

*Considerations in the Calculation of
Premium Deficiency Reserves
(Under U.S. accounting rules)*

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Abstract

Effective in 2001, statutory accounting rules will change as a result of the NAIC's (National Association of Insurance Commissioner's) "codification" project. One of these changes will be the creation of a new statutory reserve requirement for property/casualty companies, the required calculation of a "premium deficiency reserve". Although these reserves have been required under U.S. GAAP accounting rules for quite some time, there has been little said about them in the available actuarial literature, especially as to how they might be calculated. This paper is meant to address that gap, both as to current U.S. GAAP accounting rules and the new statutory accounting rules (including a discussion as to how the premium deficiency reserve differs under these two accounting systems).

Introduction

What are Premium Deficiency Reserves, and why are they an emerging issue for property/casualty companies?

The Premium Deficiency Reserve represents the expected loss on in-force policies that has yet to otherwise be recorded. A simplistic calculation would be the unearned premium reserve, less "the sum of expected claim costs and claim adjustment expenses, expected dividends to policyholders, unamortized acquisition costs¹, and maintenance costs"² relating to the unearned premium reserve. Starting January 1, 2001, the calculation of these reserves will be required for the first time under statutory accounting, greatly expanding the number of companies impacted by the reserve, even if only a few of the calculations result in a non-zero value.

These reserves have been a requirement under U.S. GAAP accounting rules at least since the issuance of Financial Accounting Standards Board - Statement 60 (FAS 60)³, in 1982. FAS 60 devotes only two sentences to guidance on how the reserve is to be calculated⁴. An Issues Paper on the computation of premium deficiency reserves was circulated by the AICPA⁵ in 1984, but

¹ "Unamortized acquisition costs" include both acquisition costs *yet* to be paid (and associated with this unearned premium) and any such costs that have *already* been paid, but were then offset in the income statement by the establishment of a deferred acquisition cost (DAC) asset. Note that this and the other terms in this quote are discussed later, in B.2 - "Issues affecting individual components" of this paper.

² Financial Accounting Standards Board (FASB), Statement # 60 - Accounting and Reporting by Insurance Enterprises, paragraph 33. This FASB statement is often abbreviated as SFAS 60, or FAS 60.

³ FAS 60 stands for Financial Accounting Standard 60.

⁴ for short-duration contracts. FAS 60 provides separate accounting rules for what are described as short-duration versus long-duration contracts. Most property/casualty contracts are considered short-duration contracts, while most life insurance contracts are considered long-duration contracts. While no definitive definition is given in FAS 60, paragraph 7 describes a short-duration contract as a contract that "provides insurance protection for a fixed period of short duration and enables the insurer to cancel the contract or to adjust the provisions of the contract at the end of any contract period, such as adjusting the amount of premiums charged or coverage provided."

The two sentences regarding premium deficiency reserves and short-duration contracts are found at the end of paragraph 32 and the beginning of paragraph 33 in FAS 60.

The FASB is working on a "fair value" project for financial instruments. If applied to insurance, this project would eliminate the need for a premium deficiency reserve, as it would require establishing the loss and unearned premium reserves at what their "fair value" would be. Presumably this fair value would already reflect any deficiency in the original premium.

⁵ AICPA stands for the American Institute of Certified Public Accountants. This issue paper, titled "Computation of Premium Deficiencies in Insurance Enterprises" was sent to the FASB in March, 1984.

FASB took no action on it, hence it is not authoritative guidance. As a result, the only guidance for U.S. GAAP purposes comes from private publications with no authoritative standing, such as those used internally by the big 5 accounting firms.

Statutory accounting rules never used to mention this reserve. This changed with the NAIC's attempt to standardize, or codify⁶, statutory accounting rules. The resulting Statement of Statutory Accounting Principles Number 53 (SSAP 53) establishes a premium deficiency reserve requirement, effective January 1, 2001. Only one paragraph is devoted to describing their calculation.⁷

This paper is an attempt to address the lack of guidance or public discussion on the premium deficiency reserve calculation⁸, especially for the actuarial audience. It will address issues and possible calculation alternatives for GAAP and statutory accounting of property/casualty premium deficiency reserves, for short duration policies only. It is not authoritative guidance, as such guidance can only be produced by an official "standards" body, but hopefully it will be an educational reference for those interested in or responsible for calculating these reserves.

The rest of this paper is organized into the following sections.

- A. Simple calculation example - fundamental steps in the calculation of these reserves.
- B. Issues - including Stat vs. GAAP differences. Each issue will be discussed in relation to the impact on fundamental steps.
- C. Suggested multi-tier approach - a suggestion as to how to minimize the effort and resources required to calculate these reserves.
- D. Data sources - a brief discussion of the major alternative data sources that can be used in parameterizing the Premium Deficiency Reserve (PDR) calculation, and their strengths and weaknesses.
- E. Findings and conclusions

A. Simple calculation example

Below is a simple example of how the premium deficiency reserve can be calculated, both under GAAP and Statutory accounting rules. The example shows the components of the calculation in the same order as the description in the introduction. (All future examples will follow the same order, so that the impact of each added complication can be more easily tracked.)

⁶ This project became known as the "codification" project. A brief summary of the codification project can be found in the preamble to the NAIC's Accounting Practices and Procedures Manual. For the March 2000 edition of the version effective January 1, 2001, this summary is found on pages P-3 and P-4.

⁷ For certain long-duration property/casualty contracts, such as long term warranties, there is at least one paragraph (# 29) in SSAP 65 describing a required reserve calculation that looks like a premium deficiency reserve.

⁸ There was a discussion concerning Canadian premium deficiency reserve requirements, titled "Study Note on Actuarial Evaluation of Premium Liabilities", published in the Fall 1999 CAS Forum. While many of the concepts underlying the calculation in Canada are the same, there are enough differences in U.S. versus Canadian accounting to justify a separate discussion.

This example makes the following simplifying assumptions:

- Premiums are all booked, billed and collected up-front, with no installments and no agents balances issues.
- No reflection of time value of money will be made.
- The company has only one legal entity (statutory accounting issue)
- The company writes only one line, with all business acquired, serviced, and measured (as to profitability) in the same manner
- No federal income taxes (FIT)
- No reinsurance impacts

Table 1 - simple Premium Deficiency Reserve calculation

Accounting rules	Scenario	Unearned Premiums (a)	Expected L&AE (b)	Expected policyholder dividends (c)	unamortized acquisition costs (d)	maint. costs (e)	Profit (f)	Premium Deficiency Reserve (g)
GAAP	A	100	60	5	20	5	10	0
	B	100	80	5	20	5	-10	10
	C	100	100	5	20	5	-30	30
Statutory	A	100	60	-	0	5	35	0
	B	100	80	-	0	5	15	0
	C	100	100	-	0	5	-5	5

Notes:

item (f). "Profit" equals (a) - (b) - (c) - (d) - (e)

item (c) is not included in the statutory calculation instructions

item (d) should be the same for statutory and GAAP calculations, except for the impact of amortizing the deferred acquisition cost (DAC) asset. Statutory accounting does not allow DAC assets.

Note that the premium deficiency reserve (PDR) can go no lower than zero. As such, once it has been established that the floor of zero applies, the reserve calculation is finished. This aspect of the PDR can be used to greatly simplify its calculation. (See discussion in section C below.)

GAAP accounting rules require any premium deficiency reserve to be reflected first as a reduction to the deferred acquisition cost asset. Only after this asset has been fully offset would a separate premium deficiency liability appear. The table below shows the impact of these rules applied to the simple example above.

Table 2 - accounting balance sheet entries resulting from simple example

Scenario	GAAP accounting				statutory accounting	
	Indicated PDR	DAC asset		net PDR liability	PDR liability	DAC asset
		pre-offset	post offset			
A	0	20	20	0	0	na
B	10	20	10	0	0	na
C	30	20	0	10	5	na

B. Issues

If the PDR calculation was always as simple as the above example, then there would not be a need for this paper. Unfortunately, the calculation of this reserve can become extremely complex.

Major complicating issues in the calculation of this reserve are discussed below. The first issues discussed are those affecting *all* of the reserve components⁹ in the simple example. Next, the issues affecting just individual components are discussed. All the examples provided of an issue's impact follow the same general format as in the simple example above.

1. Issues affecting all reserve components
 - a) Risk margin / conservatism
 - b) Time value of money
 - c) Actual costs versus expected costs
 - d) Line of business groupings and offsets
 - e) GAAP versus statutory differences
 - f) Reinsurance
2. Issues affecting individual components
 - a) Interest rate
 - b) Premium issues
 - c) Losses & loss adjustment expenses
 - d) Policyholder dividends
 - e) Acquisition costs
 - f) Maintenance costs
 - g) Other (including FIT)

1. Issues affecting all reserve components

a. Risk Margin / Conservatism

The premium deficiency reserve is meant to reflect the *expected* deficiency in the in-force premiums. It is not meant to reflect the *possible* deficiency in those premiums. That is the job of the company's capital and surplus. As such, there should be no adjustment for risk or reflection of risk in the parameters selected in the reserve calculation, even when reflecting the time value of money (discussed later).

Support for the statement that only the *expected* deficiency is recognized comes from the premium deficiency reserve accounting guidance, and accounting guidance on loss reserves.

The GAAP premium deficiency reserve guidance (FAS 60) uses the terms "*expected* claim costs and claim adjustment expenses" and "*expected* dividends to policyholders". The corresponding

⁹ These components are: (Unearned) premiums, loss and loss expense, policyholder dividends (GAAP only), acquisition costs, maintenance costs.

statutory guidance (SSAP 53) uses the term "*anticipated* losses, loss adjustment expenses, and maintenance costs"¹⁰

The GAAP general guidance relative to all estimates (including loss reserves) is that they be free from bias¹¹.¹² The statutory guidance relative to loss estimates comes from SSAP 55, which requires claim liabilities to be set at management's "best estimate", again implying an unbiased value¹³.

b. Time value of money

It is less obvious how to reflect the time value of money in this calculation¹⁴. Neither GAAP nor statutory accounting guidance discuss how to reflect the time value of money, or even if it is allowed. The only reference (under both accounting standards) is required disclosure of "anticipated investment income"¹⁵ was reflected in the PDR calculation. (This required disclosure can be considered implicit approval of the practice by both GAAP and statutory

¹⁰ All italics in this paragraph's quotes were added for emphasis. These italics do not exist in the original source.

¹¹ FASB Concepts Statement 2 and 5 include discussion of conservatism and neutrality.

¹² There is an exception to this guidance that applies to long-duration insurance contracts. FAS 60, paragraph 15 requires that the premium for long-duration contracts (e.g., a whole life insurance contracts) be recognized fully when due from the policyholder, i.e., there is no such thing as "unearned premium". This creates the need to set up a "liability for future policy benefits", or "policy reserve". GAAP rules (FAS 60, paragraph 21) require that this reserve be set up at the expected value, plus a "provision for the risk of adverse deviation". This provision for adverse deviation offsets the fact that initial reserving assumptions for this contract are not allowed to change in future reportings (i.e., they are "locked in"), unless a premium deficiency situation exists. Such a premium deficiency situation only exists if "anticipated" (i.e., not conservatively estimated) future net payouts, on a present value basis, are greater than the existing policy reserve (which includes the provision for adverse deviation). The above discussion points out three areas of difference between current U.S. accounting for short-duration versus long-duration policies under FAS 60:

- a) when premium is recognized (or "earned")
- b) when reserving assumptions are updated.
- c) whether a provision for adverse deviation is allowed.

My belief is that the constant updating of property/casualty reserving assumptions at each valuation date (called a "fresh start" accounting approach), and the use of the full unearned premium reserve until the losses are incurred, eliminate the need for a provision for adverse deviation in financial accounts.

(Note: Additional differences between long-duration and short-duration accounting also exist for policyholder dividends.)

¹³ Interestingly, despite the GAAP concept that the reported values be free from bias, the 1984 AICPA Issues paper on this reserve advocated a conservative approach to the payment pattern assumption, when time value of money is to be considered. The same paper did not see any need for a conservative valuation for any other item in the calculation, such as the interest rate, loss ratio, etc..

Statutory accounting concepts advocate a bias towards conservative valuation, although this is not applied universally in its rules. For example, loss reserves are required to be established at a "best estimate" level, not a conservative level. The use of risk-based capital and other financial regulatory tools (e.g. laws limiting investment choices for insurers) allow for conservatism and risk reflection to be addressed in places other than the accounting.

¹⁴ Note that there is no need to reflect the time value of money if not reflecting it still results in an indicated PDR of zero. Reflecting investment income in that situation would not change the indication, but could noticeably increase the workload, hence it is not worthy of discussion here. The following discussion assumes that reflecting the time value of money will make a difference in the calculation

¹⁵ FAS 60, paragraph 60e.

accounting rules.)¹⁶

Those arguing against reflecting the time value of money focus on what happens immediately after the currently unearned premium is earned. Under current (statutory and GAAP) accounting rules, future investment income is not booked immediately upon incurring a loss, unless losses are allowed to be discounted. Therefore, they argue, the premium deficiency reserve should forecast the accounting only as far forward as the earning of this premium, reflecting only the time value of money up till then and no further. This would include reflecting investment income through the period that the unearned premium becomes earned, and reflecting discounting only to the extent that the newly incurred losses can be discounted.

Those arguing for reflecting the time value of money focus on the eventual profitability or loss of in-force policies, given the premium charged. They see it as contradictory to require time value of money to be reflected in pricing, then to ignore it totally in the accounting (especially when gauging the "deficiency" of the premium). If the accounting requires a profitable policy to record an initial accounting loss before the eventual profit is recognized, they see this as a surplus allocation issue, and not something that justifies setting an additional reserve.

Assuming that the time value of money will be reflected in the calculation, which was true for both GAAP and statutory accounting rules¹⁷ as of the date of this paper, there are three decisions that need to be made in designing the calculation. They are:

- *Discounting vs. Expected future investment income* - Should you use discounted values, or project the expected investment income from the insurance flows?
- *Unearned vs. In-force future flows* - Should the deficiency calculation only look at the flows from the unearned portion of the policy, or should all the remaining flows from in-force policies be considered?
- *Premium provided funds vs. accounting balance derived funds* - When calculating the expected investment income, should one reflect the investment and runoff of only those funds provided through the premium, or should the calculation of invested "funds" be based on the corresponding liabilities set up in accounting records.

Discounting vs. Expected future investment income (Exhibit 1, sheet 1)

In the discounting approach, the future premium, loss, expense and other flows are discounted at an interest rate¹⁸. A premium deficiency exists if the present value of the net outflows is greater than the initial funds established to support these flows. There is no explicit calculation of investment income under this method.

Under the expected future investment income approach, the total funds available to invest are calculated, and this fund projected forward until the last item related to the policy is paid.

¹⁶ The 1984 AICPA Issues Paper mentioned earlier focused heavily on the issue of whether, and if so then how, to reflect the time value of money in the PDR calculation. But since that paper was never acted on by FASB, it is not authoritative guidance.

¹⁷ Effective January 1, 2001. As mentioned earlier, a PDR calculation was not required by statutory accounting prior to January 1, 2001.

¹⁸ Theoretically, discounting could be done using a yield curve and not a single rate. In practice, a single rate is more typically used. The selection of an appropriate discount or interest rate is discussed later in this section.

Investment income is calculated each year (or more frequently), based on the average fund balance and the interest rate. A premium deficiency exists if the sum of ultimate losses and expenses (and other such outflows, net of any inflows¹⁹) is greater than this initial fund plus investment income. In other words, a premium deficiency exists if the fund turns negative.

The size of the premium deficiency reserve under this second approach is the shortfall in the initial fund, i.e. the amount that, when added to the initial fund, would cause the combined funds plus investment income to meet the required cashflows with nothing left over. If the interest rate used in this "funds" approach is the same as the discount rate in the discounting approach, the two methods are equivalent (see Exhibit 1, sheet 1 for an example of the two methods).

The initial funds under these two approaches are generally defined to be the net liabilities for the PDR components (e.g., UPR, DAC, etc.) as of the balance sheet date. An alternative interpretation is discussed later, under the heading "Premium provided funds vs. accounting balance derived funds".

The 1984 AICPA paper on this subject would have set the premium deficiency reserve differently. It would have set the reserve equal to the value of the ending (negative) fund balance when the last outflow is paid, after modeling the flows in a manner similar to the expected future investment income approach mentioned above. As can be seen in Exhibit 1, sheet 2, this results in counter-intuitive answers if the payment pattern is extended. Normally, lengthening the expected claim payout, keeping everything else constant, would reduce the indicated price. Hence it should reduce any indicated premium deficiency reserve. The opposite would occur under the AICPA paper's recommendation, however. The fund would increase each year due to continual "borrowing" costs, until the final payment is made, at which point the "borrowing" is arbitrarily stopped. Due to this anomaly, I do not consider this to be a valid method.

Unearned vs. In-force future flows (Exhibit 1, sheet 3)

Some have argued that the premium deficiency reserve should be based on the (otherwise not reflected) deficiency in the total in-force premiums, not just the unexpired portion of these premiums. This approach would require including the runoff of existing loss reserves on the earned portion of in-force policies. An example of this method is given in Exhibit 1, sheet 3.

Under this approach, any deficiency in the previously earned portion of in-force policies has already been reflected, via the setting up of a loss reserve. As a result, this method should produce a lower PDR indication, due to the future investment income expected from the runoff of these (frequently undiscounted) already-established loss reserves.

Premium provided funds vs. accounting balance derived funds (Exhibit 1, sheet 4)

The 1984 AICPA paper raised the issue of exactly how the initial fund balance is determined under these methods. The previous exhibits (Exhibit 1, sheets 1 through 3) all assumed that the invested funds equal the balance sheet liabilities associated with the unexpired policies (less any related non-invested "insurance" assets, such as agents balances). The implicit assumption is that the balance sheet insurance liabilities (net of insurance assets) are automatically supported

¹⁹ For example, future premium collections or salvage/subrogation recoveries.

by invested assets, and that establishing such a liability results in an increased allocation of invested assets²⁰. This approach can be thought of as a "accounting balance derived funds" approach. (*The issue of which insurance assets to subtract from insurance liabilities is discussed in greater detail in footnote ²¹*).

An alternative approach (Exhibit 1, sheet 4) looks at only those funds provided by the in-force policy premiums, as if they were forever closed off from other company funds. The starting fund value for the PDR calculation would be based on

- total in-force policy collected premiums,
- *less* losses and expenses (including other underwriting expenses) paid-to-date,
- *plus* investment income to-date on those net funds.

Future profits would then be calculated, with future revenues coming from future earned premiums and investment income (from the runoff of these closed funds), and future expenses coming from losses&lae; policyholder dividends, amortization of DAC, and maintenance costs. If future profits are zero or positive, no premium deficiency reserve is indicated. If future profits are negative, the premium deficiency reserve equals the level at which the reserve, plus future investment income from this reserve, exactly offsets the negative profits.

(Note that this is the only method discussed so far that would reflect total underwriting expenses, rather than just unamortized acquisition costs and future maintenance costs. This method is also generally used only in conjunction with "in-force" flows rather than unearned flows, due to

²⁰ Note that this is an increased allocation, not an increased level. Increasing a company's liabilities in isolation does not generate an asset, but it may increase the proportion of total assets supporting liabilities, to the detriment of assets supporting surplus.

²¹ Some non-cash assets arising directly from the insurance transaction ("insurance" assets) clearly support insurance liabilities. A clear example of an insurance asset is agents balances. Other examples may include reinsurance recoverable on paid losses or deductible recoverable amounts on paid losses. Assuming that a company is solvent, the net of insurance liabilities less these insurance assets should equal the amount of supporting invested assets.

The cash flows from the runoff of these insurance liabilities and insurance assets must be projected for all the methods discussed, either to calculate their present value relative to the initial invested assets, or to project the future level of the invested asset "fund". For nearly all of these items, projecting these cash flows is a straightforward and logical exercise. But what is the cash flow runoff for DAC? Given that it does not generate any future cash flow (positive or negative), should it be included as an insurance asset in the calculation of supporting invested assets?

The examples in Exhibit 1, sheets 1-3 do treat any existing DAC asset as an insurance asset (reducing the total level of invested assets allocated to the unexpired policy), despite the fact that the DAC runoff generates no future cash flow. But given that DAC is not recognized for statutory accounting purposes, and statutory accounting rules frequently dictate required capital, risk-based capital and investment rules, it could be argued that the existence of DAC does not reduce the level of invested assets supporting the insurance liabilities. This would seem to imply that calculated invested assets should not be reduced by any DAC.

If invested assets are not reduced for DAC, then the earnings hurt resulting from DAC runoff needs to be reflected elsewhere, since the "accounting balance" method shown here reflects only cash outflows, and not asset "depreciation". This might be done by modifying the methods shown in Exhibit 1, sheets 1-3 to reflect the future earnings approach in Exhibit 1, sheet 4.

The approach used instead in this paper, to treat the DAC as a reduction to invested funds up-front, is simpler, and allows for ready equivalence of the expected investment income method to the discounting method. It is also the common approach, per the author's understanding. But the author acknowledges that other approaches may be justified.

problems with isolating the premium funds allocable only to unearned premiums and related costs.)

The author believes that the accounting balance approach better reflects the management of insurance company assets. Existing statutory laws and regulations (and the approaches both rating agencies and stock analysts use to evaluate a company's financial situation) pressure, if not force, a company to maintain adequate invested assets equal to statutory liabilities (net of related insurance assets). An increase in these liabilities can result in an increase in the investments an insurer attributes to support of liabilities (and a corresponding reduction in investments supporting surplus)²².

The statutory definition and GAAP definition for the premium deficiency reserve reference only the unearned premium reserve, not "in-force" policies, hence only the flows from the unearned premium will be used in subsequent exhibits. In addition, future exhibits will use the accounting balance approach, for reasons given previously.

c. Actual costs versus expected costs.

Reserves are set for a given evaluation date, but are generally not published or publicly reported until some later date, after some subsequent development has occurred. How much of this new information is to be used in the PDR calculation? Or to give an explicit example, how does the PDR calculation treat a catastrophe or other large loss that occurred between the evaluation date and the publication date?

The statutory definition of the premium deficiency reserve refers to "anticipated" losses and expenses. Likewise, the GAAP definition uses the term "expected" losses and expenses. The anticipated or expected amounts are those as of the balance sheet date. They should not reflect subsequent actual activity.

The premium deficiency reserve is meant to cover expected or anticipated premium deficiencies, not bad luck. A fire policy written for a house that burned down was not obviously underpriced, as it was not expected that that policy would suffer a total loss. Likewise, a group of property policies written in a coastal state were not necessarily underpriced simply because a 1 in 100 year storm hit that year. This actual experience is only reflected to the extent that it reflects conditions that should have been known at the balance sheet date.

²² The author is aware of several companies that segmented their investment portfolios into those supporting insurance liabilities and those supporting surplus. One version of the NAIC model investment law also contains a "reserve test" that would penalize an insurer that did not maintain invested assets of suitable quality greater than or equal to net insurance liabilities.

d) Line of business groupings and offsets (Exhibit 2)

At what line level of detail is the premium deficiency reserve to be calculated? By annual statement line? By company business line (however so defined by the company)? By state, by line? GAAP guidance (FAS 60, paragraph 32) says that:

"Insurance contracts shall be grouped consistent with the enterprise's manner of acquiring, servicing, and measuring the profitability of its insurance contracts to determine if a premium deficiency exists."

Statutory guidance (SSAP 53, paragraph 13) says essentially the same thing.

This wording is frequently interpreted under U.S. GAAP to mean the company's business line, i.e., the level of line detail at which the company reports its earnings. This could be Commercial Lines versus Personal Lines, Domestic business versus International business, or some other similar delineation used in the company's shareholder reporting.

It is less obvious what the words mean when applied to statutory accounting. Companies that file both GAAP and statutory statements would probably use the same line groupings for both, since the GAAP and statutory guidance is worded virtually identically²³. Companies that file only statutory statements will probably follow a similar approach, defining line based on how they manage the business, and not using the line of business structure found in the statutory annual statement.

Why does the level of line grouping matter? Because of different rules regarding offsets between groups versus within a group. The premium deficiency reserve can go no lower than zero for a particular group, hence a negative indicated reserve for one group does not (and can not) offset a positive indication in another group. Unlimited offsetting is allowed within a line grouping, but no offsetting is allowed outside the group. As a result, the finer the grouping used in the calculation, the higher the premium deficiency reserve.

e) GAAP versus Statutory accounting rule differences

The most obvious difference between GAAP and statutory calculations of the premium deficiency reserve is DAC. Statutory accounting does not recognize an asset for prepaid ("deferred") acquisition costs, hence the cost of amortizing this asset does not have to be recognized in the PDR calculation. This should decrease the incidence of non-zero PDR reserves under statutory accounting.

A less obvious GAAP vs. stat. difference is the level of legal entity aggregation. GAAP accounting is generally done on a consolidated entity basis, while statutory accounting is done on a legal entity basis. Therefore, a publicly owned insurance group with two business line segments and twenty insurance company legal entities would perform two PDR calculations for GAAP purposes, but up to forty²⁴ for statutory purposes. This could mean forty different runoff

²³ This was intentional (based on discussions with those involved with the process). The codifiers of statutory accounting were asked to minimize differences between the GAAP and statutory premium deficiency reserve requirements, and to a large extent this request was met.

²⁴ There would be less than 40 if some of the legal entities contain business from only one of the business segments.

loss ratio selections versus two, forty different expense assumptions versus two, up to forty different interest rate assumptions²⁵ versus two. (While all companies in a quota share pool may be expected to have the same loss or expense ratio, they all could have noticeably different investment results, as investment income is generally not quota shared.) Besides requiring more work, this more detailed approach would tend to increase the incidence of non-zero PDR reserves for statutory accounting versus GAAP.

Besides DAC, there are other balance sheet differences between GAAP and statutory accounting. For example, agents balances for statutory accounting reflect only those amounts less than 90 days overdue, due to statutory non-admitted asset rules. GAAP does not have a 90 day rule, but does allow for bad debt reserves, based on previous collection experience. These differences affect the current accounting, but not the eventual cash collection or payout. As such, such differences may affect the initial level of invested funds assumed (depending on whether and how an "accounting balance" approach is used), but they should not affect the projected cash runoff of the individual account balances.

Lastly, the GAAP guidance on premium deficiency reserves requires projection of related policyholder dividends. The statutory guidance does *not* require consideration of related policyholder dividends. To the extent that deficient premiums do not generate policyholder dividends, this is not an effective difference, but some casualty dividend plans can result in non-zero total dividends even when an overall premium deficiency exists²⁶.

f) Reinsurance (Exhibit 3)

The types of reinsurance programs a company has, combined with significant differences between the accounting for gross versus net business, can add subtle complications to the PDR calculation. Values that appear at first to be net of reinsurance may really be gross of at least some reinsurance. Assumptions valid for runoff of direct balances may not hold for net (of reinsurance) balances.

To illustrate this point, assume a company writes only annual policies, written evenly throughout the year. Also assume that they purchase pro rata reinsurance via a treaty effective January 1st of each year, with premium ceded monthly based on the monthly direct *earned* premiums²⁷. As can be seen in Exhibit 3, this would result in a ceded unearned premium reserve of zero, even

This could happen if the business segment breakdown was commercial vs. personal, and the legal entities wrote (on a net of reinsurance basis) either personal or commercial, but not both.

²⁵ Each legal entity has its own investment portfolio, hence there would need to be at least twenty different interest rate assumptions, versus possibly only one under the consolidated GAAP approach in the above example. Some companies maintain segmented investment portfolios for each major business segment. For these companies, the choice is clearly forty different interest rate assumptions versus two in the above example.

Another reason for possibly having a separate interest rate assumption for each line grouping is materially different cash flow patterns. The projection of anticipated future investment income for a long tail line may justify a different investment yield assumption than the same projection for a short tail line.

²⁶ This issue is discussed further in item 2d of this overall section.

²⁷ The problem mentioned in this paragraph does not exist if the cession is based on direct written premium, or if the full annual cession is estimated and booked up-front as written premium.

when direct unearned premiums are significant. In such a situation, the reported unearned premium reserve can significantly overstate the true runoff exposure, even when calendar period earned premiums and incurred losses appear reasonable and undistorted.

An opposite problem could possibly occur for facultative reinsurance, where the underlying direct policy is written on an installment basis and the direct premiums are only recorded when each installment is billed. In this situation, it may be possible for the full ceded written premium to be recorded up front, while much of the direct written premium is deferred. The resulting UPR is then more equivalent to a ceded UPR, than a theoretical net or direct UPR.

Reinsurance programs in place for the future calendar period may also distort loss and expense runoff patterns. Direct loss payment patterns may be significantly different from net patterns, particularly where significant levels of excess reinsurance cessions exist. Historic expense ratios reflect past reinsurance ceding commissions (including contingent ceding commissions), and may not be indicative of future ceding commission levels. The ceding commissions may also face a different runoff pattern than the gross commissions (as seen in Exhibit 3). Therefore it may sometimes be advisable to model the direct (or gross) versus ceded flows separately in determining the PDR.

2. Issues affecting individual components

a) Interest rate

The interest rate²⁸ used in reflecting the time value of money should reflect reasonable expectations of what will be achieved during the runoff period, and should not reflect conservatism or risk. Three possible choices for this rate are:

- the investment portfolio interest rate
- the new money rate
- the "newer" money rate.

To the extent that the current major cash inflows have already occurred, the selected interest rate should reflect the current investment portfolio, and the expected runoff thereof.

To the extent that additional cash inflows are expected during the runoff, either through new premium receipts or the maturing of invested assets, the new money rate should be reflected.

To the extent that asset / liability matching exists, it might be appropriate to reflect the assets already purchased from previous inflows of currently in-force policies. This would argue for the "newer" money rate, say the rate associated with recent investment purchases.

The "true" interest rate of the runoff is probably a combination of all three of these rates. In practice, the selected rate would probably reflect several simplifying assumptions, both due to the cost involved in being more precise and the relative benefit vis-à-vis the uncertainty in the other assumptions (principally the runoff loss ratio assumption).

²⁸ All these rates should be after investment expenses.

b) Premium issues

The biggest issues in projecting premium runoff (besides the reinsurance issues mentioned previously) are agents balances runoff, installment premiums and audit premiums.

Agents Balances (Exhibit 4, Sheet 1)

The runoff of agents balances is probably simpler when dealing with total in-force runoff, rather than unearned premium runoff. This is because the agents balances can support both loss reserves²⁹ and unearned premiums. Depending on premium collection and write-off patterns, a company may want to make the simplifying assumption that all agents balances support the unearned premium reserve. (See Exhibit 4, Sheet 2 for an example of how to calculate the portion supporting loss reserves, and the relatively small size in most cases.)

Agents balances first enter into the PDR calculation as a reduction of beginning invested assets³⁰. The runoff of these balances are then modeled, based on historic collection patterns. This runoff projection may require knowledge of the agents balances by billing system and billing method (e.g., installment versus single payment)³¹.

Installment premiums

For at least one line of business (Workers' Compensation), companies have the option under statutory codification of deferring the booking of premium (as written) until the premium is billed. When this happens, an estimate needs to be made of the amount of "hidden" premium resulting from future installments of in-force policies. Those additional amounts could be handled in the PDR calculation by increasing the beginning UPR and agents balances amounts. Care must be taken to adjust the corresponding expense amounts, however, as this booking practice may have resulted in a deferral of commission and tax payments.

There should also be an understanding of how commissions and taxes are handled for any other installments. Are the commissions paid separately, and up front? Are commissions paid as premium is collected? Are there separate installment plans in place, such as an option for either agent-collected installments versus directly billing the insured for any installments, with different commission treatment for each? Are there any finance or servicing charges that should be considered (that might be recorded as other income, but should still be considered in the PDR calculation)?

²⁹ from both in-force policies and expired policies, although the expired policy portion should be minor. Those balances that most support loss reserves are those relating to billed installments and audit premiums, plus accrued retro premium balances from retrospectively rated policies.

³⁰ Using the accounting balance method, beginning invested assets or funds equal the beginning reserves less beginning supporting non-invested insurance assets, like agents' balances.

³¹ It is also possible that the total runoff amount can be (predictably) greater or less than the beginning agents balances amount. This is most likely when the non-admitted or bad debt portion of this balance is arbitrarily determined, and not based on actual write-off experience. In most cases, the author would not expect this difference to be material.

Audit premiums³² (Exhibit 5)

Some lines of business generate material amounts of audit premium. Beginning in 2001, statutory accounting will require an estimation (and booking) of these amounts, under the label EBUB (Earned but Unbilled)³³. (GAAP currently provides for recognition of future audit premium.) There are several PDR complications raised by the EBUB "reserve".

First, companies will be given the option of booking these estimated future audits as written premium, or as an adjustment to earned premium. If booked as written, then this amount can be treated similarly to other agents balance amounts. The only exception is that a larger portion will be directly allocable to both the expired portion of in-force policies, and policies no longer in-force. Hence one or both of these pieces need to be excluded from the PDR calculation.

If companies book these amounts as an adjustment to earned premium, then this adjustment will show up as an adjustment to the unearned premium reserves used in determining earned premium. These unearned premium adjustments are re-classed to agents balances for balance sheet presentation. These adjustment amounts also reflect only the *earned* portion of future audit premiums. Hence their effect needs to be totally removed from the data, if running off only the unearned portion of in-force policies, and their location can be either agents balances or unearned premiums, depending on the data source used in the calculation.^{34 35}

For the "adjustment to earned premium" scenario, an estimate will have to be made as to future audit premium relating to the un-expired portion of in-force policies. This additional³⁶ amount can usually be added to both agents balances and unearned premiums for calculating the PDR, with additional adjustments to commissions and taxes. This is similar to how future unbooked installments can be treated, except that the timing of commission expenses may differ between the two³⁷.

c) Losses & loss adjustment expenses ("I&lae")

The major issues here are generally more straight-forward, and to some extent have already been discussed. They are the projection of future losses, and the impact of loss reserve discounting.

Projection of future losses.

As mentioned earlier, the PDR calculation is based on expected or anticipated future costs, not actual costs. It is also focused only on in-force policies, usually only on the unexpired portion of same. As such, recently reported loss ratios may not be relevant to the PDR calculation.

³² The following discussion, while focused on audit premiums for in-force and expired policies, generally also applies to accrued retrospective premiums.

³³ per SSAP 53.

³⁴ If running off all in-force policy flows, including the expired piece, then only the adjustment relative to expired policies needs to be removed.

³⁵ Besides an unearned premium adjustment, corresponding adjustments may also have been made to tax, commission, loss and other reserves, that may need to be considered (or removed) in the PDR calculation.

³⁶ Premium audits typically generate additional amounts, on average. Returns are possible, but as the insured has no incentive to overpay the initial premium, returns should be relatively small when they do happen.

³⁷ In addition, if premium audits apply to a line, some level of premium audit expense should also be expected.

If recently reported loss ratios are used, the impact of prior policy or accident years need to be removed (e.g., reserve movements during the year from prior policy or accident years), as well as the impact of large or unusual current year events, such as large catastrophes. Any distortion due to changing loss expense definitions or allocations may need to be adjusted for (such as when the NAIC introduced the terms Adjusting & Other and Defense and Cost Containment)³⁸. Lastly, any expected impact due to recent pricing, inflation or underwriting changes needs to be adjusted for. As a result, business plans or budgets may be a better source of loss ratios for the PDR calculation than historic financial statements.

Loss reserve discounting

The models shown in the attachments focus on cash flow runoff, with balance sheet values used only in establishing the initial invested fund. As such, the impact of loss reserve discounting on the PDR calculation is limited.

Where the beginning balance sheet value is discounted, the resulting runoff should reflect the ultimate, undiscounted amount.

If a time value of money approach is not to be used, then the accounting earnings over the remaining earning period of the policy are to be modeled. Those projected accounting earnings should still reflect the booking of discounted reserves (to the extent permitted by accounting rules and to the extent consistent with the company's accounting practices).

The development of l&lae payment patterns is an integral part of the PDR calculation. This paper will not say much on this topic, already very familiar to actuaries, except to say that the l&lae portion of the unearned premium reserve runoff will not look exactly like an accident year. It should have a slightly shorter tail than a typical accident year, due to an average loss date a few months earlier, but this difference is probably not material.

d) Policyholder dividends

The existing balance sheet values for policyholder dividends generally reflect only the earned portion of any in-force policies, and for statutory purposes, may reflect only expired policies³⁹. Hence, additional estimates may need to be made to reflect projected dividends from the unearned portion of in-force policies. In addition, a reduced level⁴⁰ of such dividends may be

³⁸ For example, the movement of an expense from one category to another may change how it is allocated to line and/or accident year. The year this change is made, the calendar year results by line and/or accident year may be significantly impacted, such that the calendar year results are not indicative of current in-force policy exposures.

³⁹ GAAP rules may result in a higher policyholder dividend reserve than statutory rules. Statutory rules generally only reflect this dividend liability after the dividends have been declared by the company's board of directors, which usually doesn't happen until after or around policy expiration. GAAP rules allow reflection sooner, as long as the recognition criteria under FAS 5 are met.

⁴⁰ Some may ask why any policyholder dividends are paid at all, given that premiums are deficient. The answer may be that, although the aggregate premiums are deficient, some policyholders included in the aggregate calculation may have qualified for a dividend, based on individual good experience. In addition, sometimes these dividends are paid due to the calibration of the dividend scales, which either purposely or inadvertently pay

expected from policies with "deficient premiums". (Note that the statutory definition of the PDR does not require consideration of these dividends.)

e) Acquisition costs

Acquisition costs typically include commissions (regular and contingent), premium based taxes, and policy underwriting and issuance costs. For GAAP purposes, payments made for these items that relate to unearned premiums may be set up as a deferred acquisition cost (DAC) asset. Companies may calculate this asset based only on commissions and taxes, and not all reported acquisition costs.

Two PDR issues associated with this item are reinsurance distortions and contingent commissions.

Reinsurance

Heavy use of treaty reinsurance can significantly distort historic commission levels, especially in relation to the unearned premium reserve. As mentioned earlier (under the Reinsurance section), some treaty reinsurance contracts result in ceded written premium booked monthly or quarterly, based on a factor times the reported subject earned premium. As such, the unearned premium reserve being run off may not reflect any of the future treaty cessions.

Most likely, the regular commission charge on direct business is substantially different from the ceded commission charge. The regular commissions due to existing unearned premium reserve may have also been charged off. Hence, future regular commission cash flows may be limited to ceding commissions, and the rate for these commissions may be significantly different than calendar year net commission rates. These problems can be handled by modeling the direct versus the ceded runoff. (See Exhibit 3 for an example of this situation.)

Contingent commissions

Contingent commissions generally have a longer "tail" than regular commissions. They may be incurred as premium is written (e.g., due to volume incentive plans) or as premium is earned (e.g. due to profit sharing plans), but they generally are not paid up-front. While there may be multiple contingent commission plans at work, with significantly different resulting cash flows, the impact relative to the total PDR calculation may be minor⁴¹. Hence it may make sense to ignore the various contingent plans in place and choose one simplifying assumption instead. (This may be less true for the contingent ceding commissions, which can be significant relative to net premium. Therefore these amounts may need to be separately modeled, when significant.)

dividends even when an aggregate net loss is projected.

⁴¹ For example, the total direct contingent commission may be only 1% to 2% of premium, with a payout that extends at most only a year or so. The impact of a more precise calculation of these flows is frequently overwhelmed by the uncertainty in the size and length of the loss flows.

f) Maintenance costs

Maintenance costs are defined in FAS 60 (Appendix A) as:

"Costs associated with maintaining records relating to insurance contracts and with the processing of premium collections and commissions"

The PDR calculation requires an estimate of runoff maintenance expenses. Note that any expenses assumed to be paid up-front, or around policy issuance time, are not to be included in the PDR calculation. In addition, general overhead costs are generally not included under this definition⁴². Therefore, the runoff maintenance costs, as a percentage of unearned premium reserves, are substantially smaller than total underwriting expenses less acquisition costs.

Estimates of the PDR based on general expense rates may substantially overstate the need for a PDR reserve. This is because general expense ratios are frequently in the 5 to 10% (of premium) range⁴³, while maintenance costs may be just a fraction of that amount. Therefore, PDR calculations that use the entire general expense ratio (with no allowance for up-front expenses) may overstate total runoff costs by 5 to 10% of premium.

g) Other (including FIT)

The above discussion dealt with essentially all the underwriting income (and investment income) components of unearned premium runoff. There may also be items related to other income that impact the runoff. The most likely item, i.e., service or finance charges associated with installment premiums, was mentioned earlier.

Federal income taxes are a different issue. The inclusion of taxes would have no impact on the calculation if:

- all the future income or loss modeled in the PDR calculation is taxable,
- there is no deferred tax asset or liability associated with the beginning balances modeled, and
- the indicated PDR is zero.

Generally speaking, taxes will only reduce the level of expected profit, and not turn a positive net profit into a loss. Therefore they can safely be ignored when the indicated premium deficiency reserve is zero.

The situation changes when the indicated PDR is positive. If all income is taxable, then the existence of taxes should theoretically reduce the premium deficiency reserve, to the extent that the resulting negative taxable income would result in cash recoveries from:

- prior year tax payments,
- positive indicated tax liability for other lines (with zero PDRs), or
- positive indicated tax liability for other affiliates in the overall corporate tax filing.⁴⁴

⁴² The author is aware of at least one auditing firm that explicitly states that general overhead costs do not belong in the calculation of maintenance costs. Only the marginal costs associated with the policy runoff are to be included. This would normally be expected to be a very small portion of the total unearned premium (1% or less?).

⁴³ Best's Aggregates & Averages, Property-Casualty, United States, 1999 edition, page 288.

⁴⁴ And a corporate-wide tax agreement exists that requires positive tax entities within the consolidation to pay "tax"

Given this dependence on prior year tax payments, the tax situation of other lines and possibly even the tax situation of affiliated companies, accurate reflection of income tax effects in PDR calculations may be problematic. This situation is made even more problematic when the impact of deferred tax assets (due to loss reserve discounting for tax purposes) is factored in⁴⁵

C. Suggested Multi-tier approach (with exit points)

As the above pages illustrate, a full, detailed PDR calculation can be very complicated and time-consuming. This process can be vastly simplified, however, by taking advantage of the reserve's floor of zero.

The PDR reserve for a particular grouping can never be lower than zero. Therefore, if conservative assumptions result in a negative PDR indication before applying the floor, more unbiased assumptions (which would indicate an even more negative PDR indication prior to applying the floor) will not change the final result. Hence, conservative assumptions can be used to produce an unbiased PDR estimate, as long as an indication of zero results.

For the following multi-tier approach, the calculation ends and all subsequent steps omitted as soon as a zero PDR indication results.

First tier - *Net combined ratios consistently and materially below 1.0, and stable*

The first step in the calculation should be a quick check to see if combined ratios (or combined ratios after removing previously expensed acquisition costs, such as commissions and taxes) are consistently and reliably below 1.0. If this is the case, then the calculation might be able to stop there.

Second tier - *unearned premium reserve runoff, no investment income*

The second step may be to estimate the runoff, using conservative values where desired for simplicity purposes, with no reflection for the time value of money. If the indication is for a PDR of zero, the calculation is over. This may be done at first with very conservative values, which are then selectively refined until a zero indication is achieved. (If desired, further refinement could be delayed until a later step.

Third tier - *unearned premium reserve runoff, solve for minimum interest rate*

The third step would be to calculate the runoff with reflection for investment income, solving for the interest rate at which the PDR equals zero. If this rate is clearly lower than the forecasted interest rate for the entity(ies) in question, then the calculation is over. (Note: This approach would greatly reduce the complexity of the calculation for a quota share pool under statutory accounting, where the underwriting results may be identical for the members of the pool but the

to the negative tax entities within the same consolidation. The author is aware of several of these agreements.

⁴⁵ Current federal income tax law also creates a difference in the timing of taxable income and reported (GAAP or statutory) income, due to the treatment of the unearned premium reserve. Only 80% of the unearned premium is allowed as a deduction, hence revenue is accelerated for tax purposes versus what statutory income would be.

investment portfolios and interest rates vary. Under this approach, only one calculation may be necessary for all the pool companies, as long as the all such companies clearly will surpass the minimum rate.⁴⁶⁾

Fourth tier (optional, may not always be allowable) - in-force runoff, solve for minimum interest rate

For those situations where an in-force runoff is allowed/desired, runoff of the remaining flows on in-force policies, including the expired portion of such policies, could be done as a next step. This may allow enough investment income to be reflected (due to the establishment of undiscounted or conservatively discounted loss reserves) to result in a zero PDR indication at a low interest rate.

Fifth tier. - gradually refine the material conservative assumptions to unbiased levels

The next step, if a positive PDR still results after the above, is to gradually refine the more material conservative assumptions to remove any bias to see if a zero PDR indication is achievable. If this is not possible, the next step must be taken.

Last tier - full analysis

The last step is to do a full detailed analysis, reflecting unbiased estimates for all material inputs. Separate interest rate projections will be necessary for each member of a quota share pool⁴⁷

Note that even if the procedure ended with step one, a company might want to disclose and view its method as encompassing the entire process, so as to not imply a change in method when subsequent steps are called for at a later date.

D. Data Sources - strengths/weaknesses

This section will look at the principal data sources available to those performing a PDR calculation, and evaluate their strengths and weaknesses for this application. Most of these should be familiar to actuaries, but two may be currently overlooked: runoffs used for asset/liability management and runoffs used by publicly owned companies to prepare SEC market risk disclosures.

Plan/Budget

Business plans or budgets are used by companies to forecast results for the coming period(s), and to aid in management for these periods.

Strengths

- Source of company "anticipated" losses, expenses for the projection period. Therefore they should reflect runoff only, with no impact (or readily identifiable impact) from prior

⁴⁶ When a company has business that is not quota-share pooled, then additional calculations may be necessary, and one calculation for the entire pool may not suffice.

⁴⁷ The only situation where this will not occur is when investment results are also part of the quota share agreement. The author is not aware of any company or group where this is the case.

- year reserving actions. Should also reflect premium levels of unexpired policies.
- Probably in detail consistent with "grouping" required by the calculation.
- Readily available, even in advance of balance sheet date.
- Readily understood by management (and may arguably already reflect management's "best estimate").

Weaknesses:

- May be biased, unreliable for those companies most likely to have positive premium deficiency reserves. As such, it's reliability should probably be tested before use.
- May reflect future business to be written in the coming year, not just in-force business.
- Unlikely to be audited.
- May not fully reconcile to financial statements.
- Generally does not contain cash flow information, or sufficient information to perform a cash flow runoff calculation.
- May not contain needed legal entity investment data.

Statutory annual statement, Insurance Expense Exhibit

Statutory annual statements, associated schedules and supplements, and the Insurance expense exhibit are produced on a regular basis by *all* U.S. domiciled insurance companies. These statements are also highly detailed, when compared to the corresponding GAAP statements.

Strengths

- Audited, at least as to items material to the entire (legal) entity.
- Complete. They include all business of the company.
- Readily available.
- Frequently well understood by actuaries.
- Large amount of detailed data.
- Source of legal entity investment results and investment portfolio data.

Weaknesses

- May be distorted due to one-time events and redefinitions / reallocations, such as catastrophes, changing definitions of loss expense categories, expenses associated with a major corporate restructuring, commencement or cancellation of major reinsurance programs, etc.
- Calendar year components may be distorted due to prior year reserve actions, such as mass tort reserve strengthening.
- Historical, not forward looking. As such, may reflect past profitability and not in-force runoff profitability.
- Calendar year expense levels may not be indicative of runoff expense levels.
- May not be detailed enough for required grouping. For example, some annual statement lines may contain elements of multiple groups (e.g. other liability could include both commercial general liability policies and personal umbrella policies).
- May not contain adequate cash flow runoff data.
- May not be available on a timely basis. Most detailed information is produced only annually, with the information available internally not long before external publication of

the PDR is required.

Internal Management reports -actuals

Many companies maintain an additional reporting system, for internal management purposes. Reports from these systems are frequently used to compare actual experience to budgets/plans, and to evaluate where management action is necessary.

Strengths

- In detail consistent with "grouping" required by the calculation.
- Many such systems reconcile with the accounting ledger. (This is a weakness, when such system does not reconcile.)
- Support systems frequently have the desired cash flow information.
- Typically subject to internal audit, since management relies on such data for its decision making.
- Normally available on a timely basis.
- Readily understood by management.

Weaknesses (most of these are very similar to the Annual Statement weaknesses, as both are predominately calendar year data sources):

- May be distorted due to one-time events and redefinitions / reallocations, although these distortions may be explained and quantified somewhere in the information flow.
- May be distorted due to prior year reserve actions, such as mass tort reserve strengthening (although, once again, identification and explanation of these distortions may be available).
- Historical, not forward looking. As such, may reflect past profitability and not in-force runoff profitability.
- Calendar year expense levels may not be indicative of runoff expense levels.
- May be biased and/or unreliable for those companies most likely to have positive premium deficiency reserves. As such, its relative bias and reliability should probably be tested before use.

Asset / Liability management information

Companies that practice asset / liability management usually have a process to update and analyze the runoff of existing insurance balances. The underlying data and analysis could be used as a PDR data source.

Strengths

- May match up well with required grouping, if investment funds are similarly segregated.
- Readily available source of (frequently hard-to-get) runoff cash flow assumptions.
- Forward looking.
- No or minimal distortion due to one-time events or reallocations / redefinitions. Where these do exist, they are likely to be separately identified and explained.

Weaknesses

- May not be complete. May only be done for a portion of the business.
- Unaudited.
- May not be updated on a timely basis.
- Runoff of unearned premium flows may not be a point of focus. As such, the unearned runoff may not be reliable due to greater emphasis on the more material expired runoff. (This situation can vary drastically by company. For some companies, the unearned runoff may be more material than the expired runoff.)

Market risk disclosure workpapers

Starting in 1997, the Securities Exchange Commission (SEC) has required companies fitting a certain description (including many insurers) to disclose their exposure to various market risks, including interest rate risk⁴⁸. The workpapers underlying these disclosures may be a valuable resource for the PDR calculation, in those cases where the company chose to analyze these risks relative to their insurance liabilities⁴⁹.

Strengths

- Source of valuable cash flow runoff information, including unearned premium runoff.
- More likely to be audited or controlled, due to its use in a public disclosure.
- Generally available timely, as quarterly disclosure is required if material changes occur.
- May be available in required "group" detail.
- Expertise and resources required to do these calculations mirror closely those required for PDR calculation.

Weaknesses

- May not be available for companies not subject to the SEC disclosure requirement.
- Not required to be done by legal entity. As such, the workpapers may not be adequate for a legal entity calculation. (This should be less of a problem for quota share pool companies).
- Runoff of unearned premium flows may not be a point of focus. As such, the unearned runoff may not be reliable, due to greater emphasis on the more material expired runoff. (This situation can vary drastically by company. For some companies, the unearned runoff may be more material than the expired runoff.)
- May not be complete, as could exclude some portions considered not material for GAAP consolidated reporting of these risks.

⁴⁸ This requirement is titled SEC Release #33-7386, "DISCLOSURE OF ACCOUNTING POLICIES FOR DERIVATIVE FINANCIAL INSTRUMENTS AND DERIVATIVE COMMODITY INSTRUMENTS AND DISCLOSURE OF QUANTITATIVE AND QUALITATIVE INFORMATION ABOUT MARKET RISK INHERENT IN DERIVATIVE FINANCIAL INSTRUMENTS, OTHER FINANCIAL INSTRUMENTS, AND DERIVATIVE COMMODITY INSTRUMENTS".

⁴⁹ The expansion of this analysis to insurance liabilities is not currently required, but companies may do so voluntarily, and public disclosures have revealed that some companies are doing so.

E. Findings and conclusions

The Premium Deficiency Reserve calculation is not currently an issue for non-publicly owned U.S. property/casualty insurance companies, and is done on a highly summarized (i.e., consolidated) basis for those companies that are subject to it. This will change with the implementation of new statutory accounting rules in 2001. All U.S. domiciled property/casualty insurers⁵⁰ will now be required to perform these calculations on a legal entity basis, greatly increasing the numbers of people involved in their calculation.

While a full analysis and calculation of these amounts can become very complex and time-consuming, a multi-tiered approach can be implemented that greatly reduces the work required in most circumstances. The restriction of refinements to only those that are material can also significantly reduce the workload.

The differences between the statutory and GAAP calculations are material, and could cause either one to be the higher of the two. Separate calculations by legal entity can cause a higher statutory PDR, relative to the consolidated GAAP calculation, while the impact of the DAC (deferred acquisition cost) asset can cause the GAAP result to be the higher of the two. In general, the more expenses are deferred and the more finely detailed the calculation, the more likely the PDR will be non-zero.

⁵⁰ Codification rules make this a requirement, under SSAP 53. States still have to implement codification for these rules to be effective. As of now, nearly all (if not all) states are expected to adopt codification by January 1, 2001. States are allowed to permit or prescribe differences from codification rules for their domiciled insurers, but the current proposal is to require disclosure of these differences.

Premium Deficiency Reserves
Time Value of Money
Discounted versus Expected Investment Income methods

Exhibit 1
Sheet 1

Year	Unearned premiums	Expected L&LAE	Expected policyholder dividends	Unamortized acquisition costs	Maint. costs	Fund balance			Inv. inc. @ 5%	Ending fund after inv. inc.	Premium Deficiency Reserve	
	(a)	(b)	(c)	(d)	(e)	begin	end	avg	(i)	(j)	(k)	
ultimate	100	100	5	20	5	(f)	(g)	(h)	(i)	(j)	(k)	
present value	100	92.1	4.9	20.0	4.9						21.9	
<i>present value method</i> →												
<i>expected investment income method</i>												
<i>balances</i>												
valuation date	100	0	0	20	0		80.0			80.0	21.9	
<i>combined</i>												
<i>cash</i>												
											<i>PDR fund</i>	<i>fund</i>
1	0	30	5	0	5	80.0	40.0	60.0	3.0	43.0	23.0	66.0
2	0	30	0	0	0	43.0	13.0	28.0	1.4	14.4	24.1	38.5
3	0	30	0	0	0	14.4	-15.6	-0.6	0.0	-15.6	25.4	9.7
4	0	10	0	0	0	-15.6	-25.6	-20.6	-1.0	-26.7	26.6	0.0

Assumptions

1. No cash removed by owners until last claim paid
2. Initial fund balance equals unearned premium reserve less unamortized acquisition costs
3. All payments made mid-year

Source:

- (f) = prior year's value for (j)
- (g) = (f) - (b) - (c) - (d) - (e)
- (h) = $0.5 \times [(f) + (g)]$
- (i) = (h) × [interest rate shown above]
- (j) = (g) + (i)
- (k) = for present value row: (a) - (b) - (c) - (d) - (e)
for valuation date row: an estimate (solved for iteratively, or from present value calculation).
for future year rows: $(1 + \text{interest rate}) \times (\text{prior year value for column (k)})$

Premium Deficiency Reserves
Time Value of Money
Problem with AICPA Issue Paper method

Exhibit 1
Sheet 2

Year	Unearned premiums	Expected L&LAE	Expected policyholder dividends	Unamortized acquisition costs	Maint. costs	Fund balance			Inv. inc. @ 5%	Ending fund after inv. inc.	Premium Deficiency Reserve
	(a)	(b)	(c)	(d)	(e)	begin	end	avg	(i)	(j)	(k)

ultimate

100

100

5

20

5

(f)

(g)

(h)

(i)

(j)

(k)

<i>Previous example</i>											
present value	100	92.1	4.9	20.0	4.9						21.9
<i>balances</i>											
valuation date	100	0	0	20	0		80.0			80.0	21.9
<i>cash</i>											
1	0	30	5	0	5	80.0	40.0	60.0	3.0	43.0	23.0
2	0	30	0	0	0	43.0	13.0	28.0	1.4	14.4	24.1
3	0	30	0	0	0	14.4	-15.6	-0.6	0.0	-15.6	25.4
4	0	10	0	0	0	-15.6	-25.6	-20.6	-1.0	-26.7	26.6

<i>Slow pay example</i>											
present value	100	92.0	4.9	20.0	4.9						21.8
<i>balances</i>											
valuation date	100	0	0	20	0		80.0			80.0	21.8
<i>cash</i>											
1	0	30	5	0	5	80.0	40.0	60.0	3.0	43.0	22.9
2	0	30	0	0	0	43.0	13.0	28.0	1.4	14.4	24.0
3	0	30	0	0	0	14.4	-15.6	-0.6	0.0	-15.6	25.2
4	0	9	0	0	0	-15.6	-24.6	-20.1	-1.0	-25.6	26.5
5	0	0	0	0	0	-25.6	-25.6	-25.6	-1.3	-26.9	27.8
6	0	0	0	0	0	-26.9	-26.9	-26.9	-1.3	-28.3	29.2
7	0	0	0	0	0	-28.3	-28.3	-28.3	-1.4	-29.7	30.7
8	0	1	0	0	0	-29.7	-30.7	-30.2	-1.5	-32.2	32.2

AICPA Issue Paper answers

Premium Deficiency Reserves
Time Value of Money
In-force policy method

Year	Unearned premiums	Expected L&LAE	Expected policyholder dividends	Unamortized acquisition costs	Maint. costs	Fund balance			Inv. inc. @ 5%	Ending fund after inv. inc.	Premium Deficiency Reserve
	(a)	(b)	(c)	(d)	(e)	begin	end	avg	(i)	(j)	(k)
ultimate (at inception)	200	200	10	40	10						
remaining											
unexpired portion	100	100	5	20	5						
expired portion	0	70	5	0	0						

unexpired portion					
<i>balances</i>					
valuation date	100	0	0	20	0
<i>cash</i>					
1	0	30	5	0	5
2	0	30	0	0	0
3	0	30	0	0	0
4	0	10	0	0	0

expired portion					
<i>balances</i>					
valuation date	0	70	5	0	0
<i>cash</i>					
1	0	30	5	0	0
2	0	30	0	0	0
3	0	10	0	0	0
4	0	0	0	0	0

Note: these flows assume the same patterns apply to the expired portion and the unexpired portion of the in-force policies, except for dividends (which are paid at total policy expiration). This is an approximation.

In-force total											
present value	175	158.2	9.8	20.0	4.9						17.8
<i>initial fund</i>											
balances											
valuation date	100	70	5	20	0	155.0				155.0	17.8
<i>cash</i>											
1	0	60	10	0	5	155.0	80.0	117.5	5.9	85.9	18.7
2	0	60	0	0	0	85.9	25.9	55.9	2.8	28.7	19.6
3	0	40	0	0	0	28.7	-11.3	8.7	0.4	-10.9	20.6
4	0	10	0	0	0	-10.9	-20.9	-15.9	-0.8	-21.7	21.6

Premium Deficiency Reserves
Time Value of Money
Premium provided funds method

Exhibit 1
Sheet 4

Year	Unearned Premiums	Expected L&LAE	Expected policyholder dividends	Unamortized acquisition costs	Maint costs	Fund balance begin	Fund balance end	Inv. inc. @ 5% avg	Ending fund after inv. inc.	Premium Deficiency Reserve	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
ultimate (at inception)	200	200	10	40	10						
<u>remaining</u>											
unexpired portion	100	100	5	20	5						
expired portion	0	70	5	0	0						

unexpired portion					
balances					
valuation date	100	0	0	20	0
cash					
1	0	30	5	0	5
2	0	30	0	0	0
3	0	30	0	0	0
4	0	10	0	0	0

expired portion					
balances					
valuation date	0	70	5	0	0
cash					
1	0	30	5	0	0
2	0	30	0	0	0
3	0	10	0	0	0
4	0	0	0	0	0

Assume underwriting expenses are 30%, and all are paid up-front except for maintenance costs.

In-force total

initial year	calculation of initial fund balance				Underwriting expenses							backed into so as to produce a value of zero, below
	Premium received	Loss&lae paid	Dividends paid	Underwriting expenses paid	0.0	115.0	57.5	2.9	117.9	24.4		
initial year	200	30	0	55	0.0	115.0	57.5	2.9	117.9	24.4		

subsequent cash flows											
1	0	60	10	0	5	117.9	42.9	80.4	4.0	46.9	25.6
2	0	60	0	0	0	46.9	-13.1	16.9	0.8	-12.3	26.9
3	0	40	0	0	0	-12.3	-52.3	-32.3	-1.6	-53.9	28.2
4	0	10	0	0	0	-53.9	-63.9	-58.9	-2.9	-66.8	29.7

Future earnings

	premium	loss&lae	policyholder dividends	unamortized acq. Costs	maint. costs	inv. inc.	profit
premium funds	100	100	5	20	5	0.3	-29.7
PDR	24.4					5.3	29.7
Total							0.0

Premium Deficiency Reserves
Line of Business groupings and offsets

Exhibit 2

Year	Unearned Premiums	Expected L&LAE	Expected policyholder dividends	Unamortized acquisition costs	Maint. costs	Fund balance begin	Fund balance end	Fund balance avg	Inv. inc. @ 5%	Ending fund after inv. inc.	Premium Deficiency Reserve
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Line A											
ultimate	100	100	5	20	5						
present value	100	92.1	4.8795	20.0	4.9						21.9
											<i>present value method</i> →
											<i>expected investment income method</i> →
balances											
valuation date	100	0	0	20	0		80.0			80.0	21.9
cash											
1	0	30	5	0	5	80.0	40.0	60.0	3.0	43.0	23.0
2	0	30	0	0	0	43.0	13.0	28.0	1.4	14.4	24.1
3	0	30	0	0	0	14.4	-15.6	-0.6	0.0	-15.6	25.4
4	0	10	0	0	0	-15.6	-25.6	-20.6	-1.0	-26.7	26.6
Line B											
ultimate	100	60	5	20	5						
present value	100	55.3	4.8795	20.0	4.9						0.0
											<i>present value method</i> →
											<i>expected investment income method</i> →
balances											
valuation date	100	0	0	20	0		80.0			80.0	0.0
cash											
1	0	18	5	0	5	80.0	52.0	66.0	3.3	55.3	0.0
2	0	18	0	0	0	55.3	37.3	46.3	2.3	39.6	0.0
3	0	18	0	0	0	39.6	21.6	30.6	1.5	23.1	0.0
4	0	6	0	0	0	23.1	17.1	20.1	1.0	18.2	0.0
Line A + B											
ultimate	200	160	10	40	10						
present value	200	147.4	9.7590	40.0	9.8						7.0
											<i>present value method</i> →
											<i>expected investment income method</i> →
balances											
valuation date	200	0	0	40	0		160.0			160.0	7.0
cash											
1	0	48	10	0	10	160.0	92.0	126.0	6.3	98.3	7.3
2	0	48	0	0	0	98.3	50.3	74.3	3.7	54.0	7.7
3	0	48	0	0	0	54.0	6.0	30.0	1.5	7.5	8.0
4	0	16	0	0	0	7.5	-8.5	-0.5	0.0	-8.5	8.4

Line A 21.9
Line B 0.0
Total 21.9

Line A + B 7.0

← Note the difference in combined calculation versus individual calculation

Premium Deficiency Reserves
 Reinsurance impacts (on select PDR calculation inputs) when ceded written premium is based on direct earned premium

	Yr 1999 policies		Yr 2000 policies		Yr 2001 policies		Total CY 2000	Total CY 2001
	CY 1999	CY 2000	CY 2000	CY 2001	CY 2001	CY 2002		
<u>Direct</u>								
Written	100		100		100		100	100
Earned	50	50	50	50	50	50	100	100
UPR - ending	50	0	50	0	50	0	50	50
Commissions	20		20		20		20	20
<u>Ceded</u>								
Written	-20	-20	-20	-20	-20	-20	-40	-40
Earned	-20	-20	-20	-20	-20	-20	-40	-40
UPR - ending	0	0	0	0	0	0	0	0
Commissions	-6	-6	-6	-6	-6	-6	-12	-12
<u>Net</u>								
Written	80	-20	80	-20	80	-20	60	60
Earned	30	30	30	30	30	30	60	60
UPR - ending	50	0	50	0	50	0	50	50
Commissions	14	-6	14	-6	14	-6	8	8
commission rate	17.5%	30.0%	17.5%	30.0%	17.5%	30.0%	13.3%	13.3%

Assume 40% cession rate, based (and booked) on direct earned premium
 20% direct commissions
 30% ceding commissions
 July 1 direct policies.
 Steady volume.

Note:

1. How the UPR differs from the eventual runoff earned premium.
2. How different the runoff commission rate is from the CY rate.
3. How the runoff WP is negative.

Premium Deficiency Reserves
Agents Balances Reflection

Exhibit 4
Sheet 1

Year	Unearned Premiums	Agents Balances	Expected L&LAE	Expected policyholder dividends	Unamortized acquisition costs	Maint. costs	Fund balance begin	end	avg	Inv. inc. @ 5%	Ending fund after inv. inc.	Premium Deficiency Reserve
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	
ultimate	100	40	100	5	20	5						
present value	100	38.9	92.1	4.8795	20.0	4.9						23.1
<i>present value method</i> →												
<i>expected investment income method</i>												
<i>balances</i>												
valuation date	100	40	0	0	20	0	40.0				40.0	23.1
<i>cash</i>												
1	0	36	30	5	0	5	40.0	36.0	38.0	1.9	37.9	24.2
2	0	4	30	0	0	0	37.9	11.9	24.9	1.2	13.1	25.4
3	0	0	30	0	0	0	13.1	-16.9	-1.9	-0.1	-16.9	26.7
4	0	0	10	0	0	0	-16.9	-26.9	-21.9	-1.1	-28.0	28.0

Assumptions

1. No cash removed by owners until last claim paid
2. Initial fund balance equals unearned premium reserve less agents balances less unamortized acquisition costs
3. All payments made mid-year
4. 90% of agents balances received in the next period, with the remainder received the following period.

Source:

- (g) = prior year's value for (k)
- (h) = (g) + (b) - (c) - (d) - (e) - (f)
- (i) = $0.5 \times [(g) + (h)]$
- (j) = (i) x [interest rate shown above]
- (k) = (h) + (j)
- (l) = for present value row: (a) - (undiscounted b) + (discounted b) - (c) - (d) - (e) - (f)
for valuation date row: an estimate (solved for iteratively, or from present value calculation).
for future year rows: $(1 + \text{interest rate}) \times (\text{prior year value for column (k)})$

Premium Deficiency Reserves
Agents Balances
Portion supporting loss reserves

Exhibit 4
Sheet 2

Month	50% weight Up front billing						50% weight Even monthly installments							
	Collection	Cumulative	Agts Bal. supporting:			P.V. factor	Weight	Collection	Cumulative	Agts Bal. supporting:			P.V. factor	Weight
	pattern	earned	loss res.	UPR	Total			pattern	earned	loss res.	UPR	Total		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)
0	50%	0%	0%	50%	50%	99.59%	4.2%	4%	0%	0.0%	95.8%	96%	99.59%	4.2%
1	30%	8%	2%	18%	20%	99.70%	4.2%	7%	8%	1.7%	87.5%	89%	99.62%	4.2%
2	15%	17%	1%	4%	5%	99.80%	4.2%	8%	17%	2.1%	79.2%	81%	99.64%	4.2%
3	5%	25%	0%	0%	0%	100.00%	4.2%	8%	25%	2.1%	70.8%	73%	99.64%	4.2%
4	0%	33%	0%	0%	0%	100.00%	4.2%	8%	33%	2.1%	62.5%	65%	99.64%	4.2%
5	0%	42%	0%	0%	0%	100.00%	4.2%	8%	42%	2.1%	54.2%	56%	99.64%	4.2%
6	0%	50%	0%	0%	0%	100.00%	4.2%	8%	50%	2.1%	45.8%	48%	99.64%	4.2%
7	0%	58%	0%	0%	0%	100.00%	4.2%	8%	58%	2.1%	37.5%	40%	99.64%	4.2%
8	0%	67%	0%	0%	0%	100.00%	4.2%	8%	67%	2.1%	29.2%	31%	99.64%	4.2%
9	0%	75%	0%	0%	0%	100.00%	4.2%	8%	75%	2.1%	20.8%	23%	99.64%	4.2%
10	0%	83%	0%	0%	0%	100.00%	4.2%	8%	83%	2.1%	12.5%	15%	99.64%	4.2%
11	0%	92%	0%	0%	0%	100.00%	4.2%	8%	92%	2.1%	4.2%	6%	99.64%	4.2%
12	0%	100%	0%	0%	0%	100.00%	4.2%	4%	100%	2.1%	0.0%	2%	99.72%	4.2%
13							4.2%	2%		0.4%		0.4%	99.80%	4.2%
14							4.2%	0.4%		0.0%		0.0%	100.00%	4.2%
	100%							100%						

Weighted total (1.0 = annual WP)	0.001	0.030	0.031	→	0.010	0.250	0.260 installments
					<u>0.001</u>	<u>0.030</u>	<u>0.031</u> up front
Assume:					0.011	0.260	0.292 Grand total
					4%	96%	100%

Policies start on first day of month

Even spread of writings by month (signified by weights in columns (h) and (o)).

Installments billed monthly, collected in same pattern as up-front, once billed, but agents balance for full annual amount set up at time zero.

Agents Balances present value factor based on amounts billed to-date.

Annual interest rate 5.0%

Monthly interest rate 0.4%

Formula for certain columns:

(d) = (l) x (c), or the amount of agents balances supporting loss reserves equals total agents balances times the portion of policy premium earned to-date.

(k) = any amounts not yet collected from previous months' billings. In this example, this equals 20%/12 + 5%/12.

Note: prior months' installment billings are 100% earned in this example

Premium Deficiency Reserves
Estimated future audit premiums

Exhibit 5

Policy	Premium volume		Portion earned	Total audit		Earned portion of audit		Unearned portion of audit	
	initially booked	including audit		% of initial	% of ultimate	% of initial	% of ultimate	% of initial	% of ultimate
Month	booked	audit	@12/31/00	booked	booked	booked	booked	booked	booked
Jul-99	100.0	110.0	100.0%	10.0%	9.1%	10.0%	9.1%	0.0%	0.0%
Aug-99	100.0	110.0	100.0%	10.0%	9.1%	10.0%	9.1%	0.0%	0.0%
Sep-99	100.0	110.0	100.0%	10.0%	9.1%	10.0%	9.1%	0.0%	0.0%
Oct-99	100.0	110.0	100.0%	10.0%	9.1%	10.0%	9.1%	0.0%	0.0%
Nov-99	100.0	110.0	100.0%	10.0%	9.1%	10.0%	9.1%	0.0%	0.0%
Dec-99	100.0	110.0	100.0%	10.0%	9.1%	10.0%	9.1%	0.0%	0.0%
Jan-00	105.0	115.5	100.0%	10.0%	9.1%	10.0%	9.1%	0.0%	0.0%
Feb-00	105.0	115.5	91.7%	10.0%	9.1%	9.2%	8.3%	0.8%	0.8%
Mar-00	105.0	115.5	83.3%	10.0%	9.1%	8.3%	7.6%	1.7%	1.5%
Apr-00	105.0	115.5	75.0%	10.0%	9.1%	7.5%	6.8%	2.5%	2.3%
May-00	105.0	115.5	66.7%	10.0%	9.1%	6.7%	6.1%	3.3%	3.0%
Jun-00	105.0	115.5	58.3%	10.0%	9.1%	5.8%	5.3%	4.2%	3.8%
Jul-00	105.0	115.5	50.0%	10.0%	9.1%	5.0%	4.5%	5.0%	4.5%
Aug-00	105.0	115.5	41.7%	10.0%	9.1%	4.2%	3.8%	5.8%	5.3%
Sep-00	105.0	115.5	33.3%	10.0%	9.1%	3.3%	3.0%	6.7%	6.1%
Oct-00	105.0	115.5	25.0%	10.0%	9.1%	2.5%	2.3%	7.5%	6.8%
Nov-00	105.0	115.5	16.7%	10.0%	9.1%	1.7%	1.5%	8.3%	7.6%
Dec-00	105.0	115.5	8.3%	10.0%	9.1%	0.8%	0.8%	9.2%	8.3%

Unbilled audit premium at 12/31/00 from:

In-force policies at 12/31/00	126.0	68.3	57.8
All policies written through 12/31/00	186.0	128.3	57.8
	<i>Audit premium adjustment if booked as adjustment to written.</i>	<i>Audit premium adjustment if booked as adjustment to earned.</i>	<i>Required adjustment to PDR calculation if only earned portion of audit was booked in financials.</i>

Assume:

1. All policies are written at the start of the month.
2. Audits are billed exactly 6 months after expiration.
3. All policies are effective for 1 year.

