Munich RE

Market Consistent Embedded Value Report 2013

Munich Re

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Contents

1 Introduction

1.1 Scope of disclosure

In June 2008, the European Insurance CFO Forum (CFO Forum) published the Market Consistent Embedded Value Principles©[1] (MCEV Principles) in order to bring greater consistency and improved disclosure to the European insurance industry's embedded value. Throughout this document, MCEV and embedded value refer to the above MCEV Principles.

In October 2009, the CFO Forum published an amendment to the MCEV Principles to allow for the inclusion of an illiquidity premium. However, as the full implications of the future European regulatory regime (Solvency II) are not known with sufficient certainty at this time, Munich Re continues to follow its prudent approach: it does not apply any yield curve adjustments such as illiquidity premiums or volatility adjustments in its valuation. This is in compliance with the CFO Forum's revised transitional guidance dating from September 2012. The revised transitional guidance states that there is no requirement to make allowance for Solvency II and associated consequences when complying with the MCEV Principles. To illustrate the impacts on our business of applying an illiquidity premium and of basing the MCEV calculations on Solvency-II-like yield curves, however, we do state the corresponding sensitivities.

Munich Re does not report its Group MCEV. In all other respects, we fully comply with the MCEV Principles.

In this report, which is a supplement to the Munich Re Group Annual Report, the following topics are dealt with for the reinsurance and primary insurance business we cover:
— The Market Consistent Embedded Value as at 31 December 2013
— An analysis of embedded value earnings for 2013
— A reconciliation of embedded value with IFRS equity
— An analysis of the sensitivities of the embedded value and value of new business as at 31 December 2013
— A detailed description of the embedded value methodology applied

1.2 Business covered

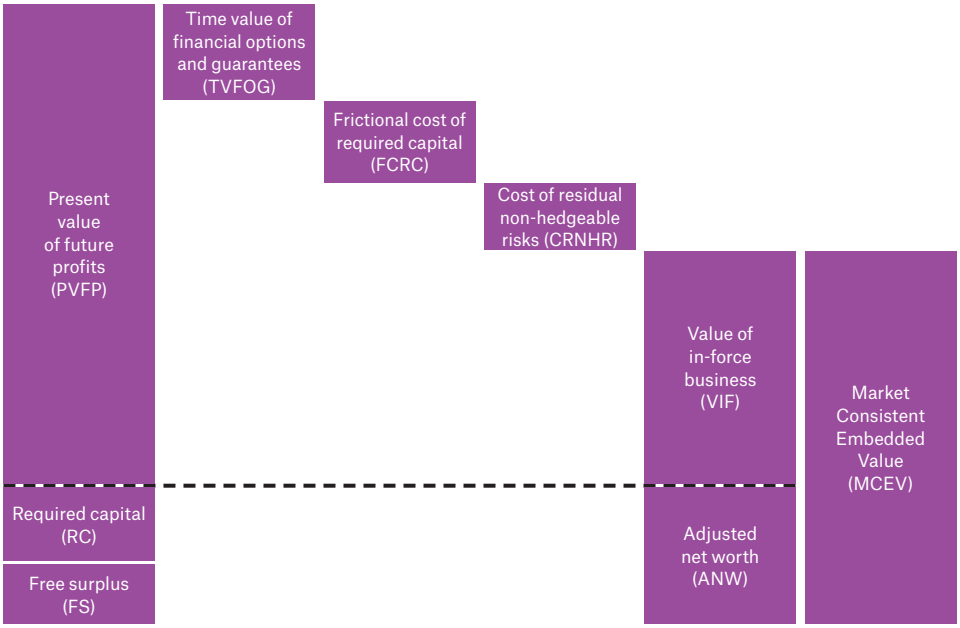
This embedded value report covers 100% of the life reinsurance business written by Munich Re and 97% of business written in the life and German health primary insurance entities of Munich Re. German health primary business is long-term in nature and therefore included, whereas health reinsurance business is short-term in nature and therefore excluded. For a detailed list of Munich Re segments and entities covered in this report, please refer to Section 5.10.

[1] Copyright: Stichting CFO Forum Foundation 2008, available online at http://www.cfoforum.nl

1.3 Definition of Market Consistent Embedded Value

Embedded value is the present value of shareholders' interests in the earnings distributable from assets allocated to the covered business after making sufficient allowance for the aggregate risks involved. It can be split into the following components:

— Adjusted net worth (ANW) broken down into the components
  – Free surplus (FS) and
  – Required capital (RC)
— Value of in-force covered business (VIF), consisting of
  – Present value of future profits (PVFP)
  – Time value of financial options and guarantees (TVFOG)
  – Frictional cost of required capital (FCRC)
  – Cost of residual non-hedgeable risks (CRNHR)



All components are net of taxes, minority interests and policyholder participations (where applicable). A detailed description of the MCEV methodology used for preparing this supplement is given in Section 5.

2 Overview of embedded value results 2013

Since 2005, Munich Re has adhered to a strict market-consistent framework. As in previous years, we refrain from applying any yield-curve adjustments in our valuation.

The increase in the Market Consistent Embedded Value as at 31 December 2012 to the Market Consistent Embedded Value as at 31 December 2013 is driven by a high value of new business, especially in our reinsurance business, assumption changes and positive economic variances, especially in our primary insurance business.

Highlights

€m	Reinsurance	Primary insurance	Total
Market Consistent Embedded Value 31.12.2012	**10,616**	**2,728**	**13,344**
Opening adjustments	–265	–247	–511
Adjusted MCEV 31.12.2012	**10,352**	**2,482**	**12,833**
Value of new business	577	213	790
Expected return at reference rate	284	11	295
Expected return in excess of reference rate	33	84	118
Experience variances	–113	200	86
Assumption changes	–301	1,963	1,661
Other operating variance	–111	–295	–406
Operating MCEV earnings 2013	**369**	**2,175**	**2,545**
Economic variances	–168	1,132	964
Other non-operating variance	–54	–	–54
Total MCEV earnings 2013	**147**	**3,308**	**3,455**
Closing adjustments	–1,117	160	–956
Market Consistent Embedded Value 31.12.2013	**9,382**	**5,949**	**15,332**
IFRS equity excluding goodwill	5,527	3,947	9,474
Value not recognised in IFRS equity	**3,855**	**2,002**	**5,857**

Favourable total MCEV earnings of €3,455m were supported by strong operating MCEV earnings of €2,545m. The recovery of capital markets worldwide led to positive economic variances of €964m, for the most part in the primary insurance segment. Tightened credit spreads for both government and corporate bonds and higher interest rates were the main driver of this positive development. However, the strong depreciation of foreign currencies against the euro reduced the reinsurance embedded value by €917m. This effect essentially stems from the development of the Canadian and the US dollar in 2013, and is disclosed as part of the opening and closing adjustments.

The total MCEV increased by 15% to €15,332m, and the value not recognised in IFRS equity is now at €5,857m.

3 Reinsurance

The embedded value of our life reinsurance business decreased from €10,616m as at 31 December 2012 to €9,382m as at 31 December 2013. For the most part, this is the result of a depreciation of foreign currencies against the euro in 2013. These foreign exchange variances add up to –€917m and are mainly due to our business in North America. The value of new business (VNB) remains at a strong level of €577m (573m), buoyed by the closing of a number of new reinsurance deals that provide solvency relief. The majority of our VNB emerged again from the substantial volumes of recurring new business written across various geographical areas. The operating MCEV earnings have been adversely affected by operating variances and assumption changes for our covered business in force in the USA and Australia.

The embedded value components of our life reinsurance business are presented in the following table, which shows the MCEV as at 31 December 2013 and at 31 December 2012.

MCEV components

	31.12.2013	31.12.2012	Change
	€m	€m	%
Present value of future profits (PVFP)	7,333	8,545	–14.2
Time value of financial options and guarantees (TVFOG)	–114	–114	0.2
Frictional costs of required capital (FCRC)	–522	–490	6.4
Cost of residual non-hedgeable risks (CRNHR)	–1,552	–2,108	–26.4
Value of in-force covered business (VIF)	**5,144**	**5,833**	**–11.8**
Free surplus (FS)	505	819	–38.3
Required capital (RC)	3,733	3,965	–5.8
Adjusted net worth (ANW)	**4,238**	**4,784**	**–11.4**
Market Consistent Embedded Value (MCEV)	**9,382**	**10,616**	**–11.6**

At €9,382m, the embedded value for Munich Re's life reinsurance business as at 31 December 2013 was 11.6% lower than last year's MCEV (€10,616m). A detailed explanation of the drivers of this development in embedded value is given below.

The time value of financial options and guarantees of –€114m as at 31 December 2013 is the same as last year. This moderate value results from the fact that within life reinsurance we concentrate on assuming biometric risks, so that the business only has minor exposure to capital market risks.

The change in the cost of residual non-hedgeable risks from –€2,108m as at 31 December 2012 to –€1,552m as at 31 December 2013 stems essentially from the higher discounting of the annual costs as a result of higher interest rates overall, positive foreign-exchange variances, and the expected unwind. The decrease is partially offset by the cost of residual non-hedgeable risks for new business written in 2013.

Required capital of €3,733m fell slightly compared with last year (€3,965m). This is driven by the following factors: new business written in 2013 led to an increase of €515m in required capital; the release of required capital from running off existing business brought about a decrease of €364m; and, finally, changes in foreign-exchange rates reduced the required capital in the reporting currency by €383m. The total required capital of €3,733m for business covered as at 31 December 2013 exceeds by €732m the capital required at a life reinsurance level to cover all minimum solvency requirements.

The change in embedded value in 2013 is shown in the following table:

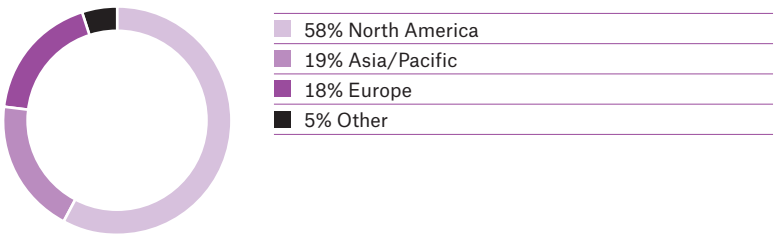
Analysis of MCEV earnings

€m	Free surplus	Required capital	VIF	MCEV
Opening MCEV	**819**	**3,965**	**5,833**	**10,616**
Opening adjustments	–17	–94	–153	–265
Adjusted opening MCEV	**802**	**3,870**	**5,679**	**10,352**
Value of new business	–562	515	624	577
Expected return at reference rate	6	36	242	284
Expected return in excess of reference rate	33	–	–	33
Transfers from VIF and required capital to free surplus	728	–250	–478	–
Experience variances	–284	94	77	–113
Assumption changes	41	–37	–305	–301
Other operating variance	–90	27	–48	–111
Operating MCEV earnings	**–128**	**385**	**113**	**369**
Economic variances	219	–137	–249	–168
Other non-operating variance	34	–96	7	–54
Total MCEV earnings	**125**	**151**	**–129**	**147**
Closing adjustments	–422	–289	–406	–1,117
Closing MCEV	**505**	**3,733**	**5,144**	**9,382**

The **opening adjustments** of –€265m represent foreign-exchange adjustments from beginning-of-year exchange rates to average exchange rates used in the MCEV earnings analysis.

A strong **value of new business** of €577m was again achieved in 2013. The level remained largely unchanged compared with 2012 (€573m). Recurring new business was once again the main contributor. As in the past few years, Munich Re's VNB also benefited from capital relief and financing business opportunities.

VNB split by region



The **expected return** at reference rate (using assumptions as at the start of the year) was €284m (267m). Because of our prudent asset allocation, the **expected return in excess of reference rate**, amounting to €33m (69m), is rather low.

Experience in mortality and morbidity business in 2013 varied against expected values, in particular for the US and Australian markets. The total effect on MCEV is –€113m (23m). Operating **assumption changes** led on aggregate to a decrease of €301m (increase of €146m). The most material negative adjustments result from updated mortality assumptions in the US and morbidity assumptions for the Australian market. Current best-estimate settings have been derived to reflect both past evidence and expected future experience for the business covered.

Other operating variance allows for model changes resulting from the continuous revision of embedded value calculation models across several markets, accounting for –€111m (–139m) in 2013. Moreover, in 2013 there was a transfer of €116m from the adjusted net worth to the value of in-force business. This transfer relates to the market value of the assets backing the liabilities, and is embedded value neutral.

Overall, we observed operating embedded value earnings of €369m, measuring 3.6% of the adjusted opening MCEV.

A rise in interest rates led to negative **economic variances**, which were partly compensated for by lower US credit spreads. The total effect is a reduction in MCEV of €168m (increase of €233m). As our reinsurance business is dominated by insurance risks such as mortality risk, the impact of changes in the interest-rate environment has a much lower effect on the embedded value than for our primary business.

The total embedded earnings of €147m account for 1.4% of the opening MCEV after adjustments.

The **closing adjustments** of –€1,117m were dominated by foreign-exchange adjustments, which result from the transition from average exchange rates used in the MCEV earnings analysis to the end-of-year exchange rates. Taking opening and closing foreign-exchange variances together, exchange rate effects had a significant impact of –€917m on the overall change in MCEV in 2013. Capital repatriations of €465m from life reinsurance to the Group complete the closing adjustments.

New business

	2013	2012	Change
	€m	€m	%
Value of new business (VNB)	577	573	0.8
Present value of new business premiums (PVNBP)	12,830	9,804	30.9
Annual premium equivalent (APE)	1,183	891	32.8
%			
New business margin (VNB/PVNBP)	4.5	5.8	–23.0
VNB/APE	48.8	64.3	–24.1

The present value of new business premiums and the annual premium equivalent increased compared with last year. At the same time, the VNB remained largely unchanged from 2012. Therefore, the new business margin and the VNB/APE ratio decreased. Especially the profitability of financially motivated transactions can be within a wider range when measured in terms of VNB in relation to premium, as reinsurance solutions for this kind of business are specially tailored to meet clients' specific require-

ments. For new business in 2013, this resulted in the aforementioned increase in premium volumes together with a stable VNB.

IFRS reconciliation

	31.12.2013	31.12.2012	Change
	€m	€m	%
IFRS equity excluding goodwill	5,527	6,653	–16.9
Market Consistent Embedded Value	9,382	10,616	–11.6
Value not recognised in IFRS equity	**3,855**	**3,963**	**–2.7**

The embedded value of business covered as at 31 December 2013 exceeds the relevant IFRS equity (excluding goodwill) by €3,855m, compared with €3,963m in the previous year.

Sensitivities for embedded value as at 31 December 2013:

MCEV and VNB sensitivities

	MCEV		Change	VNB		Change
	€m	€m	%	€m	€m	%
Base case	9,382			577		
Interest rates and assets						
Interest rates –100 BP	9,817	435	4.6	627	50	8.7
Interest rates +100 BP	8,961	–421	–4.5	525	–53	–9.1
Equity/property values –10%	9,374	–8	–0.1	577	–	–
Equity/property-implied volatilities +25%	9,371	–12	–0.1	578	–	0.1
Swaption-implied volatilities +25%	9,374	–8	–0.1	578	–	0.1
Illiquidity premium 10 BP	9,421	39	0.4	573	–5	–0.8
Expenses and persistency						
Maintenance expenses –10%	9,487	104	1.1	589	12	2.1
Lapse rates –10%	9,675	292	3.1	657	79	13.8
Lapse rates +10%	9,130	–252	–2.7	511	–66	–11.4
Insurance risk						
Mortality/morbidity (life business) –5%	11,130	1,748	18.6	710	133	23.0
Mortality (life business) +5%	7,933	–1,449	–15.4	481	–96	–16.6
Mortality (annuity business) –5%	9,302	–80	–0.9	563	–14	–2.5
No mortality improvements (life business)	5,251	–4,131	–44.0	293	–285	–49.3
Morbidity (life business) +5%	9,096	–286	–3.0	536	–41	–7.2
Required capital						
Minimum solvency capital	9,454	72	0.8	579	1	0.3
Other						
Value of original currencies –10%	8,512	–870	–9.3	529	–48	–8.3
Solvency II sensitivity	9,428	45	0.5	573	–5	–0.8

Our life reinsurance business is dominated by insurance risks, most notably mortality risk. Therefore, changes in mortality or morbidity assumptions strongly impact the embedded value and the value of new business. Compared with our primary insurance business, changes in economic assumptions only have a minor effect on the overall MCEV of our life reinsurance business.

Since Munich Re discloses its embedded value without taking any adjustments such as illiquidity premiums into consideration, we show two sensitivities in this respect. The first sensitivity shows the impact of including an illiquidity premium of 10 BP. The second one gives an indication of what Munich Re anticipates its embedded value could look like under a future Solvency II regime. As the Solvency II specifications for measures to evaluate long-term guarantee products are still ongoing, the economic assumptions applied for this sensitivity reflect a Munich Re estimation based on the current discussions. The assumptions for this "Solvency II sensitivity" are described in detail in Section 6. The minor impact of both sensitivities on our life reinsurance business is due to the generally smaller influence of economic assumptions. Furthermore, there are offsetting effects between several markets.

The sensitivity of exchange rates relative to the reporting currency reflects the high proportion of business written in non-euro currencies. More than 80% of the life reinsurance business is denominated in foreign currencies, especially in Canadian and US dollars.

Except for the stressed assumptions, the sensitivity calculations are performed analogously to the base case.

4 Primary insurance

The embedded value components of our primary business are presented in the following table, which shows the embedded value as at 31 December 2013 and at 31 December 2012.

MCEV components

	Primary insurance (Total)			German health primary		
	31.12.2013	31.12.2012	Change	31.12.2013	31.12.2012	Change
	€m	€m	%	€m	€m	%
Present value of future profits (PVFP)	5,466	3,579	52.7	3,012	2,408	25.1
Time value of financial options and guarantees (TVFOG)	-546	-1,723	-68.3	-	-	-
Frictional costs of required capital (FCRC)	-543	-393	38.1	-254	-186	36.3
Cost of residual non-hedgeable risks (CRNHR)	-1,131	-1,260	-10.3	-278	-388	-28.5
Value of in-force covered business (VIF)	**3,246**	**202**	**1,508.5**	**2,481**	**1,834**	**35.3**
Free surplus (FS)	526	434	21.1	149	113	32.1
Required capital (RC)	2,178	2,092	4.1	530	522	1.4
Adjusted net worth (ANW)	**2,704**	**2,526**	**7.0**	**678**	**635**	**6.9**
Market Consistent Embedded Value (MCEV)	**5,949**	**2,728**	**118.1**	**3,159**	**2,468**	**28.0**

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	German life primary			International life primary		
	31.12.2013	31.12.2012	Change	31.12.2013	31.12.2012	Change
	€m	€m	%	€m	€m	%
Present value of future profits (PVFP)	1,351	345	291.6	1,103	826	33.6
Time value of financial options and guarantees (TVFOG)	-468	-1,604	-70.8	-77	-119	-35.2
Frictional costs of required capital (FCRC)	-232	-161	44.2	-58	-46	24.6
Cost of residual non-hedgeable risks (CRNHR)	-779	-819	-4.8	-74	-53	39.9
Value of in-force covered business (VIF)	**-129**	**-2,239**	**-94.3**	**894**	**607**	**47.2**
Free surplus (FS)	156	106	47.5	221	216	2.4
Required capital (RC)	1,212	1,163	4.2	437	407	7.3
Adjusted net worth (ANW)	**1,368**	**1,269**	**7.8**	**657**	**622**	**5.6**
Market Consistent Embedded Value (MCEV)	**1,239**	**-970**	**-227.8**	**1,551**	**1,229**	**26.2**

At €5,949m, the MCEV of our primary insurance business increased by 118% compared with last year's MCEV (€2,728m).

Our primary insurance business benefited from the recovery of capital markets throughout the year 2013. The narrowing of credit spreads and higher interest rates led to overall positive economic variances of €1,132m. Besides the improved economic situation, the review of our model assumptions led to an increase in the MCEV by €1,963m. The main driver is revised assumptions of dynamic policyholder behaviour in our German life primary business based on an analysis of recent behaviour of the policyholders in our portfolio.

The present value of future profits (PVFP) increased by 53%, amounting to €5,466m (3,579m), as a result of tightened credit spreads for both government and corporate bonds, increased euro interest rates and assumption changes. As large parts of the guarantees in the life primary business are in the money with the current low level of interest, its time value of financial options and guarantees (TVFOG) is – despite some recovery of the capital markets – still significantly negative at –€546m (–1,723m). After the allowance for frictional cost of required capital (FCRC) of –€543m and cost of residual non-hedgeable risks (CRNHR) of –€1,131m, the MCEV of the primary insurance business increased to €5,949m.

The MCEV of the German life primary business recovered from –€970m to €1,239m, but the value of this segment is still strongly affected by the low interest-rate environment, as the segment is characterised by substantial financial options and guarantees. The recovery is driven both by the increase in PVFP from €345m to €1,351m and by the increase in TVFOG from –€1,604m to –€468m, mainly as a consequence of tightened credit spreads, higher interest rates and changed assumptions of dynamic policyholder behaviour.

Our international life primary business also benefited from the slight recovery of the capital markets. The VIF increased by 47%, from €607m to €894m. In total, the MCEV of the segment increased by €322m to €1,551m (1,229m).

Our German health primary business is less exposed to capital market fluctuations, as technical interest rates are not guaranteed for the whole contract term. Instead, policyholder options have a significant influence on shareholders' cash flows. These policyholder options are covered by the MCEV model in accordance with current experience. As changed policyholder behaviour is still difficult to estimate in the long run, an alteration in assumptions according to future experience may lead to substantial future changes in our MCEV figures. Examples of policyholder options are:
— Lapses with transfer values
— Obligatory benefit for non-payers without possibility to cancel contracts
— Change of policy

There are ongoing discussions concerning the German healthcare system. If these lead to material alterations in legislation, our future MCEV figures are expected to change substantially.

The MCEV of our German health primary business increased by 28% to €3,159m (2,468m). The main driver was the growth in PVFP, which increased by 25% to €3,012m (2,408m), mainly due to assumption changes based on the revision of assumptions reflecting both past evidence and expected future experience for the business covered. At the same time, the CRNHR decreased to –€278m (–388m).

Details of changes from MCEV 2012 to MCEV 2013 are explained in the following analysis of MCEV earnings.

Analysis of MCEV earnings

	Primary insurance (Total)				German health primary			
€m	Free surplus	Required capital	VIF	MCEV	Free surplus	Required capital	VIF	MCEV
Opening MCEV	**434**	**2,092**	**202**	**2,728**	**113**	**522**	**1,834**	**2,468**
Opening adjustments	–264	20	–3	–247	–115	–	–	–115
Adjusted opening MCEV	**171**	**2,112**	**199**	**2,482**	**–2**	**522**	**1,834**	**2,353**
Value of new business	–153	12	353	213	–27	–	111	84
Expected return at reference rate	1	8	2	11	–	2	6	8
Expected return in excess of reference rate	–	–	84	84	–	–	34	34
Transfers from VIF and required capital to free surplus	450	–15	–435	–	176	–2	–175	–
Experience variances	–63	63	199	200	34	10	82	125
Assumption changes	–30	–	1,993	1,963	–	–	748	749
Other operating variance	2	–3	–294	–295	2	–2	–112	–112
Operating MCEV earnings	**207**	**66**	**1,902**	**2,175**	**185**	**7**	**694**	**887**
Economic variances	–12	–	1,144	1,132	–34	–	–47	–81
Other non-operating variance	–	–	–	–	–	–	–	–
Total MCEV earnings	**195**	**66**	**3,046**	**3,308**	**151**	**7**	**647**	**806**
Closing adjustments	160	–	–	160	–	–	–	–
Closing MCEV	**526**	**2,178**	**3,246**	**5,949**	**149**	**530**	**2,481**	**3,159**

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	German life primary				International life primary			
€m	Free surplus	Required capital	VIF	MCEV	Free surplus	Required capital	VIF	MCEV
Opening MCEV	**106**	**1,163**	**–2,239**	**–970**	**216**	**407**	**607**	**1,229**
Opening adjustments	–48	21	–2	–29	–100	–1	–1	–102
Adjusted opening MCEV	**57**	**1,184**	**–2,241**	**–999**	**115**	**406**	**606**	**1,127**
Value of new business	–22	–	66	44	–103	12	177	85
Expected return at reference rate	–	4	–7	–3	1	2	3	6
Expected return in excess of reference rate	–	–	33	33	–	–	18	18
Transfers from VIF and required capital to free surplus	153	–4	–149	–	121	–9	–112	–
Experience variances	–37	28	168	159	–60	26	–51	–85
Assumption changes	–	–	1,318	1,318	–30	–	–74	–104
Other operating variance	–	–	–199	–199	–1	–	17	16
Operating MCEV earnings	**94**	**28**	**1,230**	**1,352**	**–72**	**31**	**–22**	**–63**
Economic variances	4	–	883	887	18	–	308	326
Other non-operating variance	–	–	–	–	–	–	–	–
Total MCEV earnings	**98**	**28**	**2,112**	**2,238**	**–54**	**31**	**287**	**263**
Closing adjustments	–	–	–	–	160	–	–	160
Closing MCEV	**156**	**1,212**	**–129**	**1,239**	**221**	**437**	**894**	**1,551**

Opening adjustments of –€247m mainly reflect dividends paid in the first half of 2013 and profit transfers. Additionally, the MCEV of German life primary increased by €19m due to the first time inclusion of Neckermann Leben in the MCEV. Neckermann Leben was merged with ERGO Direkt Lebensversicherung AG as of 1 January 2013. As large parts of our primary business are denominated in euros, foreign-exchange adjustments generally do not have a material impact.

The **value of new business** amounted to €213m. More details are given on page 16.

The **expected return at reference rate** contributed €11m. The **expected return in excess of reference rate** shows additional earnings (€84m) in embedded value consistent with management expectations for the business. The assumed risk premiums are shown in Section 6.3.4.

Experience variances show the impact of differences between expectations (e.g. for mortality, disability and lapses) and actual experience in the year. Also included are variances arising from tax, where such variances are due to management action. For 2013, experience variances in our primary insurance segment were positive at €200m. For our German life primary business entities, various positive and negative effects, e.g. with regard to profit sharing, lapses, expenses and taxation, totalled €159m, with positive deviations in taxation being the main driver. In our international life primary business, experience variances reduced the MCEV by €85m. Our German health primary business gave rise to positive experience variances of €125m, mainly due to positive effects in lapses, morbidity and expenses.

Operating assumption changes led in aggregate to an increase in MCEV of €1,963m. The revision of assumptions reflecting both past evidence and expected future experience for the business covered led to positive effects of €1,318m from our German life primary business. This increase is mainly driven by changed assumptions on dynamic policyholder behaviour and updated assumptions on mortality and expenses. For our German health primary business, the MCEV increased by €749m due to various assumption changes. Here, the main drivers are the changed assumptions of future premium adjustments, the assumption of lower expenses due to lower realised costs within German health primary business, and a decrease in the CRNHR. Assumption changes in our international life primary business led to a decrease of –€104m driven by updated assumptions on expenses.

Other operating variance allows for model changes resulting from the continuous revision of embedded value calculation models across all companies. The negative overall impact of –€295m is due to an effect of –€199m in German life primary business mainly driven by the inclusion of the value of the future increments for parts of our existing life primary business as part of the value of in-force covered business. Furthermore, in German health primary business, a more detailed modelling using a trigger factor ("Auslösender Faktor") for adjustments of the actuarial interest rate is the main driver for the reduction in the MCEV by €112m.

Overall, we posted positive operating MCEV earnings of €2,175m, representing 88% of the adjusted opening MCEV.

The embedded value earnings for 2013 are further supported by positive **economic variances**. Favourable financial market developments led to an increase of €1,132m for our primary insurance business. Tightened credit spreads, for both government and corporate bonds, and higher interest rates are the main driver of this positive development. In particular, our German life primary business benefited by €887m from the financial market recovery. The improved economic situation also increased the MCEV of our international life business by €326m. Due to fewer earning restrictions and different legal frameworks, international life primary business is less exposed to changes in economic assumptions. At –€81m, the economic variances for German health primary business were minor.

In 2013, there was no effect from **other non-operating variance**.

Overall, total MCEV earnings amounted to €3,308m (or 133% relative to the adjusted opening MCEV).

Closing adjustments of €160m for our primary insurance business consist only of foreign-exchange adjustments from average exchange rates to end-of-year exchange rates (€1m) and of capital flows from our international life primary business (€159m). The subscribed capital of the international life primary business has been increased to allow for future growth. The capital increase is recognised in the ANW to the extent that is admissible to cover solvency requirements. Profit transfers remain in the MCEV at the end of the year, and are shown as an opening adjustment in the next year.

New business

	Primary insurance (Total)			German health primary		
	2013	2012	Change	2013	2012	Change
	€m	€m	%	€m	€m	%
Value of new business (VNB)	213	146	45.6	84	104	–19.9
Present value of new business premiums (PVNBP)	5,662	7,984	–29.1	2,050	2,967	–30.9
Annual premium equivalent (APE)	545	733	–25.6	128	176	–26.9
%						
New business margin (VNB/PVNBP)	3.8	1.8	105.3	4.1	3.5	16.4
VNB/APE	39.0	19.9	95.6	65.0	59.3	9.6

→

	German life primary			International life primary		
	2013	2012	Change	2013	2012	Change
	€m	€m	%	€m	€m	%
Value of new business (VNB)	44	–18	–350.3	85	59	43.6
Present value of new business premiums (PVNBP)	2,371	3,769	–37.1	1,241	1,249	–0.6
Annual premium equivalent (APE)	264	410	–35.6	153	146	4.1
%						
New business margin (VNB/PVNBP)	1.9	–0.5	–497.8	6.9	4.8	44.5
VNB/APE	16.6	–4.3	–488.5	55.9	40.5	37.8

The **value of new business** for our primary insurance increased from €146m to €213m. The improvement mainly stems from our German life business due to favourable financial market developments and assumption changes. As the present value of new business premiums and the annual premium equivalent both decreased, whereas the new business value increased, the new business margin of our primary insurance business rose from 1.8% to 3.8%.

For our German life primary business, the favourable financial market developments and assumption changes had a positive impact. Furthermore, we have changed the methodology regarding future increments of existing life primary business. The value of future increments for a large part of our existing life primary business is classified as being part of the value of in-force, and the current year's increments on existing policies are no longer included in the new business value. Overall, the value of new business increased to €44m and the new business margin to 1.9%.

The value of new business of our international life primary business increased from €59m to €85m. Considerable contributions stem especially from Belgian business, where a positive development of volumes was accompanied by a change in the reinsurance structure. The business in the other markets also performed well in 2013. The overall new business margin increased from 4.8% to 6.9%.

For our German health primary business, the value of new business declined from €104m to €84m. The new business margin increased from 3.5% to 4.1%, thanks to a favourable business mix and assumption changes.

IFRS reconciliation

	31.12.2013	31.12.2012	Change
	€m	€m	%
IFRS equity excluding goodwill	3,947	4,175	–5.5
Market Consistent Embedded Value	5,949	2,728	118.1
Value not recognised in IFRS equity	**2,002**	**–1,447**	**–238.4**

The embedded value of the primary insurance business covered as at 31 December 2013 exceeds the corresponding IFRS equity (excluding goodwill) by €2,002m. The value not recognised in IFRS equity as at the end of 2013 improved by €3,449m compared with the end of 2012.

MCEV and VNB sensitivities

	MCEV		Change	VNB		Change
	€m	€m	%	€m	€m	%
Base case	5,949			213		
Interest rates and assets						
Interest rates –100 BP	4,223	–1,727	–29.0	142	–71	–33.5
Interest rates +100 BP	7,178	1,229	20.7	233	20	9.6
Equity/property values –10%	5,745	–205	–3.4	211	–2	–0.8
Equity/property-implied volatilities +25%	5,881	–68	–1.1	214	1	0.5
Swaption-implied volatilities +25%	6,160	210	3.5	211	–2	–0.8
Illiquidity premium 10 BP	6,275	326	5.5	213	–	0.1
Expenses and persistency						
Maintenance expenses –10%	6,010	60	1.0	218	5	2.5
Lapse rates –10%	5,909	–40	–0.7	223	11	5.1
Lapse rates +10%	5,987	37	0.6	204	–8	–4.0
Insurance risk						
Mortality/morbidity (life business) –5%	6,019	70	1.2	216	3	1.5
Mortality (life business) +5%	5,923	–26	–0.4	212	–1	–0.6
Mortality (annuity business) –5%	5,856	–93	–1.6	213	–	–
No mortality improvements (life business)	5,900	–50	–0.8	208	–5	–2.2
Morbidity (life business) +5%	5,908	–41	–0.7	212	–1	–0.3
Required capital						
Minimum solvency capital	6,090	141	2.4	192	–21	–9.7
Other						
Value of original currencies –10%	5,941	–9	–0.1	212	–1	–0.6
Solvency II sensitivity	6,842	893	15.0	241	28	13.2

Compared with our reinsurance business, most of our primary business is characterised by substantial financial options and guarantees. Therefore, the main drivers are economic assumptions.

Particularly for our German life primary business, embedded financial options and guarantees have a strong asymmetrical and non-linear impact on cash flows to shareholders. Falling interest rates thus have a higher impact on embedded value than rising interest rates. The effect increases for each further step down. For large parts of our German life insurance portfolio, current risk-free interest rates as used in our valuation are below guaranteed interest rates. All in all, the effects of all economic sensitivities are fairly high. This is especially true for the sensitivity to interest rates.

As in previous years, we do not apply any yield curve adjustments in our base case calculation. To show the impact on our primary insurance business of taking yield curve adjustments into consideration, we calculate two sensitivities. The first one demonstrates the effect of including an illiquidity premium of 10 BP for the whole portfolio. The second one gives an indication of what we anticipate that Munich Re's embedded value will look like under a future Solvency II regime. Discussions on the Solvency II specifications for measures to evaluate long-term guarantee products are still ongoing. The economic assumptions applied for the Solvency II sensitivity therefore reflect a Munich Re estimation based on the current discussions. Our assumptions for the Solvency II sensitivity are described in detail in Section 6 of this report.

The substantial effects of cross-subsidisation between new and in-force participating business (especially in German life and health primary insurance) are reflected in the approach we used to calculate the VNB sensitivities.

Except for the stressed assumptions, the sensitivity calculations are performed analogously to the base case.

5 Embedded value methodology

The embedded value methodology adopted by Munich Re is in accordance with the Market Consistent Embedded Value Principles© (MCEV Principles) published by the European Insurance CFO Forum (CFO Forum) in June 2008. We do not apply any yield curve modifications such as illiquidity premiums as permitted by an amendment to the MCEV Principles, published by the CFO Forum in October 2009. In this section, we specify the methodology used in preparing this supplementary report.

The embedded value results and IFRS equities are presented at a consolidated Group level. 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.

The embedded value reporting currency is the euro. Calculations are undertaken in the original currency of the business covered 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 part of opening and closing adjustments. For converting embedded value earnings based on the original currency into euros, average exchange rates are used. More details are given in Section 6.2.

5.1 Look-through principle

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

Where material, costs of other service companies, such as administration and IT, are also included in the embedded value on a look-through basis. Costs of holding companies related to the business covered have been allowed for in the embedded value calculations as well.

5.2 Adjusted net worth (ANW)

The adjusted net worth (ANW) of our business covered is defined as follows:
- For pure life reinsurance entities, the ANW equals the local regulatory net worth adjusted to reflect the market value of assets.
- For composite reinsurance entities, the allocated required capital is used.
- For primary insurance entities, the ANW is based on the local regulatory net worth. Profit transfers and dividends are treated on a unified basis. Therefore, the ANW also includes profit transfers.

Differences between IFRS and statutory pension liabilities are included in the MCEV as an adjustment to net assets.

The required capital (RC) is defined as follows:
— For reinsurance entities, the RC is derived taking into account both regulatory requirements and internal objectives (e.g. rating requirements, internal economic capital model).
— For German primary insurers, the RC is set to statutory net worth adjusted for differences between IFRS and statutory pension liabilities.
— For international primary insurers, the RC is equal to 100% of the EU minimum solvency requirements. This simplified assumption has little impact on the MCEV.

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

5.3 Value of in-force covered business (VIF)

A bottom-up approach to allow for risk is adopted for the calculation of the present value of in-force covered business. The economic assumptions and 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 reference rate is used for both the projection of assets and the discounting of all cash flows. In particular, it is assumed that all assets earn the reference rate.

For business with significant financial options and guarantees, a stochastic model using market-consistent scenarios is applied to determine the VIF. The stochastic models take interactions of assets and liabilities into account 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 is allowed for.

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

For our German life primary business, it is assumed that in the case of severe financial distress, approval from the regulator is granted to restrict policyholder participation and to cover policyholder guarantees by the free RfB and the terminal bonus fund. Besides this, we do not model any limited liability put options and assume that guarantees are not changed.

We have classified the value of the future increments for our existing life primary business as being part of the value of in-force covered business. However, this methodology is not yet fully in place for the whole portfolio. For those parts of the business, the current year's increments are included in the new business value.

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

The VIF consists of the following items that are exemplified in the sections below:
— Present value of future profits (PVFP)
— Time value of financial options and guarantees (TVFOG)
— Cost of residual non-hedgeable risks (CRNHR)
— Frictional cost of required capital (FCRC)

5.3.1 Present value of future profits (PVFP)

The PVFP is the present value of future local statutory shareholder after-tax profits from the in-force covered business and the assets backing the associated liabilities, net of tax, policyholder participation and minority interests.

5.3.2 Time value of financial options and guarantees (TVFOG)

Participating life 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 that has to take competitive pressure or market practice into account. The participating business has been modelled to reflect both contractual and regulatory constraints as well as management discretion. For projected surrender rates, the difference between the reference rate and the credited rate is taken into account.

In our market-consistent calculation, we allow for the potential impact on future shareholder cash flows of all financial options and guarantees within the in-force covered business. This allowance is based on stochastic techniques using methods and assumptions consistent with the underlying embedded value. All projected cash flows are valued using economic assumptions in line with the price of similar cash flows that are traded in the capital markets.

Stochastic models are used for all business with significant (substantial) financial options and guarantees. 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. The stochastic model is run using 1,000 scenarios based on an econometric model and takes the following explicitly into account:
— Management discretion concerning bonus policy and profit-sharing rules
— 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 primary business
— Surrender rates dependent on the capital markets

It is predominantly life primary business that is exposed to substantial financial options and guarantees. The following aspects of financial options and guarantees are of particular relevance:
— All policyholder options (such as full or partial surrender, premium discontinuance and annuitisation) combined with policyholder guarantees (like interest-rate guarantees, guaranteed surrender values or guaranteed annuity rates) have a large influence on the VIF.
— On the other hand, companies are able to substantially influence the value of financial options and guarantees, for example by changing their bonus policy for participating life business or by adjusting the long-term asset allocation. Such management discretion is subject to any contractual guarantees and regulatory or legal constraints.

The TVFOG published in this and other Munich Re documents reports the net effect.

For our German health primary segment, stochastic models are used that implicitly reflect TVFOG in VIF. Our life reinsurance portfolio has only a very limited exposure to financial options and guarantees, e.g. variable annuity business.

5.3.2.1 TVFOG in German life primary business

In German life primary business, by far the biggest share of the time value of financial options and guarantees results from the guaranteed interest rate together with legal restrictions for minimum policyholder participation.

The maximum actuarial interest rate in life insurance (commonly referred to as the "guaranteed interest rate") is laid down in the German federal ordinance concerning actuarial assumptions for future policy benefits ("Deckungsrückstellungsverordnung").

The German federal ordinance relating to minimum policyholder participation in life insurance ("Mindestzuführungsverordnung") applies rules concerning customers' minimum participation in statutory profits that strongly restrict loss offset from the different profit sources (investment result, risk result, other result).

5.3.2.2 TVFOG in German health primary business

For participating German health primary business, minimum profit-sharing rules are set according to current legal requirements. Management discretion is relevant for the use of free policyholder funds to reduce future premium increases necessary to cover the assumed development of healthcare costs. Furthermore, management decisions on how to proceed with changes in technical interest rates are taken into account, subject to legal restrictions.

The impact of financial options and guarantees in German health primary business varies from that in German life primary business. Besides options of the policyholder, there are also options of the company. Policyholder behaviour is modelled in accordance with current experience. However, changed policyholder behaviour is difficult to estimate in the long run. Options of the company mainly involve the following factors:

— 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 generally 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 that is equivalent to premium rate increases within the premium adjustment process.

5.3.3 Cost of residual non-hedgeable risks (CRNHR)

The cost of residual non-hedgeable risks reflects the impact of risks not already allowed for in the TVFOG or the PVFP. For determining the CRNHR, we use a cost-of-capital approach.

For all businesses, the amount of economic risk capital for non-hedgeable risks (ERCNHR) is determined by our internal economic capital model and projected over the run-off of the business. In the context of the ongoing uncertainty over standards and guidance under Solvency II, we are adhering to the methodology of past years so as to reflect our integrated risk management process and include the diversification between our covered and non-covered business. Diversification between hedgeable and non-hedgeable risk is disregarded. The economic risk capital corresponds to the value at risk over a one-year time horizon with a confidence level of 99.5%. CRNHR is the present value of the future ERCNHR of the covered business times the cost rate of 7%.

5.3.4 Frictional cost of required capital (FCRC)

The cost of holding capital derives from taxes on profits of assets backing required capital and from the cost of their management. For our German health primary business, investment income on shareholder funds is subject to policyholder participation and thus also included in the FCRC.

5.4 Change in embedded value

The change in embedded value from one valuation date to the next comprises the following elements:
— Opening adjustments
— Embedded value earnings
— Closing adjustments

The value of acquired or divested business (including the change in stakes of Munich Re in companies covered in this report) as well as capital movements, especially dividends, are shown either as **opening adjustments** or **closing adjustments** in a manner designed to best reflect the economic return Munich Re has achieved in the period. Additionally included in the opening adjustments are changes in scope as well as the impact of changes in currency exchange rates from the end of last year to an average exchange rate. Closing adjustments furthermore contain the changes from that average exchange rate to the currency exchange rate at the end of the reporting year.

Embedded value earnings are stated at average currency exchange rates and at the average share of Munich Re in the respective companies. They are explained in more detail in the following section.

5.5 Embedded value earnings

Embedded value earnings can be split into the following components:
— Value of new business
— Expected return at reference rate
— Expected return in excess of reference rate
— Transfer from VIF and required capital to free surplus
— Experience variances
— Assumption changes
— Other operating variance
— Economic variances
— Other non-operating variance

The sum of the first seven components of embedded value earnings is referred to as operating embedded value earnings.

The **value of new business** is explained in the following section.

The **expected return at reference rate** – "expected existing business contribution (reference rate)" according to the MCEV Principles – is calculated assuming a risk-free roll-forward of the embedded value at the beginning of the year.

The **expected return above reference rate** – "expected existing business contribution (in excess of reference rate)" according to the MCEV Principles – reflects management's expectation for one year with regard to asset returns above the reference rate. The parameters used for the previous and current reporting year are shown in Section 6.3.

The **transfer from VIF and required capital to free surplus** shows the release of expected profits from the value of in-force covered business to the free surplus as well as the projected release of required capital to free surplus during the year. The underlying expectation is based on the models as at the beginning of the year. Given that there is only a shift between MCEV components involved, there is no impact on the embedded value within this line item.

The **experience variances** summarise the prospective and retrospective outcome of differences between the actual operating experience in the reporting year and the operating result assumed in the previous embedded value calculation.

Assumption changes represent the aggregate impact on the embedded value of changes in the operating assumptions within the reporting year. All operating assumptions are subject to an active review at each valuation date.

Other operating variances comprise model changes or model refinements as well as the effect of tax planning action.

The **economic variances** describe the aggregate impact on the embedded value of changes in economic assumptions (including reference rate and implied volatilities) during the reporting year and in the projection years. They are the net effect of a change in economic parameters on the assets and liabilities.

Other non-operating variances summarise the impact of changes in the regulatory framework such as taxation or legislation concerning policyholder participation.

5.6 Value of new business (VNB)

The VNB is the present value as at the end of the reporting year of the future local statutory after-tax profits in respect of new business written in the reporting year, reduced by the time value of financial options and guarantees, cost of residual non-hedgeable risks and frictional costs associated with the new business. Additionally, after-tax regulatory profits in respect of this business during the reporting year are included in the reported VNB. The calculation is consistent with the methodology outlined for the value of in-force business.

For reinsurance business, the value of new business can be calculated on a stand-alone basis, as there are no material interactions between in-force and new business. New business is defined as business arising from new reinsurance contracts as well as that from the sale of new contracts on existing reinsurance treaties by our customers during the reporting period. Due to the nature of life reinsurance, the value of new business includes the value of expected renewals on those new contracts and expected future contractual alterations to those new contracts. New life reinsurance business comprises:

— For individual business, new cessions in the year on either new or existing treaties
— For group business, new group schemes on either new or existing treaties, and also new members in existing group schemes
— For annually renewable reinsurance contracts (e.g. stop-loss and other non-proportional reinsurance business), new treaties and renewals of existing treaties

For primary insurance business, because of material interactions between existing and new business, a marginal approach is used, i.e. the difference between the embedded value with and without new business. The marginal approach helps to capture the effect of interactions between in-force and new business. 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. If the value of future increments for existing primary life policies is not included in the VIF, the current year's increments on these policies are included in the new business value.

5.7 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 the business covered are split into acquisition, maintenance and investment-related expenses and are fully allowed for in the embedded value. We use a going-concern approach in line with the MCEV Principles. Future productivity gains are not anticipated in the embedded value calculations beyond what has been achieved.

5.8 Tax assumptions

Tax 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.

Within the business covered in the case of ERGO, tax grouping effects are taken into account.

5.9 Economic assumptions

The economic assumptions are derived following a market-consistent valuation approach. Many asset classes and economic assumptions are modelled stochastically. These include equity and property returns, bond yields, interest rates 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 economic scenarios have been calibrated to the market conditions at the valuation dates, i.e. reference rates, swaption prices and equity option prices. Generally, swap rates have been used as an approximation of the risk-free yield curves. In countries without deep and liquid swap markets, government bonds were used instead.

The calculations of the time value of financial options and guarantees are based on stochastic simulations. The calibration has been provided by Barrie & Hibbert (Moody's Analytics), a UK-based financial consulting company. An Economic Scenario Generator (ESG), also provided by Barrie & Hibbert, has been used to centrally generate the stochastic scenarios. Risk-free nominal interest rates are modelled using a LIBOR market model.

The parameters used for the previous and current reporting year are shown in Section 6.3.

5.10 Business covered

The MCEV reported for 2013 covers 100% of the life reinsurance business written by Munich Re. With regard to our primary insurance business, the MCEV 2013 covers 97% of our business written in the life and the German health primary insurance entities of Munich Re.

Reinsurance companies, major branches writing covered life reinsurance business, and primary insurance companies writing covered primary insurance business are listed in the following table:

Business covered

Life reinsurance business
Reinsurance companies writing covered life reinsurance business
Munich Reinsurance Company of Australasia Ltd., Sydney
Munich Re do Brasil Resseguradora S.A., São Paulo
Münchener Rückversicherungs-Gesellschaft AG, Munich
Munich Reinsurance Company of Africa Ltd., Johannesburg
New Reinsurance Company Ltd., Zurich
Munich Re of Malta p.l.c., Ta´ Xbiex
Munich American Reassurance Company, Atlanta, Georgia
Major branch offices writing life reinsurance business
Munich Reinsurance Company Canada Branch (Life), Toronto
Munich Reinsurance Company United Kingdom Life Branch, London
German life primary business
ERGO Lebensversicherung Aktiengesellschaft, Hamburg
VICTORIA Lebensversicherung Aktiengesellschaft, Düsseldorf
ERGO Direkt Lebensversicherung AG, Fürth
Vorsorge Lebensversicherung Aktiengesellschaft, Düsseldorf
German health primary business
DKV Deutsche Krankenversicherung Aktiengesellschaft, Cologne
ERGO Direkt Krankenversicherung AG, Fürth
International life primary business
ERGO Previdenza S.p.A., Milan
Sopockie Towarzystwo Ubezpieczen na Zycie Ergo Hestia Spolka Akcyjna, Sopot
ERGO Life Insurance SE, Vilnius
ERGO Insurance N.V., Brussels
ERGO Versicherung Aktiengesellschaft, Vienna

In 2013, Bank Austria Creditanstalt Versicherung AG was merged with ERGO Versicherung Aktiengesellschaft Vienna. The merger is effective as of 1 January 2013.

Furthermore, Neckermann Leben was merged with ERGO Direkt Lebensversicherung AG as of 1 January 2013. Hitherto, Neckermann Leben was not included in the MCEV.

6 Assumptions

6.1 Tax rates

Long-term tax rates

	Reinsurance		Primary insurance	
%	31.12.2013	31.12.2012	31.12.2013	31.12.2012
Germany	33	33	32	32
Italy	34	34	35	35
US	35	35		
UK	20	23		
Canada	27	27		

Within the business covered, tax grouping effects at ERGO are taken into account. The above tax rates show the company tax rates.[1]

6.2 Currency exchange rates

Currency exchange rates

€1 = ... foreign currency	31.12.2013	2013 average year	31.12.2012
US$	1.378	1.317	1.318
£	0.832	0.852	0.811
Can$	1.464	1.348	1.313

Munich Re's reporting currency is the euro. Embedded value earnings based on the original currency are converted using average currency exchange rates that are defined as the average of daily exchange rates from 1 January to 30 September. In the table above, the average exchange rates and the period-end exchange rates for the valuation year 2013 as well as the exchange rates from the end of last year are shown for the major currencies.

6.3 Economic assumptions

The embedded value results for 2013 are based on economic market conditions as at 31 December 2013. In the following sections, the key economic assumptions, i.e. the reference yield curve, implied volatilities for each asset class, and correlations between different asset classes, are described for the major currencies.

6.3.1 Reference rates

Generally, swap rates have been used as an approximation of the risk-free yield curves. In countries without deep and liquid swap markets, government bonds were used instead. For interpolation, a regression spline technique is used, and extrapolation is done using the Nelson-Siegel form.

[1] For fiscal year 2013, the corporate income tax rate in Italy temporarily increased by 8.5%. However, this does not affect long-term tax rates in our projections.

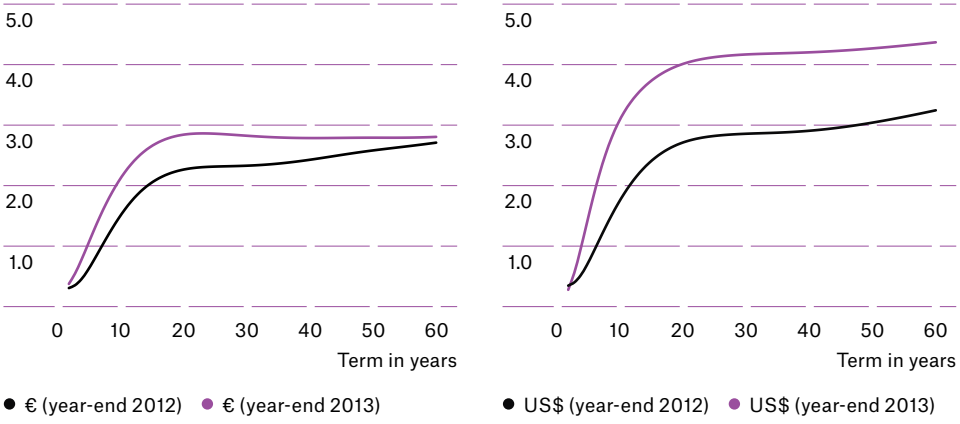
The table below shows the zero spot rates at the relevant valuation date for the major currencies.

Zero spot rate

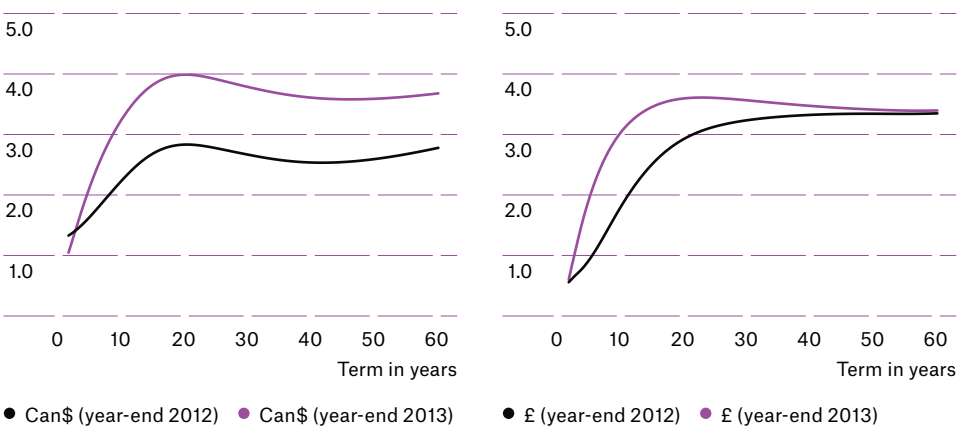
Term	31.12.2013				31.12.2012			
%	€	US$	£	Can$	€	US$	£	Can$
1 year	0.39	0.25	0.61	1.05	0.33	0.32	0.57	1.33
2 years	0.56	0.53	1.05	1.38	0.37	0.37	0.67	1.41
3 years	0.78	0.92	1.48	1.71	0.47	0.49	0.77	1.50
4 years	1.02	1.35	1.85	2.02	0.61	0.66	0.90	1.60
5 years	1.27	1.78	2.16	2.30	0.78	0.86	1.04	1.71
6 years	1.50	2.17	2.42	2.56	0.96	1.08	1.21	1.83
7 years	1.71	2.50	2.65	2.79	1.14	1.29	1.39	1.95
8 years	1.90	2.78	2.83	2.99	1.31	1.49	1.57	2.07
9 years	2.08	3.02	2.99	3.17	1.47	1.68	1.75	2.18
10 years	2.23	3.21	3.11	3.33	1.61	1.85	1.92	2.30
15 years	2.70	3.78	3.48	3.86	2.10	2.45	2.58	2.71
20 years	2.85	4.03	3.60	3.99	2.28	2.72	2.96	2.83
25 years	2.86	4.13	3.60	3.90	2.32	2.81	3.14	2.76
30 years	2.82	4.17	3.56	3.78	2.34	2.85	3.24	2.66

The following graphs illustrate the zero spot rate curves.

Zero spot rate (%)



Zero spot rate (%)



6.3.2 Volatilities

The interest-rate scenarios have been generated to replicate at-the-money swaption prices. The implied volatilities for these swaptions are outlined in the following table.

Target swaption implied volatilities (tenor of 20 years)

Term	31.12.2013		31.12.2012	
%	€	US$	€	US$
1 year	23.7	20.5	30.1	28.4
2 years	24.3	20.1	29.1	27.8
3 years	24.3	19.4	27.8	26.3
4 years	24.1	18.7	26.8	25.0
5 years	24.0	18.0	25.9	24.0
10 years	21.7	15.2	23.5	21.2
15 years	20.2	14.1	22.7	20.1
20 years	18.4	13.6	20.9	18.8
30 years	15.3	15.2	16.7	22.3

The equity models have been calibrated to implied volatilities of at-the-money equity index options observed in the OTC market. The ten-year implied volatility (the longest maturity option available) is shown in the table below.

Target equity implied volatilities

	31.12.2013		31.12.2012	
Equity index %	EURO STOXX	S&P 500	EURO STOXX	S&P 500
	20.6	24.5	24.7	26.6

6.3.3 Correlation coefficients

Our models have been calibrated to the coefficients shown in the table below, reflecting global long-term assumptions concerning the correlations between equities and interest rates. The coefficients have been estimated from historic market data.

Target correlation coefficients

Correlation pair	31.12.2013	31.12.2012
Equity and ten-year government bond	0.17	0.17
Equity and absolute changes in nominal short rates	–0.10	–0.11
Equity and absolute changes in real short rates	–0.04	–0.04
Equity and ten-year inflation-linked government bond	0.10	0.11

6.3.4 Expected return in excess of reference rate

The table below shows management's expectations for assigning excess return to all equities, real estate and fixed income securities, differentiated by their rating.

Expected return in excess of reference rate

BP	2013	2012
Equities	450	450
Real estate	310	300
Fixed income		
AAA	–	–
AA/A	80	170
BBB and worse	130	240
All other assets	–	–

6.3.5 Solvency II yield curves

Since there is still uncertainty about relevant standards and guidance for Solvency II, Munich Re continues to follow its approach of not taking any yield curve adjustments into consideration for the base MCEV calculations. However, to give an indication of what Munich Re anticipates its MCEV will look like when this includes elements of a future Solvency II framework, we publish a corresponding sensitivity calculation.

For the Solvency II yield curve sensitivity, the respective parameters have been set according to the state of debate at the time of calculating the 2013 MCEV results, taking into account the draft Omnibus II directive (November 2013), the draft implementing measures (October 2011) and the technical specification on the Long Term Guarantee Assessment that was performed by EIOPA at the beginning of 2013. This covers:

— swap rates as the basis for deriving risk-free term structures from
— credit risk adjustment (CRA)
— volatility adjustment (VA)
— extrapolation according to the Smith-Wilson methodology, comprising parameters for last liquid point (LLP), convergence speed (CS) and ultimate forward rate (UFR)

The parameters for the Solvency II yield curves for the major currencies are shown in the table below.

Parameters for the Solvency II yield curves

Currency	CRA	VA	LLP	CS	UFR
	BP	BP	Years	Years	%
€	–10	20	20	40	4.2
US$	–10	20	20	40	4.2
£	–10	30	20	40	4.2
Can$	–10	20	20	40	4.2

We did not include any matching adjustments or transitional measures for calculating this sensitivity, and it is assumed that all other economic assumptions (e.g. volatilities) are equal to the base MCEV calculations.

7 Independent assurance report

Introduction

Based on the engagement letter dated 30 July and 5 August 2013, KPMG has been engaged to audit the Market Consistent Embedded Value (MCEV) of Münchener Rückversicherungs-Gesellschaft Aktiengesellschaft in München, (Munich Re) as at 31 December 2013 as stipulated in the accompanying MCEV Report of Munich Re. Munich Re is responsible for the preparation of the MCEV Report including the calculation of the MCEV. This includes particularly setting the operative and economic assumptions, the explanation concerning the determination of the MCEV and its roll forward, the implementation and the operativeness of the system which ensures the completeness and correctness of the data which are necessary for the calculation of the MCEV. Our responsibility is to express an opinion on the calculation of the MCEV as to whether the methodology and the assumptions used comply with the Market Consistent Embedded Value Principles© as published by the CFO Forum on 4 June 2008 and amended in October 2009 (Market Consistent Embedded Value Principles) except principles 17.3.37 to 17.3.45 (Group MCEV). Munich Re does not apply an illiquidity premium in the calculation of the MCEV but discloses additional sensitivities which allow the reader to understand and to assess the impact of applying an illiquidity premium as well as Solvency-II-like yield curves on the MCEV of Munich Re.

Subject matter and criteria

For the calculation of the MCEV, Munich Re applies criteria as set out in the Market Consistent Embedded Value Principles, except principles 17.3.37 to 17.3.45. The calculation of Market Consistent Embedded Values is necessarily based on numerous assumptions with respect to economic conditions, operating conditions, taxes, and other matters. Many of these are beyond the Company's control. Actual cash flows in the future are likely to be different from those assumed in the calculation, and such variation may be material.

Work performed

We conducted our audit of the MCEV in accordance with the International Standard on Assurance Engagements (3000): "Assurance engagements other than audits or reviews of historical financial information", issued by the International Auditing and Assurance Standards Board. The effectiveness of the accounting-related internal control system in the MCEV calculation is examined primarily on a test basis within the framework of the audit. The audit includes assessing the MCEV principles used and significant estimates and assumptions made by management. As a result of determining our audit strategy and audit objectives we have established Market Consistent Embedded Value Principles 3, 6, 7 ,9, 11, 12, 13, 14, 15 and 16 as the special focus of our audit.

We believe that our audit provides a reasonable basis for our opinion.

Regarding our independence, we comply with the requirements of the IFAC Code of Ethics for Professional Accountants.

Conclusion

In our opinion, the methodology and the assumptions used comply with the Market Consistent Embedded Value Principles except principles 17.3.37 to 17.3.45. Munich Re does not apply an illiquidity premium in the calculation of the MCEV but discloses additional sensitivities which allow the reader to understand and to assess the impacts of applying an illiquidity premium as well as Solvency-II-like yield curves on the MCEV of Munich Re. In particular:

- The calculated MCEV 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. Section 5 sets out the methodology of making allowance for the aggregate risks, 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 frictional cost of required capital based on the cost of double taxation, investment expenses and, where applicable, policyholder participation on assets backing the required capital,
  - a deduction for the cost of residual non-hedgeable risks.
- 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.
- 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 other assumptions used in the projections, and with local market practice.
- We have also performed limited high-level checks on the results of the calculations. We have not, however, performed detailed checks on all the models and processes involved.

We have provided the services described above on behalf of Münchener Rückversicherungs-Gesellschaft Aktiengesellschaft in München. We have carried out our engagement on the basis of the General Engagement Terms included in our engagement agreement dated 1 January 2002. By taking note of and using the information as contained in our Assurance Report, each recipient confirms to have taken note of the terms and conditions stipulated in the aforementioned General Engagement Terms (including the liability limitations to €4m for negligence specified in item No. 9 included therein) and acknowledges their validity in relation to us.

Cologne, 19 March 2014

KPMG Bayerische Treuhandgesellschaft Aktiengesellschaft
Wirtschaftsprüfungsgesellschaft
Steuerberatungsgesellschaft

Hanno Reich
Partner

Stefan Hensen
Manager

8 Statement by directors

I confirm that the MCEV of Munich Re as at 31 December 2013 has been prepared in accordance with the Market Consistent Embedded Value Principles© (MCEV principles) issued by the CFO Forum on 4 June 2008 and amended in October 2009. In particular I confirm that

- Non-economic assumptions for future experience have been set with regard to past, current and expected future experience and to any other relevant data.

- The economic assumptions used are internally consistent and consistent with observable market data.

- Management actions are consistent with other assumptions used in the projections and assumptions used for other purposes, e.g. projections required in the annual planning of profits and losses. The investment strategy and the realisation of unrealised capital gains are in line with management's expectations. For participating business, assumptions on future bonus rates and profit allocation between policyholders and shareholders are made on a basis consistent with the projection assumptions, established company practice and local market practice.

- Dynamic policyholder behaviour is, where material, taken into consideration in the time value of financial options and guarantees.

However, the following Group-wide items of non-compliance exist:

- Munich Re does not publish a Group MCEV in line with MCEV principles 17.3.37 to 17.3.45.

Munich, 19 March 2014

Dr. Jörg Schneider
CFO

9 Disclaimer

This report contains forward-looking statements that are based on current assumptions and forecasts of the management of the Munich Re. 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. Munich Re assumes no liability to update these forward-looking statements or to conform them to future events or developments.

10 Glossary and abbreviations

Aa

Acquired (divested) business Business acquired (divested) through acquisition (sale) of stakes in insurance or reinsurance companies

Adjusted net worth (ANW) Also known as shareholders' net worth or adjusted net asset value. MCEV Principles distinguish between free surplus and required capital.

Assumption changes Aggregate impact of changes in the operating assumptions on the embedded value

Bb

Best-estimate assumption An assumption that represents the expected outcome from the range of possible outcomes of future experience

Cc

Capital movements Dividends and capital contributions

Costs of residual non-hedgeable risks (CRNHR) Allowance for risks not already included in the PVFP or TVFOG. Munich Re uses a cost-of-capital approach with a unique cost rate applied to the projected risk capital for non-hedgeable risks.

Covered business The business for which the embedded value is reported

Currency movements Aggregate impact of currency movements on the embedded value

Ee

Economic assumptions These include reference rates, discount rates, inflation rates and assumptions on the volatility of economic parameters

Economic variances Sum of the difference between projected and actual investment return in the reporting year and effects on the embedded value from changes in capital market parameters

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

Expected return at reference rate Return for the reporting year if all assumptions of the previous year remained constant (risk-free roll-forward of the embedded value at the beginning of the year)

Expected return in excess of reference rate Additional return for one year expected by management due to assumed risk premiums for certain asset classes

Experience variances The impact on the embedded value of differences between the actual operating experience in the reporting year and the operating result assumed in the previous embedded value calculation

Ff

Free surplus (FS) Amount of capital allocated to the business in excess of the required capital

Frictional costs of required capital (FCRC) Allowance for taxation and investment costs on the assets backing required capital. Additionally, for German health primary business, FCRC includes the cost of profit sharing of investment income on assets backing required capital.

Ii

IFRS International Financial Reporting Standard

Ll

Look-through basis A basis on which the impact of an item on the whole Group, rather than on a particular part, is measured

Mm

Market Consistent Embedded Value (MCEV) Embedded value according to the European Insurance CFO Forum Market Consistent Embedded Value Principles ("MCEV Principles"), Copyright Stichting CFO Forum Foundation 2008. Published in June 2008, available online at http://www.cfoforum.nl. Currently we do not make use of any illiquidity premiums in line with the amendment to the MCEV Principles, published by the CFO Forum in October 2009.

Oo

Opening/closing adjustments Change in embedded value due to capital movements, foreign-exchange variance or acquired/divested business

Operating assumptions All assumptions relating to demographic assumptions (e.g. mortality, morbidity), expenses, policyholder participation and policyholder behaviour

Operating MCEV earnings The sum of expected return, value of new business, experience variances , assumption changes and other operating variance

Other operating variance Effects from a change or improvement in models and tax-planning action

Other non-operating variance Impacts of legal or regulatory changes including taxation

Pp

Participating business Primary insurance business in which policyholders have the right to participate in the performance of a specified pool of assets or contracts

Present value of future profits (PVFP) The value of future profits from the in-force covered business and the assets backing the associated liabilities; net of tax, policy-holder participation and minorities

Present value of new business premiums (PVNBP) Present value of future premiums from new business

Rr

Reference rate Proxy for a risk-free rate

Required capital (RC) The amount of surplus assets whose distribution to shareholders is restricted

RfB The "Rückstellung für Beitragsrückerstattung (RfB)" is the provision for premium refunds in German primary insurance

Risk-free (interest) rates Prospective yields on securities considered to be free of default and credit risk

Ss

Solvency II EU legislative programme introducing a new, harmonised EU-wide insurance regulatory regime

Statutory basis Valuation basis used for reporting financial statements to local regulators

Tt

Time value of financial options and guarantees (TVFOG) The time value of financial options and guarantees is part of the VIF; the VIF before deduction of the allowance for the time value of financial options and guarantees reflects their intrinsic value

Vv

Value of in-force business (VIF) The value of in-force covered business is the present value of future shareholder cash flows (PVFP) reduced by costs of residual non-hedgeable risks (CRNHR), the frictional costs of required capital (FCRC) and the time value of financial options and guarantees (TVFOG)

Value of new business (VNB) The value added through the activity of writing new business

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