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CRE Reading Program Questions

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Pension Risk Transfers - What Every Examiner Should Know

Multiple Choice Questions — Submit Answers Online

1. Common types of Pension Risk Transfers annuity contracts are:

   a. Buy-out
   b. Buy-in
   c. Longevity transfer
   d. All of the above

2. Buy-outs are common in the:

   a. U.S.
   b. U.K.
   c. Canada
   d. All of the above

3. Longevity risk transfer transactions will increasingly be conducted via the following to ensure cost-effective execution:

   a. Captive insurance
   b. Reinsurance strategies
   c. All of the above
   d. None of the above

4. Some annuity factors that should be considered for the bidding insurer's ability to effectively run the business it is assuming as part of the Pension Risk Transfers transaction include:

   a. Quality & diversification of the provider's asset portfolio
   b. Size of the insurer relative to the proposed contract
   c. Level of the insurer's capital and surplus
   d. All of the above

5. Some major drivers of the growing Pension Risk Transfers business are:

   a. Corporate tax Reform
   b. Pension Benefit Guaranty Corp. or PBGC premiums
   c. A & B
   d. None of the above

Managing Specialists on Risk-Focused Examinations

True or False Questions — Submit Answers Online

6. In a risk-focused examination, steps 1–7 of the general IT review process should be performed prior to the completion of planning the overall financial condition examination.

   a. True
   b. False

7. It is vital that the EIC communicate the overall timing of the examination so the IT Specialists are aware of when Phase 5 work is expected to begin.

   a. True
   b. False

8. Involve IT examiners in key meetings if those meetings are more financial oriented.

   a. True
   b. False

9. The majority of Examination Actuaries' test work is performed during Phase 3.

   a. True
   b. False

10. Effective coordination with the specialists helps to ensure that valued-added recommendations are communicated to the financial analysts for follow-up and ongoing monitoring.

    a. True
    b. False

IT Review Considerations for Small Insurance Companies

Multiple Choice and True or False Questions — Submit Answers Online

11. The NAIC Financial Condition Examiners Handbook requires that examiners obtain an understanding of the IT environment and perform procedures to determine whether ITGCs are appropriately designed.

    a. True
    b. False

12. IT Review provides financial examiners comfort that the following can be relied upon to perform financial examination procedures

    a. IT system data
    b. IT system reports
    c. Automated controls
    d. All of the above

13. When assessing the APO domain for small insurers, the following should be taken into consideration:

    a. The collaboration with key business units in the IT strategic plan
    b. The ability to segregate or limit job duties in the IT function
    c. The documentation of IT policies and procedures
    d. All of the above

14. When assessing the BAI domain for small insurers, it is important to understand what system calculations and functions are relied upon for the examination as the risk of manual override of system controls is lower for smaller companies.

    a. True
    b. False

15. There are modified guidelines for the IT Review of small insurers in the NAIC Financial Condition Examiners Handbook. The IT Examiner must perform the following procedures at a minimum:

    a. Obtain the ITPQ responses from the insurer
    b. Complete a basic IT work program
    c. Prepare an IT Summary Memo concluding on the results of the IT review and its impact on the rest of the examination.
    d. All of the above

Intelligent Machines and the Transformation of Insurance

Multiple Choice and True or False Questions — Submit Answers Online

16. Which of the following is NOT a top benefit of machine learning

    a. Better Business processes
    b. Ensures greater analytic accuracy
    c. Fraud prevention
    d. In-depth, comprehensive risk assessments

17. The Financial Stability Board (FSB) has cautioned that the widespread use of machine learning poses a macro-level risk for the insurance market.

    a. True
    b. False

18. Machine learning algorithms are designed to mimic the human brain's learning process.

    a. True
    b. False

19. Most insurers are processing less than 20% of the data they possess.

    a. True
    b. False

20. Insurers who have adopted machine learning have yet to report positive returns on their investments.

    a. True
    b. False

Pension Risk Transfers – What Every Examiner Should Know

By Ben Leiser, FSA, MAAA and
Todd Muchnicki, EA, MAAA
Risk & Regulatory Consulting, LLC

Pension Risk Transfer ('PRT') is the process of contractually transferring a defined benefit plan's risks from a corporate plan sponsor in order to eliminate or reduce balance sheet risk, longevity risk, investment risk, interest rate risk, and/or other risks

Why do we care?

The most common and natural counterparty to the corporate plan sponsor are insurance companies. As PRT business is a growth area within the insurance industry, a target area of focus in a risk-focused exam related to current or prospective risks, in interim review work or in ongoing regulation should be a fundamental review of the PRT business that exists and the assumptions used in pricing and assessing the adequacy of reserves for PRT business.

Current market participants include not only some of the largest multi-national insurers, but also middle market players as well.

Prudential	Principal	OneAmerica
MetLife	Pacific Life	Mutual of Omaha
New York Life	Athene	Mutual of America
AIG	Securian	CUNA Mutual
MassMutual	Western and Southern	Legal & General America

Life insurance companies are properly equipped to engage in the PRT market given that retirement planning and payouts are a core part of their industry. For some companies, the PRT market is a way to diversify its portfolio, while for others it offers the company a way to apply its annuity expertise in a new way. Some companies enter the market with small tranches at the start (between $5 million to $500 million) so as not to be completely dependent on the business to generate profits.

Over the past seven years, a number of high-profile transactions reveal the strength of the global de-risking trend. These included industry icons such as:

General Motors	Bell Canada
Rolls-Royce	Motorola
Verizon	Fedex
British Telecom	Bristol-Myers

Each of these firms varies in terms of its resources, constraints, strategic goals and definitions of success, so each deal was tailored with features to meet the company's unique needs, and reflects a broad range of transaction sizes, with agreement amounts all the way up to $27.7 billion. These companies are looking to focus on their core business rather than managing pension plans. This will allow them to eliminate ongoing plan expenses, reduce balance sheet volatility and overall reduce risk to the plan sponsor. Often the plan is no longer part of a retirement benefit package for active employees.

PRT Basics

An annuity contract is a promise from an insurer to make a series of periodic payments, usually for a lifetime, in exchange for a single premium. A group annuity contract is a single contract covering a group of people with something in common for a single premium. Common types of PRT annuity contracts are Buy-out, Buy-in and Longevity transfer

Buy-outs are common in the U.S., U.K., and Canada and require the plan to pay a premium to the insurer to settle the liability, with the insurer then covering all investment and longevity risks for annuitants. Buy-outs allow plan sponsors to transfer risk, including investment and longevity risk, to an insurer, which guarantees payments to participants for life; eliminate administrative, actuarial, and investment management expenses, including guaranty corporation premiums; and remove pension liabilities from balance sheets. This solution is ideal for plan sponsors seeking to reduce pension liabilities leading to more predictable and manageable costs going forward.

Pension buy-ins enable sponsors to purchase bulk annuities and hold them as liability matching assets of the plan. This allows pension plans to transfer risk today without the accounting impact of liability settlement charges, and offers additional advantages for underfunded plan sponsors, including maintaining funded status, holding contributions steady and minimizing accounting and funding volatility. Though buy-ins provide plans with the precise amount of income required to make benefit payments for participants' entire lifetimes, this solution is rarely employed in the U.S. because the liability is not settled. It is more commonly implemented in the U.K. for pension funds beginning the plan termination process, or taking steps in a phased de-risking program.

Longevity risk transfer is the fastest-growing solution in the U.K. The products currently available convert an unknown future liability into a fixed liability cash flow by locking in the life expectancy of the plan participants. Large pension funds find it easier to manage an asset portfolio against a liability when the future obligation is fixed and known. After addressing funded status and asset risk concerns, longevity risk transfer can serve as the capstone to a pension hibernation strategy, with the sponsor continuing to manage the plan on its balance sheet, with risks and expenses managed within a tight tolerance. Longevity risk transfer transactions will increasingly be conducted via captive insurance and reinsurance strategies, thus ensuring cost-effective execution.

Safest Available Annuity Requirement

There is applicable regulatory guidance, which dictates how PRT transactions must occur and ensures that the plan participants become policyholders in a safe and orderly fashion as the pension plan assets and liabilities are transferred from the plan sponsor to an insurance company; this is found in Department of Labor (DOL) Interpretive Bulletin 95-1.

DOL 95-1 prescribes several requirements that must be met and on which plan fiduciaries must opine to ensure that the group annuity provided by the PRT insurer can be deemed the "safest available annuity."

In short, the safest available annuity factors that should be considered require a deep-dive look into the bidding insurer's ability to effectively run the business it is assuming as part of the PRT transaction. The factors include:

Quality & diversification of the provider's asset portfolio	Size of the insurer relative to the proposed contract	Level of the insurer's capital and surplus
Lines of business of the annuity provider and other indications of an insurer's exposure to liability	Structure of the annuity contract & guarantees supporting the annuities, such as the use of separate accounts	Availability of additional protection through state guaranty associations and the extent of their guarantees

These, of course, are the same things that we look at to assess and examine the insurance company issuing these products. What this construct effectively does to the PRT market is to help ensure that the pool of PRT providers remains financially strong, profitable, highly rated, reputable and very risk aware. This acts as a natural inhibitor to overly aggressive pricing in the PRT space.

We should not be tempted to think that DOL 95-1 compliance is simply a "cover your tracks" or "check the box" exercise. About one year after a high-profile sponsor's large 2012 PRT transaction closed, there was a class-action lawsuit brought by a group of retirees who questioned the legality of the fact that the checks they used to get from the plan sponsor were now coming from a PRT insurer. The case was thrown out of court, with the primary reason being the lengths to which parties to the transaction went to ensure DOL 95-1 compliance (and the documentation of such compliance).

Recent Trends

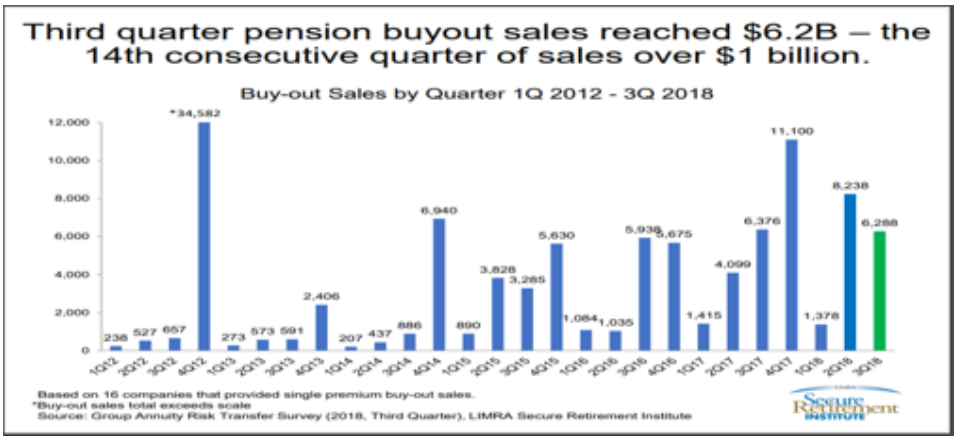
Many recent trends have contributed to, and continue to contribute to the growing PRT business. Because a higher funding ratio (the ratio of a plan's assets to liabilities) increases the ability of a U.S. corporation to purchase a group annuity contract, two of the major drivers of the growing PRT business are corporate tax reform and Pension Benefit Guaranty Corp., or PBGC premiums. Both have spurred corporations to accelerate the contributions to their plans, which in turn greatly improves their funding ratios and motivation to do a pension buyout.

The Tax Cuts and Jobs Act, signed into law by President Trump late in 2017, reduced the corporate tax rate to 21% from 35%. Tax law allows a plan sponsor to deduct a portion of its pension contributions based on its tax rate, and Corporations had until September 15, 2018, the final tax deadline, to deduct those contributions at the higher 2017 rate.

The PBGC's variable rate used to calculate premiums is based on the unfunded obligations in a defined benefit plan. The variable rate, which was as low as $9 per $1,000 of unfunded vested benefits as recently as 2013, was $34 in 2018 and rose to $42 in 2019.

There is also more competitiveness today in the pricing of premiums among insurance companies as the market has increased to over 15 participants from approximately eight insurance companies back in 2012. While the higher number of players in the market has contributed in some part to a trend of lower premiums, not only have there been an increasing number of insurers, the insurers have become more focused on particular segments of the market, whether that's the size of transactions or nature of the transactions. Not all companies are any longer bidding on everything; they are being more selective and determined on particular markets.

According to the LIMRA secure retirement institute, over $23 billion in U.S. corporate pension plan liabilities were settled in 2017 through group annuity purchases from the 15 insurance companies that serve the market, up from almost $14 billion in 2016. Through the third quarter of 2018, there was $15.9 billion, up from the $11.9 billion during the same three quarters in 2017, and it is projected that there was close to $25 billion again for the full year 2018. The total volume of group annuity purchases since 2012, when General Motors and Verizon jump-started the growth of the market by transferring almost $34 billion just between the two of them, to Prudential, is about $115 billion in settled pension liabilities. The industry strongly believes that the PRT market will continue to grow beyond 2018. The story more recently has been that we continue to see fantastic years of growth for the PRT market despite not having jumbo deals like in the past. The strong sales numbers in 2017 and 2018 proves that jumbo deals are not needed for large dollars in the overall market.



What Does This Mean for the Regulation of Insurance Companies?

The result of all of this growth in the market of course brings on not only increased risk and need for regulation just due to the new business itself, but has also led to changes within companies themselves, again increasing risk. Companies now need additional resources and have increased costs for pricing and support staff. There is increased competition in the marketplace that causes companies to lower premiums and raise minimum quote thresholds. And of course, there is the need for additional capital to support the growth.

While the areas requiring review when examining insurance companies and their PRT business might be obvious, they certainly deserve a reminder to all of us. Moreover, while DOL 95-1 does a good job of highlighting what an insurance company's overall strength and profile should look like, the list of specific impacts and risks that the PRT business will have on the company includes:

- ERM – including risk appetite, risk analysis and limit setting
- Plans for Growth / Capacity – a company cannot grow too much or too fast without understanding the risk
- Pricing and Underwriting – this becomes more important as competition increases
- Reserving – especially as the impacts of PBR become more important
- Diversification of Mortality and Longevity Risks – appropriately incorporating longevity risk into any analysis
- Mortality Assumptions – especially the inclusion of mortality improvement assumptions
- ALM Practices
- Data and Administration – under scrutiny due to recent issues with missing or lost participants

The primary risks of a PRT case are longevity risk and investment risk. An insurance company sets mortality, mortality improvement and investment return assumptions when pricing a new case. When the policyholders are on-boarded and a company takes on the ongoing obligation of ongoing annuity payments, there are no opportunities to adjust the original pricing. The risk of mispricing a case could have significant long-term financial impact on a company due to the long-term nature of the liabilities, so prudent assumption setting is necessary to mitigate the long term risks.

Determination of assumptions for deferred lives (individuals who have not yet commenced annuity payments) can produce additional uncertainty and long-term risk due to the unknown pattern of future benefit payments. To mitigate the deferred lives risk, many companies will strategically target cases where the payment patterns are known, and where minimal amounts of the current PRT inforce is made up of deferred lives.

These risks also require that a company closely monitor experience mortality versus pricing mortality, and actual investment performance against the assumptions used in the pricing process. Failure to have an understanding of evolving experience creates challenges when determining reserve adequacy and understanding how business is tracking versus expectations. The long-tail nature of the liabilities exacerbates the potential risk of under-reserving.

Conclusion

Therefore, when looking to assess, examine, monitor and opine on insurance company practices when it comes to managing their PRT business, a number of areas have emerged as best practices and high profile in terms of what the top companies do and what regulators or industry analysts should be looking for.

Firstly, the growth and size of the business has prompted companies to evaluating risk and risk exposures for the PRT business at the enterprise level; considering items such as risk appetite, risk tolerance, and the natural diversification benefits that arise between the PRT business and traditional mortality risk business such as whole life.

Of course the normal analyses of any line of business within an insurance company needs to be developed and in place for the PRT business to be able to analyze the risk profile of the PRT business, such as pricing analysis; reserving analysis on an economic, GAAP and statutory basis; mortality analysis; and experience studies.

One increasingly important area for review is the extent to which the company monitors, manages and analyzes the capacity for growth in the PRT business on a regular basis, either internally or through engaging outside experts; and how they consider and evaluate opportunities for reinsurance (including longevity swaps). As companies grow their PRT business they need to be aware of the increasing proportion it is of their overall business and how it might therefore alter their overall risk profile and risk appetite.

Finally, sometimes the need for governance and oversight and participation by all of the appropriate bodies gets lost in the growth phase of this business and it is very important to incorporating the PRT analyses into the overall firm governance process, including management and Board level participation early on.

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Managing Specialists on Risk-Focused Examinations

By William Michael, CFE,CIA,CPCU, ARe
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Have you ever been involved in a risk-focused examination ("RFE") where the results of the Information Technology ("IT") Review were provided AFTER fieldwork had been finalized?

How about this one—have you ever been involved in an examination where the actuarial analysis was being performed only a few weeks before the 18-month deadline of June 30th?

As a specialist, have you even been involved in a financial examination where the Examiner-In-Charge ("EIC") did not communicate or share details on the expected timeline and key deadlines?

Hopefully the answer to these questions is "no," but it is certainly possible you have faced a situation like one of the above in the past. Most of us have likely experienced situations where coordination with our specialists was not as effective as it could have been in hindsight, thereby resulting in some concerns or even heightened levels of stress during a RFE. Sound familiar?

While there is no doubt that everyone involved in conducting exams is busy—whether it is individuals from state insurance departments, vendors, or contractors—we will probably all acknowledge that we have many important priorities on our plates at any given moment, so we might ask why we need to devote valuable attention and time to monitoring others' work. But ineffective coordination with specialists can be a "self-inflicted wound" that should be avoided. The time you spend investing up front to avoid these issues will pay dividends in the long run!

Effective coordination with specialists is a critical factor impacting the quality of financial examinations. Operating as a cohesive unit also reduces execution risk and helps to ensure that all critical solvency concerns are identified. Working collaboratively is not solely about meeting deadlines and getting work completed timely—it is about performing an effective examination that identifies any current or prospective solvency concerns. As a result, examination teams should be focused on ensuring that the coordination with specialists is effective and present throughout the course of the examination. The specialists involved on RFEs are focused on some of the most critical risks that could cause solvency concerns for insurance companies (e.g., cybersecurity, reserving, pricing, etc.).

Use of Specialists

First, a decision must be made regarding what types of specialists, if any, are required for a financial examination. This is an important decision made by the insurance departments, and there are a number of factors that need to be considered, including the following:

- **Complexity of the Company** – Does the company have a significant amount of complex systems? Has the Company experienced any cybersecurity breaches? Is the investment portfolio complex with a fair amount of "risky" holdings? Are there complicated reinsurance contracts that are difficult to understand? These are all considerations when determining the expertise required for a RFE and if any specialists are necessary.

- **State Concerns** – The overall level of concern on behalf of the state is an important factor as well. For example, if the analysts have ongoing concerns regarding the amount of internal reinsurance contracts and they feel that they do not have a complete understanding of how the Company is managing its reinsurance program, a Reinsurance Specialist may be required as part of the RFE process.

The majority of examinations require Actuarial Specialists and IT Specialists, although there are a number of exceptions. Additionally, some RFEs may require the help of Investment Specialists, Reinsurance Specialists, Statutory Accounting Specialists, and others. It is also important to note that there may be a need for Cybersecurity Specialists as well. Cybersecurity is a high risk area, and if there are specific factors or concerns deeper expertise could be needed for a cybersecurity review. We also should consider the risk of companies developing Cyber products and covering their customers' cybersecurity risks. Similar to all other lines of business, it is critical that insurance companies understand the nature of the risks they are accepting and perform strong underwriting; if such products are written by an insurer, these risk areas could be reviewed and assessed by a Cyber Specialist from an examination perspective.

Effective Coordination with Specialists

Managing specialists effectively boils down to the EIC taking the initiative to communicate on a regular basis with each of the specialists involved on a RFE. Sounds like a simple concept, right? But we all know that communicating effectively takes effort—from all parties. It can be challenging because we know how easily the weeks start to turn into months, so best practice would suggest this area should be a primary point of focus for the EIC. We cannot assume that the specialists are on the same timeline as the EIC without the presence of solid communication. EICs need to take a vested interest in the work being performed. Two other important elements that occur on some RFEs that further highlight the importance of effective communication are:

1. Many specialists tend to work offsite. As a result, the EIC may not have those discussions that occur naturally during the course of a day from sitting next to each other and working side by side. As such, it requires more effort to dialogue regularly so everyone is on the same page.

2. Many specialists are frequently working on various engagements concurrently. Their work tends to be a bit more part-time in nature, so they often juggle roles on multiple exams and projects. This creates a situation where specialists may have competing priorities and deadlines. Therefore, it becomes critical to get out in front to this to ensure there is no slippage in work performed or completion of deliverables.

The following is a suggested checklist of items the EIC and specialists should agree to in advance of fieldwork to ensure effective coordination throughout the examination. Each of these areas essentially relates to communicating effectively and ensuring regular dialogue takes place regarding all critical matters on the examination. Some best practices to ensure this occurs are as follows:

1. **Check-ins** – Schedule weekly check-ins with each specialist involved on the exam, even if you are working onsite together. These discussions may only last a few minutes, but it will ensure progress continues to be made and can help avoid slippage of key tasks or follow-ups. Maintain frequent communication with the specialists throughout the exam is critical, even on smaller company exams that may have tighter budgets.
2. **Planning** – The EIC should be involved early in the planning process for specialty areas. Consider risks that affect financial processes and prospective risks. Specialists should inquire up front about specific expecta**tions.**
3. Budgets – Actively manage the budget and perform budget to actual analyses throughout the exam. Provide this information to the specialists so they are clear on the amount of time remaining in the budget as compared to the progress of the work.
4. **Involvement in Meetings** – Ensure the specialists are involved in the kick-off meeting and certain C-level interviews, where it makes sense.
5. **Company Status Meetings** – Determine the appropriate level of involvement in the company status meetings. It is typically helpful to have the specialists provide updates on their respective areas.
6. **Status Reports** – Obtain content for specialty areas for inclusion in status reports. Provide any specific status report formats up front. Consider creating a reminder in Outlook a few days in advance of when status reports are due to ensure all content is provided to the EIC timely.
7. Scope – Ensure the scope of the specialists' work is clearly understood by all parties, including expected timing for completion of work and deliverables.
8. **TeamMate** – Clarify expectations for TeamMate documentation.
9. Deliverables – Ensure specific deliverables for each phase are agreed upon (e.g., planning memos, matrices, reports, etc.)

10. **Reports** – Obtain input for key reports and memos (e.g., exam reports, management letter, Summary Review Memorandum ("SRM"), etc.)
11. **Exam Protocols** – Communicate exam protocols (e.g., examination requests to the company, reporting of findings, etc.)

Common Specialists Involvement

The two areas for which we most frequently utilize specialists are IT and Actuarial. In addition to the tips for effective coordination noted above, it is important that the EIC effectively communicate the expectations for the procedures to be performed and the key deliverables in the beginning of the engagement. The following is a summary of common deliverables and the timing of the procedures for these two specialist areas.

Information Technology

The most important aspects of the IT Review and the key deliverables and expected timing are as follows:

- **Timing** – As noted in the Financial Condition Examiners' Handbook ("Handbook"), "In a risk-focused examination, steps 1–5 of the general IT review process should be performed prior to the completion of planning the overall financial condition examination." This timing is significant because an effective IT general control environment provides examiners with increased assurance regarding the overall reliability of a company's IT systems and the reports generated from those systems and should factor into the financial examiners' overall planning.
- **Conclusion** – The IT Specialist's conclusion regarding effective or ineffective IT general controls ("ITGCs") is critical and impacts the work performed by the examination team in Phase 3. For example, if the ITGCs are deemed to be "effective," the financial examination team has the ability to test and rely on automated application controls.
- **Deliverables** – The primary deliverables from the IT Review are as follows:
    - **IT Planning Memo** – The Handbook notes that "after the work program has been finalized, the IT examiner should document the plan to complete the IT review." The IT Planning Memo should be completed at the end of Step 3 and approval from the EIC and supervisors should be obtained before Step 4 is started. It is important the IT Specialist provide details regarding the leverage of third party work and the controls that will be testing independently in Step 4.

- **IT Summary Memo** – Captures conclusions regarding IT related controls' effectiveness (or ineffectiveness) and findings/ recommendations. If the ITGCs are deemed to be "ineffective," the memo should specify what areas are not reliable and the impact of each. The results of the IT Review should be formally discussed with the EIC. In addition, the EIC and all states involved in the examination should review and sign-off on the memo in TeamMate as evidence that the work of the IT Specialists and their final conclusions have been accepted.
- **Cybersecurity Memo** (if applicable) – If procedures in addition to those already included as part of Exhibit C are being performed to assess the company's cybersecurity controls (e.g., regulations such as those following the NAIC's Data Security Model Law), a separate memo may be useful to provide details of the work performed, reliance on the work of others, key observations and conclusions, and any required recommendations.

As noted previously, it is vital that the EIC communicate the overall timing of the examination so the IT Specialists are aware of when Phase 3 work is expected to begin. The expected wrap-up date for Phase 2 serves as the deadline for the IT Review to be completed, according to the NAIC's Accreditation guidelines, including issuance of the final IT Summary Memo.

These are the most critical aspects of the IT Review; however, there are several other important items to consider to ensure the IT and Financial Examiners integrate efforts and work together effectively. The following is a listing of best practices the EIC is encouraged to follow:

- Involve IT examiners in key meetings, even if those meetings seem more financial oriented.
- Ask IT examiners to attend key process walk-throughs along with financial examiners to understand business processes and functions that are important to financial examiners.
- Consider inviting IT specialists to key C-level interviews (e.g., Chief Operating Officer ("COO") if IT reports into the COO; Chief Risk Officer ("CRO"); Internal Audit, etc.) in addition to those that are IT specific in nature.
- Consider the IT examiner's involvement when reviewing significant identified risks and controls within Key Functional Activities ("KFAs"). This should be done early in the planning stages, to the extent possible.
- Involve the IT examiners to help determine whether some risks in KFAs may be best mitigated by automated, system-based controls (vs. manual, people-based ones).
- Pull in IT examiners to achieve common agreement on significant applications supporting KFAs to be scoped in. Prioritize the applications together to use budgeted hours effectively.

- Maintain regular dialogue throughout the course of work to ensure everyone is on the same page.
- Discuss preliminary IT results as the examination work is executed. This will help ensure a "no surprises" environment, meet NAIC Accreditation requirements, and complete IT work before the conclusion of Phase 2.
- Ensure there is clear documentation following the Handbook's 6-step process for IT reviews.
- Ensure the work documented in the TeamMate project is easy to follow and is aligned specifically to procedures.
- Coordinate with the IT Specialists to ensure the work of third parties is being utilized and relied upon where appropriate. It is important to look for efficiencies and streamlining of documentation to minimize/avoid duplication of effort.
- Keep the NAIC's guidance in mind regarding volume of supporting workpapers. Specifically, if placing full reliance, the IT examiners do not need to catalog (and should not load into TeamMate) every single CPA or Internal Audit workpaper where testing is to be relied upon.
- For large insurance groups and coordinated exams, ensure all legal entities are scoped in, as appropriate, and listed in the IT Planning Memo. A reviewer of the IT Planning and Summary Memos should clearly understand the IT environment and the entities that are included in the scope and covered by the work of the IT Specialists.

Following these best practices and the recommendations noted above in the "Effective Coordination with Specialists" section will help to ensure the IT Review is completed timely in an effective and efficient manner.

Actuarial

Traditionally, when we think of Actuarial specialists we generally assume they will be focused on reserves; however, actuaries can provide assistance in a number of other critical areas. The expertise that actuaries provide is a valuable asset when considering a company's most significant risks. As a result, we should involve the Actuarial specialists in more than just reserving activities. The knowledge and expertise provided by actuaries significantly adds to the effectiveness of the examination. Some additional areas where actuaries can add value include the following:

- Pricing and Underwriting
- New Product Development
- Reinsurance risks, including risk transfer
- Liquidity analysis and forecasting
- Model risks
- CAT risk
- ORSA review, especially for the more complex areas included in Sections 2 and 3

We also tend to assume that the large majority of the Examination Actuaries' work will be performed as part of Phase 5. Prior to the RFE process, the actuary was generally only involved at a kickoff meeting and then spent most time providing loss reserve estimations. This is another key aspect of the actuaries' role that has evolved over the years on RFEs. Actuaries are encouraged to be involved in all aspects of a RFE, from the beginning (i.e., pre-planning/budgeting) through the conclusion of work and conducting a wrap-up meeting with the financial analysts. As such, the timing of work and the key deliverables can be summarized based on each of the seven phases of a RFE:

- **Phases 1-2** – Examination Actuaries should be focused on gaining an understanding of the Reserving, Pricing & Underwriting processes, and identifying and assessing the related risks. They should also identify potential strategic initiatives requiring actuarial review (e.g., new product development). The actuaries should review key documentation and participate in some of the C-level interviews; for example, the Chief Actuary, Chief Underwriter and Chief Claims Officer. Other meetings and/or walk-throughs should be completed as deemed necessary, such as meetings with pricing actuaries and review of models utilized by the insurer. A key deliverable for Phases 1-2 is completing the relevant portions of the Examination Planning Memo and/or a separate Actuarial Planning Memo detailing an overview of the pricing and reserving processes, along with the significant risks and assessments to be included on the risk matrices. The EIC and actuaries should come to a consensus on the risks to be included on the risk and control matrices ("matrices"). The risks included on the Pricing and Reserving matrices serve as the basis for testing performed in the later phases.
- **Phase 3-4** – Examination Actuaries should be involved in the identification of controls, overall plan for testing of controls, performing the testing of controls, the control assessments and the residual risk assessments. These conclusions influence the level of substantive work to be performed. A detailed work plan for Phase 5 should be developed with procedures that tie to individual risks.
- **Phase 5** – The majority of Examination Actuaries' test work is performed during Phase 5. The actuaries will perform the testing and evaluation of reserves, and a recalculation of reserves, if deemed necessary. At the conclusion of testing, an Actuarial Report should be drafted. It is important that the EIC discuss expectations for the template/format of the report. It should include sufficient detail to support findings, and all issues, conclusions and recommendations should be clearly defined.
- **Phases 6-7** – The Examination Actuaries should provide input into the SRM and provide recommendations for ongoing monitoring if necessary. In addition, the actuaries should draft any actuarial information included in the exam reports. All issues and recommendations should be clearly defined and included in the Management Letter or Exam Report.

Summary

EICs need to proactively manage the specialists to better ensure the full team is working cohesively as one unit. This proactive management approach is vital to the success of any financial examination and significantly reduces execution risk. When financial examiners and specialists are coordinated appropriately, the examination is executed more effectively. An effective examination helps ensure that all significant risks are identified and that the appropriate amount of testing is performed. In essence, there will be less of a chance of any important items "slipping through the cracks", and the risks of missing deadlines or exceeding the budget are greatly reduced.

Effective coordination with the specialists also helps ensure that valued-added recommendations are communicated to the financial analysts for follow-up and ongoing monitoring, which adds to the effectiveness of the risk-focused surveillance cycle. Although it might seem like a challenge at times to keep a finger on the pulse for each of the aspects noted throughout this article, the time invested to do so will yield rewards. Take the extra time upfront in laying out exam expectations with the specialists. Throughout the exam, schedule recurring meetings to ensure the exam is progressing and the EIC and specialists are on the same page. Following these action steps should lead to a smoother exam…because we're all busy, and nobody likes negative surprises!

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IT Review Considerations for Small Insurance Companies

By Uso Sayers, CISA
Johnson Lambert LLP

Why is an IT Review important?

You may wonder, why do we need an Information Technology (IT) review for small insurance companies? A small insurer is perhaps single-state, a captive, or a risk retention group, and has a simple IT system structure with no or limited IT general controls in place. What benefit can examiners derive from an IT review of a small insurance company? What should the focus be for an IT review of an insurer with no or limited IT controls?

Overall, the IT review provides financial examiners comfort that IT system data, system reports, and automated controls can be relied upon to perform financial examination procedures. When performing an IT review, various considerations should be assessed to conclude on the effectiveness of the IT environment.

For a risk-focused examination, IT examiners utilize the significant accounts on the financial statements to determine some aspects of the IT review scope. Those significant accounts on the financial statements map to business processes/financial classes of transactions. Generally, applications support business processes and there are various operating systems and databases that support the applications. We review IT General Controls (ITGCs) to gain assurance that changes to systems are authorized, tested and approved prior to being implemented to the production environment, access to systems is limited to authorized individuals, financial information and reports are complete and accurate, errors and fraud risks are reduced, and system calculations are accurate.

The NAIC Financial Condition Examiners Handbook ("The Handbook") requires that examiners obtain an understanding of the IT environment and perform procedures to determine whether ITGCs are appropriately designed. Where applicable, examiners are required to perform procedures to assess whether ITGCs are implemented and operating effectively. The Handbook specifies the procedures for assessing ITGCs, including ITGCs for small companies.

IT Review for Small Insurers

When completing an IT Review for small insurers, there are modified guidelines in the Handbook. The IT Examiner must obtain the ITPQ responses from the insurer and complete a basic work program. This must include preparing an IT Summary Memo (ITSM) concluding on the results of the IT review and its impact on the rest of the examination. The most significant area to be customized for small insurers is the IT work program. Regardless of size or complexity, some level of testing is required to be performed to verify the basic effectiveness of the small insurer's IT environment; however, the presentation of such work may vary. It is recommended that IT examiners perform some level of review for ITGCs in place within each domain of the

COBiT Framework. This may be shown using a customized version of Exhibit C, Part Two, where a limited number of controls applicable to the insurer are populated and reviewed. In limited circumstances, as described below, IT examiners may bypass the utilization of Exhibit C.

On Exhibit C, Part Two, the IT examiner may rely on the CPA's work without mapping or linking the work to a separate work program. However, the IT examiner must document their comfort with and planned reliance on the work performed. When the IT environment is simplistic and the insurer utilizes purchased software programs from well-known vendors, IT examiners may choose to summarize, in memo format, the procedures performed for each domain of the COBiT Framework. IT examiners should consider whether the company has made significant modifications to the software being used, as modifications may impact the software's reliability. In situations where significant modifications have been made and continue to be made, IT examiners should utilize Exhibit C, Part Two to document a consideration of risks relating to change management.

Exhibit C Part Two - Considerations for Small Insurers

The assessment of ITGCs in the Handbook, Exhibit C, Part Two are divided into four domains: APO, BAI, DSS and MEA. Below are the domains with an overview of the general areas to be tested, and special considerations for each domain specific to small insurers.

Align, Plan, and Organize Domain (APO)

This domain includes IT strategy and budgeting, IT organization structure, IT risk assessment, IT policies and procedures, and IT architecture model. Generally, one of the first considerations when reviewing APO is whether there is an IT strategic plan and budget. However, smaller insurers may not have a documented IT strategic plan and budget. For smaller insurers, it is important to understand whether the IT organization collaborates with business units for key business decisions regarding IT strategy and cost to ensure that the IT strategy is aligned with the strategy across the enterprise. Another consideration is whether the IT organization has the ability to segregate functions and limit job responsibilities within each function. If resources are limited resulting in segregation of duties conflicts, monitoring controls should be instituted to ensure transactions are valid. Other considerations include: whether or not the small insurer has documented IT policies and procedures or standardized processes that are followed, understanding the small insurer's approach to IT risk and the existence and frequency of IT risk assessments, and an understanding on the completion of an IT security assessment.

Build, Acquire, and Implement Domain (BAI)

This domain covers system development and change management methodology, including processes to request, authorize, test, and approve projects or changes, segregation of development and deployment duties, and monitoring of changes to the production environment.

Some of the key considerations for small insurers in the BAI domain are:

- Does the company develop most systems in-house or do they use vendor systems?
- Does the company host systems, or utilize cloud or hosted services?
- Does the company have documented system development and change management methodologies that are communicated and implemented?
- Does the company have processes (formal or informal) to request, authorize, test, and approve system changes and is access to develop and migrate changes systematically segregated?

BAI is a difficult domain to assess for small companies as many smaller companies do not have the resources to develop changes in-house, and the vendors they utilize typically do not have Service Organization Controls (SOC) reports or other assessments performed. It is important to understand what system calculations and functions are relied upon for the examination as the risk of manual override of system controls is high for smaller companies. The BAI domain also includes capacity planning, availability, and contingency planning. IT examiners should consider the controls implemented by the company to mitigate risks in these areas.

Deliver, Service, and Support Domain (DSS)

This domain covers computer operations, logical security, and physical security controls, including batch processing, backup & recovery, disaster recovery and business continuity planning, user administration, segregation of duties, data classification, privileged user management, capacity planning, data center access, and environmental controls.

The DSS domain is the most extensive of the four domains covering risk areas of computer operations, business continuity and disaster recovery planning, logical security, and physical security. IT examiners should consider whether the small insurance company processes transactions in real-time or via batch processes. If transactions are processed in batches, are there controls in place for the complete and accurate processing of transactions? Another key consideration is whether there are controls for successful backup and recovery of key company data. IT examiners should consider if the small insurer has controls to grant, modify, remove, and periodically review user access permissions, segregate duties, control privileged access, and restrict remote access the network. IT examiners should also consider whether there are adequate controls in place for incident/problem management

to understand how issues are tracked, the process to close issues timely and periodically review aged issues. Finally, if third party service providers/vendors are utilized, IT examiners should consider whether there are sufficient controls in place to monitor and manage third parties, including the review of SOC reports, if available.

Monitor, Evaluate, and Assess (MEA)

This domain includes monitoring of the performance of the IT environment, continuous monitoring of IT controls, and IT compliance with regulatory standards.

Key considerations for the MEA domain for a small insurance company includes assessing if the company has a framework in place to continuously monitor IT controls, if there are processes implemented to track any IT control findings noted through remediation, and if there procedures to keep abreast with changing regulations.

Use of Work of Others

Independent assessments, audits, or other work performed by independent parties can be utilized to supplement IT reviews. Some examples of work that can be utilized are SOC reports, internal audits, external audits, security assessments, and risk assessments. For small insurance companies, oftentimes the work of others is limited in scope or less comprehensive than for larger insurers.

When reviewing the work of others, consider the framework utilized, what detailed procedures were used and the sufficiency of test procedures performed. Also consider the nature of the procedures performed; i.e., observation, inspection, and/or re-performance. Generally, inquiry only is not sufficient for reliance. IT examiners should obtain an understanding of the sampling methodology utilized to determine whether sample sizes were aligned to the guidance in the Handbook.

Level of IT Testing Needed When SOC Reports or Other Workpapers Are Not Available

When a SOC Report or other workpapers are not available, the level of testing needed depends on:

- Scope of exam
- Number of systems
- Complexity of systems
- Number of IT dependent controls
    - Key reports
    - Automated controls/calculations

- Interfaces
- Automated approvals
- Type of IT review (design and operating effectiveness)

Financial Exam Considerations when there are no IT General Controls
When there are no IT general controls in place, IT examiners must consider the following:

- How is the company mitigating segregation of duties?
- What are the fraud considerations?
- How is the company ensuring completeness and accuracy of system data?
- How is the company addressing the risk of loss of data (no backup/ recovery procedures)?

In closing, IT Reviews of small insurance companies can be challenging and may have budget limitations, but they still require the same level of understanding as with larger entities. The best practice feedback that can be provided as a result of an IT Review for smaller company can be very important and valuable as the costs associated with an IT exam can be burdensome to small insurers. As smaller companies have less IT resources, IT Examiners will need modified considerations for the IT Review. The use of the work of others such as external auditors or internal auditors, may not be applicable and the level of independent IT testing needed may increase as SOC Reports or other audit workpapers are not available. In addition, when working with smaller insurers, the Handbook Exhibit C, Part Two ITGC work program may need to be modified to fit the company better as the small insurer may not have any formalized IT general controls in place. Despite these challenges, an IT review of a small insurance company helps financial examiners determine whether IT system data, system reports, and automated controls can be relied upon to perform financial examination procedures.

About the Author

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Intelligent Machines and the Transformation of Insurance

By Dimitris Karapiperis, NAIC

Introduction

The history of intelligent machines is punctuated by bold predictions regarding their potential, as well as admonitions about their limitations. Traditional computing is rules-based and dependent on organized information and external programming. However, the science of artificial intelligence (AI) is dedicated to making machines intelligent by allowing them to learn independently from disparate and varied data.

Machine learning, which at its core is how AI can be achieved, is the act of teaching machines to learn on their own from their experience and adapt to their environment. In effect, machines can be self-taught to replicate the multilayered complexity of human behavior, ostensibly without any faults, weaknesses or hesitation.

The ability of AI and machine learning to automate and optimize every business function has been a game-changer for all industries. The insurance industry is no exception. In fact, being a historically data-heavy industry, it has always strived to improve its analytic capabilities with the latest technological tools.

Machine learning and AI seem to be tailor-made for the insurance industry with a variety of applications already widely adopted. Most obvious applications of machine learning in insurance are in claims processing, underwriting, fraud detection, and customer service. Insurers also expect benefits from the analysis of competitor actions, customer trends and the detection of patterns in the data to gain unique insights at a detail and speed impossible for humans.

Although these new technologies are transformative in nature, they also present certain challenges just like other historical technological revolutions. This article briefly discusses how machine learning works, explores its main insurance applications and considers regulatory concerns. For a closer examination of how machines truly learn, their immense analytical capabilities and the implications for the insurance industry, the NAIC is working on a research study "The ABCs of Machine Learning," which is expected to be released in the spring of 2019.

Machine Learning Basics

Machine learning is considered a subset of AI. While AI includes the entirety of computer systems able to perform complex tasks normally requiring human intelligence, machine learning involves programs that have not been explicitly entered into a computer. Machine learning is the capability of computers to acquire their own knowledge, by extracting patterns from raw data.[1] This is distinct from other types of AI systems, which work by hard coding already acquired knowledge.

Machine learning has become the leading solution to most classic challenges with AI. Machine learning dominates the fields of computer vision, speech recognition, computer dialogue systems and robotics.[2] Interestingly, it borrows heavily from neuroscience to build algorithms based on artificial neural networks mimicking human brain processes of learning. Artificial neural networks, like their biological counterparts, are arranged in layers with information passing from one layer to another.

In this layered structure of algorithms, there are input and output layers with hidden layers between them. It is in the hidden layers where the artificial neurons process the inputs to produce an output similar to the activity in the human brain. Networks with multiple hidden layers, referred to as deep networks, allow for the processing of larger and more complex data and more computationally intensive training. Deep artificial neural networks are behind deep learning, which is a subset of machine learning.

The development of artificial neural networks would not have been possible without advanced computing power and big data. These artificial neural networks are powered by enormous amount of information in order to learn. Recent innovations, such as self-driving cars, Alexa/Siri and Facebook's facial recognition owe their existence to machine learning technologies like artificial neural networks.

Machine Intelligence in Insurance

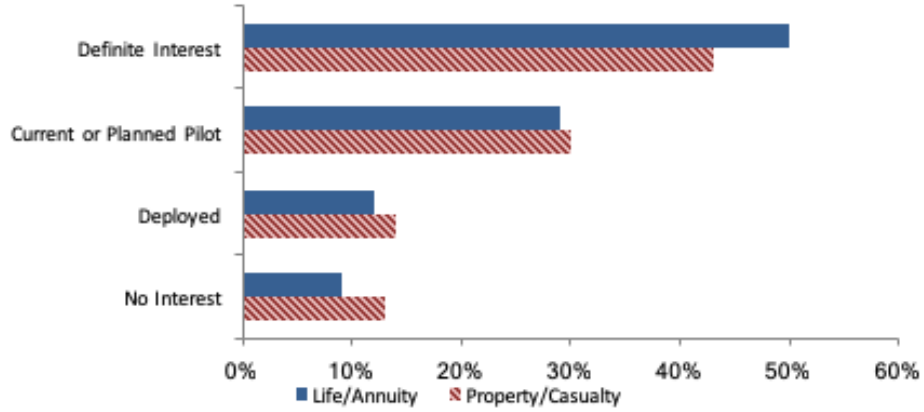
For most of their history, insurers have depended on expert judgments and simple rule-based heuristics to make critical predictions. Insurers have leveraged these new quantitative and computational technological innovations to improve their predictive modeling. However, the extensive use of data for business process optimization and evidence-based decision making has not yet been as prevalent.

Although data has always played a central role in the insurance industry, most insurers are processing just 10-15% of the data they possess.[3] Given the volume and richness of the data insurers have at their disposal, there is still much value to be tapped. Machine learning is used to effectively mine all available data for predictive analytics and business insights.

Despite the mounting interest in machine learning, the number of insurers deploying machine learning still remains relatively small.[4] According to Novarica, only 14% of property/casualty (P/C) insurers and 12% of life insurers actively use machine learning. However, about 30% of all insurers are working or plan to work on pilot programs and nearly half are interested in developing machine learning (Figure 1).[5]

Figure 1: Insurer Machine Learning Adoption

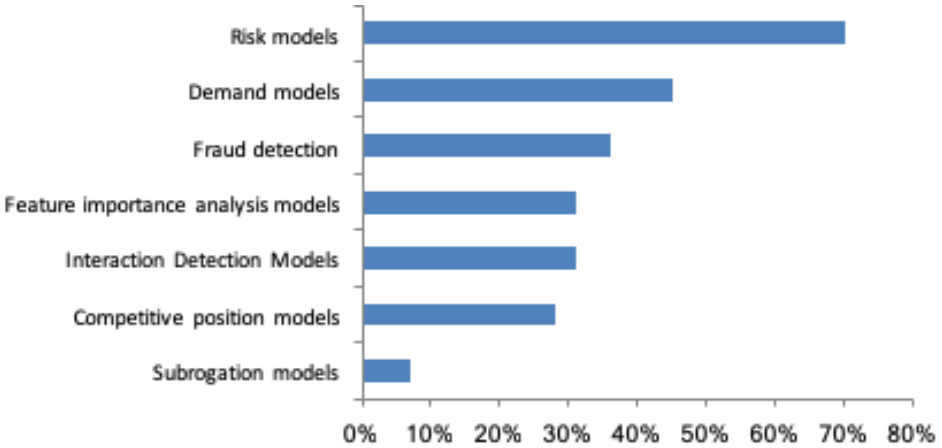
Source: Novarica



According to a recent report by Earnix, from all of the insurers currently using machine learning, 70% employ it to develop risk models, 45% to create demand models and 36% for fraud detection (Figure 2).[6] This is significantly ahead of the banking industry, in which only 11% of banks have embraced AI technologies.[7]

Figure 2: Types of Models Created with Machine Learning

Source: Earnix

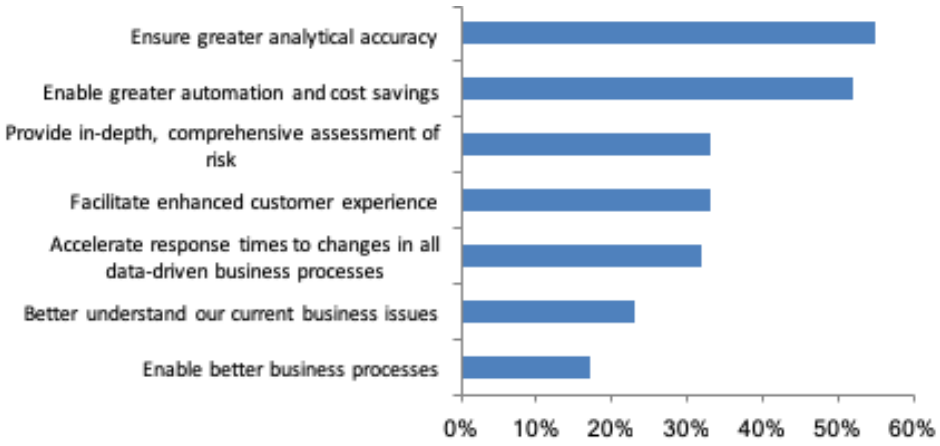


Many insurers report the process of adopting machine learning entails steep learning curves. In fact, 82% indicate they are still novices (30%) or have intermediate (52%) knowledge in developing and applying machine learning. Only 14% of insurers consider their use of machine learning as advanced and just 4% feel they are experts.[8]

Despite the learning curve, those insurers who have adopted machine learning report positive returns on their investments.[9] About 52% of insurers expect immediate benefits mainly in terms of greater analytical accuracy and cost savings (Figure 3).[10] However, benefits of machine learning tend to accrue unevenly with larger insurers being the main beneficiaries.

Figure 3: Top Benefits Realized with Machine Learning

Source: Earnix



Many insurance technology start-ups ("InsurTechs") are concentrating their innovation efforts on developing machine learning to help bring new AI-enabled applications into the insurance market. From all leading innovations among InsurTechs, the use of big data with machine learning tops the list.[11] According to a survey by International Business Machines (IBM), more than 50% of InsurTechs use AI and machine learning.[12] Leading insurers see InsurTechs as key drivers of innovation and, therefore, ideal sandboxes in which to experiment with AI and machine learning technologies. About 45% of all insurers and 81% of leading insurers have invested in or work closely with one or more InsurTechs.[13]

Fraud Detection

Insurers are primarily using machine learning to optimize traditional insurance functions. This includes the growing problem of insurance fraud. According to various estimates, annual insurer losses from fraud range from $30 billion to $80 billion.[14,15] Fraudulent claims represent a significant cost, but it is expensive to identify fraud the way claims are currently processed. By leveraging AI and machine learning, insurers have developed tools capable of sifting through all the claims to detect patterns of possible fraudulent activity.

Machine learning algorithms are superior to conventional statistical predictive models for fraud detection because they can quickly scan enormous amounts of unstructured data in different formats. This includes claims adjusters' handwritten notes, repair estimate documents and claimants' social media accounts. It can even sift through video and images to identify potential fraud.

The main advantage of machine learning is the ability to discover new variations of known and new fraud patterns. Obvious patterns have always been quite clear for investigators to spot, but many data anomalies may suggest fraudulent behavior that can be virtually undetectable by humans. With machine learning data analysis, human behavior can be analyzed at much deeper levels to produce incredibly precise criteria. The ability to continuously learn from data to detect new anomalies and patterns makes machine learning a uniquely powerful tool for fraud detection.

Machine learning has allowed investigators to prioritize claims and specifically target only those already red-flagged as likely fraudulent. The benefits of employing machine learning for fraud detection are three-fold. First, insurers can significantly reduce their overall losses from fraud. Secondly, insurers use their investigative resources more efficiently. Lastly, insurers can avoid adversarial customer interactions by not challenging innocent claims.

Claims Processing

Integrated with fraud-detecting solutions, machine learning can also be used to optimize claims processing. The interaction between the insurer and the policyholder and the ease and speed by which a claim is settled drives to large degree, both customer satisfaction and loyalty. Simplifying a stressful process for customers through claim process automation can enhance customer experience while reducing settlement time and cutting costs.

Machine learning can allow computers to communicate with customers via phone call or email, using speech recognition and text scanning, and automatically fill out a claim. Machine learning can decrease the volume of calls and inquiries during the claims process eliminating costly human errors that are often unavoidable in a very manually intensive task. An automated claims process can take only minutes to complete instead of the industry typical 72 hours.[16]

Better predictive models powered by machine learning can help insurers better understand and manage their claims costs. Gained valuable insights can save millions of dollars in costs through proactive claim management and fast claim settlement. Insurers can also calculate how much funding they need to allocate to claim reserves with more confidence and certainty.

InsurTech start-ups leading the digitalization of the industry exclusively use chatbots to interact with their policyholders during their claims process. Claims are submitted through apps on a mobile phone or computer and they are usually approved within minutes.[17] The policyholder then is notified when the payment is made. Thus, AI and machine learning can effectively and efficiently take care of every step of the process from first reporting the claim all the way to settling it.

Underwriting

Insurers have to evaluate a multitude of highly complex and often new and unfamiliar risks in the process of underwriting. In addition, there are multiple sources of useful data that can provide insights into a variety of risks. However, managing such large amounts of data is becoming challenging and often impossible for underwriters.

By incorporating real-time, highly granular data, machine learning can help underwriters simplify the complexity of their work and improve their decision making. Machine learning applications learn from training sets of past experience to highlight key considerations for human decision-makers and minimize errors.

An underwriter's assessment can be flawed if false information is used or vital information is missing. This would essentially invalidate the essence of the underwriting process. Machine learning can verify the accuracy of the information applicants provide and reveal even more information using diverse sources like social media, news media and government agencies. In property and casualty insurance, machine learning can use data from digital maps and high-resolution aerial imagery from drones and satellites to identify property features and quickly assess risks.

Machine learning can maximize the benefit from the explosion of data available to insurers from connected devices in homes, cars and even on people with wearables. In such a data-rich environment, personalized pricing in real time can be possible with machine learning. The increasing penetration of devices such as fitness trackers suggests underwriters could accurately calculate a policyholder's personal risk score based on daily activities as well as the probability and severity of potential events. With pricing available in real time based on dynamic data from usage and behavior, policyholders can make decisions regarding their actions and how they affect their insurability, coverage and premiums.

Sales and Marketing

The benefits of developing AI and machine learning capabilities in sales and marketing are evident. More than 85% of all customer interactions are predicted to be conducted without any human involvement by 2020.[18] Insurance consumers are increasingly expecting highly personalized services preferably through a digital medium, such as a smartphone. Machine learning can provide such customized experiences for consumers. It can also extract valuable insights from vast amounts data on demographics, personal preferences and lifestyle generated during these interactions. Insurers can then use the data to develop personalized offers, policies and loyalty programs for their policyholders and prospective customers.

By increasing their touch points or interactions with customers, insurers can develop a mutually beneficial long-term relationship with them. With machine learning insurers can estimate the lifetime value of their customers. This value is represented by the difference between the revenues gained and the expenses made projected into the future relationship with a customer.

Lifetime value is calculated with behavior-based models widely applied to forecast customer market preferences and retention. Machine learning algorithms process available customer data to estimate risk probabilities from behaviors and attitudes, and the likelihood of keeping or surrendering policies. Customer life value prediction enhances insurers' marketing strategy development with machine learning providing valuable consumer insights.

Machine learning algorithms can also classify consumers based on their individual attributes such as, education level, profession, income level, age, location, etc. Consumer segmentation based on personal information and characteristics can allow for more precise targeted marketing for specific policies tailored to the perceived needs of each segment.

Risk Management

Complex algorithms and machine learning-based systems are used to define and achieve organizational goals, accelerate performance and improve differentiation. Risks to growth and profitability can be quantified and analyzed, especially those considered blind spots as they are generally unknown to management.

The complexity of machine learning brings transparency concerns. In terms of risk management, there is a need for appropriate controls to be in place to manage machine learning as a tool and as a technology. The algorithms can evolve beyond even the understanding of those that created them. As the data gets reshuffled and combined in different ways with other data, it is important to be aware of new risks with these algorithms and the conclusions they provide.

Input data may also be vulnerable to risks. For instance, the data used for training in machine learning could have biases. The data may also be incomplete, outdated, or at times entirely irrelevant. There could also be a mismatch between the training data and the actual input data used to generate the output.[19]

Decisions regarding the output are also vulnerable to various risks, such as erroneous interpretation or inappropriate use of the output. Algorithmic risks can potentially have broader and long-term implications for an array of insurer risks, including financial, operational, market and reputational. Insurers should be aware of algorithmic risks when they develop and deploy machine learning solutions to ensure they are appropriately and effectively managed.[20]

Regulatory Challenges

The independent learning nature of machine learning raises concerns for state insurance regulators. With machines capable of learning how to improve independently and without any human involvement, it is important to ensure deployment of machine learning continues to adhere to regulations regarding data privacy, fairness, discrimination and cybersecurity.

Machine learning algorithms are based on proprietary data and models particularly difficult or impossible to interpret or explain. The resulting "black box" poses challenges to state insurance regulators trying to understand what data is used, from what sources, and how the machines actually reach their conclusions. This lack of interpretability and auditability could potentially embed unknown and unforeseen risks if this technology is not appropriately managed and supervised. For this reason, the Financial Stability Board (FSB) cautioned the widespread use of machine learning models could become a macro-level risk for the insurance market.[21] Adequate testing and training of machine learning tools, auditable by regulators, is essential to ensure they operate within their design parameters and in full compliance with existing regulations.

The ability of machine learning to analyze data at a very granular level for more accurate pricing and risk assessment could have consumer protection implications. To avoid discrimination, data on sensitive characteristics such as race, religion, gender, etc. are not supposed to be considered by insurers. However, machine learning algorithms may use geographical data or other individual attributes creating outcomes which implicitly correlate with those sensitive characteristics. This could result in the same biases and exclusions of groups of consumers regulators were trying to avoid in the first place.

By using machine learning applications to price risk, insurers could reduce the degree of moral hazard and adverse selection they are facing, but at the same time undermine the risk pooling function of insurance. It is true offering dynamic personal coverage with continuous pricing adjustments according to policyholders' changing circumstances and behavior could solve the moral hazard problem. It is equally true offering highly customizable policies reflecting the unique characteristics of each individual would eliminate adverse selection. However, this type of risk pricing would lead to higher premiums for riskier consumers, potentially rendering certain groups of people effectively uninsurable by the private market.

In addition, the more dynamic and adaptable machine learning programs become, the harder it is to predict their actions and their impact creating new risks, often with a distinct ethical dimension. A set of ethical guidelines for data scientists developing machine learning applications is needed to ensure their actions do not harm consumers and the public in general. The Code of Ethics of the Association for Computing Machinery (ACM) currently serves as the basis for ethical decision-making by its members.[22] It supports accountability and transparency as the most effective means to ensure compliance with developers' primary responsibility which is to always protect the public.[23]

Collecting data from diverse sources to arrive at automated conclusions and decisions about people raises a host of questions about privacy and data quality. Insurers should be able to show what inputs go into their models and explain the logic behind their decisions. At the same time, with machine learning, this kind of transparency into the data and the decision-making process tends to be more difficult than traditional rules-based models. New regulatory approaches may be required to effectively alleviate concerns about machine learning models.

Conclusion

AI and machine learning are developing technologies with broad uses and high utility for insurers. Measuring, controlling and pricing risk with greater precision can reduce costs and improve efficiency for insurers and some consumers. While machine learning can engage and empower consumers and even in some cases expand insurability, it may potentially price other consumers out of the market.

Efforts to improve the interpretability of AI and machine learning are important for insurer risk management, effective regulatory supervision and greater public trust. Insurers are innovating and changing the way insurance is delivered, purchased and experienced. Regulators are responding by broadening their regulatory scope to account for all the challenges created by these new innovations. The state insurance regulatory framework strives to be forward-looking and sufficiently flexible to allow for innovation, without straying from its mission to protect consumers and the viability of the insurance market.

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