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Retailisation in the EU

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Executive Summary

Retailisation in the EU

Over the last few years, the sale of complex products to retail investors, generally referred to as 'retailisation', has increased in Europe. The growth of this market can have implications in terms of financial stability as well as investor protection, and has, therefore, been subject to important policy initiatives, such as the European Commission proposed Regulation on Packaged Retail Investment Products (PRIPs), as well as ESMA measures in the area of UCITS (such as the Guidelines ETFs and other UCITS issues) and MiFID (such as the technical advice to the Commission as part of the MiFID review, the Q&A on complex and non complex financial instruments for the purposes of MiFID's appropriateness requirements, and the Guidelines on suitability), and informs on-going work.

This report focuses on two subsets of this market: UCITS pursuing alternative investment strategies ('alternative UCITS') and structured products targeted to retail investors. Those two classes of products are particularly relevant given the sharp increase in Assets under Management (AuM) and given the size of the structured products market. Indeed, alternative UCITS have experienced a significant growth since 2007, with a 325% increase in Assets under Management from EUR 20bn to EUR 85bn at end-2012. The volumes of structured products sold to retail investors decreased from a peak of EUR 250bn in 2007 to around EUR 110bn in 2012, but outstanding amounts account for around EUR 770bn at end-2012.

Notwithstanding the potential benefits brought by these products, trends linked to retailisation have been closely monitored by securities markets supervisors as it could increase risks for the financial system. From a consumer protection perspective, retail investors may face difficulties in understanding the drivers of risks and returns of complex products. As a result, it might be particularly challenging for investors to make proper investment decisions. If retail investors do not properly understand the risk and reward profile of complex products, unexpected losses might lead to complaints, reputational risks for issuers and a loss of confidence in the regulatory framework and, more broadly, in financial markets. From an issuer's perspective, complex products targeted at retail investors may be used to generate profits through fees and may also provide an alternative source of funding.

Alternative UCITS

The strategies implemented by some alternative UCITS might not be easy to determine, and, therefore their comparison to a proper benchmark might be challenging for retail investors. An empirical analysis of the performance of alternative UCITS shows that between 2006 and 2012, average returns were 3% on average for a sample of around 600 funds. However, the volatility of these returns was high, especially during the 2007 to 2008 financial crisis and to a lesser extent in 2010-2011. As a result, risk-adjusted returns, measured by Sharpe ratios, were close to zero, except when computed over the last five years. Those results are robust to the type of strategies implemented by these funds.

In comparison with non-UCITS hedge funds, alternative UCITS provide lower returns, but expose investors to lower volatility and expected losses during downturns. When alternative UCITS are compared to traditional mutual funds, proxied by equity and bond indices, the risk-adjusted returns are higher for the latter, especially for bond indices. However, since mid-2009, the conditional Value-at-Risk has been lower for alternative UCITS, suggesting that investors in those funds are less exposed to losses when markets are bearish.

Structured products

Empirical evidence provided in this report shows that understanding the risk and reward profile of structured products is not straightforward and requires substantial financial expertise and access to market data. In particular, the payoff structure, intrinsic value and expected returns of structured products might be difficult to assess. Given that retail investors may not possess the expertise needed to assess the drivers of

the performance of structured products, they could be at risk of facing unexpected losses. In particular, the analysis of the issuer credit risk embedded in structured product may be particularly challenging.

Based on a sample of 76 products sold in the EU, the analysis performed in this report finds that structured products are sold to retail investors with a significant issuance premium, estimated at around 4.6% of the notional value. Moreover, when the issuer credit risk is included, the average premium increases to 5.5%. While these results are in line with findings in existing academic papers, one of the limitations of the approach is linked to the small size of the sample compared to the overall number of structured products sold to retail investors.

Furthermore, an ex-post analysis of a sample of around 2,750 products shows that the performance of structured products with at least 100% capital protection has been relatively low when compared to a risk-free investment. While the financial crisis of 2007-2008 and the European sovereign crisis have certainly played a role, this low performance of structured products has been qualitatively robust across different time periods.

Given the difficulties that investors may face in understanding structured products, it is important to ensure that appropriate information regarding the characteristics of each product is provided to retail investors. In particular, the information disclosure to retail investors may be improved by including (i) a higher degree of transparency regarding the total costs of structured products, including the implicit costs that are embedded in the selling price and (ii) detailed information regarding the specific risks of each product, in particular the issuer credit risk, and its possible quantification.

Alternative UCITS: Risk and returns for retail investors

Scope and risks linked to alternative UCITS in Europe

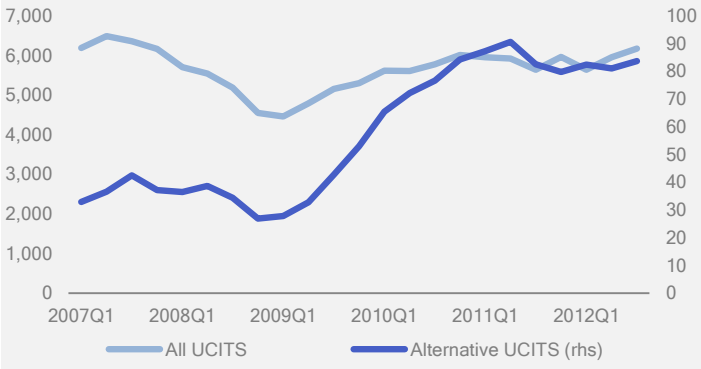
Background

Over the last years, the development of UCITS[1] pursuing alternative investment strategies ('alternative UCITS' here), i.e. UCITS that implement complex, hedge-fund like strategies, has been a significant trend in Europe. From a consumer protection perspective, such development can present risks: i) Retail investors may not be able to understand the strategy followed by the fund and iii) retail investors may not be able to understand the source of risks and rewards attached to it such as leverage and use of derivatives. This study aims at assessing the risk-return profile of alternative UCITS and comparing it to different benchmarks.

The market for alternative UCITS

At the end of 2012, UCITS assets amounted to EUR 6,29tn according to EFAMA[2], while assets managed by other funds amounted to EUR 2,5tn. UCITS accounted for around 70% of total assets of European funds. As shown in Chart C.01, alternative UCITS represent a small part of the UCITS industry with EUR 85bn end- 2012. In relative terms, while the size of the overall UCITS industry has remained stable between 2007Q4 and 2012Q4, alternative UCITS have experienced a considerable growth (+325%), resulting in an increase in their share of the overall UCITS industry from 0.5% to 1.5%. According to estimates by SEI, a provider of investment services, 40% of flows into long-term actively managed UCITS in 2011 were into alternative UCITS[3].

Assets under Management of UCITS C.01



Note: Assets under Mangement of UCITS, EUR bn.
Sources: Bloomberg, EFAMA, ESMA.

Methodology used to map UCITS alternative funds

Definition of alternative funds

As there is no generally agreed definition of an alternative UCITS, several approaches could be used to establish a sample of alternative UCITS in Europe.

The first approach relies on the use of derivatives as a proxy for complexity and sophistication: A fund that uses derivatives or takes short positions is deemed alternative[4]. However, from a practical point of view, such an approach requires granular data on funds, which are not readily available. Moreover, from a conceptual point of view, 'simple' funds may use simple derivatives, such as futures, as a hedging tool and should not, therefore, be included in the sample.

A second approach defines alternative UCITS as funds that employ a high level of leverage. According to Directive 2009/65/EC, the global exposure of UCITS must not exceed the value of the assets. To calculate their global exposure, UCITS can use two methods which are the Commitment Approach and the Value-at-Risk (VaR). The Commitment Approach consists in calculating the leverage of the portfolio reached through the use of financial derivative instruments and efficient portfolio management techniques. It is based upon the conversion of the positions into the market value of their equivalent positions in the underlying assets. The resulting leverage is limited to the total net asset value of the portfolio (leverage limited to two). Under the VaR approach, the UCITS has, at any time, to stay within the limit of a maximum expected loss, defined by the Value-at-Risk, but there is no strict limit on the level of leverage. As a result this approach could not be employed in the study.

Therefore, a third approach has been used. It defines alternative UCITS as funds that implement alternative, hedge-fund strategies such as long/short. Given that there is no unique classification of hedge funds strategies, several classifications have been used, based on the ones used by hedge fund data providers. Specifically, the following databases have been used: Eurekahedge, Lipper TASS, Mondohedge and Bloomberg. Some strategies that were not considered complex (such as fundamental and long only) were excluded.

Definition of retail funds

According to the UCITS Directive 2009/65/EC, UCITS can be marketed across EU Member States to retail investors. However, some UCITS aim at being marketed to high net worth individuals as indicated by high minimum investment. However, high net worth individuals have

[1] UCITS are Undertakings for Collective Investment in Transferable Securities.
[2] See "EFAMA European quarterly statistics, Q4 2012".
[3] See "Regulated Alternative Funds: The New Conventional", January 2012.
[4] For example, Alix Capital, a commercial data provider on alternative UCITS, uses three criteria for including an UCITS in its indices: i) the fund should seek absolute performance, ii) the fund has short positions and iii) the fund charges performance fees.

been excluded from this study, as they may tend to have a sufficient knowledge of finance or receive advice from professionals, unlike other retail investors. In order to obtain an objective criterion for distinguishing between high net worth individuals and other retail investors, a threshold for minimum investment in the fund equal to EUR 50,000 has been chosen[5]. A potential limit is that UCITS are not required to impose a minimum subscription; therefore some UCITS in the sample may target institutional investors rather than retail investors. Unfortunately, no information is available on the proportion of holding of such funds in the portfolios of retail investors and by professional investors.

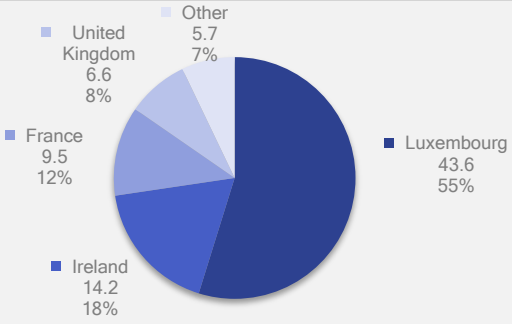
UCITS in the sample are, therefore, required to fulfil two criteria:

1. The fund implements a hedge fund-like strategy
2. The minimum investment is less or equal to EUR 50,000.

Description of the sample of alternative UCITS

The sample is composed of 623 UCITS funds[6], with AuM of EUR 85bn as of December 2012. In terms of Assets under Management (AuM), the funds are mainly domiciled in Luxembourg (55%), Ireland (18%) and France (12%). Regarding the strategies, long/short equity funds account for around 40% of the funds, followed by fixed income (10%) and bottom up (9%).

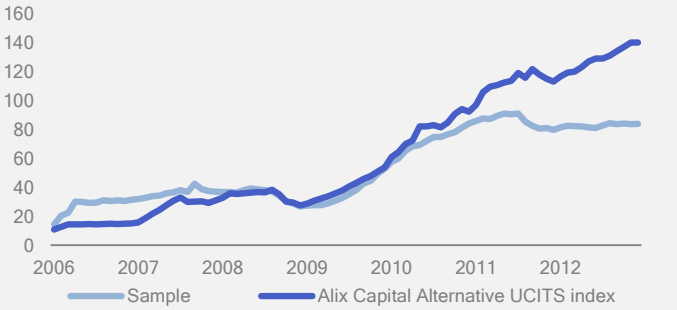
Assets under management by country C.02



Note: AuM by country, in EUR bn and share in %.
Sources: Bloomberg, ESMA.

Over the last few years, alternative UCITS have experienced considerable growth: From around EUR 20 bn in AuM in January 2007 to a peak of EUR 90bn in August 2011 (+325%). The number of alternative UCITS soared from around 100 in 2006 to more than 620 at end-2012. The fund data used in the sample seem to be broadly representative of the industry as it is relatively close to the figures computed by Alix Capital for their alternative UCITS indices, even though some significant differences can be observed in 2011-2012.

Assets under Management of alternative UCITS C.03



Note: Assets under Management of Alterrnative UCITS, EUR bn.
Sources: Bloomberg, Alix Capital, ESMA.

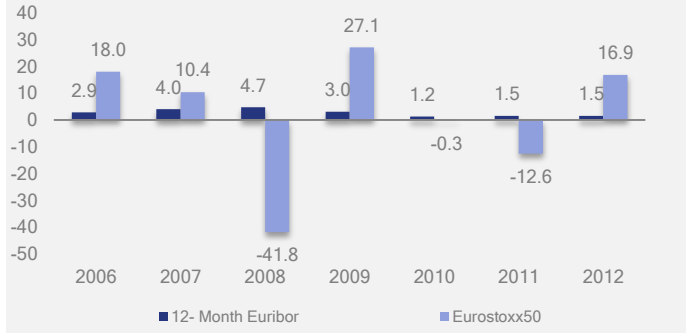
An analysis of actual returns of alternative UCITS

While retail investors may not be able to understand the drivers of risks and rewards of alternative UCITS, they may use historical data in order to assess the past performance of such funds. Therefore, an analysis of actual ex post returns can provide insights on the rewards linked to an investment into these types of funds. One drawback of this approach is that the sample period is limited to seven years of data. Another limit of this approach is that the time period includes two crises: the 2007-2008 financial crisis and the 2010-2011 European sovereign crisis. Therefore, it is crucial to compare the performance of the funds to several benchmarks to assess the robustness of the findings.

Market conditions during the time period

As shown below, in 2008 and 2011, returns of the Eurostoxx 50 index have been significantly lower than the risk-free rate, proxied by the twelve-month Euribor rate.

Performance of benchmarks during the observation period C.04



Note: Annual return of the Eurostoxx50 and the 12-Month Euribor rate.
Sources: Thomson Reuters Datastream, ESMA.

This underperformance needs to be kept in mind in the following to assess the performance of alternative UCITS and other mutual funds in comparison with the risk-free rate. Essentially, the sample period used in the report can be considered as very specific given the occurrence of two financial crises.

[5] Changing this threshold, e.g. to EUR 100,000, does not affect the qualitative conclusions of this study.
[6] The database used includes dead and merged funds which mitigates the survivorship bias that some hedge fund databases may have.

Gross returns

Based on the sample, unweighted average annual returns[7] have been computed over the last seven years. As shown in Table T.01, yearly returns have been very volatile over the last seven years, ranging from -16% in 2008 to +19% in 2009. Similar results are obtained for median returns. On average, the annual return was 3%, while the median return was 1.5%. This is explained by the wide dispersion of returns among funds, as the top 25% outperformed the bottom 25% by 14 percentage points on average. The average return on alternative UCITS has been slightly higher than the return on the Eurostoxx 50 and the 12-month Euribor over 2006-2012.

Performance of alternative UCITS T.01

Market	06	07	08	09	10	11	12	Average
Average return	8.9	4.8	-15.8	19.3	5.5	-7.0	5.3	3.0
Median return	6.4	3.5	-11.7	9.8	3.7	-5.2	4.0	1.5
Total AuM (EUR bn, December)	23.6	33.1	25.5	52.1	83.5	79.5	83.8	
Number of funds	102	140	191	250	388	472	623	
Eurostoxx 50 index total return	18	10.4	-41.8	27.1	-0.3	-12.6	16.9	2.5
12-Month Euribor	2.9	4.0	4.7	3.0	1.2	1.5	1.5	2.7

Note: Yearly returns, in %.
Sources: Bloomberg, Thomson Reuters Datastream, ESMA.

It is interesting to compare, from an investor's perspective, the performance of a fund over a time horizon equal to the typical holding period. As the holding period may vary widely among funds, three different horizons have been used: one, three and five years. As shown in Table T.02, the average performance is positive but small for the three and five-year horizon. Cumulative returns are even negative over the last three years due to negative returns in 2011. While alternative UCITS outperformed the Eurostoxx 50, returns have been higher on a risk-free investment.

Performance of alternative UCITS T.02

Market	1 year	Last 3 years	Last 5 years
Average return	5.3	1.3	1.4
Cumulative return	5.3	-2.1	3.8
Average return Eurostoxx 50	16.9	1.3	-2.1
Cumulative return Eurostoxx 50	16.9	1.9	-24.7
Average return 12-month Euribor	1.5	1.4	2.4
Cumulative return 12-month Euribor	1.5	4.3	12.6

Note: Cumulative returns, in %.
Sources: Bloomberg, Thomson Reuters Datastream, ESMA.

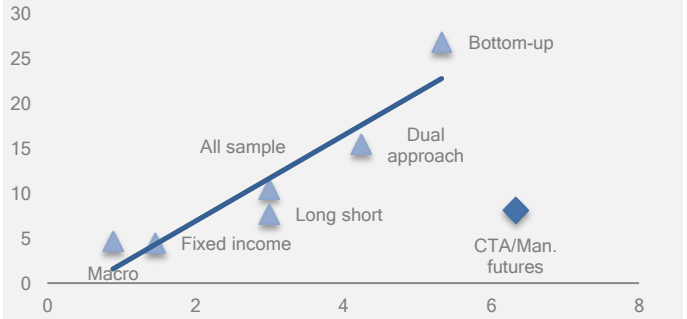
However, aggregate results may hide significant differences between strategies. Therefore the sample is split by type of strategies. There are 324 alternative UCITS, representing AuM of EUR 43 bn as of December 2011, for which the Eurekahedge strategies are available. Table T.03 shows that the performance varies with the strategy, with CTA/managed futures and Bottom-up funds providing higher average returns and Macro and Fixed income funds yielding lower returns than the average. From a risk-return perspective, the data provide evidence that funds with the highest average returns have the highest levels of volatility, with the exception of CTA funds (Chart C.05).

Performance of alternative UCITS T.03

Market	06	07	08	09	10	11	12	Avg
All sample	8.9	4.8	-15.8	19.3	5.5	-7.0	5.3	3.0
Long short	6.7	7.5	-9.9	12.8	5.9	-7.2	5.2	3.0
Fixed income	5.0	3.9	-8.1	5.4	2.8	-1.7	2.9	1.5
Bottom-up	20.2	12.1	-47.6	42.7	12.1	-15.8	13.6	5.3
Macro	6.3	-0.7	-4.4	6.6	4.6	-5.8	-0.4	0.9
Dual approach	13.6	6.3	-24.9	22.0	12.4	-12.3	12.6	4.2
CTA/Managed futures	15.5	20.3	2.3	4.8	6.7	-4.2	-1.1	6.3

Note: Average annual return and volatility by strategy, in %.
Sources: Bloomberg, Eurekahedge, ESMA.

Average returns and volatility C.05



Note: Average annual returns (x-axis) and volatility (y-axis), in %.
Sources: Bloomberg, Eurekahedge, ESMA.

Risk-adjusted returns of alternative UCITS

From an investor perspective, the relative performance of a fund compared to a benchmark is a useful tool for investing. In particular, risk-adjusted returns are an important metric to assess the performance of a fund (see Box 1 for details). Table T.04 shows that Sharpe ratios have been low but, nevertheless, positive, except for macro funds and CTA/Managed futures UCITS.

Risk-adjusted returns T.04

Market	1 year	3 years	5 years
All sample	0.5	0.1	0.0
Long short	0.3	0.1	0.1
Fixed income	0.6	0.0	0.0
Bottom-up	0.8	0.2	0.0
Macro	-0.1	-0.1	-0.1
Dual approach	1.2	1.2	1.2
CTA/Managed futures	-0.3	-0.2	-0.5

Note: Sharpe ratios, in %.
Sources: Bloomberg, Eurekahedge, Thomson Reuters Datastream, ESMA.

[7] The returns are net of management and performance fees, but do not include front-end and back-end fees.

Box 1: Measuring risk-adjusted returns

One approach to measure risk-adjusted returns is to compute the Sharpe ratio. It is computed as the excess return divided by the annualised volatility of the returns:

$$S_i = \frac{E[R_i] - r_f}{\sigma_i}$$

where S_i is the Sharpe ratio for an asset i, $E[R_i]$ is the expected return on this asset (or the actual return as in the analysis presented above), r_f is the risk-free rate and σ_i is the standard deviation of the excess return (volatility).

Excess returns are computed as the difference between gross returns and a proxy for the risk-free rate. Twelve-Month USD and GBP Libor rates are used for funds that are expressed in USD and GBP and Euribor has been used for funds expressed in EUR. For funds expressed in other currencies, the Euribor rate has been used.

Another approach is based on the Conditional Value-at-Risk (CVaR). The CVaR is the expected loss when the return is lower than the VaR. More precisely, $CVaR_\alpha(r)$, equals the conditional expectation of the return r subject to $r \leq VaR_\alpha$ where, α represents the 5th percentile of the return distribution and returns are computed over one-month horizon. CvaR is estimated by integrating the left tail of the return density function. This procedure has been applied dynamically with a rolling window of one month (see Rockafellar and Uryasev (2000)).

Excess returns over hedge fund indices

Given that alternative UCITS are subject to stricter regulation (they fully comply with the UCITS IV directive and respect all provisions) than non-UCITS hedge funds, their performance may be comparatively lower due to constraints limiting the investment choice of the asset manager. Therefore, for each type of strategy, excess returns are computed as the difference between the average returns of UCITS and the corresponding hedge fund benchmark.

Table T.05 shows that returns on UCITS have been generally lower than returns on corresponding benchmarks. However, one cannot rule out that both series have the same mean. More precisely, the ANOVA statistics show that the excess returns are not significantly different from zero. This result is linked to the high volatility of the returns over the sample period and, therefore, should not be overestimated.

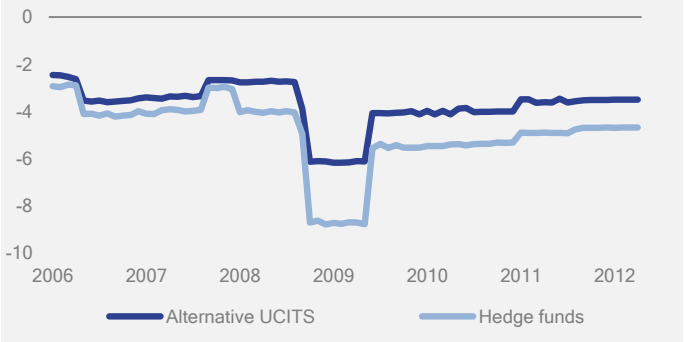
Alternative UCITS and hedge funds benchmarks T.05

Market	06	07	08	09	10	11	12	Avg
All sample	-7.0	-2.9	1.9	-1.2	-3.4	-1.0	-1.9	-2.2
Long short	-10.6	-0.6	9.0	-9.3	-2.3	0.3	-1.6	-2.1
Fixed income	-2.3	2.5	3.7	-15.7	-6.2	-1.2	-10.8	-4.3
Bottom-up	1.8	10.2	-6.4	8.0	-3.5	-4.2	-0.5	0.8
Macro	-35.4	-3.1	27.1	-7.0	-3.2	4.1	-2.2	-2.8
Dual approach	1.0	-6.7	4.4	-1.7	-2.5	-6.1	8.0	-0.5
CTA/Managed futures	11.1	7.0	-0.2	-1.9	-1.8	-6.3	-1.0	1.0

Note: Difference between the returns on alternative UCITS and the corresponding Eurekahedgehedge fund index, in %.
Sources: Bloomberg, Eurekahedge, ESMA.

Another feature is that most alternative UCITS have lower volatility than that of their benchmarks, possibly due to stringent regulations such as limits on leverage and diversification rules. This feature can be analysed by computing the Conditional Value-at-RisK (CVaR) of the UCITS and the corresponding benchmarks. As shown in Chart C.06, both alternative UCITS and hedge funds suffered significant losses during the 2007-2008 financial crisis, after which fund risk profiles remained above pre-crisis levels. Moreover, expected losses under stress, are lower for alternative UCITS than for hedge funds. This result holds when the CVaR is computed for each type of strategy, except for the dual approach and the CTA/Managed futures strategies, where the CVaR is higher for UCITS than for hedge funds. Overall, this suggests that the level of risk is generally lower for alternative UCITS than for hedge funds.

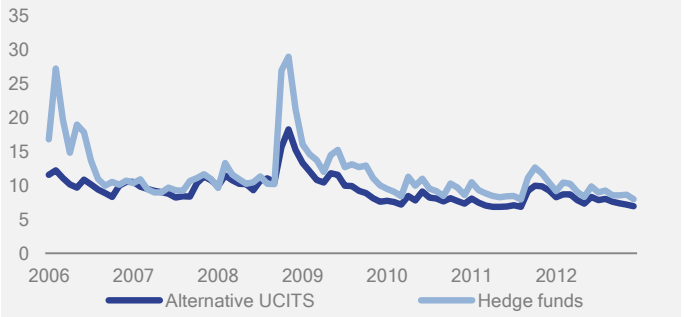
Expected losses under stress C.06



Note: Conditional VaR at the 5% level and over one-month horizon, in %.
Sources: Eurekahedge, ESMA.

The analysis of volatility has been completed by estimating a GARCH model to account for the heteroskedasticity of the returns. Chart C.07 indicates that the volatility has been higher for hedge funds than for alternative UCITS.

Volatility of alternative UCITS and hedge funds C.07



Note: Volatility of monthly returns based on a GARCH (1,1) model, in %.
Sources: Eurekahedge, ESMA.

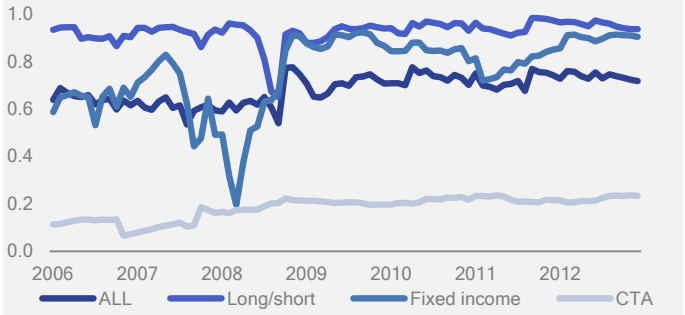
The main results are that (i) returns on non-UCITS hedge funds are higher than on alternative UCITS, but (ii) the Conditional Value-at-Risk and the volatility are higher for non-UCITS than for alternative UCITS. These results are in line with some recent academic studies: Stefanini et al. (2010), using a sample of 146 UCITS between 2009 and 2010, find that on average alternative UCITS underperform non-UCITS hedge funds. Tuchschmid et al. (2011), using data on 428 alternative UCITS from 2006 and 2010, find that UCITS performance was lower than less regulated hedge funds but with a lower level of risk. A similar result has been found by Agarwal et al. (2009) for the US: hedged mutual funds underperform hedge funds due to differences in regulation and incentives[8].

Another way of looking at the performance of alternative UCITS against hedge funds indices is to assess the correlation between the two series. As shown in Chart C.08, the correlation, estimated using the dynamic conditional correlation indicator proposed by

[8] However, Pascalau (2011), using data on 66 USD funds claims that alternative UCITS outperformed non-UCITS hedge funds over 2006-2010, but they produced a volatility higher than that of the corresponding hedge fund index.

Engle (2002), is high between returns on UCITS and returns of the corresponding hedge fund benchmarks (around 0.7 on average for the sample), the only exceptions being Macro and CTA funds for which the correlation is less than 0.5.

Correlation between alternative UCITS and hedge funds C.08



Note: Dynamic conditional correlation.
Sources: Eurekahedge, ESMA.

Excess returns over mutual funds

The performance of alternative UCITS can be compared to the performance of mutual funds, using the same approach. However, given that it is difficult to find mutual funds benchmarks, the performance of alternative UCITS have been directly compared to the performance of equity and bond indices[9]. Table T.06 shows that alternative UCITS have underperformed, in risk-adjusted terms, equity and bond indices. However, one drawback of this approach is that mutual funds' fees have not been taken into account in the calculation, unlike fees on alternative UCITS.

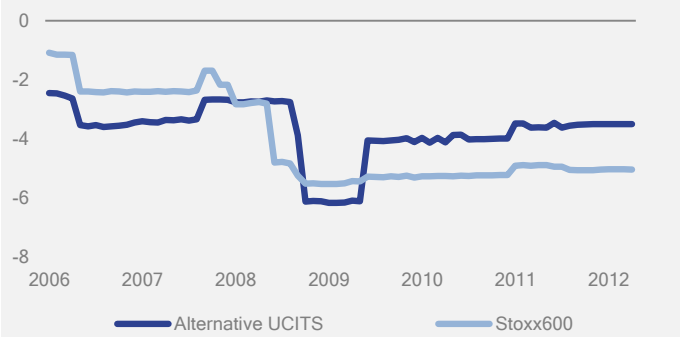
Performance of alternative UCITS and mutual funds T.06

Market	Average Sharpe ratio 2006-2012	Difference to US benchmark	Difference to EU benchmark
All sample	0.03	-0.21	-0.12
Long short	0.04	-0.14	-0.05
Fixed income	-0.28	-0.51	-0.41

Note: Difference between the Sharpe ratio of Alternative UCITS and the corresponding benchmarks: S&P500 for US equities, Stoxx Europe 600 for EU equities, Barclays US Aggregate bond index and Barclays Europe Aggregate bond index. Long short funds are compared to equity indices, Fixed income funds to bond indices and the whole sample to a weighted average of both asset classes based on the AuM by types of strategy.
Sources: Bloomberg, Thomson Reuters Datastream, ESMA.

As indicated in Chart C.10, the Conditional Value-at-Risk has been on average higher for equity indices than for alternative UCITS. In addition, the volatility has also been more elevated for bond and equity indices than for alternative UCITS. Overall, no robust conclusion can be drawn on the performance of alternative UCITS compared to mutual funds[10].

Risk/return profile of alternative UCITS and equity indices C.10

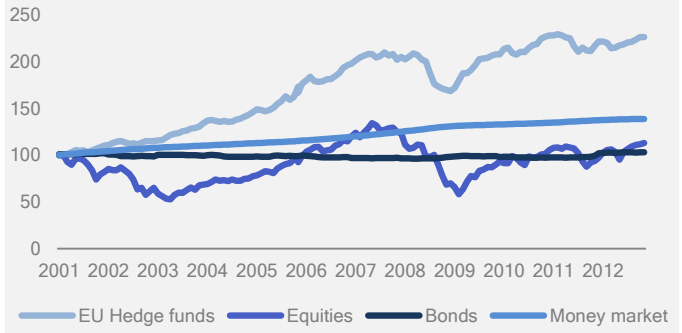


Note: Conditional VaR at the 5% level and over one-month horizon, in %.
Sources: Eurekahedge, ESMA.

A long-run perspective comparison of the performance of hedge funds and other assets classes

In order to address the potential bias linked to the small size of the sample period, the performance of different assets classes can be compared in a long-run perspective. Chart C.11 shows that the performance of European hedge funds was high compared to money market, equities and bonds. If the correlation between the performance of alternative UCITS and hedge fund indices remains high and overall hedge funds performance positive compared to other asset classes, then alternative UCITS could offer positive returns.

Long-run performance by asset classes C.11



Note: Total return on Eurekahedge European hedge Fund index, Stoxx Europe 600, Barclays Aggregate Europe bond index and twelve-month Euribor rate, 1/1/2001=100.
Sources: Eurekahedge, Thomson Reuters Datastream, ESMA.

Conclusion

Alternative UCITS funds have experienced a strong development over the last few years. From a consumer protection perspective, this may raise issues as investors may not be able to understand the risks associated with the complex strategies and instruments used by those funds.

An empirical analysis of the performance of alternative UCITS shows that between 2006 and 2012, annual returns have been 3% on average for the sample of around 600 funds. However, the volatility of the returns was high, especially during the 2007-2008 financial crisis and to a lesser extent in 2010-2011. As a result, risk-adjusted returns, measured by Sharpe ratios, are close to zero, except when computed over the last five years. Those results are robust to the type of strategies implemented by the funds.

[9] See Bhardwaj (2011) for a similar approach.
[10] However, in the US, empirical studies have found that hedges mutual funds outperformed traditional mutual funds. For example, Agarwal et al. (2009) found that hedged mutual funds outperformed traditional mutual funds, due to the advantages of greater flexibility which outweighted the agency costs attached to hedge-fund like strategies.

In comparison with non-UCITS hedge funds, alternative UCITS provide lower returns, but expose investors to lower volatility and expected losses during downturns.

Finally, alternative UCITS have underperformed mutual funds, proxied by equity and bond indices, in terms of risk-adjusted returns. However, the conditional Value-at-Risk has been lower for alternative UCITS since mid-2009, indicating that investors into such funds are less exposed to losses when markets are bearish.

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Structured products: Risk and returns for retail investors

Scope and trends in the market for structured products sold to retail investors in Europe

Background

Retailisation involves a wide range of complex products that are sold to retail investors, including structured products. After peaking at EUR 250bn in 2007, sales volumes of structured products have decreased to EUR 110bn. As of December 2012, outstanding amounts of SRPs totalled around EUR 770bn in Europe[11]. However, over the last six years, the issuance of structured products open to retail investors (SRPs) has experienced growth in certain markets, reaching more than one million new products in 2012, compared with 175,000 in 2007, although this is mainly linked to the growth and dynamics of the German market where one million products were issued in 2012 versus around 162,000 in 2007[12]. In many other European markets, the issuance of SRPs have seen a decline over the last few years.

This trend could entail risks from a consumer protection perspective as retail investors may not be able to understand the drivers of risks and returns of structured products. Moreover, unlike in the case of UCITS, for some SRPs, retail investors may be directly exposed to the credit risk of a structured product issuer[13]. Given the SRP market size, structured products may potentially give rise to financial stability risks if the exposures of retail investors are large or if issuers rely heavily on this type of products as a funding source. For instance, if the demand of structured products experiences a substantial decline, some issuers may face funding risks.

It should be noted, however, that complexity does not necessarily imply higher risks. For instance, there are simple products (e.g small cap equities) that might be riskier than others with higher complexity (e.g secured bonds with embedded call and put options).

This article aims at assessing the risks that retail investors face when purchasing SRPs. In particular, the intrinsic value of a sample of SRPs is estimated and compared to the selling price. The ex *post* performance of SRPs is also assessed in order to provide information on their actual returns over the last years.

Definition and scope

This study focuses on a sub-category of PRIPs: Structured products sold to retail investors, excluding those using bank deposits, unit-linked and warrants as wrappers.

Structured products can be defined as investment products whose return is linked to the performance of one or more reference index, price or rate. One of their key characteristics is that the return is not determined by active investment but by a pre-specified formula that sets out how the product will perform in any possible future scenario. Structured products typically have embedded derivatives to produce this specified return. These derivatives can be plain vanilla or exotic and linked to a variety of asset classes, mainly equity but also interest rate, FX, commodity, or other types of assets.

Structured products cover a wide range of financial instruments with distinct features. SRPs can be split in different categories depending on their pay-off structure, as it has a direct impact on the potential risk and performance of the underlying product, along with other specific features (such as the type of underlying, wrapper, participation rate, etc.).

In particular, the European Structured Investment Products Association (EUSIPA) provides a classification of structured products in two main categories:

Investment products: These products include capital protection products, yield enhancement and participation products.

- Capital protection products guarantee that a fraction of the investment (generally 100%) will be returned to the investor at maturity, provided that no default occurs. This category can be split between uncapped products for which the maximum return has no boundary and capped products for which there is a limit to the maximum return.
- Yield enhancement products offer capped returns and expose investors to potential losses, which are mitigated by the addition of a discount. The main types are discount certificates and reverse convertibles.
  Participation products offer unlimited participation in the increase of the underlying, possibly leveraged for outperformance certificates, but also a 1:1 participation in the decline of the underlying (for example for tracker certificates).

Leverage products: This category includes leverage products with or without knock-out features. Most of those products are sold as warrants.

Data used to assess trends in the European SRP market

For some of the complex products, including SRPs, no EU-wide statistics exist. Also, at national level, data are, most of the time, not available or difficult or costly to access. The data used in this report rely mainly[14] on

[11] Source: StructuredRetailProducts.com.

[12] In particular, issuance in Germany has increased in the last 12-18 months – however, sales volumes have not increased proportionately. This trend is mainly driven by developments such as increasing competition and market trends (e.g. replacement of knock-out products), cheap listing costs and cross-border marketing to Austria and Switzerland which have led to a surge in issued instruments. Another factor is linked to an increased coverage of the market instruments by the data provider which could limit the comparability of historical data.

[13] For instance in the case of SRPs issued as senior unsecured or subordinated notes.

[14] National Competent Authorities have also complemented the database by providing data on products in their jurisdiction.

StructuredRetailProducts.com, which is a large commercial online database of structured retail investment products, covering 19 European countries[15]. The database holds data stretching back as fas as 1995 and reached coverage of 19 countries in 2011.

The database contains sales figures for most of the products[16], based on the country of the investors (rather than the country of the issuer), e.g. a product issued in Italy but sold in Germany will appear in the German database.

The market for structured products in Europe: an overview

Outstanding amounts of SRPs represent around EUR 770bn in Europe as of December 2012. After peaking in 2010 at EUR 820bn, the SRP market declined by around 6%, to go back the levels reached in 2007.

The market for SRPs is highly concentrated in a few countries (Table T.01): The top four countries (Italy, Germany, France and Belgium) account for almost two thirds of amounts outstanding.

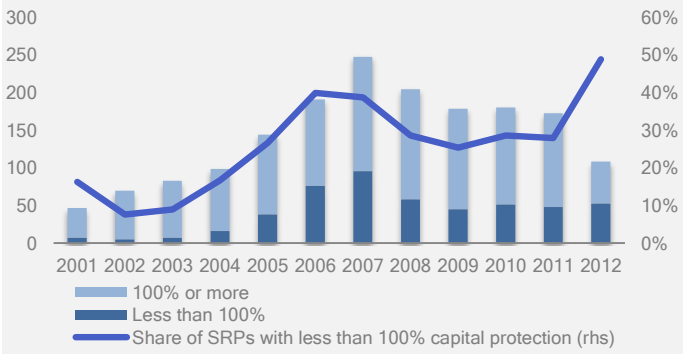
The European structured products market T.01

Country	Outstanding amounts (end-2012, EUR bn)	Market share
IT	204	27%
DE	134	17%
FR	81	11%
BE	79	10%
UK	59	8%
ES	42	5%
Others	170	22%
Total	769	100%

Source: StructuredRetailProducts.com.

In 2012, more than one million of structured products were issued[17] and sold to retail investors for a volume of EUR 110bn[18] (Chart C.01). After peaking in 2007 at EUR 250bn, volumes sold by 2012 declined to come back to their 2004-level. Most of the products were equity linked (60% of total volumes in 2012) and interest-rate linked (25%).

Volumes sold by capital protection C.01



Note: Volumes sold, EUR bn, share of SRPs with less than 100% capital protection, in %.
Sources: StructuredRetailProducts.com, ESMA.

One trend observed in the market is the increase in the share of products with less than 100% capital protection from less than 30% in 2009 to 48% in 2012 (Chart C.01). This trend can be partly explained by the low-interest rate environment that may result in search for yields.

Regarding wrapper types[19], most SRPs are issued as securities (63% of volumes sold in 2007-2012), funds (9%), deposits (8%) and life insurance products (5%), with the remaining representing a wide range of wrappers (tax efficient schemes, pension products etc.).

In terms of pay-off structure, most SRPs sold feature some degree of capital protection (two-third of volumes sold in 2007-2012). Among those products, capped and uncapped call represent around 40% of the volumes sold, followed by yield enhancement products (12%) and participation products (7%). However, there is considerable variety among European countries regarding the main types of structured products sold depending on investors risk appetite and tax issues. Finally, around 80% of SRPs are sold by banks (retail banks, savings institutions, and investment and commercial banks). The market share of asset managers and insurance companies is relatively low at around 5% each.

Drivers of demand and supply of SRP

The demand for SRPs might be explained by several factors. The current environment of low interest rates may have created incentives for retail investors to search for yield through the purchase of structured products that offer a high maximum return.

Demand for structured products may also be linked to their ability to offer exposures on some asset classes that are not easily tradable for retail investors (commodities or volatility for example). Fischer (2007), in a study based on a survey among 800 individual German investors investing in a variety of products offered in the German market, suggests that investors seek SRPs to diversify risk, to hedge against certain risks, to reduce costs (versus e.g. investment fund products) and to invest in asset classes that would otherwise be unavailable to them.

[15] As far as Europe is concerned, the database covers over 2,000,000 retail structured products issued in all the major markets: AT, BE, CZ, DK, FI, FR, HU, DE, IE, IT, NL, NO, PL, PT, SK, ES, SE, SW, and UK.

[16] In some cases, this is public information when, for example, the product is in the form of a mutual fund or a registered note. In other cases, sales information is not public, for example for deposits or many life insurance products, in which case it has been obtained directly from product issuers and mystery shoppers.

[17] This figure includes leverage products and flow products, mostly issued in DE which are standardised structured products which are usually issued in large numbers on a regular basis (around half a million new issues in 2012).

[18] This figure includes flow and leverage products and excludes non retail products.

[19] A wrapper is a term used to describe the type of investment vehicle in which a structured product is sold.

In addition, the tax regimes may also provide some incentives as some specific wrappers are used in order to minimize tax payments (for instance, unit-linked products).

From the issuers' perspective, SRPs might be used to generate profits through fees levied on retail investors. The fees might be based on potentially higher hedging cost due to the structuring of the product, but also on the difficulties that retail investors face to evaluate the SRP intrinsic value and the implicit costs that might be embedded in the selling price.

Risks linked to structured products

Structured products might pose several risks for financial markets. As with any investment in a financial instrument, the purchase of structured products may result in financial losses for the retail investor. This is especially true for products which do not offer 100% capital protection as negative outcomes may result in a partial or total loss of the initial investment.

Given their complexity, retail investors may not be able to assess (or at least to assess it with reasonable costs of information) (i) the intrinsic value of those products, (ii) the drivers of the performance of the SRPs and the expected returns and (iii) the potential credit risk embedded in SRPs.

As a result, retail clients may not possess the experience, knowledge and expertise to make a proper assessment of the different types of risks that their their investment in complex financial products may entail.

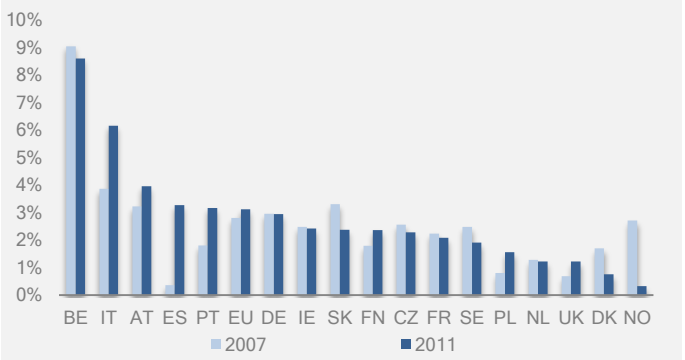
One compounding factor that may result in investment losses is the potential inability of retail investors to understand the relevant characteristics of the structured products. According to Wallmeier (2011), this may be caused by the complexity of the products sold, the lack of financial literacy of retail investors and behavioural biases. Hens and Rieger (2011) show that the potential utility improvement of SRPs for investors with Constant Relative Risk Aversion (CRRA) or Constant Absolute Risk Aversion (CARA) is small (less than ten basis points in terms of certainty equivalent interest rate) and below the average fees paid by the investors. Therefore the authors conclude that classical rational investors would not purchase SRPs and, therefore, behavioural factors such as probability misestimation, are needed to account for the existence of the SRP market[20]. Henderson and Pearson (2011) provide further evidence consistent with the hypothesis that issuing firms might shroud some aspects of innovative securities or introduce complexity to exploit information asymetries.

In most cases, the valuation and risk analysis of SRPs is not straightforward and requires suitable pricing tools and financial knowledge of the different pricing models. In particular, while some structured products can be decomposed into simpler products such as zero coupon bond and options, they are not always marketed as such by intermediaries.

As a consequence, if retail investors are not aware of the drivers of risks and returns of SRPs, they may become disappointed by the final results, giving rise to unexpected losses that might reduce their confidence in financial markets and financial institutions. Such negative outcomes might result in an increased number of complaints filed to financial authorities, and could also generate a loss of confidence in the ability of supervisors to fulfil their duties in terms of investor protection.

However, Bouveret and Burkhart (2012) show that systemic risks arising from negative wealth effects due to structured products are relatively low. Oustanding volumes of SRPs account for less than 4% of household financial wealth in Europe, ranging from 9% in Belgium and 6% in Italy to less than 3% in France and Germany (Chart C.02). As a result, a 20% decline in the value of structured products held by retail investors would result in a small decrease of GDP of 0.02 percentage point, even by taking into account the highest estimates of wealth effects[21].

Share of structured products in household financial assets C.02



Note: Ratio of outstanding volumes of SRPs to households financial assets, in %.
Sources: StructuredRetailProducts.com, Eurostat, ESMA.

Still, structured products might represent a sizeable source of funding for banks. Financial intermediaries might obtain a relatively cheap source of funding with SRP issuance (compared to funding costs in the wholesale market). This practice may pose risk for banks, since the retail market may not be stable over time, as evidenced by the sharp decline experienced during the 2007-2008 financial crisis.

An empirical analysis of SRPs

This section aims at estimating the intrinsic value of a sample of structured products, in order to assess the size of the premium paid by retail investors. The pricing process requires specific data for each product and the use of a model for the underlying, which are described the next sections[22].

[20] Using cumulative prospect theory, Roger (2008) finds the same result: SRPs are unattractive for retail investors Under cumulative prospect theory, investors put more weights on losses than on gains. As a result, depending on their risk aversion, some investors might be better off investing directly in the risk-free asset or in the underlying, instead of the SRP. For further details, see also Henderson and Pearson (2007) and Bernard et al. (2009).

[21] See Bouveret and Burkhart (2011) for further details.

[22] It should be noted that the estimation of the intrinsic value relates to the value at the point of issue, rather than for the life of the product.

Methodology used for sampling and description of the sample

In order to get a representative sample of the European market for structured products, the sampling procedure has been based on a stratified approach. For each European country, data has been gathered along three characteristics:

1. share of products sold with 100% capital protection;
2. main type of wrappers used; and
3. underlying (shares, share index, interest rates, commodities and exchange rates).

A sample of ten products for each country has been chosen, which was estimated to represent the same characteristics as the overall domestic market. All products included in the sample matured between 2008 and 2011[23]. Overall data from 13 countries were used in the evaluation exercise.

One limit of this approach is linked to the small size of the sample compared to the overall market. However, given the time and resources needed to price each SRP taking a larger sample would have resulted in significant costs. Moreover, academic studies on SRPs also used relatively small samples[24].

Under the above mentioned criteria and limitations, a sample of 76 SRPs was used. The average was 3.5 years (the minimum and maximum maturities were, respectively, 0.3 and 10.1 years. The breakdown in terms of the country in which the SRPs were marketed is presented in Table T.02.

Sample of products by country T.02

Country	Number of SRPs	Weight
IT	10	13.2%
FR	9	11.8%
DE	8	10.5%
UK	7	9.2%
PT	7	9.2%
FI	6	7.9%
LU	6	7.9%
SE	5	6.6%
AT	5	6.6%
LT	5	6.6%
CZ	3	3.9%
ES	3	3.9%
NL	2	2.6%
Total	76	100%

Source: ESMA.

The difference in the SRPs' weight of some countries comparative to others is due to the fact that several SRPs from each jurisdiction sample did not match the required criteria to include them in the evaluation exercise.

The wrappers under which these 76 SRPs were marketed are mainly securities (bonds, notes or certificates, which altogether amount to 73% of the 76 SRPs) which is consistent with the global characterisation of the European market (Table T.03).

Sample of products by wrapper type T.03

Wrapper	Number of SRPs	Weight
Notes	40	52.6%
Certificates	16	21.1%
Funds	12	15.8%
Others	8	10.5%
Total	76	100%

Source: ESMA.

Regarding the underlying assets, there is a significant predominance of share indexes or individual shares (more than 84% of the SRPs evaluated) which is also in line with the main reference assets used by European SRP issuers (Table T.04).

Sample of products by underlying assets T.04

Underlying	Number of SRPs	Weight
Share indexes	60	78.9%
Individual shares	4	5.3%
Commodities	4	5.3%
Interest rates indices	3	3.9%
Currencies	3	3.9%
Individual interest rates	2	2.6%
Total	76	100%

Source: ESMA.

Regarding capital protection, around 80% of the SRPs featured capital protection, as indicated in Table T.05. Only 25% had attached some sort of guaranteed return, while 20% did not offer any kind of capital protection.

Sample of products by capital protection T.05

Type	Number of SRPs	Weight
Capital protection without income guarantee	43	56.6%
Capital protection with income guarantee	18	23.7%
No capital protection	15	19.7%
Total	76	100%

Source: ESMA.

Models used for pricing

The pricing of structured products requires a mathematical model to describe the evolution of the underlying assets and the risk factors that affect the SRP price. Two classes of models might be used: parametric and non-parametric models. Parametric models rely on known statistical distributions (such as the Geometric Brownian motion), while non-parametric techniques (such as bootstrap) are estimated based on historical data without any assumption on the distribution of the underlying asset. Despite their simplicity, non-parametric techniques have not been used

[23] The sample was then discussed with each Competent Authority to ensure that it was representative and was modified where necessary. A template was also sent to be filled to include all the relevant characteristics of each SRP.

[24] See the literature survey on Table T. 10.

as they are based only on past information and, therefore, do not take into account the current market expectations about the future behaviour of the SRPs underlyings, which may result in substantial pricing errors.

In the most basic SRPs, the payoff structure can be replicated as a combination of simpler financial products such as zero-coupon bonds and plain vanilla options. In these cases, the SRPs have been priced by computing the individual value of each SRP component.

The choice of the parametric model depends both on the type of underlying of the SRPs, and the particular characteristics of the payoff structure. The Geometric Brownian Motion framework (GBM) has been used for structured products whose underlyings are shares, share indices and exchange rates. In most SRPs, the implementation was performed using Monte Carlo simulations[25]. However, Monte Carlo simulations might not be suitable for certain types of SRPs that allow for the possibility of early reimbursement (non-Bermudan options such as American options). In such cases the evaluation was carried out using Binomial or Trinomial Trees. For SRPs with underlying interest rates, the LIBOR Market Model (LMM) framework was used in the valuation.

Other parametric models like the Heston model for equities or Affine models for interest rate products were also considered as possible alternatives for the valuation. The Heston model allows modelling a volatility forecast than takes into consideration the relationship between returns and volatility. In this sense, one of the main features of the Heston Model is that it assumes that volatility is itself stochastic and mean-reverting. In addition, academic literature has shown that Affine models may provide closed form solutions for bonds and interest rates derivatives, thus making computations efficient and flexible at the same time.

In this regard, the results presented in this study could be subject to 'model risk', as they are sensitive to the parametric models used. This model risk can also be seen as an indication of the difficulty of assessing expected returns, especially for retail investors. However, the models used in this report are commonly employed by market participants and academics.

A description of the models used in the SRPs pricing is presented below. However, it should be noted that the description included in this section outlines only the general framework that has been taken as a reference for the pricing exercise. In the actual pricing, this general framework has been adapted in a case-by-case basis in order to take into account the particular characteristic and sensibilities of each SRP[26].

[25] The Monte Carlo method (MCM) is a statistical method for stochastic simulations and is used in several domains. This method is generally used to obtain numeric estimates of complex functions that do not have closed form solutions.

[26] For instance, as reflected in the input section, depending on the payoff characteristic of each SRP, implied volatility surfaces, time varying dividends, different interest rate curves and statistical techniques to assess correlation has been used in the valuation.

Geometric Brownian motion (GBM)

For structured products based on shares and shares indexes, the Geometric Brownian motion framework has been used in the pricing exercise. This stochastic movement was introduced by Black and Scholes (1973). The model for contingent asset pricing is based on a set of assumptions and, in particular, the underlying assets are supposed to follow a Geometric Brownian motion:

$$dS = \mu S dt + \sigma S dz$$

Where S is the price of the asset, dz is a Wiener process, μ is the expected return and σ is the expected volatility of the asset.

The Black and Scholes model is based on a risk neutral valuation. This method consists in calculating the future cash flows in a risk neutral environment. The expected payoff is subsequently discounted at the risk-free interest rate. In its most basic form, assuming that volatility, interest rates and dividend yields for each security are constant, the path of each asset can be expressed as follows:

$$S_T = S_0 e^{[(r-g-0.5\sigma^2)dt+\sigma\varepsilon\sqrt{dt}]}$$

where S_o is the spot price of the asset, r is the risk-free rate, g is the dividend rate, and ε is a random normal shock on the security's variation.

General additive binomial trees

The binomial tree is an approximation of the behaviour of asset prices. The Geometric Brownian motion process is consistent with the following binomial tree process (Cox, Ross and Rubinstein, 1979):

$$u = e^{[(r-g-0.5\sigma^2)dt+\sigma\varepsilon\sqrt{dt}]}$$

$$d = e^{[(r-g-0.5\sigma^2)dt-\sigma\varepsilon\sqrt{dt}]}$$

$$p = 0.5$$

where u refers to an up-movement and d refers to a down-movement.

Trigeorgis (1991) proposed a slight change in the model to produce better accuracy in the derivative evaluation:

$$p_u = 0.5 + 0.5 \times \frac{(r - d - 0.5 \times \sigma^2) \times dt}{\sqrt{\sigma^2 \times dt + [(r - d - 0.5 \times \sigma^2) \times dt]^2}}$$

$$p_d = 1 - p_u$$

$$u = e^{\sqrt{\sigma^2 \times dt + \left((r-d-0.5\times\sigma^2)\times dt\right)^2}}$$

$$d = 1/u$$

The underlying asset price behaviour is defined by:

$$S_t = \begin{cases} S_{t-1} \times u & probability\ p_u \\ S_{t-1} \times d & probability\ p_d \end{cases}$$

where p_u is the probability of an up-movement and p_d is the probability of a down-movement.

LIBOR Market Model (LMM)

The LIBOR market model (LMM) is generally considered as the current market standard to price interest rate derivatives with exotic features (Brace et al. (1997)). In the LMM, the evolution of a set of forward rates is modelled by a joint diffusion process. The inputs of the model are the current market level for each forward rate, and the volatility and correlation structure of such forward rates.

The model is based on a lognormal evolution of the forward rates, with a joint diffusion process that is described by the following stochastic differential equation:

$$\frac{d\boldsymbol{f}(t)}{\boldsymbol{f}(t)} = \boldsymbol{\mu}(\boldsymbol{f},t)dt + \boldsymbol{\sigma}(t)d\boldsymbol{W}(t)$$

where $\frac{d\boldsymbol{f}(t)}{\boldsymbol{f}(t)}$ is a vector containing the rate of changes of the forward rates at time t, $\mu(\boldsymbol{f},t)dt$ is a vector with the drifts applicable to each forward rate at time t, $\boldsymbol{\sigma}(t)$ is the volatility structure of the forward rate and $d\boldsymbol{W}(t)$ are correlated Brownian motions.

The LMM presents two main advantages: (i) it models the evolution of forward rates that are directly observable in the market; (ii) it is flexible enough to incorporate a volatility and correlation structure that can be calibrated to fits the market expectations that might be inferred from actively traded instruments with different maturities and strikes.

By modelling the joint evolution of forward rates, the LMM can price accurately exotic interest rate instruments such as path dependent derivatives, options whose payoff is linked to changes in slope and curvature in the yield curve, Mortgage Backed Securities, etc.

Input parameters and data used

All the former methodologies are sensitive to the inputs (parameters) that are used and the final outcome of any evaluation exercise could differ considerably depending of those parameters. The market inputs that are generally required to price SRPs are the following: spot prices, volatility and correlation of the underlyings, dividend (for equities), risk-free interest rates, forward interest rates and default intensities.

Volatility of the underlying assets

Volatility is one of the most important parameters in the evaluation of SRPs. Since the future volatility of underlying assets is not directly observable, two methods were used to estimate this parameter: i) implied volatility surface and ii) historical volatility.

Implied volatilities are a standard input in the pricing and risk analysis of SRPs. Where available, it is more appropriate to use implied volatilities than historical volatilities as the former measures the volatility expected by market participants[27]. However, implied volatilities are often only available for short maturities (e.g. 1 or 2 years) and sometimes options from which this parameter is derived are relatively illiquid, which could lead to biases in the estimation. Therefore, when implied volatilities were not available or reliable, historical volatility has been used in the pricing exercise.

Dividends

In the case of dividends paid by individual shares, the discrete dividends projected for each share up to the maturity of the SRPs were used when this estimation was available from reliable sources. This approach has several advantages over the use of a historical yield. In particular, since most shares have suffered substantial changes in the dividend yield during the financial crisis, the long term historical dividend yield might not be a good approximation of future dividends.

When the former type of dividends input was not available or not reliable, a long term approach has been used as an alternative, by averaging the dividends over the last ten years. The use of dividend yields assumes that dividends are paid in a continuous way over the year. This approach is particularly suitable for share indexes, where dividends are usually paid by the components of the index at different times over the yearly period.

Risk-free interest rate

Regarding the risk-free rate, implied swap rates or short term rates such as money market rates were used to model the forward evolution of the underlying assets and to discount the expected cash flows. In the case of SRPs with interest rate underlying, several zero coupon curves, constructed with instrument of different tenors and underlying risk has been used in the valuation.

Correlation

For SRPs linked to the performance of several underlyings, statistical techniques, like Cholesky decomposition and Principal Component Analysis have been used to assess their correlation.

Credit risk

Credit risk can be assessed using three different methods[28]. As the default risk of a structured product is linked to the credit risk of the issuer, the price of corporate bonds issued by the SRP issuer can be used to derive a market-estimate of its probability of default. The second method uses financial statements information and the credit ratings of the issuer in order to infer its credit risk. The third one relies on Credit Default Swaps (CDS) to derive risk-neutral probabilities of default from market prices (See Hull and White (2000)).

The last approach has been preferred as i) for some issuers there was not corporate bonds available to estimate their credit risk and ii) credit ratings constrain the estimates of credit risk to be bounded by the rating notches. However,

[27] The use of implied volatilities includes the kurtosis and skewness in the pricing model, as the volatility extracted from options with different strikes and maturities (volatility surface) already reflects the market consensus about the future distribution of each underlying asset.

[28] Another approach, not presented here, relates to intensity based models that model the default rate as a Poisson process, for further details, see Duffie and Singleton (1999)).

when CDS prices were not available, implied CDS prices have been estimated by using the credit rating of the issuer[29]. Using CDS spreads, a default probability has been computed for each issuer, representing the risk of a default over the maturity of the SRP.

Results

Intrinsic value

The average intrinsic value of the 76 analyzed SRPs is 95.4% (considered as the percentage of the issue price hereafter), as indicated in Table T.06.

The "yearly hidden cost" of the SRP's was also evaluated. The hidden cost is defined as:

$$hidden\ cost = 1 - [intrinsic\ price]^{\frac{1}{Maturity}}$$

On average, the yearly hidden cost amounts to 1.5% of the issue value. For half of the SRPs the yearly hidden cost is higher than 1%.

Intrinsic value of SRPs in the sample T.06

Statistic	Intrinsic value (in % of issue price)	Yearly hidden cost
Average	95.4%	1.5%
Standard deviation	4.1%	2.0%

Note: Intrinsic values and yearly hidden costs based on a sample of 76 SRPs.
Source: ESMA.

Regarding the distribution of intrinsic values, the minimum value was 82.2% and the maximum amounted to 102.6%. For the central 80% of SRPs, the intrinsic value is between 89.9% and 99.6% (Table T.07). More than 90% of the products were issued with a price above the intrinsic value.

Distribution of Intrinsic values of SRPs in the sample T.07

Percentiles	Intrinsic value (in % of issue price)	Yearly hidden cost
10%	90.0%	3.1%
20%	91.9%	2.4%
30%	93.3%	1.8%
40%	95.1%	1.5%
50%	96.0%	1.2%
60%	97.2%	1.0%
70%	97.9%	0.7%
80%	98.6%	0.5%
90%	99.6%	0.1%

Note: Intrinsic values and yearly hidden costs based on a sample of 76 SRPs.
Source: ESMA.

The SRPs intrinsic value results were also spanned with the individual and specific features of the SRP's. Capital protection and the maturity were analyzed to see how the intrinsic value is influenced by these characteristics. The average intrinsic value of capital protected SRPs is higher than the intrinsic value of the other SRPs by two percentage points.

Distribution of Intrinsic values by capital protection and maturity T.08

		Intrinsic value (in % of issue price)	Yearly hidden cost
Capital protection	YES	96%	1.2%
	NO	94%	2.1%
Maturity (years)	1	95.7%	3.8%
	2	95.7%	2.2%
	3	96,4%	1,2%
	4	94,9%	1,3%
	5	93,9%	1,3%
	6	94,8%	0,9%

Note: Intrinsic values and yearly hidden costs based on a sample of 76 SRPs.
Source: ESMA.

Regarding the SRPs maturity, the results suggest that the relationship between the intrinsic value and maturity is non-linear, but the yearly hidden cost declines with maturity.

Finally, a multiple regression model was performed to explain the intrinsic value according to the SRP characteristics. We included as explanatory variables the SRPs' maturity, their underlying assets[30], the wrapper type[31] and a dummy variable to represent if the SRP has capital protection. The results indicate that maturity of the SRP influence both, its fair value and the yearly hidden costs. Excluding the effects of the remaining regressors, on average the higher the maturity the lower the SRP fair value. The yearly hidden costs appears to exhibit a statistically significant negative association with maturity.

However, for the other regressors, no significant differences have been observed in the fair value or hidden costs across wrapper types and underlyings.

Results of the regression model T.09

Variable	Intrinsic value (in % of issue price)	Yearly hidden cost
Constant	0.9665 ***	0.0225 ***
Log (maturity)	-0.0236 **	-0.0079 **
Cap. Protection	0.0224	0.0025
Currency SRP	-0.0008	0.0020
Commodity SRP	0.0005	-0.0011
Interest Rate SRP	0.0121	-0.0086
Certificate	-0.0152	-0.0122
Fund	-0.0044	0.0015
Other	-0.0013	0.0024
R-squared	0.14	0.24
Number of obs.	76	75

Note: An outlier was removed from the regression on Hidden Costs. (***), (**) and (*) means that the variable is statistically significant at a 1%, 5% and 10% level.
Source: ESMA.

[29] CDS prices by ratings have been regressed on the corresponding corporate bond indices by rating over 2010 to 2012. The estimates have then been used to derive an implied CDS spread for each rating.

[30] A dummy variable that equals 1 if the underlying is an interest rate, a currency or a commodity.

[31] Again, a dummy variable to represent the SRP wrapper as a bond, certificate or fund.

These results are in accordance with the studies referred in the beginning of this section. Most empirical studies report a significant premium in the pricing of structured products, usually ranging between 3% and 9% on average. Table T.10 summarizes the results of similar studies carried out in the US and several European countries. As can be seen, the size of the premium varies across the markets, the types of SRP and the analyzed period. Some authors report that the premium differs from the primary market to the secondary market as well. Within the same type of SRPs, the time to maturity, the complexity of the product, the issuer´s size and the level of competition can also affect the size of the premium.

Literature survey on premium sizes of SRPs T.10

Authors	Number of SRPs	Country and time period	Premium	Method
Henderson and Pearson (2011)	64	US, 92-05	8%	GBM
Wilkens et al. (2003)	906	DE, 01	3.1%-4.2%	GBM
Jørgensen et al. (2011)	400	DK, 98-08	6%	GBM
Stoimenov and Wilkens (2005)	2566	DE, 02	3.9%	GBM,
Grünbichler and Wohlwend (2005)	192	SW, 99-00	4.3%	GBM, binomial trees
Wallmeier and Diethelm (2008)	468	SW, 07	3.4-6%	GBM, multinomial trees
Szymanowska et al. (2009)	108	NL, 06-08	6%	GBM, CEV[32]
This report	76	EU, 08-11	4,6%	GBM, multinomial trees, LMM

Intrinsic value with credit risk

Investors in some types of structured products are exposed to credit risk, even for products that are promoted as 100% capital protection. For example, the collapse of Lehman has resulted in significant losses for retail investors who had purchased what they thought were 'guaranteed' products. The credit risk depends on two factors: the type of wrapper used and the default risk of the issuer.

A substantial number of structured products are sold as senior unsecured securities. This implies a direct exposure to the balance sheet of the issuer and therefore to their credit risk. Structured products using funds as wrapper, generally provide less credit risk to the investor as their investment is backed by the actual assets of the fund.

Some structured products provide a source of credit risk and counterparty risk. Effectively, besides the credit risk of the issuer, some credit linked notes also provide exposition to the risk of default of third entities.

The credit risk analysis constains a sample of 35 SRPs, as other SRPs were either not exposed to a significant amount of credit risk (like UCITS) or there was not enough data to estimate the issuer credit risk (no rating or CDS).

For each SRP, the impact of the issuer credit risk has been considered in the valuation. In particular, the default intensity for each SRP issuer has been estimated from market quotes taking into account the information available in the CDS markets at the issuance date.

For each future payment date, the probability of the SRP issuer defaulting have been calculated and included in the pricing exercise. In particular, the intrinsic value with credit risk has been computed as (i) the present value of all the expected cash flows that will be received conditional to the SRP issuer remaining solvent plus (ii) the present value of the recovery rate that investors will obtain in case of default:

$$P_{Credit\ risk} = \sum_{j=1}^{n} CF_j\, PS_j DF_j + \sum_{j=1}^{n} R\, DF_j (PS_{j-1} - PS_j)$$

Where CF_j is the expected cash flow in payment date j, PS_j is the probability of the issuer remaining solvent at each payment date, DF_j is discount factor at time j, and R is the recovery rate[33].

As shown in Table T.11, the average premium when credit risk is included is around 1.4 percentage points higher than when credit risk is not included. In particular, the average premium is around 5.5% with credit risk, against around 4.1% without credit risk. Therefore, credit risk accounts for 35% of the overall premium paid by the investor. This result is in line with empirical studies: Baule (2008) estimates that credit risk accounts for 30% to 40% of the premium on German discount certificates.

Premium on SRP with credit risk T.11

Indicator	Without credit risk	With credit risk
Premium	4.1%	5.5%
Memo item		
Premium (full sample)	4.6%	

Note: Premium computed as the difference between the issue price and the intrinsic price, in %.
Source: ESMA.

Ex post returns on SRPs with capital guarantee

In the previous sections, the intrinsic value of a sample of SRPs has been assessed. From an investor's perspective, it is also of importance to analyse the actual returns that SRPs have yielded. In this section, actual returns for a range of capital protected products are provided and compared to a risk-free investment . It should be noted

[32] CEV is the Constant Elasticity of Variance model, see Szymanowska et al. (2009) for details.

[33] In order to calculate the intrinsic value with credit risk, the seniority of the SRP should be included in the calculation (i.e. senior unsecured vs. subordinated bonds). However, due to data limitations, this distinction was not feasible on some SRPs. In such cases, a conservative approach has been chosen, assigning a senior unsecured seniority to those SRPs where a more specific information was not available. Following generally accepted market practices, the recovery rate has been set at 40%. See Moody's (2008) for further details.

that the ex post performance has been analysed by assuming that investors hold the SRP until its maturity. Therefore, this analysis does not consider the potential return that might be locked in by investors if they decide to sell out their position in the secondary markets prior to maturity.

An alternative approach would be to compare the performance of SRPs with capital guarantee to other investment products such as mutual funds or ETFs. In particular, it would be interesting to analyse how different types of retail investment products behave when they are compared to a risk free investment. However, since mutual funds and ETFs do not generally offer a capital guarantee, the analysis in this section has been focused in assessing the ex post returns of a sample of SRPs with capital protection and comparing it to the returns offered by a risk free investment.

Sample of structured products with capital protection

The sample is composed of around 2750 structured products with at least 100% capital protection issued in EUR and GBP between 1996 and 2010. The products are either uncapped call (i.e. there is no limit on the maximum return that investors can earn) or capped call (the maximum performance is capped). Data has been retrieved from StructuredRetailProducts.com and it is based on the SRPs for which the ex post return was available[34]. The products in the sample amount to around EUR 65bn for products issued in EUR and GBP 0.8bn (Table T.12).

Descriptive statistics of the sample T.12

Indicator	Uncapped EUR	Uncapped GBP	Capped EUR	Capped GBP
Volumes sold (bn)	50.3	0.6	14.6	0.2
Number of products	1231	763	323	436
Among which				
Matured before 2008	435	262	148	297
Matured after 2008	796	501	175	139

Sources: StructuredRetailProducts.com, ESMA.

Results

For the sample of SRPs, average returns were positive and around 2.5%. However, excess returns, computed as the difference between actual returns for each SRP and the 12 month interbank rate, were negative (at around -0.5% for SRPs in EUR and -2% for GBP[35]), implying that those products, when analysed in their maturity date, have underperformed a risk-free investment (Table T.13).

Performance of SRPs in the sample T.13

Indicator	Uncapped EUR	Uncapped GBP	Capped EUR	Capped GBP
Average	2.6	2.6	2.5	2.3
Excess return	-0.5	-2.0	-0.3	-2.6
Median	2.0	1.9	1.3	0
Excess median	-1.1	-2.8	-1.0	-4.3
Max. return	20.6	15.8	8.9	13.6

Note: Excess returns are computed as the difference between actual returns and the 12-month Euribor or GBP Libor rates, compounded over the maturity of the SRP.

Sources: StructuredRetailProducts.com, ESMA.

Nevertheless, as the sample period includes the financial crisis of 2007-2008, the results may be downward biased. For this reason, in order to check for the robustness of the results, an additional analysis has been performed by decomposing the sample in two categories (i) products with a maturity data before 1st January 2008 and (ii) products that had maturity date after 1st January 2008. The results obtained for these subsamples are shown in Table T.14. On average returns were generally higher for the products that matured before 2008, except for capped products issued in GBP. However, in terms of excess returns, the results are qualitatively similar: The average and median excess returns are negative in both periods. The only exception is for capped calls issued in EUR, for which excess returns were positive for the pre-2008 sample.

Tests of equality of average and excess returns between the two series (before and after 2008) show that the difference is significant for most products, with the exception of uncapped products issued in EUR[36]. Therefore, it appears that the performance has been worse for products that matured after 2008.

Performance of SRPs in the sample T.14

Indicator	Uncapped EUR1	Uncapped EUR08	Uncapped GBP1	Uncapped GBP08
Average	2.5	2.6	3.7	2.0
Excess return	-0.3	-0.6	-1.2	-2.4
Median	2.1	2.0	3.4	1.5
Excess median	-0.8	-1.2	-2.1	-3.0
	Capped EUR1	Capped EUR08	Capped GBP1	Capped GBP08
Average	3.5	1.8	2.0	2.9
Excess return	0.6	-1.0	-2.9	-1.8
Median	3.6	0.2	0.0	2.5
Excess median	0.9	-1.8	-4.6	-2.4

Note: EUR1 and GBP1 refer to SRPs that matured before 1st January 2008 while EUR08 and GBP08 refer to SRPs that matured after that date. Annualized returns, in %.

Sources: StructuredRetailProducts.com, ESMA.

[34] Therefore, some SRPs have not been included in the analysis.

[35] The excess returns are more negative for products issued in GBP as the 12-month Libor rate was higher than the Euribor rate over the sample period due to different monetary policies in the euro area and the United Kingdom .

[36] ANOVA tests have been performed and the results were all significant at the 1%level (except for uncapped SRPs issued in EUR), indicating a significant difference in value between the pre and post 2008 series. Simple hypothesis tests for the average and excess returns also indicate that the values are significantly different from zero for all series.

Conclusion

This study shows that in order to understand the drivers of risks and returns of SRPs, significant financial knowledge and access to market data is required. In particular, the empirical analysis based on a sample of 76 products sold in the EU, indicates that the products are sold with a significant premium, estimated at around 4.6%. Moreover, when the issuer credit risk is included, the average premium increases to 5.5%.

Given that retail investors may not possess the knowledge and expertise needed to assess the drivers of the performance of structured products, they could be at risk of facing unexpected losses. In particular, the analysis of the issuer credit risk embedded in structured product may be particularly challenging.

Regarding actual returns, the performance of SRPs over the last few years has been lower than the risk-free rate. While the results are less negative for products that matured before the financial crisis, the qualitative results in different time periods are similar: on average, structured products delivered a lower return than a risk-free rate investment.

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