

**TIP\$TER®**  
**Bug Fixes and Material Algorithm Alterations**

**I. 10/12/08 – TIP\$TER® version 1.1 released**

TIP\$TER® version 1.1 corrects an error that version 1.00 had made in the computation of the cumulative shortfall risk.

**II. 11/05/08 – TIP\$TER® version 1.3 released**

TIP\$TER® version 1.3 also replaces an old 1992 Period Life table with a newer, 2004 Period Life table, retrieved from the Social Security administration's website.

**III. 05/18/09 – TIP\$TER® version 1.4 released**

TIP\$TER® version 1.4 rebuilds the Asset Allocation chart, which previously, under some circumstances and on some platforms, caused Excel to crash.

**IV. 08/05/09 – TIP\$TER® version 2.0 BETA released**

**Change in how bequest goals are handled:** Version 1.5 of TIP\$TER treated a bequest goal as if the amount were to be subtracted from the user's portfolio at the beginning of the last year of the targeted portfolio duration. Starting with TIP\$TER 2.0 and forward, TIP\$TER treats a bequest goal as if the amount is distributed *after* the targeted portfolio duration. Generally, this has only a slight impact on outcomes.

**Excel rounding errors created a problem:** During one particular test, shortfalls were being reported when they did not exist. There is a macro formula that compares the minimum draw for the year (A) with the amount available in the portfolio and other income sources (B). If  $A > B$ , a shortfall is reported. When these values (both doubles) were equal, Excel sometimes rendered the "if greater than" comparison as true. To correct this problem, the formula was modified to if  $A > B + \$0.01$ .

**Modification in calculation of shortfall risk:** TIP\$TER generally incorporates the risk of outliving one's portfolio in the calculation of one's shortfall risk. But if a person's other lifetime income sources (e.g., social security, pension, annuity, and reverse mortgage income) are sufficient to at least meet "absolute minimum retirement budget," then the risk of outliving one's portfolio duration shouldn't increase one's shortfall risk. The shortfall risk algorithm was modified accordingly.

**Modification in handling of absolute minimum budget:** In versions 1.x, TIP\$TER added any "additional draws" set forth in the "Additional Inputs" section to the absolute minimum budget in computing the required minimum draw for any year of a simulation. In version 2.0, TIP\$TER no longer incorporates any "additional draws" into the required minimum draw. This can, under some circumstances, have the effect of reducing the shortfall risk.

**Elimination of switch-to-safe 5X savings threshold:** Previous editions of TIP\$TER converted a simulated portfolio to 100% TIPS any time it fell below a threshold equal to 5X the investors' targeted retirement budget. This feature has been removed from TIP\$TER 2.0.

**Modification of variable retirement budget logic:** TIP\$TER slightly modifies the variable retirement budget logic. Now TIP\$TER resolves the constraints in the following order: (1) budget = targeted budget; (2) if budget < variable floor then budget = variable floor; (3) if budget > variable ceiling, then budget = variable ceiling; (4) if budget < absolute minimum budget, then budget = absolute minimum budget. In this manner, a user can force TIP\$TER to always make the budget = the variable ceiling, by setting the absolute minimum budget to zero and setting either the targeted budget, or the variable floor, at such an extremely high level that it always exceeds the variable ceiling.

**Slight Modification of Variance Drag Formula:** The variance drag formula to convert an annualized expected return to an arithmetic one was adjusted just slightly, from the simple form of  $AR = GR + 0.5 * Var$  to the slightly more accurate one of  $AR = \sqrt{GR^2 + Var} - 1$ . This very slight change

## V. August 2009 – bug fixes in TIP\$TER® version 2.0 BETA

**Fixed Errors Caused by Extreme Terminal Wealth Goal Settings:** A bug in TIP\$TER's amortization algorithm was corrected to eliminate errors caused by setting terminal wealth goals that were considerably higher than one's existing savings. TIP\$TER's baseline retirement budget and amortization algorithms were also modified to prevent TIP\$TER from projecting negative retirement budgets in order to meet extreme terminal wealth goal settings. Now neither the baseline budget nor the portfolio can ever go negative. These changes only affect the outcomes with relatively unusual and somewhat extreme variable sets.

**Fixed Shortfall Risk bugs:** One of TIP\$TER's actuarial algorithms was off by one year. Another bug in TIP\$TER's shortfall risk calculation sometimes double-counted the risk of outliving the targeted portfolio duration. Together, these bugs caused the computed shortfall risks, in some scenarios, to slightly exceed 100%. Both bugs were corrected.