

# A Review of Selected Equity and Credit Investment Strategies of Reinsurer

Martin Kocúrek<sup>1</sup>

<sup>1</sup> University of Economics in Bratislava, Faculty of National Economy,  
Department of Finance, Dolnozemská cesta 1, Bratislava, 852 35,  
Slovak Republic

`martin.kocurek@euba.sk`

<https://doi.org/10.53465/EDAMBA.2023.9788022551274.104-115>

**Abstract.** This paper analyses specific type of investor on financial markets – a reinsurance company and its value-creating process, with focus on its investment activities. A special attention is focused on reinsurer’s idiosyncratic investor’s profile due to core business activities, i.e. underwriting. This makes its investment profile an objectives different to other market participants. We modelled and analysed reinsurer’s three main investment strategies based on underlying asset classes of particular portfolios. Each of these portfolios is comprising of three sub-portfolios which are managed by different portfolio managers. Analysed investment strategies are: (i) Listed Equity Portfolio, (ii) Corporate Credit USD Portfolio and (iii) Structured Credit USD Portfolio. We analysed and compared performance of these strategies, risk-adjusted performance, volatility and duration (where applicable). Performance of investment strategies is assessed on 2010-2015 time-frame against selected composite benchmark. This period was chosen for analysis due to the relative macroeconomic stability of previous decade (2010-2019) which have been dominated by strong returns among many asset classes.

**Keywords:** Reinsurer, Investment Strategies, Portfolio Management.

**JEL classification:** *G22, G11, G32*

## 1 Introduction

Retail insurance companies and many companies seek ways to reduce risks. It has become an important issue as managers have been under pressure from company shareholders manage risk exposure more efficiently. The consequences of firm’s risk-taking have effect on firm’s performance and value. Particular type of such risk retail insurers aim to minimize is characterised by high-variance risks of their insurance portfolios. Insurers and businesses intend to transfer risks fully or at least partially on a

second party by buying reinsurance protection from reinsurance companies in order to cover losses they do intend to fully retain. Reinsurance reduces underwriting and solvency risks and enables insurers to sell additional insurance products, i.e. underwriting. Such transfer of risk imposes additional cost on risk transferor in form of reinsurance premium payable to reinsurer. The crucial task for management of reinsurer is to understand how to achieve value creation (Barton, 2011 or Jesse and Currall, 2011). The reinsurer aims to create economic value from its underwriting and investment activities which generate economic results (either profit or loss). Both activities represent different risk-return relationships.

This paper, does not study underwriting activities, but focuses on economic value created from reinsurer's investment activities by its asset management arm. The previous decade (2010-2019) was characterised by strong returns across multiple asset classes. Diversification was the biggest challenge and both, equity and bond markets were either fully valued or overpriced. Asset managers needed to implement more comprehensive portfolio strategies to cope with the prevailing investment field of lower return and higher risk. Government bonds were more overpriced than equities and the issue for asset managers was whether fully valued equity markets could be diversified into even more expensive government bond markets. In addition, many companies decided to pursue large buybacks of their shares which contributed with additional fuel to equity market growth. Finally, a large growth sector was contributed thanks to continually supportive monetary and fiscal policy. When making investment decision, reinsurer chooses different asset classes while considering trade-offs between its expected return and risk profile. In addition opportunity costs of variety of multiple investment opportunities into various asset classes are considered as well. This paper compares performance of three investment strategies of reinsurer, in particular: Listed Equity Strategy, Corporate Credit USD Strategy and Structured Credit USD Strategy on a 5 year time horizon during the time of economic stability (2010-2015). For each investment strategy several portfolios managed by various portfolio managers are selected and appropriate benchmark is assigned to given strategies and portfolios.

## **2 Literature Review**

### **2.1 Fundamentals of Reinsurer**

Reinsurance companies are specific type of investors on financial markets who dispose with significant amount of financial resources, in particular free capital which enables them to allocate available resources either fully or partially into financial assets based on their investment policy and risk profile. Available financial resources of reinsurance stream from their core business activities, i.e. underwriting, with focus on reinsurance and wholesale insurance. Retail insurers and industrial conglomerates seek reinsurance because of their need for controlled risk management and financial and operational stability. The answers to relationship between capital, reinsurance and risk taking for insurance firms who seek to maximize their value are provided by Venter (2001), Mankai and Belgacem (2016). In addition, reinsurance is beneficial for

reinsuree especially in financial terms in positive earnings and valuation effects (Venter, 2006). Retail insurers buy reinsurance despite it reduces their expected profit from short-term perspective (increased cost for reinsurance premium) as the risk-neutral subjects will use reinsurance to maximize the total value of the firm as the benefits of reinsurance provides stability (long-term focus). Reinsurance maximises retail insurer's expected utility in form of its wealth, hedges underwriting risk and provides stability and various benefits - positive externalities (Mao, Carson, and Ostaszewski, 2017). Therefore potential losses are stabilised, capacity and limit liability on specific risks is increased (against insurance claims during catastrophes), thus reduced capital costs. Reinsurance reduces the volatility loss ratio, but on the purchase of reinsurance increases costs (Cummins, Dionne, Gagné, and Noura, 2008).

Risk transfer from retail insurer to reinsurer is expensive. The reinsurance pricing has been widely discussed which led to multiple premium methodologies. In general terms however, the higher magnitude of the expected risk transfer to a reinsurer, the more expensive the reinsurance premium is (MacGregor, Nanthakumaran and Orr, 2012; Wu and Olson, 2013; Porth, Pai and Boid, 2013). When risks are low and uncorrelated across geographical regions, reinsurance premium are more favourably priced in favour of the risk transferor. The price of reinsurance premiums has been constantly increasing due to larger volatility of losses caused by natural catastrophes and lower investment returns in recent years. In perfect market, reinsurance premium for catastrophic events should be similar to expected losses as catastrophic events are uncorrelated with financial markets (Froot, 2001 and Gall, Nguyen, Cutter, 2015).

Reinsurer is active in multiple business segments, thus consolidates income from underwriting into specific segments due to risk pooling (reduction of variance of aggregate risks of reinsurance portfolios with diversification at the same time). Reinsurer applies valuation frameworks for liabilities (underwriting) and assets (investing). Biggest reinsurers apply their own internal methodologies, however since January 2023 new standard IFRS 17 has been adopted (IFRS, 2023) and provides unified method for valuation of liabilities and assets.

## **2.2 Reinsurer's Investment Process**

Reinsurer employs capital which becomes available to different risk pools of insurance and reinsurance risk (underwriting risk) and invests them into assets on financial markets (investment risk), thus underlying liabilities are matched into assets by applying asset liability matching framework (ALM). This approach enables split of economic balance sheet into investment and underwriting balance sheet, thus separate underwriting risk from market risk and enable to earn profit on the top of underwriting activities, from investment activities, thus create additional added value. A comprehensive and generally accepted model of total return of reinsurer is provided by Bingham (2000) from which various accounting frameworks were developed.

Considering risk pool of particular liability and underlying investment portfolio, reinsurer's portfolio managers seeks ways to choose the most suitable investment strategy that matches risk profile of given portfolio. Reinsurer uses multiple

investment strategies. The result of the chosen investment strategy is the portfolio performance itself, which is measured against the respective benchmark (Prather, Bertin, and Henker, 2004). Active strategies are managed with the aim to beat the respective benchmark, whereas the primary reason for passive strategies is not necessarily to beat benchmark, but further objectives are predominantly considered. Benchmarks in insurance or reinsurance companies can be set in relation to liabilities incurred. This benchmark type based on growth rate of liabilities is relatively easy to beat as portfolios with significant weightings in equities tends to exceed the growth rate of liabilities (Blake and Timmermann, 2013; Korkie, 2002; Tonks, 2002). Portfolio managers could choose from a variety of investment strategies which are based on their risk profiles. In the most cases they decide between safe and risky assets (Fama and French, 2014). The challenge for investors, however, is not limited only to choosing the particular asset class (equities, bonds, derivatives, credit, etc.), but rather to more complex question of how to compose portfolio that suits their risk profile in the best possible way (Massa and Patgiri, 2009). Reinsurer's investment strategies focus on their investment objectives while maintaining sufficient liquidity and managing risk and regulatory requirements. Risk management and diversification techniques must be also incorporated and are influenced by the regulatory environment and the ratings agencies that evaluate their financial stability (Moody's, S&P, Fitch) and are required to maintain high levels of capital reserves, which can limit the amount of risk they are able to take on in their investment strategies. Considering reinsurer invests significant portion of its portfolio into fixed income and credit securities, duration management is critical. Duration is a measurement framework of the sensitivity of an asset or liability to changes in interest rates.

### **3 Methodology and Data**

We modelled and analysed reinsurer's three investment strategies: (i) Listed Equity Portfolio, (ii) Corporate Credit USD Portfolio and (iii) Structured Credit USD Portfolio. Portfolio performance is analysed by using Bloomberg PORT function. In addition to Bloomberg Terminal, BlackRock Aladdin technical platform was used to source data, construct portfolios and calculate risk and return analysis, regional and currency exposure and portfolio duration.

Performance of investment strategies is assessed on 2010-2015 time-frame. This period was chosen for analysis due to the relative macroeconomic stability of previous decade (2010-2019). 5 year period was chosen as a result of shorter contractual time frame of underlying liability portfolio from underwriting and is not studied in this paper.

### **3.1 Listed Equity Portfolio**

The investment objective is to outperform equity market measured by the selected MSCI benchmark while retaining a defined level of portfolio diversification and liquidity. Permitted portfolio securities are listed equities on various developed markets and minor part of portfolio can be constructed from emerging market equities. The use of leverage and short selling is not permitted. Listed equity strategy includes the total amount of funds allocated by reinsurer into equity investments. Based on regional, i.e. geographical exposure, reinsurer applies three main equity portfolios: (i) Global Equity (Large Cap Companies), (ii) US Equity Portfolio (Large Cap Companies) and (iii) Local Currency portfolio.

### **3.2 Corporate and Structured Credit USD Portfolio**

The objective is to actively manage portfolio to earn a reasonably high and stable level of income and achieve a total return in excess of the selected benchmark. Corporate credit portfolio represents the total amount of funds allocated by reinsurer into corporate credit securities and consists of 3 smaller sub-portfolios, referred to as “Credit 1 USD PF”, “Credit 2 USD PF”, “Credit 3 USD PF” where each of these sub-portfolios are managed by different portfolio manager.

Structured credit portfolio is the total amount of funds allocated by reinsurer into structured credit products which based on definition by Oaktree Capital (2019) are created via securitisation process which involves pooling similar debt obligations into interest-bearing securities by those assets and issued and sold to investors. This pooling relocates risk and return potential in the underlying loan. Reinsurer in this type of portfolios invests into securitised consumer credit products. Structured credit portfolio consists of 3 smaller sub-portfolios, referred to as “Strategy 1 PF”, “Strategy 2 PF”, “Strategy 3 PF” where each of these sub-portfolios are managed by different portfolio manager.

## **4 Results and Discussion**

### **4.1 Listed Equity Portfolio**

We analysed performance of equity strategy on three equity portfolios: Global Equity Portfolio, US Equity Portfolio and Local Currency Equity Portfolio on a time frame from December 2010 till June 2015. As benchmarks we applied MSCI World USD index for Global Equity Portfolio, S&P 500 for US Equity Portfolio and MSCI China A Shares for Local Currency Equity Portfolio.

**Table 1.** Return Analysis of Listed Equities Portfolios

| Portfolio                       | NAV (m USD) | ItD Return (%) | Font size and style   |
|---------------------------------|-------------|----------------|-----------------------|
| <b>Listed Equity</b>            | <b>2774</b> | <b>78.4</b>    | <b>MSCI World USD</b> |
| Global Equity (Large Cap)       | 1132        | 62.5           | MSCI World USD        |
| US Equity Portfolio (Large Cap) | 1551        | 92.1           | S&P 500 TR            |
| Local Currency Portfolio        | 91          | 110.9          | MSCI China A Shares   |

Source: Prepared based on Bloomberg Terminal and BlackRock Aladdin data (2023).

Table 1 provides overview of Listed Equity investment strategy comprising of three portfolios. Reinsurer applied this strategy from November 2011 till November 2015. The total net asset value (NAV) as of 31 December 2015 of all listed equity portfolios was 2.774 bil USD. Of this amount, 1.132 bil USD represents Global Equity portfolio (40.81% share of Listed Equity's NAV) investing into enterprises with large capitalisation whose performance is assessed against MSCI World USD. US Equity Portfolio of 1.551 bil USD NAV (55.91% share of Listed Equity's NAV) invests similarly as the former into large cap companies with geographic focus on the USA only. Local Currency Portfolio of 91 mil USD NAV (3.28% share of Listed Equity's NAV) focuses 100% on Chinese equities.

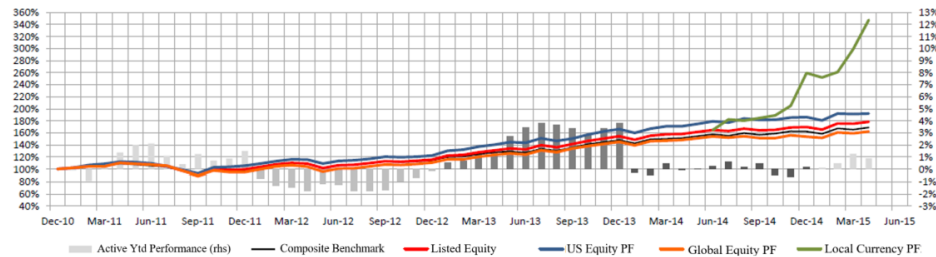
**Table 2.** Regional & Currency Exposure of Listed Equity Strategy

| Regional Exposure | NAV (%) | Currency Exposure | NAV (%) |
|-------------------|---------|-------------------|---------|
| USA               | 81.1    | USD               | 83.6    |
| Europe            | 13.8    | EUR               | 4.4     |
| China             | 4.0     | GBP               | 5.2     |
| Emerging Markets  | 1.0     | CHF               | 1.4     |
|                   |         | JPY               | 2.5     |
|                   |         | Other             | 2.9     |

Source: Prepared based on Bloomberg Terminal and BlackRock Aladdin data (2023).

When analysing listed equity currency exposure based on Table 2, the biggest proportion of 83.6% is denominated in USD which is in line with geographical exposure in Table 2 with 81.1% of portfolio streaming from North America. The remaining 18.9% currency exposure accounts for 4.4% in EUR, 5.2% GBP and 1.4% CHF which makes these European currency's share 11% on currency exposure in comparison to 13.8% on geographical exposure. Asia-Pacific geographic exposure is 4.0%. In terms of corresponding currency to this region, JPY accounts for 2.5% exposure, the remaining part is included in other currencies. This currency and

geographical exposure are a result of investments by reinsurer’s asset management which within ALM allocated funds to given currencies due to exposure from underlying



liabilities from underwriting activities which were underwritten within given geographies.

**Fig. 1.** Equity Strategies Performance Analysis 2010-2015

Source: Prepared based on Bloomberg Terminal and BlackRock Aladdin data (2023).

Based on Table 1 and Fig. 1 we assess performance of Listed Equity strategy which is comprising of three main portfolios. The best performing strategy was Local Currency portfolio which with inception to date (ItD) absolute return of 110.9%, US Equity Portfolio (Large Cap) with ItD absolute return of 92.1%, Global Equity (Large Cap) with ItD absolute return of 62.5%. The Listed Equity Strategy’s ItD absolute return is 78.4%. All portfolios outperformed the composite benchmark.

#### 4.2 Corporate Credit Portfolio

Reinsurer’s investments into corporate credit are realised via Corporate Credit USD Portfolio comprising of three sub-portfolios, in particular Credit 1 USD PF, Credit 2 USD PF, Credit 3 USD PF. Each sub-portfolio is managed by different portfolio manager with funds being allocated into different types of corporate credit representing 95.7% of NAV. The remaining part of NAV is invested into Sovereigns of 3.4% and cash 0.9%. Of 95.7% of NAV allocated into corporate credit, 51.4% of this amount is allocated into industrials (focus on consumer non-cyclical of 14.1%, communications of 9.1%, energy of 9.0%, consumer cyclic of 8.8%). The 35.6% of NAV is invested into financial corporations (focus on banking with 22.5%). Due to the limited scope of this paper, it could not have been possible to accommodate more detailed overview in a separate analysis.

**Table 3.** Return Analysis of Corporate Credit USD Portfolio

| Portfolio                   | NAV (m USD) | ItD Return (%) | Volatility (%) | Sharpe Ratio |
|-----------------------------|-------------|----------------|----------------|--------------|
| <b>Corporate Credit USD</b> | <b>7330</b> | <b>18.8</b>    | <b>3.0</b>     | <b>0.47</b>  |

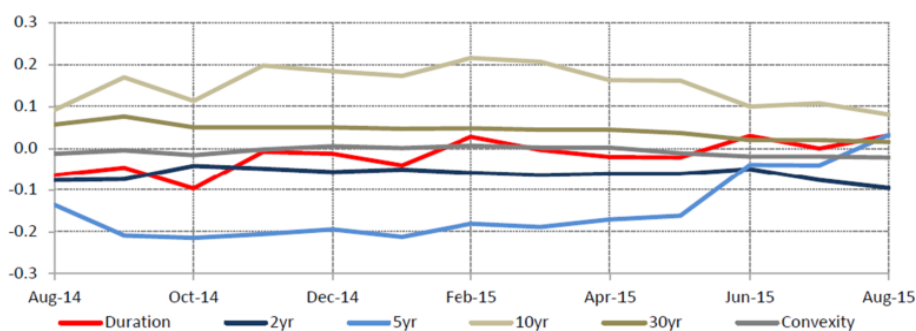
|                 |      |      |      |      |
|-----------------|------|------|------|------|
| Credit 1 USD PF | 2799 | 20.0 | 2.85 | 0.51 |
| Credit 2 USD PF | 2224 | 16.4 | 3.01 | 0.51 |
| Credit 3 USD PF | 2306 | -0.3 | n/a  | n/a  |

Source: Prepared based on Bloomberg Terminal and BlackRock Aladdin data (2023).

The best performing ItD sub-portfolio of Corporate Credit USD Portfolio was Credit 1 PF with ItD absolute return of 20.0%, then Credit 2 PF with ItD absolute return of 16.4% and Credit 3 PF which with ItD absolute return of -0.3%. The ItD absolute return of Corporate Credit USD Portfolio was 18.8%. Negative ItD absolute return of Credit 3 PF is caused due to its short existence (launch in May 2015), effect of fees and launch costs.

In terms of assessing risk-adjusted performance by Sharpe Ratio we follow the logic the greater a portfolio's Sharpe ratio is, the better its risk-adjusted performance is. Based on this assessment, both Credit 1 PF and Credit 2 PF were assessed with Sharpe ratio of 0.51 and Sharpe Ratio of Corporate Credit USD Portfolio was 0.47.

In terms of volatility, Corporate Credit USD Portfolio's volatility in measured period was 3.00% or if measured by Beta 0.95. The highest volatility was observed on Credit 2 PF with volatility of 3.01%, beta 0.95. The second highest volatility is calculated for Credit 2 PF of 3.01% and Beta 0.95.



**Fig. 2.** Active Duration Exposure - Corporate Credit USD Strategies

Source: Prepared based on Bloomberg Terminal and BlackRock Aladdin data (2023).

Measurement of the sensitivity of the price of a bond or fixed income instrument to a change in interest rates is referred to as duration which are influenced by time to maturity and coupon rate. Based on Fig. 2, active duration exposure is assessed for 2014 and 2015. The higher the duration, the more an investment's price will drop as interest rates increase (or increase as interest rates decrease). Securities of Corporate Credit USD Strategies which are the most sensitive to price drop in case of



increase in interest rates are securities with 10 year duration. On the contrary, the opposite case is for securities with 5 year duration whose price will increase as interest rates decrease.

### 4.3 Structured Credit Portfolio

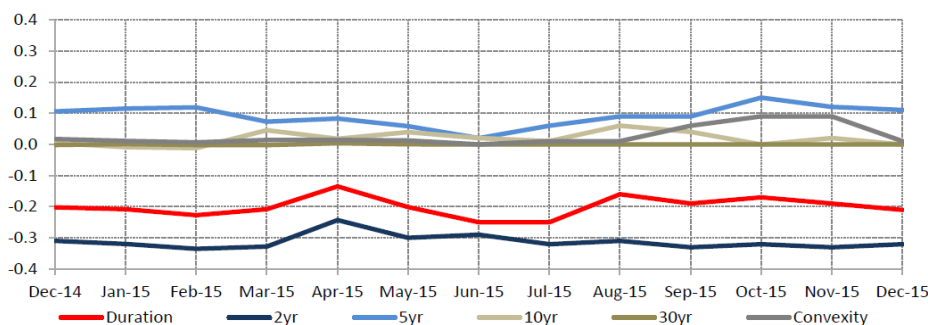
Reinsurer’s investments into structured credit is realised via Structured Credit USD portfolio comprising of three sub-portfolios, in particular Strategy 1 PF, Strategy 2 PF, Strategy 3 PF. Each sub-portfolio is managed by different portfolio manager with funds being allocated into Asset Backed Securities (ABS) of 72.7% of NAV. 27.3% is allocated into Auto asset-backed securities (auto ABS) which are structured finance securities that are collateralized by auto loans or leases, such as those to prime (high credit standing) and subprime (low credit standing) borrowers. 24.5% of ABS into securitized credit card debt, 6.6% into student debt and 9.2% other securitized debt. Besides ABS, reinsurer allocates funds into commercial mortgage-based securities (CMBS) of 23.9% of NAV). Due to the limited scope of this paper, it could not have been possible to accommodate more detailed overview in a separate analysis.

**Table 4.** Return Analysis of Structured Credit USD Portfolio

| Portfolio                    | NAV (m USD) | ItD Return (%) | Volatility (%) | Sharpe Ratio |
|------------------------------|-------------|----------------|----------------|--------------|
| <b>Structured Credit USD</b> | <b>1675</b> | <b>13.0</b>    | <b>2.07</b>    | <b>0.60</b>  |
| Strategy 1 PF                | 575         | 4.5            | 2.03           | 0.61         |
| Strategy 2 PF                | 611         | 12.6           | 2.16           | 0.57         |
| Strategy 3 PF                | 488         | 12.9           | 2.03           | 0.62         |

Source: Prepared based on Bloomberg Terminal and BlackRock Aladdin data (2023).

In terms of performance, Structured Credit USD Portfolio bet the selected composite benchmark. All sub-portfolios, in particular Strategy 1 PF, Strategy 2 PF, Strategy 3 PF bet the selected benchmark as well. The best performing ItD sub-portfolio of Structured Credit USD Portfolio was Strategy 3 PF with ItD absolute return of 12.9%, then Strategy 2 PF with ItD absolute return of 12.6% and Strategy 1 PF which



with ItD absolute return of 4.5%. The performance of Structured Credit USD Portfolio was 13.0%.

**Fig. 3.** Active Duration Exposure – Structured Credit USD Strategies

Source: Prepared based on Bloomberg Terminal and BlackRock Aladdin data (2023).

In terms of assessing risk-adjusted performance by Sharpe Ratio, Strategy 3 PF Sharpe Ratio is 0.62 representing the best risk-adjusted performance, then Strategy 1 PF with Sharpe Ratio of 0.61 and Strategy 2 PF Sharpe Ratio is 0.57. Sharpe Ratio of Structured Credit USD Portfolio was 0.60.

In terms of volatility, Structured Credit USD Portfolio's volatility in measured period was 2.07% or if measured by Beta 0.95. The highest volatility was observed on Strategy 2 PF with volatility of 2.16%, beta 0.99. The second highest volatility is calculated for both, Strategy 1 and 3 PF of 2.03% and Beta 0.93 respectively.

When assessing active duration exposure for 2014 and 2015 in Fig. 3, there have not been major deviations as a reaction on change of interest rates due to relatively stable economic environment. Active duration exposure of all types reached identical values in the beginning of measured period in December 2014 and at the end in December 2015. Securities within Structured credit USD Strategies the most sensitive to price drop in case of increase in interest rates are securities with 5 year duration. On the contrary, the opposite case is for securities with 2 year duration whose price will increase as interest rates decrease.

## 5 Conclusion

This paper analysed selected investment strategies of specific type of investor on financial markets, a reinsurer company. Performance of investment strategies is assessed on 2010-2015 time frame. All investment strategies bet selected benchmarks. Listed Equity Strategy with NAV of 2.774 bil USD, focused with 81.1% of its NAV on USA with 83.6% currency exposure to USD. Its ItD absolute return was 78.4%. This strategy is comprising of three portfolios which form the Listed Equity Strategy. The best performing of them was Local Currency portfolio (ItD absolute return of 110.9%, however small size of only 3.28% Listed Equity's share of NAV with focus on China), US Equity Portfolio Large Cap (ItD absolute return of 92.1%, 55.91% share of Listed Equity's NAV), Global Equity Large Cap, (ItD absolute return of 62.5%, 40.81% share of Listed Equity's NAV).

In terms of credit investments, reinsurer applies Corporate Credit and Structured Credit strategies. Corporate Credit USD Portfolio with NAV of 7.3 bil USD is 4.35 times bigger than Structured Credit USD Portfolio with NAV of 1.68 bil USD. In terms of performance, both portfolios bet the composite benchmark. The ItD absolute return of Corporate Credit USD Portfolio was 18.8% which achieved higher return than Structured Credit USD Portfolio of 13.0%.

Corporate Credit Strategy's volatility of 3.0% is higher than Structure Credit's volatility of 2.07%. For risk-adjusted performance assessment by Sharpe Ratio we follow the logic the greater a portfolio's Sharpe ratio is, the better its risk-adjusted

performance is. In this respect Structured Credit's Sharpe Ratio of 0.6 provides better risk-adjusted performance than Corporate Credit's 0.47.

The traditionally conservative risk profile of reinsurer has been reflected in its investment strategies. From NAV of 11.779 bil USD allocated for investments, 76.45% (9 bil USD) was allocated into credit strategies (for structured credit 14.22% of NAV, 1.647 bil USD; for corporate credit 62.23% of NAV, 7.330 bil USD). Corporate Credit yielded 18.8% and Structured Credit yielded 13.0%. Although more risky Listed Equity strategy reached ItD absolute return was 78.4% which is considerably higher than for both credit strategies (4.17 times more than Corporate Credit USD Strategy and 6.03 times more than Corporate Credit USD Strategy), Listed Equity's share on NAV was only 23.55%.

## References

1. Barton, D., 2011. Capitalism for the long term. *Harvard business review*, 89(3), pp.84-91.
2. Bingham, Russell E. "Risk and Return: Underwriting. Investment and Leverage Probability of Surplus Drawdown and Pricing for Underwriting and Investment Risk." *Proceedings of the Casualty Actuarial Society*. Vol. 37. 2000.
3. Blake, D. and Timmermann, A., 2002. Performance benchmarks for institutional investors: Measuring, monitoring and modifying investment behaviour. In *Performance Measurement in Finance* (pp. 108-141). Butterworth-Heinemann.
4. Blake, D., Rossi, A. G., Timmermann, A., Tonks, I., & Wermers, R. (2013). Decentralized investment management: Evidence from the pension fund industry. *The Journal of Finance*, 68(3), 1133-1178.
5. Cummins, J.D.G. and Dionne, R.G., A. Nouira. 2008. The Cost and Benefits of Reinsurance. A publication of the Interuniversity Research Centre on Enterprise Networks, Logistics and Transportation (CIRRELT).  
[https://www.hec.ca/iea/cahiers/2008/iea0804\\_rgagne.pdf](https://www.hec.ca/iea/cahiers/2008/iea0804_rgagne.pdf)
6. Froot, K., 2001. The Market for Catastrophe Risk: A Clinical Examination. *Journal of Financial Economics*. 60(2-3). 529-571.
7. Gall, M., Nguyen, K.H. and Cutter, S.L., 2015. Integrated research on disaster risk: Is it really integrated?. *International journal of disaster risk reduction*. 12. pp.255-267.
8. Jesse, B., Currall, S. 2011. A model for focusing executives on Long-Term value creation. *Harvard Business Review*. <https://hbr.org/2011/10/a-model-for-focusing-executive>
9. Korkie, B., 2002. A clinical analysis of a professionally managed portfolio. In *Performance Measurement in Finance* (pp. 198-228). Butterworth-Heinemann.
10. Macgregor, B.D., Nanthakumaran, N., Orr, A.M., 2012. The sensitivity of UK commercial property values to interest rate changes. *Journal of Property Research*, 29(2), pp.123-151.
11. Mankaï, S. and BELGACEM A. (2016) "Interactions between Risk Taking, Capital, and Reinsurance for Property-Liability Insurance Firms." *Journal of Risk and Insurance* 83(4): 1007–1043.
12. Mao, H., Carson, J.M. and Ostaszewski, K.M., 2017. Optimal insurance pricing, reinsurance, and investment for a jump diffusion risk process under a competitive market. *Journal of Insurance Issues*. pp.90-124.
13. OAKTREE CAPITAL., 2019. Strategy Primer: Investing in Structured Credit. <https://www.oaktreecapital.com/docs/default-source/default-document-library/investing-in-structured-credit.pdf>

14. Porth, L., TAN, K. T. and Weng, C. 2013, Optimal Reinsurance Analysis From a Crop
15. Prather, L., Bertin, W. J. and Henker, T. (2004). "Mutual fund characteristics, managerial attributes, and fund performance," *Review of financial economics*, 13(4), 305-329.
16. Tonks, I., 2002. Measurement of pension fund performance in the UK. In *Performance Measurement in Finance* (pp. 342-365). Butterworth-Heinemann.
17. Venter, G.G., 2006. Capital Allocation for P & C Insurers: A Survey of Methods. *Encyclopedia of Actuarial Science*, 1.
18. Venter, G.G., Gluck, S.M. and Brehm, P.J.. 2001. Measuring value in reinsurance. In *CAS Forum* (Vol. 2001, pp. 179-199).
19. Wu, D. D., & Olson, D. L. (2013). Computational simulation and risk analysis: An introduction of state of the art research. *Mathematical and Computer Modeling*, 58, 1581–1587.