# Pension Solutions:
# Dollar Duration Matching and Cash Flow Matching

Ryan ALM believes that the objective for a defined benefit pension is to fund and secure benefits in a cost-effective manner. Pension management is an assets vs. liabilities objective rather than assets versus generic market indexes objective. Pension asset/liability management (ALM) starts with understanding the pricing and interest rate sensitivity of liabilities and continues with measuring and monitoring such liabilities. There are two primary asset/liability bond strategies in use today: Duration Matching and Cash Flow Matching.

**Duration Matching**

The purpose of duration matching is an attempt to match the interest rate risk sensitivity of assets to liabilities. The objective is to have the market value or PV changes (growth rate) in the bond portfolio match the market value or PV changes (growth rate) in liabilities for a given change in interest rates. Many fixed income managers attempt to match the average duration of the bond portfolio to the average duration of a bond market index with a similar duration to liabilities (i.e., Bloomberg Barclays long Corporate index). They use the generic bond index as a proxy for liabilities. There are several problems with this strategy.

The fatal flaws in this approach are:

1) a generic bond index cannot replicate any client's unique liability cash flows. Client's liabilities are like snowflakes: different labor force, salaries, mortalities and plan amendments.
2) average durations give erroneous information because there are an infinite number of combinations of maturities for a bond portfolio that can all have the same average duration, but they will not have the same risk/reward profile.
3) duration matching is only accurate for small *parallel shifts* in the yield curve. But the yield curve rarely moves an equal number of basis points at every point along the curve. For more info, Ron Ryan wrote a research paper "The Seven Flaws of Duration" while head of Ryan Labs… see the Ryan ALM website/insights/white papers/classics.

Bond management evolved to remedy these flaws by using Key Rate Durations which attempts to match the duration of multiple points along the yield curve. Key Rate Duration is an improvement over using a single average duration, but it still has several deficiencies:

1) Actuaries usually do not provide the average duration of liabilities and the projected benefits in their annual actuarial report… reason why generic bond indexes are used.
2) Matching key rate durations of a generic market index = wrong Key Rate Durations.
3) Duration is a present value calculation requiring pricing each projected benefit with a discount rate yield curve (i.e., ASC 715 discount rates). As a result, 30 annual benefit payments require 30 separate discount rates.
4) Duration must be modified (duration/1+YTM) to use as a price return measurement.
5) Modified duration is a price return measurement and does not include income.

## Dollar Duration Matching (DDM)

DDM matches the Dollar Value change per basis point change in yield for assets with the Dollar Value change per basis point change in yield for liabilities. When the Dollar Duration of assets is matched to the Dollar Duration of liabilities for every year in the term structure of liabilities, then DDM is the most precise form of Key Rate duration matching because it matches the Key Rate durations at every point along the liabilities yield cure or benefit payment schedule (30 years = 30 key rate durations). The Ryan ALM approach offers several value-added differences:

1. **Actuarial Projections** - We use the actuarial projected benefits of our clients and not a generic bond index.
2. **Modified durations** - to be an effective price sensitivity measurement, duration must be modified. Modified Duration measures the *percent change* in market value or present value for future value cash flows given a 100-basis point movement in yield.
3. **Dollar duration** - our objective here is to match the *dollar value change per basis point* in assets and liabilities in every maturity on the projected benefit schedule.

The Ryan ALM DDM approach greatly improves the accuracy of Key Rate duration matching by matching the Dollar Value changes in liabilities with the Dollar Value changes in assets across the term structure and yield curve for both assets and liabilities. The liabilities are represented by using a Custom Liability Index to more precisely measure and monitor the dollar value movement in assets versus liabilities given any movement in interest rates.

## Cash Flow Matching (CFM)

Ryan ALM believes that the objective for a defined benefit pension is to fund and secure benefits when due in a cost-efficient manner. Ryan ALM does not believe that bonds are performance assets. **The value in bonds is in their known and scheduled cash flows** which is why cash flow matching has been used as a major strategy for hedging liabilities for many decades (i.e., dedication, defeasance). It is the matching and funding of benefits (future values) that is of primary concern. As such, future values are not interest rate sensitive… a major benefit of cash flow matching. Cash flow driven investing (CDI) dominates the way European pensions are managed under IASB accounting standards. Key Rate Duration using Dollar Duration is great for matching market value (PV) movements between assets and liabilities but what about funding liability payments (future values)?

Since the primary value in bonds is in the certainty of their cash flows, Ryan ALM will cash flow match (fund) projected benefit payments *chronologically* which provide the plan sponsor with numerous benefits:

1) Secures the benefits,
2) Significantly de-risks the plan,
3) Reduces funding costs significantly,
4) Reduces volatility of funded ratio and contributions,
5) Buys time for performance assets (Alpha) to grow unencumbered,
6) Hedges pension inflation on Retired Lives, Active Lives and Expenses, and
7) No interest rate risk since LBP is funding future values (benefit payments).

A major cash flow matching benefit is that it buys time for the performance assets to grow unencumbered. History tells us that given time risky assets perform better (i.e., S&P 500). History also tells us if the Alpha assets can grow without any dilution, they perform much better (dividends reinvested > 50% of the S&P 500 growth in the last 50 years). If interest rates rise, cash flow matching can reinvest any excess cash flows at the then higher yields (lower costs) while bonds managed with a purely total return focus would get hurt with lower price returns.

**Solutions**

Ryan ALM uses a turnkey system approach to asset/liability management for defined benefit pensions:

1) **ASC 715 Discount Rates** – Ryan ALM is one of few vendors providing ASC 715 discount rates (AA corporate zero-coupon bonds). We will price each annual projected benefit payment on a monthly basis.

2) **Custom Liability Index (CLI)** - Ryan ALM creates a **Custom Liability Index (CLI)** for each client based on their actuarial projected benefits. We do not use generic market indexes because that would be assets vs. assets. We measure and monitor the performance of assets versus liabilities. The CLI provides all of the calculations needed for either duration matching or cash flow matching. The CLI will calculate YTM, duration, growth rate and interest rate sensitivity for each annual projected benefit as a term structure as well as total liabilities.

3) **Liability Beta Portfolio™ (LBP)** – our LBP will cash flow match projected benefits either chronologically or as a dollar duration match using our proprietary LBP cost optimization model that will reduce funding costs significantly.

Whether it is dollar duration matching or cash flow matching, Ryan ALM provides both products as part of our asset/liability management product line. Please contact us to learn how our turnkey system can enhance your pension fund.

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