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Thoughts on How an Actuarial Control Cycle can Apply to Accelerated Underwriting

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In the individual life insurance space, accelerated underwriting is the newest iteration of underwriting. In these programs, instead of collecting blood and taking the physical measurements of the applicant, the underwriting relies on self-reported measurements along with information from various databases and scoring tools. This article begins with a brief history of accelerated underwriting, then discusses how it can be applied to risk management.

HISTORY OF ACCELERATED UNDERWRITING

Accelerated underwriting has evolved since it was first introduced in the early 2000s. As described in this section, these programs have evolved significantly since they were first introduced approximately 10 years ago.

Accelerated Underwriting 1.0

In early accelerated underwriting programs, companies simply changed their age and amount requirements. For certain ages and face amounts, paramedical exams and fluid testing were replaced with checks on prescription drug (Rx) and motor vehicle records (MVR) databases. The mortality impact of removing fluids was assessed as a load to the company's fully underwritten mortality assumption, which was partially offset by a discount associated with the protective value of the new underwriting tools and expense savings. In addition, because these changes meant that the underwriting decision would be based on self-reported information rather than tested information (e.g., build and smoker status), loads were introduced to account for asymmetry of information and additional adverse selection.

These early programs often passed on the net increase in expected mortality to the end consumer. Also, the first adopters of these programs usually did not allow for preferred risk classes. Thus, these programs were not priced competitively and were prone to additional adverse selection. Few, if any, of these programs achieved their sales targets, and the mortality experience often performed poorly.

Accelerated Underwriting 2.0

To make these products more attractive in the market and with the intent of attracting better risks, companies started to introduce various changes. Figure 1 outlines the general evolution of these products over time.

Significantly, companies started to offer preferred classes at competitive rates. They also introduced more underwriting tools and various forms of underwriting triage systems to select better risks or introduce a sentinel effect. These underwriting tools continue to evolve. Some tools under consideration in the market are electronic health records, health insurance claims records and activity information from wearable devices. We do not know how the mortality experience of these products will

Figure 1
Evolution of Accelerated Underwriting Products, 2010–2019

Industrywide	2010	2014	Today
Number and type of programs	The first programs were introduced around this time	Fewer than 10 programs available in the market	Over 30 programs in the market and many more under development
Underwriting tools	MIB, MVR, Rx	MIB, MVR, Rx, other vendor tools, first-generation predictive models, interviews, reflexive questions	MIB, MVR, Rx, credit-based scores, more sophisticated predictive models, interviews, reflexive questions, triage
Rules engines	Rare	Half	Most
Nonsmoker risk classes	1	2 or more	Same as fully underwritten
Pricing	Table 4-8	10%–15% loads	Fully underwritten premiums
Maximum face amounts	$100,000	$250,000	$500,000 or higher

Abbreviations: MIB, Medical Information Bureau; MVR, motor vehicle records; Rx, prescription drug databases.

emerge over time or how wide the range of mortality experience based on differences in underwriting will be.

ACTUARIAL CONTROL CYCLE AND RISK MANAGEMENT

When setting a price and assessing the profitability of a new product, an initial set of best-estimate assumptions must be determined. Once the product is launched, experience needs to be monitored, and as experience deviates from expected, assumptions need to be updated to reflect the actual experience. This process is iterative and as credibility builds, assumptions should converge to a long-term average.

When applied to insurance products, this process has been termed *the actuarial control cycle*. Much like the scientific method, successful actuarial implementation of the control cycle requires data that is collected over time. The data in this case comes from monitoring the experience. To be successful, the monitoring process needs to be designed at the beginning of the product development process. That way the necessary data collection can be put in place from day one.

With accelerated underwriting, rates are often set at the same premium level as traditionally underwritten products, but because of how new they are, there is no credible mortality experience of accelerated underwriting programs. Thus, the mortality level has a high degree of uncertainty for these programs. Mortality experience will take some time to emerge. As such, monitoring should initially focus on the leading indicators such as straight-through processing rates; distribution by age, gender, face amount and product type; and lapse experience. These could be compared to the pricing assumptions to help validate the original pricing ahead of actual claims experience. Other items to monitor include misrepresentation rates on application questions, such as build and smoking status. In a triage system, it would also be important to track and measure these variables by underwriting path. The next section discusses some of the ways to implement this monitoring.

CREATING A SENTINEL EFFECT AND INFORMING THE ACTUARIAL CONTROL CYCLE

Actuaries and underwriters have a number of tools at their disposal for evaluating their exposure to risk presented by

accelerated underwriting programs. These tools have strengths and weaknesses that must be understood in order to correctly interpret results.

Retrospective Studies

To set initial assumptions for accelerated underwriting programs, a company will often perform a retrospective study. In such a study, a pool of applications that were previously underwritten under a traditional program will be evaluated using the new, accelerated underwriting rules. The actuary can then use the misclassification by class, smoker status and decline cases to calculate an implied load from the traditional underwriting to the accelerated underwriting program.

One item to consider is that if the retrospective study is based on a pool of applicants that originally underwent traditional underwriting, the conclusions of the study would be incomplete. Since the applicants were aware at the time they applied that they would need to undergo paramedical exams and submit to fluid requirements, it is assumed they were more motivated to honestly disclose information on the application than they otherwise would be. This effect is called the sentinel effect. In accelerated underwriting programs, the risk is that applicants become aware that they may not need to submit to such exams and thus disclosure rates will decrease and misrepresentation rates will increase. A load for the loss of sentinel effect must then be added on top of the loads derived from the retrospective study. The mortality impact of the loss of sentinel effect is a very difficult assumption to derive.

Random Holdouts

Many accelerated underwriting programs perform random holdouts. A random holdout is an application that has fully qualified for accelerated underwriting yet has been randomly chosen to also undergo full underwriting. Random holdouts serve two main purposes: to introduce a sentinel effect and to provide information that would aid in the actuarial control cycle. Both are intended to refine the underwriting rules and/or update or refine the pricing and valuation assumptions. Since the selection of the holdout applications is random, once the sample size is large enough, the results should be distributed evenly about the mean. This is illustrated in Figure 2 with a 10 percent random holdout rate.

One problem encountered with random holdouts is that applicants withdraw their applications when they are requested to submit to invasive underwriting requirements. This could be because they view the underwriting request as bait and switch, or it may be because these applicants are misrepresenting their health status and thus it's in their best interest to withdraw the

Figure 2
Distribution of Random Holdouts

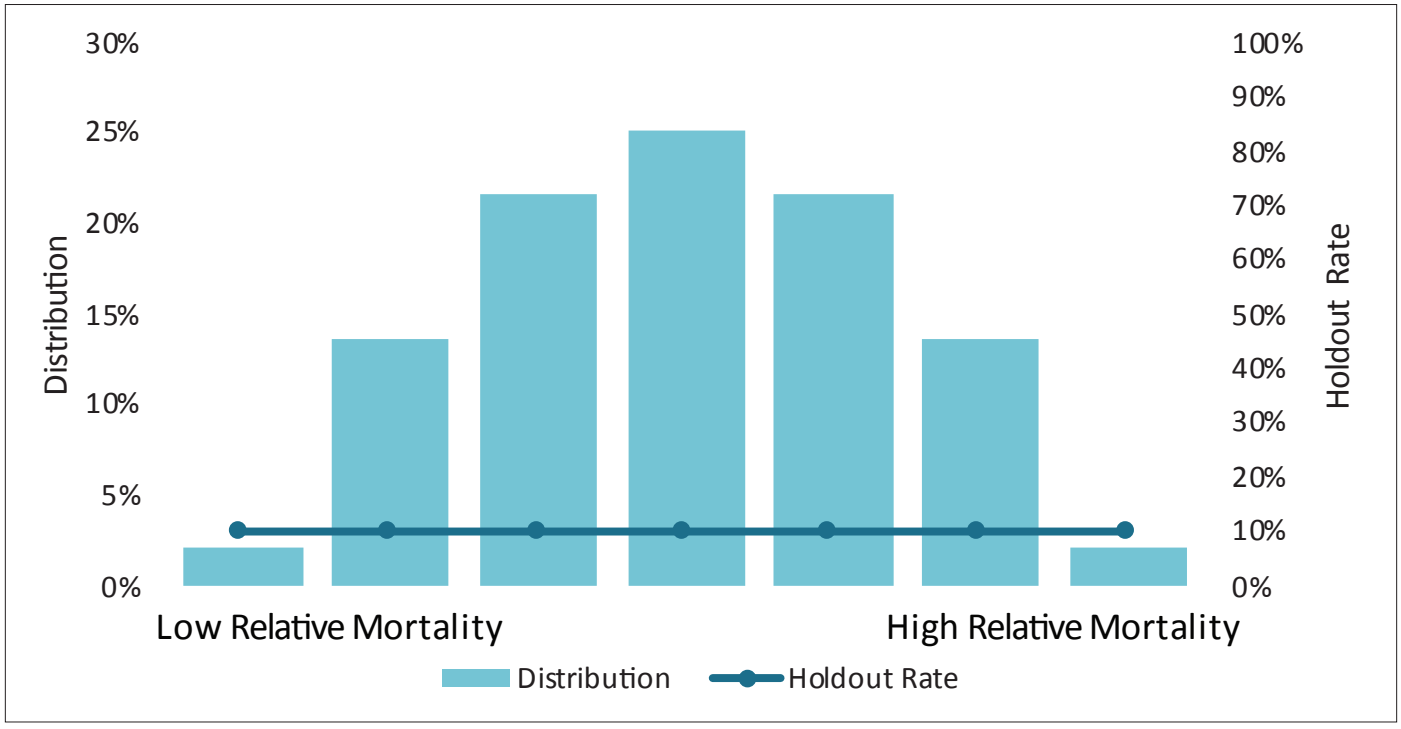
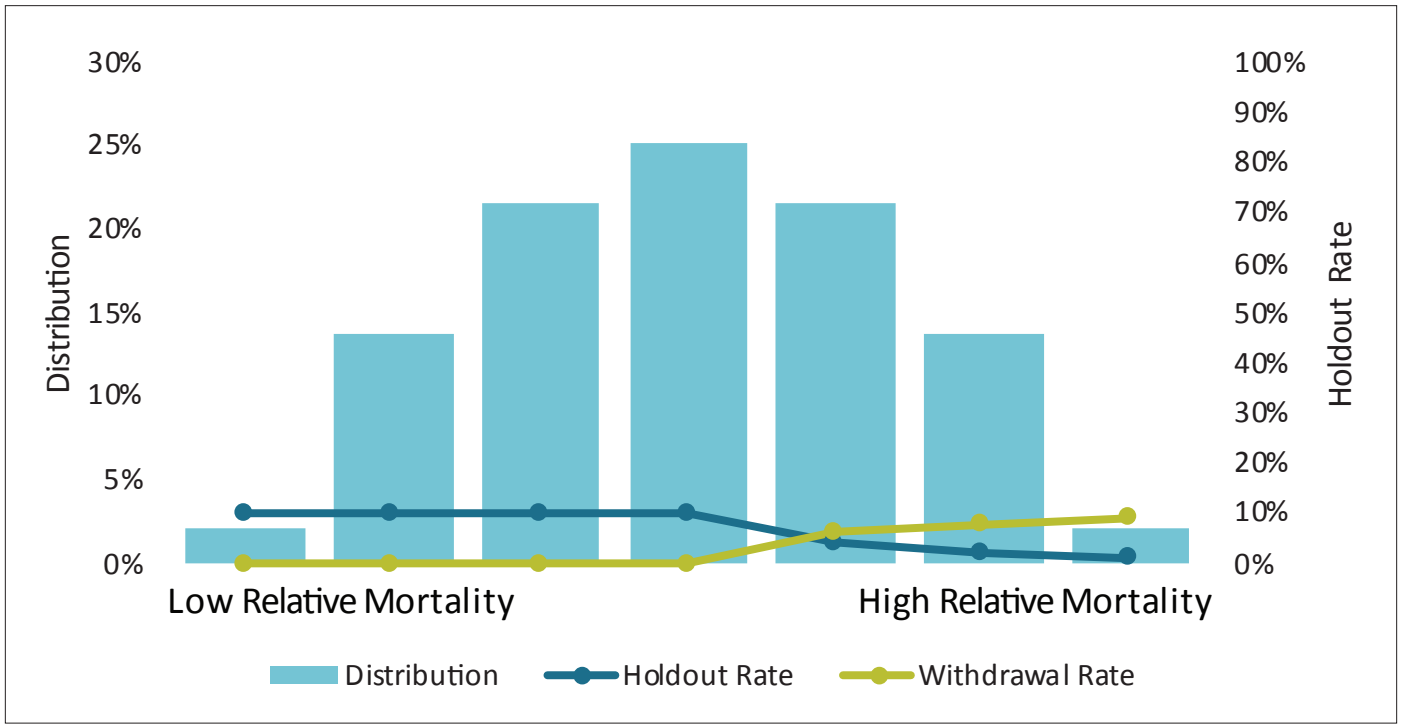


Figure 3
Distribution of Random Holdouts With Withdrawals



application and try applying elsewhere. If the latter is the case, Figure 2 becomes skewed, as shown in Figure 3.

The higher the withdrawal rate of the holdout applications, the more skewed the results could be. This would reduce the accuracy of the information being used in the actuarial control cycle to reset underwriting rules or updated pricing assumptions.

Targeted Holdouts

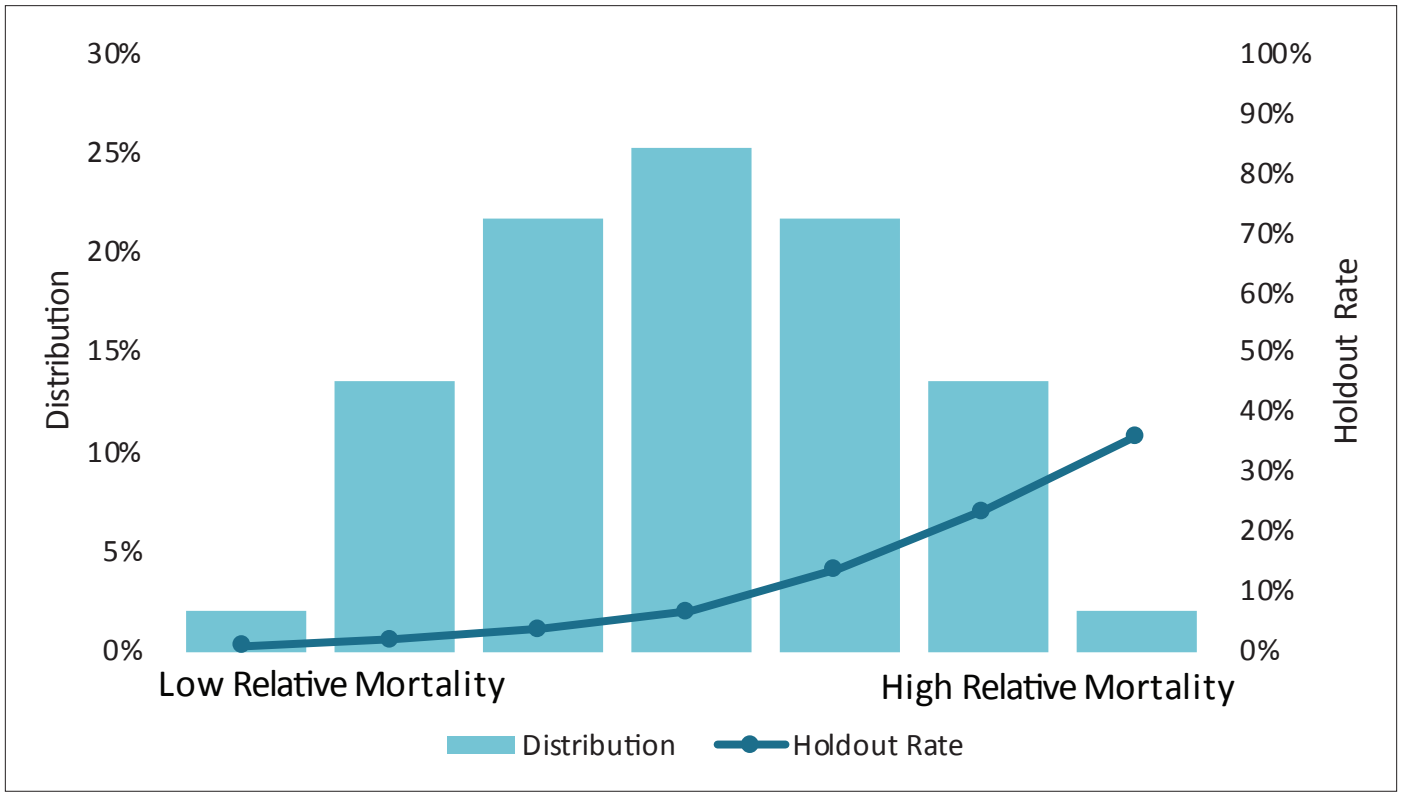
Some companies perform targeted holdouts. Like random holdouts, targeted holdouts select a subset of otherwise accelerated-underwriting-eligible applications and send them to traditional underwriting. However, the selection of these applications is not random. Instead, some type of predictive analysis is performed to target applications that are more likely to be misrepresenting their health status. One form of predictive analysis that is being used to choose the targeted holdout set is a smoker propensity model intended to catch smokers who are misrepresenting their smoker status. Similar propensity models can be built for build misrepresentation, agent behavior or other risk factors. One advantage of targeted holdouts over random holdouts is that, since the selection of holdouts is skewed toward the worst risks, withdrawals are more likely to provide protective value to the program, whereas, with random holdouts, those withdrawals may very well be missed sales that were good underwriting risks (Figure 4).

Post-issue Analysis

Another alternative is to perform post-issue analysis. *Post-issue analysis* is where a subset of policies issued under accelerated underwriting are selected to go through additional review. Various tools are used in post-issue analysis. Most often, an attending physician's statement (APS) is requested, and an underwriter will use the APS to evaluate the risk from a traditional underwriting viewpoint. The assessment of the underwriter can then be compared to the assessment of the accelerated underwriting program. This can inform both the pricing assumptions and the underwriting rules as part of the actuarial control cycle. Action can be taken in cases of material misrepresentation or fraud.

An additional benefit of post-issue analysis is that the policies are already in force, so the withdrawal rate will be zero. One drawback is that for the target demographic of most accelerated underwriting programs, APS hit rates might be low. Younger applicants may not regularly visit the doctor or even have one. Another drawback is that information on an APS is not exactly the same as the information a traditional underwriting

Figure 4
Distribution of Targeted Holdouts



assessment would have from paramedical exams and fluid tests, which creates some basis risk between APS and fluid testing.

MISCLASSIFICATION ANALYSIS

With any of the tools just described, a misclassification matrix could be created. This misclassification matrix can then be used to approximate the shift in risk class distribution (prevalence) and relative mortality (relative risk) under the proposed accelerated underwriting rules, thus approximating the impact on profitability of the new program.[1] There is no unique solution for what the implied loads should be when using a misclassification matrix method. We will illustrate one method here.

Let's assume the following misclassification matrix between full underwriting and accelerated underwriting is observed for a specific program (Figure 5). We will assume a very small sample size for the ease of illustration. The conclusions can be generalized to larger sample sizes. We will also assume that the accelerated underwriting program issues policies only to lives that are assessed standard or better through accelerated underwriting rules; otherwise they are referred to an underwriter and drop out of our analysis.

Figure 5
Misclassification Matrix

		Accelerated Underwriting Class			
		Preferred	Standard	Smoker	Refer to UW
Full UW Class	Preferred	40	0*	0	0
	Standard	6	26	0	0
	Smoker	1	1	6	0
	Substandard	1	1	1	0
	Decline	1	1	1	1

* Misclassification can occur in the cells above the main diagonal, but we will assume the applicant has perfect information and thus would not accept an offer in the accelerated underwriting program that is less than optimal.

We will also assume that the relative risk based on the fully underwritten experience is as presented in Figure 6. Relative risk here can be thought of as the factor needed to be multiplied to a standard mortality table to get to the mortality level of the respective risk class.

Figure 6
Relative Mortality and Prevalence
(Traditional Underwriting Class)

	Relative Mortality	Prevalence
Preferred	80%	47%
Standard	125%	37%
Smoker	200%	9%
Substandard	250%	3%
Decline	500%	3%

Figure 7
Distribution Within Each Accelerated Underwriting Preferred Class

		Accelerated Underwriting Class		
		Preferred	Standard	Smoker
Full UW Class	Preferred	82.0%	0.0%	0.0%
	Standard	12.0%	90.0%	0.0%
	Smoker	2.0%	3.3%	75.0%
	Substandard	2.0%	3.3%	12.5%
	Decline	2.0%	3.3%	12.5%

Next we calculate the distribution within each accelerated underwriting preferred class that corresponds to each fully underwritten class (Figure 7).

Now, if we calculate the sum-product between this normalized matrix and the vector of relative risk in the fully underwritten program, we will get a vector of implied relative mortality in the accelerated underwriting program. The results are shown in Figure 8.

The few cases that exhibit extreme mortality deviations, such as a case that would have been declined under traditional underwriting but was classified as preferred under accelerated underwriting, would imply a material load to the mortality. For example, if the 2 percent declines had not been misclassified into the preferred class, the implied relative mortality of that class would have been 91 percent rather than 100 percent.

Figure 8
Implied Relative Mortality and Prevalence
(Accelerated Underwriting Class)

Risk Class	Implied Relative Mortality	Prevalence*
Preferred	100%	57%
Standard	144%	34%
Smoker	244%	9%

* Prevalence should be measured on expected claims so that total actual-to-expected ratio is preserved. Here we are using case count since that is the way misclassification matrices are usually presented.

Thus, it would be beneficial to investigate those cases to identify any common areas of misrepresentation and then take steps to improve the insurance application or the underwriting process to mitigate those risks in the future.

CONCLUSIONS

Although mortality experience is not generally available for accelerated underwriting programs, monitoring leading indicators can provide valuable insights into emerging experience. The different types of holdouts or post-issue analysis can provide valuable monitoring and allow for the establishment of a control cycle to measure implied mortality deviations. This information can be used to gain comfort with assumptions or can be used to inform pricing and underwriting updates before the development of actual experience. ■

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ENDNOTE

1 Blind retrospective studies do not account for change in population or the effect of adverse selection due to the loss of the sentinel effect. Additional adjustments would need to be included. Random holdout studies or post-issue studies on accelerated underwriting programs would include these effects to varying degrees.