PUBLISHED BY

CLEAR PATH ANALYSIS

INSURANCE LINKED SECURITIES FOR INSTITUTIONAL INVESTORS

Exploring how asset classes can help institutional investors meet their return targets

JUNE 2019

SPONSOR

THIS IS AN EXCERPT OF A FULL REPORT.
Download the full report from www.clearpathanalysis.com

SPONSOR

Twelve Capital is an independent investment manager specialising in insurance investments for institutional clients. The company employs approximately 50 staff in Zurich and London and manages assets in excess of $4bn. Its investment expertise covers the entire insurance balance sheet, including Insurance Bonds, Insurance Private Debt, Catastrophe Bonds, Private Insurance-Linked Securities and Insurance Equity. It also composes portfolios of its Best Ideas. It was founded in October 2010 and is majority-owned by its employees.
Further information: www.twelvecapital.com.

3.2 WHITEPAPER

Machine Learning for US Hurricane Forecasting - New Signals for ILS Investment Management

Dr. Jamie Rodney,
Director, ILS Analytics,
Twelve Capital

Dr. Thomas Loridan,
CEO and Co-Founder,
reask

The field of hurricane seasonal forecasting began with the pioneering work of Professor William Gray in the early 1980s[1]. Forecasts typically rely on utilising the climate information available in spring to anticipate trends in summer hurricane activity. Within this framework, spring climate patterns are measured through key metrics referred to as 'climate predictors', which are often engineered to reflect current understanding of how fluctuations in the climate are connected over large distances (e.g. The El Nino Southern Oscillation climate predictor and its effect on hurricane activity). Following recent advances in the fields of image classification and pattern recognition, machine-learning methods provide powerful alternative ways to mine large volumes of climate data and to automatically generate 'smarter' non-engineered climate predictors.

Machine learning and climate predictors

Machine learning (ML) allows the development of algorithms from data without human-specified rules. In the context of climate predictor development, ML methods provide tools to automate knowledge discovery from global climate data (i.e. pattern extraction). Figure 1 below summarises the approach taken to generate smart global climate predictors using neural networks where patterns in global climate data are automatically recognised by the network and linked to known climate signals. Automation allows a large amount of potential climate predictors to be generated in the spring and automatically tested for their reliability in predicting hurricane summer activity[2]. Predictor reliability for forecasting hurricane activity is assessed in two ways:

- Correlation to hurricane count metrics, such as basin wide numbers, regional (cluster) activity and landfalls.
- Correlation to environmental conditions known to favour hurricane activity in the summer. These include anomalously warm sea surface temperatures, low environmental pressure and weak vertical wind shear (i.e. reduced change in winds with height).

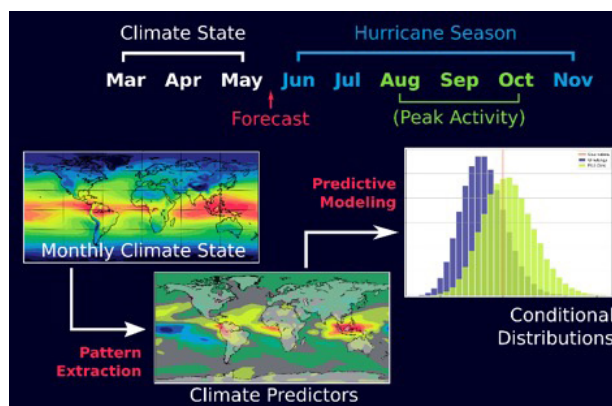

Figure 1: Seasonal hurricane forecasting timeline and machine learning (ML) based forecasting system: Key climate patterns are extracted from monthly gridded data in spring and provided as input to (or 'reask generated') ML based predictive algorithm. The system models distributions of hurricane risks conditional on the state of the climate in spring. Source: reask, May 2019.

[1] *Klotzbach et al., 2017.*
[2] *The system models distributions of hurricane risks conditional on the state of the climate in spring.*

Forecasting approach

Since early 2000, a growing number of institutions have followed Professor Gray's lead and started developing seasonal forecasts of hurricane activity[3]. Such forecasts are typically issued at the beginning of June and aim to estimate the mean number of named storms (Category 0 and above), hurricanes (Category 1 and above) and major hurricanes (Category 3-5) expected during the June-November season. While such metrics are of interest to the academic community, the unknown landfall location makes extrapolation to insured losses a challenge.

In order to fill in these information gaps and to move beyond simple basin-wide activity metrics, the automated ML process has been implemented as a chain of three models that focuses on geographical landfall location and identifies storms that have a high impact potential (see Figure 2 below) :

- Step 1: Model the distribution of storm activity in the basin conditional on the state of selected spring climate predictors.
- Step 2: Conditional on Step 1 distributions and additional climate predictors, predict activity in three key sub-areas of the basin:
    - Cape Verde region / Main Development Region (MDR),
    - Gulf of Mexico / Caribbean,
    - East coast of the US / Atlantic North.
- Step 3: Estimate for each of the above, the probability of US landfalls, conditional on Step 2 activity and further climate predictors.

Thanks to this conditional chain, the approach can quantify the probability of potentially high impact US land-falling systems such as the ones emanating from the Cape Verde / MDR region (e.g. Irma 2017).

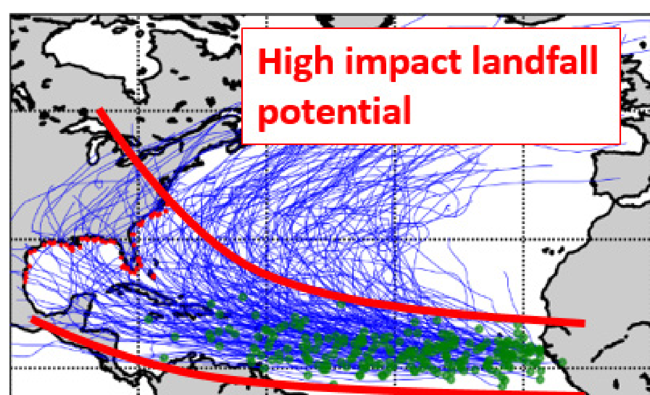

Figure 2: High impact potential storms identified from the Cape Verde/MDR region. Source: reask, May 2019.

Hurricane Seasons – 2004-2018

Season	Actual observed landfalls	Mean prediction	Probability of 0 landfalls	Probability of 1 landfall	Probability of 2 or more landfalls
2018	1	0.77	0.48	0.34	0.18
2017	2	1.34	0.27	0.34	0.39
2016	1	1.17	0.33	0.35	0.32
2015	0	0.26	0.78	0.19	0.03
2014	0	1.08	0.36	0.35	0.29
2013	0	0.76	0.47	0.35	0.18
2012	1	1.14	0.34	0.35	0.31
2011	2	2.21	0.12	0.24	0.64
2010	0	1.26	0.3	0.35	0.35
2009	0	0.47	0.64	0.28	0.08
2008	3	2.48	0.1	0.21	0.69
2007	0	1.13	0.33	0.36	0.31
2006	1	0.97	0.38	0.37	0.25
2005	3	1.56	0.22	0.32	0.46
2004	5	3.41	0.04	0.12	0.84

Table 1: leave-one-out evaluation of model's predictions for the number of US land-falling systems issued from the Cape Verde / MDR region. Source: reask, May 2019.

Past model performance is assessed via a 'leave-one-out' cross validation exercise, where we repeatedly leave out a year from the dataset used to train the algorithm and use it for independent model evaluation instead. Table 1 summarises results over the 2004-2018 period in terms of US land-falling systems originating from the Cape Verde / MDR region (shown in Figure 2) and highlights the strength of the approach in distinguishing high potential risk seasons such as 2004, 2005 and 2008 from those with lower threat such as 2009 or 2015.

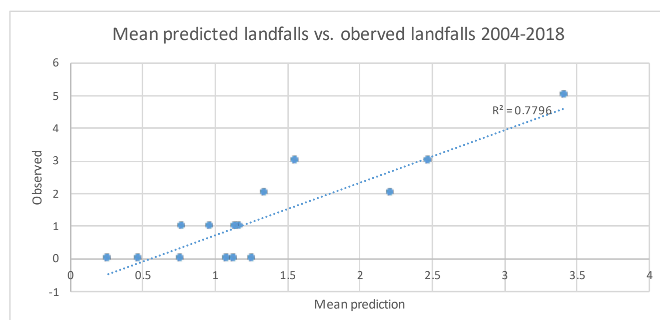

Figure 3: Scatter plot of model mean prediction (leave one out) and observed number of landfalls from the Cape Verde/MDR region. The model mean shows good skill in predicting the number of landfalls from storms developing in the Cape Verde/MDR region. Source: reask, May 2019.

[3] See http://seasonalhurricanepredictions.bsc.es/ for an overview of groups currently providing seasonal predictions.

Application to ILS investing

Reliable forecasts of hurricane landfall probability and location, combined with suitable risk metrics, could provide an indication of the expected levels of hurricane risk associated with an upcoming season. High predicted levels of risk could provide probabilistic guidance on the amount of regional hurricane risk a portfolio manager might be willing to accept during a particular season. This could also lead to an increased allocation to more senior North Atlantic hurricane-exposed positions within an insurance-linked securities (ILS) portfolio. High-expected levels of risk may also constitute an opportunity to benefit from opportunistic hedging strategies. Low levels of predicted risk could indicate potential strategies with portfolio composition focused to more junior North Atlantic hurricane positions. Portfolio construction and management is not only influenced by potential levels of risk but is a careful balance of market liquidity, valuations, inflows and outflows and seasonality, all of which could, in tandem or in isolation, make a significant contribution to portfolio performance during a particular season.

Twelve Capital and reask – co-operation

Since June 2018, Twelve Capital and reask have worked closely together to further the development of hurricane forecasting tools by using machine learning. Twelve Capital and reask believe that advances in technology and computing power can enhance ILS investment management.

Twelve Capital manages more than USD 4bn in assets across different asset classes in the insurance sector and is an active investor in ILS. It manages ILS investment strategies across Cat Bonds, Private Cat Bonds, Collateralised Reinsurance and Multi-Asset formats. Twelve Capital is based in Zurich and London and employs approximately 50 staff.

Reask is a specialised research firm servicing the global reinsurance industry in the fields of catastrophe risk management, modelling and forecasting. Reask is based in Sydney with its team of experts in risk analysis, machine learning and high performance computing. Their team has vast experience in natural catastrophe modelling having developed their expertise from previous engagements at RMS, WillisRe and other specialised firms.

References: *Klotzbach, P.J., J.C. Chan, P.J. Fitzpatrick, W.M. Frank, C.W. Landsea, and J.L. McBride, 2017: The Science of William M. Gray: His Contributions to the Knowledge of Tropical Meteorology and Tropical Cyclones. Bull. Amer. Meteor. Soc., 98, 2311–2336, https://doi.org/10.1175/BAMS-D-16-0116.1*

- Insurance-Linked Securities
- Insurance Bonds
- Insurance Private Debt
- Insurance Equity
- Insurance Multi-Asset Strategy

The independent insurance sector specialist

TWELVE CAPITAL (UK) LTD
Moss House, 15-16 Brook's Mews
London W1K 4DS
United Kingdom

TWELVE CAPITAL AG
Dufourstrasse 101
8008 Zurich
Switzerland

www.twelvecapital.com

info@twelvecapital.com

Twelve Capital (UK) Limited is authorised and regulated by the UK Financial Conduct Authority and is registered as an investment adviser with the U.S. Securities and Exchange Commission (the "SEC") and as a commodity pool operator ("CPO") with the U.S. Commodity Futures Trading Commission ("CFTC") and is a member of the National Futures Association (the "NFA") in such capacity.

Twelve Capital AG is licensed as a Manager of collective investment schemes by the Swiss regulator FINMA.

4.1 ROUNDTABLE DEBATE

Multi-asset ILS investing

Moderator

Sara Benwell,
Content Publisher,
Clear Path Analysis

Panellists

Raffaele Dell'Amore,
Executive Director,
Portfolio Management,
Private ILS Strategy,
Twelve Capital

Florian Steiger,
Director, Portfolio
Management,
Cat Bonds Strategy,
Twelve Capital

Etienne Schwartz,
Director, Portfolio
Management,
Best Ideas Strategy,
Twelve Capital

POINTS OF DISCUSSION

- *Multi-asset strategies offer a new alternative to traditional insurance-linked security investment opportunities*
- *To select an ILS strategy, investors should determine whether they want liquidity or if they are able to tolerate a degree of illiquidity*
- *Including ILS collateralised reinsurance transactions in a portfolio means certain types of perils can be added that are not typically offered in the Cat Bond market*
- *Investors need to determine what product provides the best fit for their needs and some may need to allocate across a number of strategies*
- *ILS strategies tend to be innovative and Cat Bonds and collateralised reinsurance can be viewed as a disruptive force*

Sara Benwell: Can you explain the three different ILS strategies you adopt?

Etienne Schwartz: As a company, Twelve Capital differs from other ILS managers in that it uses ILS in a multi-asset way in addition to managing individual ILS strategies. In that respect, Twelve has liquid Cat Bonds strategies and less liquid broader ILS strategies with material allocations to collateralised reinsurance transactions.

In the so-called multi-asset (Best Ideas) strategy, investment may be in different instruments across the whole insurance balance sheet. Holdings are not restricted to ILS transactions as allocations can also be made to credit and equities within the insurance sector. The aim is to utilise the information gathered through proprietary research in order to build portfolios that offer an attractive risk and return profile to investors.

Twelve Capital therefore offers investors a choice of strategies by which they can access the ILS market and the opportunities that it offers. This may range from a standalone liquid Cat Bond strategy through to less liquid/ semi-liquid investments in the collateralised reinsurance ILS segment, or as part of a multi-asset allocation with exposure to a number of risks across the whole (re-)insurance balance sheet.

Sara: What is the value of having three strategies? Why not just offer Cat Bonds or collateralised reinsurance?

Raffaele Dell'Amore: Collateralised products (Twelve Capital's so-called Private ILS Strategy) are based on balanced risk profiles. Focus tends not to be upon aggressive returns nor on the

"TWELVE AIMS TO UTILISE ITS ILS AND INSURANCE SECTOR INVESTMENT CAPABILITY IN A BROADER MULTI-ASSET WAY. THE GOAL IS TO EXPLOIT RELATIVE VALUE OPPORTUNITIES ACROSS AN INSURER'S BALANCE SHEET AS WELL AS ACROSS THE UNDERLYING ASSETS - INSURANCE DEBT, INSURANCE EQUITIES AND ILS"

conservative risk area of this universe. Twelve's view is that there is a 'sweet spot' in the moderate risk area where, for the risk taken, there is appropriate compensation given the returns that can be generated.

Twelve Capital's Private ILS strategies aim to deliver returns ranging from 8-10% to 11-13% depending on risk profile[2]. For this level of returns, however, investors will ideally have a longer-term view and be prepared to accept the limited liquidity offered given the 'buy-and hold' characteristics of collateralised reinsurance transactions.

Liquidity management in these collateralised reinsurance strategies is mainly achieved by an allocation to Cat Bonds and diligent management of collateral at times of renewals.

Florian Steiger: There is a strong interaction between the Cat Bond strategies and the collateralised reinsurance strategies when it comes to identifying the most attractive transactions. Investing in broader ILS strategies allows investors to benefit from the entire universe, including standard 144A Cat bonds[1], so-called private Cat Bonds as well as collateralised reinsurance transactions, including industry loss warranties. Therefore, the risk and return profile of these products can be adjusted and managed with more flexibility, which enables a manager to exploit the larger opportunity set offered.

Investors need to determine whether they want liquidity or if they are able to tolerate a degree of illiquidity. Depending on the preference, the segment of the ILS where such liquidity requirements are best addressed can be selected. If liquidity is required, an allocation to Cat Bond strategies would generate weekly liquidity. This provides an alternative to fixed income where, depending on risk appetite, a Cat Bond portfolio may generate returns of 6-9% in US dollars[2].

The Cat Bond market has repriced considerably over the last couple of months, driven by a number of factors. A key driver of the price adjustment has certainly been the more recent loss history created by the insured Cat events that occurred in in 2017 and 2018. In 2019, as a consequence of the recent loss history, less risk capacity seems to be available in the property catastrophic reinsurance market, and this therefore drives up the price for reinsurance. Risk spreads also adapt accordingly within the Cat Bond market too, as currently observed with the market recently returning to spreads last seen in 2012. However, seven years ago, it was possible to achieve similar returns in other fixed income assets; this is much more challenging now. The current repricing in Cat Bonds, in Twelve's view, means now represents an optimal time to invest.

Raffaele: If an investor is able to absorb a degree of illiquidity, they may want to consider an allocation in the ILS collateralised reinsurance transactions in their portfolio. This means certain types of perils can be added that are not typically offered in the Cat Bond market, allowing for the construction of a more diversified portfolio with an attractive return profile.

It is really up to the investor's risk and liquidity appetite, as well as their preference regarding the risk/return profile they are seeking in terms of selecting between the different strategies offered.

Within the collateralised reinsurance segment, the aim is to source different types of risks that are generally not ceded into the broad

[1] *In a Rule 144A offering, securities can be offered and sold without registration to qualified institutional buyers. Securities sold under Rule 144A are restricted securities that cannot be resold freely.*
[2] *Gross returns (pre-fees).*

ILS market. As an example, within portfolios, there may be exposure to crop risk, energy (both onshore and offshore) and other perils, for example, Twelve Capital is currently working on a transaction with aviation exposure. The aim is to develop the collateralised reinsurance market further in terms of different risk types so that investors can be offered a well-diversified and balanced product with attractive return potential, rather than purely focusing on elemental key perils such as hurricanes and earthquakes.

Etienne: As mentioned earlier, Twelve's multi-asset strategy, Best Ideas, combines three different asset classes, i.e. ILS (typically Cat Bonds, given the liquidity constraints), Insurance Debt and Insurance Equities. For this strategy, Twelve effectively aims to utilise its ILS and insurance sector investment capability in a broader multi-asset manner. The goal is to exploit relative value opportunities across an insurance or reinsurance company's balance sheet as well as across the underlying asset classes; Insurance Debt, Insurance Equities and ILS, typically Cat bonds.

Etienne: Exactly. It would be very difficult to construct a fund-of-funds portfolio with similar properties because correlations and other single position considerations would need to be taken into account when making investment decisions.

For example, the portfolio focus shifts from Cat Bonds towards Insurance Equities around October. Following a mild hurricane season, primary insurers in Florida, as well as other (re-)insurance companies, build up their capital and potentially, pay out special dividends the following year. Hence, given a mild hurricane season, the Twelve Insurance Best Ideas strategy could potentially benefit twice. Firstly, by harvesting coupon payments and benefitting from price increases in the Cat Bond space and secondly, by shifting into Insurance Equities after the traditional hurricane season is over.

It is also possible to use the equity allocation opportunistically, in that, once a hurricane is underway and on the water, Twelve Capital can leverage in-house cross-asset class expertise in order to identify and exploit relative value opportunities.

> “Sometimes an initial investment may be in Cat Bonds and a gradual shift into Collateralised Reinsurance may develop or the implementation of a Best-Ideas strategy too”

The philosophy behind the Best Ideas strategy is based on a characteristic inherent in the Cat Bond market, namely that, historically, hurricane risks have paid the highest premium and these risks occur along a meteorologically-driven seasonality pattern. Hurricanes in the North Atlantic only form under certain meteorological conditions. Those conditions are, in the main, only met between June and October. As a result, an investor who invests in this peril generally only bears a risk of an event loss during that specific period.

For a fund that solely invests in Cat Bonds, this can be an issue, as the fund would only earn a risk premium during that limited period. For the remainder of the year, assuming investments were in US wind risks only, the fund should, in theory, only earn the 'risk-free' rate of return. The goal of the Best Ideas strategy is to exploit this situation and to invest in US wind risks when there is a premium to be earned and to reduce the Cat Bond allocation around October while, at that point in time, identifying investments in Insurance Debt and Insurance Equities. With this dynamic allocation strategy, the fund only invests in hurricane risks for half the year and, as a result, this has the potential to significantly increase the annualised return stemming from the Cat Bond allocation.

Sara: So it is mirroring what someone would do with a multi-asset fund where you are mixing up equities, debt etc. but are you doing this all through an insurance lens with Cat Bonds, Insurance Debt and Insurance Equities?

This was a successful strategy deployed following the hurricane events experienced in 2017 and 2018.

Sara: Are you in competition with each other for business or is it that someone who is looking for a specific level of return, liquidity or risk would be more inclined to go with a particular offering?

Florian: When speaking to clients and potential clients, the aim is to determine what product provides the best fit for their needs. For many clients, it is often more than just one product and in some instances, clients allocate across a number of the strategies that Twelve Capital offers.

Twelve Capital always aims to understand its clients' needs fully and depending on what these are, tries to bring the best solutions to the table. In addition, the journey an investor wants to take in the sector may also play a role in the assessment. Sometimes an initial investment may be in Cat Bonds and a gradual shift into Collateralised Reinsurance may develop or the implementation of a Best-Ideas strategy too. For example, a large corporate pension fund client is invested across several of Twelve Capital's strategies simultaneously.

Sara: If a pension scheme came to Twelve Capital and wanted to allocate to ILS how would you help them determine what the best choice would be?

> "TYPICALLY, NEW PERILS APPEAR IN THE PRIVATE ILS MARKET FIRST WHICH BRINGS BOTH ADVANTAGES AND CHALLENGES"

Raffaele: The main consideration is what level of knowledge the client has in respect of ILS in general. Often a defensive approach to the sector is the initial approach in order to ensure that the investment is working to plan for the client. Risk appetite and risk tolerance are important aspects as are liquidity requirements. Furthermore, regulatory requirements and the legal aspects of the underlying fund structure are also key for many of our investors.

The importance of these aspects, as well as the corresponding jurisdictions, can differ for each client and country. It could be that in one country a certain fund structure is eligible but in another that this is not the case. It is therefore important to be able to offer tailor-made solutions to potential clients to ensure a suitable fit. Twelve Capital has been focusing on such solutions since the foundation of the company in 2010. These may be in the form of single investor funds or managed accounts structured in an efficient cost-effective manner. More than 35% of the company's assets under management are in bespoke structures, with several track records dating back to 2010 or 2011.

Sara: Does the private ILS market have potentially new ways and opportunities of investing in this space?

Raffaele: Typically, new perils appear in the private ILS market first which brings both advantages and challenges. These new perils improve the diversification potential of portfolios and the risk/return profile should therefore become more balanced, which is positive. The challenge is however, that there is generally more limited understanding of the ultimate risk and the potential impact of such new peril types within the market. Therefore, the validation and clarification of the modelling quality for such new perils tends to be more challenging than for more standard and elemental perils such as hurricane and earthquakes. Given that hurricanes and earthquakes are among the perils with the strongest drawdown potential in the reinsurance market, quite naturally more research, funding and validation of corresponding modelling output for event occurrences and loss experiences has been put into these segments.

As portfolio managers, this issue is always a matter for debate, particularly in determining the acceptable level of information uncertainty that can be tolerated in order to increase portfolio diversification.

The ultimate question is whether comfort can be obtained in respect of the inherent level of uncertainty implicit in the issuance of new risks and whether this level of uncertainty appears to be appropriately factored into the price offered to investors. The data may indicate one thing, however, it is Twelve's role to identify whether the data collected is valid and makes sense, from both a stand-alone perspective as well as from a portfolio perspective.

Sara: What have some of the changes been to the ILS market and in particular, how scalable is the market?

Florian: The Cat Bond market is roughly USD 40bn in size and the private ILS market is roughly USD 65bn. Hence, there is plenty of capacity for new investors to come into this space. Obviously, it is still not as liquid as the corporate bond market, so investors should expect to invest with a mid to long-term investment horizon.

There are certain times of the year when it is easier to enter the marketplace, typically before or after the hurricane season. This is because, during the hurricane season, meteorological uncertainty effectively results in less primary issuance during the period.

Etienne: As the Best Ideas strategy invests in three different asset classes, this is clearly less of an issue for this strategy. Within the three target asset classes, the Insurance Equity market is highly liquid so there is the potential to scale up weightings within the respective

portfolio's significantly should this be needed. The same applies to Insurance Debt as it is a large universe with deep liquidity. The Cat Bond allocation is also scalable when required, as it is only part of the portfolio. Should it be necessary, for Cat Bond exposure, focus could initially be upon the highest-paying peril, i.e. US wind risk, therefore providing scalable access to the sector. This would particularly apply when the insurance equity seasonality theme is added around the time of the US hurricane season.

Sara: Is there any further innovation that is going down the track for Twelve Capital? How are you developing the ILS business from a pure Cat Bonds, Collateralised Reinsurance but also Multi-Asset perspective?

Florian: The entire space is innovative and, at least for traditional reinsurance companies, both Cat Bonds and collateralised reinsurance can certainly be viewed as a disruptive force. Twelve is bringing capital markets and the reinsurance market together, which is certainly an innovation and this is likely to continue with new ideas and strategies. Furthermore, Twelve Capital is active in the investment in new risk perils and regions whether it be in the form of Cat Bonds or Collateralised Reinsurance transactions.

The Best Ideas strategy is also a good example of how Twelve's ILS expertise is utilised to invest on a broader scale in order to capture associated return potentials and risk premia.

Raffaele: In terms of innovation, Twelve Capital is also focusing on an analytics project, in the form of a research and development project with Reask, a company which combines artificial intelligence and machine learning algorithms. The analytics project involves working on these areas along with more traditional hurricane forecast methods. It is still very early days, however, the aim is to continuously improve the strategies and services offered to enhance solutions for investment in the insurance sector.

Florian: When referring to innovation, reference should also be made to Twelve's private Cat Bonds programme (called Dodeka, Greek for 'Twelve'). So far, Twelve Capital has structured 25 of these transactions with a combined value of approximately USD 500m. These instruments are structured and negotiated directly between Twelve Capital and the protection buyer and are transactions exclusively structured for the funds and mandates managed by Twelve Capital. Generally speaking, these Dodekas are structured so as to offer high risk diversification in terms of peril, attachment level and/or geographic diversification. Typical transactions transformed in the Dodeka format have included risks such as marine or onshore/offshore energy or terror risks.

Etienne: The liquid Best Ideas strategy invests in Cat Bonds & Dodekas only, although there are also illiquid Best Ideas mandates managed by the company which can invest in more illiquid instruments. These would include Collateralised Reinsurance (Private ILS) and Insurance Private Debt (i.e. regulatory capital of unlisted insurance companies). For example, Insurance Private Debt, particularly in Florida, is an interesting area in which to seek to capture the return potential associated with the ILS market through the growth of the insurance sector in that state. As a firm, Twelve has undertaken over 28 insurance private debt transactions over the last four years.

Sara: Thank you all for sharing your thoughts on this topic.

CLEAR PATH ANALYSIS

TO READ MORE FREE REPORTS VISIT:

www.clearpathanalysis.com

The opinions expressed are those of the individual speakers and do not reflect the views of the sponsor or publisher of this report.

This document is for marketing and/or informational purposes only, it does not take into account any investor's particular investment objectives, strategies or tax and legal status, nor does it purport to be comprehensive or intended to replace the exercise of an investor's own careful independent review regarding any corresponding investment decision. This document and the information herein does not constitute investment, legal, or tax advice and is not a solicitation to buy or sell securities or intended to constitute any binding contractual arrangement or commitment to provide securities services. The information provided herein has been obtained from sources believed to be reliable at the time of publication, nonetheless, we cannot guarantee nor do we make any representation or warranty as to its accuracy and you should not place any reliance on said information.

© Clear Path Analysis Ltd, registered in England and Wales No. 07115727.
Registered office: 601 London Road, Westcliff-On-Sea, United Kingdom, SS0 9PE.
Trading office: Business Design Centre, 52 Upper Street, London, N1 0QH

W www.clearpathanalysis.com
T +44 (0) 207 688 8511
E marketing@clearpathanalysis.com
ClearPathAnalys
in clear-path-analysis