The Cumulative Claim Cost (C^3) Index: A Tool for Managing Long-Tail Casualty Claims

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Abstract

On-the-job employee accidents create legal and fiduciary obligations on the part of employing organizations: To compensate injured workers, while also to manage the overall injury-related expenditures in a fiscally sound manner. As it regards the latter of the two obligations, active and effective management of the total cost of on-the-job accidents demands informational specificity that very few organizations have, in spite of the requisite detailed accident and injury data being readily available. Especially vexing is the challenge of effective cost management of long-tail casualty claims, which are those that remain open more than 12 months after the initial filing date. The primary problem that impedes effective management of those claims is their inherent age and type heterogeneity, which makes meaningful cross-time comparisons difficult. This paper discusses a simple computational approach – the Cumulative Claim Cost Index, or C^3 Index – designed to help managers make objective and reliable year-over-year long-tail claim cost comparisons, while also being able to "drill down" into the underlying causes of any observed variability.

Introduction: The Management of Risk & Informational Adequacy

Risk is ubiquitous and takes many forms: downside vs. upside, internal vs. external, controllable vs. uncontrollable, etc. (Banasiewicz, 2009). While some threats are fairly deterministic, as is the case with governmental regulations, most are highly probabilistic – i.e., have an uncertain chance of occurrence – or altogether not objectively estimable, as is the case with extremely rare events. Given that inherent uncertainty that permeates the management of risk, it follows that the efficacy of the overall risk management process[1] is highly contingent on the precision, or the accuracy of informational inputs that shape and guide each stage of the overall process. That is particularly the case for the first two stages in the process – risk identification and (risk) estimation – which are especially dependent on the accuracy of the underlying information. In fact, as suggested earlier, absent valid and reliable empirical data, risk estimation is altogether not possible.

Data availability, however, is only a part of the estimation dilemma. Many of the currently used risk estimation approaches rely on aggregate analyses, which can lead to informationally inadequate decision inputs for two fundamental reasons: First, as implied by their name, those methods tend to focus on combined outcomes, which can lead to insufficient informational granularity. Among the resultant undesirable consequences of poor insight granularity is a loss of event type distinctiveness, which is to say that numerous, otherwise distinct threats are not adequately differentiated. The second of the two reasons is that aggregate analyses tend to emphasize the "what" over the "why", or in more operational terms, tend to make use of trend extrapolation, effectively foregoing cause delineation. As a result, potential remedies are obfuscated, which is akin to diagnosing a problem without offering a hint of a solution.

Informational inadequacy will obviously have an adverse impact on any decision, but its impact will be particularly profound in situations where decision makers are faced with multiple, competing courses of action. One such situation arises in the context of casualty risk, which is liability arising out of injuries to persons, especially in an employment setting. A business organization managing a book of such claims needs to fulfill its legally-mandated responsibilities toward injured workers, while also acting in a fiscally-sound manner, doing which calls for robust informational supports.

Casualty Risk: On-the-Job Accidents

Among the risks of particular concern to labor-intensive industries, such as heavy manufacturing, construction or oil/gas exploration, are on-the-job accidents. When an employee is injured while carrying out his/her employment-related duties, it creates an obligation on the part of employer to provide for medical treatment and salary/wage continuation for the injured worker (commonly known as "worker's compensation"). Although in principle on-the-job accidents can and do occur in virtually all employment settings, the frequency and the severity of those accidents –

[1] The commonly used risk management process is comprised of several sequential steps which are as follows: *risk identification → estimation → mapping → response → capitalization.*

and thus their aggregate cost – vary considerably across industries, and to a somewhat lesser degree, among individual organizations within each industry. Generally, organizations that rely on physically demanding or otherwise dangerous work tend to incur far greater worker injury costs than the so-called "light" industries, such as financial services or retailing. Furthermore, in contrast to other types of risks, such as property damage or securities litigation, which can take advantage of speculative risk pooling to transfer the majority of costs emanating from those risks onto the commercial insurance market, more than 90%, of the cost of on-the-job injuries is borne directly by the employers (as the frequently recurring nature of those events severely limits the applicability of speculative risk pooling; commercial insurance is a viable option for only the extreme-most cases[2]). These costs can be quite significant – according to the National Council on Compensation Insurance (NCCI), on average, U.S companies spend about $1 per every $100 of payroll on injury-related worker's compensation; as implied earlier, those costs tend to vary across industries and, to a somewhat lesser degree, within-industry peers.

Naturally, business organizations invest considerable resources and effort into accident prevention and safety engineering with the goal of curbing the occurrence and the severity of accidents. Still, not all accidents can be prevented and some of those accidents can be quite severe, ultimately requiring prolonged treatment and wage continuation benefits. Hence, from the risk management standpoint, high casualty risk organizations face a dual challenge: 1. to mitigate the likelihood of occurrence and the severity of on-the-job accidents, and 2. to manage the long-tailed book of claims in a fair (to injured workers), though cost-effective manner. While the former received a considerable amount of practical (e.g., the DuPont Process Safety Management and Operational Risk Management systems, originally developed about three decades ago) and theoretical (Attwood, Khan & Veitch, 2006; Choudhry, Fang & Mohamed, 2007; Dong & Tomlin, 2012; Hamalainen, Takala & Saarela, 2006; Khanzode, Maiti & Ray, 2012; Lemstra & Olszynski, 2003; Lopez et al., 2011; Rikhardsson & Impgaard, 2002; Sears, Blanar & Bowman, 2013; Yip and Yau, 2005;) attention, the latter has been largely overlooked by practitioners and theoreticians alike. It is the purpose of this paper to contribute to the development of rational basis for managing long-duration books of casualty claims.

Fundamental Claim Typology

In risk management and legal terms, an occurrence of on-the-job employee accidents gives rise to a "claim", which is a demand by the injured party (an employee) for compensation in the form of medical and related expenses as well as wage continuation. From the standpoint of the claim-incurring employer, the event creates both a legal obligation stemming from an applicable (state, in the U.S) law, as well as a less well-defined fiduciary one, which is to manage the total claim related costs in a fiscally-sound manner.

[2] The so-called "excess" worker's compensation insurance coverage only offers protection once the cost of a qualifying event exceeded (hence the name) a pre-determined level, which for larger U.S companies tends to be set at about $500,000 (per accident), on average.

It is well known that the severity of on-the-job accidents and other casualty claims are not normally distributed (Attwood, Khan & Veitch, 2006; Sears, Blanar & Bowman, 2013; Yip and Yau, 2005;), which is evidenced by the widespread use of the Poisson and negative binomial distributions in modeling of casualty events (Yip and Yau, 2005;). In a more qualitative – i.e., claim management – sense, on-the-job accidents can be broadly described in terms of their overall *cost*[3] and *duration*, as illustrated by a simple 2x2 categorization schema shown in Figure 1 below.

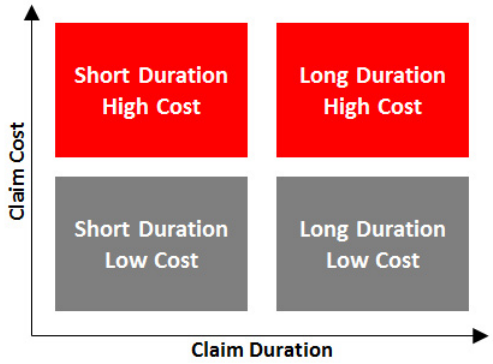

Figure 1
A Basic Casualty Claim Categorization Schema

The fundamental claim categorization illustrated above uses the simplest, or binary, splits – high vs. low – for both Cost and Duration dimensions. It is worth noting that multichotomous splits can be used as well, where each of the two continua are broken into three (high – medium – low), four (e.g., quartile 1, quartile 2, etc.) or more categories – however, the added complexity of the resultant categorization schema may not yield sufficient informational or application benefits. In practical applications in particular, less is more as there tends to be an inverse relationship between the number of categories and the distinctiveness of behavioral actions implied by each category. In many instances, inflating the number of categories may actually diminish the practical utility of the solution by unnecessarily increasing decision ambiguity: There is a clear behavioral implication that is communicated by the high-low split; that clarity diminishes as the number of splits increases (e.g., high-medium-low, etc.). Hence, it is advisable to begin with the simplest categorization schema, such as the 2x2 framework in Figure 1, only adding additional splits when compelling evidence to do so emerges.

Turning back to the simple binary categorization schema, the high vs. low splits on both Cost and Duration dimensions result in four distinct claim categories: Short Duration—Low Cost; Short Duration—High Cost; Long Duration—Low Cost and Long Duration—High Cost[4]. As implied by the name, the first category, Short

[3] The overall cost is usually a sum of salary/wage continuation (indemnity), medical and legal expenses.

[4] It should be noted that a commonly used short vs. long duration line of demarcation is one year, while the low vs. high cost distinction is largely organization-specific, as even after eliminating the extreme-most cases, there are considerable cross-company differences in terms of the average cost.

Duration—Low Cost, is comprised of mostly trivial events which have minimal impact on aggregate costs (often 5% or less); at the other end of the spectrum, the Long Duration—High Cost category is made up of the costliest, most severe events that often contribute as much as 80-90% of the aggregate cost. At a point in time, a high casualty risk organization (e.g., a construction or a heavy manufacturing company) can be expected to have a mix of claims falling into each of the aforementioned four categories, which poses a significant challenge to effective claim cost management of the overall book. That challenge is as follows: Risk managers are commonly unsure if the claim-specific cost accrual (often referred to as "claim development") is reasonable given the innate characteristics of the underlying injuries, or if it is excessive. Furthermore, even if management is able to ascertain that the cumulative claim costs are indeed excessive, the decision makers typically lack clarity regarding the underlying causes, which is largely due to claim mix heterogeneity distortions. To that end, there are numerous potential causal factors that might be responsible for the observed cost inflation, including an increasing number of claims that remain open beyond one year, accelerating medical expenses or an increasing overall cost of a "typical" claim. As can be expected, the ambiguity surrounding root causes of the observed claim development impedes meaningful claim management, which in turn severely constrains the ability of the organization to fulfill its fiduciary obligations outlined earlier.

The Components of Claim Cost

The informational deficiency outlined above is a product of data under-utilization and as such, it is a surmountable problem. Nowadays, virtually all employers have – or could get – access to detailed and fairly accurate accident and injury detail data, yet many are "stuck" in looking at the available metrics in a summative view, which compresses accident/employee level details into aggregate outcomes. A case in point: The widely used actuarial trends capture the overall annual increases in outcomes such as exposure, benefit levels or loss inflation, all of which offer summarizations of aggregate outcomes, but little-to-no diagnostic or prescriptive insights. Hence, while it is worthwhile to objectively assess the key accident cost related trends, such assessments: 1. confound time-dependent effects with claim specific cost variability[5], and 2. are not indicative of the underlying dynamics, other than the passage of time, that impact the observed outcomes.

Looking beyond summative assessment and leveraging the readily available claim level detail, an organization can construct a decomposable index capturing time-adjusted, year-over-year cost variability for longer tail (i.e., those that remained open for longer than one year) on-the-job accident claims. Consider Figure 2:

[5] Generally speaking, claims that remain open continue to accumulate cost, hence, everything else being equal, older claims will have accumulated more cost only due to having been open longer.

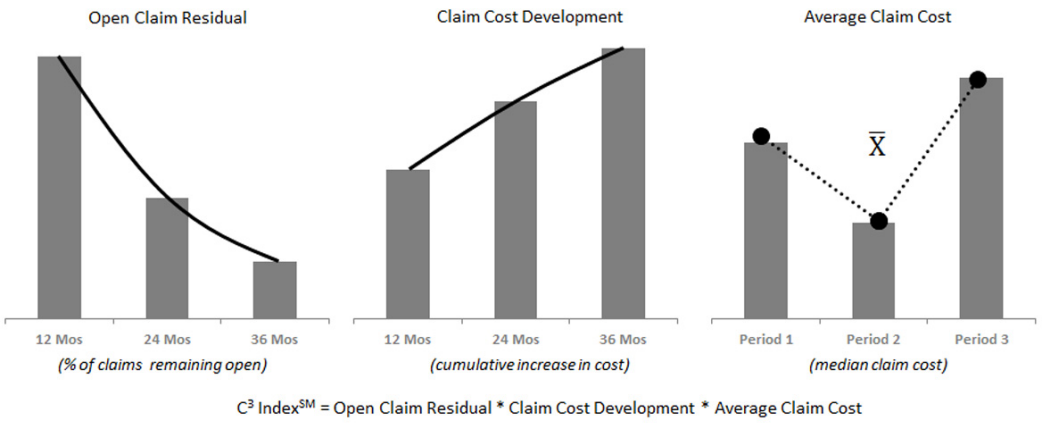

Figure 2
The Cumulative Claim Cost Index (CCCI) Logic

The *Cumulative Claim Cost Index* (*CCCI*, or *C^3 Index*) is meant to capture year-over-year changes in the book of claims that are being carried over beyond one year. The idea behind the Index is that while it is fairly straightforward to determine the cost of claims that have been incurred during the current year (and thus make year-over-year comparisons), due to the ever-changing mix of residual (i.e., older than one year) claims, making properly controlled year-over-year comparisons becomes quite difficult. Still, as noted earlier, effective casualty cost management not only demands an objective assessment of both new and residual costs – it also calls for that assessment to done in a manner allowing the management to determine the underlying root causes of any period-over-period changes. The C^3 Index was designed with that dual goal in mind.

There are three distinct components that comprise the Index: 1. *Open Claim Residual*, which is a proportion of claims that remained open 12, 24 and 36 months post-opening; 2. *Claim Cost Development*, operationalized as a cumulative increase in the cost 12, 24 and 36 months old claims; 3. *Average Claim Cost*, measured as the average of the three period-specific cost medians. The overall C^3 Index Score is a normalized product of these three independent metrics, the overall results of which are interpreted as follows:

- C^3 Index = 1.0: year-over-year claim carrying costs is flat;
- C^3 Index > 1.0: year-over-year claim carrying cost is increasing;
- C^3 Index < 1.0: year-over-year claim carrying cost is decreasing.

The Index uses annually rolling inputs, which means that any year-over-year comparison effectively captures the relative impact of the most recent year on the three-year composite. Furthermore, the aggregate score of the C^3 Index can be decomposed into the aforementioned three elements to help the decision makers gain insights into the source(s) of the aggregate change in the claim carrying cost. For example, if the Index is suggestive of an increase in cost, evaluating its individual components can shed light on the source, or sources, of the observed increase, which could be a decline in the claim closure rate (which would be evidenced by an increase in the Open Claim Residual), an increase in total cost due to large loss claims

(captured in the Claim Cost Development) or an increase in the cost of a typical, i.e., median, claim (as captured in the Average Claim Cost). Clearly, so-refined informational granularity will have a far greater decision-guiding value.

Conclusions

The goal of this paper was to outline a simple computational method designed to help business organizations more effectively manage the total cost of on-the-job accident related employee claims. The Cumulative Claim Cost, or C^3 Index presented here offers organizations the ability to objectively and reliably estimate year-over-year changes in the costs of longer-term (more than one year in duration) claims, in the manner that not only removes claim mix heterogeneity distortions, but also enables easy root cause drill-downs. The C^3 Index should be of particular interest to organizations that incur significant number of on-the-job accidents, such as those in heavy manufacturing, construction or oil/gas exploration industries.

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