Medicaid Managed Care Underwriting Margin Model

JUNE | 2022

Health Care Cost Trends

Diversity, Equity and Inclusion
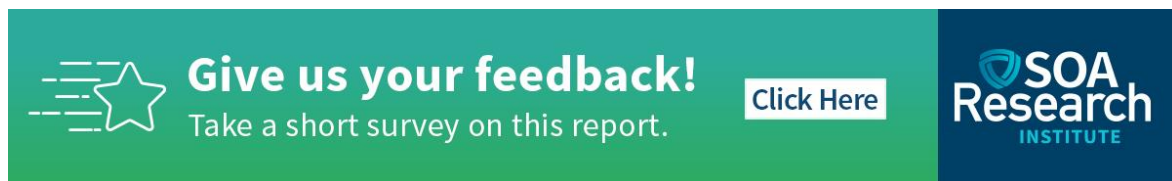
Medicaid Managed Care Underwriting Margin Model

Authors   Mardo Atoyan, MBA
Principal
HealthCare Analytics

Tom Donlon, FSA, MAAA, FCA
Managing Director
Legacy 3 Consulting

Grant Porter, PhD
Senior Consultant
Faulkner Consulting Group

Sponsors   Society of Actuaries
SOA Research Institute

Give us your feedback! Take a short survey on this report. Click Here

SOA Research INSTITUTE

Table of Contents

Disclosures and Limitations

The opinions expressed and conclusions reached by the authors are their own and do not represent any official position or opinion of the Society of Actuaries or its members. The Society of Actuaries makes no representation or warranty to the accuracy of the information.

This report and the accompanying Excel model are intended to be used in their entirety by qualified actuaries setting rates or evaluating rates for Medicaid Managed Care programs to develop the underwriting margin component of the capitation rates. It should not be relied on for any other purpose. The methodologies and assumptions discussed in this paper as well as the calculations in the Excel model are not intended to account for all possible scenarios. Users should use actuarial judgment to determine if model results are appropriate for the specific circumstances of the program being evaluated. Actual underwriting margin results will vary from the model estimates.

The model relies upon historical Medicaid managed care organization statutory financial filings with the National Association of Insurance Commissioners (NAIC). The authors reviewed the data for reasonableness but did not perform an audit of the data.

Executive Summary

Since the publication by the Center for Medicare and Medicaid Services (CMS) of the 2016 Final Rule that memorialized the ASOP 49 standard for the inclusion of a margin, most rate certifications for Medicaid managed care (MMC) have included an explicit provision for margin, whether described as a risk margin, profit margin, underwriting gain or underwriting margin. Across the 256 data books reviewed for the period between 2016 and 2020, 85% included an explicit provision for a margin that ranged from 0.35% to 3.15%, excluding programs with rate PMPMs less than $100 (i.e., for limited benefits, such as family planning only, dental only). Actual financial performance over the past few years by Medicaid plans has varied more widely, both within and across states; but, overall, the average underwriting ratio before taxes has ranged from −0.25% in 2019 to 2.19% in 2015.

The research presented in this report and reflected in the accompanying Excel workbooks defines an empirically supported, methodologically sound and actuarially grounded model, the Underwriting Margin Model, for transparently developing an underwriting margin within the context of MMC rate certification. The authors define the underwriting margin to include financing related to the following:

1. The cost of capital or the opportunity cost associated, primarily, with risk-based capital requirements and
2. A margin for risk and/or a contingency against general losses or a net income target.

Given existing regulations around MMC rate setting, this report maintains that the inclusion of an adequate and transparent underwriting margin is necessary for maintaining a competitive and fair MMC market.

This research project offers guidance and a model for actuaries to use when performing their professional services related to Medicaid (Title XIX) and the Children's Health Insurance Program (CHIP or Title XXI) managed care capitation rate setting, including, but not limited to, their certification on behalf of a state in accordance with the requirements for actuarial soundness as set forth in law,[1] federal regulation[2] and CMS guidance,[3] as well as the actuary's professional obligations under the Actuarial Standard of Practice (ASOP) 49 issued by the Actuarial Standards Board.[4] The authors intend for this model to be used in the development of comprehensive medical rates for MMC. Additional considerations may be necessary in its application to limited benefit plans, such as dental-only products, or for Medicare/Medicaid product lines, such as dual eligible special needs plans.

The model follows on the 2017 study by Teppema, Goldman, Smith and Tutewohl, sponsored by the Society of Actuaries (SOA),[5] and the 2019 model developed by Gibson, Piekut and Simons and published by the Medicaid Health Plans of America (MHPA).[6]

---

[1] 42 USC § 1396b(m)(2)(A)(iii).

[2] 42 CFR § 438.4.

[3] Centers for Medicaid & Medicare Services. June 2021. 2021–2022 Medicaid Managed Care Rate Development Guide. Retrieved June 28, 2021, from https://www.medicaid.gov/Medicaid/downloads/2021-2022-medicaid-rate-guide.pdf.

[4] Actuarial Standards Board. 2015. Actuarial Standard of Practice No. 49: Medicaid Managed Care Capitation Rate Development and Certification. Retrieved June 13, 2021, from http://www.actuarialstandardsboard.org/asops/medicaid-managed-care-capitation-rate-development-and-certification/.

[5] S. Teppema, J. Goldman, L. Smith and S. Tutewohl. 2017. Medicaid Managed Care Organizations: Considerations for Calculating Margin in Rate Setting. Society of Actuaries. Retrieved March 12, 2022, from https://www.soa.org/globalassets/assets/files/research/medicaid-managed-report.pdf.

[6] S. H. Gibson, J. R. Piekut and J. Simons. 2019. Underwriting Gain Development for Managed Medicaid Capitation Rates. Medicaid Health Plans of America. Retrieved March 12, 2022, from https://medicaidplans.org/wp-content/uploads/2020/07/MHPA-Underwriting-Gain-

The paper proceeds over four sections. The first section offers background on MMC and rate setting in the context of Medicaid. It also introduces the authors' definition of underwriting margin in greater detail and a justification for its explicit consideration in the context of MMC. The following section reviews the prior underwriting margin studies and how the present study extends and differs from them. With this historical context, the authors then offer an overview of the model and its parameters. This is followed with a detailed review of its results and various sensitivity analyses that arise from changing certain parameters. The last section includes technical instructions for the model that are separately contained within the accompanying Excel workbook. The latest version of the Excel workbook is available for download from the Society of Actuaries at http://www.soa.org/. Any technical changes to the model or updates to the referenced data made after the publication of this report will be highlighted in the "changelog" tab. The appendix to this report includes all the base data referenced in this report and used in the model.

Before presenting the model and its specific variables below, it is worth noting that current events may impact some of the critical assumptions and variables underlying its construction.

Some readers may contend that the market retrenchment over the first quarter of Calendar Year (CY) 2022 offers a critique of the relevancy of the use of backward-looking benchmarks and the use of a formula that is dependent upon the historical performance of the S&P 500 as a proxy for the equity premium. They may also note how the implications of COVID-19 on utilization, the role of the public health emergency on MMC enrollment, or the impact that inflation may have on both benefit costs and administrative costs, including wages and rent, could challenge MMC's historical performance.

To these concerns, the model's authors are cautiously optimistic that their model is sufficiently robust to allow the user to make necessary adjustments and substitute user-defined assumptions for specified parameters. However, such changes should be made cautiously. For example, although the model offers users flexibility in selecting their own equity premiums, the current decline in market returns may be either temporary and/or correlated with a rise in Treasury yields (i.e., the risk-free rate) that would moderate the impact of the decline in the market return on the overall cost of capital. Although a specific rate certification is likely to be for a 12-month period, most MMC contracts span multiple years, and so the long-term historical returns may remain relevant for the purpose of rate stability. The same rationale for stability may apply to risk margin or overall net income targets.

The reader and user of the accompanying Underwriting Margin Model should note that all assumptions used in developing an underwriting margin should be reviewed individually, in their totality and in the context of their application. This model is open by design because it is intended to be used as a tool to derive an underwriting margin. The authors' intent is not to dictate a policy position. To that end, unreasonable assumptions will yield unreasonable and questionable results, and the user should be aware of the limitation imposed by the flexibility of this model.

Development-Report_June-2019_FINAL.pdf. See also S. H. Gibson, J. R. Piekut and J. Simons. 2019, October 31. Underwriting Gain in Managed Medicaid: Starting the Conversation. *Health Watch* (Society of Actuaries).

Introduction

MEDICAID AND MEDICAID MANAGED CARE

The growth of Medicaid managed care (MMC) over the past several decades represents a "remarkable evolution of the provision of US public health insurance."[7] The number of Medicaid beneficiaries enrolled in managed care increased from just 10% of all Medicaid beneficiaries in the mid-1980s through the early 1990s to more than 75% of Medicaid members being currently enrolled in a comprehensive risk-based managed care plan. Managed care is now the dominant delivery system in 38 states, including nine of 10 states with the largest total Medicaid enrollment. Overall, some 56 million persons were enrolled in comprehensive managed care with total premium revenue exceeding $280 billion in Federal Fiscal Year (FFY) 2019.[8]

Although a few states that previously maintained MMC contracts have reverted to fee-for-service (FFS), and Alaska and Oklahoma have recently halted reforms to expand or implement MMC, the overall trend in managed care enrollment remains positive. Significantly, on July 1, 2021, 1.6 million Medicaid members in North Carolina began to receive their Medicaid benefits through MMC. Until the Oklahoma Supreme Court invalidated the state's procurement process awarding $2.1 billion in annual contracts to four insurers, nearly 800,000 Oklahomans were scheduled to transition to MMC on October 1, 2021. Finally, eight of the 12 states that as of March 2022 had not yet implemented Medicaid expansion to all nonelderly adults up to 138% of the federal poverty level primarily rely upon MMC. Were these states to implement Medicaid expansion, another 3.2 million Americans could gain insurance coverage through MMC at a cost exceeding $25 billion in additional premiums.[9,10] MMC is already an impactful business sector in most states, and its import to both state residents and a state's health care sector is only likely to grow over time.

RATE SETTING IN THE CONTEXT OF PUBLIC INSURANCE

The 38 states that have nearly 80% of their Medicaid beneficiaries covered in managed care have accepted that competition by private managed care organizations (MCOs) can lead to either lower costs for taxpayers, better outcomes for the beneficiaries or ideally both. Whether or not it was a state's primary motivation for implementing managed care, the desire to rein in Medicaid spending growth remains a persuasive part of the political rhetoric that state leaders use to support such financial arrangements over traditional Medicaid FFS. Yet various state and federal regulations and statutes may limit if not outright prohibit MMC plans from implementing some of the very practices by which private health insurers successfully control health care costs, specifically, the ability to manage networks and negotiate lower

---

[7] J. Gruber. 2017, November. Delivering Public Health Insurance through Private Plan Choice in the United States. *Journal of Economic Perspectives* 31, no. 4:3–22. Retrieved July 12, 2021, from https://dspace.mit.edu/handle/1721.1/114041.

[8] Centers for Medicaid & Medicare Services. Expenditure Reports from MBES/CBES. Retrieved July 1, 2021, from https://www.medicaid.gov/medicaid/financial-management/state-expenditure-reporting-for-medicaid-chip/expenditure-reports-mbescbes/index.html. See also for FFY 2020 not yet released publicly: https://www.healthmanagement.com/blog/medicaid-managed-care-spending-in-2019/.

[9] The 12 states that have not expanded Medicaid as of March 2022 are Alabama, Florida, Georgia, Kansas, Mississippi, North Carolina, South Carolina, South Dakota, Tennessee, Texas, Wisconsin, and Wyoming. Missouri began enrolling residents into Medicaid expansion in October 2021 after the Missouri Supreme Court unanimously ruled that the state legislature must fund the new program.

[10] K. Braham, C. Peters and B. Sommers. 2021, May 28. Estimates of Uninsured Adults Newly Eligible for Medicaid if Remaining Non-Expansion States Expand. Assistant Secretary of Planning and Evaluation. Office of Health Policy. Retrieved March 12, 2022, from https://aspe.hhs.gov/sites/default/files/migrated_legacy_files//200641/aspe-data-point-medicaid-expansion-new-eligible.pdf.
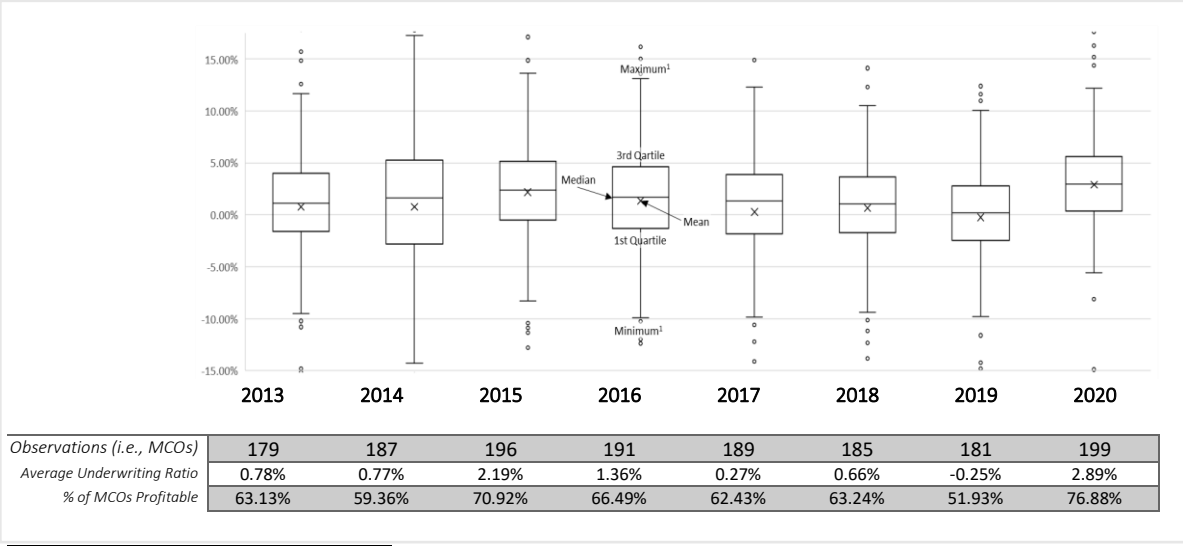
provider reimbursement rates and/or influence their member utilization by adjusting cost-sharing arrangements.[11,12,13,14,15]

As the steward of their public's revenues, the desire by policymakers to control Medicaid spending and/or mitigate the influence of health care inflation on a state's budget is laudable. It is this desire that may account, in part, for the narrow tolerances afford by the rate setting in the context of MMC. Overall, the average net underwriting ratio (net underwriting gain/[loss] divided by total revenue) before income taxes of a Medicaid plan was 0.84% between 2013 and 2020, ranging from 2.19% in 2015 to an average loss of 0.25% in 2019, less than half the expected returns of a large commercial insurer in the U.S.[16]

Figure 1 summarizes data from the National Association of Insurance Commissioners (NAIC) filings reviewed by the research group's actuary. More than one-third of all MMC insurers in the authors' dataset reported annual underwriting losses between 2013 and 2020. In 2019, it was a coin toss as to whether the insurer was likely to break even on what, across the 181 observations, was an average $1.4 billion business venture. The insurers performed significantly better in Calendar Year (CY) 2020, with an average net operating ratio before taxes of 2.9%. However, such financial performance was likely biased by the unprecedented simultaneous influence of COVID-19 and related public health emergency on reducing utilization and increasing in MMC enrollment.[17]

Figure 1.

MEDICAID MANAGED CARE UNDERWRITING RATIO BEFORE INCOME TAXES FROM NAIC FILINGS, BY YEAR

Box Chart specifying Minimum, Maximum, Interquartile Range, Median and Mean of Underwriting Ratio where minimum/maximum exclude outliers defined as 1.5 times the interquartile range (i.e., the difference between first and third quartiles)

	2013	2014	2015	2016	2017	2018	2019	2020
Observations (i.e., MCOs)	179	187	196	191	189	185	181	199
Average Underwriting Ratio	0.78%	0.77%	2.19%	1.36%	0.27%	0.66%	-0.25%	2.89%
% of MCOs Profitable	63.13%	59.36%	70.92%	66.49%	62.43%	63.24%	51.93%	76.88%

[11] M. Duggan and T. Hayford. 2013. Has the Shift to Managed Care Reduced Medicaid Expenditures? Evidence from State and Local-Level Mandates. *Journal of Policy Analysis and Management* 32, no. 3:505–535. http://dx.doi.org/10.1002/pam.21693.

[12] D. Cutler, M. McClellan and J. Newhouse. 2000. How Does Managed Care Do It? *RAND Journal of Economics* 31, no. 3:526–548.

[13] A. Dor, M. Grossman and S. Koroukian. 2004. "Transaction Prices and Managed Care Discounting for Selected Medical Technologies: A Bargaining Approach. NBER Working Paper 10377 https://www.nber.org/system/files/working_papers/w10377/w10377.pdf.

[14] Y. Shen and G. Melnick. 2006. Is Managed Care Still an Effective Cost Containment Device? *Forum for Health Economics & Policy (Frontiers in Health Policy Research)* 9, no. 1:Article 3.

[15] B. Garrett and S. Zuckerman. 2005. National Estimates of the Effects of Mandatory Medicaid Managed Care Programs on Health Care Access and Use, 1997–1999. *Medical Care* 43, no. 7:649–657.

[16] See also J. Palmer, C. Pettit and I. McCulla. 2019, June. Medicaid Managed Care Financial Results for 2018. Milliman. Retrieved March 12, 2022, from https://assets.milliman.com/ektron/Medicaid_managed_care_financial_results_for_2018.pdf.

[17] For their Underwriting Margin Model, the authors excluded the results from CY 2020.

These margins are less than the weighted average profit margin of 3.7% as earned among the largest commercial insurers between 2013 and 2020, ranging from a low of 3.1% (for 2016) to a high of 4.3% (for 2017).[18] Even in comparison to Medicare Advantage plans, the potential margins for Medicaid appear constrained, with the average *gross* margin—a good indicator of the plan's overall financial performance including its potential profitability—for a MMC plan being less than a quarter of that for Medicare Advantage plans: an average of $420 gross margin per covered person per year between 2018 and 2019 for MMC versus $1,722 for Medicare Advantage over the same periods.[19]

Such a variance in overall financial performance is not necessarily bad nor undesired. Even in those scenarios where the underwriting ratios are minimal, the returns in absolute terms can be substantial. Given the transactional nature of premium payments from the states to the insurer, it may be more appropriate to consider an insurer's returns in relation to their invested capital or equity requirements.[20] Fundamentally, Medicaid is a highly regulated industry that is funded by taxpayers through a combination of state and federal revenues, and it is this public financing of MMC that may warrant its distinct value propositions by both the insurers that are assessing the adequacy of their expected earnings and the states and their consulting actuaries that are charged with ensuring appropriate stewardship of the public purse.

Nevertheless, as a monopsony—that is, a sector in which there is only one buyer of services such as a state buying insurance for its Medicaid population—a state may be incented to put downward pressure on MMC capitation rates and thereby mitigate the need for trade-offs among the competing priorities for a state's limited revenues. With narrow net income margins at the outset, even a subtle influence on market prices can lead to unintended market distortions.

As the authors of the 2019 MHPA study noted,

> *One significant way that Medicaid managed care is unique from other health insurance is that the entity setting the capitation rates (price) is not usually the entity bearing the mispricing risk. Since the rate setting actuaries do not bear the financial risk of mispricing, they do not have the same economic incentive to include margin for deviation as does a pricing actuary working in other lines of health insurance.*[21]

---

[18] Here the authors define the largest commercial health insurers as Anthem, CVS Health, UnitedHealth Group, Cigna, Humana and Centene.
[19] D. Dermont et al. 2020, December 16. Health Insurer Financial Performance through September 2020. Kaiser Family Foundation. Retrieved March 12, 2022, from https://www.kff.org/private-insurance/issue-brief/health-insurer-financial-performance-through-september-2020/. See also a prior study by Kaiser Family Foundation that similarly assessed the favorable margins of the publicly financed Medicare Advantage. "In every year since 2006, average gross margins for Medicare Advantage plans have exceeded those of plans in the individual and group markets," the authors summarized; see G. Jacobson et al. 2019, August 5. Gross Margins for Medicare Advantage Plans Averaged $1,608 per Person per Year. Retrieved April 1, 2022, from https://pnhp.org/news/gross-margins-for-medicare-advantage-plans-averaged-1-608-per-person-per-year/.
[20] Even a MMC insurer operating with a low profit margin (see Figure 1) may still offer the potential for significant returns on equity and/or capital. For example, the average MMC insurer with $1.5 billion in annual revenues might reasonably expect an underwriting margin of 1.25% for net income of $18.75 million. If the MMC plan requires $180 million in reserves to meets its capitalization requirements (i.e., an approx. 350% RBC where the ACL is equivalent to 3.5% of premium), the plan's return on capital may be as high as 10%. And if one-fifth of the required capital were raised through debt financing, the return on equity (or invested capital) of the MMC plan would be approximately 13%. For further discussion of returns in the health care sector, see T. Leste, Y. Siegal and M. Shukla. 2019. Deloitte Insights. Retrieved March 12, 2022, from https://www2.deloitte.com/us/en/insights/industry/health-care/return-on-capital-health-care.html.
[21] S. H. Gibson et al. note that state actuaries generally community-rate for the overall membership using a combined data set rather than separately rating for each specific MCO. This approach "further increases the risk that the rates for any one MCO within the program may not be adequate. Not only will actual results vary from expected results for the entire Medicaid program, but results will

In addition to this potential to misprice benefits and therefore inadequately finance some contingency for adverse risk, a state may also underestimate the insurer's general hurdle rate or opportunity cost to operate in the state's MMC sector. Specifically, because the state does not need to raise capital from the private equity market to finance its own operations, the state may discount the cost of capital associated with financing an insurer's MMC operations including but not strictly limited to its regulatory-required reserve requirements.[22]

Overall, given the comparatively narrow net income margins in MMC and what could be construed as a relatively high probability of loss (based on the historical performance summarized in Figure 1), certifying actuaries and their client state should give serious consideration to the adequacy of the underwriting margin and its implications for both the general viability and overall solvency of insurers participating in the state's Medicaid market. Without properly considering the underwriting margin, a state could endanger the general solvency of certain insurers and therefore the competitiveness of the MMC market. At minimum, the proposed Underwriting Margin Model makes transparent to the insurer (and the public) the state and its actuary's assumptions around the contingency for risk and the implicit opportunity cost of participating in the market.

MEDICAID RATE DEVELOPMENT—ASOP 49 AND THE FINAL RULE(S)

The specificity of the federal statute, regulation and legal precedent mitigate any inadvertent or overt abuse by the state of its purchasing power. Most recently, the Fifth Circuit in *State of Texas v. Retting*,[23] in upholding the Affordable Care Act, noted that the provisions for "actuarially sound capitation rates have consistently required that all reasonable, appropriate, and attainable costs be covered by rates." The Fifth Circuit also affirmed the constitutionality of the "Certification Rule" that requires Medicaid rates to be certified as actuarially sound "by actuaries who meet the qualification standards established by the American Academy of Actuaries and follow the practice standards established by the Actuarial Standards Board [ASB]."[24]

The ASB's standard for Medicaid capitation rates was formerly outlined in 2015 with Actuarial Standard of Practice (ASOP) No. 49 defining Medicaid capitation rates as being "actuarially sound" if "projected capitation rates and other revenue sources provide for all reasonable, appropriate, and attainable costs." Such costs include the projected expenses for the following:

1.   Claim and non-claims-based medical treatment
2.   General administration and operations
3.   Taxes, fees and assessments and
4.   Underwriting margin.

---

vary by each individual MCO." See S. H. Gibson, J. R. Piekut and J. Simons. 2019. Underwriting Gain Development for Managed Medicaid Capitation Rates, p. 5. Medicaid Health Plans of America. Retrieved March 12, 2022, from https://medicaidplans.org/wp-content/uploads/2020/07/MHPA-Underwriting-Gain-Development-Report_June-2019_FINAL.pdf.

[22] For purposes of the Underwriting Margin Model, the authors are interested in explicitly pricing the cost of capital necessary for maintaining the reserves sufficient to meet the state's risk-based capital requirements. The more general financing of specific net income target to align with the broader opportunity cost incurred by the insurer for participating in MMC, including, for example, the recoupment of any start-up costs not subject to amortization or the perceived risk of the investment, may be considered as part of the risk margin component of the Underwriting Margin.

[23] *Texas v. Rettig*, 987 F.3d 518 (5th Cir. 2021), Retrieved July 5, 2021, from https://www.ca5.uscourts.gov/opinions/pub/18/18-10545-CV0.pdf.

[24] See also 67 FR 41000, which implemented the 2002 Final Rule, redefining "actuarial soundness" given the changing market where "there [was] an increasing number of States that lack[ed] recent [fee-for-service] data to use for rate setting."

The most significant costs incurred by the insurer are their projected medical expenses followed by their projected administrative overhead charges. For each of these components, the ASOP's and Center for Medicare and Medicaid Services's (CMS) guidance provides specific standards for the data and the data quality acceptable for Medicaid capitation rate development, Medicaid certifications and Medicaid statements of actuarial opinion. Additionally, the required financing necessary to meet the costs imposed on the insurer by any taxes, assessments and fees is typically defined in statute or regulation and generally not controversial from a pricing perspective (e.g., an all-payer assessment for vaccinations or an insurer tax levied in a state or, in the case of the Affordable Care Act's Health Insurer Fee, established by the IRS). Accurately accounting for these expenses is necessary to ensure the solvency of a reasonably efficient insurer but may be insufficient to ensure that they will continue to operate within the MMC market.

Underwriting margin, when compared to the other components, however, is the least well defined and most opaque in its calculation. At minimum, the authors argue that the underwriting margin should explicitly account for[25,26]

1.   The cost of capital and
2.   A risk margin.

The cost of capital relates primarily to the opportunity cost that an insurer incurs for maintaining sufficient reserves to meet its state's risk-based capital requirements. However, the cost of capital may also apply to considerations related to cash flow, transfer payments and the infusion of cash to replenish reserves. The risk margin reflects uncertainty inherent in an actuary's best estimate of benefit spend and is used to capture margin needed to avoid some specified probability of loss or ruin, or to obtain a specified net income target.

DEFINING OF UNDERWRITING MARGIN

Although the CMS and the Actuarial Standards Board (ASB) have previously published standards and guidance for MMC rate development that include reference for the necessary consideration of underwriting margin[27] and its components, such guidance neither offers a specific target nor establishes a consensus around the data and financial models appropriate for deriving such a metric.

On April 26, 2016, CMS published its Medicaid and CHIP (Children's Health Insurance Program) Managed Care Final Rule (2016 Final Rule)—the first major revision to its 2002 Final Rule that established the initial parameters around MMC contracts. The 2016 Final Rule affirmed the guidance set forth in ASOP no. 49 and the necessary inclusion of an underwriting margin in Medicaid rate development.[28] Specifically, the 2016 Final Rule clarified that in addition to the "reasonable, appropriate, and attainable expenses related" to

---

[25] From ASOP 49 Section 3.2.12(b). The underwriting gain provision provides compensation for the risks assumed by the MCO. These risks may include insurance, investment, inflation and regulatory risks, as well as risks associated with social, economic and legal environments.

[26] ASOP 49 also requires that the actuary take into consideration the impact of income taxes on the actuarial soundness of the rates. However, these taxes are framed only in their relationship to investment income earned by the MCO and the cost of capital, and so the consideration of such taxes is done exclusively in the context of how they might influence the derivation of the underwriting gain.

[27] The authors prefer the term "underwriting margin" to "underwriting gain" for two reasons. First, the connotation of "margin" was deemed to be comparatively neutral. Second, the "underwriting margin" is an amount applied to the capitation payment *prospectively* and should not be equated with any guarantee of an underwriting gain or operating profit (before taxes). However, in general, the two terms can be treated synonymously.

[28] 81 FR 27497, pp. 27497–27901. Retrieved March 13, 2022, from https://www.govinfo.gov/content/pkg/FR-2016-05-06/pdf/2016-09581.pdf.

administration, taxes and fees, the non-benefit component of the rate must include financing of margin that accounts for the "contribution to reserves, risk margin, cost of capital."[29]

Nonetheless, the 2017 Society of Actuaries (SOA) study by Teppema, Goldman, Smith and Tutewohl found that there is "no pre-determined formula for developing margin" and therefore "[g]iven this lack of a defined formula, actuaries must use their own knowledge and judgment to develop margin in Medicaid capitation rates."[30] This emphasis on an actuary's own judgement can lead to inconsistency in the approaches that members of the Academy use to provide for the margin when developing rates. This contrasts with the generally accepted development methodologies for the other components of the rate, namely, medical expenses, administration and taxes, that are comparatively more transparent and less dependent on actuarial judgment.

Given the general lack of guidance around what the underwriting margin should be, it is worthwhile reviewing CMS's responses to the public's comments to their initial draft of the 2016 Final Rule and CMS's resulting revisions to the regulation. Such changes to the rule help clarify the intent of the federal government with respect to what should be definitively included in the component of the rate that this report colloquially refers to as the "underwriting margin."

Specifically, although CMS agreed with a commenter's suggestion "that 'risk margin' is a more appropriate term than 'profit margin'," CMS noted that such semantics do not preclude the inclusion of an explicit provision for profit as an allowable non-benefit expense in Medicaid rate setting. Further, CMS clarified that "contribution to reserves, risk margin, [and] cost of capital" were to be treated as necessary prerequisites, as opposed to optional considerations, for the development of actuarially sound rates. To summarize its changes to the regulation, CMS explained,

> *After consideration of public comments, we are finalizing §438.5(b)(3) with modifications. The revisions are: (1) To use "risk margin" rather than "profit margin"; and (2) to use "and other operational costs" [rather than "or other operational costs"] to clarify that all listed categories of non-benefit costs must be included in the development of actuarially sound capitation rates.*[31]

The 2020 Final Rule and CMS's Medicaid managed care rate development guide for the 2021–2022 rating period(s) reaffirmed the underwriting margin, among other categories of costs, as a necessary component of the non-benefit cost incurred by the MCO that must be included in actuarially sound rates.

AN UNDERWRITING MARGIN IS NOT A PROFIT MARGIN

It is worth reiterating that despite the clarification by CMS that risk margin and profit margin are not the same, there may be a tendency by some, including legislators looking for budgetary savings or journalists reporting on government spending, to conflate the proposed underwriting margin with a health plan's profit margin. Although the two may be correlated, the underwriting margin is not synonymous with an

[29] 42 CFR § 438.5(e).
[30] S. Teppema, J. Goldman, L. Smith and S. Tutewohl. 2017. Medicaid Managed Care Organizations: Considerations for Calculating Margin in Rate Setting. Society of Actuaries. Retrieved March 12, 2022, from https://www.soa.org/globalassets/assets/files/research/medicaid-managed-report.pdf.
[31] 81 FR 27573. Retrieved March 14, 2022, from https://www.federalregister.gov/d/2016-09581/page-27573.

insurer's profit. Nor, for clarification purposes, is the inclusion of a provision for the cost of capital the same as a company's expected return on capital or its return on invested capital (see footnote 20).

For purposes of this report, the underwriting margin is being narrowly defined as the amount, required by federal law and actuarial soundness guidelines, to adequately finance a health plan's operational costs related to its cost of capital applied to its reserve requirements and, potentially, cash flow considerations imposed on the insurer by the state, as well as to provide a risk margin for other contingencies including, but not limited to, benefit expenditures. The accompanying model calculates the underwriting margin as a percentage of the per-member-per-month (PMPM) capitation rate inclusive of all nonmedical expenditures and other non-benefit expenses, but before application of taxes and fees.

Review of Previous Studies

The research and model presented in this report follow on the earlier works by Teppema, Goldman, Smith and Tutewohl, sponsored by the Society of Actuaries in 2017 (2017 SOA study),[32] and that by Gibson, Piekut and Simmons and published by the Medicaid Health Plans of America in 2019 (2019 MHPA study).[33]

The 2017 SOA study leveraged a comprehensive dataset of MMC financial performance between 2013 and 2015 and the learnings from dozens of structured interviews with MMC executives across the nation to provide actuaries with objective standards for assessing a margin appropriate for the Medicaid line of business. The 2017 SOA study uses the term "margin," which it defined as "the amount included in revenue to cover insurance risk, contributions to risk-based capital, income taxes, investment expenses, and profit." Additionally, its authors suggested that the margin "must fund several generally accepted components of an insurer's operations and liabilities" including the cost of investment in existing infrastructure and new enterprises and returns to owners/shareholders or, for nonprofits, the community.

The 2019 MHPA study took many of the elements identified in the 2017 SOA study and abstracted them into the first publicly available model that an actuary could use to transparently calculate a margin.

Whereas the 2017 SOA study offers a robust survey of the financial performance of MMC and specific considerations for the development of a margin, the Underwriting Margin Model developed in this report is admittedly more limited in scope. Although the model includes many parameters and multiple options for those parameters that are included, it remains a necessary abstraction for derivation of a margin. For example, in comparison to the 2017 SOA study, this model employs a narrower definition that does not explicitly account for income taxes, profits or investment expenses. Further, the Underwriting Margin Model does not include any provision for investments in infrastructure because the authors assume that such expenses, among others, should be either weighed against resulting return of the venture or capitalized and amortized for some number of years consistent with Generally Accepted Accounting Principles (GAAP). These business expenditures, where they are "reasonable, appropriate, and attainable," should be adequately financed or considered in the administrative component of the rate, not incorporated into the underwriting margin.

The authors of this Underwriting Margin Model have updated the base data developed in the SOA 2017 study and used in the 2019 MHPA study. The authors also developed a secondary dataset containing a

---

[32] Supra note 30.
[33] Supra note 21.

limited set of data fields that is a hybrid of the 2017 SOA dataset and the financial metrics identified in Appendix 2 of the "Milliman Research Report of Medicaid Managed Care Results for 2020."[34] The data elements and source of the authors' original dataset are summarized in Table 6.

NAIC Financial Metrics.

The authors have also introduced several new parameters to the model, thereby extending its use in many important ways. For example, although the 2019 MHPA study certainly notes several alternative metrics for estimating the market returns as needed for the calculation of the weighted average cost of capital, this Underwriting Margin Model gives significant attention to the implications of such alternative metrics. It also considers the various interrelated elements of the cost of capital calculation, including an extended discussion of the appropriate treatment of equity risk premium in the next section.

The authors include additional parameters in this Underwriting Margin Model to allow the user to adjust the cost of capital for investment income earned by the MMC, the time value of money through the treatment of cash flow, and inclusion of transfer payments and risk share arrangements.

Finally, whereas the 2019 MHPA model solved for a targeted net income, this Underwriting Margin Model allows for the user to calculate an underwriting margin needed to achieve a net income target, a specified probability of ruin or a defined risk margin. Each of these goals is addressed in subsequent sections.

Overview of the Underwriting Margin Model

This section provides additional details about the construction of the two major components to the underwriting margin calculated by the model: the cost of capital and risk margin. This section also explains the three different targets that the user can define for determining the necessary cost of capital and risk margin to apply to the rate.

COST OF CAPITAL

DEFINING THE COST OF CAPITAL

As noted above, both the ASOP 49[35] and CMS's current MMC rate setting guide[36] require state actuaries to incorporate the "cost of capital" into their rating. Neither document, however, explicitly defines the term, and CMS separately lists "contributions to reserves" and "cost of capital" without clarifying the distinction. As such the authors narrowly define the cost of capital as the required return calculated using the weighted average cost of capital (WACC) formula that the insurer needs to finance: (a) contributions to its risk-based capital (RBC) reserve requirements as well as (b) the maintenance of an adequate cash flow to preserve this reserve.

---

[34] Milliman Medicaid managed care financial results for 2020. Retrieved November 12, 2021, from https://www.milliman.com/en/insight/medicaid-managed-care-financial-results-for-2020.
[35] ASOP 49 3.2.12(b) p. 9. Retrieved March 20, 2022, from http://www.actuarialstandardsboard.org/wp-content/uploads/2015/03/asop049_179.pdf.
[36] CMS. 2021, June. 2021–2022 Medicaid Managed Care Rate Development Guide, pp. 29, 30. Retrieved March 20, 2022, from https://www.medicaid.gov/medicaid/managed-care/guidance/rate-review-and-rate-guides/index.html.

In defining the cost of capital in such a limited manner, it is important to acknowledge that the term is often applied more broadly to mean a company's opportunity cost or hurdle rate—that is, a calculation of the minimum return needed for entity to justify an investment in some capital project. In the insurance sector, this could be the expected return needed to convince the CFO to approve an upgrade to a claims processing system or the implementation of a new care management program. However, the expense associated with the investment should appear on an amortization schedule or be financed with regular interest payments, and so the operating cost of the investment should already be incorporated into the administrative component of the rate. Such expenses are not included in the underwriting margin.

However, whereas the interest expense or amortized charges may adequately incorporate the direct expense associated with an investment needed for efficient operations, any return exceeding this actual expense that was necessary to justify the original investment is unlikely to be reflected in the administrative component of the rate. This is also true of the expected return associated with any start-up costs that may have been incurred by the insurer before entering a new MMC market.

Although such broad applications of the cost of capital to investments are legitimate considerations for actuaries setting the underwriting margin, they are not treated as part of what the authors have defined here as the "cost of capital" component of the underwriting margin. The Underwriting Margin Model subsumes the broader consideration of the minimum return (or profit margin) needed to encourage innovation and continued participation by MMC insurers as part of an overall net income target with the result being reflected in the aggregate risk margin separately calculated from the cost of capital.

RISK-BASED CAPITAL AND CONTRIBUTIONS TO RESERVE

All insurers regulated by state insurance departments are subject to some form of risk-based capital (RBC) requirements. RBC standards, created by the NAIC and adopted in the 1990s in response to insurance crises of the prior decade, established standards around the minimum amount of surplus capital that an insurer must hold to "support its overall business operations in consideration of its size and risk profile."[37,38] The requirement that insurers maintain adequate capital creates a safety net against the risk of liquidation and therefore should give beneficiaries confidence that their insurance will deliver its intended benefits.

Considerable policy and academic debate surround the appropriate RBC level.[39] For those states that have adopted the NAIC's model law, as is the norm across all the states providing MMC products, the effective minimum amount of surplus capital—i.e., its net worth—that an insurer must have to avoid regulatory action is equivalent to 200% of their authorized control level (ACL), also referred to as an RBC ratio of 200%. Although the amount of capital needed to meet this threshold is an elastic figure, both in absolute terms and as a percentage of premium, dependent upon the insurer's risk profile and performance, an RBC ratio of 200% is generally equivalent to about 7.0% of the insurer's annual premiums.

If RBC falls below this threshold, the state insurance department will begin to impose additional requirements on the insurer. As such, the standard practice is for insurers to hold RBC amounts

---

[37] NAIC. 2021. Risk-Based Capital. Retrieved July 2, 2021, from https://content.naic.org/cipr_topics/topic_riskbased_capital.htm.
[38] Most, but not all, states use the NAIC's Risk Based Capital (RBC) for Health Organizations Model Act. Retrieved July 3, 2021, from https://content.naic.org/sites/default/files/MO315.pdf.
[39] See also ASOP 55, effective November 1, 2019, which considers capital adequacy assessment. Actuaries should review the procedures outlined in the standards in assessing the appropriateness of the underwriting margin as it relates to cost of capital and maintaining adequate reserves for the insurer.

significantly higher than this minimum threshold. Figure 2 summarizes the ACL and RBC reserves held by the MMC entities in the NAIC dataset used in the Underwriting Margin Model. Excluding the 2020 data, the amount of RBC held by insurers has averaged 445% of the ACL, with the interquartile range of the RBC ranging from 300% to about 550%. With an ACL of $49.4 million over the same period, the average amount of surplus held by insurers was equivalent to $219.8 million.

The 2019 MHPA study recommended that the level of reserves to be financed in the MMC rates "should be based on all capital investments of the MCO, not just the minimum required by statute."[40] The authors agree with this perspective in principle. However, in practice, guaranteeing the financing of too much in terms of reserves, especially if funding with a generous equity premium, could lead to an inefficient allocation of reserves and in inflated cost of capital that represents an otherwise unattainable return on invested capital.

Figure 2.

MEDICAID MANAGED CARE RISK-BASED CAPITAL AS PERCENTAGE OF AUTHORIZED CONTROL LEVEL FROM NAIC FILINGS, BY YEAR

Box Chart specifying Minimum, Maximum, Interquartile Range, Median and Mean of Underwriting Ratio where minimum/maximum exclude outliers defined as 1.5 times the interquartile range (i.e., the difference between first and third quartiles)

	2013	2014	2015	2016	2017	2018	2019	2020
Observations (i.e., MCOs)	179	187	196	191	189	185	181	199
Authorized Control Level	$33.4 M	$39.8 M	$45.5 M	$50.9 M	$53.2 M	$58.3 M	$64.3 M	$62.1 M
Average RBC (% of ACL)	476%	455%	425%	433%	432%	452%	445%	521%

In general, the RBC calculation considers different categories of risk in relationship to various asset, underwriting and reserve items. In recognizing that it is "extremely unlikely" that the risks of financial losses will occur simultaneously, the derivation of an insurer's RBC applies a covariance function to the different categories so that the combination of risk factors is less than the sum of the parts. A 3.0% factor is applied to the result to account for potential operational risk. The insurer's ACL is then equivalent to half the resulting "RBC after Covariance Including Operational Risk."

---

[40] Supra note 21, p. 5.

The NAIC formula for the Authorized Control Level RBC is

$$\text{Authorized Control Level RBC} = \frac{1.03 \times \left(H0 + \sqrt{H1^2 + H2^2 + H3^2 + H4^2}\right)}{2}$$

where
$H0 \rightarrow$ **Affiliate** asset risk
$H1 \rightarrow$ Asset risk
$H2 \rightarrow$ Underwriting risk
$H3 \rightarrow$ Credit risk
$H4 \rightarrow$ Business risk.

Without going into complex derivation of each component, it is important to note that for each category of risk, the risk factor is higher for items with a greater underlying risk and lower for less risky items. For example, the financing needed to fund an insurer's underwriting risk ($H2$) is higher for comprehensive medical plans than it is for a limited-benefits product such as a dental plan and is lower for expenditures paid on a more predictable capitated basis than those paid on a fee-for-service basis. Similarly, the likelihood of a financial loss, and therefore the magnitude of the asset risk ($H1$), is typically less if the insurer's capital is held in guaranteed savings bonds than when invested in common stocks, which are more likely to sustain losses in a volatile market.

RISK-BASED CAPITAL COMPONENTS

The Underwriting Margin Model allows the user to calculate an ACL based on the anticipated underwriting risk using the product's overall claims expenditures and application of any managed care discount factor derived from the user's input and application of NAIC factors, if applicable. The business risk is based on the user-defined administrative component and the implied weight of the $H4$ risk factor taken from the NAIC filing data. Alternatively, the user can enter their own predefined ACL, measured as a percentage of premium. Among the Medicaid-dominant plans, the average ACL (i.e., 100% RBC) as a percentage of revenue was 3.38%.

Table 1 summarizes the average weights of the different types of risk included in the RBC calculation for all health insurers filing with the NAIC as well as a select list of Medicaid-dominant plans. The data are based on NAIC filings for 2016 through 2020 and 2019 through 2020, respectively.

Having established the ACL, the user must set the RBC threshold(s) to finance. The average reserves held across the insurers in the Underwriting Margin Model's dataset is 450% of the ACL. The model suggests using this figure as the default; however, the user may elect to finance any amount between 200% and 1,000%.

Further, the user may elect to apply a discount to the cost of capital applied to the value of the RBC reserves held by the insurer that are between the state's minimum threshold and some threshold either maintained in practice or desired by the state. For example, the user may fully finance the insurer's cost of capital for the minimum RBC requirements (i.e., 200%) but discount by 50% any amount exceeding this threshold up to, say, 450%, the hypothetical reserves held by the average insurer in the state. When considering the minimum to finance, the actuary should consider expectations of the market and state regulators as they pertain to reserves and weigh the practical need for insurers to fund some amount above the state-required minimum to avoid falling below the minimum at any point in time.

Table 1.

NAIC RISK-BASED CAPITAL DATA, MULTIYEAR AVERAGE FOR ALL HEALTH INSURANCE FILINGS AND MEDICAID-DOMINANT FILINGS

	ALL FILINGS 2016 – 2020 Average	MEDICAID-DOMINANT FILINGS 2019 and 2020 Average
H0: ASSET RISK – AFFILIATES W/RBC	$4.66 B	$0.34 B
H1: ASSET RISK – OTHER	$9.17 B	$1.13 B
H2: UNDERWRITING RISK	$41.32 B	$13.25 B
H3: CREDIT RISK	$3.47 B	$0.72 B
H4: BUSINESS RISK	$6.44 B	$0.98 B
TOTAL RBC BEFORE COVARIANCE	$65.06 B	$16.41 B
Weights of Risks Relative to (H2) Underwriting Risk		
H0: ASSET RISK – AFFILIATES W/RBC	11.3%	2.5%
H1: ASSET RISK – OTHER	22.2%	8.5%
H2: UNDERWRITING RISK	100.0%	100.0%
H3: CREDIT RISK	8.4%	5.4%
H4: BUSINESS RISK	15.6%	7.4%
Relative Contribution to ACL		
H0: ASSET RISK – AFFILIATES W/RBC	9.5%	2.4%
H1: ASSET RISK – OTHER	4.1%	0.7%
H2: UNDERWRITING RISK	83.7%	96.1%
H3: CREDIT RISK	0.6%	0.3%
H4: BUSINESS RISK	2.0%	0.5%
Revenue	$697.95 B	$218.84 B
Authorized Control Level (100% RBC)	$24.45 B	$7.04 B
ACL as % of Revenue	**3.50%**	**3.22%**
Aggregate RBC%	587%	436%
Median RBC%	**642%**	**420%**

"ALL FILINGS" data from NAIC (2021, June 30) "Aggregated Health Risk-Based Capital Data" Retrieved March 21, 2022, from https://content.naic.org/sites/default/files/inline-files/2020%20Health%20RBC%20Statistics_as%20of%202020-06-30.pdf.

"MEDICAID-DOMINANT FILINGS" data from NAIC via Keven Russell FSA, MAAA (Mercer). Received February 15, 2022.

CASH FLOW

Consistent with CMS's guidance that recognizes how temporary shortfalls in revenue may have non-benefit costs that an actuary may want to consider in their rate development, [41] the Underwriting Margin Model includes multiple parameters for factoring either (a) the costs associated with a delay in premium payments or a withhold of reimbursement from the state to the MMC, (b) the savings accrued from claims payment delays from the MMC to its providers or (c) both.

In each scenario, if there is an interruption to the timeliness of payments to the insurer, the insurer may need to seek an alternative funding source to maintain its reserves if the user assumes the insurer's costs are constant and the rates accurately captured the benefit and non-benefit spend to be incurred in the rating period.

With respect to a lag in revenues—either the monthly premium payments or the reimbursement of any earned withhold—it is important to reiterate how the insurer's expected benefit and administrative expenses not only determine the overall premium but also influence the plan's RBC requirements. Any

---

[41] Section 4.B.ii(a)(vi) of Medicaid Rate Development Guide 2021–2022, p. 24. https://www.medicaid.gov/medicaid/managed-care/downloads/2021-2022-medicaid-rate-guide-11102021.pdf

shortfall in this revenue therefore could lead to a hypothetical deficit by the insurer against its RBC target. Where there is a lag in revenues for any reason, the insurer will need to pay for its ongoing operation costs either using its existing equity, thereby reducing its surplus reserves relative to its desired RBC thresholds, or by acquiring new debt and with it the associated interest expense that is unlikely to be reflected in the rate development unless explicitly addressed.

For example, using the value for the cost of debt (based on the 10-year average Aaa corporate bond rate of 3.58%), the cost of a payment lag equivalent to one month premium would be 0.29% of the overall premium (absent any tax implications that would reduce the cost of debt). Related to this, a 2.0% withhold that the actuary did not anticipate the state reimbursing until 12 months after the close of the contract period would have a financing cost equivalent to 0.14% of the overall premium.[42]

The same logic used for pricing into the rates the cost of lag in revenues may also be applied to any savings accrued by the insurer from its own routine lag for provider reimbursements. Holding all else equal, were the state to prospectively pay the insurer in a timely fashion, which then in turn consistently pays its providers on a lag of +45 days, the MMC would have a favorable cash flow equivalent to 1.5 months of the proportion of premium effected by the lag. This in turn would inflate the MMC reserves, allowing it to earn greater investment earnings.

This last cash flow parameter, however, should be used with discretion and understanding of its implications. First, such a lag is likely to be inconsistent period over period and applicable to only a portion of the claim's expenditures. The expenditures also may differ by the insurers for whom the actuary is collectively rating, so adding an adjustment for lag could penalize the insurer that pays its providers more quickly than others. Second, any lag may already be factored into the insurer's targeted RBC threshold, and with that the investment earnings discount to the RBC threshold being financed. Also, an MMC does not generally have the same market dominance relative to its provider network as the state has vis-à-vis the MMC, so the same justification for the adjustment being a necessary corrective to a market distortion may not apply here.

Cash Flow Components
By default, the model suggests no costs associated with interruptions to cash flow.

---

[42] The cash flow parameters included in the Underwriting Margin Model may be manipulated to proxy the implications of other potential payment lags not directly addressed in the model. For example, as the authors of the 2017 SOA study noted, and consistent with this study's authors' own anecdotal experience, "in some cases, states simply fall behind in their payments to the MCOs, and the MCOs are subject to carrying costs that can affect margins." Supra note 30, p. 27. For example, one scenario may see a state continuing to pay the prior rates for several months into the new rating period. If the expected change to the rates is a 5.0% increase over the prior period and this change is not expected to be effectuated until midway through the current rating period, at which time that amount owed in arrears to the MMC will be paid in full, the actuary may want to proxy the impact by modeling a 2.5% withhold with the value for the user-defined parameter "Months after Rating Period before Withhold Paid" set to 0. Although the result, in this scenario, would be just 0.04% or $100,000 for every $250 million in annual premium, the important thing for the actuary to recognize is that there is a nonzero cost to such a payment lag that may be appropriately redressed in the underwriting margin.

APPLICATION OF WEIGHTED AVERAGE COST OF CAPITAL TO RBC AND CASH FLOW

For purposes of the Underwriting Margin Model the cost of capital is derived by solving for the WACC formula and applying the resulting percentage to the RBC amount that the actuary deems sufficient. Certain components of the WACC are applied to cash flow considerations as well as to transfer payments and gains or losses included in the risk margin; the latter will be discussed in more detail below.

The formula for the WACC is

$$\text{Weighted Average Cost of Capital (WACC)} = \left(\frac{E}{V} \times Re\right) + \left(\frac{D}{V} \times Rd \times (1 - Tc)\right)$$

where
$E \rightarrow$ Market value of firm's equity
$D \rightarrow$ Market value of firm's debt
$V \rightarrow E + D$
$Re \rightarrow$ Cost of equity
$Rd \rightarrow$ Cost of debt
$Tc \rightarrow$ Corporate tax rate

The formula is a simple means for calculating the blended after-tax cost of a company's various sources of capital, where the firm's equity may include its common or preferred stock and the firm's debt may encompass the cost of issuing bonds and acquiring any other long-term debt. Because most of the elements of the formula are estimates themselves, and neither constant nor consistent estimates at that, the formula appears easier to calculate than it is. That the reader may see the cost of capital variably described as an opportunity cost, a discount rate, a cost of financing or a hurdle rate for investments demonstrates, at least superficially, the nuance of the formula. Potential investors and different analysts are likely to have different metrics and measures of these various costs.

Cost of Debt

For the most part, determining the cost of debt (Rd) is more straightforward to calculate than the cost of equity (Re). For a small firm, the amount of debt available may be severely limited, minimizing the $\frac{D}{V}$ ratio, and its cost might vary significantly depending on the source of capital and purpose of its use; but it is likely to be best estimated using the insurer's average cost of acquiring a loan or line of credit with its bank. For a large private firm, the company's credit rating as reported by an entity such as Moody's is helpful for determining the cost of debt. Finally, a publicly traded company generally must report its debt obligations and the terms thereof. Because of this, the firm's SEC filings can be used for the purposes of discerning such cost of debt.

Interest payments on debt are deductible expenses. Because of this, the net cost of a company's debt, however defined, should be discounted by the amount saved in taxes. The total discount will vary by state with the effective cost of debt being comparatively higher in a low-tax state versus a high-tax state.

The model includes estimates for the cost of debt based on the average of Moody's Aaa and Baa corporate bond yield as reported by the Economic Research Division by the Federal Reserve Bank of St. Louis. The former yield is likely to be a sufficient proxy for publicly traded insurers, whereas the higher rate of the latter, the riskier Baa-graded corporate bond, may reflect a rate that is more likely to be available for financing a loan by a larger nonprofit insurer. Alternatively, the user can enter its own cost of debt based on the actual interest payments of the insurers operating within the MMC market.

Table 2 summarizes the three-, five-, and 10-year average yields (based on month-end observation data) available in the model as a proxy for the cost of debt (*Rd*). The suggested default value is the 10-year Aaa corporate bond yield of 3.58% and assumption of 20% debt financing.

Table 2.
PARAMETER SELECTION FOR COST OF DEBT (*Rd*)

Selected Time Period:	10-Year	
Most Recent Year of Data:	2021	
	Corporate Aaa	**Corporate Baa**
Selected:	3.58%	4.51%
10-Year	3.58%	4.51%
5-Year	3.24%	4.11%
3-Year	2.86%	3.78%

Source: Monthly Observational Data for Moody's Seasons Corporate Bond Yield (Not Seasonally Adjusted) from Federal Reserve Bank of St. Louis, Economic Research Division. ALFRED (Archival Federal Reserve Economic Data). Retrieved March 1, 2022, from https://alfred.stlouisfed.org.

Cost of Equity

Cost of equity is the return that a firm requires to make an investment in some capital project. A common formula used to calculate the cost of equity is the capital asset pricing model (CAPM), a formula that describes the relationship between the expected return of an investment and its relative risk. It presents the expected return of equity as being equal to the risk-free return plus a risk premium, the latter based on the beta of the security relative to the average market return.

The CAPM formula is

$$\bar{R}_a = r_f + \beta \times (\bar{r}_m - r_f)$$
where
$\bar{R}_a \rightarrow$ Expected rate of return (i.e., *Re* $\rightarrow$ cost of equity)
$r_f \rightarrow$ Risk-free rate of return
$\bar{r}_m \rightarrow$ Expected rate of market return
$\beta \rightarrow$ Beta (of industry)
$(\bar{r}_m - r_f) \rightarrow$ Risk premium
$\beta \times (\bar{r}_m - r_f) \rightarrow$ Equity risk premium

Although it is not supported by this Underwriting Margin Model, a more complicated WACC that considers the cost of equity for both preferred and common stocks, for example, may use distinct expected rates of return and betas for each of the different types of ownership.

The risk-free rate of return is generally set based on the annual expected yield of a U.S. Treasury bond. Table 3 presents the average annual yields of three-month, 10-year and 20-year U.S. Treasury bonds. For the purposes of the CAPM it is appropriate to select the total yield of the Treasury bond matching the investment's duration. Most Medicaid contracts are for three to five years, but most insurers would expect to maintain operations across multiple contract periods, and so using the 10- or 20-year bond is appropriate. The suggested default for the risk-free rate is the expected return on the 10-year Treasury based on CY 2020 yields.

Table 3.

PARAMETER SELECTION FOR RISK-FREE RATE OF RETURN (r_f)

	3-Month Treasury	10-Year Treasury	20-Year Treasury
Selected Time Period:	10-Year		
Most Recent Year of Data:	2021		
	3-Month Treasury	**10-Year Treasury**	**20-Year Treasury**
Selected:	**0.59%**	**2.04%**	**2.49%**
10-Year	0.59%	2.04%	2.49%
5-Year	1.05%	1.94%	2.28%
3-Year	0.81%	1.50%	1.92%

Source: Monthly Observation Data for Market Yield of U.S. Treasury Securities at Constant Maturity (Not Seasonally Adjusted) from Federal Reserve Bank of St. Louis, Economic Research Division. ALFRED (Archival Federal Reserve Economic Data). Retrieved March 1, 2022, from https://alfred.stlouisfed.org.

Less conclusively defined is what metrics one should use for determining equity risk premium (i.e., $\beta \times (\bar{r}_m - r_f)$) associated with the investment. The lack of consensus around the appropriate equity premium means that the selection of the expected rate of market return and the beta can have a significant and variable impact on the overall CAPM and by extension the WACC.

As such the Underwriting Margin Model includes several options for calibrating the cost of equity and thereby the CAPM and, ultimately, the WACC to apply to the RBC reserves. The model also defers to the user and allows for the inclusion of a user-defined parameter for the cost of equity.

For the equity risk premium $\beta \times (\bar{r}_m - r_f)$, the model presents the option of determining it using the CAPM model noted above or by using the Implied Equity Risk Premium proposed by Aswath Damodaran, a professor of corporate finance and valuation at Stern School of Business at New York University. In Damodaran's words,

> *The problem with any historical [risk] premium approach, even with substantial modifications, is that it is backward looking. Given that our objective is to estimate an updated, forward-looking premium, it seems foolhardy to put your faith in mean reversion and past data.*[43]

Instead of the CAPM model for assessing the risk premium, Damodaran argues that his measure of the implied equity risk premium (ERP), which incorporates stock buybacks and dividend yields as well as additional considerations around market volatility, better reflects the actual risk premium in the U.S. market. In general, Damodaran's implied ERP is lower than results of the CAPM.

Both Damodaran's implied equity risk premium and the CAPM-derived equity risk premium, which uses the expected rate of market returns ($\bar{r}_m$), reflect the user-selected reference periods for 10-year, five-year and three-year averages. The model also presents the betas (β) for the following sectors: health insurers, utilities and the S&P 500 itself as benchmarks for the corresponding periods for the calculation of the CAPM-derived equity risk premium; see Table 4. The expected rate of return or cost of equity ($\bar{R}_a$), then, is the risk-free rate plus the equity risk premium.

---

[43] A. Damodaran. 2019, April 14. Equity Risk Premiums (ERP): Determinants, Estimation and Implications—The 2019 Edition. NYU Stern School of Business. Retrieved March 20, 2022, from https://ssrn.com/abstract=3378246.

Table 4.
PARAMETER SELECTION FOR EXPECTED RATE OF MARKET RETURN AND BETA

	S&P 500 (Index)	Select Insurers (Stocks)	Utilities (Stocks)	Implied Equity Risk Premium[4]
Selected Time Period: 5-Year				
Total Return (inc. Dividends): No				
Period: Jan. 2011 – Dec. 2021				
Selected Return:	12.23%	21.18%	9.28%	5.57%
Selected Beta	1.00	0.86	0.32	1.00
Annual Return[1,2]				
10-Year	14.13%	21.32%	9.30%	5.57%
5-Year	16.05%	20.47%	11.06%	5.33%
3-Year	23.85%	20.91%	13.03%	5.15%
Annual Dividend Yield[3]				
10-Year	1.79%	1.28%	3.59%	0.00%
5-Year	1.65%	1.31%	3.36%	0.00%
3-Year	1.47%	1.29%	3.20%	0.00%
Beta				
10-Year	1.00	0.86	0.32	1.00
5-Year	1.00	0.97	0.38	1.00
3-Year	1.00	0.86	0.48	1.00
Twelve Month Trailing Return				
10-Year	12.23%	21.18%	9.28%	5.57%
5-Year	12.61%	15.96%	9.48%	5.33%
3-Year	14.44%	16.21%	9.07%	5.15%
Tickers	SPY	CI, CVS, CNC, ANTM, HUM, UNH	NEE, DUK, SO, D, AEP, SRE, EXC, XEL, PEG	n/a see source

Note 1. For Implied Equity Risk Premium, the Annual Return reflects average Trailing 12-Month Return.
Note 2. Annual Return and Trailing 12-Month Return derived from Month-End Close, from Google Finance function in Google Sheets.
Note 3. Dividend Yield includes historical dividend payments from Dividend Investor. Retrieved March 1, 2022, from https://www.dividendinvestor.com/dividend-history/.
Note 4. The Implied Equity Risk Premium proxy reflects the ERP T12m field (replaced with ERP T12m with COVID Adjustment where applicable), from Damodaran Online. Retrieved March 1, 2022, from http://people.stern.nyu.edu/adamodar/New_Home_Page/home.htm.

Figure 3 presents a partial sensitivity test of the how the cost of capital—calculated on an after-tax basis and measured as a percentage of PMPM—can change based on the application of different equity premiums to financing requirements for varying amounts of risk-based capital as a percentage of the ACL. In each of these scenarios, the $\bar{r}_m$ reflects the average 12-month trailing return of the S&P 500 (ticker: NYSE.SPY) and the beta, if applicable, of the selected benchmark over the past five years, with the following assumptions being held constant:

Authorized Control Level as % of PMPM	3.33%
Revenue PMPM	$450
Risk Free Rate of Return	2.04% (10-Year Treasury)
% Debt	20%
Cost of Debt	3.58% (Moody's Aaa Corporate Yield)
Investment Discount	n/a
Federal Corporate Tax Rate	21.0%
State Corporate Income Tax	6.11%

Figure 3.
SENSITIVITY TEST: AFTER-TAX COST OF CAPITAL AS PERCENTAGE OF PREMIUM AS DETERMINED BY CHANGES IN EQUITY PREMIUM ($\bar{r}_m$) AND RBC THRESHOLD
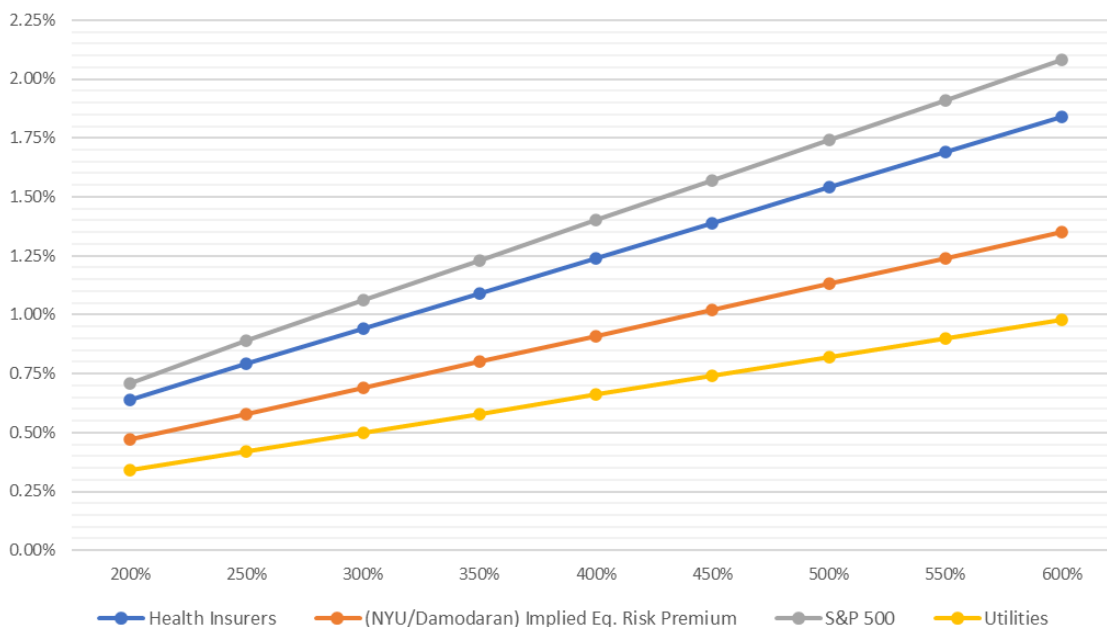
Treatment of Investment Income

The application of the WACC and CAPM formulas to the entirety of an insurer's reserves implies that the associated cost of capital is something that the MMC insurer must forgo in its entirety to meet its state regulatory requirements around RBC, and therefore this cost of capital needs to be financed by the state because unlike a commercial plan the MMC insurers lack the ability to directly price this non-benefit cost into its capitation rates.

If the reality is that insurers generally earn something on these reserves, the justification for fully financing the cost can be challenged. Although the realized return on maintaining the reserves may be less than the return required to justify the overall investment by the insurer in the MMC market, the existence of some earnings may reduce what is needed in the capitation rates to incentivize participation by the insurer in the MMC program.

For example, if an insurer expects a return of 10% on its capital investments and must maintain reserves of $100 million to operate within a state's MMC market, it will need to earn revenues of at least $10 million to justify the investment. Otherwise, the insurer would pursue some alternative investment that would earn them this prerequisite amount. If the insurer cannot directly earn this return, it may be the state's responsibility to finance it. However, if the insurer can earn $4 million on the $100 million in reserves while still meeting its RBC targets, the amount of cost of capital that would need to be financed in the rates would be reduced to $6 million.

The 2019 MHPA model purposefully excluded the consideration of investment income as a component to its underwriting gain model. This approach was consistent with ASOP 49, which allows, but does not require, the inclusion of investment income. In contrast, this Underwriting Margin Model includes a parameter that serves as a discount factor to the calculated cost of capital needed to finance an insurer's reserves.

A review of the NAIC filing data suggests that applying a discount of 3.7% is reasonable. This reflects the average rate of investment earnings by insurers operating within the Medicaid sector. The authors calculated this as the average investment earnings of the insurer divided by the insurer's total surplus over three years of NAIC filing data, between 2017 and 2019.

In addition to providing for a user-defined discount factor as another alternative to the author-derived discount factor of 3.7%, the model provides a proxy for discounting the necessary cost of capital. This alternative approach eliminates the risk-free rate and finances only the equity risk premium (i.e., the difference between the risk-free rate and expected market rate of return, multiplied by the beta) based on the assumption that even if Medicaid insurers are making conservative investment choices with their reserves, they could expect to minimally achieve a return equivalent to the risk-free rate.

Treatment of Income Tax
The WACC can be applied on a before- or after-tax basis. The suggested default is the after-tax basis.

RISK MARGIN

In addition to estimating the cost of capital component, the Underwriting Margin Model calculates a risk margin that considers the following:

1.   A detailed description of the user's program scenario identifying claims, administrative charges and cost of capital parameters
2.   The historical distributions of underwriting ratios (i.e., net gains and losses divided by revenues) as reported by the MCO industry to the NAIC for 2013 through 2019 and
3.   A user-defined target for probability of ruin, net income or risk margin.

Historical data are used to develop a statistical model that defines a probability distribution for the variation of the underwriting ratios (UWRs). The statistical model is based on a best-fit normal distribution of the data after removal of outliers. This best-fit statistical model is used to assign a probability to a set of expected claim outcomes for the user-specified program scenario. The model begins with a risk margin at zero and gradually increases the risk margin until the user-defined target is satisfied. The result is a risk margin that reflects the user's scenario, the historic industry distribution of underwriting ratios and the user-defined target.

The variations in UWRs are due to the variations in two components of the rate: claims and administrative costs. Since the available data do not offer enough details to delineate the variations in claims versus administrative costs, the model treats the UWR variation as solely the variation in claims because the variation in claims is likely to be more significant than the variation in administrative costs. For purposes of the modeling, the authors assume that the administrative cost will be fixed and not contribute to the variation of outcomes. This approach provides a reasonable distribution of expected claim outcomes, each associated with a UWR-driven distribution probability, that allows the model to calculate the implications of risk-sharing corridors and minimum/maximum medical loss ratio (MLR) requirements.

SELECTING AN UNDERWRITING MARGIN TARGET

The Underwriting Margin Model allows the user to select one of three different target types and sets the target level for the type selected.

The user of the model should analyze the results provided on the dashboard. Although the model will present a solution that is based on the target selected, the user should understand the implications of

selecting that target. For example, the user may select a probability of ruin target, but the solution offered by the model could generate a negative net income. The authors suggest carefully analyzing the implications of the target selection by examining the probability of ruin, net income, distribution of gains and losses and competitiveness of the premium rate. Reaching an acceptable result may involve testing various target types and target levels.

NET INCOME (BEFORE TAXES)

When the user selects the net income (before taxes) target, the model will find the risk margin that satisfies the target for the user's program scenario after accounting for the necessary cost of capital to meet reserve requirements. The net income is the sum of expected revenues less the sum of expected expenses. Revenues include premiums adjusted for unachieved withholds and net transfer payments to the insurer as well as the cost of capital paid to the insurer to fund its reserves and any cash flow considerations financed in the rate. Expenses include claims, administrative expenses, premium taxes, adjustments for gains returned to the state and short-term earnings on gains. Each of these components of net income is calculated for the set of claim outcomes that are weighted by the probabilities defined by the best-fit statistical model.

RISK MARGIN

The user can select the risk margin as the target type. For this selection, the model will return that same risk margin as a result. Although this may appear to be a simple exercise of just returning the user-provided entry as a result, the authors included this option because situations may come up where the user would like to use the model to calculate the cost of capital while setting a specific risk margin. Such a situation may arise when the certifying actuary wants to recognize a degree of uncertainty in their state- or product-specific experience that is not fully captured by the historical data that are normally distributed around a mean specified as the break-even point used in the model.

PROBABILITY OF RUIN

The user can also select the probability of ruin as its target type. The probability of ruin is the likelihood that the user's program will generate a net income loss that exceeds the target RBC amount. For example, if the user selects a probability of ruin of 0.5% and a target RBC of 525% of the ACL, the model will calculate a margin such that the cumulative probability of net income losses in excess of 525% of the RBC level is less than 0.5%. With the help of the model, the actuary can determine implications of the tradeoff between increasing the margin and reducing the probability of ruin.

The probability of ruin summary table in the Results Dashboard tab provides additional information about the probability of ruin including the following:

1. The probability that the RBC equity will fall below the user-defined minimum RBC level, as measured from the implied target RBC level, and
2. The probability that the RBC equity will fall below the 200% of ACL RBC level, as measured from the implied target RBC level.

The Underwriting Margin Model

At a summary level, the user of the Underwriting Margin Model provides underwriting/rating information, including the anticipated claim assumption for the rating period and the risk-sharing arrangement, selects the adjusted normal curve for the model to use to generate a set of probabilistic outcomes based on the cumulative density function of the selected curve, and selects the goal-seek parameter of the model as either net income, ruin probability or risk margin. Using this information, the model calculates the underwriting margin necessary to satisfy the user-specified goal-seek target. The Underwriting Margin Model employs the adjusted normal curve of the UWRs chosen by the user to simulate the variation of underwriting gains and losses, the variation of which is based on the selected curve's standard deviation.

The model uses an iterative calculation process that begins by setting the risk margin at zero and calculating a premium amount as the sum of the claims, administrative fees and underwriting margin. Then, using the calculated premium, net income before taxes and ruin probability is determined. This is done for a series of expected outcomes in a series of possible claims bins based on the user-selected adjusted normal curve/standard deviation, with the midpoint of the distribution being the user-provided anticipated claim assumption, and the variation around the claim midpoint dictated by the user-selected adjusted normal curve and its standard deviation. The model assumes that the variation in underwriting gains and losses is due to the variation in claims. A composite net income and ruin probability is then calculated to represent the results of the iteration under consideration. This composite is the weighted average of all the varied net income and ruin probabilities in the bin results, with the weights represented by the probability of each occurrence reflected in the selected curve.

In this iterative process, the risk margin is gradually increased causing the premium to increase and the bin results to change to yield a different set of outcomes until the user-specified goal-seek target is achieved, be it net income, probability of ruin or risk margin. At the end of the process, the model provides the risk margin that satisfies the user-stated target.

The model uses the following iterative process to determine the risk margin:

1. The model sets the risk margin at zero.
2. The model calculates the premium using the claims, administrative fees, the cost of capital and the risk margin (initially zero).
3. The model calculates the median loss ratio by dividing the claims by the premium.
4. The model sets up 160 expected claim outcome bins around the midpoint, 80 of which are based on the median loss ratio plus increments of 0.5% above the median, and another 80 based on decrements of 0.5% below the median.
5. For each claim bin, the net income is calculated applying the user provided parameters regarding the minimum loss ratio, the maximum loss ratio, the risk-sharing provisions, the MLR limits, the net transfer payments, the cost of capital infusions and the cost of unachieved withholds.
6. The UWR is calculated for each bin and is assigned a probability of that UWR occurring according to the selected normal distribution curve derived from the NAIC data.
7. A weighted average of the net income results is calculated using the bin probabilities.
8. The probability of ruin is determined by adding the probabilities for all bins where the losses exceed the user-defined RBC target.
9. If net income is the target, the weighted average net income is compared to the target and the difference is calculated. If the difference is very close to zero, the process ends. If not, one-half of this difference is added to the margin estimate, and the process returns to Step 2.
10. If the probability of ruin is the target, a line is determined between the minimum and maximum RBC levels. The minimum RBC level will have a pair of data points, defined by the probability of

ruin and the RBC as a percent of premium; the maximum RBC level will have a similar pair. A straight trend line is drawn between the two pairs, and the calculated probability of ruin is fitted to the straight line to determine the corresponding percent of premium. This percentage of premium is subtracted from the target percent of premium to determine the differential from the target. If this differential is close to zero, the process ends. If not, this difference is divided by 10 and added to the margin estimate. The process returns to Step 2.

11. If the risk margin is the target, the process will end after an initial run because the margin will equal the target.

The model assumes that the claims and administrative cost PMPM assumptions are projections that are as accurate as that for the typical MCO. The model uses a normal distribution for the expected claims outcomes that assumes that the claim PMPM assumption is the median outcome and expected claim losses will be perfectly offset by expected gains, excluding risk sharing, loss ratio limits, cash flow adjustments and withhold recoupment. If the user's estimate of expected claims is expected to be more variable than typical, such as claim estimates for a new program, a new market or a LTC program, the actuary may consider a provision for additional or reduced risk margin beyond that which is determined by the model. Further, the cost of capital is treated as the minimum underwriting margin that eliminates the possibility of negative risk margin that the researchers view as being impermissible per CMS guidelines.

Development of the Underwriting Margin Model

NAIC ANNUAL HEALTH STATEMENTS AND MCO DATA BOOKS

For the development of the Underwriting Margin Model, the authors sought to understand the historical variation of Medicaid underwriting margins for MCOs throughout the country and to determine whether MCO performance over time would support a statistical model that can estimate future performance of MCOs, given a set of user-provided parameters that shape the probabilities of outcomes. For this evaluation, the authors relied on the SOA Research Institute's subscription to S&P Capital IQ Pro to review and analyze S&P's database of NAIC Health Annual Statements for health plans from CY 2013 through 2020.

The authors also reviewed MCO data books for rate periods ending from 2016 through 2021 to ascertain the prevailing practice for the inclusion of and the amount of underwriting margin in MMC rate development. The purpose of this review was to inform the design of the Underwriting Margin Model and, if possible, incorporate it into the development of the model. Project Oversight Group members assisted the authors with obtaining a total of 280 rate books covering rate periods ending 2016 through 2021. These rate books covered 33 states as of rate periods ending 2020, and 23 states for 2016 with a progressively greater number of covered states between 2016 and 2020. Having been collected during mid-2021, the inventory for 2021 was deemed incomplete, with only 17 states covered for 2021.

REVIEW AND ANALYSIS OF THE MCO DATA BOOKS

Review and analysis of the rate books yielded observations, highlighted in

Table 5, that were informative and consistent with the SOA's previous study and surveys on this subject and pointed to a downward trend in the amount of margin included in rate development. However, its incorporation into the Underwriting Margin Model was determined to be limited because of the mismatched characteristics of the rate books vis-à-vis the NAIC financial statements, from which retrospective performance statistics were obtained. The rate books generally provide benefit- or population-specific rates with a prospective look at a particular rate period that may not adhere to a calendar year, and they are prepared by the entity setting the rates, that is, states. This contrasts with the NAIC financial statements of Medicaid MCOs, which provide a retrospective view of the performance of the MCOs' Medicaid line of business on a calendar year basis, in the aggregate, with no discernment of the benefit plans or subpopulations served.

The authors effectively reviewed a total of 2,885 rate developments, with each rate book containing an average of 10.3 rate categories as defined by product types and rate cells. The 2021 inventory was deemed incomplete, as noted above, and inconclusive for the authors' review, because some may have contained provisions for the impact of the COVID-19 pandemic. The authors therefore focused their analysis on the rate periods ending 2016 through 2020, covering 256 (91%) of the 280 total rate books obtained, and 2,593 (90%) of the 2,885 total rate developments. Although 2020 saw the onset of the COVID-19 pandemic with uncertainties around its impact on 2020 health claims, the authors did not exclude 2020 from this review because the rate books represented the prospective, anticipated claims expenses forecasted during 2018 and 2019 and were most likely free of COVID-19 impact anticipations.

As exhibited in

Table 5,

1. 91% of the rate developments in the rate books covering rate periods ending in 2020 included an explicit provision for an underwriting margin; this contrasts with 83% for rate periods ending in 2016.
2. The non-weighted average of the reported underwriting margins, excluding 0% and the nonreported, shows a decreasing trend over time, with 2016 at an average of 1.39% and 2020 at an average of 1.20%.
3. Further examination of the minimum and maximum underwriting margin in any given year does not provide a meaningful trend over time, though one could conclude a general downward direction in both the minimum and maximum margins when measured at the two end points of 2016 and 2020.
4. The average of the reported underwriting margins for the 2016 to 2020 rate periods is 1.31%, with a range of 0.42% for the minimum and 3.61% for the maximum.
5. A further delineation of the underwriting margins to exclude dental- and chiropractic-only benefit plans has a noticeable impact on the observations, with lower margin ratios for both the averages and the maximums in any year and for the 2016 to 2020 period.
6. The average underwriting margins, excluding dental- and chiropractic-only plans, for the 2016 through 2020 rate periods is 1.24%, with a high of 1.30% for 2016 and a low of 1.15% for 2020.
7. The maximum underwriting margins, excluding dental- and chiropractic-only benefit plans, for the 2016 through 2020 rate periods is 2.44%.

Table 5.
SURVEY OF MEDICAID DATA BOOKS, 2016–2020

	2016	2017	2018	2019	2020	2016–2020
Count of state data books/files reviewed	40	46	52	58	60	**256**
Count of rate developments reviewed	334	408	564	725	562	**2,593**
Percent of rate developments reporting UW margin	83%	86%	85%	81%	91%	**85%**
Non-wt. avg. of UW margin, excl. 0%	1.39%	1.37%	1.35%	1.23%	1.20%	**1.31%**
Minimum UW margin, excl. 0%	1.00%	0.35%	0.75%	0.01%	0.01%	**0.42%**
Maximum UW margin	3.70%	3.85%	4.00%	3.45%	3.03%	**3.61%**
Maximum UW margin, excl. chiro. & dental	**2.05%**	**3.15%**	**2.38%**	**2.38%**	**2.26%**	**2.44%**
Non-wt. Avg. of UW margin, excl. chiro. & dental	**1.30%**	**1.29%**	**1.29%**	**1.18%**	**1.15%**	**1.24%**
Informational						
Maximum UW margin–chiro.-only plans	3.70%	3.85%	4.00%	3.45%	3.03%	**3.61%**
Maximum UW margin–dental-only plans	2.06%	2.09%	2.08%	2.05%	2.09%	**2.07%**
Non-wt. avg. of UW margin–chiro.-only plans	2.21%	2.16%	2.04%	2.08%	2.03%	**2.10%**
Non-wt. avg. of UW margin–dental-only plans	2.00%	2.05%	2.03%	2.03%	2.03%	**2.03%**

REVIEW AND ANALYSIS OF NAIC DATA WITH S&P CAPITAL IQ PRO

After reviewing key sets of data fields and metrics, such as those used in the 2017 SOA study and the 2019 MHPA study, as well as Milliman's annual report titled "Medicaid Managed Care Financial Results[44]," the authors developed a hybrid dataset that includes the financial metrics as defined by Milliman in Appendix 2 of its 2020 report (see Figure 4) and additional fields delineating for-profit or not-for-profit status and indicating state participation in Medicaid Expansion. This dataset covers eight calendar years, from 2013 through 2020, and is included in the Excel Workbook. The references and descriptions for the key fields used in the calculation of ratios and statistics employed are listed in Table 6.

Table 6.
NAIC FINANCIAL METRICS

NAIC Reference	Column Name	Line Item	S&P Capital IQ Pro Report Name
P7, Row 7, Col. 8	Title XIX-Medicaid	Total Revenue	Analysis of Operations by LOB
P7, Row 17, Col. 8	Title XIX-Medicaid	Total Hospital and Medical Expenses	Analysis of Operations by LOB
P7, Row 19, Col. 8	Title XIX-Medicaid	Claims Adjustment Expenses	Analysis of Operations by LOB
P7, Row 20, Col. 8	Title XIX-Medicaid	General Administrative Expenses	Analysis of Operations by LOB
P7, Row 21, Col. 8	Title XIX-Medicaid	Increase in Reserves for A&H Contracts	Analysis of Operations by LOB
P7, Row 24, Col. 8	Title XIX-Medicaid	Net Underwriting Gain or (Loss)	Analysis of Operations by LOB
P28, Row 14, Col. 1	Total Adjusted Capital–Current Year	Total Adjusted Capital	SNL Highlight Pages (S&P database)
P28, Row 15, Col. 1	Authorized Control Level–Current Year	Authorized Control Level	SNL Highlight Pages (S&P database)
P30, Row 6, Col. 9	Title XIX-Medicaid	Current Year Member Months	Exhibit of Premiums, Enrollment and Utilization

---

[44] Supra note 34.

The delineation field for-profit/not-for-profit status were determined in several steps starting with the NAIC Ownership Structure field in the S&P database, then the status identified in the 2017 SOA dataset, and finally an individual company search when information was not available in the other two sources. The Medicaid Expansion state designation was based on information obtained from Kaiser Family Foundation as of November 2021.[45]

The authors calculated ratios and statistics on the following: the underwriting ratio (UWR), medical loss ratio (MLR), and average per member per month (PMPM) for each of the MCO/year entries. The UWR was calculated by dividing the Net Underwriting Gain/(Loss) by the Total Revenue. The MLR was calculated as the sum of Total Hospital and Medical Expenses and Increase in Reserves, divided by Total Revenue. The PMPM Revenue was calculated by dividing the Total Revenue by the Total Member Months

The resulting dataset for 2013 through 2020 contained 1,698 MCO/year entries with nonzero Medicaid member months. After reviewing the data in detail, the authors applied filters to exclude potential outliers, resulting in a net of 1,308 MCO/year entries.

The 1,308 entries comprise the final dataset for the Underwriting Margin Model. The details of the data filters, their justification and impact are listed in Table 7.

Table 7.
OUTLIER EXCLUSIONS FROM MCO/YEAR DATA ENTRIES

Initial MCO Data Entries	1,698
Less entries with fewer than 50,000 member months *Elimination of small and new plans whose results could skew the data*	−85
Less entries with revenue PMPM less than $100 PMPM *Elimination of plans with limited benefits, such as dental- or chiropractic-only plans*	−95
Less entries with UWRs less than −50% or greater than 50%. *Elimination of plans exhibiting extreme variability in their results*	−5
Less six entries with UWR's equal to zero that were all reported by the same entity for six consecutive years and assumed to be erroneous	−6
Less CY 2020 data *Significantly higher UWRs are likely due to the COVID-19 pandemic*	−199
Filtered MCO Data Entries	1,308

Table 8 presents the by-year summary and statistics the authors reviewed for the development of the underwriting margin curve selections in the model.

Table 8.
SUMMARY OF THE UNDERWRITING MARGIN MODEL DATASET, BY YEAR, 2013–2020

Year	Number of MCOs	Member Months	Revenue PMPM	Mean Underwriting Ratio (UWR)	Std. Dev. of UWR	Mean Medical Loss Ratio (MLR)	Std. Dev. of MLR
2013	179	1,537,917	$365.43	0.78%	0.0686	87.89%	0.0768
2014	187	1,758,402	$401.56	0.77%	0.0797	86.79%	0.0808
2015	196	2,120,449	$419.19	2.19%	0.0692	85.68%	0.0736
2016	191	2,308,526	$460.82	1.36%	0.0618	86.65%	0.0706
2017	189	2,365,097	$478.02	0.27%	0.0719	88.68%	0.0745
2018	185	2,431,497	$532.69	0.66%	0.0607	86.67%	0.0725
2019	181	2,426,229	$580.34	−0.25%	0.0563	88.20%	0.0631
Total/Average	1308	2,138,091	$462.25	0.84%	0.0675	87.20%	0.0738
Informational							
2020	199	2,451,700	$616.85	2.89%	0.0509	84.24%	0.0618

Starting with the composite of the CY 2013 through CY 2019 data, the authors sorted the 1,308 data entries from the smallest UWR to the largest, determined the median and calculated the standard deviation for the data set. Using the median and the standard deviation, the authors developed a normal curve and compared it to the data entries and calculated the R-squared to determine how well the normal curve represented the data. By adjusting the standard deviation, the authors maximized the R-squared and improved the fit of the normal curve.

The result of this process for the composite CY 2013–CY 2019 period is shown in Table 9.

Table 9.
RESULTS FOR CY 2013 TO CY 2019 DATASET

Number of Entries	1,308
Median UWR	0.0144
Standard Deviation of UWR	0.0675
R-squared	0.8302
Adjusted Standard Deviation of UWR	0.0371
Adjusted R-squared	0.9595

Upon further consideration of the dataset, the authors added additional flexibility in curve selection options for the user to meet varying rating considerations and preferences, including the option for the user to select a user-defined curve. The composite data of CY 2013 to CY 2019 were delineated into various subsets for which UWR curves were developed with a similar process noted above. These subsets include the following:

1. CY 2013 to CY 2015 composite
2. CY 2016 to CY 2019 composite
3. MCO for-profit status
4. MCO not-for-profit status
5. Expansion (Medicaid) state

6. Non-expansion (Medicaid) state
7. MCO size (see methodology discussion below for greater detail in sample construction of curve)

Table 10 provides the statistics for these curves, repeating the CY 2013 to CY 2019 statistics.

Table 10.
RESULTS FOR ALL AVAILABLE CURVES, EXCLUDING MCO SIZE

	CY 2013 to CY 2019	CY 2013 to CY 2015	CY 2016 to CY 2019	For-Profit MCOs	Not-For-Profit MCOs	Expansion State	Non-Expansion State
Number of Entries	1,308	562	746	811	497	824	484
Median UWR	0.0144	0.0202	0.0123	0.0200	0.0041	0.0148	0.0141
Standard Deviation–UWR	0.0675	0.0728	0.0631	0.0631	0.0714	0.0669	0.0686
R-squared	0.8302	0.7629	0.8052	0.8660	0.7103	0.8108	0.7785
Adjusted Std. Deviation–UWR	0.0371	0.0389	0.0353	0.0398	0.0336	0.0362	0.0389
Adjusted R-squared	0.9595	0.8825	0.9267	0.9488	0.8995	0.9470	0.8829

MCO Size Curve Selection

For the "MCO Size" curve selection, the model provides a curve with a standard deviation that varies by the member months number the user provides in the user parameters. To develop a relative factor, the authors allocated the 2013–2019 data into deciles (10% ranges) based on member month size and observed that the standard deviation for each decile decreased as the member months increased. The authors then plotted the member month and standard deviation pairs for each decile, and then they fitted a curve to the plotted points, maximizing the *R*-squared statistic; see Figure 4.

Figure 4.
STANDARD DEVIATION OF UW RATIO, BY MCO SIZE (2013–2019)
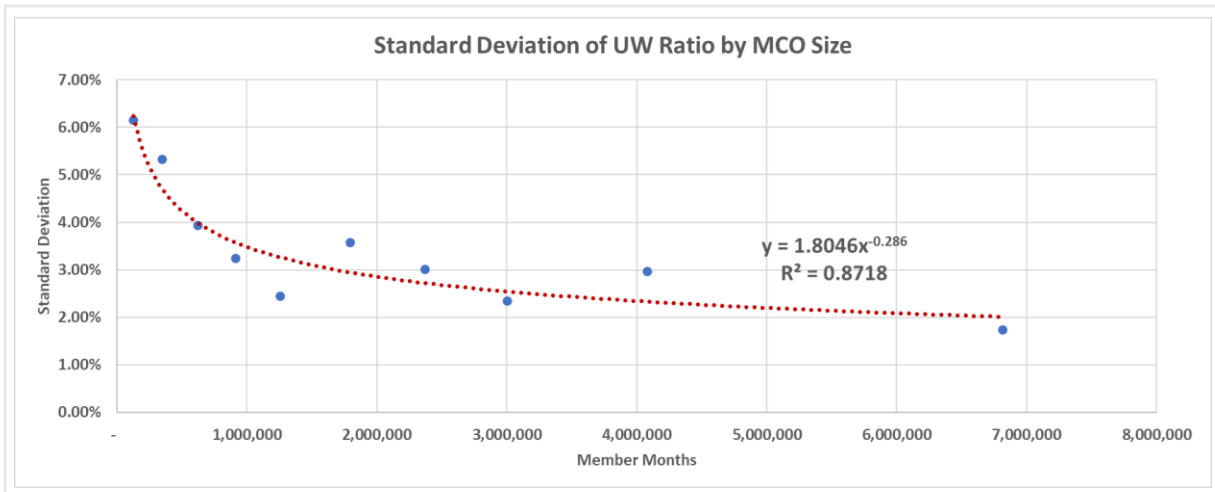
The MCO size curve function, hence, is expressed as

$$Y = 1.8046x^{-0.286},$$

$$R^2 = 0.8718,$$

where *x* is the member months number, and *Y* is the standard deviation. The model uses this curve function to assign a standard deviation to the user-provided member months number when the MCO size

curve is selected. The standard deviations for each of the deciles were adjusted proportionally using the standard deviation adjustment made to the CY 2013 to CY 2019 composite curve.

Note that this formula does not adjust for LTSS (long-term services and supports) -only MCOs that may be included in the dataset. These plans tend to be smaller and are likely subject to more variation. The user should be aware of this limitation when using this formula.

Conclusion

The authors of this report have presented the case for incorporating margin, also referred to as risk margin, profit margin, underwriting gain and underwriting margin, in actuarially sound Medicaid Managed Care (MMC) capitation rates, drawing on and referring to federal regulation,[46] CMS guidance,[47] Actuarial Standards of Practice[48] issued by the ASB, health plan financial data and MMC rate book submissions.

This research project follows on previous work on the subject, first initiated in a study titled "Medicaid Managed Care Organizations: Considerations in Calculating Margin in Rate Setting,"[49] published in 2017 by the Society of Actuaries (SOA 2017 study), then followed by a study with an accompanying Excel-based model titled "Underwriting Gain Development for Managed Medicaid Capitation Rates,"[50] published in 2019 by the MHPA (MHPA 2019 study). Although the SOA 2017 study drew on experience and financial data from 2013 through 2015, rate book information and comprehensive surveys of health plan actuaries and executives to present the prevailing practice and level of margin incorporated in MMC capitation rates, the MHPA 2019 study utilized the SOA 2017 dataset and presented additional research on defining the components of a margin and presented a model to assist the rate-setting actuary in developing a margin.

In this report, the authors propose "underwriting margin" as the unifying term for the different monikers by which margin has been referred to in previous reports, guidance and discussions, and they present the considerations for the components that should make up an underwriting margin, those being cost of capital and a margin for risk. The accompanying Excel-based model draws on health plan experience data from 2013 through 2019, circumventing the unknown impact of COVID-19 in 2020–2021 experience, and presents the user with a flexible model that incorporates a number of parameters and considerations for MMC capitation rate setting, with user overrides on some parameters, gives the user the flexibility of choosing how to deploy the model's underlying historical reference data, and offers the user three goal-seek options for the development of the underwriting margin.

The authors believe that this report, the research and the accompanying model provide a basis for developing an underwriting margin that is transparent in its development, empirically supported, methodologically sound and actuarially grounded—all of which are characteristics that the authors deem necessary for maintaining a competitive and fair MMC market.

It is worth noting that current events as they relate to the impact of the recent retrenchment in the U.S. equity markets on equity premium development (for cost of capital calculation), the implications of COVID-19 (on utilization), as well as inflation weighing on benefit costs and administrative costs present questions for which the authors are cautiously optimistic their model is sufficiently robust to allow the user to make necessary adjustments and substitute user-defined assumptions for specified parameters.

To the actuary using this model, all assumptions used in developing an underwriting margin should be reviewed individually, in their totality and in the context of their application. This model is open by design

---

[46] 42 CFR § 438.4.

[47] Centers for Medicaid & Medicare Services. June 2021. 2021–2022 Medicaid Managed Care Rate Development Guide. Retrieved June 28, 2021, from https://www.medicaid.gov/Medicaid/downloads/2021-2022-medicaid-rate-guide.pdf.

[48] Actuarial Standards Board. 2015. Actuarial Standard of Practice No. 49: Medicaid Managed Care Capitation Rate Development and Certification. Retrieved June 13, 2021, from http://www.actuarialstandardsboard.org/asops/medicaid-managed-care-capitation-rate-development-and-certification/.

[49] Supra note 30.

[50] Supra note 21. See also S. H. Gibson, J. R. Piekut and J. Simons. 2019, October 31. Underwriting Gain in Managed Medicaid: Starting the Conversation. *Health Watch* (Society of Actuaries).

because it is intended to be used as a tool to derive an underwriting margin. Unreasonable assumptions will yield unreasonable and questionable results, and the user should be aware of the limitation imposed by the flexibility of this Underwriting Margin Model.

Acknowledgments

Appendix A

FILES FOR DOWNLOAD

Accompanying this report are two Excel workbooks:

1. SOA 2022 Underwriting Margin Model-v0.60.xlsx. This workbook is the model the reader can use to generate an underwriting margin for the purposes of Medicaid Managed Care capitation rate setting. Additional discussion on the use of the model is presented below. The model will be available for download from the SOA website.

2. SAO 2022 UW Margin Model Data Backup-v0.20.xlsx. This workbook contains the historical NAIC dataset referenced in the report, the development of the underwriting margin curves used in the model, and the charts and graphs used in the report. Refer to the "Descriptions" tab/worksheet in the workbook for information on the contents of the workbook. The workbook will be available for download from the SOA website.

Appendix B

A GUIDE TO USING THE SOA 2022 UNDERWRITING MARGIN MODEL

The SOA 2022 Underwriting Margin Model is an Excel-based workbook model with seven visible tabs/worksheets that can be categorized into three major themes:

1. Information
2. Inputs and
3. Outputs

INFORMATION

The Information category includes the following tabs/worksheets:

Instructions–This tab contains descriptions of the user parameter fields included in the User Parameters tab, and suggested defaults for some of them.

Interpretation–This tab provides a brief guide on interpreting the different sections of output results on the Results Dashboard.

INPUTS

The Inputs category includes the User Parameters tab/worksheet. Here the user is presented with a series of cells where the user will either input values directly or select from a drop-down list. Most of the input cells will have an information symbol ⓘ next to them, clicking on which will display explanatory information and, where appropriate, suggest a default value for the user to consider. The full list of user parameters and descriptions can be found in the Instructions tab of the SOA 2022 Underwriting Model workbook. The User Parameters are grouped into four broad categories:

1. General Parameters–In this section, the user selects the goal-seek orientation for the model as either probability of ruin, net profit before taxes or risk margin, and provides the calculation target for the model. The user then selects the underwriting margin curve to be used in the analysis and provides basic information about the program being rated, e.g., enrollment, claims, administrative expense, withhold percent etc.

2. Cost of Capital Parameters–In this section, the user either selects from a drop-down list or provides the values needed to develop the cost of capital component of the underwriting margin. Parameters include risk-based capital (RBC) thresholds, methods and the variables needed for developing the weighted average cost of capital (WACC), consideration for investment income, and considerations for the impact of cash flow interruptions on the cost of capital. See the report for a detailed discussion of the topic of the cost of capital, its consideration and its development. Note that the managed care discount factor, parameter no. 17, has a corresponding section for the user to provide additional information related to the calculation of the managed care discount factor as per NAIC guidelines. This parameter and its corresponding section are visible only when "NAIC Filings + User Parameters" is selected for parameter no. 15.

3. MLR Provisions and Risk Share Parameters–In these sections the user will have the opportunity to indicate whether minimum and/or maximum MLR provisions apply, and whether the program will have risk-sharing provisions. For the risk share provisions, the

user can indicate whether the risk share is around the medical baseline or a MLR. Upon selection of either type of risk share, the user can also specify the corridors for the risk share arrangement.

4. User-Defined Parameters Inputs–This section contains all the parameters for which there is a user-defined option. Whenever "user-defined" is selected in an applicable parameter a corresponding line in this section will become visible and highlighted in green for the user to input their own value to be considered in the corresponding field in one of the other categories.

OUTPUTS

The Outputs category includes the following tabs/worksheets:

A. Results Dashboard
B. Graphs
C. COC (cost of capital) Calculation
D. Net Income Matrix

The **Results Dashboard** is divided into multiple tables and output results. Below are descriptions of select tables; the full list of tables and their descriptions can be found in the Interpretations tab of the SOA 2022 Underwriting Margin Model workbook.

Underwriting Margin–This table provides the user with the basic components of the underwriting margin, the risk margin and the cost of capital as determined by the model.

Probability of Ruin by RBC Level–This table shows the probability of ruin, the likelihood of spending all of the RBC reserve on losses for various RBC levels. The RBC amount is shown as a dollar amount, PMPM and a percent of premium. The value of excess losses is the expected value of net income losses in excess of the RBC level. The last column shows, assuming a loss in excess of the RBC level, the average loss amount ($M[millions]) weighted by the relative probability of occurrence.

Gain and Loss Distribution–This table shows the likelihood of a gain or a loss for various percentage intervals. It also totals how often a gain, or a loss, will occur for all intervals and what the average gain is given that a gain occurs, and what the average loss is given that a loss occurs. This table is accompanied by a graphical representation of the gain/loss intervals and the likelihood of gains and losses.

Premium Development and Cost of Capital Summary–This table shows the components used to build the premium. The premium includes the user-provided assumptions for claims, administrative expenses and premium taxes and the model-generated cost of capital and risk margin. The results are shown as $M[millions], PMPM and percent of premium.

Graphs–This tab contains graphical representations of the following tables from the Results Dashboard:

Probability of Ruin by RBC Level
Income Statement
Premium Development

COC (cost of capital) Calculation–This worksheet presents a detailed, step-by-step development of the cost of capital, with considerations for investment income on reserves, as well as considerations for time value

of money on cash-flow considerations related to delays in premium payments, withhold recoveries, claims payment delays, and gains and losses on the income matrix.

Net Income Matrix—This worksheet presents detailed premium, net income and probability of ruin development based on the information in the User Parameters section and the cost of capital development, to calculate gain/(loss) scenarios with considerations for risk share provisions, MLR provisions, transfer payments and unachieved withholds. Gain/(loss) calculations are made for a total of 160 observations (bins) around the median, where the median is defined by the user-provided information for claims expense PMPM, administrative expenses PMPM, state premium tax and the model-generated underwriting margin. The 160 bins are laid at 80 intervals of loss ratios spaced at 0.5% above the median and 80 intervals of loss ratios spaced at 0.5% below the median. These 160 bins represent the normal curve around the median at +40% and −40% loss ratios, distributed based on the standard deviation of the underwriting margin curve selected in the User Parameters tab, and its probability density function. The results of each bin are totaled as the weighted average based on the probability associated with each bin. Information from the worksheet is relayed to the Results Dashboard.

The workbook also contains hidden worksheets that include backup data used in the drop-down selections in the User Parameters tab. The user may unhide these worksheets for review and/or update.

About The Society of Actuaries Research Institute

Serving as the research arm of the Society of Actuaries (SOA), the SOA Research Institute provides objective, data-driven research bringing together tried and true practices and future-focused approaches to address societal challenges and your business needs. The Institute provides trusted knowledge, extensive experience and new technologies to help effectively identify, predict and manage risks.

Representing the thousands of actuaries who help conduct critical research, the SOA Research Institute provides clarity and solutions on risks and societal challenges. The Institute connects actuaries, academics, employers, the insurance industry, regulators, research partners, foundations and research institutions, sponsors and non-governmental organizations, building an effective network which provides support, knowledge and expertise regarding the management of risk to benefit the industry and the public.

Managed by experienced actuaries and research experts from a broad range of industries, the SOA Research Institute creates, funds, develops and distributes research to elevate actuaries as leaders in measuring and managing risk. These efforts include studies, essay collections, webcasts, research papers, survey reports, and original research on topics impacting society.

Harnessing its peer-reviewed research, leading-edge technologies, new data tools and innovative practices, the Institute seeks to understand the underlying causes of risk and the possible outcomes. The Institute develops objective research spanning a variety of topics with its strategic research programs: aging and retirement; actuarial innovation and technology; mortality and longevity; diversity, equity and inclusion; health care cost trends; and catastrophe and climate risk. The Institute has a large volume of topical research available, including an expanding collection of international and market-specific research, experience studies, models and timely research.

Society of Actuaries Research Institute
475 N. Martingale Road, Suite 600
Schaumburg, Illinois 60173
www.SOA.org