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# Company Profitability and Risk Dashboards—A Tool in the Understanding and Management of Risk, Part 1

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With principle-based reserves (PBR) becoming effective on Jan. 1, 2017, the decisions regarding what to do about implementing PBR at the company level have become more immediate and important. Companies have a range of options, from the “small company exemption” to a “wait-and-see” approach (the “phase-in”) to the possible use of simplified methods for PBR to electing full PBR with its “less risk, less work” provisions, including stochastic and deterministic exclusion tests.

Regardless of the approach a company may take, it is important to remember that *PBR was intended to embed risk analysis more fully into both reserve and capital calculations.*

Risk analysis is performed to drive decision-making regarding the design and pricing/repricing of products, assessing investment and risk mitigation strategies, developing compensation strategies for agents and employees, and field force management. To communicate effectively with decision-makers, results of detailed analysis must be distilled in a way that communicates results to both actuaries and non-actuaries. Methods like using dollar amounts, indexes and visual representations to summarize the detail work well. Also, with the new data visualization tools available in the marketplace today, companies are finding the management dashboard to be extremely useful.

A dashboard is a tool that provides key business performance data to management on a frequent and regular basis.

This tool is also helpful to companies to support PBR implementation efforts and enable effective communication about profitability and risk with the company board of directors, rating agencies and regulators. Even a small company with limited resources can implement this type of tool, provided pricing and cash-flow projection models and experience studies are available to produce the information on a regular basis.

Developing a dashboard is a unique process to each company—giving consideration to its particular products, target markets, distribution channels and the associated risk profiles.

In this article, we discuss a case study that develops a management dashboard for a hypothetical life insurance company that includes the following key business indicators:

- Actual-to-expected (A/E) ratios for experience assumptions associated with key product risks
- Agent/agency/channel quality of business scores
- Customer value scores and clustering techniques for in-force and new policyholders
- Production levels and product mix versus plan
- Current value of new business written
- Current level of surplus strain
- Additional indicators or statistics specific to a particular product or risk (e.g., agent debit balances for final expense carriers)

## DEVELOPING ACTUAL-TO-EXPECTED RATIOS FOR EXPERIENCE ASSUMPTIONS RELATED TO KEY PRODUCT RISKS

### Identifying Key Product Risks in In-Force Blocks

As a first step, companies will need to identify the primary risks inherent in their current product portfolios.

With today’s more complex products, risk profiles can vary considerably from product to product, based on product design. Despite significant differences in risk, options provided to policyholders are often modeled without any degree of calibration to actual experience. Some optional benefits may be significantly lapse-supported because there is no requirement for an incremental cash surrender value related to the benefit.

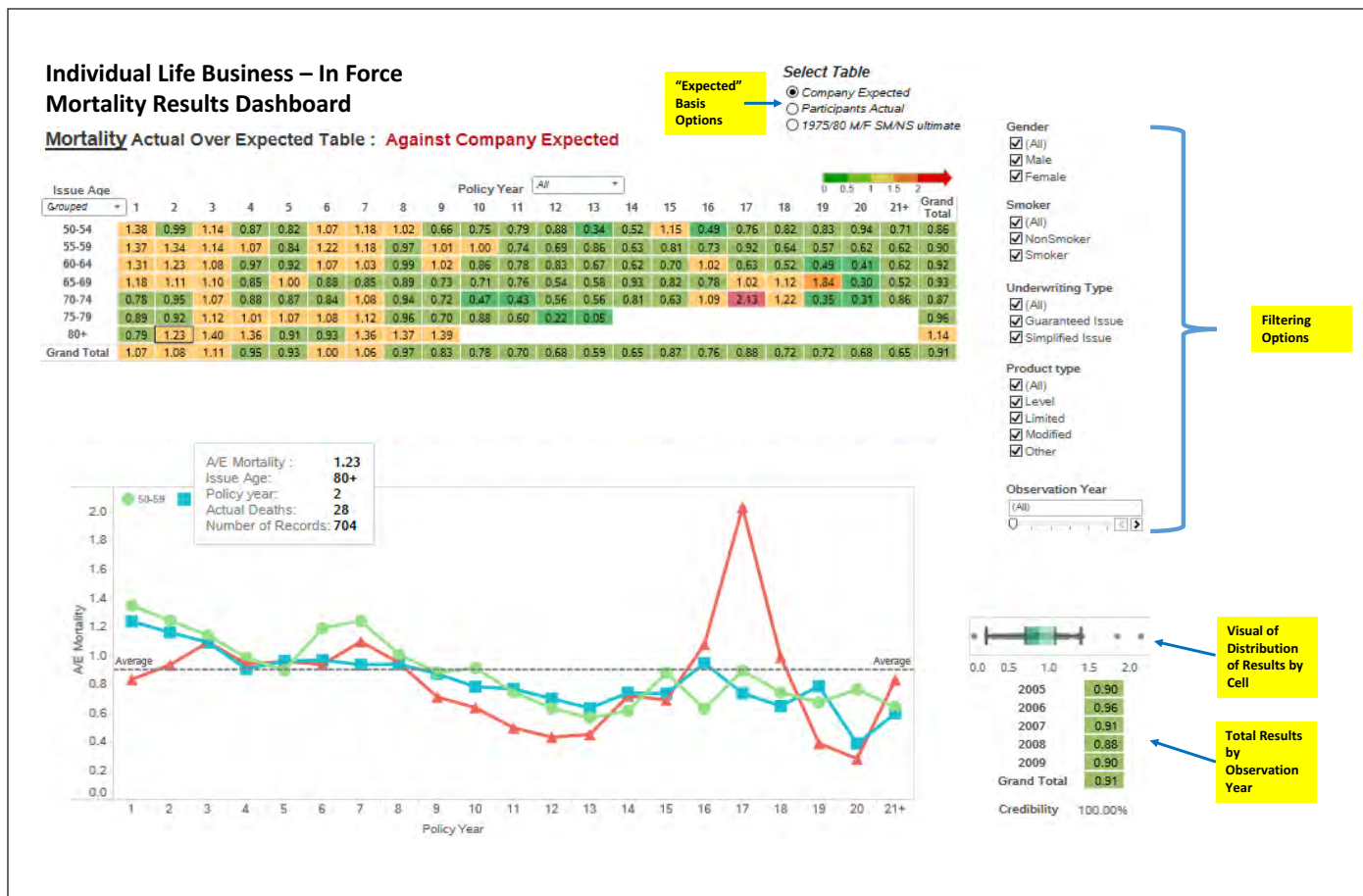
Targeted sensitivity testing utilizing existing pricing models and asset adequacy analysis models can help identify the key risks. In this analysis step, the company may want to select and document a set of objective criteria for identifying key product risks through sensitivity-testing results.

### Aligning Experience Studies With Key Product Risks

After the key risks for a product or product group are identified, it is important that the company align its experience studies with key assumptions related to these risks in order to determine the A/E ratios to be included in the dashboard monitoring.

Figures 1a and 1b demonstrate examples of a life insurance focused product risk monitoring dashboard. These dashboard views track mortality and lapse results for the in-force block. The user can look at subsets of the data via the filters available on the right-hand side of the dashboard. These were identified as part of the key product risk identification process.

Figure 1a  
Dashboard for In-Force Mortality Monitoring



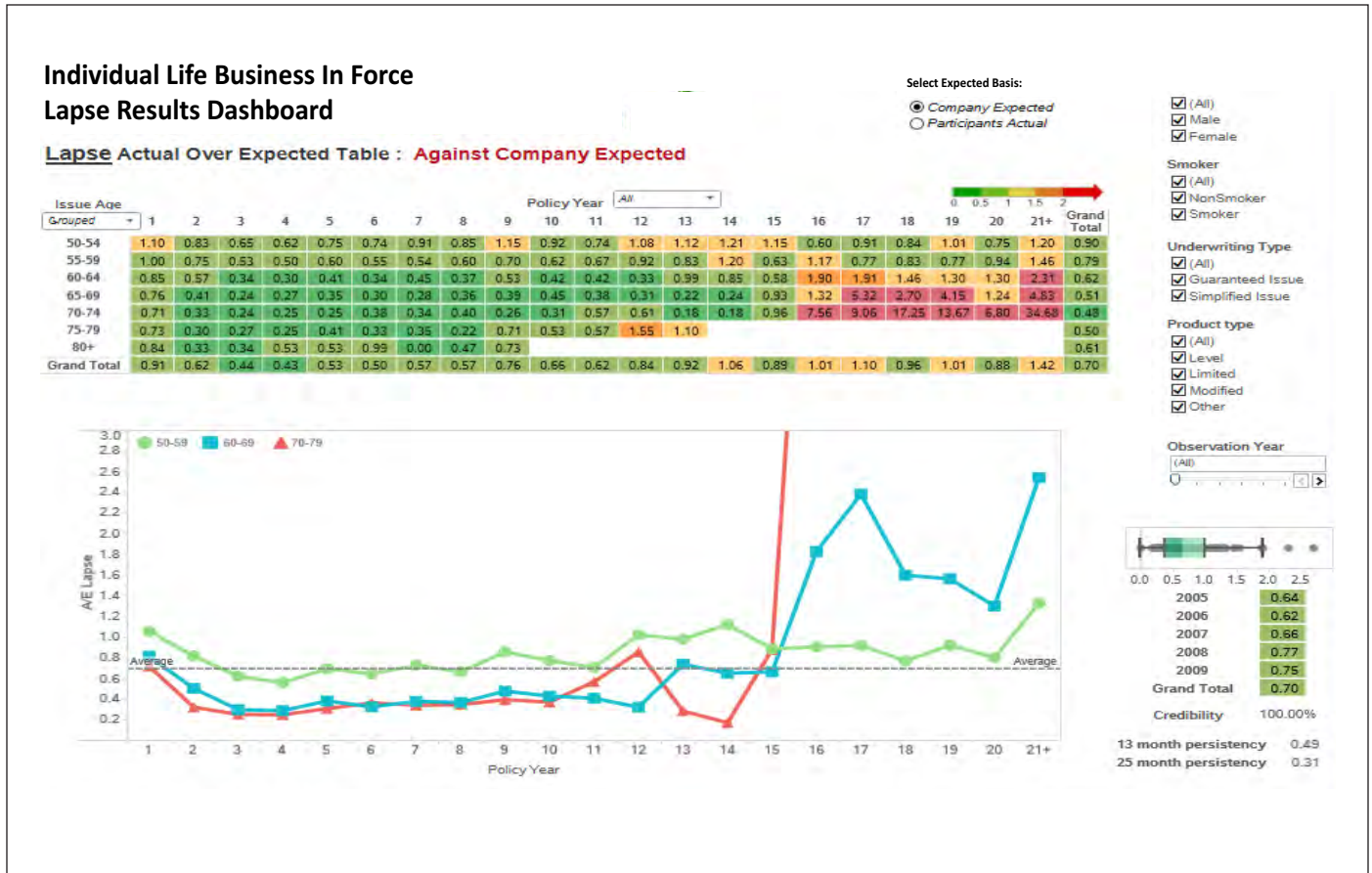
The two dashboard views are consistently designed. For Figure 1a, results are presented as ratios of A/E results with three options for the “expected” basis—a company expected mortality table, the total of all participants in a particular industry study, and for the mortality dashboard only, an industry expected table. (Note that this sample dashboard was designed as part of a tool provided to companies participating in a consortium study of industry experience, which allows for aggregation of all companies results.)

Note that information is presented in several different formats—graphs, tables and figures. The large graph in the lower area shows higher-level, more visual and more summarized results, while the table above it provides more detailed information underlying the particular view. The table also employs a “heat mapping” approach, allowing the user to see overall areas where results are favorable or unfavorable. In this example, the colors range from green (favorable) to red (unfavorable). The design of the tool should consider all the information needs of potential users. Needs range from a high-level view of the re-

sults and trends to drilling down for more exploration of the underlying data.

Although smaller companies may have less credible data regarding their own business, establishing this targeted monitoring process allows companies to begin to understand high-level differences in their own experience compared to industry-average experience as more credible data emerges over time. A problem with relying solely on industry studies for assumption setting is that these studies do not fully represent the distribution of individual company experience around the average. In fact, even larger companies have occasionally misinterpreted and misapplied industry study results. To some extent, every company is unique in factors like its markets, products, distribution channels, underwriting practices and conservation practices. Using the emerging information on individual company A/E ratios in sensitivity testing can provide an insightful view of the cost of setting assumptions that may vary from company experience, regardless of the statistical credibility of that experience.

Figure 1b  
Dashboard for In-Force Lapse/Surrender Monitoring



**Other Sources of Risk to Profitability of Business**

Figure 1c provides A/E ratios for maintenance expenses and net investment earnings. These values complete a set of A/E ratios that began with mortality and lapses in Figures 1a and 1b. These ratios serve as additional measures for management to understand where the company is doing well with respect to sources of profit.

To develop an A/E ratio for maintenance expenses, a company would perform a high-level expense analysis for the current period (e.g., year-to-date), including identifying actual acquisition expenses, maintenance expenses and investment expenses, and deciding how to handle non-recurring (one-time) expenses. This expense analysis can be performed using either a fully allocated approach or a marginal expense approach, but it is important that all expenses are accounted for.

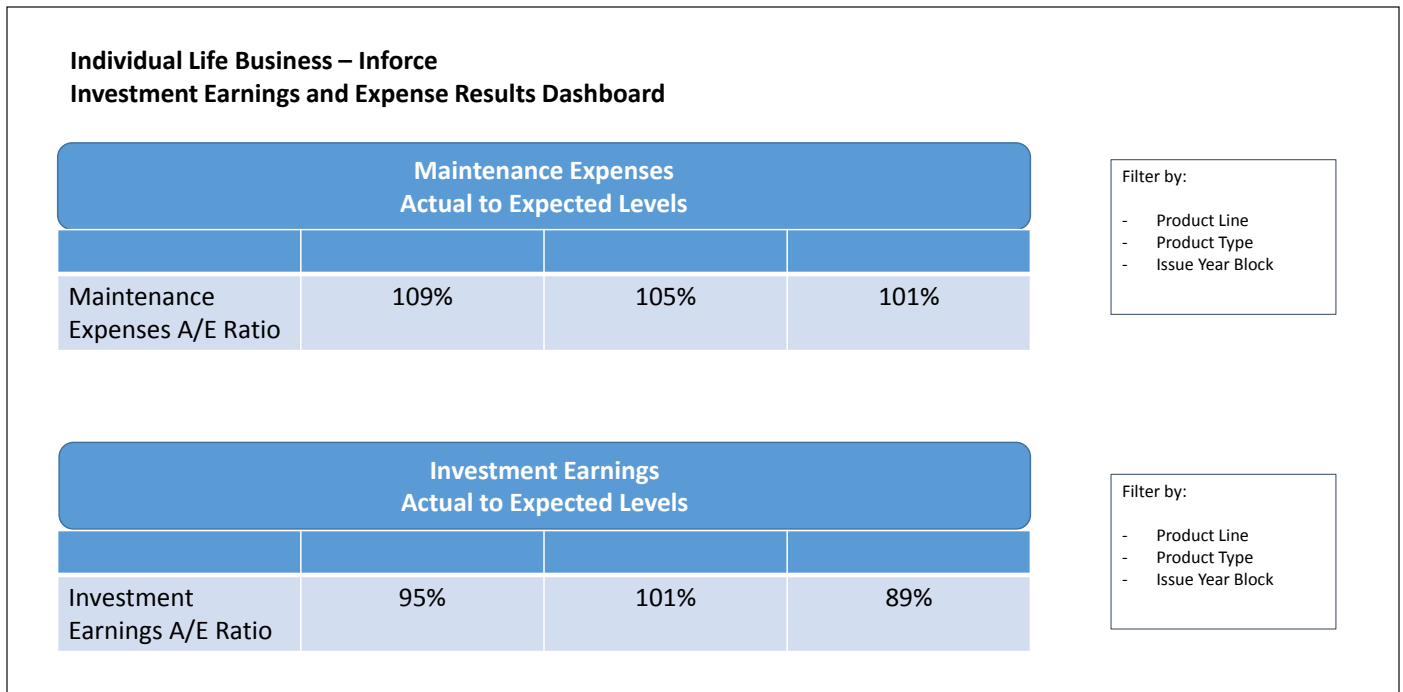
Expected maintenance expenses can be developed by multiplying the maintenance unit expense assumptions (e.g., dollars per policy for the portion of the year-to-date) by the actual units (e.g., number of policies) plus expected fixed expenses not as-

signed to a base. The A/E ratio is the total actual maintenance expense, derived from the expense analysis year-to-date, divided by the expected maintenance expenses, appropriately pro-rated.

For investment earnings, the issue of allocating investment earnings between target capital and free surplus may be significant. Some companies use a multiple of statutory risk-based capital as an estimate of target capital. However target capital is calculated, free surplus would be the difference between statutory total adjusted capital and target capital. The important point is that including the earnings on free surplus can mask the true profitability of the blocks of business being reported to management by making them appear worth more than they actually are. In a real sense, free surplus could be treated as a separate line of business from the insurance business. So, in calculating actual investment earnings, the earnings attributable to free surplus should be excluded.

Expected investment earnings year-to-date may be calculated in a manner consistent with the development of the company business plan.

Figure 1c  
Investment Earnings and Expense Results



The A/E ratio is the total actual investment earnings year-to-date divided by the expected investment earnings year-to-date. An A/E ratio for earnings on free surplus may also be calculated by dividing the actual allocated investment earnings on free surplus by the corresponding value in the company business plan.

### DEVELOPING AGENT/AGENCY/CHANNEL BUSINESS QUALITY MEASURES

For many companies, a key risk to be managed is related to the quality of new business written. For these companies, much effort and surplus may be required to produce the business initially. This includes the costs associated with evaluation of mortality and/or morbidity in connection with each application received due to the risk of anti-selection and to establish appropriate prices for the risks accepted by the company. For companies that advance first-year commissions, recovery of agent debit balances can also be a significant issue.

At Mark's former company, the question of the quality of new business was addressed by performing traditional mortality and lapse experience studies at different levels, including by product and key product risk as well as by writing agent. These results stimulated the repricing of certain products and a more informed view of agent performance. New business quality became one of the criteria for company awards. While there is an issue related to the credibility of data at such a granular level,

they found that (with exceptions), the quality of business written by an agent was fairly consistent.

Taking that process a step further, the company used its most-current pricing models to run each agent's business for the current period (e.g., quarterly, year-to-date), adjusting the mortality and lapse assumptions by the A/E ratios for that agent. This produced a measure of the present value of profits by agent for the current period. It turned out that 15 to 20 percent of the agents were responsible for about 75 percent of the present value of profits, while a smaller group of agents wrote business that produced a present value loss. The company was then able to focus on nurturing relationships with this top tier of agents and consider its best options with respect to the remaining agents, particularly those whose production reduced company value.

Figure 2 demonstrates the inclusion of a "drill-down" capability in a dashboard designed to track a score of agent/agency/distribution channel quality for a particular company. The agent quality score would be developed by identifying key predictors of agent performance using company historical data, as well as other data obtained or developed by the company regarding each existing agent. For example, companies can obtain demographic data from data vendors and develop internal models of expected losses in debit balances by agent. Using the identified key predictors, scoring models could be developed to monitor existing agents (and evaluate potential new agents).

Figure 2  
Distribution Quality Score Dashboard



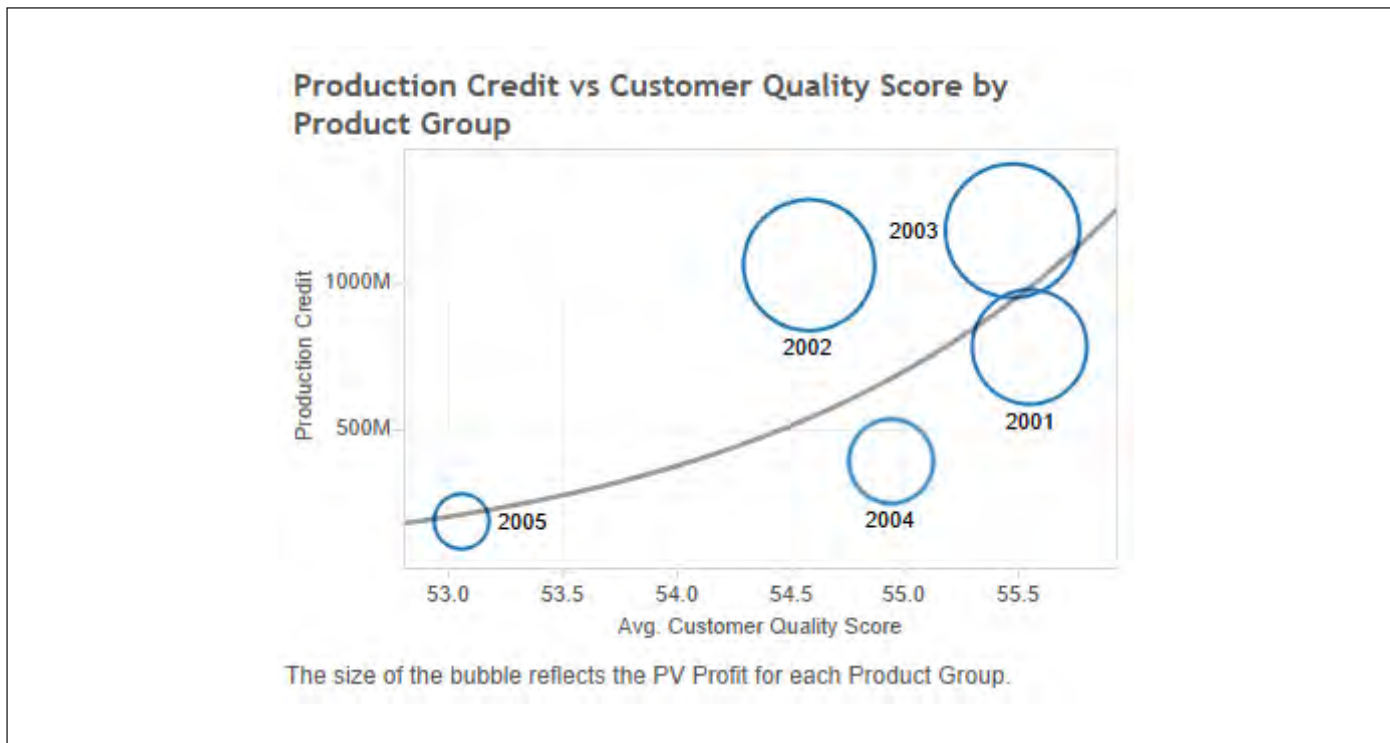
This dashboard format allows the user to explore agent quality measures at different levels of aggregation, from the agent level up to the distribution channel level. Agent quality scores and A/E ratios for mortality and lapse can be sorted by column to focus on agents or agent groups with higher or lower values for these three measures. In this example, a low agent quality score corresponds to favorable (low) A/E mortality and lapse ratios.

**CUSTOMER VALUE SCORES AND CLUSTER ANALYSIS**

Consistent with the agent quality score, the process of developing a customer value score includes identifying the key predictors for key product risks, such as mortality and lapse, using company historical data. This includes policyholder data contained in company records, policy information and agent information, as well as data obtained by the company from sources such as MIB,

*Continued on page 12*

Figure 3  
Customer Value Score Dashboard



motor vehicle records and data vendors. This process can also be aided by statistical techniques, including predictive modeling and factor analysis.

In working through this process for life insurance customers, it is important to recognize the interaction between mortality and lapse. When customers lapse a life insurance policy, they are likely to be relatively healthy, or they would keep paying the premiums. This anti-selection in lapse behavior means that higher lapses are correlated with higher mortality for life insurance and vice versa.

Using the identified key predictors, a scoring model would be developed that could be used to score existing policyholders and provide management information on the distribution of scores across the business. By collecting appropriate information at the time of application, the scoring model could also be used to evaluate new applications for insurance.

Using cluster analysis, the data related to lapse propensity can also be used to identify customer clusters. Customer clusters are for both evaluating potential customers in lead lists as well as becoming a potential key predictor for agent quality scoring. Whether customer clusters are more or less likely to lapse can be identified and tracked using a dashboard monitor.

The scatter diagram in Figure 3 is an example of a dashboard that examines the relationships between customer value score and production level, premium credits and first-year commissions for the five product groups in the sample data. This view is filtered on production credit. Note the upward-sloping trend exponential curve and larger circles indicating that higher production levels are correlated with higher-quality customers in the sample data.

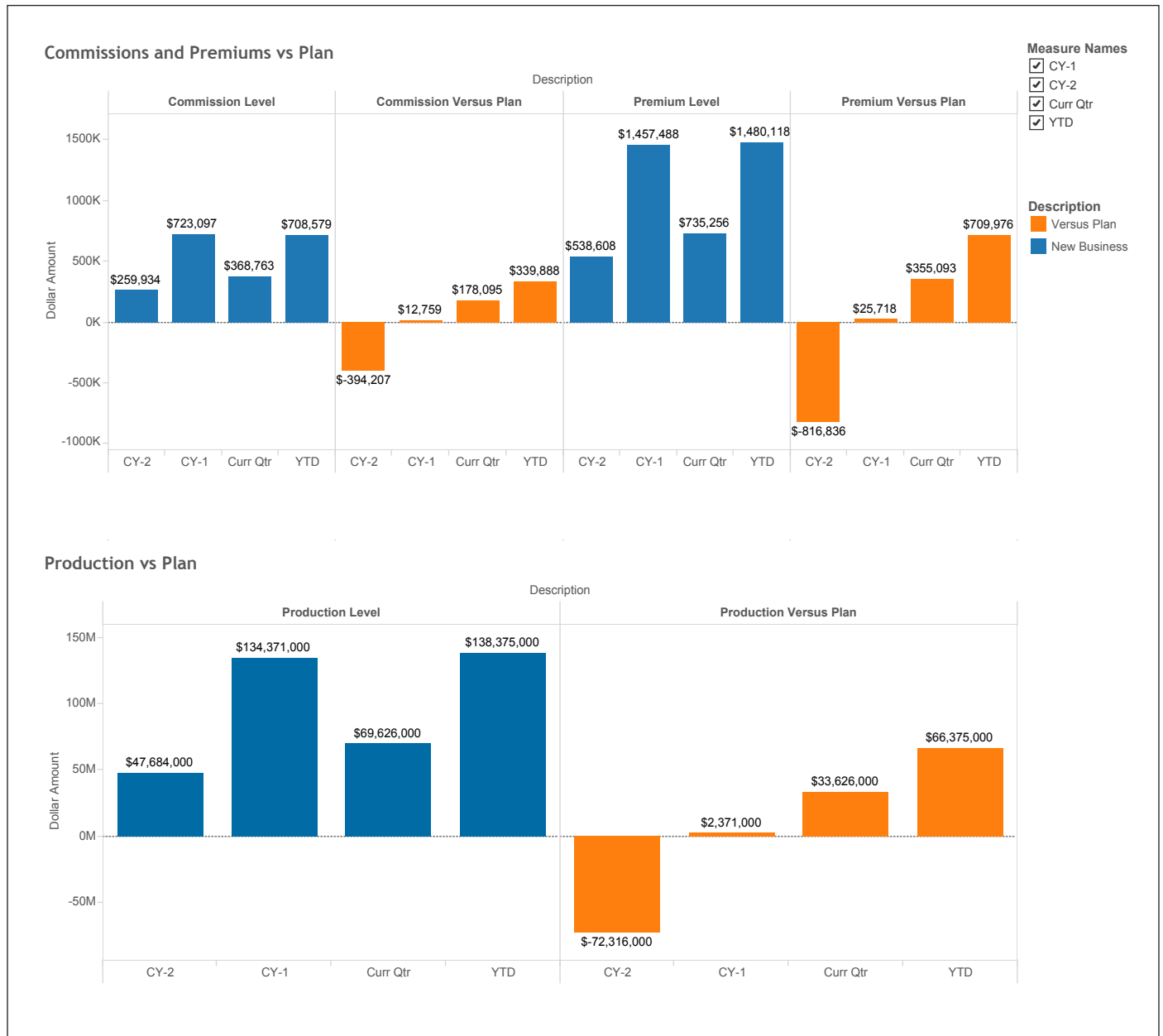
#### PRODUCTION LEVELS AND PRODUCT MIX VERSUS PLAN

Figure 4 provides comparisons of production levels to the company business plan, including an estimate of the impact of actual product mix to anticipated product mix. Quantifying variations in product mix can inform decisions regarding product pricing and compensation strategies.

#### CURRENT VALUE OF NEW BUSINESS WRITTEN AND SURPLUS STRAIN

Consider next the sample dashboard displayed in Figure 5, which portrays the value of profits and surplus strain for the current period. Note that the filter capability enables the user to explore the graphical information according to several listed criteria, including region, agency and/or agent identification number, product group and customer cluster. The graph in

Figure 4  
Sales Tracking Dashboard



Value of New Business and Product Mix Index

Description	CY-2	CY-1	Current Quarter	Year-to-Date
VNBW per \$1,000 Production*100	\$1,919	\$1,847	\$1,924	\$1,942
Plan VNBW per \$1,000 Production*100	\$1,667	\$1,667	\$1,667	\$1,667
Product Mix Value = (1 - 2)/100 * Production/\$1,000	\$120,122	\$242,580	\$178,847	\$381,005



Figure 5  
Value of New Business and Surplus Strain



the lower left-hand corner displays an analytical variable times strain, which is the negative ratio of the present value of profits divided by the surplus strain, and which can be interpreted as a measure of the return on the investment of surplus. The graph in the lower right-hand corner compares the surplus strain and present value of profits with the company business plan for year-to-date and the two prior years. These graphs tell a story about the value being added to the company through new business; the surplus investment required to produce that new business; where the value is coming from by producer group, product group and customer type; the efficiency of the use of the surplus investment; and how well the new business level fits with company plans.

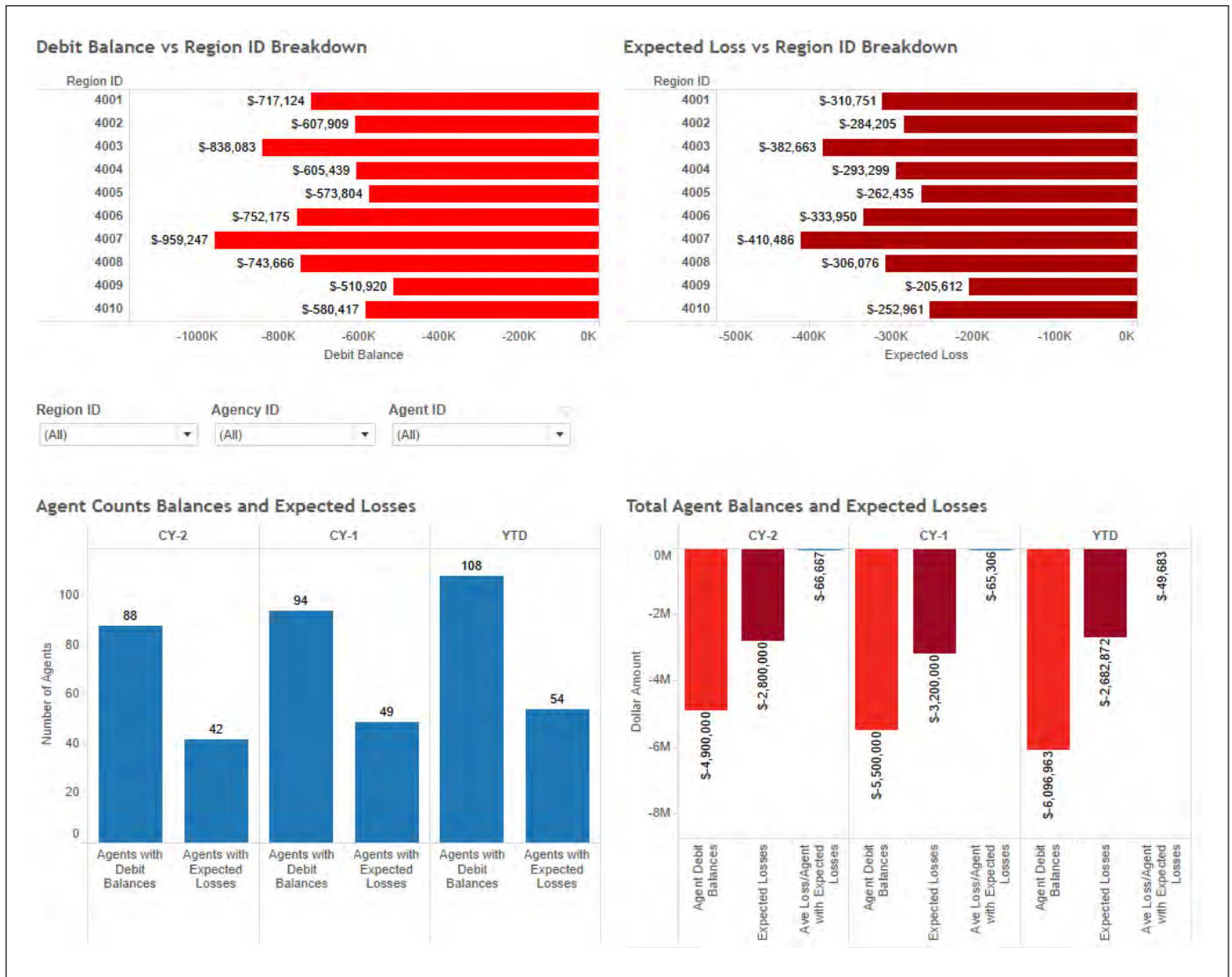
EXAMPLE OF ADDITIONAL INDICATORS FOR INCLUSION IN A DASHBOARD: AGENT DEBIT BALANCES

Each company will have unique statistics and information that will be important to track on a regular basis for managing the business and its associated risks. These data can also be incorporated into the dashboard tools developed.

For example, Figure 6 provides information regarding debit balances and expected losses by region, agency and agent. The calculation of expected losses from debit balances would likely be impacted by agent quality scores or vice versa.

In summary, dashboards can be designed to help companies manage the quality of new business and to understand, mea-

Figure 6  
Agent Debit Balances and Expected Losses



sure and manage risks in the context of pricing, reserving and managing capital. Use of the dashboard will help drive objective decision-making through providing a regular management focus on the key drivers of company value. Both actuarial and non-actuarial management will have a greater understanding of the company risk profile and trends in experience that, together with other management reporting, will enable them to make sound decisions to effectively manage company risks and communicate with their boards of directors, rating agencies and regulators. In Part 2 of this article, we will add data to the sample company profitability and risk dashboard with respect to quantifying and ranking risk margins and measuring target capital and company value. ■



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