



Government Finance Officers Association

Recommended Practice

Managing Market Risk in a Portfolio (2007) (CASH)

(formerly known as *Maturities of Investments in a Portfolio - 1997 and 2002*)

Background. Fixed-income securities are investment instruments that provide a stream of cash flows in the form of coupon and principal payments. Typically, they are issued with maturities ranging from overnight to 30 years. A security's stated maturity is the date on which its final interest and principal payments are due. There are several general structures for fixed-income securities:

- **Bullet securities** – the principal payment will be paid in one payment at maturity. They are issued without any option that could cause redemption prior to the stated maturity;
- **Securities with options** – issued with 1 of 2 options that could change the stream of cash flows. Call options give the issuer the right to redeem bonds prior to maturity in accordance with the call schedule. Put options give the investor the right to submit a bond for redemption prior to maturity in accordance with the rules of the put; and
- **Amortizing securities** – pay a portion of the principal with each interest payment throughout the life of the bond (e.g. – mortgage securities, asset-backed securities). They have a stated final maturity and an average maturity, and can also have early redemption options.

Market risk refers to the effect that changing interest rates have on the value of a fixed-income security. There is an inverse relationship between interest rates and price. As interest rates rise, the value of a security falls. The reverse is true as interest rates fall. The extent of price change is a function of the length of term to maturity, the level of interest rates and the size of the coupon. Of these factors, the most important is the length of term to maturity. Generally, the longer the maturity of a security, the greater its market risk as measured by price volatility. Longer maturities have greater volatility because as the time to maturity increases, each change in interest rates has a greater impact on the present value of a security.

The size of a security's coupon will also impact price volatility. When analyzing securities with the same maturity, securities with low coupons will have greater price volatility than securities with high coupons. The security with the greatest price volatility for any given maturity is a zero coupon security.

Market risk is generally the greatest risk that a government investor manages. Therefore, it is important to understand fully the maturity structure of securities before investing. To ensure appropriate liquidity and to reduce interest rate risk in operating portfolios, most state and local governments:

1. Limit the maximum maturity for securities they purchase;
2. Ensure that funds are available for scheduled disbursement by developing cash flow projections and properly structuring the maturities in a portfolio according to the expected cash flows; and
3. Ensure that a security can be sold with ease and minimal cost (price disruption) to the investor by investing in high grade, actively traded fixed-income securities.

Maximum maturity and weighted average maturity limits relate directly to an entity's statute and policy constraints, investment objectives and cash flow projections. Although setting maximum maturity constraints may help limit the market risk in a portfolio, it is not generally considered to be the most effective way for managing market risk and understanding the potential price volatility of either an individual security or an entire portfolio.

A widely used measure of market risk in the investment industry is *modified duration*. Durations can be obtained from professional market resources such as Bloomberg. For governments without access to these resources, broker-dealers may send documentation of the durations. Duration is more comprehensive and accurate in measuring market risk than the maturity of a security for two important reasons. First, duration takes into consideration all cash flows (interest and principal payments) of a fixed-income security using their present values. Maturity as a market risk measure only considers the principal payment of a security using its future value.

Second, modified duration is a multiplier that measures the approximate percentage change in the value of a security or portfolio given a 1% (100 basis points) move in interest rates. For example, if a security has a modified duration of 1.74 and interest rates rose by 50 basis points, the security would experience approximately a -0.87% change in value.

Formula and calculation:

$$\% \text{ change in market value} = (-1) * (\text{modified duration}) \times \left(\frac{\text{basis points change in yield}}{100} \right)$$

$$-0.87\% = (-1) \times (1.74) \times \left(\frac{+50}{100} \right)$$

* multiplied by -1 because of inverse relationship between price and interest rates

With this type of price volatility analysis, a government investor can determine more accurately the amount of market risk in a security or portfolio.

Weighted average maturity and weighted average duration in a portfolio are calculated using the maturity and duration values of all the securities in a portfolio. Weighted average maturity allows a government to verify compliance with investment constraints since most investment policies and state statutes have maximum weighted average maturity limitations. Weighted average duration is considered industry wide as an acceptable measure of market risk in a portfolio. As such, it can provide the government investor with valuable information for managing the market risk in a portfolio.

The Governmental Accounting Standards Board (GASB) in GASB Statement No. 40 requires a disclosure of all risks associated with a government entity's portfolio, including market risk. Weighted average maturity and weighted average duration are two of five accepted methods for disclosing a portfolio's market risk. (A description of the other three is beyond the scope of this Recommended Practice.) In accordance with the GASB fair market value reporting requirements in GASB Statement No. 31, a government entity's portfolio could show unrealized losses or gains for any reporting period.

Recommendation. The Government Finance Officers Association (GFOA) makes the following specific recommendations to government investors with respect to managing market risk in their operating portfolios:

1. State and local governments must comply with applicable sections of the legislative statutes pertaining to investing public funds along with all investment policy constraints.
2. It is recommended that cash flow projections be developed and updated regularly in order to determine what dollar amount of the portfolio needs to remain liquid to meet disbursement obligations within a six month period, as well as what dollar amount is available for longer-term investing to the maximum maturity as stated in the investment policy.
3. The portfolio should be structured to provide sufficient liquidity for anticipated cash flow requirements by continuously investing a portion of the portfolio in money market type investments such as local government investment pools, money market mutual funds, overnight repurchase agreements and money market securities.
4. The maturity structure of a security should be fully understood. Prior to purchase, the government should confirm compliance with its investment constraints and overall investment strategy. If a security has options associated with it such as call options, the structure of the option should be analyzed to determine its potential impact on market risk through an analysis such as option adjusted spread (OAS) analysis. The stated maturity date should always be used to determine compliance with maximum maturity constraints, not any potential call dates unless an official announcement of a call has been released.
5. Governments should adopt weighted average maturity limitations and/or weighted average duration targets, which often range from 90 days to three years, consistent with the government's investment objectives, constraints, cash flow needs and risk tolerances. The weighted average maturity limitations can be used to *limit* the market risk in a portfolio consistent with the constraints in the governing state statutes and the investment policy. The weighted average duration targets can be used to *manage* market risk in a portfolio.
6. Unless matched to a specific cash requirement and permitted by a government's investment policy, governments should not directly invest in securities with maturities greater than five years. The maturities of such investments should coincide as nearly as practicable with the expected use of funds. The government should follow the process identified in its investment policy, including adhering to procedures for authorizing longer-term investments and for providing any disclosures that may be required.

References

- GFOA Sample Investment Policy, 2003.
- *Investing Public Funds*, Second Edition, Girard Miller with M. Corinne Larson and W. Paul Zorn, GFOA, 1998.
- www.GASB.org for GASB Statement No. 31 and Statement No. 40

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