition of new business.

### **4.3 Look-through principle**

The assets related to the covered business are mainly managed by Munich Re Group asset management units. The costs of as well as the profits emerging 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 the covered business have been allowed for in the embedded value calculations.

### **4.4 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

The ANW is adjusted to reflect any pension fund deficits.

#### **4.4.1 Required capital**

The required capital (RC) is defined as follows:

- For reinsurance entities and German primary insurers RC is derived from internal risk models and additional regulatory restrictions
- For foreign primary insurers RC is equal to 100% of EU minimum (this is a simplifying assumption that due to the size of the EEV emanating from foreign primary insurers has little impact on Munich Re Group's EEV)

#### **4.4.2 Free surplus**

The free surplus (FS) is defined as the difference between the ANW and the RC.

### **4.5 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 risk 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 in order 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 the 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.

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

Stochastic models are predominantly used for primary life and health insurance businesses in Germany and Italy. For smaller entities, the value of financial options and guarantees is approximated, or deterministic models are used without an explicit valuation of financial options and guarantees. In the case of deterministic models, a risk

spread of 300 basis points in the discount rate is used to allow for the aggregate risk of the business.

The stochastic model is run using 1,000 scenarios based on the econometric model described in section 4.12.

#### **4.5.1 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:

- Profit sharing rules combined with policyholder guarantees, such as interest rate guarantees
- Policyholder options, such as full or partial surrender, premium discontinuance, and annuitisation, combined with policyholder guarantees, such as guaranteed surrender values or guaranteed annuity rates

German primary health business is exposed to a lesser extent to FOG than the primary life business. 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 case of an interest rate reduction this leads to higher premium rates for the policyholder.
- In the absence of any surrender values, policyholder options are more limited.

The life reinsurance portfolio of Munich Re is exposed to FOG only in a very limited way.

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.

#### **4.5.2 Participating business**

Participating life business, predominantly the German and Italian primary business, is generally characterized 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.

For participating German primary health 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 health care costs. Further, management decisions on how to proceed with changes of technical interest rates have to be 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 health 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.

#### **4.6 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 health business (CoC for policyholder participation)
- 1% p.a. frictional cost on the embedded value less free surplus to allow for non-financial risks (Frictional CoC)

The 1% frictional cost represents an allowance for non-financial risks not reflected in the market-consistent valuation of the PVIF. 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.

#### **4.7 Change in embedded value**

The change in embedded value from one valuation date to the next comprises 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 of the participation rates in Munich Re Group's subsidiaries is included.

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

#### **4.8 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
- Investment variances
- Economic assumption changes

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

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 of changes in the operating assumptions within the reporting year on the embedded value. 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 of changes in the tax legislation during the reporting year on the embedded value. All tax assumptions are subject to an active review at each valuation date.

Investment variances reflect the differences between the actual investment return in the current year and the investment return assumed in the previous embedded value calculation.

The economic assumption changes reflect the aggregate impact of changes in the economic environment in the reporting year on the embedded value. All economic assumptions are subject to an active review at each valuation date.

#### **4.9 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 arising on new business written in the reporting year plus the after-tax regulatory profits arising on 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 4.5.

For most businesses, the value of new business can be calculated on a stand-alone basis, as there are only limited or no interactions between in-force and new business. For German and Italian primary insurance business, however, a marginal approach has been used to calculate the time value of FOG for new business in order to allow for the various effects of new business on the in-force business.

#### **4.10 Operating assumptions**

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

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 the covered business are included in the embedded value.

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

#### **4.11 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.

#### **4.12 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 a careful calibration to the underlying market parameters to ensure that the valuation replicates the market prices of assets. The key areas for calibration are the initial yield curves, the implied market-consistent volatilities of all relevant asset classes, and the correlations between asset classes and currencies. 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 options prices. Swap rates are used as an approximation of the risk-free yield curve. The parameters used for year-end 2004 and year-end 2005 are shown in section 7.4.

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.

#### **4.13 Consolidation**

The embedded value results are presented on a consolidated segment 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.

#### **4.14 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.

#### **4.15 Foreign currency translation**

The embedded value reporting currency is the 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 exchanges 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 the embedded value earnings.

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



## 5 IFRS reconciliation

The embedded value of the covered business as at 31 December 2005 exceeds the corresponding IFRS equity excluding goodwill by EUR 2,146m. As the embedded value does not include the value of future new business, the goodwill is excluded from the IFRS equity for this comparison.

All figures in €m	31.12.2005*	31.12.2004**
<b>IFRS equity</b>	<b>7,804</b>	7,256
- thereof goodwill	1,165	1,271
<b>IFRS equity excluding goodwill</b>	<b>6,639</b>	5,985
<b>Embedded value</b>	<b>8,785</b>	6,898
<b>Value not recognised in IFRS equity</b>	<b>2,146</b>	913

\* Based on European Embedded Value, excluding KL and NHL.

\*\* Based on traditional embedded value, including KL and NHL.

The value not recognized in IFRS equity increased in 2005 by EUR 1,233m. This increase includes the positive impact of the restatement of the European Embedded Value of EUR 808m.

## 6 Sensitivities

Sensitivities of the embedded value as at 31 December 2005 and the 2005 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 September 2005. The sensitivity "100bp p.a. increase in the yield on equity/property assets" is not meaningful in the context of a market-consistent valuation and is therefore omitted in accordance with the CFO Forum's Additional Guidance.

### 6.1 Reinsurance

Sensitivities for the embedded value as at 31 December 2005:

All figures in €m	EV	Difference	Change
Base case	<b>5,920</b>		
Frictional cost rate +100bp	<b>5,416</b>	-504	-9%
No frictional costs	<b>6,556</b>	636	11%
Mortality/morbidity (life business) -5%	<b>6,546</b>	626	11%
Mortality (annuity business) -5%	<b>5,911</b>	-9	0%
No mortality improvements (life business)	<b>4,770</b>	-1,150	-19%
Lapse rates -10%	<b>5,973</b>	53	1%
Maintenance expenses -10%	<b>5,966</b>	46	1%
Interest rates -100bp <sup>1</sup>	<b>6,328</b>	408	7%
Equity/property values -10%	<b>5,901</b>	-19	0%
Minimum solvency capital	<b>6,023</b>	103	2%

Sensitivities for the 2005 value of new business:

All figures in €m	VANB	Difference	Change
Base case	<b>247</b>		
Frictional cost rate +100bp	<b>175</b>	-72	-29%
No frictional costs	<b>337</b>	90	36%
Mortality/morbidity (life business) -5%	<b>342</b>	95	38%
Mortality (annuity business) -5%	<b>248</b>	1	0%
No mortality improvements (life business)	<b>84</b>	-163	-66%
Lapse rates -10%	<b>265</b>	18	7%
Maintenance expenses -10%	<b>256</b>	9	4%
Interest rates -100bp <sup>2</sup>	<b>265</b>	18	7%
Equity/property values -10%	<b>247</b>	0	0%

<sup>1</sup> Values reported at 9 May 2006: EV 6,064; Difference 144; Change 2%.

<sup>2</sup> Values reported at 9 May 2006: VANB 235; Difference -12; Change -5%.



## 6.2 Primary insurance

Sensitivities for the embedded value as at 31 December 2005:

All figures in €m	EV	Difference	Change
Base case	<b>2,865</b>		
Frictional cost rate +100bp	<b>2,366</b>	-499	-17%
No frictional costs	<b>3,452</b>	587	20%
Mortality/morbidity (life business) -5%	<b>2,876</b>	11	0%
Mortality (annuity business) -5%	<b>2,815</b>	-50	-2%
Lapse rates -10%	<b>2,821</b>	-44	-2%
Maintenance expenses -10%	<b>2,935</b>	70	2%
Interest rates -100bp	<b>1,341</b>	-1,524	-53%
Equity/property values -10%	<b>2,590</b>	-275	-10%
Minimum solvency capital	<b>3,206</b>	341	12%

Sensitivities for the 2005 value of new business:

All figures in €m	VANB	Difference	Change
Base case	<b>72</b>		
Frictional cost rate +100bp	<b>49</b>	-23	-32%
No frictional costs	<b>103</b>	31	43%
Mortality/morbidity (life business) -5%	<b>74</b>	2	3%
Mortality (annuity business) -5%	<b>70</b>	-2	-3%
Lapse rates -10%	<b>76</b>	4	6%
Maintenance expenses -10%	<b>77</b>	5	7%
Interest rates -100bp	<b>-8</b>	-80	-111%
Equity/property values -10%	<b>62</b>	-10	-14%



## 7 Summary of assumptions

### 7.1 Shareholder shares

In %	Shareholder share	
	Primary insurance	
	31.12.2005	31.12.2004
Germany - Life	10.0%	7.5%
Germany - Health	15.0%	15.0%
Italy	18-20%*	18%-20%*

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

### 7.2 Tax rates

In %	Tax rate			
	Reinsurance		Primary insurance	
	31.12.2005	31.12.2004	31.12.2005	31.12.2004
EUR - Germany	40	40	40	40
EUR - Italy	38	40	38	38
USD	35	35	na	na
CAD	35	35	na	na
GBP	30	30	na	na

### 7.3 Currency exchange rates

1EUR = ... foreign currency	Currency exchange rates		
	31.12.2005	average of year 2005	31.12.2004
USD	1.17955	1.24458	1.35925
CAD	1.37790	1.50867	1.62860
GBP	0.68710	0.68391	0.70795

### 7.4 Economic assumptions

#### 7.4.1 Risk-free interest rates

The economic scenarios have been calibrated to the market conditions at the valuation dates. 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 dates for the major currencies.



Swap yield curves	31 December 2005				31 December 2004			
	EUR	USD	GBP	CAD	EUR	USD	GBP	CAD
1 year	2.87%	4.79%	4.58%	4.08%	2.36%	3.08%	4.92%	2.76%
2 years	3.04%	4.80%	4.54%	4.11%	2.60%	3.43%	4.86%	3.13%
3 years	3.11%	4.77%	4.56%	4.14%	2.81%	3.64%	4.87%	3.43%
4 years	3.17%	4.79%	4.56%	4.16%	2.98%	3.83%	4.88%	3.68%
5 years	3.23%	4.81%	4.56%	4.19%	3.14%	4.00%	4.88%	3.90%
6 years	3.28%	4.80%	4.55%	4.21%	3.28%	4.15%	4.90%	4.10%
7 years	3.33%	4.80%	4.52%	4.25%	3.42%	4.28%	4.90%	4.28%
8 years	3.37%	4.80%	4.52%	4.27%	3.53%	4.41%	4.90%	4.42%
9 years	3.42%	4.80%	4.50%	4.30%	3.63%	4.51%	4.90%	4.53%
10 years	3.46%	4.80%	4.48%	4.33%	3.72%	4.61%	4.90%	4.63%
15 years	3.63%	4.89%	4.40%	4.51%	4.01%	4.95%	4.86%	5.01%
20 years	3.73%	4.95%	4.34%	4.59%	4.19%	5.10%	4.82%	5.21%
25 years	3.77%	4.99%	4.27%	4.58%	4.28%	5.17%	4.76%	5.26%
30 years	3.77%	5.01%	4.23%	4.59%	4.31%	5.20%	4.71%	5.26%

## 7.4.2 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 2005			31 December 2004		
	EUR	USD	GBP	EUR	USD	GBP
1 year	15.5%	16.9%	13.2%	13.1%	16.4%	11.9%
2 years	15.9%	16.7%	13.2%	12.8%	15.8%	12.3%
3 years	15.7%	16.5%	13.2%	12.4%	15.1%	12.3%
4 years	15.7%	15.9%	13.1%	12.1%	14.6%	12.3%
5 years	15.6%	15.5%	13.1%	11.8%	14.1%	12.2%
10 years	14.3%	13.5%	12.5%	10.1%	10.9%	11.8%
15 years	13.4%	12.0%	12.5%	8.9%	9.7%	11.8%
20 years	12.8%	11.1%	12.4%	8.6%	10.2%	12.0%
30 years	12.9%	9.7%	12.1%	8.3%	na	12.3%

\* For at-the-money swaptions with 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 implied equity volatilities	31 December 2005		31 December 2004	
	EUROSTOXX	S&P 500	EUROSTOXX	S&P 500
Equity index	23.6%	23.6%	20.2%	18.8%



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.

## 8 External opinion

The scope of Tillinghast's review covered the results of Munich Re's European Embedded Value calculations as at 31 December 2004 and 31 December 2005, the 2005 embedded value earnings and the 2005 value added by new business. It included a review of the methodology and assumptions used as described in sections 4 and 7 and of the compliance with the European Embedded Value Principles. The review covered also the reconciliation of the restated European Embedded Value as at 31 December 2004 to the traditional embedded value published in May 2005 and the sensitivities shown in section 6.

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 in particular that:

- the methodology makes allowance for the aggregate risks in the covered business through the methodology set out in section 4, in particular by
  - a 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 on the required capital and a 1% p.a. frictional cost on the embedded value;
- the operating assumptions are reasonable in the context of recent available experience and the expected future operating environment;
- the economic assumptions used are internally consistent and consistent with observable market data; and
- for the primary participating business, management actions assumed for participating business are consistent with established company practice and local market practice.

Tillinghast has also performed limited high-level checks on the results of the calculations and has confirmed that - subject to the remarks mentioned below - the results are reasonable given the methodology and assumptions adopted and 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 primary business approximations were used in the determination of the components of the embedded value earnings analysis and in the sensitivities. In arriving at these conclusions, Tillinghast relied on data and information provided by the Munich Re Group.

## 9 Glossary

<b>Acquired (divested) business</b>	Business acquired (divested) through acquisition (sale) of stakes in insurance or reinsurance companies.
<b>Adjusted net worth</b>	The adjusted net worth (ANW) is also known as shareholders' net worth or adjusted net asset value (ANAV).
<b>ANW</b>	See adjusted net worth.
<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</b>	The cost of holding capital, or CoC, represents the cost of holding the required capital. It 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 assumption changes</b>	Aggregate impact of changes in the economic environment on the embedded value.
<b>Economic assumptions</b>	Economic assumptions include risk-free interest rates, discount rates, inflation rates and assumptions on the volatility of economic parameters.
<b>Embedded value</b>	The embedded value is the present value of shareholders' interests in the earnings distributable from assets allocated to the covered business after sufficient allowance for the aggregate risks in the covered business.

<b>Embedded value components</b>	<p>The embedded value consists of the following three components:</p> <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 required 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>▪ Investment variances</li> <li>▪ Economic assumption changes</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>Policyholder options and guarantees whose value is impacted by the behaviour of financial variables.</p>
<b>FOG</b>	<p>See financial options and guarantees.</p>
<b>Free surplus</b>	<p>Free surplus is the amount of capital allocated to the business in excess of the required capital.</p>

<b>Frictional CoC</b>	The frictional cost of capital represents an allowance for non-financial risks.
<b>Frictional cost rate</b>	Annual cost rate applied to calculate the frictional cost of capital.
<b>IFRS</b>	International Financial Reporting Standards.
<b>Investment expense CoC</b>	The investment expense CoC is the present value of the investment expenses related to the assets covering required capital.
<b>Investment variances</b>	The impact on embedded value of differences between the actual investment return in the current year and the investment return assumed in the previous embedded value calculation.
<b>Look-through basis</b>	A basis via which the impact of an item on the whole Munich Re Group is measured, rather than on a particular part.
<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 business</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</b>	The present value of in-force business is the present value of future shareholder cash flows projected to emerge from the assets backing liabilities of the in-force covered business (PVIF). This value is reduced by the value of financial options and guarantees.
<b>PVIF</b>	See present value of in-force 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>	The valuation basis used for reporting financial statements to local regulators.
<b>Tax CoC</b>	The tax cost of capital is the 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</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.
<b>VANB</b>	See value added by new business.