Your Retirement Savings on Cruise Control?
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Motivation. Federal government employees, including military service members, recently received a mailing touting the lifecycle (L) funds of the Thrift Savings Plan (TSP). The postcard contained catchy phrases like "Investing is like driving: Your decisions get you to your destination … or lost along the way" and "Put your TSP investments on cruise control." The L funds are professionally designed to provide the highest possible rate of return for the risk taken, given an individual's retirement time horizon. Mutual fund companies, including Fidelity Investments, Vanguard Group, and T. Rowe Price, offer 135 similar lifecycle funds in their 401(k) plans.[1] In general, the hands-off approach of lifecycle funds has many advantages for those saving for retirement. However, this approach may have some unintended consequences for uniformed[2] service members and government civilian employees who receive (or expect to receive) government pensions. They can end up with lower expected returns than they should due to a suboptimal exposure to risk.

TSP Overview. The TSP was established in 1986 as a tax-deferred retirement savings vehicle as an integral part of the Federal Employee Retirement System (FERS) for civilian employees; it was opened to uniformed service members in 2002. The TSP is a *defined contribution* plan funded by voluntary contributions by the service member or employee (and possibly matching contributions from the government). This is a significant difference from *defined benefit* plans like military retirement, the Civil Service Retirement System (CSRS), or the basic benefit portion of FERS. In addition to the benefits of tax-deferred savings, because there is no minimum *vesting* period for most TSP assets, they are portable if a service member or employee leaves government service before reaching retirement eligibility. Core investment funds in the TSP consist of five different funds in general asset classes, as indicated in Table 1.

Fund	Description	Invests In or Tracks	Assets
G	Government	Short-term U.S. Treasury Securities	$66.6B (39.2%)
F	Fixed-Income	Lehman Brothers U.S. Aggregate Index	$10.2B (6.0%)
C	Common Stock	Standard & Poor's 500 Stock Index	$66.7B (39.3%)
S	Small Cap Stock	Dow Jones Wilshire 4500 Completion Index	$13.7B (8.1%)
I	International Stock	Morgan Stanley Capital International EAFE (Europe, Asia, Far East) Index	$12.6B (7.4%)

Table 1. TSP funds overview, as of Dec 31, 2005.[3]

L Funds. The L fund managers use modern portfolio theory or mean-variance optimization, which seeks the maximum expected returns for a specified level of risk, to allocate assets to the five core TSP funds described above. An individual's retirement time horizon is also considered, as investors are encouraged to pick the L fund that corresponds to their planned retirement date, according to guidelines given in Table 2.[4]

Choose	If your time horizon is:
L 2040	2035 or later
L 2030	2025 through 2034
L 2020	2015 through 2024
L 2010	2008 through 2014
L Income	Sooner than 2008

Table 2. L Fund Selection Criteria.

Figure 1 provides the initial allocations of the L funds to the five core TSP funds.[5]

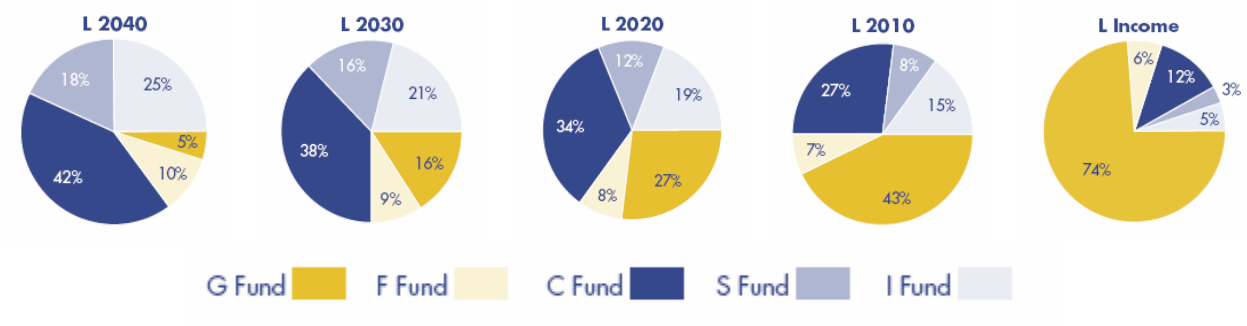

Figure 1. L Fund allocations to core TSP funds.

The L fund allocations to the five core funds adjust quarterly. Notice how the percentage invested in the G fund increases as the retirement horizon nears, while allocations to the more risky (but potentially more rewarding) F, C, S, and I funds decrease as time passes to reflect the change in investment objective from growth to preservation of assets. Once the target retirement date is reached (i.e. a dated L fund becomes the L Income fund) the percentages do not change since rebalancing among the asset classes (funds) no longer occurs. Figure 2 shows the risk-reward profile for the five core TSP funds (using diamonds) and the five L cycle funds (marked with crosses). The curve above all the individual funds is the *efficient frontier*, i.e. the curve that shows the maximum possible expected return for a given level of risk. The I fund appears to be *dominated* by the C fund, meaning that is provides less expected return for greater risk. However, if the correlation between the I fund and other funds is sufficiently low (or negative), there may be reason to include it in an optimal portfolio. Also notice that the L Income fund is relatively close to the efficient frontier, while the lifecycle funds with longer horizons are further away from it. This is due to the inclusion of the I fund in their asset mix. None of the optimal portfolios calculated to generate the efficient frontier using annual return data from 1988 to 2005 allocates any assets to the I fund, while all of the L funds do. Also shown is the resulting risk-reward profile for a portfolio that allocates 20% to each core fund. For being a naïve approach, it does not perform too badly, as shown by its position midway between the L2030 and L2040 funds.

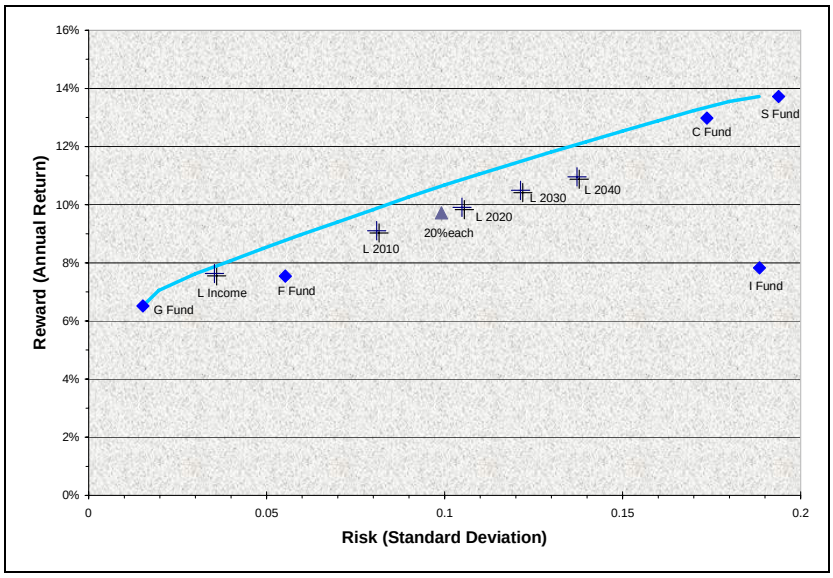

Figure 2. Risk-reward profile and efficient frontier of TSP funds, 1988-2005.

Contradiction. Most investors consider the income from a defined benefit plan (like a military or civilian retirement pension) when determining their income needs in retirement. There is evidence that Social Security and other pensions depress savings and may be implicitly considered when making asset allocation decisions.[6] However, the fact that over 39% of all TSP assets are invested in the G fund (see Table 1. TSP funds overview, as of Dec 31, 2005.) indicates that the value of these plans are not formally included in portfolio analysis. Given the importance of the asset allocation decision in determining portfolio return[7], this seems to be a contradiction. This forms the basis for including the value of pensions into account when making asset allocation decision in planning retirement savings, including TSP, Individual Retirement Accounts (IRA), etc.

"Pseudo-Bonds". In 2001, Jennings and Reichenstein addressed this inconsistency and proposed a valuation method that considers the value of a military retirement as a "pseudo-bond" in their expanded portfolio.[8] The justification for this treatment is that a military retirement is backed by the U.S. government and indexed for inflation using the Consumer Price Index (CPI), just like Treasury Inflation-Protected Securities (TIPS). Therefore, using TIPS *real yields* as the discount rate allows computing the value of retirement for inclusion in an individual's portfolio. Similar methods exist for valuing Social Security wealth and other pension systems.[9]

Examples. Consider the following examples of how choosing an L fund provides the uniformed service member or civilian employee with a less than optimal retirement portfolio. In the military cases presented below, retirement is assumed to occur at the end of 2006 under the "High-3" retirement system, with three years in the rank at which they are retiring. The "High Pay" system would result in slightly higher valuations for the majority of retirees, as pay is usually highest in the last year of service. The "Redux" retirement system is not considered, as the situations in which this choice makes sense are so limited.[10]

Using the discounting method mentioned above (available in detail in Jennings and Reichenstein's book)[11], it is possible to compute the *net present value* (NPV) of the retirement

income streams. Consider the NPV of a pension or annuity as "the amount of money someone would need to have saved, at the time of retirement, to generate an income stream equivalent to their pension for the rest of their expected life." Table 3 provides data for two hypothetical investors — an officer and an enlisted service member, each single, with 20 years of military service, with complete retirement at age 65.

Pay Grade	Age	Fully Retire In	NPV of Retirement
O-5	42	2031	$844K
E-7	38	2035	$446K

Table 3. Hypothetical investor profiles.

Marital status plays a role in the valuation because of the potential value of the Survivors' Benefit Plan (SBP) to a surviving spouse; the value of retirement for a single service member is approximately 3-5% lower than for those who are married. Similarly, the NPV for females is approximately 2-5% higher than for males due to life expectancy differences. As both retirement income and TSP withdrawals are taxable, it is not necessary to reduce the value by an appropriate tax rate for comparison purposes.

Assuming that each hypothetical investor has their TSP in the appropriate L fund, their current asset allocation would be as follows. Starting TSP balances were calculated under the assumption that each hypothetical investor made the maximum allowable yearly contributions (which were initially limited to a percentage of pay) since TSP was opened to uniformed service members in 2002. Currently, the only restriction is the IRS limit of $15K per year. This may be unrealistic (especially for the E-7 to have contributed $15K in 2006); however, if they had made smaller contributions, the resulting imbalance would be even more pronounced, as they would have smaller starting TSP (and therefore stock) balances. Also assumed is the common strategy (prior to the initiation of the L funds,) of placing 20% in each fund. These assumptions result in the following approximate TSP balances and allocations for the nearly retired service members.

Pay Grade	TSP Total	L Fund	G Fund	F Fund	Bond Total	C Fund	S Fund	I Fund	Stock Total
O-5	$51,300	L 2030	$8,200	$4,600	$12,800 (25%)	$19,500	$8,200	$10,800	$38,500 (75%)
E-7	$34,300	L 2040	$1,700	$3,400	$5,100 (15%)	$14,400	$6,200	$8,600	$29,200 (85%)

Table 4. Current TSP allocations for hypothetical investors.

Although the allocations in the TSP accounts (determined by the L fund asset mixes) appear to be rather aggressive (with over 75% invested in stocks), including the value of retirement creates a tremendous shift in the expanded portfolio allocations, as shown in Table 5 and Figure 3.

Pay Grade	TSP Bonds	NPV of Retirement ("Pseudo-Bond")	Bond Total	TSP Stocks	Stock Total
O-5	$12,800	$844,200	$857,000 (96%)	$38,500	$38,500 (4%)
E-7	$5,100	$445,800	$450,900 (94%)	$29,200	$29,200 (6%)

Table 5. Bond/Stock allocations in expanded portfolios.

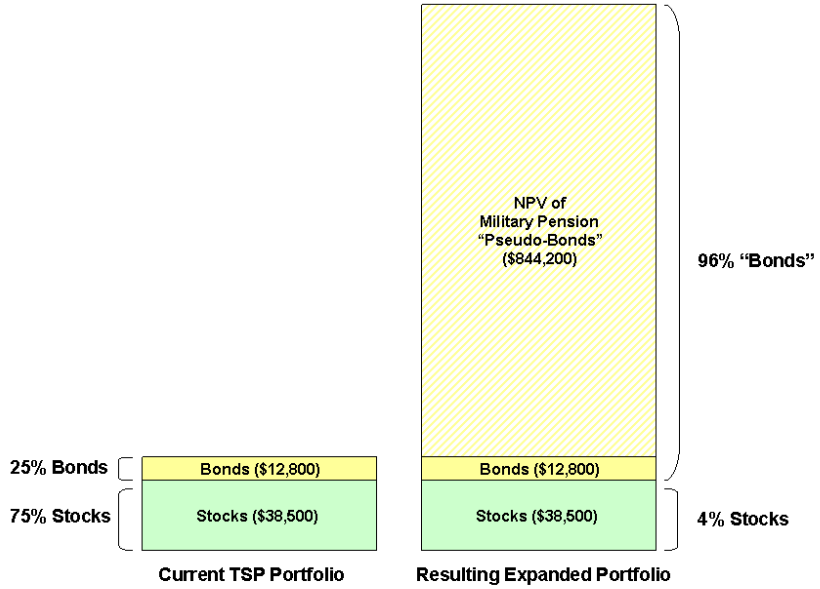

Figure 3. Bond/stock mix change by including value of military retirement for O-5.

Instead of an aggressive, stock-heavy TSP portfolio, the expanded portfolio is now quite conservative, with the vast majority of the total investment in bonds. To counteract this effect, TSP allocations could be adjusted to only include the three stock funds. The resulting expanded portfolios would then be:

Pay Grade	TSP Bonds	NPV of Retirement ("Pseudo-Bond")	Bond Total	TSP Stocks	Stock Total
O-5	$0	$844,200	$844,200 (94%)	$51,300	$51,300 (6%)
E-7	$0	$445,800	$434,400 (93%)	$34,300	$34,300 (7%)

Table 6. Effect of reallocating TSP balance to only stock funds.

The resulting portfolios for the hypothetical investors are not terribly different in their bond/stock mix because of the relatively recent introduction of the TSP for military members. These are extreme examples as they have only had five years to build up their TSP balances; future retirees will have greater opportunity to take advantage of including the value of military retirement as a "pseudo-bond" in their asset allocation decision. An example of a civilian retiree with substantial TSP assets would demonstrate this. However, the corresponding valuation procedure for civilian retirees is somewhat more complicated and not currently available. Also, while military retirees and civilian annuitants under FERS are eligible for Social Security, this value is not included in the analysis because it is small in comparison to the NPV of military retirement and would actually make the results more extreme.

The optimal allocation of TSP assets among the three stock funds is not addressed here, but could easily be accomplished with standard mean-variance optimization. Also, moving only the G fund investments to stocks would largely achieve the desired result; the F fund could be used with the three stock funds if an individual investor wanted to maintain some exposure to corporate debt (bonds). The reallocation of TSP investments away from government bonds could be accomplished by individual investors; alternatively, the Federal Retirement Thrift Investment Board could offer a series of "P (for Pension) funds" for those who (will) receive a military retirement within the TSP.

Extensions. For those still on active duty who are not yet retirement eligible (i.e. have not reached 20 years of service), the effect of including the NPV of a military retirement is still present but more difficult to calculate. The complication results from the difficulty in determining an appropriate method of discounting to acknowledge the risk of not ever receiving the military retirement income stream, due to *cliff vesting* (all or none) at 20 years of service. Also, the selection of an appropriate discount rate is problematic as there is empirical evidence from the downsizing of the 1990's that service members have discount rates that are significantly higher (over 15%) than recent TIPS rates of 4%[12]. Resolving these issues in valuation for those not yet retired (but planning on staying until at least 20 years) is an area of active research for the author. Other extensions being considered include: use of coherent risk measures[13] (e.g. Conditional Variance at Risk) as alternatives to variance; advantages of multi-period portfolio models over traditional, single-period optimization; and consideration of non-Gaussian returns (to account for skewness and kurtosis) rather than the conventional assumption of Normally-distributed returns.

Concluding Thoughts. A recent publication on the TSP website, "Investing on Autopilot" promotes the L fund by advising investors to beware of: investing too conservatively, investing only in a single fund, investing in a combination of funds that are less than optimal, and other hazards.[14] However, before taking the hands-off approach to retirement saving with the L funds, uniformed service members and civilian employees who are retired (or expect to retire) from government service should consider including the value of their defined benefit pension when determining asset allocations, or they may fall into one or more of the very pitfalls the L funds were designed to prevent. With some additional thought and effort, TSP contributions can provide a potentially higher return for a given level of risk than offered by the L funds.

Disclaimer. The opinions contained in this article are the author's and not the position of the U.S. Army, U.S. Government, or Federal Retirement Thrift Investment Board.

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