From pure protection to real asymmetric profiles

Dynagest's **Dr René Sieber** explains how portfolio insurance techniques have evolved and facilitated the development of a new generation of products

Constant Proportion Portfolio Insurance[1] (CPPI) is now an established technique, but the objective of CPPI-based investment has progressively shifted in recent years. Where previously, the aim was to use CPPI to protect the absolute investment floors, today it is being used to devise investments with truly asymmetric return profiles.

This more flexible application of portfolio insurance techniques has made it possible to launch a new generation of products that are better able to cope with higher volatilities and lower short-term interest rates.

The aim of this short study is to summarise some aspects of this evolution based on some examples using DAX®.

We present the pro forma results of different CPPI-based approaches on DAX®

because the index itself has historically been characterised by substantial volatility. The study considers different variants of the Time Invariant Portfolio Protection[2] (TIPP) concept, also known as the 'dynamic ratchet'.

Pro forma management is performed using exclusively Eurex futures contracts on DAX® (FDAX). According to the applied portfolio insurance principles, the futures are sold or bought in order to adjust the exposure of an existing long spot position on the underlying index (an indexed portfolio) representing 100 percent of the initial value of the investment. As well as the quarterly rollover of open positions, transactions occur, if necessary, once a day on

the futures closing prices. The results shown in table 1 are net of management and transaction fees.

Towards more reactive approaches

There are many variations that could be used, some of which we describe below and some that are also depicted in table 3. With the exception of variant 7, all the variants illustrated use a base level of authorised exposure of 100 percent.

Variant 1 corresponds to a 'pure' version of 'dynamic ratchet' in which the aim is to protect a floor representing 90 percent of the initial investment, and to lock in the highest value reached during the life of the

The objective of CPPI-based investment has progressively shifted in recent years

Table 1: simulated net performances of different CPPI-based approaches on DAX®: 1993–2007

	1993–2007			01/01/97–07/03/00			07/03/00–12/03/03				12/03/03–31/12/07			
	Return in % (p.a)	Volatility in %	Sortino ratio	Return in % (p.a)	Volatility in %	Sortino ratio	Level[1] 07/03/00	Level[1] 12/03/03	Return in % (p.a)	Volatility in % (p.a)	Level[1] 31/12/07	Return in % (p.a)	Volatility in %	Sortino ratio
Underlying equity market														
DAX®	11.7%	22.6%	0.39	38.1%	25.6%	1.48	522	143	-35.0%	32.5%	522	31.0%	17.9%	1.84
Dymnamic Ratxhet – net of fees[2,3] 1 <Pure> (90%/100%)	7.6%	13.6%	0.32	14.1%	20.4%	0.60	231	208	-3.4%	10.9%	299	7.9%	9.8%	0.58
2 <Pure> (85%/100%)	8.9%	13.5%	0.42	16.6%	19.4%	0.76	253	216	-5.2%	11.0%	359	11.2%	10.5%	0.89
3 Minimum exposure of 30% (85%/100%)	9.2%	13.7%	0.45	26.6%	19.6%	1.33	329	220	-12.5%	13.0%	373	11.6%	9.3%	1.07
4 Fees charged to the floor (85%/100%)	9.6%	13.6%	0.48	19.1%	19.5%	0.90	275	227	-6.2%	10.6%	397	12.4%	10.9%	0.97
5 Conditional exposure recapture (85%/100%)[4]	11.4%	14.3%	0.60	25.9%	18.9%	1.33	348	235	-12.3%	11.0%	506	17.3%	13.9%	1.21
6 Combination <3-4-5> (85%/100%)	11.4%	14.7%	0.58	29.6%	19.4%	1.51	382	228	-15.8%	13.7%	508	18.1%	12.8%	1.33
7 Combination <3-4-5> leveraged (80%/150%)	15.6%	17.4%	0.76	41.8%	21.8%	2.00	601	334	-17.7%	13.7%	880	22.4%	17.2%	1.25
Short Term	3.7%			3.1%			135	152	4.0%		173	2.7%		

1) Base = 100 on 1 January 1993.
2) Management fee of 1% p.a and transaction fees.
3) For each CPPI-based approach, the information in parenthesis indicates the base level of the floor and of authorised exposure.
4) Conditional floor lowering : 3.5% at most of the initial investment value during the 1st year, 7% at the most on the previous year-end value of the investment during the following years.

[1] See Fisher Black & Robert Jones, Simplifying Portfolio Insurance, *Goldman Sachs Research Report, August 1986 and Journal of Portfolio Management, Fall 1987.*
[2] See A. Perold & W. Sharpe, Dynamic Strategies for Asset Allocation, *Financial Analysts Journal, January-February 1988.*

Table 2: simulated transactions volumes of different CPPI-based approaches on DAX®: 1993–2007

	1993–2007			01/01/97–07/03/00			08/03/00–12/03/03			13/03/03–31/12/07		
	Trades per week	# of contracts per trade[2]	per week[3]	Trades per week	# of contracts per trade[2]	per week[3]	Trades per week	# of contracts per trade[2]	per week[3]	Trades per week	# of contracts per trade[2]	per week[3]
1 <Pure> (90%/100%)	30	129	387	2.7	169	454	2.7	73	205	3.3	103	337
2 <Pure> (85%/100%)	27	99	263	3.2	113	362	3.7	52	147	2.2	97	215
3 Minimum exposure of 30% (85%/100%)	1.4	127	179	2.1	142	301	0.8	70	380	0.8	98	83
4 Fees charged to the floor (85%/100%)	26	107	276	3.2	119	381	3.8	59	149	2.0	116	229
5 Conditional exposure recapture (85%/100%)[4]	23	148	340	3.0	145	429	3.3	89	176	1.7	201	347
6 Combination <3-4-5> (85%/100%)	1.8	162	294	2.3	167	382	1.9	101	222	1.6	191	302
7 Combination <3-4-5> leveraged (80%/150%)	1.8	308	564	2.2	284	639	1.9	179	264	1.7	448	775

1) Average number of trades per week, quarterly rollovers not included.
2) Average number of DAX® Futures contracts (sold or bought) per trade for an initial investment amount of DEM 200 millions quarterly rollovers not included.
3) Average number of DAX® Futures contracts traded (sold or bought) per week for an initial investment amount of DEM 200 million, quarterly rollovers not included.

investment, ie, an absolute floor that can only be adjusted upwards.

Variant 2 also represents a 'pure' version, but with a floor level of 85 percent, which means smaller exposure adjustments (see table 2).

Although *variants 3 to 5* all have the same floor level of 85 percent, each of them integrates distinct elements that make them more reactive to the upside, while preserving their protective nature.

Variant 3, for instance, maintains a minimum level of exposure of 30 percent. Thus, even if the underlying asset falls in price, the exposure does not fall below this minimum, so the investment value can actually decline below the level reached by the floor. In this way one can switch from CPPI to a 'constant-mix', in which the floor becomes a 'soft floor'.

In *variant 4*, management and transaction fees are charged on the floor, meaning that the fees do not affect the exposure management.

In *variant 5*, we can lower the floor in order to recapture exposure when the underlying asset falls in price. These recaptures are based on a predefined additional annual risk budget and will depend on the evolution of the underlying. In this case, they are based on a statistical model that identifies extreme downside movements in DAX®.

The two remaining *variants, 6 and 7* combine the three elements described above. While variant 6 considers a base exposure of 100 percent, variant 7 introduces leverage with a base exposure of 150 percent, the exposure above 100 percent being taken through long positions in the futures market.

Long-term advantages
The period taken into account for the pro forma management covers the 15-year period from 1993 to 2007. This period is particularly illustrative of the differences between the various CPPI-based portfolio approaches, as it covers not only a major 'speculative' bubble (from 1997 to 2000), but also one of the most severe corrections experienced by equity markets, followed by one of the most spectacular rebounds.

Over the whole period DAX® has experienced an average return of 11.6 percent per annum. Variant 1 – the 'pure' version of 'dynamic ratchet' with a 90 percent floor – would have achieved a performance, net of fees, of 7.6 percent p.a. With an 85 percent floor, the average return with a 'pure' CPPI would have delivered a much improved return of 8.9 percent p.a. This result is interesting since it highlights the fact that, despite a lower initial level of protection, the implied lower cost of hedging makes it possible to raise the floor over time to a higher level. At the end of 2007, the floor was 213 percent above the initial investment in variant 2,

Table 3: simulated net performance of variants 2, 4, 6 and 7

Source : Dynagest S.A Geneva
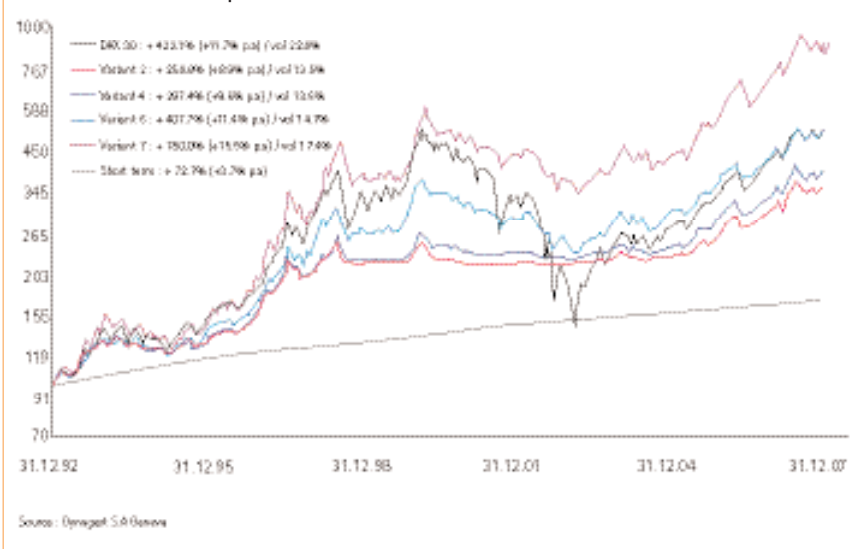
while it stood at 179 percent in variant 1.

The return could be further improved using one of the four other variants on a base level of 100 percent for the authorised exposure and 85 percent for the floor. Variant 4 is of particular interest, since by merit of having charged the fees on the floor, it was possible to increase the average annual return from 8.9 percent to 9.6 percent.

The best results, however, come when one conditionally increases the exposure as the price of the underlying falls. With variants 5 and 6 and a net annual return of 11.4 percent, it was possible to achieve a performance close to the underlying index, but with average volatilities of 14.3 percent and 14.7 percent respectively – significantly lower than the 22.6 percent of the index itself.

Finally, in variant 7, which has a base level of 150 percent for the authorised exposure and 80 percent for the floor, it was possible to generate a net out-performance of almost 400 basis points p.a., with a volatility of 17.4 percent, despite an average effective exposure of close to 100 percent.

Coping with a 'collapse' and a strong recovery

Analysing the two sub-periods that correspond to the stock market collapse from March 2000 to March 2003, and the strong recovery that ensued and continued until 2007, highlights several interesting points. First, the 'pure' versions provided the expected protection during the first sub-period. With an underlying index that lost almost 73 percent (35 percent p.a.) from the value reached on 7 March 2000, these two variants helped to limit the decline of the investment to 10 percent (3.4 percent p.a.) and 14.8 percent (5.2 percent p.a.) respectively.

During the ensuing recovery that saw DAX® increase by 226.2 percent (31 percent p.a.) from its value on 18 March 2003, the performance of the two 'pure' variants was limited by the fact that the exposure, which had been reduced to almost zero, needed quite some time before rebuilding to its base level of 100 percent. However, with average annual returns of 7.9 percent and 11.2 percent, the investments at the end of 2007 were significantly above the levels

reached on 7 March 2000 (29.5 percent and 41.6 percent higher, respectively), while the recovery in the index brought it back to its March 2003 peak level.

It should come as no surprise that the more reactive approaches – and particularly those that have conditional exposure recapture – offered less protection during the 'collapse'. In variants 5 and 6, investors would have lost 12.3 percent p.a. and 15.8 percent p.a. respectively, although in return they would have benefited from substantially higher returns during the recovery (17.3 percent p.a. and 18.1 percent p.a.). Such returns also made it possible to bring the value of the investment at the end of 2007, well above the levels reached on 7 March 2000 (45.3 percent and 32.8 percent above, respectively).

Finally, the leveraged variant proved to be the least protective during the 'collapse', even though it fell significantly less than the index. However, with a 163.6 percent (22.1 percent p.a.) net increase from 12 March 2003 to end of 2007, it would have also provided the best participation. When evaluating this participation (61.5 percent of the recovery of the underlying index), one has to bear in mind that the exposure in variant 7 was at its minimum level of 30 percent on 12 March 2003. From the end of 2003 to end of 2007, the participation rate increased almost to 100 percent, giving a net average annual return of 19.2 percent, 0.2 percent, below the return of DAX®.

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Dynagest SA

Dynagest is a specialist in interest rate management and portfolio insurance. Established in 1993, Dynagest is a joint-stock company with a capital of CHF 1 million. Banque Cantonale Vaudoise, Lausanne, acquired 15 percent of the company's share capital in 2005. Dynagest operates in two fields: fixed income advisory services and management, and quantitative management. It offers services to banks, pension funds, independent portfolio managers, insurance companies, foundations and high net worth individuals.

Dr René Sieber

René is a founding manager of Dynagest and member of the Board of Directors. From 1987 to 1993 he worked for Banque Unigestion, Geneva, where he was responsible for macroeconomic analysis and fixed income investment strategy. He headed the Institutional Accounts Department from 1990 and was appointed assistant manager in 1991. He has been a lecturer in finance at the Geneva University since 1988 and has also taught at the Training Center for Investment Professionals, Switzerland (TCIP) since 1991. René holds a doctorate in economics from Geneva University and has been a Visiting Scholar at the Massachusetts Institute of Technology.