Mitigating claim development through predictive modeling

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Agenda

► What drives the adverse development of claims?
  ► Fact-based predictors
  ► Leakage predictors

► Analysis methodology
  ► Predictive modeling
  ► Operational and financial claim leakage assessment

► Implementation

► Next steps
What is claim leakage?

Claim leakage capture is the process of identifying, analyzing and measuring the adjudication process and resulting claims payments/recoveries or lack of, against established standards to identify opportunities for improvement.

Claim leakage is defined as the difference between the actual claim payment made and the amount that would have been paid if more effective claim payment controls were in place (operational and financial).

Leakage is caused by deviations from established industry or company standards and/or leading practices.

Leakage is also calculated against the probability that a company utilizing leading practices with the same claim fact pattern would have identified and avoided the result.

Leakage = (actual payout – appropriate payout) X probability.
Typical causes of claim leakage

► Assignment of claim to inappropriate adjuster by skill level resulting in poor recognition of critical issues
► Repeated re-assignment of files across various claim handlers causing delay and lack of case continuity
► Improper determination of coverage or risk transfer obligation
► Failure to perform and document meaningful investigations, as well as infrequent communication with relevant parties
► Inadequate management or inappropriate use of vendors, including legal and medical professionals
► Lack of proactive claim handling and resolution planning
► Failure to pay according to a contractual agreement or fee arrangement
► Missed subrogation, recovery or offset opportunities
Potential cost savings

► The analysis of historical claim development via predictive modeling allows for the quantification of the root-cause cost drivers of adverse claims development.

► Once potentially severe claims are identified, actions can be taken:
  ► Prompt assignment of senior claims handler
  ► Prompt assignment of nurse case manager or rehab specialist
  ► Early enrollment in vocational rehabilitation
  ► Early application of return-to-work strategies/initiatives
  ► Continued proactive communication with injured party and employer
  ► Claims management committee review
  ► Proactive early settlement efforts

► Early application of mitigation strategies could reasonably allow for capture of a significant portion of adverse development that would have occurred.
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 when the claim is first reported.
- Analytics and early detection of potential claim leakage (factors on profiles) provide a potential edge and cost savings in the current competitive and economic environment.
- A predictive model that identifies the main quantifiable drivers of individual claim leakage at the point of first report.
Claims model development process

Data collection and cleansing

Modeling database construction

Model construction

Model results and calibration

Claim leakage analysis

Claims modeling implementation

Activity
- Internal data analysis
- External data research

Assemble data on individual historical claim level

Multivariate statistical analysis

Analyze model results on held-out policy-year of claims

Analyze sample of claims with predicted high leakage

Building functionality of claims mgmt tool

Result
- Report on external data sources
- Modeling database and variable report
- Selected models and preliminary results
- Lift charts and final model results
- Recommendations for new and improved processes and controls
- Customized implementation application
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.
Hypothesis: The day that an indemnity claim occurs could be a fraud indicator.
Finding: Claims that occur on Monday tend to develop into significantly larger claims.
Hypothesis: The reporting lag of a claim affects the ultimate settlement amount. 
Finding: Claims that take longer to report tend to be significantly more expensive.
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:

<table>
<thead>
<tr>
<th>Data source name</th>
<th>Type</th>
<th>Value</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data source 1</td>
<td>Business</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Data source 2</td>
<td>Business</td>
<td>High</td>
<td>Med</td>
</tr>
<tr>
<td>Data source 3</td>
<td>Business</td>
<td>High</td>
<td>Med</td>
</tr>
<tr>
<td>Commercial credit vendor</td>
<td>Credit</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Personal credit vendor</td>
<td>Credit</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Crime index</td>
<td>Demographic</td>
<td>Med</td>
<td>Low</td>
</tr>
<tr>
<td>Litigiousness index</td>
<td>Demographic</td>
<td>Med</td>
<td>Low</td>
</tr>
<tr>
<td>Hospital index</td>
<td>Hospital</td>
<td>Med</td>
<td>Low</td>
</tr>
<tr>
<td>Data source 9</td>
<td>Business</td>
<td>Med</td>
<td>Med</td>
</tr>
<tr>
<td>Data source 10</td>
<td>Business</td>
<td>Med</td>
<td>High</td>
</tr>
<tr>
<td>Voting patterns</td>
<td>Demographic</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Traffic safety index</td>
<td>Demographic</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Data source 16</td>
<td>Business</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>
Combining internal and external data

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

- **Internal data**
  - **Historical claims level data**

- **External data**
  - **Company owner**
    - Bankruptcies
    - Debt burden
    - Credit score
    - Credit balance
  - **Commercial credit**
    - Bankruptcies
    - Number of collection trades
    - Number of employees
    - Account balance per trade
  - **Socio-economic**
    - Unemployment
    - White collar crime
    - DUIs
    - Hit-and-run accidents
  - **Workplace safety**
    - OSHA inspections
    - OSHA violations
  - **Geographic**
    - Household income
    - Education level
    - Political profile
    - Urban v. rural areas

Data collection and cleansing → Modeling database construction → Model construction → Model results and calibration → Claim leakage analysis → Claims modeling implementation
Modeling database will contain all internal and external risk factors.
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

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

Are geo-demographic characteristics significant?

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

Is the claimant’s prior claim history significant?

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

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

Is financial condition of claimant predictive of ultimate settlement value?

*Measured by:*
- Personal credit data of claimant
- Individual credit attributes of claimant
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.
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.
Hypothesis: Claims that occur in urban areas tend to be more expensive. Finding: Claims in urban areas are 50% more expensive than claims in rural areas, on average.
1. Construct a database, including internal and external data.
2. Build a predictive model that supplements existing claim management procedures.
3. Score recent month’s claims by expected adverse development.
4. Divide the ranked claims into equal bins (quartiles, deciles, etc.).
5. Measure the experienced adverse development within each bin.
Testing is performed on claims that are outside of the modeling data set.

Recognition of expense-saving claims

Apply specific claim mitigation strategies
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 analysis

► Certain factors that contribute to increased claim leakage are not available at first report and therefore are not 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 predictors are part of analysis to identify trends and opportunities for process improvement.

► The analysis includes building a historical claim database and identifying common themes and characteristics among the sample of claims reviewed that are the main drivers of high claim leakage.

► The claim leakage analysis results in a recommendation report for each leakage process that has been identified.
Potential benefits of the claim leakage process

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

► Performance improvement
  ► The claim leakage process utilizes data which provides a basis for a consistent measure of claims performance.
  ► The information is used to develop actionable performance improvement procedures.

► 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.
A claim specialist was assigned a new loss for a worker who alleged a back injury first thing on a Monday morning. The adjuster contacted the employer who confirmed that there were no witnesses and the employee was referred to the panel physician. The adjuster then contacted the treating physician who confirmed that the injured employee was treated and placed on TTD for four weeks. No further investigation was completed. Compensability was accepted and TTD payments were issued after the appropriate wait period and medical bills were paid when received and processed by bill review provider. The injured worker treated for 11 months and collected TTD for the same period before being released back to work. Total payments incurred:

- $25,200 for 48 weeks of TTD @ $525/wk
- $20,100 for medical
- $45,300 Total paid

The claim was reviewed as part of the claim leakage study and the analyst determined that claim leakage occurred due to the adjuster’s failure to timely follow up with the employer to seek and execute a modified duty for return to work (RTW) and lack of proactive medical management.

<table>
<thead>
<tr>
<th>Leakage</th>
<th>Probability</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjuster did not obtain timely or actively seek modified duty or RTW; also adjuster didn’t medically manage claim to mitigate loss.</td>
<td>30-40% of the time, these payments could have been impacted by utilizing leading practice.</td>
<td>Discount to probability applied due to unknown availability of modified duty during the disability period. In addition, there is a limited time to direct care in the loss state. Applying discount factor provides realistic estimates.</td>
</tr>
<tr>
<td>Payment(s) of $45,300 is gross leakage.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$45,300 X 30%–40% = $13,590–$18,120 Leakage
Claim leakage database

Mitigating claim development through predictive modeling
Vendor management

Description
► Rationalize the number of claims vendors utilized across LOBs
► Eliminate duplication of internal and external claim services (i.e., appraisal tools, software)
► Develop formal vendor management program to govern the usage of key vendors, identification, selection, contracting and performance measurement
► Optimize organizational scale to drive more favorable pricing

Initiative

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Estimated benefit</th>
<th>Estimated cost</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vendor rationalization</td>
<td></td>
<td>($0.4)</td>
<td></td>
</tr>
<tr>
<td>Reduce duplication of services</td>
<td></td>
<td>($0.2)</td>
<td></td>
</tr>
<tr>
<td>Vendor management program</td>
<td></td>
<td>($0.6)</td>
<td></td>
</tr>
</tbody>
</table>

Net benefit: All values in millions
$12.75 ($1.2) $11.55

Implementation assessment

<table>
<thead>
<tr>
<th>Vendor rationalization</th>
<th>Reduce duplication of services</th>
<th>Vendor mgmt program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effort</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Cost</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Duration</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Risk</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

Assumptions
► Target benefit estimates include a combination of reduced leakage ($5.25m) as well as cost reduction ($7.5m) achieved through vendor management program implementation and vendor rationalization
► Cost reduction estimate includes 10% savings of 2008/2009 average ALAE ($75m)
► Estimated internal resource cost includes 2.5 FTEs and supporting tools and technologies
► External vendor cost estimate is a one-time charge

Legend

<table>
<thead>
<tr>
<th>Effort</th>
<th>Team size</th>
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</thead>
<tbody>
<tr>
<td>M</td>
<td>L &lt;3</td>
</tr>
<tr>
<td>M</td>
<td>M 3–10</td>
</tr>
<tr>
<td>H</td>
<td>H 10+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost</th>
<th>Spend</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>L &lt;$1m</td>
</tr>
<tr>
<td>M</td>
<td>M $1m–$2m</td>
</tr>
<tr>
<td>H</td>
<td>H $2m+</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Duration</th>
<th>Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>L &lt;3</td>
</tr>
<tr>
<td>M</td>
<td>M 3–6</td>
</tr>
<tr>
<td>H</td>
<td>H 6+</td>
</tr>
</tbody>
</table>
Implementation needs to be customized and flexible

Several implementation options available:
- Stand-alone desktop claims management tool
- Integration of model scoring algorithm to claims system
- Claims scorecard for use in branches or field
- Monthly scoring of claims

Objective of implementation is the efficient and effective realization of model benefits

Example of stand-alone desktop application on following slide
Can be deployed to claims personnel through a desktop interface
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 handler
- Prompt assignment of nurse case manager or rehab specialist
- Early enrollment in vocational rehabilitation
- Continued proactive follow-up with injured party
- Claims management committee review
- Proactive early settlement efforts
- Application of return-to-work initiatives

The loss mitigation strategies identified and implemented will vary based on the client and data available.

“Rule set” would be developed to guide the application of the strategies.
Loss mitigation rule set – example 1

Potentially severe claim identified:
► Moderate back strain/sprain
► Expected recovery time of 2-4 months
► Geographic area of high unemployment

Model prediction:
► Adverse development of $500k

Given facts, rule set indicates:
1. Assignment to more senior adjuster
2. Case added to supervisor diary
3. Assignment of nurse case manager
4. Aggressive return-to-work program
5. Vocational rehabilitation

Outcome:
No claim leakage, resulting in overall reduction in loss cost
Loss mitigation rule set – example 2

Potentially severe claim identified:
- Lower back injury
- Highly litigious jurisdiction
- High-wage skilled trade

Model prediction:
- Adverse development of $850k

Given facts, rule set indicates:
1. Assignment of senior claims adjuster
2. Case added to supervisor diary
3. Early intervention by nurse case manager
4. Early independent medical exam
5. Proactive early settlement efforts

Outcome:
Limited claim leakage, with ability to impact overall results
Loss mitigation rule set –
example 3

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:
Limited claim leakage with mitigation of loss cost
Summary

► Systematic claim leakage presents considerable costs.

► These costs can be limited if general processes and controls can be implemented to curb claim leakage and if individual claims with high potential for claim leakage are identified early.

► Claim leakage processes and controls and loss mitigation strategies can be applied proactively.

► When claim leakage processes and controls are implemented successfully, there is a possibility to capture 11%–15% of claim leakage.