EIOPA thematic review: Big Data Analytics in insurance

A summary of EIOPA's recent report on the use of Big Data in motor and health insurance

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In May 2019, the European Insurance and Occupational Pensions Authority (EIOPA) published its thematic review on the benefits and risks arising from the use of Big Data Analytics (BDA) in health and motor insurance.

The review gathered empirical evidence on the use of BDA from 222 insurance undertakings and intermediaries from 28 jurisdictions. This coverage accounts for approximately 60% of the total gross written premium (GWP) of the motor and health insurance lines of business in the respective national markets.

The report (which can be found here) examines the application of BDA across the insurance value chain from product development and sales right through to claims management. Unsurprisingly, the report focusses on concerns over data quality and the ability to audit vast amounts of data, as well as ethical issues around transparency and fairness, however, it also considers the potential benefits of BDA.

Big Data and BDA Tools

DATA ENRICHMENT

Data is a cornerstone of the insurance industry and informs decisions made across all activities of an insurer. Insurers have historically relied on traditional sources of data collected predominantly by the insurers themselves. These traditional data sources include health data, exposure data (e.g. car type and distance driven), demographic data and many other types. However, these are increasingly combined with new data sources such as online media or telematics data.
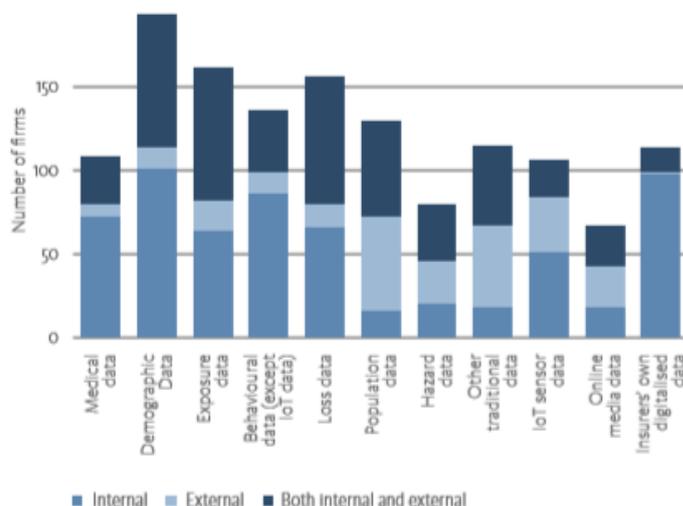
EIOPA's review highlighted two key findings relating to the use of BDA in insurance.

The first is the growing use of data made available by digitalisation. 50 of the 222 participants indicated that they already use Internet of Things (IoT) data such as "black boxes" (event data recorders fitted to vehicles to measure how safely an insured person drives by recording metrics such as speed, distance and braking etc.) and wearables such as fitness tracking bands and Smartwatches. The huge amounts of data collected from these devices informs more accurate individual underwriting of policies and can be used to assess the validity of claims, amongst many other uses. Many participants indicated that they also use their own digitalised data such as cookies on their website to inform targeted marketing campaigns.

The report notes that BDA is being used to complement traditional data sources, not replace them. Many health insurers indicated that they outsource the analysis of their health data to providers who use digital tools to process large datasets in shorter times. In motor insurance, the use of post codes as proxies for rating factors such as incidence of crime are being complemented with "micro-zoning" from geocoding data (assessing risk at a more granular house-by-house level). Geocoding data is also being used to optimise the locations of tied motor vehicle repair shops and distribution channel offices.

The second trend is the growing use of external data sources to complement traditional data. The report points to the increasing use of bank and credit card data to predict propensity for shopping around/churning of business and to check fraudulent claims. Many also use third parties to track social media data as a method of fraud detection and data from search engines to optimise targeted marketing campaigns. Figure 1 shows the main types of data used by insurers and whether it is gathered from internal or external sources.

FIGURE 1:   MAIN USES OF INTERNAL AND EXTERNAL DATA

Source: EIOPA BDA thematic review

Figure 1 excludes the uses of genetic data as it is insignificant by comparison to other datatypes. Genetic data remains a sensitive issue with many ethical concerns around this area. For example, is it fair to underwrite health insurance by identifying pre-dispositions to certain medical conditions from an applicant's DNA and are insurers then obliged to inform applicants of the findings? Despite the challenges, 9 participants from 7 different countries say they plan to use genetic data in the next 3 years.
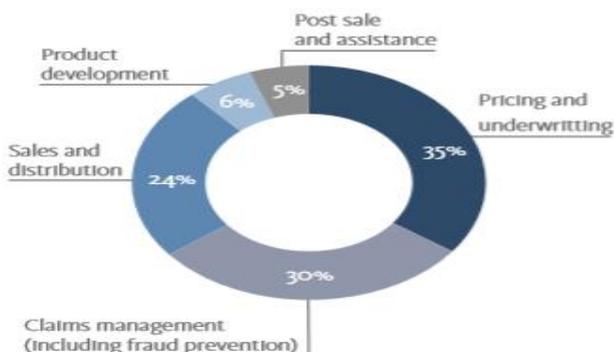
MACHINE LEARNING, AI AND THE CLOUD

31% of those surveyed indicated that they are already actively using BDA tools such as Artificial Intelligence (AI) or Machine learning (ML) and a further 24% are experimenting with their application. ML and AI allow the development of very accurate models with little or no human interaction, increasing the efficiency of the decision-making process. Most firms indicated that they have developed these solutions in-house with a small few purchasing "off-the-shelf" packages. EIOPA's report also points to the growing use of open source tools such as "Python" and "R". However, the use of these tools creates challenges around ensuring accuracy, transparency and auditability. With many tools such as Artificial Neural Networks (a type of ML) there is a complex layer of computation between input and output making it very difficult to explain the relationship between the two. Furthermore, these tools can amplify biases present in the historic input data used, so data quality and governance are crucial in addressing this issue.

The popularity of cloud computing technology has grown significantly since the late 2000s and lower development costs, faster time to market and automatic scaling make it a suitable partner for BDA solutions. In addition, many firms offering cloud computing solutions also provide outsourced AI and ML services. 33% of respondents already use cloud services and a further 32% expect to use them in the next 3 years. However, data security is a major concern with this technology, especially when data is held outside the EU or there is a lack of transparency over the location of data across multiple centres.

Application of BDA across the Insurance Value Chain

Figure 2 below highlights the uses of BDA across all aspects of the value chain. The evolution of the split shown in figure 2 over the next 3 years is expected to remain fairly constant according to EIOPA's findings. Most participants focus their BDA efforts on one specific function and very few use these techniques across a range of functions.

FIGURE 2:   USE OF BDA TOOLS ACROSS THE VALUE CHAIN

Source: EIOPA BDA thematic review

In product development, BDA has enabled greater insight into customer needs and characteristics and allows for a more granular assessment of risk. This has driven the development of Usage Based Insurance (UBI) products or telematics such as Pay As You Drive or Pay How You Drive. While the current penetration of these products into the European market is quite low (15% of motor insurers and 4% of health insurers indicated that they sell these products), the development of technologies such as 5G mobile networks and increasingly connected vehicles is set to fuel growth in this area.

BDA allows more specific profiling and segmentation of customers at the sale and distribution stages. Customer Relationship Management (CRM) systems are able to aggregate all customer information into one system, increasing efficiencies and reducing operational costs. Many respondents indicated they are using or plan to use BDA to forecast business volumes and estimate customers' lifetime value to inform marketing.

The majority of participants claim to use BDA at some stage in their claims management process. Of those that do, 55% developed their approach in-house. Many use models to assign fraud scores to each claim to focus claim investigation efforts. It is also being used to increase efficiency in dealing with invoices and claim forms. Figure 3 summarises some of the uses of BDA across the insurance value chain.

FIGURE 3: SUMMARY OF THE USES OF BDA ACROSS THE VALUE CHAIN.

Product Development

- Personalised products and services
- New risk factor identified
- New products
- Usage Based Insurance/Telematics
- Fine tuned predictive analytics models benefit customer and insurer

Sales and Distribution

- Targeted/personalised marketing
- Cross selling and up-selling
- Analyse churn propensity
- Sophisticated CRM systems
- Robo-advisers
- Development of Next Best Action (NBA) approach.

Post-sales service and assistance

- 24/7 automated call centres
- Chatbots
- Process mobile app data
- Automated customer service quality evaluations
- Speech analytics in customer authentication

Claims Management & Fraud Prevention

- Claim prevention-safety warning push notifications
- Segmentation of claims by type
- Automated invoice validation
- Targeted fraud investigation
- Estimation of claim severity from images or video
- Claim settlement propensity models
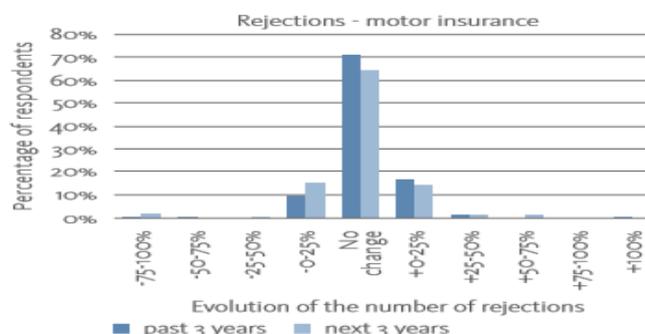
Source: EIOPA BDA thematic review report

BDA in Pricing and Underwriting

The growing popularity of price comparison websites, as well as new market entrants, has increased competition in Europe's non-life market. Insurers are now focusing efforts into utilising new technology and data sources to optimise business. BDA can play a key role here in influencing rating factors used in underwriting, providing a more granular segmentation of risk and enabling more effective risk selection.

EFFECT ON FINANCIAL EXCLUSIONS / INCLUSIONS

A major concern for consumers is that the use of BDA in underwriting will affect the ability of high-risk customers to purchase affordable insurance and so may be excluded. EIOPA examined several indicators testing the impact of BDA on exclusions. Ultimately, there was insufficient evidence in the investigation to suggest that exclusions were increasing due to the use of BDA. The investigation found no significant increase in the standard deviation of average premiums or the membership of insurability schemes which provide affordable cover for high-risk policyholders who were rejected by insurers or received very high quotes. Figure 4 below illustrates how rejection rates have changed very little in recent years and are not expected to change significantly over the next 3 years in motor insurance. The picture is the same for health insurance.

FIGURE 4: EVOLUTION OF REJECTION RATES IN MOTOR INSURANCE

Source: EIOPA BDA thematic review

Some respondents believe BDA may actually improve inclusion. For example, telematics may provide better rates for young drivers and the ability to more accurately price high-risk polices will increase competition and decrease premiums in these groups.

RATING FACTORS

BDA is likely to facilitate the use of a greater number of rating factors, particularly in motor insurance where the number of rating factors tends to be greater than in health insurance. While most respondents indicated that the number of risk pools they used in motor insurance had not increased in the past 3 years, a significant proportion of insurers had increased their number of pools. Furthermore, almost 50% believe that the number of rating factors used in motor insurance will increase by up to 25% over the next 3 years. One firm currently uses

over 350 rating factors, clearly demonstrating the potential to use BDA in underwriting.

MICRO-SEGMENTATION AND RENEWAL OFFERS

Few respondents have reached a policy-by-policy BDA pricing approach in motor or health insurance. However, some insurers believe it is not possible to move to this level of segmentation without using behaviour data from telematics, while others believe it would not be desirable to price on a policy-by-policy basis. Several respondents cited GDPR as a barrier to this level of individual pricing.

A few participants explained how they believe BDA should be used to enhance traditional actuarial and statistical methods rather than to replace them. This mostly centres around using behavioural models to carry out price optimisation (adjusting premiums for factors in addition to the risk of the insured event). One example of this involves analysing a customer's propensity to shop around at the renewal stage and to offer lower premiums to those that are more price sensitive.

These practices pose significant regulatory issues as "unfair" pricing tactics like these could affect the most vulnerable customers, particularly the elderly who are less likely to spend hours comparing premiums online. In fact, in the US a number of states have already prohibited price optimisation or rating based on price elasticity in personal lines insurance. The extent and impact of price optimisation in Europe is unclear, but BDA will certainly facilitate understanding of price elasticity and propensity to churn, and so will pave the way for price optimisation strategies. Six participants already use price optimisation at the renewal stage using retention models to quote premiums based on willingness to pay.

BDA Governance

EIOPA asked participants how they addressed issues relating to the accuracy, transparency and fair use of data arising from BDA. Most insurers claim that they have not encountered issues around accuracy and have robust governance to address any issues that arise. Some respondents noted the difficulty in purchasing third party data that is of the same standard as that collected internally. For this reason, many insurers use only internal data for their BDA and use third party data for marketing only. Many participants stated they do not use "black boxes" due to accuracy and transparency issues and those that do either outsource these tools or use them to support core functions rather than to replace human intervention.

Complying with existing legislation satisfied many insurers that their BDA practices were ethical, and similarly they believe that not practicing price optimisation and basing price purely on risk makes their pricing and underwriting fair. Several firms smooth the output of machine learning algorithms with caps to ensure ethical outcomes, yet some firms still expressed concerns over explaining such outcomes to customers in a transparent way.

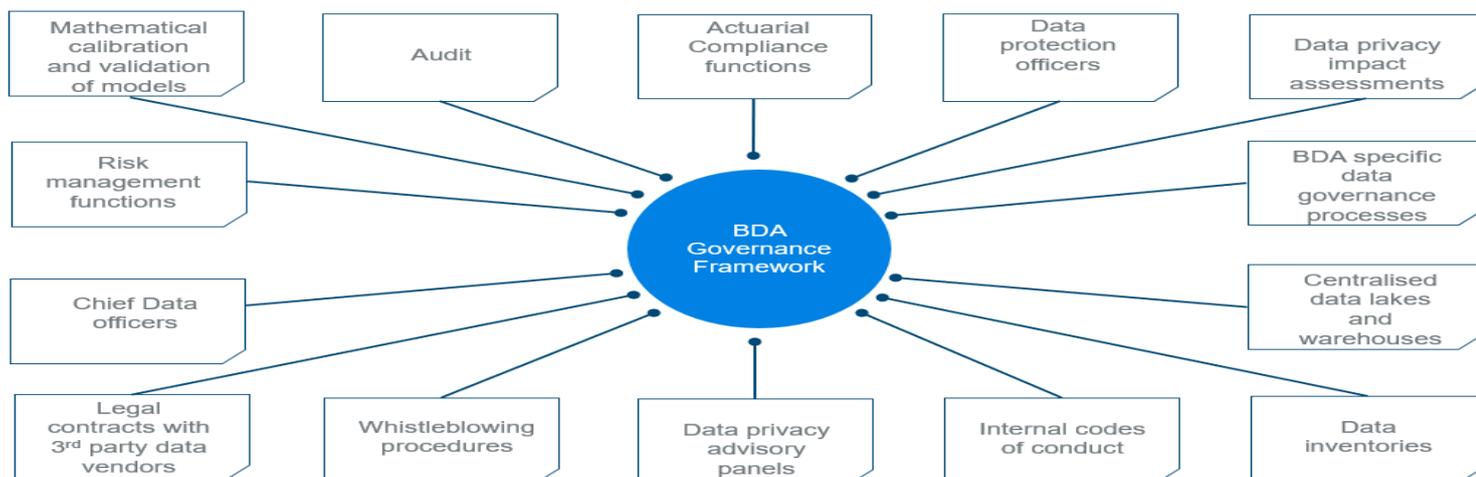**FIGURE 5: DATA GOVERNANCE TOOLS AND ROLES TO ENSURE ACCURACY, TRANSPARENCY AND FAIR USE OF DATA**

Source: EIOPA BDA thematic review report

Figure 5 shows the main methods respondents are using to address these concerns over transparency and accuracy.

Next Steps

BDA offers benefits both to consumers and insurers and EIOPA have looked at how the existing governance frameworks and those being developed can mitigate risks arising from BDA. EIOPA's report emphasises how BDA has the potential to amplify some existing issues around ethics and Treating Customers Fairly and the need to address challenges surrounding the accuracy, transparency and auditability of BDA tools and data.

While the application of BDA is not yet widespread across the European insurance industry it is expected to see considerable growth in the next 3 years. BDA will attract attention from industry commentators and regulators. The following is a list of the work EIOPA plans to carry out in the BDA field in the near future:

- The Joint Committee of the European Supervisory Authorities will conduct a review of AI in 2019.
- EIOPA will assess how AI and ML can be supervised in practice and how these differ from current model supervision.
- EIOPA will consider the introduction of BDA specific governance regulation.
- EIOPA plans to explore 3rd party vendor issues around data accuracy and regulatory oversight.
- EIOPA also plans to issue guidelines on the outsourcing of cloud computing services by European insurers.

How can Milliman help?

Milliman can assist you with all aspects of your Big Data projects, and your Data Science needs in general, including advice on:

- Best practice frameworks for Data Science processes
- Collection and processing of data
- Identifying applications
- Identifying suitable tools and techniques for particular circumstances
- Implementing BDA solutions
- Model development and validation
- Understanding the implications of results
- Constraints and practical challenges

For further information please contact your usual Milliman consultant or those below.

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