EQUITY COLLAR FOR SCR/ RISK MANAGEMENT

Not only for Solvency II investors

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% DPAM

DEGROOF PETERCAM **ASSET MANAGEMENT**

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2 WHAT?

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1 WHY?

EQUITY INVESTING FOR INSURERS

Solvency 2 imposes a significant capital requirement for investing in equities, equivalent to a 99.5% Value-at-Risk (VaR):

- On average 39% for equities listed on regulated market in OECD/EEA, but fluctuating
- Countercyclical symmetrical adjustment (+/- 10%) dependent on recent market trend
- Additional capital requirement if equities not denominated in EUR and/or listed elsewhere.

Solvency Capital Requirement for investing in OECD Equities

Source: EIOPA, 30/04/2021

OBJECTIVE

IMPROVE THE RELATIONSHIP BETWEEN RETURNS AND THE CAPITAL REQUIREMENT

➢ **Improve the expected return relative to the capital requirement** for an insurer…

- … who already invests in equities:
  - *The capital requirement can be reduced by substituting a part of the equity portfolio with hedged equities.*
  - *Holding the capital requirement stable, an insurer can increase its investment portfolio, by investing more in hedged equities versus unhedged equities.*

- … who currently does not invest in equities:
  - *By substituting e.g. a part of the bond portfolio with hedged equities, the expected return can be increased while the associated increase in capital requirement for investing in equities is tempered by the hedge.*

➢ **Gain access to DPAM's well established expertise in equity investing** in a capital requirement- efficient way.

2

WHAT?

Equity collar

SCR calculation

Return and risk

CAPITAL REQUIREMENT REDUCED VIA HEDGING

Lowering an equities' exposure VaR via hedging reduces the Solvency Capital Requirement (SCR). In a VaR shock, long puts rise significantly in value and short calls become virtually worthless. Both effects decrease the VaR and thus decrease the SCR of an equity collar.

The VaR reduction from hedging can be taken into account to reduce the SCR, provided that:
- hedging is systematic and documented
- a close relationship between the underlying investment and the basis for hedging can be demonstrated
- the hedging instrument's maturity exceeds one year. If it's shorter, its SCR impact is recognized pro rata temporis.

The solution is to systematically purchase puts to hedge the equity portfolio. Simultaneous call overwriting, contributes to financing the purchase of protection, i.e. we focus on collars.
- Focus on listed options –so there is no additional counterparty risk SCR.
- Focus on EUR denominated stocks –so there is no additional currency risk SCR.

COLLAR CONFIGURATION

General collar configuration:

- Buy long-term protection and sell short-term upside to take advantage of relative expensiveness of short term options vs. long term options.
- Target an average delta that is sufficiently large to capture (part of) the equity risk premium.

The varying exposure to the underlying portfolio –in other words the volatility in the delta- is an attention point for option strategies.

DPAM's solution is built to **MINIMIZE THE DELTA VARIABILITY**, via:

- **Frequent option rolling** smoothening arbitrary choice of rebalancing dates.
- Options entering the portfolio with **a fixed delta**, instead of with a fixed moneyness.
- Keeping **only long dated put options**.
- **Call roll strategy** smoothening the delta.

IMPROVED RETURN / CAPITAL REQUIREMENT

Returns	MSCI EMU	MSCI EMU - Fixed Delta	DPAM Euroland - Fixed Delta
2006	7.77%	5.89%	7.47%
2007	7.88%	7.21%	8.43%
2008	-44.85%	-19.54%	-19.00%
2009	27.27%	17.28%	13.99%
2010	2.85%	5.16%	15.99%
2011	-15.28%	-6.17%	-2.06%
2012	18.96%	8.74%	14.54%
2013	23.45%	12.44%	13.18%
2014	4.24%	3.99%	-0.93%
2015	10.76%	4.51%	11.54%
2016	3.75%	3.56%	4.16%
2017	12.63%	8.20%	14.84%
2018	-13.23%	-7.99%	-6.90%
2019	26.34%	10.51%	15.99%
2020	-0.64%	-0.41%	7.97%
2021	21.70%	13.57%	17.38%
2022	-10.79%	-5.81%	-7.58%
Total	66.6%	70.5%	165.0%
Post '09	104.1%	59.1%	146.2%

Ret / SCR	MSCI EMU	MSCI EMU - Fixed Delta	DPAM Euroland - Fixed Delta
Total	0.09	0.22	0.41
Post '09	0.16	0.24	0.47

Simulation Gross of fees 02/10/06 – 13/04/22
Source: DPAM, 21/04/2022

PAST PERFORMANCE DOES NOT PREDICT FUTURE RETURNS

CUSTOMIZATION / STRUCTURE

➢ The solution can be **tailored**, both in terms of underlying DPAM equity investment strategy as in terms of collar specification. Additional simulations and analytics can be provided.

➢ The solution can be implemented through e.g., a (new) **UCITS and/or in a mandate**.

SCR CALCULATION

The SCR is calculated in the following way:

$$SCR_{t,collar} = 100\% - \frac{Ptf_{t,shocked}}{Ptf_t}$$

$$PTF_{t,shocked} = Eqty_t * \left(1 - SCR_{t,eqty}\right) + Put_{t,shocked} - \left(Call_t - \overline{TTM}_{Call_t}\left(Call_t - Call_{t,shocked}\right)\right)$$

$Eqty_t$: Equity part of the portfolio at time t

$SCR_{t,eqty}$: Equity SCR at time t

$Put_{t,shocked}$: Value of puts in portfolio, assuming the price index for the puts' underlying declines with the $SCR_{t,eqty}$ and holding other parameters in the Black & Scholes formula stable.

Puts get full SCR recognition as they have a maturity longer than 12m.

$\overline{TTM}_{Call_t}$ Average time-to-maturity of calls in the portfolio at time t, expressed in years.

$Call_t$: Value of short calls in portfolio at time t

$Call_{t,shocked}$: Value of calls in portfolio, assuming the price index for the calls' underlying declines with the $SCR_{t,eqty}$ and holding other parameters in the Black & Scholes formula stable. In practice virtually zero.

Source: DPAM, 22/01/2022

3 HOW?

EQUITY COLLAR – CONFIGURATION

To immunize arbitrary choice of the rebalancing date, option positions are frequently rebalanced.

▪ Roll 1/24 of put options, each week
  - Buy puts expiring at the expiration date at the 4th next semester end.
    Puts have an initial maturity between 24 and 18m.
    All the puts have a maturity above one year, so they get full SCR recognition.

  - Sell puts expiring at the 3rd next semester end.
    The remaining maturity for the sold puts is between 18 and 12m. They are thus kept for half a year in the portfolio.
    Via selling them early, the portfolio holds only long-dated puts. This reduces the delta variability.

▪ Roll 1/8 of call options, each month
  - Sell calls expiring at the 3rd next month end
  - Buy the calls expiring at the next month end
    As a consequence, short calls are kept on average two months in the portfolio.

Example Weekly rebalancing with semi-annual puts and monthly calls

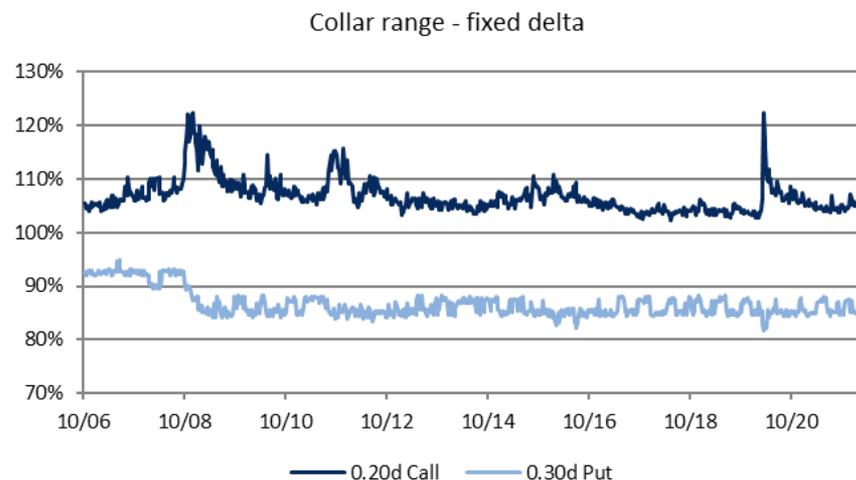|	Expiration date of bought put	Expiration date of put sold	Expiration date of sold call	Expiration date of bought call
18/05/20	17/12/21	18/06/21	21/08/20	19/06/20
25/05/20	17/12/21	18/06/21	21/08/20	19/06/20
02/06/20	17/12/21	18/06/21	21/08/20	19/06/20
08/06/20	17/12/21	18/06/21	21/08/20	19/06/20
22/06/20	17/06/22	17/12/21	18/09/20	17/07/20
29/06/20	17/06/22	17/12/21	18/09/20	17/07/20
06/07/20	17/06/22	17/12/21	18/09/20	17/07/20
13/07/20	17/06/22	17/12/21	18/09/20	17/07/20
20/07/20	17/06/22	17/12/21	16/10/20	21/08/20
27/07/20	17/06/22	17/12/21	16/10/20	21/08/20
03/08/20	17/06/22	17/12/21	16/10/20	21/08/20
10/08/20	17/06/22	17/12/21	16/10/20	21/08/20
24/08/20	17/06/22	17/12/21	20/11/20	18/09/20

Source: DPAM, 22/01/2022

FIXED MONEYNESS VS. DELTA **– CONFIGURATION**

We investigate both collars with a fixed moneyness and a fixed delta on rebalancing dates:

- Fixed moneyness: 85% puts / 107.5% calls
- Fixed delta: 0.30d puts / 0.20d calls

The moneyness for the two legs of the fixed delta collar can be found in the chart below.
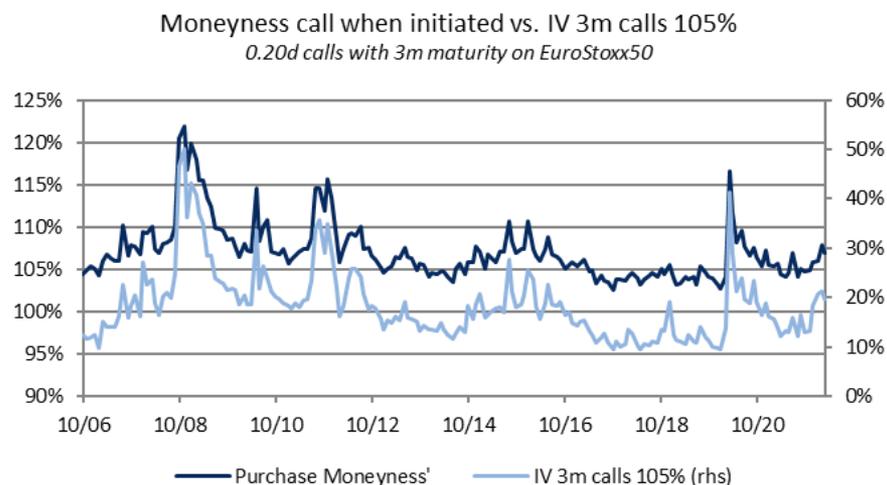
DPAM B Equities Euroland before fees is used as underlying for the equity collar.

Collar range - fixed delta

Source: DPAM, 13/04/2022

PAST PERFORMANCE DOES NOT PREDICT FUTURE RETURNS

FIXED MONEYNESS VS. DELTA **– COLLAR RANGE**

The collar's range broadens during volatile times and vice versa.

The chart below shows that the call options' moneyness increases whenever its implied volatility increases.
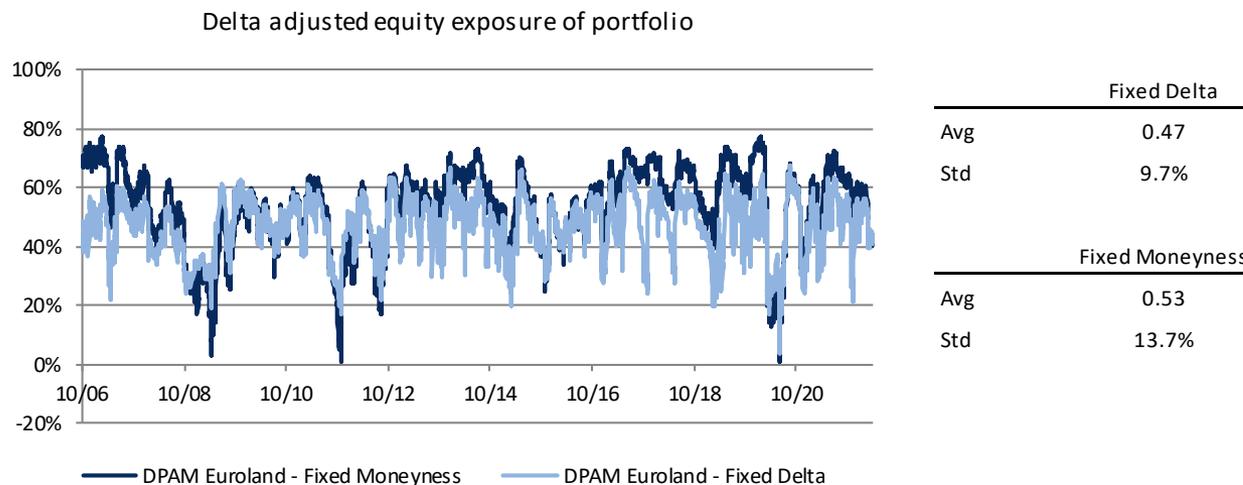

Moneyness call when initiated vs. IV 3m calls 105%
0.20d calls with 3m maturity on EuroStoxx50

Source: DPAM, 21/04/2022

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FIXED MONEYNESS VS. DELTA **– EQUITY EXPOSURE**

As expected, the <u>fixed delta exposure has a more stable equity exposure </u>through time.

While the fixed moneyness collar seems to have a less volatile exposure towards the end of the simulation period, it is actually residing further from its average, thereby increasing its standard deviation.

Delta adjusted equity exposure of portfolio

— DPAM Euroland - Fixed Moneyness   — DPAM Euroland - Fixed Delta

	Fixed Delta
Avg	0.47
Std	9.7%

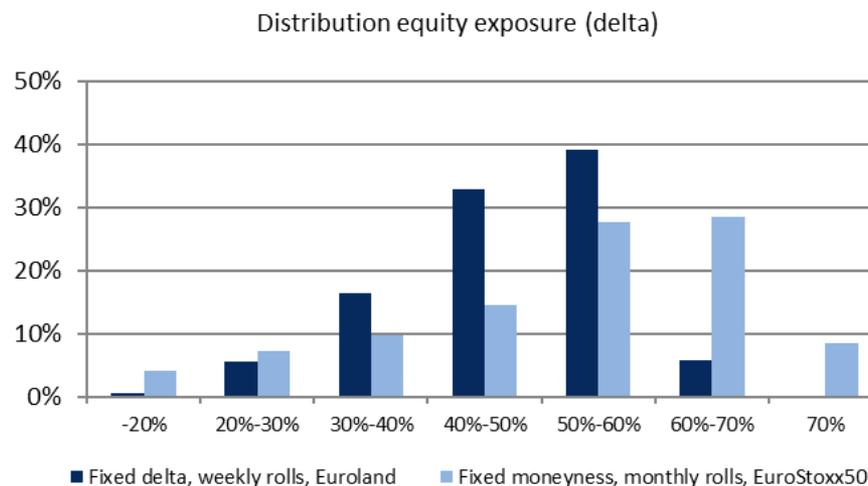|	Fixed Moneyness
Avg	0.53
Std	13.7%

Source: DPAM, 21/04/2022

FIXED MONEYNESS VS. DELTA **– EQUITY EXPOSURE**

As expected, the <u>fixed delta exposure has a more stable equity exposure</u> through time.

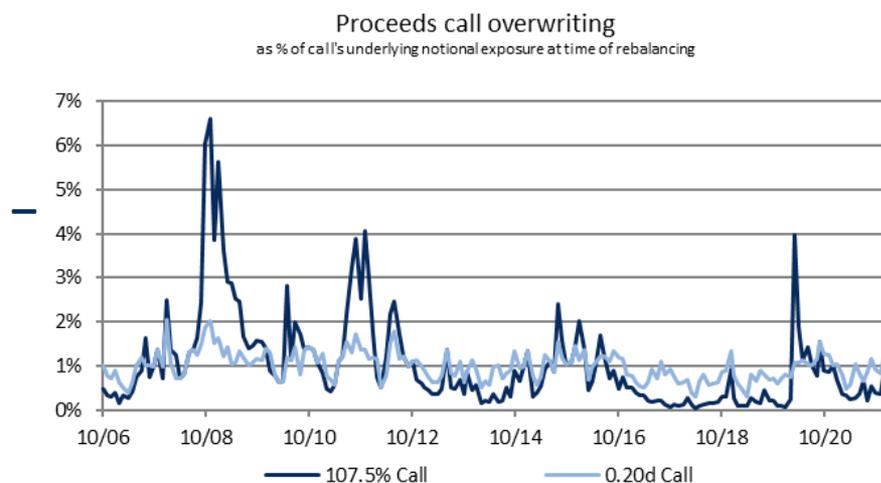Frequent rebalancing improves the stability of the delta exposure.

Equity exposure is more concentrated around the mean:
- ***71.8% of the time between 40%-60%*** *for the weekly rolled fixed delta collar.*
- *42.1% of the time between 40%-60% for the monthly rolled fixed moneyness collar.*

Distribution equity exposure (delta)

■ Fixed delta, weekly rolls, Euroland   ■ Fixed moneyness, monthly rolls, EuroStoxx50

Source: DPAM, 21/04/2022

FIXED MONEYNESS VS. DELTA **– OPTIONS' PREMIA**

As expected, the fixed delta collar has a more stable collar roll cost. In particular the proceeds for call overwriting are much more stable.

Proceeds call overwriting
as % of call's underlying notional exposure at time of rebalancing

Legend: 107.5% Call | 0.20d Call
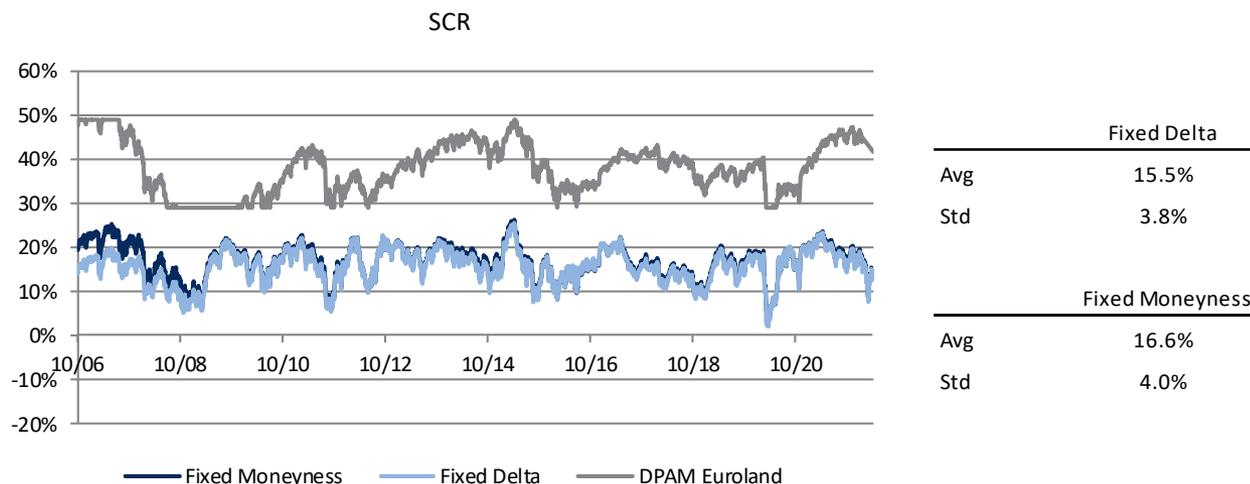
Source: DPAM, 21/04/2022

SCR EQUITY COLLAR

Systemic hedging significantly reduces the SCR.

The SCR varies through time, influenced mainly by the equity SCR and the moneyness of the puts that are held.

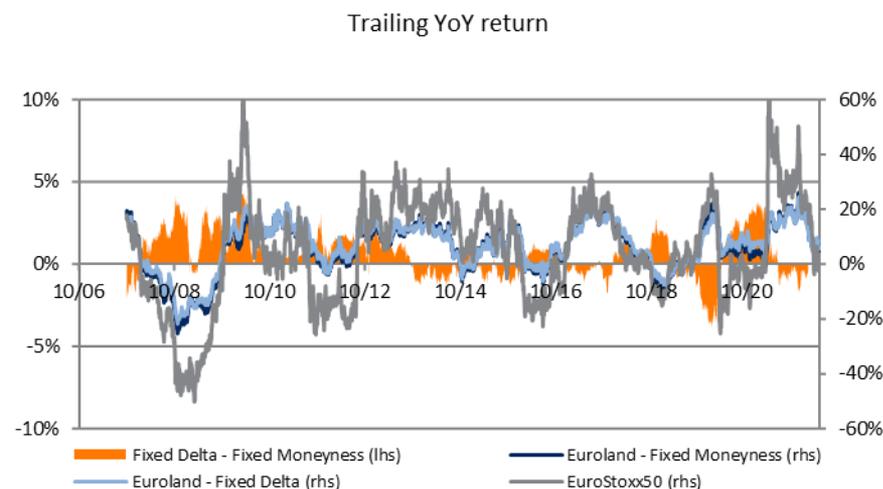The fixed moneyness and fixed delta collar's SCR is similar.
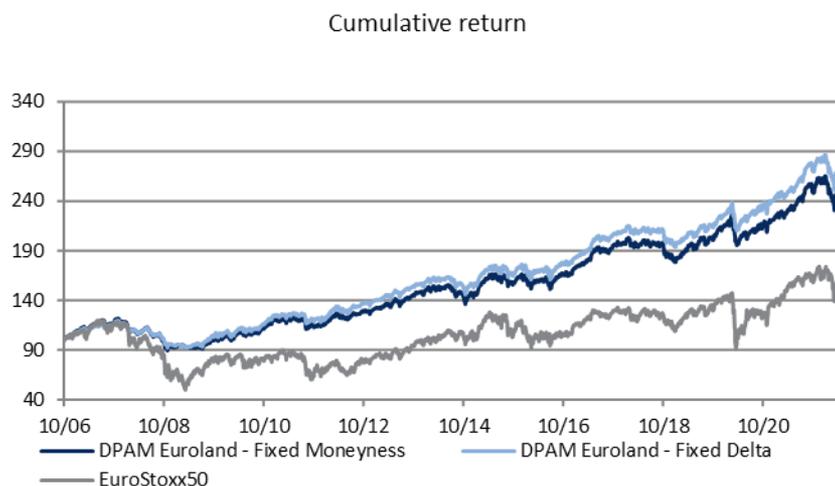
SCR

	Fixed Delta
Avg	15.5%
Std	3.8%

	Fixed Moneyness
Avg	16.6%
Std	4.0%

Source: DPAM, 21/04/2022

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RETURN

- The equity collars had higher returns than the equity market over the period.
- Effective downside protection.
- Fixed delta collar regularly outperforms fixed moneyness collar, but not in 2019 due to strongly increasing equity markets and a lower moneyness for the fixed delta calls then.

Cumulative return

Trailing YoY return

Source: DPAM, 21/04/2022

PAST PERFORMANCE DOES NOT PREDICT FUTURE RETURNS

CALENDAR YEAR RETURNS AND RETURN / SCR

Returns	EuroStoxx50	MSCI EMU	DPAM Euroland - Fixed Moneyness	DPAM Euroland - Fixed Delta
2006	6.14%	7.77%	8.31%	7.47%
2007	9.72%	7.88%	9.35%	8.43%
2008	-42.37%	-44.85%	-21.68%	-19.00%
2009	25.51%	27.27%	11.93%	13.99%
2010	-2.36%	2.85%	15.72%	15.99%
2011	-14.54%	-15.28%	-2.70%	-2.06%
2012	17.65%	18.96%	12.68%	14.54%
2013	21.61%	23.45%	14.08%	13.18%
2014	3.93%	4.24%	-1.91%	-0.93%
2015	7.44%	10.76%	11.91%	11.54%
2016	3.07%	3.75%	4.53%	4.16%
2017	9.15%	12.63%	14.06%	14.84%
2018	-12.46%	-13.23%	-8.66%	-6.90%
2019	28.96%	26.34%	19.55%	15.99%
2020	-2.78%	-0.64%	4.51%	7.97%
2021	22.91%	21.70%	18.12%	17.38%
2022	-10.74%	-10.79%	-8.14%	-7.58%
Total	52.1%	66.6%	143.5%	165.0%
Post '09	80.6%	104.1%	134.6%	146.2%

Ret / SCR	EuroStoxx50	MSCI EMU	DPAM Euroland - Fixed Moneyness	DPAM Euroland - Fixed Delta
Total	0.07	0.09	0.35	0.41
Post '09	0.13	0.16	0.43	0.47

The return/SCR improvement also manifests itself after the GFC.

Simulation gross of fees 02/10/06 – 13/04/22
Source: DPAM, 21/04/2022

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RETURN AND VOLATILITY

- Sharpe ratio improvement is evident.

Return and volatility - EMU equities and collar
2/10/2006 - 13/04/2022

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Simulation gross of fees 02/10/06 – 13/04/22
Source: DPAM, 21/04/2022

PAST PERFORMANCE DOES NOT PREDICT FUTURE RETURNS
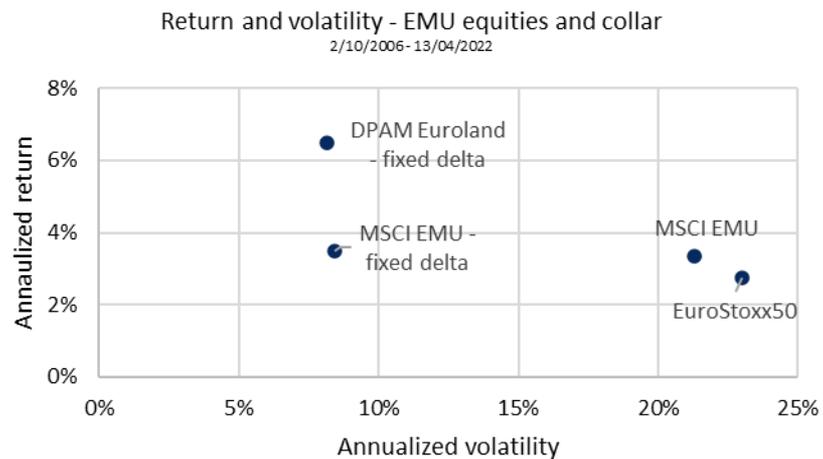
VOLATILITY

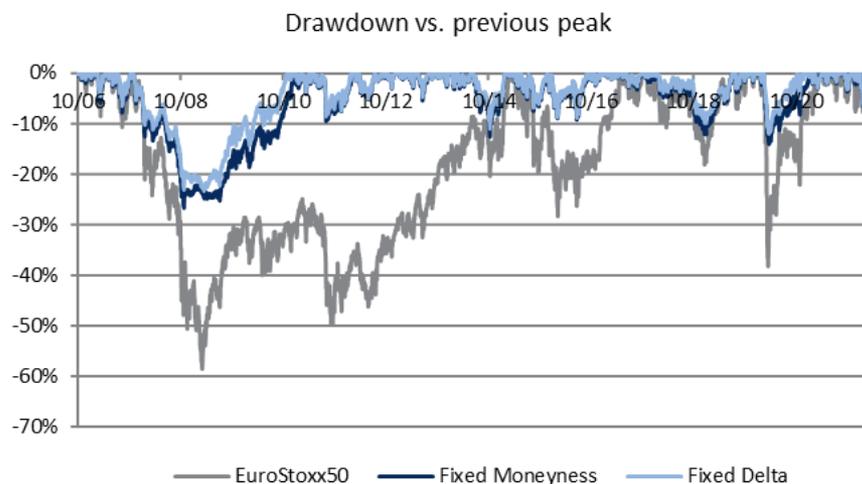- Stable volatility for collars versus significantly fluctuating volatility for equities.
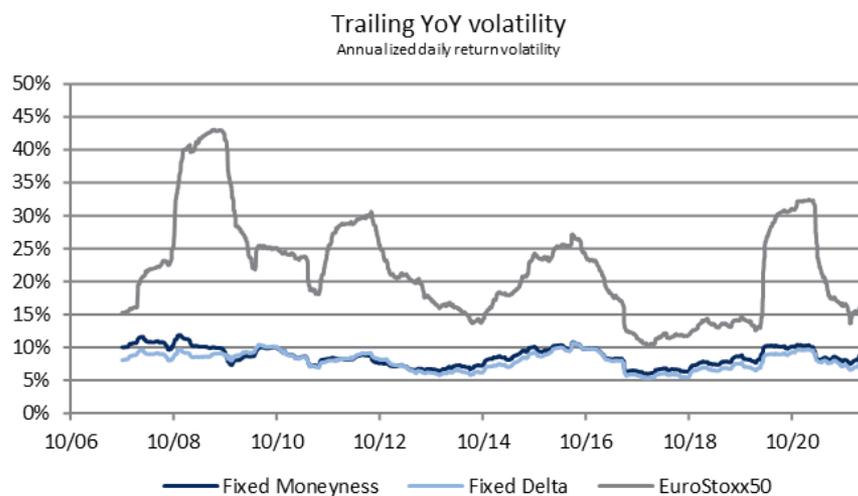
Source: DPAM, 21/04/2022

DRAWDOWN

- Maximum drawdown respectively of ca. -25% and -59% for collars and EuroStoxx50.

- MDD for fixed delta lower than for fixed moneyness collar (-23.3% vs. -27%).
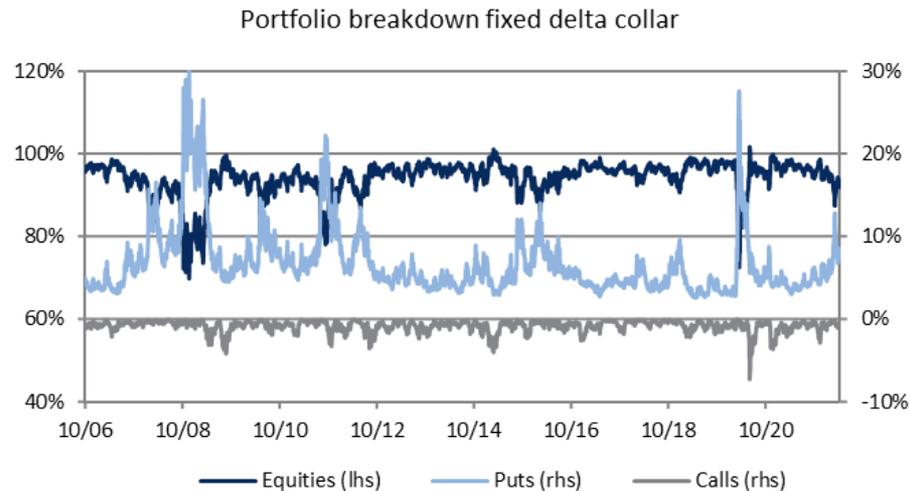
- Faster recovery time for collars

Drawdown vs. previous peak

EuroStoxx50　　Fixed Moneyness　　Fixed Delta

Source: DPAM, 21/04/2022

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PORTFOLIO **BREAKDOWN**

- Equity positioning mostly a bit below 100% of portfolio, but declining substantially during significant market corrections, with the puts gaining value then.

Portfolio breakdown fixed delta collar

Equities (lhs)   Puts (rhs)   Calls (rhs)

Source: DPAM, 21/04/2022

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SUMMARY **STATISTICS**

	MSCI EMU	Fixed delta collar
Return (cum.)	66.6%	165%
Return (ann.)	3.3%	6.5%
Volatility	21.3%	8.1%
MDD	60.1%	23.3%
Recovery time (yr)	5.96	1.63
SCR	38.0%	15.7%
Ann. Ret / Avg SCR	0.09	0.41
Avg Delta PTF	1	0.47
Avg mnn call at incept.	-	107%
Avg mnn put at incept.	-	87%
% of times Call closed in-the-money	-	17.8%
% of times Put closed in-the-money	-	14.5%
Avg moneyness when Call closed in-the-money	-	97.2%
Avg moneyness when Put closed in-the-money		115.7%

Simulation with DPAM B EQUITIES Euroland gross of fees as underlying, 02/10/06 – 13/04/22

Source: DPAM, 30/04/2022

PAST PERFORMANCE DOES NOT PREDICT FUTURE RETURNS

STRATEGY **RISKS / BENEFITS**

Strategy risks

- **Equity market** performance

- The choice of the options' initial **delta**.

- Returns are equity market **path-dependent**.

- Underlying investment strategy's **equity factor exposure,** responsible for **basis risk**.

- **Changes in implied volatility** influence option prices.

Strategy benefits

- Capture part of **the equity risk premium** in a …

- **… risk-controlled** way, reducing the VaR.

- **Delta variability is reduced** by design.

- Underlying equity strategy can be **tailored**, allowing to **capture the alpha**.

- Listed options increase option pricing **transparency** vs. OTC options.

CONCLUSION

WHY?

- **Improve the return / capital requirement ratio via systemic hedging**
- **Gain access to DPAM's well established expertise in equity investing** in a capital requirement-efficient way.

WHAT?

- DPAM's unique solution focuses on **reducing the variability of the equity exposure.**
- **Listed options** eliminate counterparty risk and increase transparency.
- The solution can be offered through e.g., **a mandate, UCITS,…**
- **Customization** is possible.

HOW?

The following contributes to a reduction in the equity exposure variability:

- Frequent option rolling
- Options entering the portfolio with a fixed delta, instead of with a fixed moneyness.
    - *Collar range broadens when volatility increases and v.v..*
    - *More stable net collar cost.*
- Use of long dated put options.
- Call roll strategy.

4 APPENDIX

23 June 2022
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CARL VAN NIEUWERBURGH, CFA

Quantitative Equity Strategist – Fund manager

21 Years of Experience

2021
DPAM: *Quantitative Equity Strategist - Fund Manager*

2015 / 2016
Degroof FMC / DPAM: *Head of Asymmetric Management - Fund manager*

2011
Degroof FMC: *Head of Quantitative Research – Fund manager*

2007
Degroof FMC: *Fund manager*

2004
Degroof IAM: *Quantitative analyst*

2001
The Capital Markets Company: *Business consultant*

Education
University UAMS: *Master in Banking*
University of Antwerp (Belgium): *Master in Commercial Engineering, Finance*

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