Volatility from FASB Changes to Traditional Liabilities (Part 1)

By Leonard Reback

Under current US GAAP, as promulgated by FAS 60 and by FAS 97 for limited payment contracts, reserves for traditional nonparticipating contracts use locked-in cash flow assumptions and discount rates, as long as no premium deficiency emerges. Under targeted improvements, as promulgated recently by ASU 2018-12 and which will generally become effective in 2021, reserves for these contracts will use unlocked assumptions and discount rates. The impact of unlocking the discount rate will be reported in other comprehensive income (OCI). The impact of unlocking cash flow assumptions will result in retrospectively updating the net premium ratio (or net to gross ratio), with the net impact to the reserve reported in net income. The net premium ratio (NPR) will be capped at 100 percent and the reserve floored at zero by cohort. In addition, for limited payment products, the deferred profit liability will also be retrospectively updated. The unlocking of assumptions will generate more volatility in the reserves than occurs under current US GAAP.

INTRODUCTION

We can gain some insight into the volatility of reserves by examining the reserve formula under targeted improvements. In the absence of a change in discount rate, the results will be similar to the impact of DAC unlocking for FAS 97 UL-type contracts under current US GAAP or of unlocking SOP 03-1 reserve assumptions.

In this series, I demonstrate the impacts to reserves of updating projected future cash flows or truing up assumptions to reflect actual experience. Further, I demonstrate the reserve impacts under the condition that the discount rate has not changed since the contracts were issued. Even if discount rates have changed, these will be the reserve impacts that affect net income. In a future article, I will discuss the reserve impacts under the condition that discount rates have changed since the contracts were issued.

In all cases, I will assume that the NPR is not currently capped at 100 percent (i.e., the present value of gross premiums in the contract exceeds the present value of benefits) and that the reserve is not currently floored at zero. Also, for contracts that apply modified retrospective transition, the transition date would replace the contract inception date.

UPDATING CASH FLOW ASSUMPTIONS FOR PERIODIC PREMIUM PRODUCTS (NO CHANGE IN DISCOUNT RATE)

Assuming that the discount rate has not changed since inception and that historical cash flows have been trued up to reflect actual experience, the reserve at time t can be written as:

$$V_t = PVFB_t - PVFP_t \times NPR_t$$

Where:

V_t =	Reserve at time *t*
$PVFB_t$ =	Present value of future benefits (plus any expenses included in the reserve) at time *t*
$PVFP_t$ =	Present value of future gross premiums at time *t*
NPR_t =	Net premium ratio as measured at time *t*

Retrospectively updating the NPR means that the ratio will reflect all actual cash flows from inception through the valuation date and all updated projected cash flows subsequent to the valuation date. So, the NPR can be written as:

$$NPR_t = PVFB_{0,t}/PVFP_{0,t}$$

Where:

$PVFB_{o,t}$ =	Present value of all benefits from inception through the end of the contract, as measured at time t at the original contract discount rate
$PVFP_{o,t}$ =	Present value of all gross premiums from inception through the end of the contract, as measured at time t at the original contract discount rate

For convenience, I will drop the *t* subscript from the (*o*,*t*) and just use $PVFB_O$ and $PVFP_O$. Also for convenience, I will introduce two additional terms:

$PVFB_S = PVFB_O - PVFB_t$ =	Present value of all benefits incurred through the valuation date, as measured at time *t* at the original contract discount rate

$PVFP_s = PVFP_0 - PVFPt =$ Present value of all gross premiums incurred through the valuation date, as measured at time t at the original contract discount rate

So, $PVFBt$ includes all future benefits; $PVFB_s$ includes past benefits; and $PVFB_0$ includes all benefits. Now the reserve is written as:

$$V_t = PVFB_t - PVFP_t \times PVFB_0/PVFP_0 = PVFB_t - PVFP_t \times (PVFB_s + PVFB_t)/(PVFP_S + PVFP_t)$$

To see what happens if I change an assumption that impacts future benefits or if a true-up in the amount of inforce impacts future benefits, I can take the derivative of Vt with respect to $PVFBt$. This results in:

$$\frac{dV_t}{dPVFB_t} = 1 - PVFP_t/(PVFP_s + PVFP_t) = 1 - PVFP_t/PVFP_0 = PVFP_s/PVFP_0$$

This derivative, and those that follow, assumes that the change in future benefits ($PVFBt$) is independent of any change in future premiums ($PVFPt$) or benefits and premiums already incurred ($PVFB_s$ and $PVFP_s$).

The reserve impact of a change in present value of future benefits will be the change in present value of future benefits, multiplied by the ratio of the present value of all historic gross premiums collected through the valuation date to the present value of all gross premiums expected to be collected over the life of the contract.

This is not surprising given the rationale for retrospective unlocking of the NPR. The change in present value of future benefits is spread over the life of the contract. To the extent that part of the life (as measured in premiums) has elapsed, that portion of the cash flow change gets reported through the reserve immediately. The remaining portion of the change is spread over the remaining life of the contract. This relationship becomes more complex if the discount rate has changed since contract inception, as I will discuss below.

In order to see how the reserve reacts to truing up actual benefit incurred, take the derivative of Vt with respect to $PVFB_s$. That is because the experience true-up represents a change to current period benefits, which are part of the historical cash flows as of the valuation date. This results in:

$$\frac{dV_t}{dPVFB_s} = 0 - PVFP_t/(PVFP_s + PVFP_t) = -PVFP_t/PVFP_0$$

When incurred benefits experience is trued up, the reserve will decrease if the true-up generated current period benefits that were greater than those previously projected. The reserve will increase if the true-up caused a reduction to the previously projected benefits. The change to the reserve will be the ratio of the present value of all future gross premiums expected to be collected as of the valuation date to the present value of all gross premiums expected to be collected over the life of the contract. Again, this relationship becomes more complex if interest rates have changed since contract inception.

See how the reserve reacts if I change the assumption of future gross premiums by taking the derivative of Vt with respect to PVFPt. Applying the quotient rule and some algebra, the result is:

$$\frac{dV_t}{dPVFP_t} = 0 - [(1) \times PVFB_0/PVFP_0 + PVFP_t \times (0 - (1) \times PVFB_0/PVFP_0^2)] = -PVFB_0/PVFP_0 + (PVFP_t \times PVFB_0/PVFP_0^2)$$

Since $PVFB_0/PVFP_0 = NPRt$, this reduces to:

$$\begin{aligned}\frac{dV_t}{dPVFP_t} &= -NPR_t + NPR_t \times PVFP_t/PVFP_0 \\ &= NPR_t \times (PVFP_t/PVFP_0 - 1) \\ &= NPR_t \times (-PVFP_s/PVFP_0) \\ &= -NPR_t \times (PVFP_s/PVFP_0)\end{aligned}$$

The impact to the reserve of a change in present value of future premiums is similar to the impact of a change in present value of future benefits, with two key differences. One is the sign. When the future premiums increase, the reserve goes down, rather than up as when future benefits increase. This is as expected. The other difference is the presence of the NPR in the impact.

If the NPR is close to zero, changing the future premiums will have very little impact on the reserve. If the NPR is close to 100 percent, the impact of a change in future gross premiums will be very similar (except for the sign) to that of a change in future benefits.

See, too, how the reserve reacts if I true up actual gross premiums incurred by taking the derivative of Vt with respect to $PVFP_s$. Again, applying the quotient rule and some algebra, the result is:

$$\frac{dV_t}{dPVFP_s} = 0 - PVFP_t \times [0 - (1 \times PVFB_0)/PVFP_0^2]$$
$$= (-PVFP_t \times -PVFB_0)/PVFP_0^2$$
$$= (PVFB_0/PVFP_0) \times (PVFP_t/PVFP_0)$$
$$= NPR_t \times (PVFP_t/PVFP_0)$$

As in the situation of changing a premium assumption, when truing up actual historical experience of premiums incurred, the reserve impact is similar to the impact of truing up benefit experience but with the opposite sign and with an impact from the NPR.

Although all the calculations above assume an NPR below 100 percent, it can be easily demonstrated that as long as the NPR is capped at 100 percent:

- Changes in the present value of future benefits or gross premiums would directly impact the reserve; and
- truing up actual cash flows would not impact the reserve.

This is because if the NPR is 100 percent, the reserve reduces to:

$$V_t = PVFB_t - PVFP_t$$

The reserve is simply a function of future cash flows, and historic cash flows have no impact. Thus, if the NPR is 100 percent:

$$\frac{dV_t}{dPVFB_s} = \frac{dV_t}{dPVFP_s} = 0$$

UPDATING CASH FLOW ASSUMPTIONS FOR SINGLE PREMIUM CONTRACTS

The impacts for limited payment contracts are similar to those for contracts with premiums throughout the life of the contract. For simplicity, let's look at a single premium contract. A limited payment contract such as a single premium contract would defer the premium loadings as a deferred profit liability (DPL) and amortize the DPL over an appropriate base, such as insurance inforce for a life insurance contract. I will assume here that inforce is the DPL amortization basis, although a different base can be used with no loss of generality.

If there have been no discount rate changes since contract inception, since there is only a single premium at inception the reserve at time t, Vt can be written as:

$$V_t = PVFB_t$$

The DPL at time t can be written as:

$$DPL_t = (P - PVFB_0) \times (PVFI_t/PVFI_0)$$

Where:

P = the single premium at contract inception

PVFIt = the present value of future in force amounts at the locked-in discount rate at time *t*

PVFI0 = the present value of future in force amounts at the locked-in discount rate as of contract inception

For convenience, I will also define *PVFIs* as the difference between *PVFI0* – *PVFIt*, i.e., the present value of the inforce amounts that have already been reflected in DPL amortization through the valuation date.

Thus, the DPL at time *t* can also be written as:

$$DPL_t = (P - PVFB_s - PVFB_t) \times (PVFI_t/PVFI_0)$$

The total liability at time *t*, *Lt*, can thus be written as the sum of the reserve plus the DPL, or:

$$L_t = V_t + DPL_t = PVFB_t + (P - PVFB_s - PVFB_t) \times (PVFI_t/PVFI_0)$$

To see the impact of the liability for a change in assumption causing the present value of future benefits to change, take the following:

$$\frac{dL_t}{dPVFB_t} = 1 - PVFI_t/PVFI_0 = PVFI_s/PVFI_0$$

For the impact of truing up actual benefits, take the following:

$$\frac{dL_t}{dPVFB_s} = -PVFI_t/PVFI_0$$

CONCLUSION

Under targeted improvements, the liability for traditional nonparticipating contracts will become more volatile. This volatility will be a challenge to understand and explain. Even if the effect of a single change is understood, when multiple effects occur at the same time, the explanations will be more complex. For example, even if the current period reserve impact of higher-than-expected death benefits is understood, the increased mortality may have additional knock-on effects, such as a current experience deviation in premiums collected and lower in force than expected, impacting projected future benefits and premiums. ■

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