



**Predictive modeling
with claims analytics**

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Page 1



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Page 2



Agenda

What drives adverse claim development?

- ▶ Fact-based predictors
- ▶ Leakage predictors

Analysis methodology

- ▶ Claims predictive modeling
- ▶ Claims triaging and mitigation strategies
- ▶ Operational and financial claim leakage assessment
- ▶ Process improvement
 - ▶ Claims process
 - ▶ Underwriting process

What drives adverse claim development?

- ▶ Adverse development is disproportionately driven by specific types of claims.
- ▶ The drivers of claims development are those not identified or fully understood early in the process.
- ▶ It can be extremely difficult (or impossible) to quantify the preponderance of factors that drive claims development.
- ▶ Early identification of these claims provides the opportunity for proactive claims handling and real cost savings.

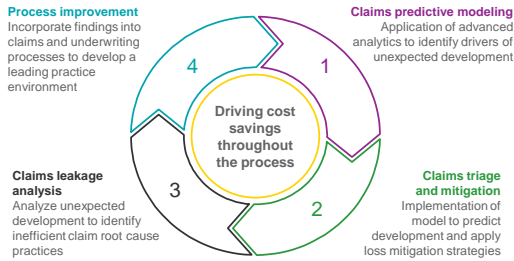
Current claims handling practice

- ▶ Early recognition of claims which may develop adversely is largely dependent on supervisory and adjuster judgment.
- ▶ Claim teams are under more pressure due to complex case loads, increased administrative tasks and the increasing use of new technology and systems.
- ▶ Obviously severe claims will be triaged when reported and experienced handlers will be assigned.
- ▶ Potentially severe claims that do not initially appear costly are challenging to differentiate.
- ▶ These claims represent 60% on average of the claims population.

Potential cost savings

- ▶ The key is early detection of the characteristics of the claims within a loss portfolio that drive adverse development of those claims.
- ▶ Once potentially severe claims are identified, actions can be taken.
- ▶ Better classification of claims allows for improved claim staffing across their field offices based on the degree of specialization called for through the implementation and maintenance of a robust predictive modeling program.
- ▶ Early recognition and effective triage will provide an opportunity to reduce overall claim leakage by 20-40% of adverse development that would have otherwise occurred.

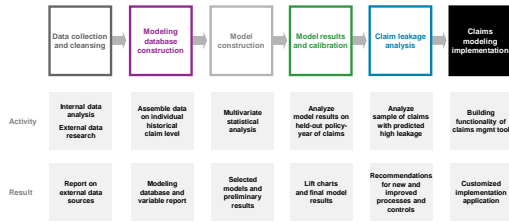
Claims process improvement cycle



Predictive modeling process

- ▶ Predictive models are now being successfully applied in insurers' claims operations.
- ▶ The models are used to identify which claims have the potential to develop adversely based on information known early in the life of the claim.
- ▶ Analytics and early detection of potential adverse claim development provide a potential edge and cost savings in the current competitive and economic environment.
- ▶ Companies need to go beyond model development and incorporate a review of their claim management practices to fully take advantage of an effective predictive model.

Claims model development process



Internal data collection and cleansing



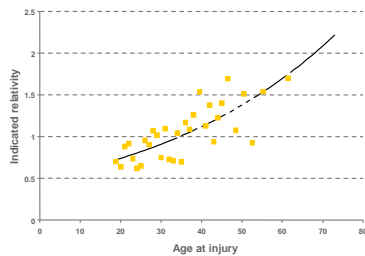
- ▶ The first phase of the predictive modeling process is to construct the internal claims database file.
- ▶ Internal claims data is assembled at the claim level to include claim identifiers, potential predictor variables and response information.
- ▶ This internal data is then tested and modeled before external data is appended.

Claim identifiers			Predictor variables					Response		
Policy number	Claim number	Accident year	Occupation code	Injured body part	Days until notice	Age at injury	State	Indemnity losses at reporting	Indemnity losses at 24 months	Development
000012	7568871	2003	Const	Back	0	59	CT	\$36,434	\$18,932	\$17,502
000018	8404981	2004	Const	Upper ext	1	47	NY	\$93,106	\$146,728	\$53,622
000138	7350087	2003	Manu	Upper ext	0	41	NY	\$21,316	\$30,284	\$8,968
000148	8347860	2004	Const	Lower ext	0	25	NY	\$4,604	\$6,820	\$2,216
000157	7350092	2003	Manufac	Back	8	56	ME	\$27,893	\$48,961	\$20,968
000160	8343256	2004	Office	Back	2	34	RI	\$34,312	\$40,985	\$6,773
000229	7738091	2003	Const	Head	0	51	MA	\$42,695	\$45,691	\$3,196
000405	8760021	2004	Manu	Neck	0	25	NY	\$33,785	\$34,874	\$1,089

Internal data modeling – age at injury



Hypothesis: The age of the claimant affects the ultimate cost of the claim.
Finding: Older claimants have significantly larger claims on average.



Incorporating external data sources



- ▶ Much of the power in a predictive model comes from the incorporation of additional external data.
- ▶ There are numerous vendors that can provide various types of potentially valuable external data.
- ▶ Examples of some of these sources are shown below:

Data source name	Type	Value	Cost
Data source 1	Business	High	Low
Data source 2	Business	High	Med
Data source 3	Business	High	Med
Commercial credit vendor	Credit	High	High
Personal credit vendor	Credit	High	High
Crime index	Demographic	Med	Low
Litigiousness index	Demographic	Med	Low
Hospital index	Hospital	Med	Low
Data source 9	Business	Med	Med
Data source 10	Business	Med	High
Voting patterns	Demographic	Low	Low
Traffic safety index	Demographic	Low	Low
Data source 16	Business	Low	Low

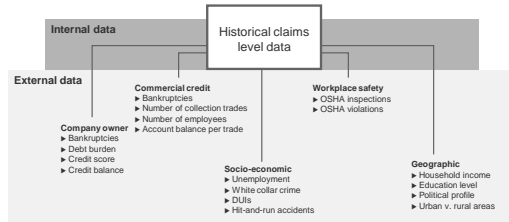
Page 12 Predictive modeling with claims analytics



Combining internal and external data



- ▶ External data is matched to internal claims data to capture many potential predictor variables.



Page 13 Predictive modeling with claims analytics



Modeling database



- ▶ Modeling database will contain all internal and external risk factors.

Claim identifiers		Predictor variables					External predictor variables					Response				
Policy number	Claim number	Accident year	Occupation code	Injured body part	Days and notices	Age at injury	Sex	Average household income	Credit score	Prior claims	% w/ bachelor degree	% in legal profession	Unemployment rate	Indemnity amount at reporting	Indemnity amount at 24 months	Development
000010	700001	2003	Control	Back	0	59	CT	44,004	632	No	33%	1%	3.5%	\$36,424	\$18,102	\$17,503
000018	840001	2004	Control	Upper Ext	1	47	NY	57,218	540	No	30%	2%	3.2%	\$53,108	\$18,728	\$33,822
000018	750001	2003	Manual	Upper Ext	0	41	NY	25,311	796	No	4%	3%	3.0%	\$21,316	\$30,284	\$8,968
000046	804700	2004	Control	Lower Ext	0	25	NY	35,201	742	No	27%	2%	3.0%	\$4,004	\$6,000	\$2,216
000017	750002	2003	Manual	Back	8	56	ME	26,381	581	No	19%	2%	3.0%	\$27,805	\$48,861	\$20,958
000090	804026	2004	Office	Back	2	34	RI	59,136	719	No	33%	2%	4.2%	\$34,212	\$40,985	\$6,773
000039	772001	2003	Control	Head	0	51	MA	68,711	603	No	17%	1%	4.2%	\$42,605	\$45,891	\$3,196
000040	870001	2004	Manual	Neck	0	25	NY	26,117	578	No	30%	0%	4.2%	\$33,785	\$34,874	\$1,089
001429	750003	2003	Control	Lower Ext	1	28	NY	47,159	571	No	38%	4%	4.2%	\$8,947	\$721	\$8,226
000100	807400	2004	Control	Back	0	37	NY	16,758	747	No	21%	2%	4.2%	\$74,685	\$91,988	\$7,303
000100	280400	1997	Control	Head	1	35	MA	45,000	748	No	42%	1%	5.0%	\$97,685	\$179,309	\$82,224
000089	260123	1998	Control	Upper Ext	0	32	CT	42,750	521	No	51%	1%	5.0%	\$80,172	\$59,346	\$3005
000089	780204	2003	Control	Upper Ext	2	50	CT	42,216	776	Yes	37%	2%	5.0%	\$19,837	\$34,216	\$14,281
000033	750001	1997	Control	Upper Ext	0	44	RI	49,680	840	No	29%	4%	5.0%	\$49,284	\$48,002	\$4,138
000043	870005	2003	Control	Lower Ext	0	38	RI	47,245	511	Yes	3%	1%	5.0%	\$52,542	\$75,660	\$15,118
000042	260101	1997	Office	Multiple	0	33	MA	45,000	745	No	19%	1%	5.0%	\$39,702	\$69,975	\$28,182
000083	300001	1998	Manual	Back	1	30	MA	42,750	767	No	12%	4%	5.0%	\$88,307	\$168,877	\$80,530

Examples of tested hypotheses



Do socio-economic conditions impact claims?

- Measured by:*
- Unemployment in geographic location of injury
 - Average household income in area of injury



Is the claimant's prior claim history significant?

- Measured by:*
- Number of past claims
 - Severity of past claims
 - Claim settlement
 - Litigated vs. non-litigated

Does the lack of consistency in the claim management process increase claim leakage?

- Measured by:*
- Repeated re-assignment of claim handlers
 - Lack of case continuity

Is abidance by contract rules significant?

- Measured by:*
- Failure to pay according to contract or fee arrangement
 - Failure to recognize third-party risk transfer protection – indemnity/hold harmless/ additional insured provisions

Are geo-demographic characteristics significant?

- Measured by:*
- Demographic data
 - Census data
 - Venue data

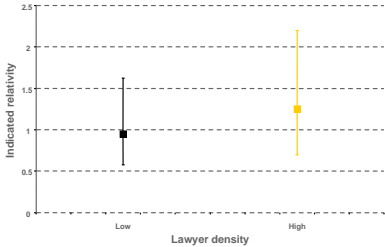
Is financial condition of claimant predictive of ultimate settlement value?

- Measured by:*
- Personal credit data of claimant
 - Individual credit attributes of claimant

Multivariate modeling results – lawyer density



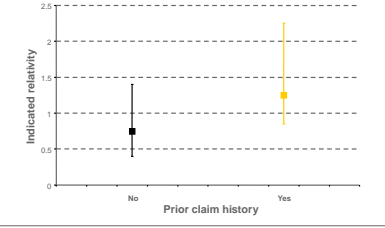
Hypothesis: The density of lawyers in a geographic area increases claim amounts.
Finding: Lawyer density in a geographic area leads to higher ultimate claim values.



Multivariate modeling results – prior claims history



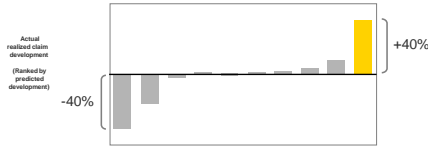
Hypothesis: An individual's claim history is predictive of current claim value.
Finding: Prior claims history is highly predictive of the amount required to settle a current claim.



Demonstration of value



- ▶ Predictive modeling can lead to an improvement of approximately +/- 40% in the prediction of actual ultimate incurred claim amounts.
- ▶ Action can be taken on those claims with expected adverse development.
- ▶ While it may not be possible to completely eliminate that adverse development, it is realistic to capture a significant portion.



Claim leakage assessment



- ▶ Once the predictive model is finalized, the model is run against a set of held-out claims, measured early in the life of the claim.
- ▶ Predictive values are then compared against actual claim incurred values at 24 months.
- ▶ Claims that developed significantly beyond their predicted values are then reviewed to determine the cause(s) of the adverse development that was not predicted by the model.
- ▶ "Claim leakage" is the additional amount paid above what should have been had all leading practices been applied.
- ▶ The analysis includes building an historical claim database and identifying common themes and characteristics among the sample of claims reviewed that are the main drivers of high claim leakage.

Claim leakage overview



- ▶ **The analysis of leakage is:**
 - ▶ A minimum estimate of overpayment that could have been prevented through the use of leading practices
 - ▶ A benchmark payment amount that would have resolved the claim if handled more appropriately
 - ▶ The difference in the amount paid and what a quality, experienced claims handler would have paid with more complete information and the availability of additional key resources
 - ▶ Identification of claim adjudication and claim service standard that require enhancement, modification or implementation to prevent future financial exposure
- ▶ **The analysis of leakage is not:**
 - ▶ Finding fault within existing claims operations
 - ▶ Addressing procedural errors that do not affect payments
 - ▶ A methodology used to evaluate claim values
 - ▶ A tool used to justify staffing increases

Claim leakage overview



Client Number: [input]	Policy Number: [input]	Date of Loss: [input]	Injury Description	
Client Name: [input]	Case Name: [input]	Date Reported to LFI: [input]	Body Part	Injury Type
Client Contact: [input]	Case Status: [input]	Date Assigned to Claim Officer: [input]	[input]	[input]
Insurance Company: [input]	Product Name: [input]	Product Reported to LFI: [input]	[input]	[input]
Claim Status: [input]	Policy Effective Date: [input]	Policy Effective Date: [input]	[input]	[input]
Coverage: [input]	Claimant Name: [input]	Internal Reference(s): [input]	[input]	[input]
Case No: [input]	Case No: [input]	Date Primary Reported: [input]	[input]	[input]
Case No: [input]	Case No: [input]	Date of Loss: [input]	[input]	[input]

Home Dashboard Claims Reports Settings Help

Claim Summary Notice and Assignment Coverage Analysis Claim Parties Initial Investigation Liability Evaluation Reasoning Exposure Evaluation Claim Mitigation Subrogation Recovery Claim Strategy Claim Resolution Supervision

1. Has claimant Medicare status considered as part of settlement evaluation? **31. Did adjuster follow the registration alert?**
 2. Has this claim assigned? **32. Did adjuster follow the registration alert?**
 A. If yes, what is the reason? **33. Have settlement negotiations conducted as a priority matter?**
 ... **34. If fully, what was the amount of the settlement?**
 ... **35. Has the settlement amount appropriately based on evaluation of liability and damages?**
 ... **36. If no, what was the amount of the settlement?**
 ... **37. Has settlement amount been negotiated and documented agreement?**
 ... **38. Settlement paid after Agent had been?**
 ... **39. Have all appropriate resources engaged for the aspect of the alert?**
 3. Payment to Medicare beneficiary available, was Medicare case used if concluded and documented? **40. If engaged, were the resources effectively managed?**
 4. Did adjuster appropriately take into account all issues when evaluating the date for settlement? **41. If engaged, were the resources effectively managed?**
 5. Did adjuster determine appropriate settlement range prior to initiating registration? **42. If engaged, were the resources effectively managed?**
 6. The settlement date used is based on actual settlement date, not the case the carrier documented as part of the settlement agreement or management solution? **43. Has the total amount of the case well managed?**
 7. If necessary, was a recovery address generated in a timely manner? **44. Estimate the return amount of leakage.** Dollar amount:
 8. Did the alert affect an appropriate registration alert? **45. Estimate the return amount of leakage.** % of claim:
 Comments:



Claim leakage overview



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Claim Summary Notice and Assignment Coverage Analysis Claim Parties Initial Investigation Liability Evaluation Reasoning Exposure Evaluation Claim Mitigation Subrogation Recovery Claim Strategy Claim Resolution Supervision

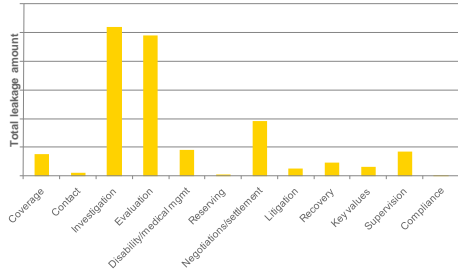
1. If the selected claimant(s) already retained an attorney, was contact made directly with the attorney to obtain the appropriate information? **31. Was claimant Medicare Status verified?**
 2. Was the TCO search on other claimant(s)? **32. Did adjuster recognize subrogation opportunity?**
 3. Was the TCO appropriately reviewed and addressed by the adjuster? **33. Was Subrogation Unit alerted?**
 4. Was a HIPAA release sent to the claimant after claim set up? **34. Were fraud triggers present for the selected claimant?**
 5. Was the release appropriately secured by the adjuster? **35. Did adjuster identify fraud triggers for the selected claimant?**
 6. Was the release obtained timely? **36. Was public report requested?**
 7. Did adjuster require about prior injuries, medical treatment, or co-morbid conditions? **37. Were photographs of the car taken?**
 8. Based on results of TCO and document inquiries, did adjuster follow up and obtain and review prior medical records for impact on current claim? **38. Were photographs of the accident scene taken?**
 9. Were the prior medical records obtained timely? **39. Were overall claim investigator completed timely for the selected claimant?**
 10. Did adjuster obtain current medical records related to claimant(s)? **40. For selected claimant, were all appropriate resources engaged for the aspect of the alert?**
 11. Were the current medical records obtained timely? **41. If yes, what resources should have been engaged?**
 12. Did adjuster review, analyze and document medical response and causal relationships to incident? **42. If engaged, were the resources effectively managed?**
 13. Was a claimant profile obtained? (Employment, education, injuries, pain level) **43. If engaged, were the resources effectively managed?**
 14. Estimate the return amount of leakage. Dollar amount:
 Comments:



Claim leakage drivers



Leakage impact analysis by process



Development of leakage rule set – 19 dimensions to consider



Self-critical analysis questionnaire	
Overall self-critical analysis assessment Self-critical analysis scoring results	Exceeded expectations 98%
<ul style="list-style-type: none"> 1. Initial claims triage and assignment process 2. Identification of coverage issues 3. Three point contact elements 4. Elements of the compensability evaluation 5. Appropriate subsequent contact made with all applicable parties 6. Effectiveness of the action plan 7. Completion of the proper facts surrounding the investigation 8. Effectiveness of subrogation efforts 9. Elements of the medical treatment plan 10. Elements of lost time claim characteristics 	<ul style="list-style-type: none"> 11. Reserve accuracy 12. Aspects of reserve accuracy 13. Aspects of the settlement process 14. Special fund process 15. Elements of the recovery process 16. Aspects of claim adjuster file completeness 17. Aspects of vendor management 18. Aspects of supervisor involvement in claim process 19. Claims handling compliance with state statutory requirements

The benefits of the claim leakage process



Performance improvement

The claims leakage process utilizes collected data which provides a basis for a consistent measure of claims performance and continuous performance improvement. The information is used to develop actionable performance improvement solutions.

Flexibility

This process can be customized and adjusted for various lines of business.

Potential recoverables

The claims review process can help identify opportunities to recover paid dollars.

Management prioritization

The results help to focus management attention and resources on the areas of greatest impact and to specifically target individual and group improvement initiatives where needed.

Claim leakage summary



- ▶ Certain factors that contribute to increased claim leakage are not available early in the life of the claim and therefore are not able to be included as factors in the predictive model.
- ▶ Claim leakage analysis aims at reviewing a sample of historical claims with high leakage that cannot be attributed to the predictors identified during the model development.
- ▶ Claim leakage drivers are part of an analysis to identify trends and opportunities for process improvement.
- ▶ The claim leakage analysis results in a recommendation report for each leakage process that has been identified.

Page 30

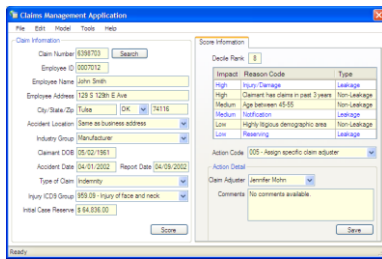
Predictive modeling with claims analytics



Claims triaging tool



- ▶ Can be deployed to claims personnel through a desktop interface



Page 31

Predictive modeling with claims analytics



Claims triaging tool



Claim scorecard (two sample prior claims)					
Claim characteristics		Claim ID			
		24815		39854	
Date of accident		3/5/2010		3/28/2010	
Date of claim reporting		3/9/2010		3/29/2010	
Initial incurred loss at 30 days		\$5,000		\$22,000	
State claim		NY		MA	
		---		---	
Predictor variable	Value	Model effect	Value	Model effect	
Injury type	---	Category 3	---	Category 1	---
Driver prior loss experience	3*	Negative	---	1-2	Positive
Editor reporting lag	4	Negative	---	1	Positive
Weather conditions	0.65	Neutral	---	0.45	Neutral
		---		---	
Model output					
Predicted incurred loss at 24 mos		\$150,000		\$10,000	
Decide rating (based on expected development)		5		2	
		---		---	
Rule set					
Suggested action 1		1. Assignment to senior adjuster		1. Deprioritize claim in case log	
Suggested action 2		2. Increased supervisory review frequency			
Suggested action 3		3. Proactive early settlement efforts			
		---		---	
Actual outcomes					
Actual incurred losses at 24 mos		\$250,000		\$6,000	
Current incurred losses at present day		\$265,000		\$6,000	

Potential loss mitigation strategies



- ▶ Identify specific loss mitigation strategies to be applied to claims with potential claim leakage.
- ▶ Possible loss mitigation strategies are as follows:
 - ▶ Prompt assignment of senior claims resource
 - ▶ Immediate review and coaching from claim supervisor
 - ▶ Early assignment of medical, vocational or other vendor specialists
 - ▶ Increased rate and depth of communication with claimant and other associated parties to the claim
 - ▶ Increased rate and depth of ongoing supervisory review and guidance
 - ▶ Senior claims management committee review
 - ▶ Proactive early settlement efforts
- ▶ The loss mitigation strategies identified and implemented will vary based on the client and data available.
- ▶ Develop "rule set" ("guiding principles") to guide the application of the strategies.

Loss mitigation rule set



Potentially severe claim identified:

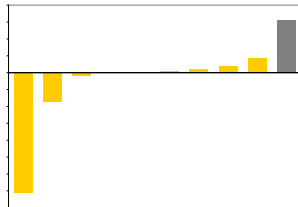
- ▶ Nerve damage
- ▶ Significant pre-existing conditions:
 - ▶ Overweight
 - ▶ Diabetes
- ▶ Extensive claims history

Model prediction:

- ▶ Adverse development of \$1m

Given facts, rule set indicates:

1. Promptly assign senior adjuster
2. Promptly assign nurse case manager
3. Proactive medical management
4. Order independent medical exam
5. Seek early return to work (light duty)

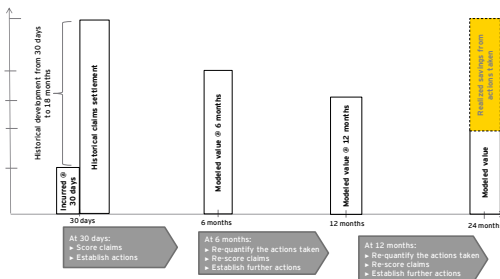


Outcome:
Reduced claim leakage (lower indemnity, permanent impairment + on-going medical) resulting in reduction in total incurred loss

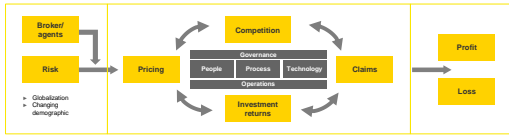
Claims development lifecycle



- ▶ The claim development lifecycle starts within 30 days with a claims modeling score and a specific leakage prevention action plan.
- ▶ Subsequent to the scoring of the claims along with the associated action plans invoked, a re-evaluation is required through a re-scoring process.

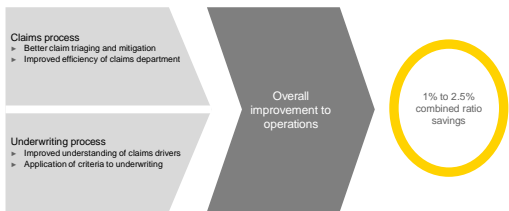


Process improvement



Competition	Customers	Service	Regulatory	Financial markets
<ul style="list-style-type: none"> Emerging products and technology Increase in market concentration More specialization and market niches Decentralized, globalized insurance model focused on cost control Increased frequency and sophistication of marketing (web, social media) 	<ul style="list-style-type: none"> Event pressure on pricing Repeat global, end-to-end solutions Move ability to move for price and service between Continuing innovation Complexity increasing related to lack of knowledge of local, political and geographic laws and customs 	<ul style="list-style-type: none"> Short-term financial pressure Legacy technology issues High overheads and chain of control Turnover at all levels Ineffective vendor management Sub-optimal recovery practices Lack of sustained testing programs 	<ul style="list-style-type: none"> Rating agency pressure Increased regulatory action due to government interventions Increased foreign regulator and insurance environment Unfavorable regulatory and claims law environment 	<ul style="list-style-type: none"> Debt and equity market spreads Increasing government intervention Increased foreign exchange pressure Increased desire by financial markets in lieu of insurance to manage risk (e.g., cat bonds)

Process improvement



Summary

- ▶ Claim leakage processes and controls and loss mitigation strategies can be applied proactively.
- ▶ There is significant opportunity for potential savings by applying claims predictive modeling and leakage analysis to a company's claims operations.
- ▶ Companies that leverage the knowledge from the above combined process all the way back to underwriting will benefit the most.

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