



United States Postal Service – OIG

**RETIREE FUNDS
INVESTMENT STRATEGIES**

Office of the Inspector General
Risk Analysis and Research Center

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Retiree Funds Investment Strategies

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A. Executive Summary

Overview

The United States Postal Service (USPS) Office of the Inspector General (OIG) has engaged Segal Consulting to examine alternatives to the current investment strategy for three funds that provide benefits to USPS retirees:

- The Postal Service's share of the Civil Service Retirement System (CSRS),
- The Postal Service's share of the Federal Employees' Retirement System (FERS), and
- The Postal Service Retiree Health Benefits Fund (PSRHBF).

Currently, these benefit plan assets are restricted to government trust funds invested in U.S. Treasury securities—a very conservative, low-risk investment strategy that has produced insufficient returns to meet the plans' actuarial liabilities. This leaves projected plan funding levels significantly below those needed to meet all future benefit obligations to USPS retirees.

In light of this concern, the OIG seeks to explore reasonable data-supported alternatives to the current strategy that would improve the long-term funding outlook for these plan assets, while still maintaining an acceptable level of risk. For the purposes of this overview, we use a standard definition of risk: the potential that returns on investment assets will be lower than expected, which can cause a benefit plan's funding levels to deteriorate in the absence of increases in employer contributions and/or changes in benefits design.¹

In the following analysis, Segal presents six portfolio options that would provide additional expected return beyond the current strategy. While these six portfolios may introduce more risk, they provide an attractive rate of return to the current strategy over the long term.

Key Findings Identified

- In our analysis, we reviewed the current investment strategy of USPS's plans. As a result of our analysis, we have identified a number of alternatives to the current asset allocation that appear to offer attractive return and risk trade-offs.
- Depending on risk appetite, the different plans may warrant different strategic asset allocations based on their funded ratios, open versus closed plan designs and the type of benefits paid out.
- Strong governance is an important component of implementing long-term investment programs.
- To implement any of these investment options, special attention is needed with respect to the unique nature of the current investment portfolio and due to the size of the asset pools.

¹ For the more detailed discussion that follows, we use two approaches to measuring risk. The first approach is to measure risk by the conventional definition of risk, i.e., the portfolio return's annual volatility or dispersion (technically defined as the annual standard deviation of the plan's rate of return). The second approach is to evaluate risk by examining the potential downside to the accumulated plan assets over a long horizon.

A Brief Primer on Asset Allocation and Risk Tolerance

Operating defined benefit pension and post-retirement plans involves managing three key components: benefits design, contribution policy and investment structure. This report focuses on the third component—the investment structure—of the CSRS, FERS and PSRHBF plans. Central to the concept of investment structure is “asset allocation,” which refers to how investments are allocated within a portfolio to different asset classes, such as stocks and bonds.

To determine a benefit plan’s asset allocation, the plan sponsor must consider both the plan’s *ability* to take risk and the sponsor’s *willingness* to take risk. To determine a plan’s ability to take risk, the sponsor must first consider the financial condition and objectives of the plan. Based on that assessment, the sponsor can assess a range of feasible asset-allocation options for achieving those objectives. The sponsor’s “risk appetite”—or willingness to take risk to achieve the objectives—will then determine which asset allocation the sponsor ultimately chooses.

In this report, we focus on the USPS plans’ *ability* to take risk. The designated plan fiduciaries will determine the plan’s *willingness* to take risk. For an overview of decision-making practices as they relate to risk tolerance and portfolio selection, as well as the process by which these decisions are implemented (or not), see the “Governance” section beginning on page 36.

Once the asset allocation is determined, the plan sponsor will create an investment policy statement reflecting those decisions. Plan assets are invested according to this statement, which defines a target asset allocation and sets bounds around deviations from that target.

Current Investment Structure

Currently, the USPS’s benefit plan assets are allocated to special-purpose Treasury securities. This type of fixed-income security is backed by the full faith and credit of the U.S. government, making it one of the highest quality investments available. The current strategy has many conservative features, but is by no means risk-free. The greatest risks inherent in the current strategy are reinvestment risk and inflation risk relative to the actuarial liabilities, potentially resulting in returns which fail to keep pace with the liabilities’ growth. Reinvestment risk is the risk of a bond that matures and is reinvested in a lower interest rate environment. Inflation risk relative to actuarial liabilities is the risk of the liabilities growing faster than the assets that support those actuarial liabilities, potentially leading to a wider funding gap.

Given the recent low-interest-rate environment and our outlook for low expected returns on these and other investments, we anticipate that the current CSRDF investment strategy for the USPS’s benefit plans will have a modest expected return of approximately 3.3% per annum over the next two decades.² Adjusted for inflation, that return is even lower—at 1.25% per annum—based on our outlook for Consumer Price Index (CPI) increases of 2.0% per annum.³ Importantly, note that our return outlook is below the valuation return assumptions that are currently used to determine the funded position of the various plans, as seen in the table below. The modeling results contained in this report are based on a starting point of fiscal-year-end 2015. Due to the long-term nature of the modeling, none of the observations and conclusions would be affected by adjusting the starting point a year later.

² See the Current asset allocation section

³ $1.25\% = 3.25\% - 2.00\%$

TABLE 1: PLAN CHARACTERISTICS

(Billions)	CSRS (projected as of 9/30/2015)	FERS (projected as of 9/30/2015)	PSRHBFB (as of 9/30/2015)
Discount Rate	5.25%	5.25%	4.10%
Inflation	3.00%	3.00%	NA
Implicit Real Rate ⁴	2.25%	2.25%	NA
COLA	3.00%	2.40%	NA
Market Value of Assets	\$179B	\$108B	\$50B
Actuarial Accrued Actuarial Liability	\$200B	\$111B	\$105B
(Deficit) Surplus	-\$20	-\$4	-\$55
Funded Ratio	90%	97%	48%
Plan Design	Closed	Open	Open

Totals do not always sum due to rounding.

Sources: U.S. Office of Personnel Management (OPM), Financial Reporting Information with Respect to Pension Obligations of the Postal Service, Projected Unfunded Liabilities – End of FY 2015; OPM, Valuation of Post-Retirement Health Liabilities and Normal Costs, and U.S. Postal Service, Form 10-K, FY 2015.⁵

Proposed Portfolios

We have provided for your consideration two sets of portfolios. The “traditional” portfolios, labeled T1, T2 and T3 which is represented in the table below. These portfolios include publically traded stocks and bonds. The “alternative” portfolios, A1, A2 and A3, include non-traditional, or alternative, asset classes such as high yield bonds, emerging market bonds, private real estate, private equity and multi-asset class solutions (MACS).⁶ The portfolios with alternative assets are structured to have similar risk levels as the traditional portfolios but higher expected returns due to greater diversification of asset classes, as well as from the premiums associated with certain types of investments.⁷

We categorize the portfolios in each set as spanning conservative, moderate and aggressive risk appetites. For example, the conservative portfolio T1 has an allocation of 80% to fixed income (bonds), which are generally lower-risk investments, and only 20% to public equities (stocks), which are generally higher-risk. The T1 portfolio’s returns will be lower but more stable, year-in and year-out, than the aggressive portfolio T3, which has 40% bonds and 60% equities.

⁴ Discount rate less inflation rate.

⁵ Segal began its analysis prior to OPM’s publication of the updated pension and retiree health valuations used in the FY 2016 10-K. The updated numbers do not substantially change the recommendations of the report.

⁶ Multi-asset class solutions include tactical asset allocation of stocks, bonds, commodities, currencies, etc. (or market timing), risk-managed equity strategies and non-conventional fixed income strategies.

⁷ One additional characteristic of some of these alternative asset classes is illiquidity. Illiquidity refers to the locking-up of investment capital, which limits an investor’s ability to sell assets quickly or inexpensively. Private equity is an example of an illiquid asset class. Capital is committed to a private equity fund for perhaps ten years and is not easily accessed in the interim.

The six portfolios also address the different needs of the various plans. For example, for a better-funded plan, the conservative portfolios T1 and A1 may be more attractive, because those portfolios tend to reduce the probability of a significant loss and increase the probability of maintaining the funded ratio (funded ratio is the assets divided by the actuarial liability).

Table 2 compares the different investment portfolio strategies described above. The key metrics used to evaluate those strategies are: (1) expected return, (2) standard deviation and (3) Sharpe ratio. The expected return is a combination of the projected returns of the underlying asset classes. Standard deviation is a measure of risk for that strategy; the higher the standard deviation, the higher the risk. The Sharpe ratio is a statistic that compares the expected return to the amount of risk of a given portfolio; the higher the Sharpe ratio, the more “efficient” the portfolio. A higher Sharpe ratio is generally preferable.

Compared to the current strategy, the six portfolios all have a higher return and better risk-adjusted return, as measured by their Sharpe ratios. If plan assets are shifted into any of the six portfolios, the expectation is these assets would grow faster than they would in the current Treasury-bond strategy. However, it is also important to note that the standard deviation, or risk, is greater in the six portfolios.

**TABLE 2: PORTFOLIOS COMPOSITION AND RETURN METRICS
(20-Year Horizon)**

		Current	T1	T2	T3	A1	A2	A3
Fixed - Income	Inflation Linked Bonds	0.0%	60.0%	50.0%	40.0%	50.0%	37.0%	20.0%
	Core Fixed Income	0.0%	20.0%	10.0%	0.0%	10.0%	2.0%	0.0%
	High Yield	0.0%	0.0%	0.0%	0.0%	2.5%	3.5%	4.0%
	Emerging Markets Debt	0.0%	0.0%	0.0%	0.0%	2.5%	3.5%	4.0%
	Multi-Asset Class Solutions	0.0%	0.0%	0.0%	0.0%	5.0%	6.0%	7.0%
Equity	US Equity	0.0%	10.0%	20.0%	30.0%	7.0%	15.0%	22.0%
	Developed Equity	0.0%	8.0%	16.0%	24.0%	6.0%	12.0%	18.0%
	Emerging Markets Equity	0.0%	2.0%	4.0%	6.0%	2.0%	4.0%	5.0%
Alts	Private Equity	0.0%				5.0%	7.0%	10.0%
	Real Estate	0.0%				10.0%	10.0%	10.0%
	Sum		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% Total Fixed Income		80.0%	60.0%	40.0%	65.0%	46.0%	28.0%
	% Multi-Asset Class Solutions					5.0%	6.0%	7.0%
	% Total Equity		20.0%	40.0%	60.0%	15.0%	31.0%	45.0%
	% Total Alternatives					15.0%	17.0%	20.0%
Risk & Return	Average Return	3.4%	4.6%	5.8%	6.9%	5.5%	6.7%	7.9%
	Portfolio Compound Return	3.3%	4.5%	5.4%	6.3%	5.3%	6.4%	7.3%
	Standard Deviation	4.2%	6.1%	8.7%	12.0%	6.2%	9.0%	12.1%
	Sharpe Ratio	0.05	0.24	0.30	0.31	0.38	0.40	0.40

Source: Segal Consulting based on their 2016 capital market assumptions (inflation linked bonds are also known as TIPS)

The table below illustrates the potential outcomes for the portfolios above assuming a starting value of \$100 billion. To determine the range of outcomes, we ran 2,000 simulations using Monte Carlo techniques that stochastically varied the potential returns from year to year. As this chart is illustrative and designed to show growth in assets, we assumed all funds were reinvested and that there were no cash flows out of or into the funds.⁸ The potential returns were ranked

⁸ Scenarios including cash flows appear starting on page 25.

from highest to lowest and the results at key percentiles appear below. The analysis shows the various outcomes including downside risk. Note that downside risks for the alternative portfolios appear favorable compared to the current strategy as well as the traditional strategies.

TABLE 3: 20-YEAR ASSET-ONLY PROJECTION OF THE VARIOUS STRATEGIES (\$ Billions)⁹

Percentile	Projected Assets						
	Current	T1	T2	T3	A1	A2	A3
95 th	253	399	551	769	468	673	939
75 th	216	290	383	493	340	468	603
50 th	190	235	291	346	275	355	422
25 th	168	188	210	231	220	257	282
5 th	140	136	133	123	159	162	150

Source: Segal Consulting based on their 2016 capital market assumptions

For example, comparing the current investment strategy to A3 demonstrates the benefits of diversification. The highly adverse (5th percentile) return from A3 is better than the comparable figure for the current plan, while the 25th percentile return—still somewhat adverse—is higher than the best return for the current asset allocation.

Key Observations

- All six portfolios show benefits over the current asset allocation. The six portfolios address the needs of different plans.
- The CSRS plan is closed to new entrants and is fairly well funded. Given that no new participants come into the plan, the growth rate of the actuarial liabilities is modest. In light of those plan features, the conservative portfolio options (T1 and A1) may be viable candidates because, as noted above, a more conservative portfolio reduces the probability of a significant loss and increases the probability of maintaining the funded ratio.
- The FERS plan is open and also fairly well funded. Since the plan is growing with new benefit accruals, it may desire to take on more risk for more return in hope of reducing the contribution cost. Thus, the moderate portfolio options (T2 and A2) may be strong candidates for adoption.

⁹ Note that asset projections are based on Segal Consulting's Proprietary Forecast model. Rate of return analytics may differ from mean variance assumptions due to Monte Carlo technologies. These include: stochastic volatility, yield curve and credit spread models, etc.

- The PSRHBF is also open to new plan participants. That plan provides for medical claims, which have much greater variability (more unpredictable) than the benefits from the pension plans. Historically, increases in medical costs have often exceeded overall trend rates, which can necessitate a need for a higher level of return. In addition, PSRHBF is poorly funded, also making the plan potentially more reliant on higher investment return. While there is no guarantee that the aggressive portfolio with 60% stocks (T3) will outperform the other portfolios, given the needs of the plan, it could be a strong candidate for the aggressive portfolio. A3 may also be a suitable portfolio but its viability will depend on that plan's cash flow profile in order to manage liquidity.

Conclusion

This report analyzes the current strategic asset allocation for USPS's plans and, as potential alternatives, provides two sets of portfolios spanning three risk appetites: conservative, moderate and aggressive. For each of these risk appetites, there is a set that includes only traditional public stocks and bonds, and a set with various alternative asset classes. The portfolios provide increased expected returns, albeit with greater risk, particularly in the short-term. In addition, all six of the portfolios are more efficient than the current strategy in terms of risk-adjusted return. As such, we find that even the conservative proposed portfolios offer great promise in overcoming current shortfalls in funding of the USPS retirement plans.

The balance of this paper discusses the above items with more detail and technical background. The key sections are governance, review of the current investment strategies, overview of investment structure development in the public and private marketplaces today, overview of capital markets' risk/return development and outlook, examples of pension fund asset allocations and our conclusions.

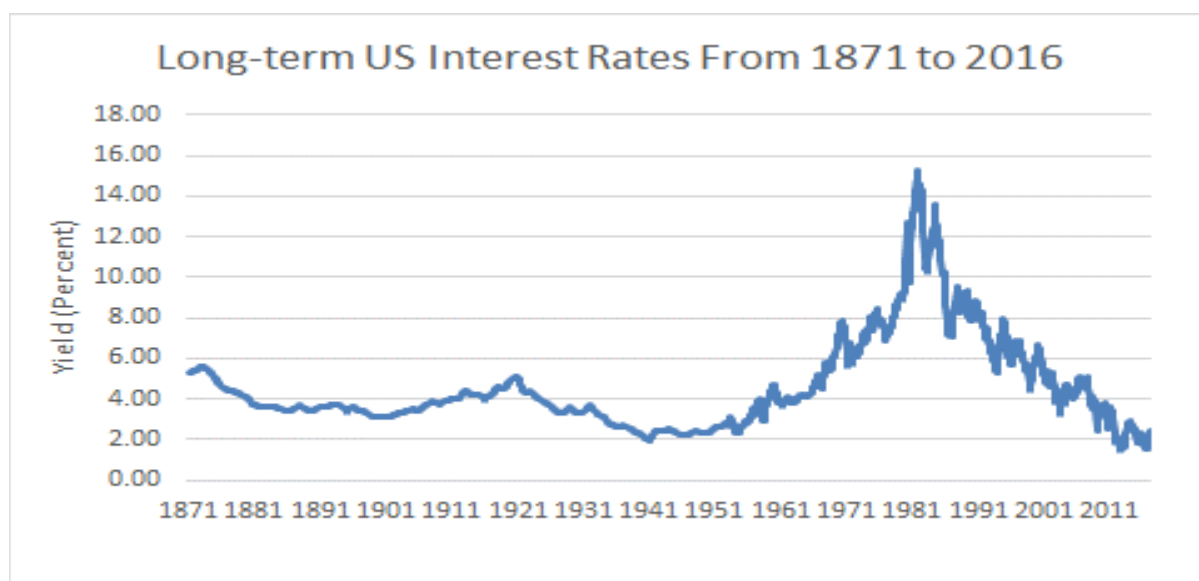
B. Review of the Current Investment Strategy

Current Return Environment

Our view is that today's outlook for the current portfolio's expected returns is more modest than historical returns. Current low bond yields are an indicator of lower expected returns in the future.

For example, at the end of 2015, 10-year nominal Treasuries and 10-year inflation-indexed bonds were yielding 2.27% and 0.73%, respectively. The 10-year Treasury bond yield achieved its historical low yield in calendar year 2016. The chart below illustrates the historical level of bond yields and shows how long-term U.S. interest rates have declined since the 1980s.

CHART 1: LONG-TERM U.S. INTEREST RATES (1871 TO 2016)



Source: Robert J. Shiller market data

Current Investment Strategy

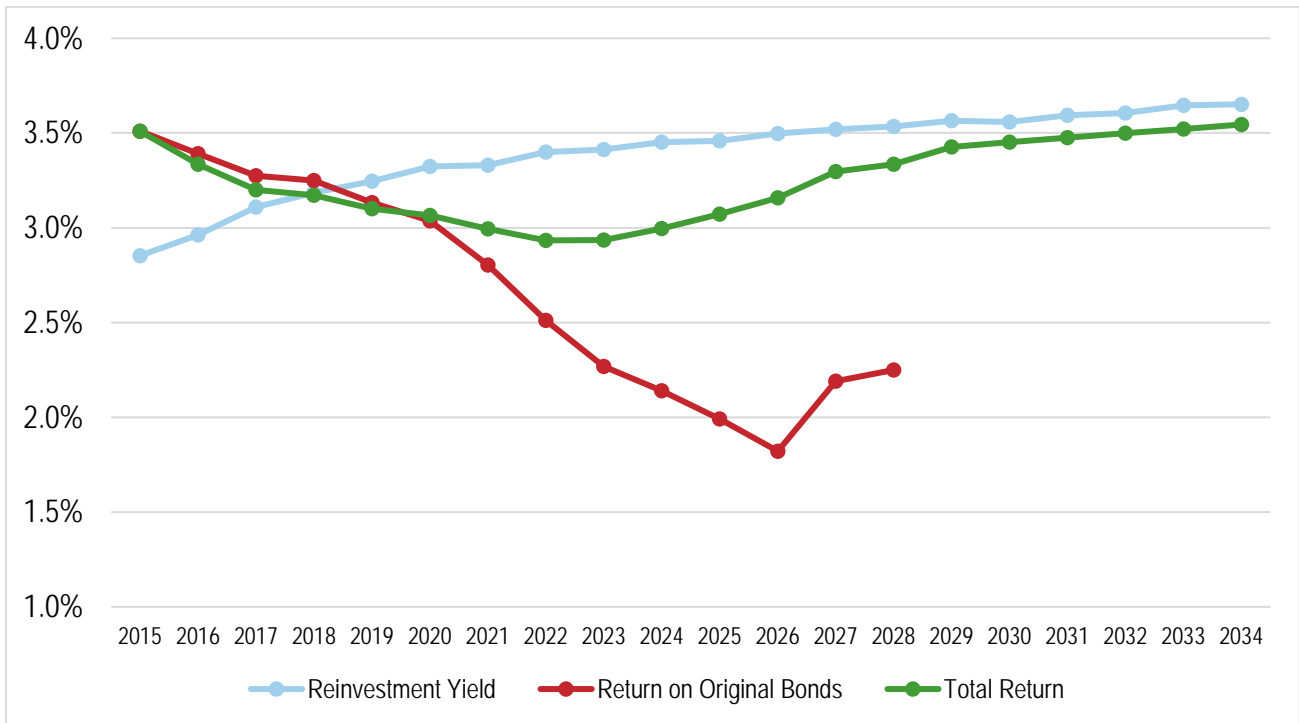
Currently, all three of USPS's plans' assets are invested in special purpose Treasuries. These securities are issued by the United States Treasury Department and are backed by the full faith and credit of the United States. The securities of the CSRS and FERS are a subset of the assets of the Civil Service Retirement and Disability Fund (CSRDF)¹⁰.

The bonds usually range in maturities between 1 – 15 years and are valued at par. The “yield” (the income component of a bond's return) at issue is based on the average yield of existing marketable Treasury bonds with maturities longer than 4 years.

¹⁰ The investment assets for the PSRHBF are based on their own portfolio of special purpose Treasuries with the same range of maturities as the CSRDF. For modeling purposes, the CSRDF was used without affecting the analysis's conclusion.

Since the bonds have a range of maturities, the total return over time for the current strategy is an average of the yields on the existing bonds and the reinvestment yields over time in new bonds (reinvestment yield). Based on our “most-likely” scenario, the portfolio will be reinvested into a rising rate environment. The total below (green line) is a combination of the known return on existing bonds in the current CSRDF portfolio (red line) and our estimate of the “most likely” returns the funds will yield when they are re-invested in new bonds (blue line).

CHART 2: CURRENT STRATEGY BASELINE RETURN PROFILE



In the short-term, the return is known with a high degree of certainty as the portfolio earns its fixed nominal coupon. The dispersion in asset value is limited. Over time, as the existing set of par bonds matures and a new set of bonds is purchased each year, the range of asset outcomes widens.

**CHART 3: ASSET-ONLY PROJECTION OF THE CURRENT STRATEGY
(Initial CSRS Asset Value of \$179B)**



Source: Segal analysis using Monte Carlo simulations to vary reinvestment returns

The floating bars above represent possible outcomes for the current investment strategy.¹¹ The top of the bar represents the 95th percentile event (1-in-20 chance assets are greater than), while the bottom of the bar represents the 5th percentile event (1-in-20 chance assets are less than or equal to).

¹¹ We used Monte Carlo techniques that varied the potential returns from reinvestments.

As illustrated in the floating bar chart above, the range of possible outcomes for the current strategy is narrow in the short-term. In other words, the investment risk is modest¹². In the short-term, the historical bonds purchased with known yield are the key drivers of the return realized.

Over the long-term, the current strategies' outcomes become more uncertain, as can be seen with the wider floating bar. There is significant risk over the long-term as the investment return will be driven by future interest rate levels that are unknown and can vary significantly.

It is also important to note that the bond portfolio is a nominal bond portfolio¹³ (as opposed to a bond whose principal and coupons adjust with inflation.) The par value does not change with inflation—a mechanism built into Treasury Inflation-Protected Securities (TIPS), for example. The laddered nature¹⁴ of the bond portfolio does provide some inflation protection, as a higher inflation environment would more often than not correspond with a rising yield environment.

TIPS are an attractive form of fixed income securities for real investors (as opposed to nominal investors), i.e., investors whose investment objective or goal is defined in CPI-U¹⁵ adjusted terms. Both the CSRS and FERS pension funds have some form of inflation indexing of retiree benefits. The active participants' benefits are also inflation-sensitive through their wage adjustments. The PSRHBF has inflation exposure through medical claims experience, although the correlation between changes in CPI-U and medical trends is less strong than the pension plans (which are driven by CPI-W). Of course, the rate of increase in medical claim costs also reflects changes in medical technology and utilization – it is not solely inflation-linked. And historically medical price inflation has exceeded the rate of increase in the overall CPI.

Because TIPS have a direct contractual relationship with CPI-U, they are a core component of the six portfolios (T1-T3 and A1-A3). In many ways, they could be considered the low risk asset class. As CSRS and FERS benefit payments are adjusted with CPI-W, the par value underlying the TIPS portfolios is indexed in a similar fashion. This will produce the effect that both assets and actuarial liabilities move together. In other words, the assets are hedging the actuarial liability changes and reducing plan risk. This is also true to a degree for PSRHBF, but the correlation is less.

¹² Investment risk is defined as the uncertainty of future wealth driven by lower rates of return than anticipated. For example the difference between the median asset value in the chart and the 5th percentile asset values represents investment risk.

¹³ Examples of a nominal bond are traditional Treasury bonds and the majority of corporate bonds.

¹⁴ Under a “laddered” approach, the investor gains some protection against potential rises in interest rates by purchasing multiple smaller bonds with different maturities, making it easier to periodically reinvest returned principal.

¹⁵ Note that both the CSRS and FERS plans provide COLAs that are linked to changes in CPI-W. CPI-W is highly correlated with CPI-U with a correlation of 0.85 over a recent trailing 10-year period. CPI-U and CPI-W have both averaged similar trends but CPI-W is more volatile given its heavier weight to energy and transportation.

The current special purpose Treasury profile for CSRS and FERS¹⁶ is a subset of the following as of 9/30/2015:

TABLE 4: SPECIAL PURPOSE TREASURY PROFILE

Maturity Date	Average Interest Rate	Par Value
2016	5.0%	\$53,121,879,000
2017	4.7%	\$54,084,731,000
2018	3.5%	\$54,533,693,000
2019	4.3%	\$54,121,174,000
2020	3.9%	\$54,104,093,000
2021	4.7%	\$54,442,616,000
2022	4.6%	\$54,445,403,000
2023	3.8%	\$54,421,513,000
2024	2.8%	\$54,719,343,000
2025	2.6%	\$55,651,433,000
2026	2.4%	\$55,651,433,000
2027	1.4%	\$55,651,433,000
2028	1.8%	\$8,351,433,000
2029	2.3%	\$55,651,433,000

Source: Civil Service Retirement and Disability Fund Annual Report Fiscal Year Ended September 30, 2015

¹⁶ They investments shown are almost perfectly laddered (with the exception of the 2028 maturity). These are indicative of the profile of the PSRHBFB as well.

In the table below, we list key investment and actuarial liability risks and the three plans' current asset allocation's exposure to them.

TABLE 5: KEY INVESTMENT AND ACTUARIAL LIABILITY RISKS

	Exposure of Current Asset Allocation
Asset Risks	
Business Cycle ¹⁷	Very Low
Default Risk ¹⁸	Very Low
Re-investment Risk ¹⁹	Medium
Price Risk ²⁰	Very Low
Actuarial Liability Risk	
Inflation	Yes
Duration	Long
Longevity	Yes
Other Actuarial	Yes
Asset and Actuarial Liability Risk	
Inflation	Yes
Re-investment Risk	Yes

Within the limited asset pool of low-return Treasury securities, however, the yield on the current investment can be advantageous, depending on the yield curve. The Treasury applies a composite interest rate (based on its marketable securities with maturities of up to 30 years) to short-, intermediate- and long-term securities (with maturities of one to 15 years) that are completely liquid. At the end of June 2016, for example, the Office of Personal Management's (OPM's) investment yield of 1.875% on all maturities from one to 15 years provided a good bit of incremental current income versus Treasury market yields, which ranged from 45 basis points on a one-year bill to 1.01% on a five-year note to 1.49% on a 10-year note, 1.86% on a 20-year bond, and 2.30% on a 30-year bond (source: www.treasury.gov).

Our key observations for the current investment strategy are as follows: The outlook for the expected return is modest given the historical and baseline forecast of Treasury yields and is anticipated to fall short of the discount rates used in the current actuarial valuations. The portfolio's outcomes are fairly certain in the short term and can be considered low risk. But over the long term, the strategy is fairly risky. This risk comes from the need to roll over the bond portfolio, and the uncertainty of expected bond yields for future bond purchases. And risk also comes from the cost-of-living adjustments (COLA) in benefit payments and medical trend increases that are not matched by corresponding changes in bond yields.

¹⁷ Business cycle risk is the risk of an asset price declining in an economic recession.

¹⁸ Default risk is the risk the bond principle and coupon are not paid.

¹⁹ Re-investment risk is the risk of investing in a lower yield environment upon the maturation of a current investment.

²⁰ Price risk is the risk of the market re-pricing the security lower.

C. Overview of Investment Structure

Development in Public and Private Marketplaces Today

Investment allocation structures for institutional investors have changed significantly over the years. The advances have been a direct response to changing technology in capital markets, changing return and risk expectations, and the changing regulatory landscape.

A couple of key themes have emerged over the past couple of decades. More than ever, plan sponsors have moved away from a sole focus on expected return as the key plan objective. For example: publicly traded corporations sponsoring defined benefit plans have adopted Liability Driven Investing (LDI) approaches, which moves away from asset-only considerations in establishing the investment portfolio and rather takes into account their liability objectives as well, while minimizing investment risk. On the other hand, state and local municipal pension plans focus on how the asset allocation can affect future contribution rates. Noting that it is much like the “tail wagging the dog,” plan sponsors increasingly recognize that a portfolio’s expected return is a means to an end, but not the end itself. Instead, the concept that has emerged is objective-based asset allocations.

Within the confines of objective-based asset allocations, pension and post-retirement medical plans have a clear objective for the assets, which is to meet the benefit payments and claims accrued by the various plan participants. The success of a plan’s investment strategies is defined by strong funded ratios and minimal plan deficits. Even risk is newly defined today. Short-dated U.S. Treasury securities (i.e., with maturities no longer than one year) were viewed historically as a low risk investment, as their high credit quality and short maturity meant that the return was fairly certain over short horizons. Today, however, those securities may be very risky if their goal is to meet a benefit payment 20 years into the future, as the reinvestment yields may be lower than anticipated.

The second key theme to emerge is how the actuarial liability is defined. The first is the traditional Actuarial Pricing Paradigm (APP), in which the benefit payments of the system are discounted back using the portfolio’s expected rate of return. This has the peculiar characteristic that the riskier the portfolio structure, the lower the actuarial liability value (because of the higher discount rate).

Financial economics (FE) has emerged as a challenge to the traditional actuarial pricing paradigm and has strong support among the academic financial community. It has also been widely adopted globally for accounting purposes by plans sponsored by corporations. FE views pension and post-retirement claims as just another form of debt of the plan sponsor. Therefore, the discount rate has no relationship to the plan’s asset allocation. Rather, it is valued as a series of market instruments that replicate the actuarial liability payouts. In most cases, the investments that replicate the benefits from a pension or post-retirement medical plan are nominal or real bonds.

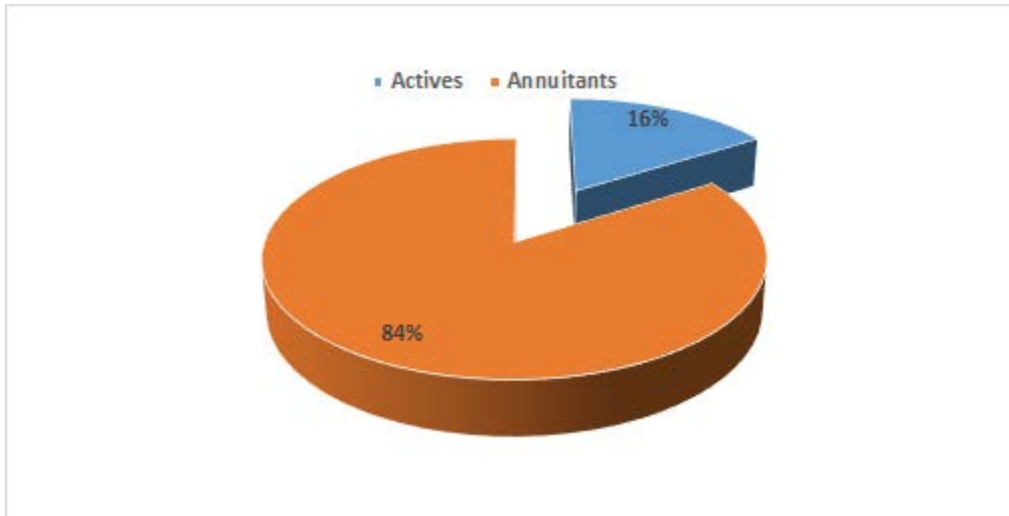
FE has the advantage that investment decisions can be made unambiguously, in the sense that investment strategies do not directly affect the actuarial liability calculation. Rather the risk / reward trade-offs affect the actuarial costs as they are realized.

Example: The Civil Service Retirement System (CSRS)

CSRS is one of two retirement plans in which Postal Service employees participate. To be a participant of the CSRS, the employee must have been hired before January 1, 1984. Given that provision, CSRS is considered a closed plan (i.e., it has no new entrants) and the majority of the plan's actuarial liability is payable to current retirees.

The chart below illustrates the profile of the actuarial liability (present value of benefits) as well as the benefit payment profile (as of the 2015 measurement date.)

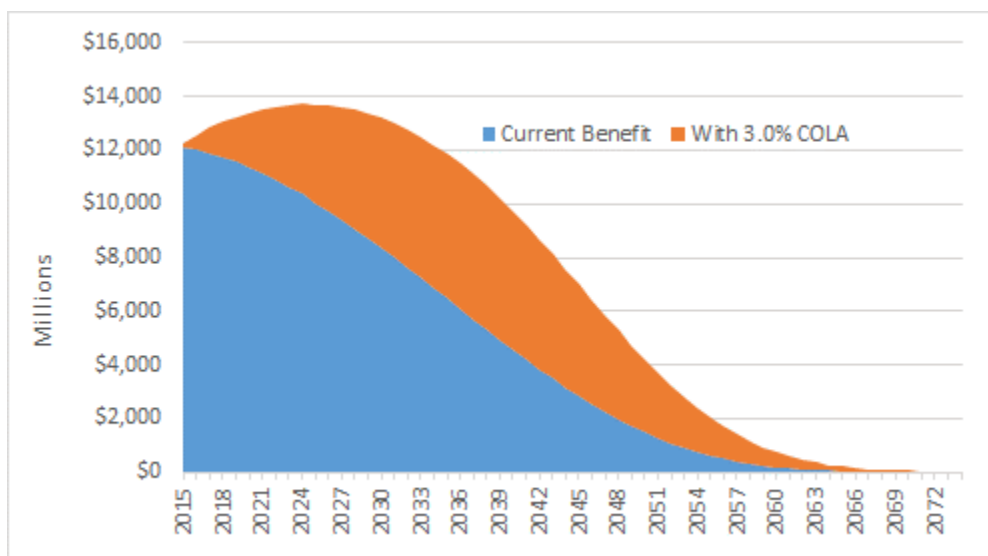
CHART 4: CSRS ACTUARIAL ACCRUED LIABILITY (as of 2015)



Source: Korn Ferry Analysis t provided by USPS OIG

A chart illustrating the projected benefit payments (both benefit payments and expenses) for the USPS CSRS Plan that includes both the current accrued benefits as well as benefit payments projected with the COLA assumption appears in the chart below.

CHART 5: CSRS BENEFIT & EXPENSES



Source: Korn Ferry Analysis provided by USPS OIG

In the table below, we provide characteristics of the CSRS pension plan. The discount rate is used to discount the future benefit payments of the pension plan back to today. The discount rate may be viewed as the plan’s long-term expected rate of return. The CPI assumption represents the annual increase in benefit payments for an individual as projected by the actuary. The difference between the discount rate and the CPI assumption can be considered the plan’s expected real return. In 2015, the plan has an actuarial liability (net present value) of \$200 billion. The duration measures how much the actuarial liability would change if the real yield changed. For example, if the real yield was reduced to 1.25% from 2.25%, the actuarial liability would increase by approximately 14%.

TABLE 6: CHARACTERISTICS OF CSRS PENSION PLAN

	CSRS
Discount Rate	5.25%
CPI	3.00%
Implicit Real Rate	2.25%
Actuarial liability projected as of 9/30/2015 (billions)	\$200

Our capital market assumptions (20-year) have a lower projected rate of return for the current investment allocation as well as a lower CPI forecast compared to the CPI assumed by the plan’s actuary. The net effect is a real return outlook of approximately 1.2%, which compared to the implicit real yield in the valuation assumptions will result in a higher plan actuarial liability.

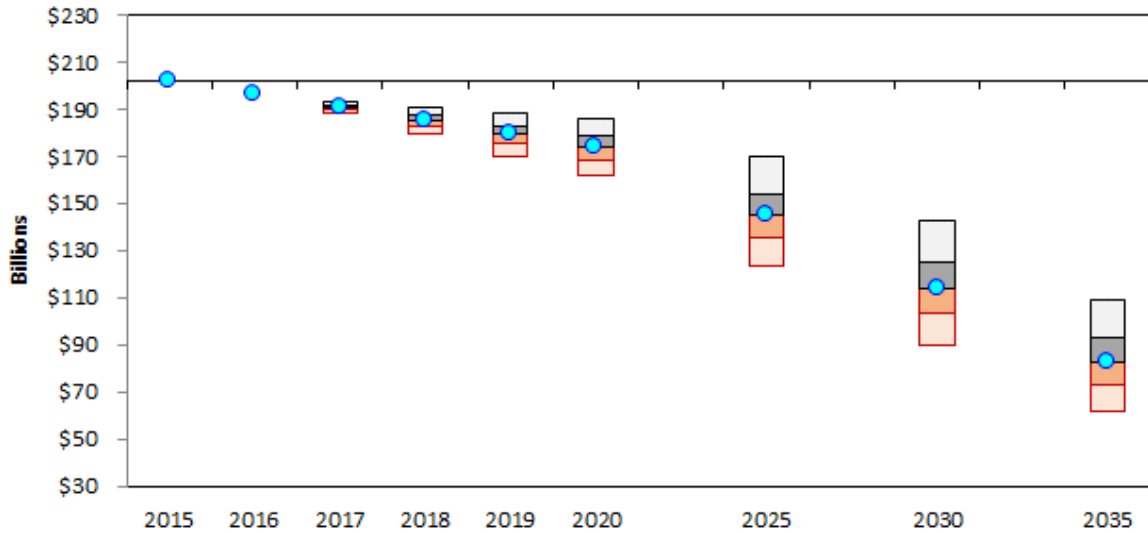
TABLE 7: COMPARISON OF CAPITAL MARKET ASSUMPTIONS AND CSRS PENSION PLAN ASSUMPTIONS

	CSRS	Projected CSRS Capital Market Assumptions
Discount Rate	5.25%	3.25%
CPI	3.00%	2.00%
Implicit Real Rate	2.25%	1.25%

Since CSRS is closed and predominately retiree actuarial liability, the forecast of the actuarial liability is one of declining value over the next 20 years. The forecast below assumes the actuary continues to use the current valuation assumptions: 5.25% discount rate and 3.0% CPI assumption. We do forecast the impact of the variable CPI (actual CPI differing from the 3.0% actuarial assumption) over time, as shown by the dispersion in the actuarial liability in the out years.²¹ As can be seen from the widening bands over time, inflation risk materializes in the plan over time through cost-of-living adjustments

²¹ The CPI is varied using Monte Carlo techniques.

CHART 6: CSRS ACTUARIAL ACCRUED LIABILITY FORECAST



Source: Segal analysis using Monte Carlo simulations to vary CPI with 2,000 trials

TABLE 8: \$ BILLIONS

CSRS AAL									
Percentiles	2015	2016	2017	2018	2019	2020	2025	2030	2035
95 th	200	196	193	190	188	186	170	143	109
75 th	200	196	192	187	183	179	154	124	93
50 th	200	196	191	185	179	174	145	114	82
25 th	200	196	190	183	175	168	135	103	73
5 th	200	196	188	179	170	162	123	89	61

Source: Segal analysis using Monte Carlo simulations to vary CPI with 2,000 trials

Our median forecast is an annualized inflation rate of 2.0% per annum over the next 20 years. Higher rates of inflation will increase the benefit payments and residual actuarial liability, while a low inflation (or deflation) environment will have the opposite effect.

D. Overview of Capital Markets' Risk/Return Development and Outlook

In this section, we will provide a background on how Segal Consulting develops its capital market assumptions. This paper overviews and explains the analytics around the current investment strategy and alternative ones. These analytics are based on assumptions around stock and bond expected returns and risks, changing bond yields, inflation rates, etc. This section also provides context on how we determine those various inputs.

The starting point for every portfolio design is to set capital market assumptions for the key asset classes available to the plan.

Modern portfolio theory (MPT), which is an offspring of Nobel Prize winner Harry Markowitz's seminal paper on portfolio allocation, can be broken into three steps:

1. Establish capital market assumptions (CMAs).
2. Produce an optimal frontier²² of portfolios based on the CMAs.
3. Choose the portfolio that best fits the plan sponsor's objectives and risk appetite.

While appearing as a fairly simple process, the implementation of Steps 1 and 3 is neither easy nor straightforward.²³ For much of history, practitioners simply took sampled means, standard deviations and correlations (building blocks of optimal portfolios) from historical returns.

Most practitioners today recognize the large sampling error even in long histories, the nonstationary nature of capital markets, and changing valuations and their role on future returns.

Segal Consulting CMA development is based on the following four key principles:

1. Focus on forward-looking returns.
2. Build assumptions on key fundamentals such as yields, spreads, PE ratios, etc.
3. Assumptions are passive in nature where possible.
4. Assumptions may be horizon dependent (as they are today with lower returns in the short term).

²² In portfolio theory, an optimal, or "efficient," frontier is the set of portfolios that offers the lowest risk for a given level of expected return or, alternately, the highest expected return for a given level of risk.

²³ While investors are reminded to optimize on their risk appetite, what is an investors risk appetite can be difficult to determine. The old adage 'take only as much risk as will allow you to sleep at night,' while colorful, is not easy to implement.

TABLE 9: 20-YEAR CAPITAL MARKET ASSUMPTIONS (Nominal)²⁴

		Compound Return	Standard Deviation
Fixed - Income	Cash	3.1%	2.0%
	Inflation Linked Bonds	3.3%	5.5%
	Core Fixed Income	3.6%	5.0%
	Dev. Mkts. Fixed Income	2.3%	10.0%
	High Yield	6.2%	12.5%
	Emerging Markets Debt	6.6%	10.5%
	Municipal Bonds	5.0%	6.0%
	Global Fixed Income	2.9%	8.2%
	Long-Term Fixed Income	3.0%	11.5%
Equity	US Equity	7.2%	18.5%
	Developed Equity	7.5%	21.0%
	Emerging Markets Equity	9.4%	24.0%
	Global Equity	7.5%	18.9%
	Global REITs	6.2%	20.5%
Alternatives	Private Equity	10.9%	24.5%
	Hedge Fund of Funds	5.6%	6.3%
	Equity Long/Short	7.4%	10.8%
	Credit-Event -Driven	7.6%	6.1%
	Global Macro	5.9%	7.2%
	Commodities	4.3%	21.0%
	Real Estate	5.9%	12.0%
Real Assets	Timber	7.4%	10.0%
	Farmland	8.1%	13.0%
	Oil & Gas	7.8%	35.0%
	Infrastructure	7.4%	15.0%

Capital Market Outlook Key Observations

Almost uniformly, asset classes are more expensively priced today than history suggests, and therefore forward-looking returns are lower. While historically there have been periods of over-valuation in equities (for example, the late 1920s and 1990s) and bonds (the 1950s), seldom has there been a period when both were highly valued at the same time.

Fundamentals and valuations today will create a significant headwind in the short to intermediate term as we anticipate normalization as the most likely outcome.

²⁴ The asset classes listed include the full opportunity set of Segal Consulting. For the modeling work, a subset of asset classes was used based on various criteria. The assumptions above are used as starting inputs in the Monte Carlo simulation for the current and alternative portfolios.

Interest Rate Environment

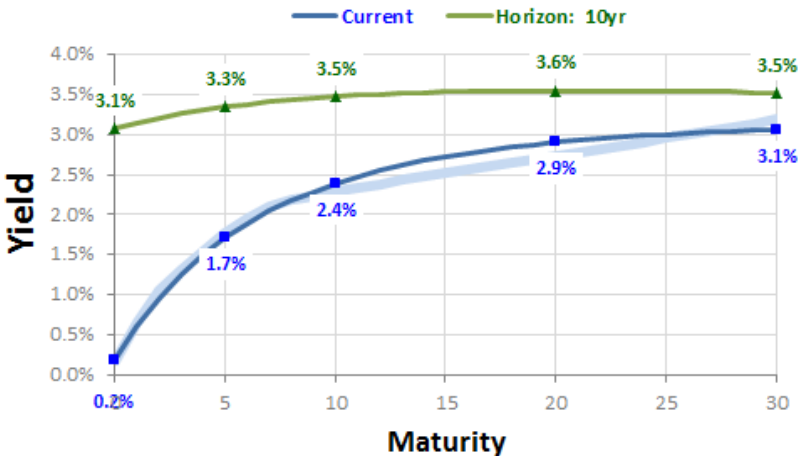
The expected return on cash plays an important role in our valuation methodology. In its simplest manifestation, the expected return of an asset class is the expected return on cash plus a risk premium.

Asset Class Expected Return = Cash Return + Risk Premium

A key aspect of today’s investment environment is historically low yields. A byproduct of the Great Financial Crisis was the extraordinary monetary policy response. The Federal Reserve responded to the crisis by reducing its targeted range for the federal funds rate to 0-25 basis points²⁵ in December 2008 and keeping it there until December of 2015. In addition, the Federal Reserve’s balance sheet has increased from \$800 billion pre-crisis to approximately \$4.5 trillion today.

Our outlook on forward-looking cash returns is heavily influenced by today’s yield curve. Embedded in the term structure of interest rates is a combination of (a) an outlook on monetary policy and the normalized rate and (b) an indication of term premium for risks embedded in locking up money over time (in particular, an inflation risk premium).

CHART 7: 12/2015 AND 10-YEAR FORWARD MEDIAN YIELD CURVE (Horizon: 10 Year)



We view the most-likely future yield environment as having higher yields as well as a flatter term structure

As of 12/2015 (average of yield during the month of December), the yield curve (blue line in the chart above) is relatively steep, with yields that are further out in maturity having a higher yield. Our view is that the majority of the steepness is an indication of higher short-term rates, with the residual being a term risk premium (or an inflation risk premium.) Note that our view today is that the term premium is more modest than historical levels.²⁶ At a 10-year forecast horizon (green line, above), we anticipate as the most likely outcome a flatter yield curve with higher rate levels, particularly on the front end of the curve. It is important to remember that the green line is

²⁵ A basis point refers to the yield on an investment. For example, 1.0% is 100 basis points.

²⁶ We believe the reduced term premium is a combination of (a.) very stable recent historical inflation and thus a lower forward-looking inflation risk premium, (b.) increased demand for long duration debt from LDI plan sponsors as a consequence of financial economics and (c.) the introduction of inflation indexed bonds.

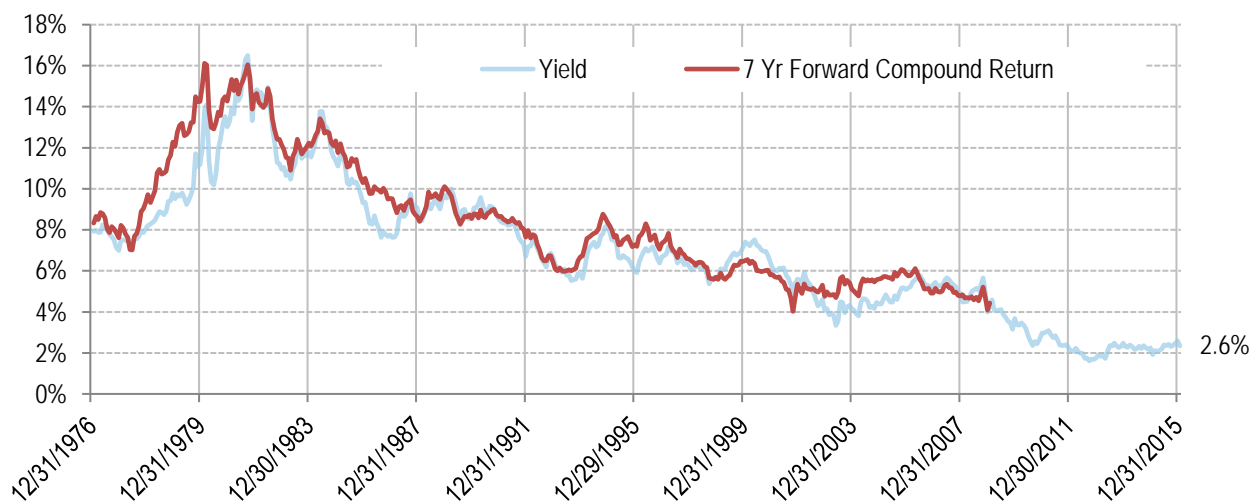
a median forecast of future yield environments. A high inflation environment, driven possibly by excessive fiscal and monetary policies, or a deflationary environment, possibly driven by debt and demographics, are scenarios priced into our tail risks.²⁷

Note that the yield curve dynamics have a significant effect on the plans' current investment strategy as new purchases are made with a coupon based on the prevailing yield environment.

Predictors of Future Returns for Fixed Income Investments

Yields today are a strong predictor of future returns on domestic investment-grade fixed income securities.²⁸ The chart below provides historical yields and compound returns on the Barclays Aggregate Bond Index.

CHART 8: BARCLAYS US AGGREGATE BOND INDEX
R-squared = 0.92



Statistically, the relationship between yield today and the compound return over the next seven years for the broad investment grade bond market has an R-squared²⁹ of 0.92.³⁰ This high correlation is shown by the close correspondence of the red and blue lines in the chart above. Based on this historical relationship, we conclude that the 7-year forward return outlook for core bonds is low—in the range of 2.6 %.

²⁷ Tail Risk – The risk of extreme events.

²⁸ The 7 Year forward compound return is the expected yield on a bond 7 years from now.

²⁹ R-squared is a statistical measure of the proportion of a security's variance that is predictable based on the variance of a benchmark such as above-mentioned Barclays U.S. Aggregate Bond Index.

³⁰ While an R-squared of 1.0 is a perfect predictor, an R-squared of 0.92 is a very strong predictor (as can be seen visually).

Predictors of Future Returns for Equity Investments

Similar to fixed income, public equity has long-term predictability through various fundamentals. PE ratios are a common measure of fundamental value. The price an investor pays today for one unit of earnings has an influence on long-term returns. The higher the price relative to earnings (PE), the lower the expected long-term rate of return.

A popular manifestation of the PE ratio is Robert Shiller's cyclically adjusted price earnings or CAPE ratio. The CAPE ratio measures the price of stocks relative to their inflation-adjusted earnings of the past 10 years. By smoothing inflation-adjusted earnings over ten years, the PE is less vulnerable to business-cycle fluctuations and more predictive.

High CAPE values (blue line) correlate to lower 10-year compound returns, as demonstrated by the late 1920s and 1990s peaks. Conversely, low CAPE values (early 1950s and 1980s) are associated with high future compound returns.

Today, the CAPE ratio is significantly elevated, at levels only exceeded by the late 1920s and 1990s equity bubbles.^{31, 32} Today's CAPE ratio is indicative of low returns on equities in the years ahead.

CHART 9: SHILLER CAPE



³¹ Note that equity valuations are more subjective than investment grade nominal bonds. Unlike bonds whose coupon is fixed, the yield on equities (dividends and buybacks) has an implied rate of growth. High PE ratios today can be indicative of high future growth rates of dividends and cash buybacks and thus not necessarily an indication of lower expected return. Unfortunately for today's environment, the historical record leans toward lower expected returns.

³² Wharton finance professor Jeremy Siegel has often challenged the implication of today's Shiller CAPE ratio based on the view that accounting methods and the Great Financial Crisis are distorting the indicator and that expected returns for equities are much higher than what might be implied by today's CAPE Ratio.

U.S. Equity Risk Premiums – Forward-looking Versus Historical

The U.S. economy continues to be the most influential risk factor driving global capital markets today. While there are times when “decoupling” between the world’s economies seems to occur, our intermediate term outlook continues to see relatively high correlation between the returns of the U.S. equity markets and international developed and emerging markets.

Given the U.S. equity market’s importance in the global market portfolio, what equity risk premium we use is very important. Given the valuation levels today, our assumption on the U.S. equity risk premium is lower than the precedents of many historical periods.

NOTE: Our US Equity forward-looking (arithmetic) risk premium is:

$$5.6\% = 8.8\% \text{ (US Equity 20 year)} - 3.2\% \text{ (Cash 20 year)}$$

Which is lower than various historical periods:

- 7.92% (1928 to 2015),
- 6.05% (1966 to 2015); and
- 7.87% (2006 to 2015)

TABLE 10: HISTORICAL EXCESS RETURN

	Arithmetic Average	
	Stocks—T. Bills	Stocks—T. Bonds
1928 – 2015	7.92%	6.18%
Std Error	2.15%	2.29%
1966 – 2015	6.05%	3.89%
Std Error	2.42%	2.74%
2006 – 2015	7.87%	3.88%
Std Error	6.06%	8.66%

Source: Ibbotson Historical Data The link defines the difference between the arithmetic and geometric averages.
<http://www.actuarialstandardsboard.org/asops/selection-economic-assumptions-measuring-pension-obligations/>

Portfolio Sets

We have provided six portfolios in two subsets: a subset consisting of “traditional” asset classes and a second subset that includes “alternative” asset allocations prevalent today. Each subset spans low, medium and higher risk portfolios that can address various plan designs (open versus closed), funded statuses and risk appetites.

Our 20-year nominal expected compound return outlook for the current investment structure is 3.3%. The annualized standard deviation over the 20 years is 4.2%.

A key observation in the proposed portfolios is the introduction of Inflation-Linked Bonds. We view these as the low risk anchor around the portfolios. These securities have the low default risk embedded in the current special purpose Treasury securities but include a CPI component. As the

pension plans' actuarial liabilities adjust with CPI, these securities, laddered to match the benefit payment duration profile, would be an effective hedge.

As the expected return increases, the exposure to public equity increases as well, thereby gaining access to the equity risk premium. We are strong believers in diversification and including international equities in the portfolio. The public equity breakdown by geography is approximately similar to the current global equity market.

Alternative portfolios introduce additional asset classes such as: high yield, emerging market debt, multi-asset class solutions, private equity and real estate. These asset classes add to the portfolio alternative risk factors and thus provide greater diversification. The portfolios A1, A2 and A3 were designed to have a similar risk profile to the traditional portfolio set but increase the compound return. It is important to note that the additional expected return does include illiquidity risk premiums and in general increased parameter or modeling risk.³³

TABLE 11: PORTFOLIO CHARACTERISTICS

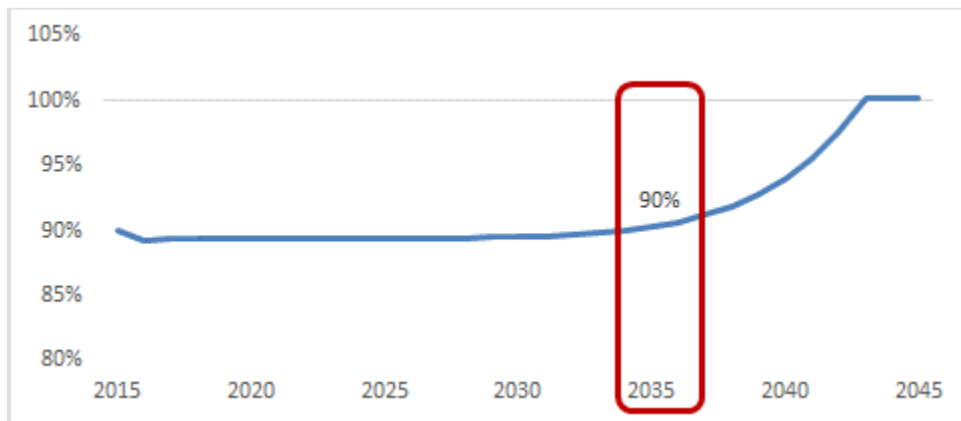
		Current	T1	T2	T3	A1	A2	A3
Fixed - Income	Inflation Linked Bonds	0.0%	60.0%	50.0%	40.0%	50.0%	37.0%	20.0%
	Core Fixed Income	0.0%	20.0%	10.0%	0.0%	10.0%	2.0%	0.0%
	High Yield	0.0%	0.0%	0.0%	0.0%	2.5%	3.5%	4.0%
	Emerging Markets Debt	0.0%	0.0%	0.0%	0.0%	2.5%	3.5%	4.0%
	Multi-Asset Class Solutions	0.0%	0.0%	0.0%	0.0%	5.0%	6.0%	7.0%
Equity	US Equity	0.0%	10.0%	20.0%	30.0%	7.0%	15.0%	22.0%
	Developed Equity	0.0%	8.0%	16.0%	24.0%	6.0%	12.0%	18.0%
	Emerging Markets Equity	0.0%	2.0%	4.0%	6.0%	2.0%	4.0%	5.0%
Alts	Private Equity	0.0%	0.0%	0.0%	0.0%	5.0%	7.0%	10.0%
	Real Estate	0.0%	0.0%	0.0%	0.0%	10.0%	10.0%	10.0%
	Sum		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% Total Fixed Income	0.0%	80.0%	60.0%	40.0%	65.0%	46.0%	28.0%
	% Multi-Asset Class Solutions					5.0%	6.0%	7.0%
	% Total Equity	0.0%	20.0%	40.0%	60.0%	15.0%	31.0%	45.0%
	% Total Alternatives					15.0%	17.0%	20.0%
Risk & Return	Average Return	3.4%	4.6%	5.8%	6.9%	5.5%	6.7%	7.9%
	Portfolio Compound Return	3.3%	4.5%	5.4%	6.3%	5.3%	6.4%	7.3%
	Standard Deviation	4.2%	6.1%	8.7%	12.0%	6.2%	9.0%	12.1%
	Sharpe Ratio	0.05	0.24	0.30	0.31	0.38	0.40	0.40

³³ Increased parameter and modeling risk recognizes that some asset classes are more difficult to determine expected returns and risk. For example, private equity and hedge funds have significantly less transparency than public equities and bonds.

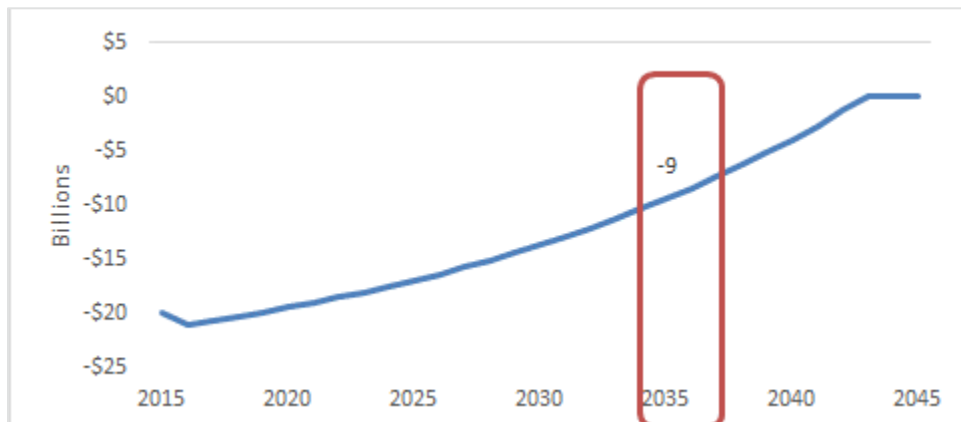
Asset and Actuarial Liability Metrics for the CSRS Plan

A deterministic forecast (an approach in which no randomness is involved in the development of the future states) of the CSRS plan's assets and actuarial liabilities is provided in the charts below. The forecast is based entirely on OPM's projection in *Appendix A*. The charts assume the assets return 5.25% per annum and COLA increases are 3.0% per annum. They also assume that the Postal Service and its employees make the projected contributions, including amortization payments, and that outflows from the fund occur as OPM projected.

CHART 10A: CSRS FUNDED RATIO
Deterministic Projection based on 5.25% Investment Return and 3.0% COLA



CSRS (Deficit) SURPLUS
Deterministic Projection based on 5.25% Investment Return and 3.0% COLA



Source: OPM, Financial Reporting Information with Respect to Pension Obligations of the Postal Service, 2015 as shown in *Appendix A*.

Over the next 30 years, the plan becomes fully funded: the funded ratio is 100% and the Plan's deficit is \$0. Even over 20 years, the deficit improves substantially, being reduced by approximately 50%. The source for these forecasts is the FY 2015 pension valuation prepared by OPM.

As discussed previously, our outlook for the plan’s expected compound return is significantly less than 5.25% per annum over the next 20 years. Also, note that our CPI-U assumption is lower as well.

Below are asset-actuarial liability metrics for the CSRS plan based on the portfolios listed above and our forward-looking capital market assumptions. For illustrative purposes, we are assuming employee contributions and Postal Service amortization payments into the plan are static,³⁴ and we assume no actuarial liability experience gains or losses other than those related to the COLA. To determine the range of outcomes for each portfolio, we ran 2,000 simulations using Monte Carlo techniques that stochastically varied the potential returns from year to year including the static contributions into the fund each year and stochastic outflows to pay benefits (COLAs) from the fund each year.

Unlike the deterministic forecast, our capital market assumptions for the current strategy show the deficit increasing by 50% (from \$20 billion to \$30 billion) over the next two decades while the funded ratio deteriorates significantly.

CHART 11A: (Deficit) SURPLUS AT 20-YEAR HORIZON - CSRS

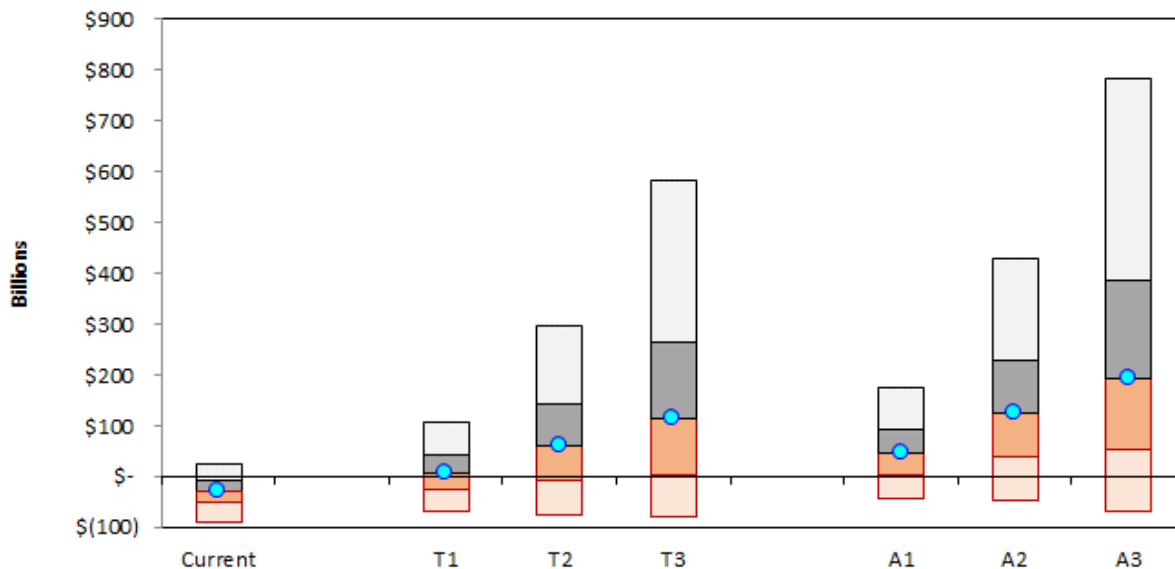


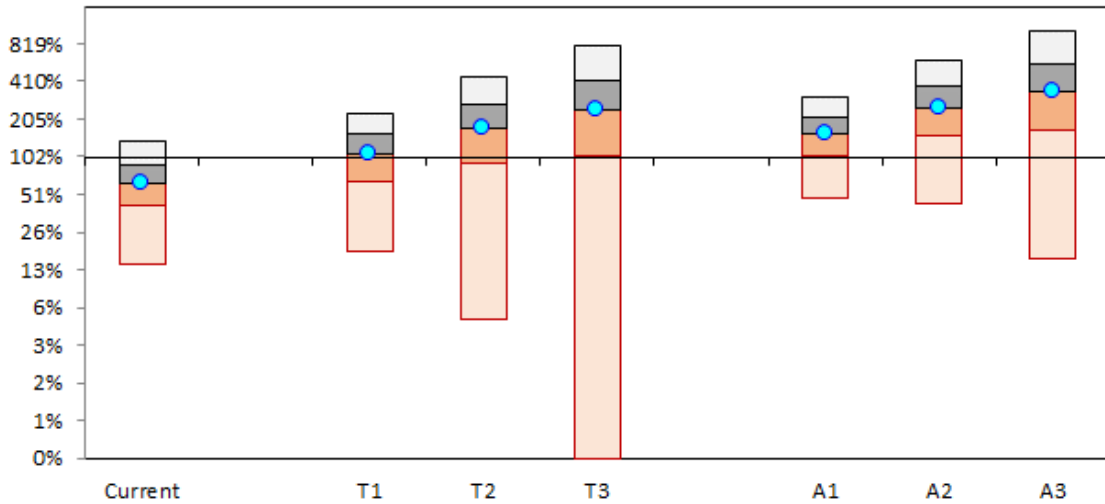
TABLE 12A: CSRS (Deficit) SURPLUS AT 20-YEAR HORIZON

Percentiles	(Deficit) Surplus \$ Billions						
	Current	T1	T2	T3	A1	A2	A3
95 th	23	107	297	584	174	428	784
75 th	(8)	43	141	264	93	230	387
50 th	(31)	5	58	114	44	124	193
25 th	(53)	(28)	(8)	3	4	40	54
5 th	(90)	(69)	(75)	(81)	(44)	(49)	(68)

Source: Segal analysis using 2,000 Monte Carlo simulation to vary returns and CPI.

³⁴ This is a simplifying assumption. See *Appendix A* for the contribution details.

CHART 12A: FUNDED RATIO AT THE 20-YEAR HORIZON – CSRS



Note that the chart is plotting funded ratios in logarithmic scale to emphasize downside risk versus upside reward.

TABLE 13A: FUNDED STATUS AND PROBABILITY OF CSRS BEING FULLY FUNDED IN 20 YEARS

Percentile	Funded Ratio at Year 20						
	Current	T1	T2	T3	A1	A2	A3
95 th	134%	229%	447%	792%	304%	605%	1037%
75 th	89%	154%	270%	418%	214%	377%	565%
50 th	62%	106%	172%	243%	156%	252%	342%
25 th	41%	65%	91%	103%	106%	150%	167%
5 th	14%	18%	5%	0%	48%	43%	16%
Probability Fully Funded	17%	54%	71%	76%	78%	86%	85%
Probability of Insolvency	1%	2%	4%	8%	0%	2%	4%

Source: Segal analysis using 2,000 Monte Carlo simulation to vary returns and CPI.

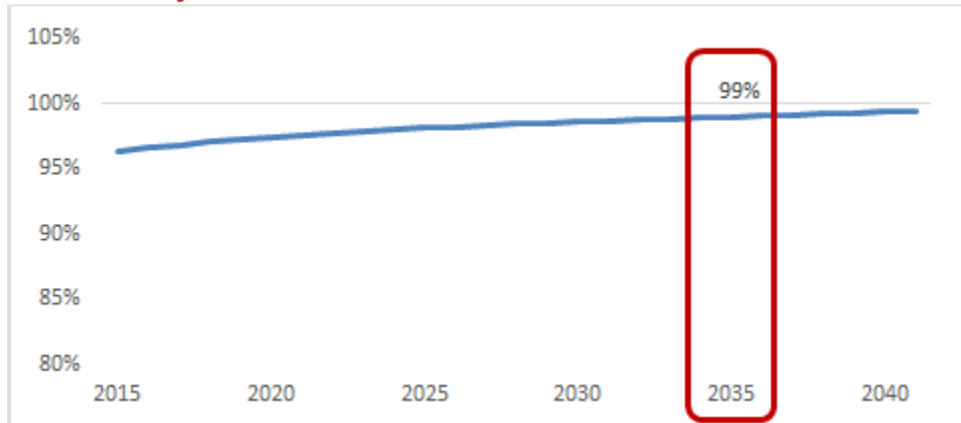
A number of observations are of particular note in this discussion: The current strategy's expected compound return of 3.3% results in the plan's deficit increasing over the next 20 years while the funded ratio deteriorates substantially (note that the plan is "mature" (a mature plan is where there are more participants receiving benefits versus actively contributing to the plan), and assets and actuarial liabilities are declining over time). The incremental return generated by moving to strategy T1 is enough to improve the median funded ratio such that the plan becomes fully funded (54% probability). T1 also has a better 5th percentile (or 1-in-20 downside tail) than the current strategy, although both outcomes are poor. Similarly, T2 and T3 both improve the median outcome substantially over the current strategy; however, they also increase the downside funded ratio risk. In addition, all three alternative portfolios (A1-A3) show attractive trade-offs relative to the current strategy as well as to the traditional portfolios.

Although small, there are probabilities that the CSRS fund becomes insolvent over the next 20 years where insolvency is defined as not having sufficient assets to meet a projected benefit payment.

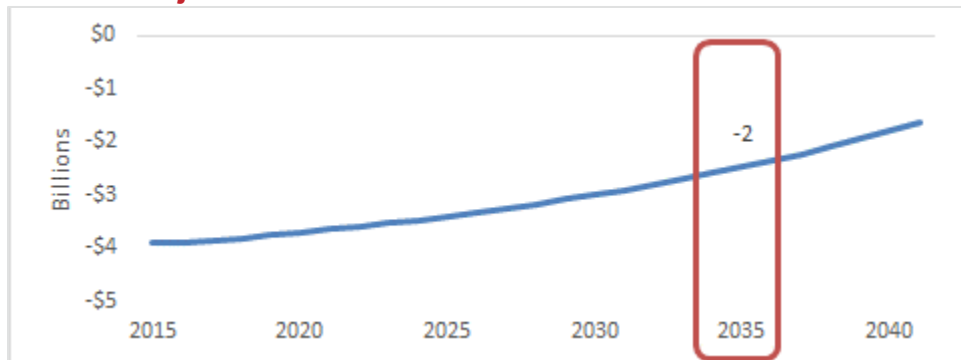
Asset and Actuarial Liability Metrics for the FERS Plan³⁵

A deterministic forecast (an approach in which no randomness is involved in the development of the future states) of the FERS plan's assets and actuarial liabilities is provided in the charts below. The forecast is based entirely on Korn Ferry's open group projection in Appendix A.³⁶ The charts assume the assets return 5.25% per annum and COLA increases are 2.4% per annum, and that all other actuarial demographic assumptions are met. They also assume that the Postal Service and its employees make the projected contributions, including amortization payments, and that outflows from the fund occur as projected.

CHART 10B: FERS FUNDED RATIO
Deterministic Projection based on 5.25% Investment Return and 2.4% COLA



FERS (Deficit) SURPLUS
Deterministic Projection based on 5.25% Investment Return and 2.4% COLA



Source: Korn Ferry open group projection as shown in Appendix A.

Over the next 20 – 25 years, the plan approaches fully funded: the funded ratio is 99% and the Plan's deficit is \$2B by 2035. The source for these forecasts is the open group projection prepared by Korn Ferry.

³⁵ There are some significant differences between FERS and CSRS. FERS benefits by design are substantially smaller than CSRS. (FERS annuitants' pensions are supplemented by Social Security and have a larger dependence of the Thrift Savings Plan). Unlike CSRS, FERS benefits are not fully indexed to inflation. OPM assumes that FERS benefits will increase at 80 percent of the CPI. As explained above, FERS is open to new entrants.

³⁶ Open group projections assume some level of replacement for employees as they leave. There was no available long-term open group projection for FERS, so the OIG asked the actuarial firm Korn Ferry to develop one using OPM assumptions.

As discussed previously, our outlook for the plan’s expected compound return is significantly less than 5.25% per annum over the next 20 years. As previously mentioned, our CPI-U assumption is lower as well.

Below are asset-actuarial liability metrics for the FERS plan based on the portfolios listed above and our forward-looking capital market assumptions. For illustrative purposes, we are assuming employee contributions and Postal Service amortization payments into the plan are static,³⁷ and we assume no actuarial liability experience gains or losses other than those related to the COLA. To determine the range of outcomes, we ran 2,000 simulations using Monte Carlo techniques that stochastically varied the potential returns from year to year including the static contributions into the fund each year and stochastic outflows to pay benefits from the fund each year.

Unlike the deterministic forecast, our stochastic forecast (which utilizes our capital market assumptions for the current strategy) show the deficit increasing materially, from \$4 billion currently to \$40 billion (at the median) over the next two decades while the funded ratio deteriorates significantly from 96% to 81% (at the median).

CHART 11B: (Deficit) SURPLUS AT 20-YEAR HORIZON – FERS

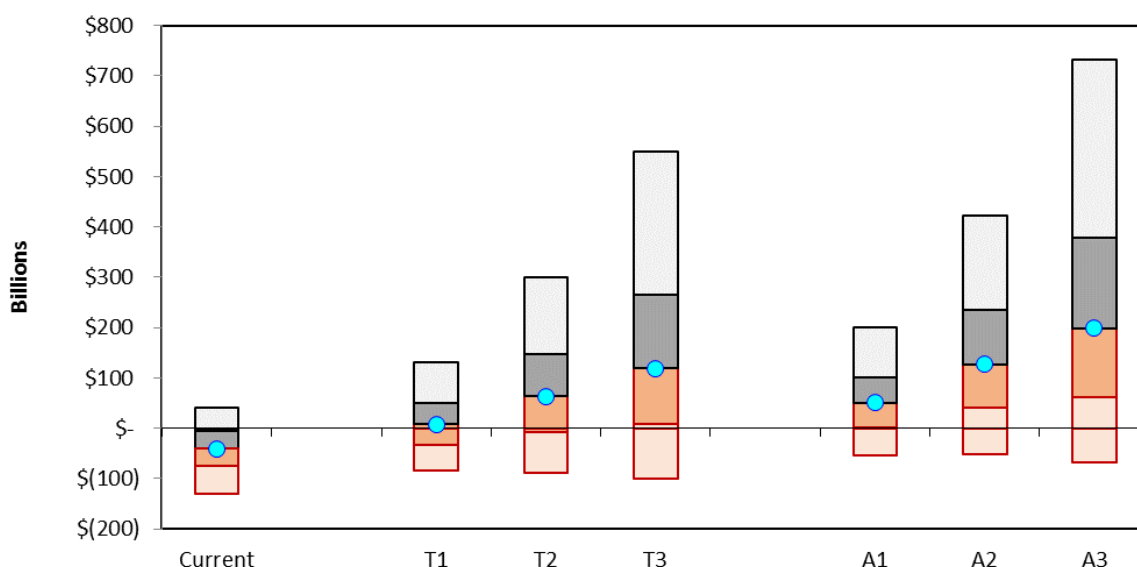


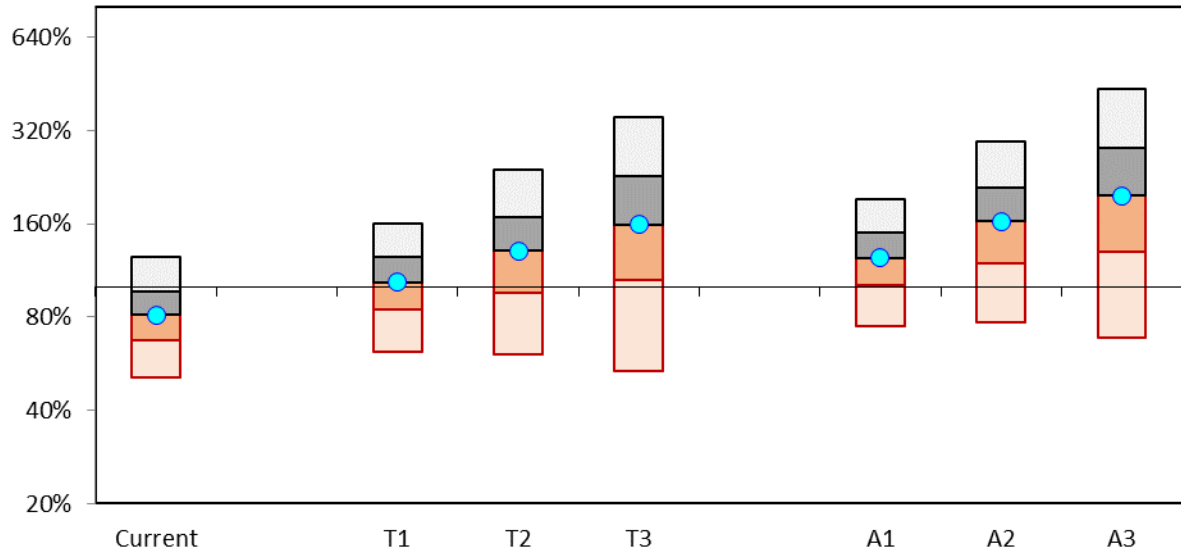
TABLE 12B: FERS (Deficit) SURPLUS AT 20-YEAR HORIZON

Percentiles	(Deficit) Surplus \$ Billions						
	Current	T1	T2	T3	A1	A2	A3
95 th	41	130	300	550	199	423	731
75 th	(7)	51	147	265	102	235	379
50 th	(40)	8	63	119	51	127	198
25 th	(74)	(33)	(9)	9	2	41	62
5 th	(129)	(84)	(90)	(100)	(55)	(51)	(68)

Source: Segal analysis using 2,000 Monte Carlo simulation to vary returns and CPI.

³⁷ This is a simplifying assumption. See *Appendix A* for the contribution details.

CHART 12B: FUNDED RATIO AT THE 20-YEAR HORIZON – FERS



Note that the chart above is plotting funded ratios in logarithmic scale to emphasize downside risk versus upside reward.

TABLE 13B: FUNDED STATUS AND PROBABILITY OF FERS BEING FULLY FUNDED IN 20 YEARS

Percentile	Funded Ratio at Year 20						
	Current	T1	T2	T3	A1	A2	A3
95 th	125%	161%	239%	355%	192%	295%	438%
75 th	97%	125%	169%	228%	150%	210%	282%
50 th	81%	104%	131%	159%	124%	163%	197%
25 th	67%	84%	96%	105%	101%	120%	130%
5 th	51%	62%	60%	54%	75%	77%	68%
Probability Fully Funded	21%	55%	72%	77%	76%	87%	87%
Probability of Insolvency	0%	0%	0%	0%	0%	0%	0%

Source: Segal analysis using 2,000 Monte Carlo simulation to vary returns and CPI.

A number of observations can be made: The current strategy is expected to compound the return of 3.3% results in the plan's deficit increasing over the next 20 years, while the funded ratio deteriorates substantially.

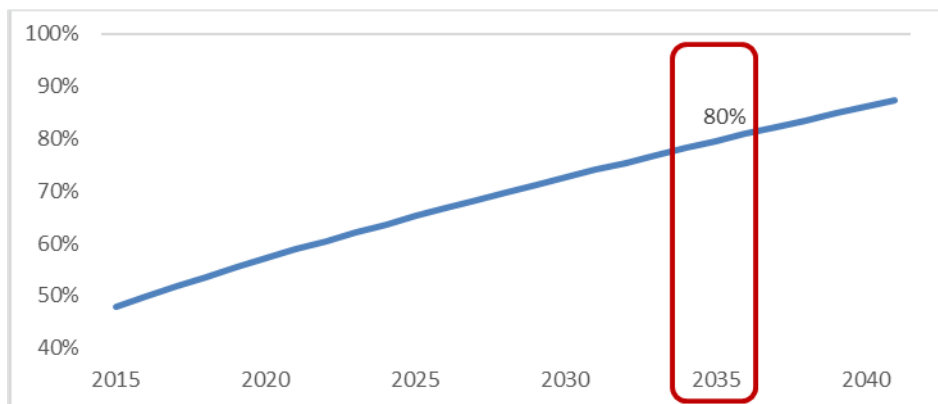
Unlike the CSRS plan, none of the simulated trials resulted in insolvency. The FERS plan is not as mature as the CSRS plan is, therefore you do not see the dramatic downside events we noticed with the CSRS modeling (as these were due in part to large benefit payments as a proportion of assets during down markets). This analysis assumes that all contributions are made as scheduled.

The incremental return generated by moving to strategy T1 is enough to improve the median funded ratio such that the plan becomes fully funded (55% probability). T1 also has a better 5th percentile (or 1-in-20 downside tail) than the current strategy, although both outcomes are poor. Similarly, T2 and T3 both improve the median outcome substantially over the current strategy; and they also produce better 5th percentile results than the current strategy (although they produce worse 5th percentile results than T1). In addition, all three alternative portfolios (A1-A3) show attractive trade-offs relative to the current strategy as well as to the traditional portfolios.

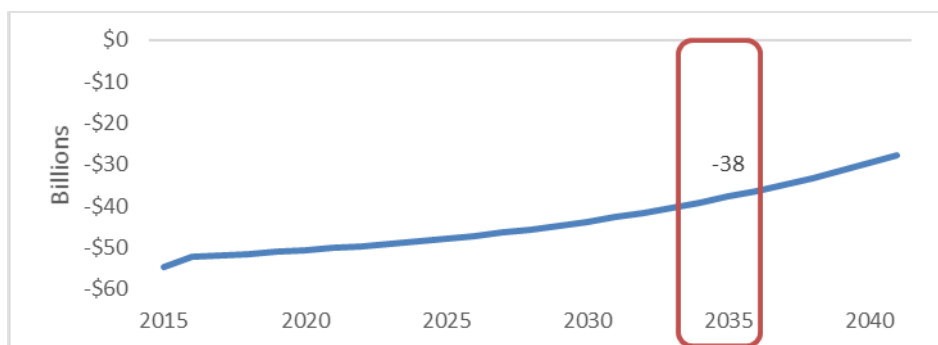
Asset and Actuarial Liability Metrics for the PSRHBF Plan

A deterministic forecast (an approach in which no randomness is involved in the development of the future states) of the PSRHBF plan’s assets and actuarial liabilities is provided in the charts below. The forecast is based entirely on Korn Ferry’s open group projection in Appendix A.³⁸ The charts assume the assets return 3.90% per annum in keeping with OPM’s assumption for the PSRHBF and that all other actuarial demographic assumptions are met. They also assume that the Postal Service makes all the projected contributions, including amortization payments on the full unfunded liability, and that outflows from the fund occur as projected.

CHART 10C: PSRHBF FUNDED RATIO
Deterministic Projection based on 3.90% Investment Return and OPM Trend



PSRHBF (Deficit) SURPLUS
Deterministic Projection based on 3.90% Investment Return and OPM Trend



Source: Korn Ferry open group projection as shown in *Appendix A*.

³⁸ As with FERS, there was no available long-term open group projection for the PSRHBF, so the OIG asked Korn Ferry to develop one using OPM’s assumptions.

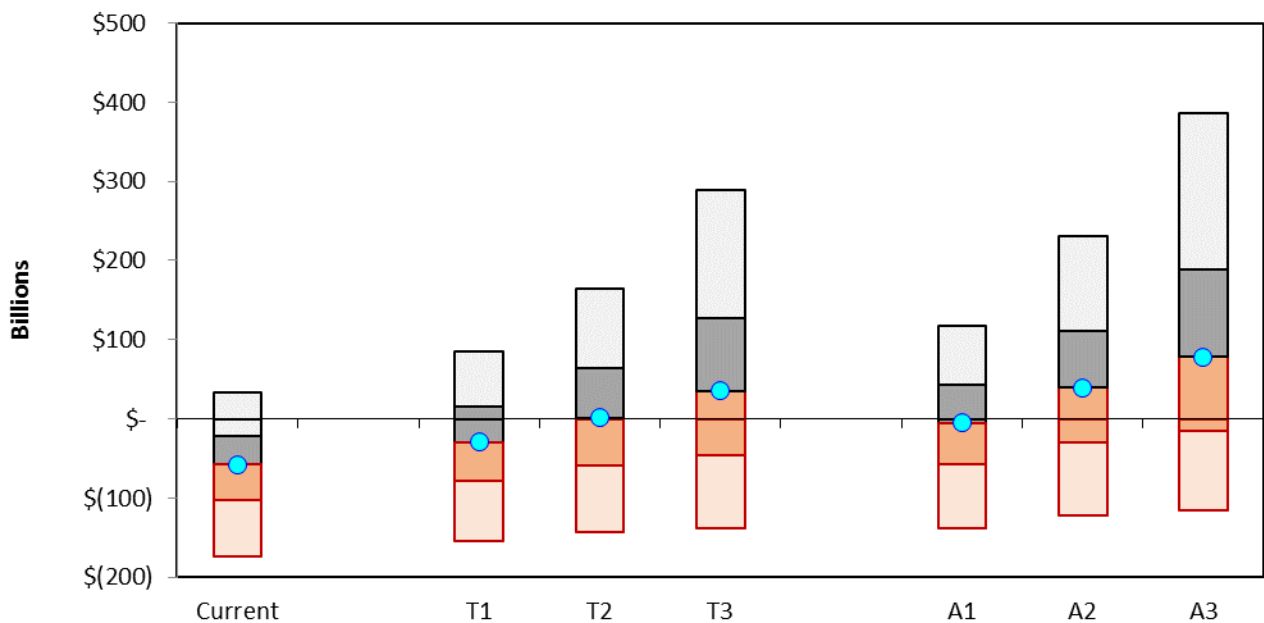
Over the next 20 – 25 years, the plan’s funded status improves: the funded ratio is 80% and the Plan’s deficit is \$38B by 2035.

As discussed previously, our outlook for the plan’s expected compound return is less than 3.90% per annum over the next 20 years.

Below are asset-actuarial liability metrics for the PSRHBF plan based on the portfolios listed above and our forward-looking capital market assumptions. For illustrative purposes, we are assuming employee contributions and Postal Service amortization payments into the plan are static,³⁹ and we assume no actuarial liability experience gains or losses other than those related to the medical trend. To determine the range of outcomes, we ran 2,000 simulations using Monte Carlo techniques that stochastically varied the potential returns, as well as realized medical inflation, from year to year including the static contributions into the fund each year and stochastic outflows to pay benefits from the fund each year.

Unlike the deterministic forecast, which shows the dollar deficit decreasing during the forecast, our stochastic forecast (which utilizes our capital market assumptions for the current strategy) show the deficit remaining steady at about \$57 billion (at the median) over the next two decades. Meanwhile, although the funded ratio improves from 48% to 69% (at the median), this is lower than the 80% funded ratio at 2035 we saw in the deterministic forecast.

CHART 11C: (Deficit) SURPLUS AT 20-YEAR HORIZON - PSRHBF



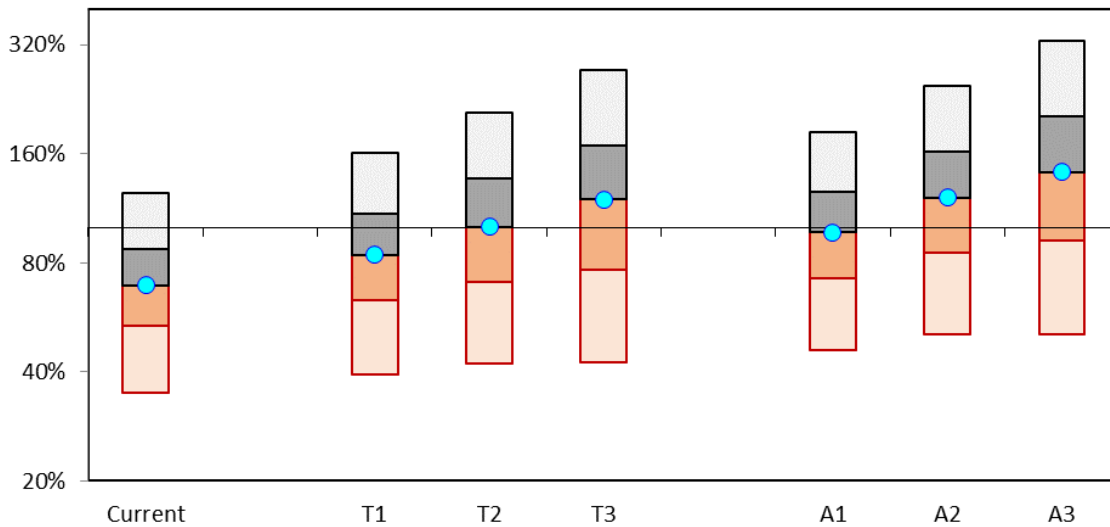
³⁹ This is a simplifying assumption. See *Appendix A* for the contribution details.

TABLE 12C: PSRHBF (Deficit) SURPLUS AT 20-YEAR HORIZON

Percentiles	(Deficit) Surplus \$ Billions						
	Current	T1	T2	T3	A1	A2	A3
95 th	33	86	165	289	118	231	386
75 th	(21)	15	64	127	43	111	188
50 th	(57)	(29)	1	35	(6)	40	78
25 th	(102)	(79)	(59)	(46)	(57)	(30)	(16)
5 th	(174)	(155)	(144)	(138)	(138)	(122)	(116)

Source: Segal analysis using 2,000 Monte Carlo simulation to vary returns and medical inflation.

CHART 12C: FUNDED RATIO AT THE 20-YEAR HORIZON - PSRHBF



Note that the chart is plotting funded ratios in logarithmic scale to emphasize downside risk versus upside reward.

TABLE 13C: FUNDED RATIOS AND PROBABILITY OF PSRHBF BEING FULLY FUNDED IN 20 YEARS

Percentile	Funded Ratio at Year 20						
	Current	T1	T2	T3	A1	A2	A3
95 th	125%	161%	208%	273%	184%	247%	328%
75 th	87%	109%	136%	169%	125%	163%	203%
50 th	69%	84%	101%	120%	97%	121%	143%
25 th	53%	63%	71%	77%	73%	85%	92%
5 th	35%	39%	42%	42%	46%	51%	51%
Probability Fully Funded	14%	33%	51%	62%	47%	64%	71%
Probability of Insolvency	0%	0%	0%	0%	0%	0%	0%

Source: Segal analysis using 2,000 Monte Carlo simulation to vary returns and medical inflation.

A number of observations can be made: The current strategy's required contributions and expected compound return of 3.3% result in the plan's deficit remaining stable over the next 20 years while the funded ratio improves gradually. The incremental return generated by moving to strategy T2 is enough to improve the median funded ratio such that the plan becomes fully funded (51% probability). All of the "traditional portfolios (T1, T2 and T3) also improve the 5th percentile result (or 1-in-20 downside tail) over the current strategy, although all 5th percentile outcomes are still poor. Similarly, T3 improves the median outcome substantially over the current strategy; while producing a 5th percentile result this about at par with T2 (and better than T1). In addition, all three alternative portfolios (A1 – A3) show attractive trade-offs relative to the current strategy as well as to the traditional portfolios.

Similar to the FERS plan (and unlike the CSRS plan), none of the simulated trials resulted in insolvency. The PSRHBFB plan is not mature and therefore you do not see the dramatic downside events we noticed with the CSRS modeling (as these were due in part to large benefit payments as a proportion of assets during down markets). This analysis assumes that all contributions are made as scheduled.

Asset and Portfolio Constraints and Rebalancing Bands – Example A2

In addition to establishing a "target" asset allocation, the plan investment policy statement will include constraints or rebalancing bands. The bands provide an upper and lower bound on the portfolio weights (whose review is also specified by the investment policy statement).

The target asset allocation should be "efficient" in that the composition will result in a portfolio whose expected return, for the risk specified, is the greatest. To the extent that the portfolio's allocation drifts from the target, there could be a loss of efficiency. The balancing bands provide that discipline to reallocate portfolio weights back to target, particularly in environments where that discipline is most difficult to maintain (such as buying out of favor or declining assets).

The rebalancing bands are developed based on Segal Consulting's proprietary optimization model that develops bands around the target optimal allocation given a tracking error budget. This is balanced with transaction costs and asset class liquidity.⁴⁰ The bands establish limits on when rebalancing is required; however rebalancing can be considered while operating within the bands.

⁴⁰ Based on a paper by Christopher Donohue, "A Broader View of the Mean-Variance Optimization Framework."

The following table demonstrates what the rebalancing bands would look like for our A2 asset portfolio:

TABLE 14: REBALANCING BANDS

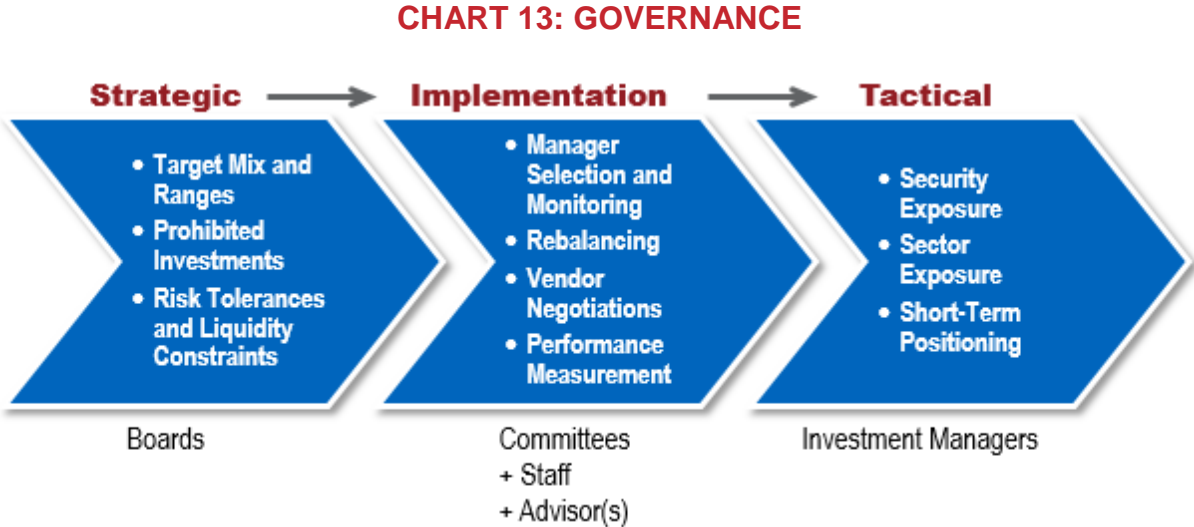
		A2	Lower Band	Upper Band
Fixed - Income	Inflation Linked Bonds	37.0%	20.0%	54.0%
	Core Fixed Income	2.0%	0.0%	10.0%
	High Yield	3.5%	0.0%	7.0%
	Emerging Markets Debt	3.5%	0.0%	7.0%
	Multi-Asset Class Solutions	6.0%	2.0%	10.0%
Equity	US Equity	15.0%	5.0%	25.0%
	Developed Equity	12.0%	2.0%	22.0%
	Emerging Markets Equity	4.0%	0.0%	8.0%
Alts	Private Equity	7.0%	0.0%	14.0%
	Real Estate	10.0%	5.0%	15.0%

E. Governance

Successful investment programs have a common trait: good governance. Governance is the process of making and implementing (or not implementing) strategic decisions about an investment program. This section will discuss the keys to building a good governance model to help the governing bodies of the CSRS, FERS and PSRHBFB plans of the United States Postal Service. Note that governance is regarded as a fiduciary responsibility to the beneficiaries, and management of plan assets is to be devoid of political or Postal Service management influence.

No two governance models are alike. However, each reflects the plan’s history, status quo, the combined perspectives of key constituents and their unique interpretations of strengths and weaknesses of the plan and its investment structure. It is important for models to be flexible, as organizations evolve through turnover and the shifting needs, opportunities and threats to the organization. Investing evolves, too, and a board should be flexible to adapt to a changing environment. Ultimately, governance models are best when they are an optimal combination of resources and decision-making, and are adaptable to current and future needs and opportunities.

The graphic below illustrates a general breakdown of governance tasks and responsibilities.



A board is a group of people who have all the powers to decide and control the working body. It is usually the apex of the entity. The members of the board are appointed by the real owners of the entity. There may or may not be fixed terms for the board members.

In the case of benefit plans, boards are typically well-suited to determine the long-term strategic goals, make policy-level decisions, and conduct periodic reviews of policies, procedures and progress. Boards will also determine the risk tolerance, liquidity needs and implementation constraints of the investment program. Boards are typically *not* well suited to handle investment manager selection, rebalancing of plan assets and any decision that needs to be made and implemented on an expedited basis. The reasons include boards’ lack of proximity to the details of implementing such decisions and time or resource constraints.

A committee is a subgroup of the original body that is made up of both Board members and non-Board members. It is formed for a specific purpose. The members of committees are generally selected on merit and should consist of individuals with diverse backgrounds. Committees are best for implementation of board policies. They can provide feedback on progress to the board, including feedback on manager selection, rebalancing, contract negotiations with outside vendors and other implementation-related issues.

Committees are supplemented by staff and the investment consultant. Ad hoc decision-making at the committee-level, with input by staff and the investment consultant, should be enabled. Sometimes a subset of the committee is “on-call” to address any ad hoc issue that may arise.

Good Governance Helps to Avoid Poor Decision Making

One common problem we see with governance is intransigence. Adherence to the status quo can become the most powerful force that guides (or hinders) a board. Many boards and committees do things “because that’s how it’s always been done” and pay too little attention to policies and procedures. When it comes to investment decisions, a disproportionate amount of time is spent on investment manager issues, and too little is spent on policy-level decisions, such as defining risk tolerance, asset allocation targets and permissible investments. We also find a board’s focus can be on short-term results and peer-group rankings. Every plan is different, with a unique set of goals and objectives. The focus should be on meeting those goals rather than comparing a plan to what others are doing or routinely selecting managers with the best recent performance.

Investment Policy Statement

The investment policy statement is a document that serves as a guide created by the board and outlining the objectives of the plan, target asset allocations, permissible investments, benchmarks of those investments and the process for making investment changes. The asset allocation will determine approximately 90% of a plan’s investment return. Therefore, it is critical to maintain the allocation within a reasonable range. A table illustrating these rebalancing bands appears on page 35. When the plan’s asset allocation falls outside of that range as a result of factors such as investment performance, the committee should rebalance the plan’s assets within the range defined in the investment policy statement. Rebalancing is critical during times of market distress, as it tends to be during those times that a plan will fall outside of the allotted ranges. For example, in 2008, the equity markets declined dramatically, and as a result, many plans fell below the lower limit of their equity allocations. A well-constructed investment policy statement would have guided the committees to rebalance towards equities.

In addition, the investment policy statement can address implementation decisions such as active versus passive investment management. The traditional portfolios include only asset classes that can be easily implemented with passive investment management structures. Whereas the alternative portfolios include asset classes which often necessitate the need for active management (for example Multi-asset class solutions by design are active products.)

Investment Manager Return

Once the board sets the objectives of the plan and an asset allocation is determined, the committee will identify the investment managers to execute the investment strategy. There are many factors a committee should consider when selecting an investment manager. These factors include the investment strategy, quality of the investment organization, experience of the investment team and its historical track record. Typically, a committee will evaluate multiple candidates for a single strategy and select the organization that most aligns with plan objectives.

For a plan of this size, many organizations will also engage internal investment managers to work in conjunction with the external investment team.

Once a manager(s) is selected, the committee will monitor the investment manager to ensure the tenets upon which the manager was selected still hold true. If there is a deviation from those tenets, the committee will evaluate a comparable replacement. The investment policy statement will outline the tenets used to evaluate the investment manager.

Next Steps

Much of what we have raised here is introspective with an understanding that USPS (and its stakeholders) knows USPS best. We can offer examples of what we have seen work well, and what has not.

It is worth noting that these things usually evolve over time, and rarely change quickly. Policymakers can create a simple governance structure that builds on successes and learns from mistakes. Ultimately, successful governance is something that will require ongoing attention and revision.

Lastly, it should be noted, given the significant size of the various Plans the committee tasked with implementing the investment strategy should layout a detail plan for transitioning the assets. The plan should include elements of timing and size of investment made. Timing could include such strategies as dollar cost averaging, and staggering the implementation of various asset classes.

F. Example of Pension Fund Asset Allocations

Federal Reserve Retirement Plan

We thought it would be helpful to review the investment structure of a quasi-governmental institution, the Federal Reserve Banks. The information provided in the table and text below comes from the Federal Reserve Banks Combined Financial Statements, which is public information.

TABLE 15: FEDERAL RESERVE RETIREMENT PLAN

The system Plan's policy weight and actual asset allocations at December 31, by asset category, are as follows:

	2015 Policy Weight	Actual Asset Allocations	
		2015	2014
Fixed income	50.0%	48.6%	51.2%
U.S. equities	24.7%	25.4%	25.8%
International equities	17.4%	17.8%	17.6%
Emerging markets equities	4.5%	4.5%	4.9%
Private equity	1.7%	1.3%	0.0%
Real estate	1.7%	1.7%	0.0%
Cash	0.0%	0.7%	0.5%
Total	100.0%	100.0%	100.0%

With a policy breakdown of 50% fixed income, 46.5% public equity and 3.5% alternative investments, the strategic asset allocation appears to be similar to our “moderate” risk portfolio and to lie somewhere between the traditional and alternative design. Note that the plan does include, although modestly, exposure to private equity and real estate.

The public equity exposure is global in nature, and the weighting appears close to the current market capitalization breakdown in world equity indices.

Governance of the Federal Reserve Retirement Plan

As noted in the Statements: “The System’s Committee on Investment Performance (CIP) is responsible for establishing investment policies, selecting investment managers, and monitoring the investment managers’ compliance with their policies. At December 31, 2015 the Plan’s assets were held in 14 investment vehicles: three actively-managed long-duration fixed income portfolios, a passively-managed long-duration fixed income portfolio, an indexed U.S. equity fund, an indexed non-U.S. developed-markets equity fund, an indexed emerging-markets equity fund, two private equity limited partnerships, a private equity separate account, two core real estate funds, a real estate limited partnership, and a money market fund.”

It is interesting to note that the public equity appears to be managed passively via index funds. The long bond portfolios, which are tailored to match the Plan's actuarial liability duration risk, are more actively managed.

The Federal Reserve Banks do provide post-retirement health care benefits, but these actuarial liabilities appear not to be funded.

G. Conclusion

In the preceding analysis, we reviewed the current investment strategy of USPS's plans. There are a number of alternatives to the current asset allocation that appear to offer attractive return and risk trade-offs. As in implementing any investment program, strong governance is an essential feature of ensuring long-term success.

Key Findings Identified

- In our analysis we reviewed the current investment strategy of USPS's plans. As a result of our analysis, we have identified a number of alternatives to the current asset allocation that appear to offer attractive return and risk trade-offs.
- Depending on risk appetite, the different plans may warrant different strategic asset allocations based on their funded ratios, open versus closed plan designs and the type of benefits paid out.
- Strong governance is an important component of implementing long-term investment programs.
- To implement any of these investment options, special attention will be needed to manage to the unique nature of the current investment portfolio, especially given the relatively large size of the asset pools.

Appendix A: Contribution Scenarios and Liability Information

TABLE 16: PROJECTED CSRS CONTRIBUTION AND OUTLAYS

Projected CSRS Contributions and Outlays under Funding Assumptions

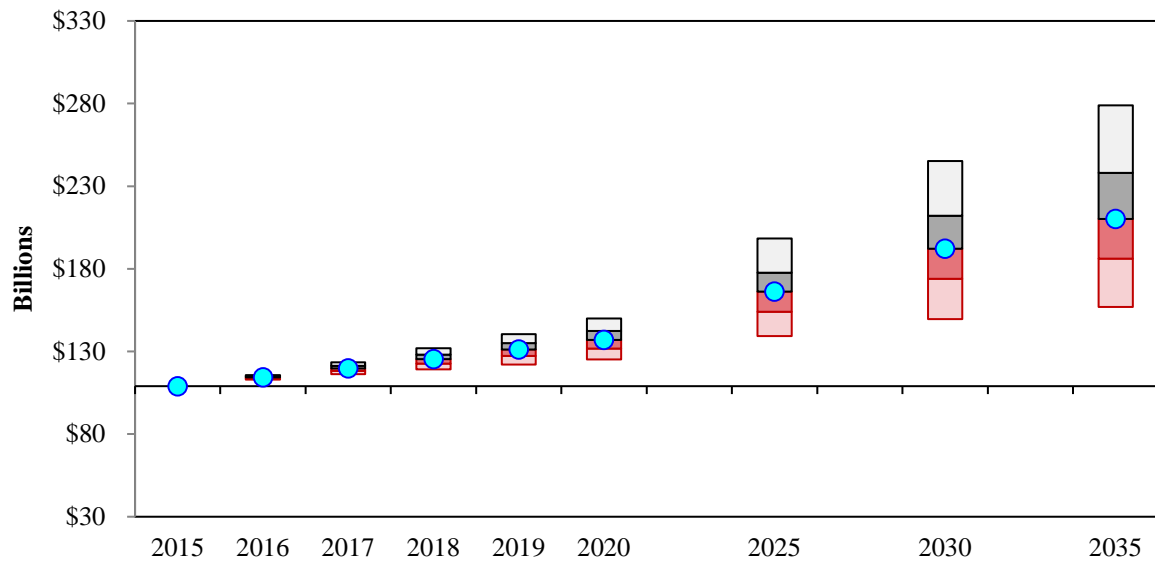
The following projection applies long term economic assumptions of:
3.0% COLA for annuitants, 3.25% general salary increase, and 5.25% interest.

(in millions of dollars)

Fiscal Year	Employee Contrib	USPS		USPS	Interest	Postal Fund
		Suppl Amort	Transfer Pymnt	Share Benefits		
2015	173.8	0.0	0.0	-12265.0	9245.5	179227.2
2016	146.2	0.0	0.0	-12546.8	9088.1	175914.8
2017	123.5	1507.3	0.0	-12821.5	8906.5	173630.6
2018	103.8	1507.3	0.0	-13055.2	8780.0	170966.6
2019	86.9	1507.3	0.0	-13251.7	8634.6	167943.8
2020	72.6	1507.3	0.0	-13410.1	8471.4	164585.0
2021	60.4	1507.3	0.0	-13535.4	8291.5	160908.8
2022	50.0	1507.3	0.0	-13627.7	8095.9	156934.3
2023	41.0	1507.3	0.0	-13687.9	7885.4	152680.2
2024	33.4	1507.3	0.0	-13716.9	7661.1	148165.1
2025	27.0	1507.3	0.0	-13711.9	7424.0	143411.6
2026	21.7	1507.3	0.0	-13674.8	7175.3	138441.1
2027	17.2	1507.3	0.0	-13606.6	6916.0	133275.1
2028	13.5	1507.3	0.0	-13506.4	6647.3	127936.8
2029	10.4	1507.3	0.0	-13372.0	6370.4	122452.9
2030	7.8	1507.3	0.0	-13206.6	6086.7	116848.3
2031	5.7	1507.3	0.0	-13010.0	5797.5	111148.8
2032	4.0	1507.3	0.0	-12777.4	5504.3	105387.0
2033	2.7	1507.3	0.0	-12510.7	5208.7	99595.1
2034	1.7	1507.3	0.0	-12209.9	4912.4	93806.6
2035	1.0	1507.3	0.0	-11877.0	4617.1	88055.0
2036	0.6	1507.3	0.0	-11510.0	4324.6	82377.5
2037	0.3	1507.3	0.0	-11108.9	4036.9	76813.2
2038	0.1	1507.3	0.0	-10679.8	3755.9	71396.8
2039	0.1	1507.3	0.0	-10218.5	3483.5	66169.3
2040	0.0	1507.3	0.0	-9730.2	3221.7	61168.1
2041	0.0	1507.3	0.0	-9216.8	2972.5	56431.1
2042	0.0	1507.3	0.0	-8682.4	2737.6	51993.7
2043	0.0	1507.3	0.0	-8130.9	2519.0	47889.2
2044	0.0	0.0	0.0	-7567.4	2318.1	42639.9
2045	0.0	0.0	0.0	-6996.8	2057.3	37700.3
2046	0.0	0.0	0.0	-6423.3	1812.8	33089.8
2047	0.0	0.0	0.0	-5853.8	1585.5	28821.6
2048	0.0	0.0	0.0	-5293.3	1376.0	24904.3
2049	0.0	0.0	0.0	-4745.8	1184.5	21343.0
2050	0.0	0.0	0.0	-4218.4	1011.2	18135.8
2060	0.0	0.0	0.0	-743.0	128.3	2196.5
2070	0.0	0.0	0.0	-51.1	14.3	260.2
2080	0.0	0.0	0.0	-15.0	7.0	133.3

Source: OPM, Financial Reporting Information with Respect to Pension Obligations of the Postal Service, 2015

CHART 14: FERS ACTUARIAL ACCRUED LIABILITY FORECAST



Source: Segal analysis using Monte Carlo simulations to vary CPI with 2,000 trials

TABLE 17: PROJECTED FERS CONTRIBUTIONS AND OUTLAYS

Projected FERS Contributions and Outlays under Funding Assumptions

\$ billions

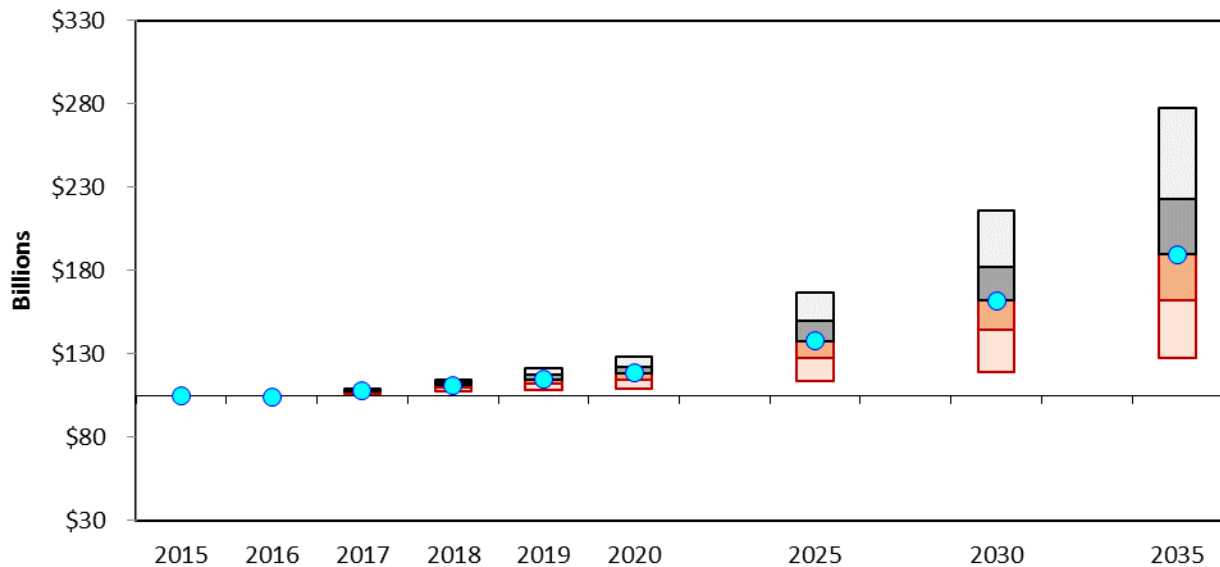
Year	Benefit Payments	Total Contributions (Employee and Employer)	All Other Contributions - Supplemental Liability Contributions	Asset Interest	Postal Fund
2015	2.34	3.50	-	3.08	105.1
2016	2.55	3.75	-	5.55	111.8
2017	2.86	3.85	0.25	5.90	119.0
2018	3.23	3.99	0.25	6.26	126.3
2019	3.64	4.11	0.25	6.64	133.6
2020	4.08	4.23	0.25	7.02	141.0
2021	4.55	4.35	0.25	7.40	148.5
2022	5.04	4.47	0.25	7.78	156.0
2023	5.56	4.59	0.25	8.17	163.4
2024	6.08	4.71	0.25	8.55	170.8
2025	6.61	4.83	0.25	8.93	178.2
2026	7.15	4.94	0.25	9.31	185.6
2027	7.72	5.06	0.25	9.68	192.9
2028	8.30	5.17	0.25	10.05	200.0
2029	8.90	5.29	0.25	10.42	207.1
2030	9.50	5.41	0.25	10.78	214.0
2031	10.09	5.53	0.25	11.13	220.9
2032	10.67	5.66	0.25	11.48	227.6
2033	11.23	5.78	0.25	11.82	234.2
2034	11.77	5.90	0.25	12.16	240.7
2035	12.31	6.03	0.25	12.49	247.2
2036	12.83	6.16	0.25	12.82	253.6
2037	13.34	6.28	0.25	13.15	259.9
2038	13.84	6.41	0.25	13.47	266.2
2039	14.32	6.55	0.25	13.79	272.5
2040	14.78	6.68	0.25	14.11	278.8
2041	15.21	6.82	0.25	14.44	285.0

Assumptions:

Federal-Wide OPM	
Projection Type	Open
Total Interest Rate	5.25%
Inflation	3.00%
FERS COLA	2.40%
Real Return	2.25%
Total Wage Growth	3.25%
Real Wage Growth	0.25%
Aggregate Payroll Growth	2.00%

Note: 2015 data actuals from OPM including lower actual interest expenses. All other data projected by Korn Ferry.

CHART 15: PSRHBF ACTUARIAL ACCRUED LIABILITY FORECAST



Source: Segal analysis using Monte Carlo simulations to vary medical inflation with 2,000 trials

TABLE 18: PROJECTED PSRHBF CONTRIBUTIONS AND OUTLAYS

Projected PSRHBF Contributions and Outlays

\$ billions

Year	Benefit Payments*	Employer Normal Cost Contributions*	Employer Amortization Contributions	Asset Interest	Postal Fund
2015	3.11	-	-	1.50	50.3
2016	3.31	-	-	1.52	51.9
2017	3.52	2.78	2.50	2.01	55.6
2018	3.73	2.93	2.51	2.16	59.5
2019	3.96	3.09	2.52	2.30	63.4
2020	4.20	3.26	2.53	2.46	67.5
2021	4.43	3.43	2.54	2.61	71.7
2022	4.67	3.61	2.55	2.78	75.9
2023	4.89	3.80	2.56	2.94	80.3
2024	5.12	3.99	2.57	3.11	84.9
2025	5.35	4.19	2.58	3.29	89.6
2026	5.58	4.40	2.59	3.47	94.5
2027	5.82	4.61	2.59	3.66	99.5
2028	6.07	4.84	2.60	3.86	104.7
2029	6.34	5.07	2.60	4.06	110.1
2030	6.61	5.32	2.60	4.27	115.7
2031	6.89	5.58	2.60	4.49	121.5
2032	7.19	5.85	2.60	4.72	127.5
2033	7.50	6.14	2.60	4.95	133.7
2034	7.80	6.44	2.59	5.19	140.1
2035	8.11	6.75	2.58	5.44	146.8
2036	8.41	7.08	2.57	5.70	153.7
2037	8.71	7.43	2.55	5.97	160.9
2038	9.02	7.79	2.53	6.25	168.5
2039	9.35	8.17	2.50	6.55	176.4
2040	9.69	8.57	2.47	6.86	184.6
2041	10.02	8.98	2.43	7.18	193.1

Assumptions:

Federal-Wide OPM
 Projection Type Open
 Maintains Fixed Population
 Total Interest Rate 3.90%
 Health Care Trend based on Getzen Model

Unfunded liability amortization -
 Amortization payments start in FY 2017
 Run through FY 2056

* Benefit payments did not come from the fund until FY 2017. The Postal Service paid them separately. Normal cost contributions are also first due in FY 2017.

Note: 2015 and 2016 actuals from OPM including asset interest. All other data projected by Korn Ferry.

TABLE 19: FERS ASSUMPTIONS

	FERS	Projected FERS Capital Market Assumptions
Discount Rate	5.25%	3.25%
CPI	3.00%	2.00%
COLA	2.40%	2.00%
Implicit Real Rate	2.50%	1.25%

Assumed the total plan inflation impact is between the CPI and COLA.

TABLE 20: PSRHBFB ASSUMPTIONS

	PSRHBFB	Projected PSRHBFB Capital Market Assumptions
Asset Rate of Return	3.90%	3.25%
Medical Trend	5.50% grading down to 3.50%*	5.50% grading down to 3.50%*

*Note that the medical trend varies over time.

Appendix B: Asset Class Information

	Definition		Pros (+) and Cons (-)
Core U.S Bonds	All fixed rate debt securities issued in the U.S., including government, corporate, agency, mortgage pass-through and asset-backed securities, that are rated investment grade (BBB) or higher. Duration comparable to Barclays Capital Aggregate	+ + -	With its income component, bonds provide stability in a diversified portfolio Large very liquid market with many derivative instruments to supplement exposures Bond value is sensitive to changes in interest rates, credit quality, and inflation
High Yield	All corporate debt issued in the U.S. that is rated below investment grade, or is not rated. These securities have a higher yield than investment grade corporates, and are riskier, both in terms of price risk and default risk	+ + - - -	Offer higher expected long-term returns than investment grade bonds. 90% + of the return is derived from the bonds' interest income Increased diversification. High Yield has a low correlation with every major asset class Higher volatility than investment grade corporates Higher default rate relative to traditional investments Specialized management skills are needed to effectively invest in the asset class
Emerging Market Debt	Emerging market debt includes debt securities in countries with less developed economies	+ + - -	High current income component Potential for enhanced returns relative to core fixed income Higher default risk associated with lower quality issuers Interim volatility associated with political or economic instability of emerging market countries
Developed Non-U.S. Fixed Income	Bond that are issued by companies or governments in developed countries other than U.S.	+ + - -	Pays fixed coupon rate Diversification across multiple yield curves Exposure to currency exchange risk Exposure to political or economic instability
Inflation Linked Bonds (TIPS)	A special type of Treasury note or bond that offers protection from inflation. As with other Treasuries, when you buy an inflation-linked bond you receive interest payments every six months, which is continuously adjusted for inflation	+ + + - -	High credit quality Principal and interest are protected against inflation Accrued principal value is higher than its face value Principal could decline during deflation Due to the protection against inflation, which guarantees a real rate of return, TIPS offer a low return

	Definition		Pros (+) and Cons (-)
Long-Term Fixed Income	Bond issues with maturities typically greater than 15 years	+ + - -	Higher interest rates than core fixed income Extends duration of assets in an LDI framework for defined benefit plans Higher credit and inflation risk Higher overall volatility than core fixed income
U.S. Equities	Stock issued by companies domiciled or registered in the United States, which trade on domestic stock exchanges	+ + - -	Provides greatest potential for growth for the larger institutional asset classes over the long term Large very liquid market with many derivative instruments to supplement exposure Cyclical in nature More volatile than cash or bonds
Non-U.S. Developed Equity	Stock issued by companies in developed economies, excluding the U.S.	+ +/-	Provides access to a large segment of the global economy with market cycles that could differ from the U.S. Currency risk can be hedged
Emerging Market Equity	Stocks issued by companies domiciled in countries with less developed economies in terms of GDP per capita as defined by the World Bank	+ + - -	Provides access to a large segment of the global economy with market cycles that could differ from the U.S. as well as the developed Non-U.S. markets Enhanced return potential over U.S. Equity Currency risk not easily hedged More exposed to operational, liquidity and political risks than developed countries
Private Real Estate	Real estate includes investment in income producing properties. Real estate investments can vary by property type, geographic location, position in the property cycle, structure of the deal and investment vehicle	+ + + - - -	Low correlation to public equity Offers a partial inflation hedge Stable returns associated with high income component Illiquidity requires long-term horizon to achieve investment expectations No public market or price system Fees are higher than most other public market classes
Global REITs	A publicly traded pool of investments as described for real estate above	+ + + +/- +/-	Offers partial inflation hedge Stable returns associated with high income component More liquid than private real estate, given the public trading mechanism Real estate component provides some diversification relative to public equity; however, the trading mechanism increases the correlation with public equity markets Fees comparable to other public market asset classes

Multi-Asset Class Solutions

As the name implies:

- An investment program that includes a broad cross-section of asset classes
- Solutions-oriented in that they can be tailored to fit specific client needs
- Will shift allocations between various asset classes to produce improved outcomes, including diversified beta or less-correlated alpha

Examples include:

- **Global Tactical Asset Allocation (GTAA):** 60/40 benchmark-based with enhanced return objective (generally 3+%)
- **GTAA Reduced Risk:** Goal of exceeding bills by 60/40 return with lower volatility and higher Sharpe Ratio through downside protection
- **Absolute Return CPI:** Goal of exceeding inflation by 5-8% with attractive risk return
- **Income Oriented:** Diversified high income as a substitute for Core Fixed Income
- **Risk Parity:** Balances contribution to portfolio risk between stocks, bonds, and commodities
- **Risk Mitigation:** Targets a specific level of downside or liability based risk