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Executive Summary

This report evaluates the expected returns on U.S. Treasury bonds and their role in the Board's asset liability management framework. U.S. Treasuries are the world's largest and most liquid government bond market, forming the basis of the discount rate used to value the fund's liabilities. Key factors influencing yields over the next five years include inflation, geopolitical conflict, fiscal deficits and demographic change, which together shape both the level and slope of the yield curve.

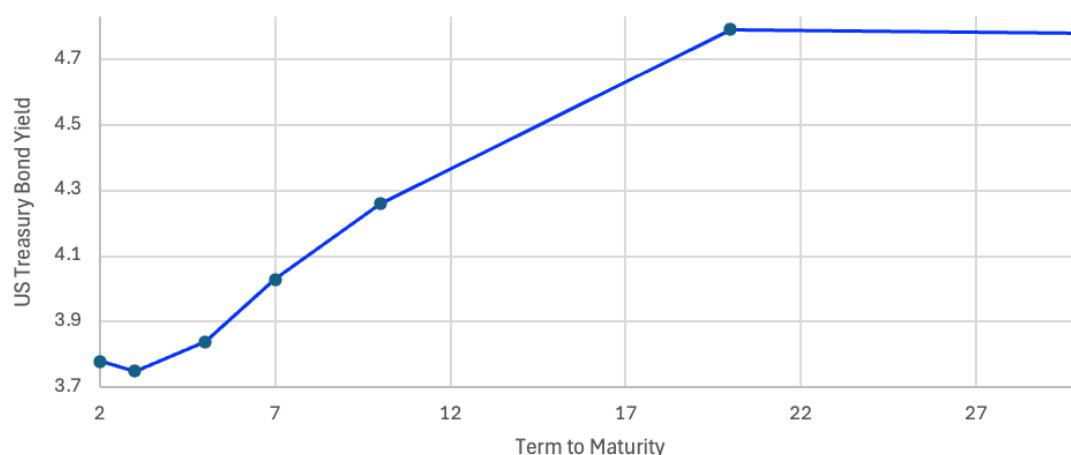
The Board's policy to allocate 40% of assets to Treasuries and apply treasury yields to liability valuation highlights the importance of timing in bond purchases. Calculations show that delaying investment could reduce purchase costs if yields rise but exposes the fund to reinvestment risk and potential mismatches if yields fall. Immediate purchase locks in current yields, stabilises funding ratios and provides a stronger asset-liability match. Accordingly, the report recommends Strategy A: immediate investment.

1 Treasury Bonds

1.1 Introduction to U.S. Treasury Bonds

U.S. Treasury bonds encompass a suite of debt instruments issued by the United States Department of the Treasury to finance government spending. These bonds underpin financial markets around the world, providing a benchmark yield curve¹, shown in **Figure 1.1**.

Figure 1.1 – Official Yield Curve of the US Treasury 1/7/2025



Reference: US Department of the Treasury (2025). US Treasuries Yield Curve. <https://www.ustreasureryieldcurve.com/>

1.2 U.S. Treasury Bonds Markets

U.S. Treasury bonds are first issued in the primary market through regular competitive and non-competitive auctions conducted by the Department of the Treasury². The purpose of the primary market is to raise funding for government operations. At auction, primary investors submit bids, and the clearing yield reflects their required compensation. The primary market anchors the official starting yields across maturities. Once issued, bonds trade in the secondary market, which provides liquidity by facilitating the trade of previously issued bonds. Here, yields are updated daily in response to new information as participants demand and offer prices in accordance with emerging news, making the secondary market the dominant force in shaping the yield curve³. Shorter-term bonds are more sensitive to immediate monetary policy signals while longer-term bonds reflect structural factors.

¹ The yield curve is a graphical representation that plots the yield of government bonds with the same credit quality across varying maturities and is adjusted to smooth for a continuous curve.

² US Department of the Treasury (2025). About Treasury Market Securities. TreasuryDirect, <https://treasurydirect.gov/marketable-securities/>

³ US Department of the Treasury (2021). Yield Curve Methodology Change Information Sheet. US Department of the Treasury. <https://home.treasury.gov/policy-issues/financing-the-government/yield-curve-methodology-change-information-sheet#:~:text=The%20new%20MC%20method%20will,to%20reflect%20the%20effective%20date.>

For instance, when the Federal Reserve began raising the federal funds rate in March 2022, the 2-year bond yield increased sharply by 3.92% by November 2022⁴. This immediate reaction in the secondary market reflected repricing of short-term expectations. By contrast, the 30-year Treasury yield rose only 1.9% by November 2022⁵, as long-run inflation expectations remained anchored, and the term premium stayed low.

Secondary market trading updates yields in real time; these yields then inform bids at subsequent primary auctions. The primary and secondary markets differ by their participants and function. Together, the two markets ensure that yields across maturities reflect immediate policy expectations and structural risks. The primary market sets issuance costs, but the secondary market drives the rapid repricing determining the shape of the yield curve.

1.3 U.S. Treasury Bond Market Participants

The primary market is dominated by the U.S. Department of the Treasury as the sole issuer, with primary dealers, institutional investors and foreign central banks as the principal buyers. Primary dealers are financial institutions that act as market makers by underwriting auctions, distributing bonds and maintaining liquidity⁶. Their capital base and trading expertise make them pivotal in price setting and stabilising demand. Institutional investors such as pension funds and insurance companies participate in both markets but exert particular influence in the primary market due to their scale and predictable liability structures. Pension funds in particular favour 10 to 30-year maturities, reflecting their long-dated obligations. Foreign central banks are also critical buyers, seeking to manage exchange risk and diversify reserves. Historically, China and Japan have been the largest holders of U.S. Treasuries, but geopolitical frictions have reduced their appetite.

The secondary market is broader and more dynamic, comprising fund managers, individuals, corporations, banks and others. Asset managers are the largest and most consistent participants, using Treasuries for liquidity management and liability matching. Their responsiveness and scale make them especially influential in short-term yield movements. The Federal Reserve also plays a role in the secondary market. Since 2008, and especially in 2020, the Federal Reserve has implemented quantitative easing programs through open market operations to affect the money supply and control inflation⁷.

⁴ US Department of the Treasury (2025). 2 Year Treasury Rate. Y Charts. https://ycharts.com/indicators/2_year_treasury_rate

⁵ US Department of the Treasury (2025). 30 Year Treasury Rate. Y Charts. https://ycharts.com/indicators/30_year_treasury_rate

⁶ US Department of the Treasury. (2025). Financing the Government. US Department of the Treasury. <https://home.treasury.gov/policy-issues/financing-the-government/quarterly-refunding/primary-dealers>

⁷ Board of Governors of the Federal Reserve. (2025). Policy Tools. Board of Governors of the Federal reserve System. <https://www.federalreserve.gov/monetarypolicy/openmarket.htm>

Over the last 20 years, the secondary market has evolved more substantially than the primary market. The rise of exchange-traded funds has expanded asset manager activity, while regulatory reforms increased commercial bank holdings of Treasuries for capital adequacy⁸. The primary market has remained stable, reflecting its narrower participant base. Looking forward, pension funds and insurers are expected to gain importance as an ageing population increases demand for long-term bonds. Foreign central banks may continue to reduce exposure amid geopolitical uncertainty. The Federal Reserve could again participate if fiscal deficits rise. The role of primary dealers and fund managers are expected to remain prominent. In summary, the top three projected participants are likely to be the U.S. Treasury, primary dealers and asset managers.

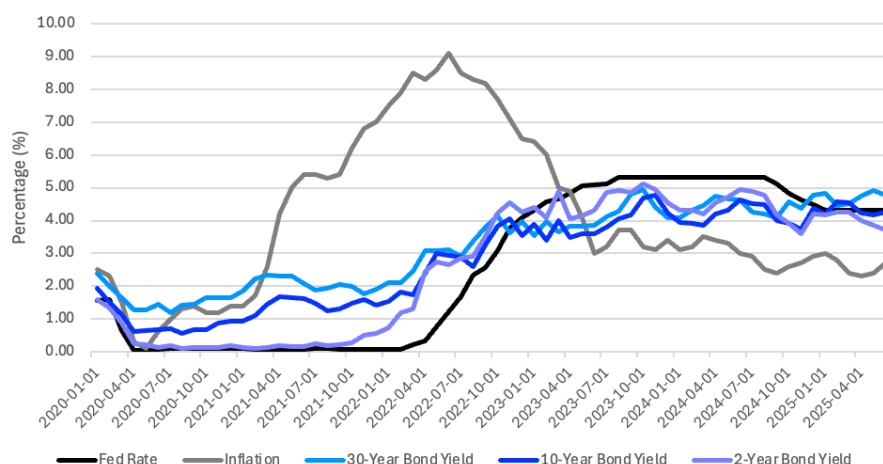
1.4 Factors Effecting U.S. Treasury Bond Returns

U.S. Treasury bond returns are driven by interlocking economic, political and structural forces. Over the next five years inflation, geopolitical conflict, national debt and demographic change are crucial. Each factor transmits through distinct channels, shaping the level and slope of the yield curve differently across maturities.

1.4.1 Inflation

When inflation rises, real returns on Treasuries fall and the Federal Reserve responds by raising policy rates, immediately repricing the front end of the curve. Longer maturities adjust more slowly, through changes in inflation expectations and higher term premiums. **Figure 1.2** demonstrates the strong reaction of 2-year bonds to emergency rate drops by the Federal Reserve in 2020, while 10 and 30-year bonds had more moderate reactions.

Figure 1.2 – Inflation and Bond Yields over Previous Five Years



References: Board of Governors of the Federal Reserve System. (2025). Selected Interest Rates. FRED. <https://fred.stlouisfed.org/series/FEDFUNDS>

US Bureau of Labor Statistics. (2025). United States Inflation Rate. Trading Economics. <https://tradingeconomics.com/united-states/inflation-cpi>

Board of Governors of the Federal Reserve System. (2025). US Treasury Security Yields. FRED. <https://fred.stlouisfed.org/series/DGS30>

⁸ Liang, N. (2025). What's going on in the US Treasury market, and why does it matter? Brookings. <https://www.brookings.edu/articles/whats-going-on-in-the-us-treasury-market-and-why-does-it-matter/>

Inflationary expectations are currently very volatile, largely due to the significant tariffs introduced by President Trump in early 2025. Tariffs increase the cost of importing, raising the price of imported and competitor goods, subsequently driving inflation. Recent data is showing the cost of tariffs emerging with core inflation increasing 0.3% over the month of June⁹. Assuming the tariffs remains in effect over the next five years, in line with the stated goal of reinvigorating American manufacturing, inflation would continue to rise. The varying effects on treasury bonds are shown in **Figure 1.3**.

Figure 1.3 – Impact Summary Table for Inflation

Maturity	Current	Yr 1-2	Yr 3-4	Yr 5	Total Impact
2-Year	3.75%	Sharp increase.	Slower increase as rate hikes moderate.	Stabilisation if inflation eases.	Minor increase
10-Year	4.29%	Moderate increase.	Moderate increase as expectations adjust.	Stable.	Minor increase or stable.
30-Year	4.89%	Moderate increase.	Minor increases continue.	Stablising as uncertainty reduces.	Minor increase or stable.

Shorter maturity yields will increase quickly as investors demand compensation to account for higher short-term inflation. Due to the election cycle, expectations of inflation increases are mostly limited to the next four years and hence have lower magnitude effects on 10 and 30-year bonds compared to 2-year bonds. The yield curve will see an initial flattening but if inflation persists, this will evolve into a steepening as term premiums rise at the long end. Assuming this to be a temporary political measure, the relevant assets to this fund, primarily 30-year bonds, are likely to see minimal yield adjustment.

1.4.2 Geopolitical Conflict

Geopolitical tensions directly impact demand for U.S. Treasuries by foreign investors. Tariffs and other political conflicts have seen key foreign central banks reduce their holdings of long-dated U.S. Treasury bonds. In the secondary market, portfolio rebalancing by foreign private investors has a faster impact, particularly on the center of the curve. The primary market absorbs these shifts with a lag, as reduced foreign bidding raises yields at auction.

Foreign official holdings of U.S. Treasuries fell by \$48 billion in early 2025, due to foreign and trade policy conflicts¹⁰. China's holdings have fallen by more than \$300 billion and Japan's by \$190 billion since 2022, signaling a longer-term trend¹¹. **Figure 1.4** shows the potential effects on bond yields over the next five years.

⁹ Smith, C. (2025). U.S. Inflation Report Shows Effects of Trump's Tariffs. The New York Times. <https://www.nytimes.com/live/2025/08/12/business/cpi-inflation-tariffs-fed>

¹⁰ McKenna, G. (2025). Central Banks have dumped \$48 billion in Treasuries as foreign wealth officials divorce the dollar. Fortune. <https://fortune.com/2025/06/18/central-banks-have-dumped-48-billion-in-treasuries-as-foreign-wealth-officials-divorce-the-dollar/>

¹¹ Labonte, M. (2025). Foreign Holdings of Federal Debt. Congress Gov. <https://www.congress.gov/crs-product/RS22331>

Figure 1.4 – Impact Summary Table for Geopolitical Conflict

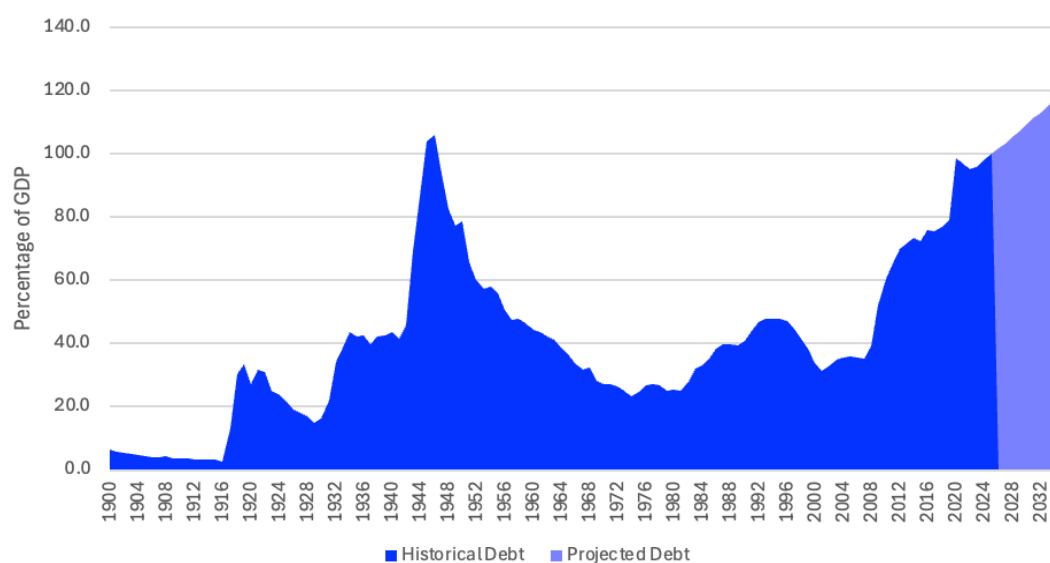
Maturity	Current	Yr 1-2	Yr 3-4	Yr 5	Total Impact
2-Year	3.75%	Minimal Impact as domestic factors dominate.	Little change.	Stable.	Stable overall.
10-Year	4.29%	Mild increase as private foreign investors reduce holdings.	Continued small increases.	Stabilisation as markets adjust.	Minor increase.
30-Year	4.89%	Limited immediate impact.	Large increases as official reserve diversification increases.	Sustained upward pressure if tensions persist.	Moderate increase.

Foreign central banks' preference for long-term holdings means 30-year yields are most vulnerable. The 2-year bond is least affected as demand is primarily domestic. Over time, this is likely to steepen the curve, with foreign divestment reducing demand at the long end. The long-term nature of this fund's liabilities and appetite for longer duration bonds, places them in the same market as these foreign investors, so changes in these yields are paramount in liability matching.

1.4.3 National Debt and Deficit Funding

Persistent fiscal deficits and rising federal debt levels increase Treasury supply, exerting upward pressure on yields. Larger issuance in the primary market directly lowers auction prices, while in the secondary market it increases supply, reducing liquidity. The effect is strongest where issuance is concentrated, however the term premiums will magnify the impact on longer-dated bonds. The U.S. federal debt has been increasing over recent years, standing at 99.9% of GDP in 2025 and is projected to rise to 109.2% by 2030, shown in [Figure 1.3](#).

Figure 1.5 – U.S. Federal Debt Held by the Public as a Percentage of GDP



Reference: Congressional Budget Office. (2025). *The Budget and Economic Outlook: 2025 to 2035*. Congressional Budget Office.
<https://www.cbo.gov/publication/60870>

The effects of the projected increase in national debt are detailed in **Figure 1.6**.

Figure 1.6 – Impact Summary Table for National Debt

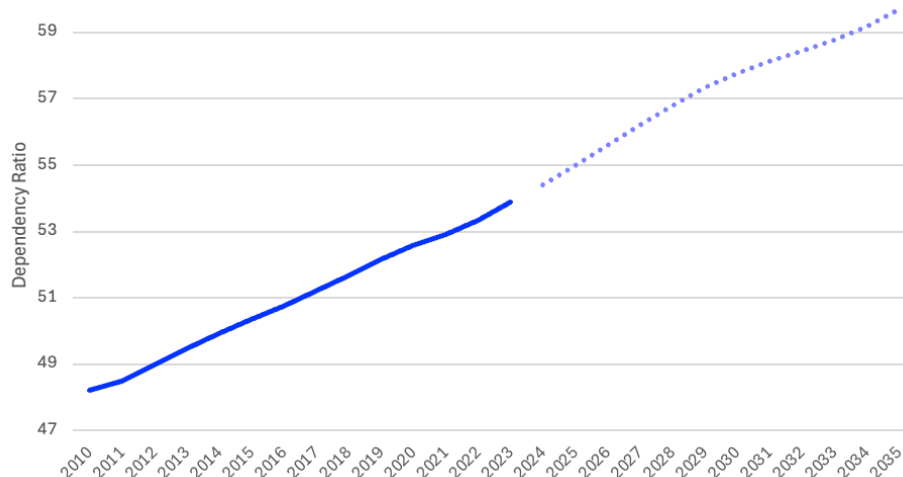
Maturity	Current	Yr 1-2	Yr 3-4	Yr 5	Total Impact
2-Year	3.75%	Minimal increase given strong liquidity.	Modest increase.	Stable.	Minor increase.
10-Year	4.29%	Moderate increase.	Continued increase as issuance grows.	Increase if deficits continue.	Moderate increase.
30-Year	4.89%	Strong increase.	Term premiums rise further.	Significant long-term increase.	Significant increase.

Short-dated bonds absorb new supply due to high turnover and liquidity, but longer maturities require additional compensation, driving term premiums higher. The impact is therefore steepening the curve. For the fund, this creates both risk of capital loss on existing long bonds and opportunities for reinvestment at higher yields in the medium term.

1.4.4 Demographic Shifts

Demographic change in the U.S. effects both demand and supply for Treasuries. Ageing populations increase demand for fixed-income assets through pension funds and insurers, particularly in the 10 to 30-year range. However, over time, the shrinking working-age population reduces aggregate domestic savings, lowering demand for these Treasuries. The U.S. dependency ratio, young and elderly populations versus workers, is projected to reach almost 60% in the next ten years, shown in **Figure 1.7**.

Figure 1.7 – U.S. Dependency Ratio Projection



Source: UN World Population Prospects. (2024). Age-dependency ratio. Our World in Data. <https://ourworldindata.org/grapher/age-dependency-ratio-projected-to-2100>

The impact of this projected demographic change is detailed below in **Figure 1.8**.

Figure 1.8 – Impact Summary Table for National Debt

Maturity	Current	Yr 1-2	Yr 3-4	Yr 5	Total Impact
2-Year	3.75%	Minimal demographic effect	Stable.	Stable.	Stable
10-Year	4.29%	Mild decrease as demand increases.	Continued decreases as population continues aging.	Continued decreases.	Moderate decrease.
30-Year	4.89%	Stable initially.	Stable or slight decrease as pension funds demand more.	Slight increase as demand begins to subside as savings deplete.	Stable with signs of future increases.

In the near term, the curve flattens as 10-year yields decline relative to 30-year yields. Beyond five years, however, demographic changes will begin to cause weaker long-run demand, steepening the curve again. For the fund, these shifts suggest relative stability in mid-duration assets, while longer-dated positions face gradual yield pressure extending beyond five years.

1.4.5 Interaction Effects

These factors compound one another: tariffs drive inflation, rising debt increases supply, and demographic shifts weaken long-term demand. The near-term effect is a flatter curve as short yields rise quickly, but over time the combined pressures steepen the curve as long-term yields adjust upward.

1.5 Components of Expected Returns on U.S. Treasury Bonds

1.5.1 Inflation

For the 10-year bond, inflation expectations feed directly into yields as the Federal Reserve adjusts policy rates. The 30-year bond responds more gradually, with investors demanding compensation for long-term inflation uncertainty through higher term premiums. Over the next five years, inflation volatility driven by tariffs, supply chain shifts and political pressure on the Federal Reserve is expected to keep the 10-year yield more volatile, while the 30-year yield gradually incorporates a higher inflation risk premium, especially if tariffs remain in place.

1.5.2 Term Premiums

Historically, the term premium has been low, has begun to climb recently, shown in [Figure 1.7](#). For the 10-year bond, a modest increase in the term premium is likely as deficits drive more issuance and inflation expectations remain unsettled. For the 30-year, the impact will be more pronounced as investors require additional compensation for current uncertain environments¹². The result is a steepening of the curve in the next three to five years, as long bonds demand a greater premium to attract buyers.

Figure 1.9 – Term Premiums on U.S. Treasury Bonds



Reference: Board of Governors of the Federal reserve System (2025). The Term Premium. The FRED Blog.

<https://fredblog.stlouisfed.org/2025/05/the-term-premium/>

1.5.3 Liquidity Premiums

The 10-year bond, as one of the most actively traded bonds globally, typically offers a liquidity discount for the ease of trading. This liquidity advantage stabilises yields even in times of market stress. By contrast, the 30-year bond is less liquid, with smaller issuance volumes and a narrower investor base. This reduced liquidity raises the premium required by investors, amplifying expected returns. Over the next five years, this liquidity differential is expected to widen as foreign central banks diversify away from long-dated Treasuries, and the national debt increases.

¹² Economy, Strategy and Finance Center. (2025). US Leading Indicators. The Conference Board. <https://www.conference-board.org/topics/us-leading-indicators/>

1.5.4 Uncertainty-Related Premiums

The 10-year bond is sensitive to near-term political risks including fiscal policy shifts, tariff regimes and potential interference with the Federal Reserve's independence. These risks can produce short bursts of yield volatility but tend to normalise quickly. The 30-year bond, however, incorporates longer-term uncertainties such as fiscal sustainability, demographic change and structural inflationary pressures. These risks accumulate over time, leading to persistently higher required returns as investors demand compensation uncertainty.

1.5.5 Required Risk-Free Return

Market participants' required compensation is anchored in the Federal Reserve's policy stance. The 10-year bond embeds expectations of policy rates over a medium horizon, adjusting quickly when rates change. The 30-year bond, by contrast, reflects long-term equilibrium views of the neutral policy rate, adjusted upward by uncertainty and term premiums. Should political pressure succeed in forcing premature rate cuts, the 10-year bond would initially deliver higher returns, but raise long-run inflation expectations eroding real returns on 30-year bonds.

2 Investment Strategies

The board has identified two potential strategies regarding the service of a 10-year liability of \$50 million. The investment management team has proposed financing the liability through the purchase of 10-year treasury bonds, either purchasing immediately or delaying for 6 months.

2.1 Strategy A – Immediate Purchase

The features of the available bond are detailed below, accompanied by the calculation of the bond's current price per \$100 face value, \$98.00 (clean). Hence, the firm would require \$49.6 million to purchase the required bonds immediately, based on the dirty price.

10-Year Treasury Bond			
 March 15 2035	 4.25% p.a.	 4.50% p.a.	 \$100
Maturity Date	Coupons	Yield	Face Value

Pricing Methodology

- (1) Calculate the 'clean' bond price by discounting the cashflows at 2.25% per half-year.

The cashflows are:

- 20 payments of \$2.125 paid at half yearly intervals
- Repayment of principle with face value of \$100

$$B_{clean} = \sum_{i=1}^{20} \frac{2.125}{1.0225^i} + \frac{100}{1.0225^{20}}$$

$$B_{clean} = 2.125 \left(\frac{1 - 1.0225^{-20}}{0.0225} \right) + \frac{100}{1.0225^{20}}$$

$$B_{clean} = \$98.00$$

- (2) Calculate the 'dirty' bond price accounting for the interest earned by the seller during the current coupon period, of which 92 days has elapsed.

$$B_{dirty} = 98.00 \times 1.0225^{92/184}$$

$$B_{dirty} = \$99.10$$

Assumptions

Half-yearly coupon paid on 3/15 and 9/15

First coupon to be paid on 9/15/25

Last coupon to be paid on 3/15/35

92 days from 3/15 to 6/15

184 days from 3/15 to 9/15

Accrued interest is earned linearly over time

Yield is constant over the life of the bond

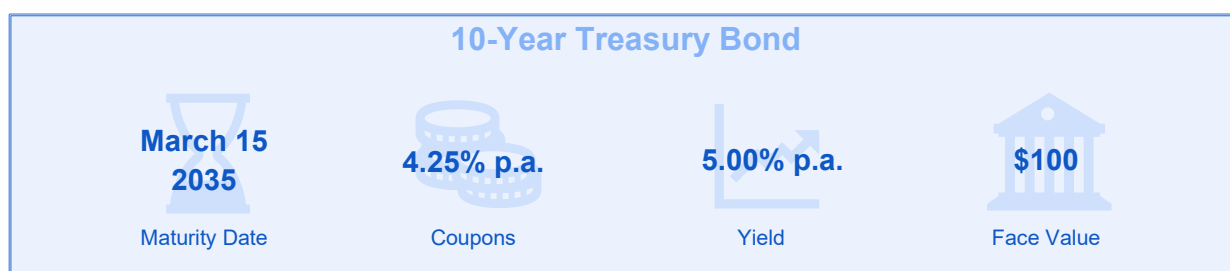
No reinvestment risk is considered

No taxes, fees or transaction costs

No options on the bond

2.2 Strategy B – Delay Investment

The impact of delaying the investment decision is subject to considerable uncertainty. Here, one scenario is considered, but the likelihood of this is unknown, and other outcomes should be considered when comparing strategies. The new price of the bond, in six months' time would be \$94.38 (clean). Hence, the firm would need \$47.8 million to purchase the required bonds, based on the dirty price. This corresponds to a 3.69% capital gain compared to Strategy A, using the clean prices.



Pricing Methodology

- (1) Calculate the 'clean' bond price by discounting the cashflows at 2.50% per half-year.

The cashflows on this bond are:

- 19 payments of \$2.125 paid at half yearly intervals
- Repayment of principle with face value of \$100

$$B_{clean} = \sum_{i=1}^{19} \frac{2.125}{1.025^i} + \frac{100}{1.025^{19}}$$

$$B_{clean} = 2.125 \left(\frac{1 - 1.025^{-19}}{0.025} \right) + \frac{100}{1.025^{19}}$$

$$B_{clean} = \$94.38$$

- (2) Calculate the 'dirty' bond price accounting for the interest earned by the seller during the current coupon period, of which 91 days has elapsed.

$$B_{dirty} = 94.38 \times 1.025^{91/181}$$

$$B_{dirty} = \$95.56$$

- (3) Calculate the capital gain.

$$\text{Capital Gain} = \frac{98.00 - 94.38}{98.00} \times 100 = 3.69\%$$

Assumptions

Half-yearly coupon paid on 3/15 and 9/15

One coupon has been paid

Last coupon to be paid on 3/15/35

91 days from 9/15 to 12/15

181 days from 9/15 to 3/15

2026 is not a leap year

Accrued interest is earned linearly over time

Yield is constant over the life of the bond

No reinvestment risk is considered

No taxes, fees or transaction costs

No options on the bond

3 Recommendations

The Board's policy to allocate 40% of assets to U.S. Treasury bonds and use the weighted average of 10 and 30-year Treasury yields as the discount rate makes the timing of bond purchases critical to effective asset-liability management. The relevant 10-year liability has been discounted by the 10-year bond yield only, in exception to the policy, given the close maturity match. In making the investment decision, the funds primary goal of capital adequacy and delivering for our members must be prioritised above profit maximisation at undue risk.

This analysis assumes that Treasury markets remain liquid and accessible, that inflationary pressures and fiscal deficits will keep yields volatile and that there will be no structural break in the functioning of Treasury markets. Additionally, it assumes that the 10-year treasury bonds are an appropriate match for the considered liability, as suggested by their maturities. It is also assumes that the selection of discount rate formula by the board is appropriate and indicative of the underlying liability.

The inverse relationship between bond yields and prices arises due to the fixed face value of bonds. Hence, as treasury yields change the value of 40% of assets will inversely adjust. In addition, as liabilities are discounted, liability values will also inversely adjust with yields. Hence, when the \$50 million liability is matched with 10-year Treasury bonds, despite yield shifts, the assets and liabilities will move together, maintaining liability coverage.

If the Board proceeds with purchasing now, the fund locks in current yields of 4.50% p.a. and a price of \$98.00. This immediately establishes a clear match between asset returns and the liability valuation basis. Due to the mechanism above, as yields change the funding ratio would remain largely stable despite market volatility. By contrast, delaying the purchase prioritises maximising returns. If the yield rises by 0.5%, the purchase price could lower to \$94.38, enhancing long-term returns, paired with reducing liability values. However, many other scenarios are possible. If, the yield decreases by 0.5%, the price would rise to \$101.96 (clean), locking in weaker returns while liability valuations increase.

Pricing Methodology

- (1) Calculate the 'clean' bond price by discounting the cashflows at the half-yearly yield rate of 2.00%. The cashflows and assumptions are the same as the previous scenario.

$$B_{clean} = 2.125 \left(\frac{1 - 1.02^{-19}}{0.02} \right) + \frac{100}{1.02^{19}} = \$101.96$$

- (2) Calculate the 'dirty' bond price.

$$B_{dirty} = 101.96 \times 1.02^{91/181} = \$102.98$$

The key consideration is the trade-off between interest rate and reinvestment risks. Purchasing now reduces reinvestment risk by locking in today's yield, ensuring the fund holds an asset with cash flows aligned to the liability. However, this exposes the fund to interest rate risk if yields rise, as the bond's market value would fall. Conversely, delaying the purchase leaves the fund exposed to reinvestment risk. If yields decline, the cost of acquiring the bond rises and the liability valuation increases, potentially leading to insufficient allocated assets to purchase the bonds. However, by ensuring the liabilities match the purchased assets, assured by discounting by the 10-year yield only, interest rate risk is hedged in Option A, hence limiting exposure to both risks.

As discussed in Section 1.4, most potential factors influencing 10-year bonds are likely to lead to mild increases over the next five years and as 4.5% is already on the high end of the recent 2-years' experience, the likelihood of the yield increasing is low. Hence, the reinvestment risk associated with Option B is not accompanied by sufficient likelihood of returns to warrant its adoption.

Overall, the evidence suggests that the Board should invest now. This approach protects the funding position against falling yields while ensuring that rising yields do not create a destabilising mismatch, as higher yields reduce both asset values and liability valuations in tandem.

Appendix A – Presentation Link

A presentation detailing this reports' recommendation is available here:

<https://youtu.be/4C5AeSH7mG4?si=64K3Dyk5BAxUwG1U>