

Primer on Risks in Equities and Bonds

By Rudy Narvas

In other articles, InvestWELL Financial has discussed optimal portfolio allocations using equity and fixed income securities. However, it is also important to have an understanding of the differences in risks associated with various financial instruments. In this article, we address market risk for equities and interest rate risk for bonds. For equities, we need to refer to the use of beta as a tool to observe risk in equity markets. In discussing risks in bonds, we examine the use of duration as a measurement in calculating the sensitivity of the price of a bond to a change in yield.

Equities and Beta

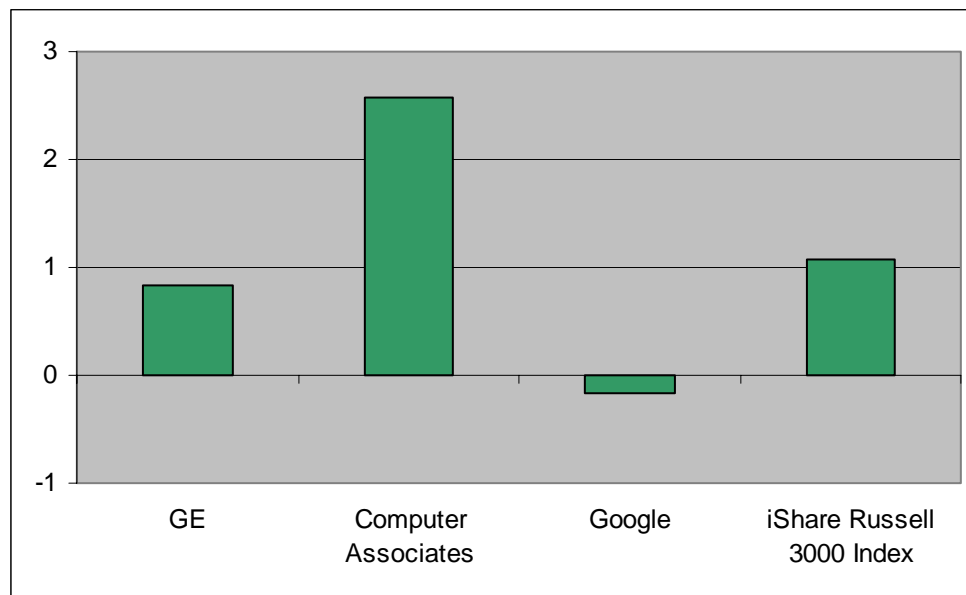
One of the most often used theories of equity investment used is the Capital Asset Pricing Model (CAPM). While the debate continues on the usefulness of this theory, its principles are still widely used by market practitioners. The CAPM is represented by a linear relationship of the expected return on a risky asset using the following equation:

Expected Return of Individual Stock = Risk Free Rate + Beta (Market Return – Risk Free Rate)

Since we are concerned about risk in this primer, this theory postulates that two forms of risks are present, unsystematic and systematic risk. Unsystematic risk is defined as risk that is firm or sector specific risk that may be minimized through portfolio diversification. On the other hand, systematic risk cannot be diversified, as it is the risk relative to the entire market portfolio. In the above equation, systematic risk or market risk is represented by beta. Looks familiar? Most financial literature and research will often quote the beta of a stock or fund. Beta calculates the responsiveness of a stock's price to swings in the market portfolio, and will vary from firm to firm.

For example, let us consider betas of the following stocks: GE = 0.83, Computer Associates = 2.57, Google = -0.17 and iShare Russell 3000 = 1.07 (see Chart 1). What does this mean? The higher the beta, the more volatile the stock is compared to the market, and therefore carrying more systematic risk. GE's beta of 0.83 is very close to one, possibly reflects the bellwether nature of this investment. Computer Associates has a high beta, indicating that it is more volatile than the market, and swings in the market will be magnified in changes in the price of this stock. Google's low beta tells the investor the stock is completely unresponsive thus far to changes in the market (it only started trading at \$100 on August 19, 2004), but this does not mean that the price is not volatile. It may still be volatile; it is just not highly correlated with the market. Not surprisingly, the iShare Russell 3000 beta is almost one, reflecting that fund's objective of matching movements in the entire market.

Chart 1. Betas



The one key feature of the theory is that it suggests that excess returns from a risky investment are dependent on beta, systematic risk, not overall risk. This idea is a very strong assumption, but, nonetheless remains a useful indicator of security specific risk that is still widely used. If an investor's risk appetite is low, we would advocate using ETFs in their portfolio to achieve a beta near 1, matching the risk in the broader market.

Bonds and Interest Rate Risk

One of the biggest risks with fixed income investments (e.g., plain option-free nominal bonds) is related to the fluctuation in interest rates. These fluctuations could be due to an overall change in market sentiment towards shifts in monetary policy by central banks. Hence, the value of the bond changes as shifts in interest rates will affect the yield of the bond, which is inversely related to the price. For example, if the U.S. Federal Reserve surprises the market and raises the fed funds rate, then the yield on a 10-year U.S. Treasury will rise by a certain amount. As a result, the rise in yield will be accompanied by a decrease in the price in the bond, resulting in a loss of value.

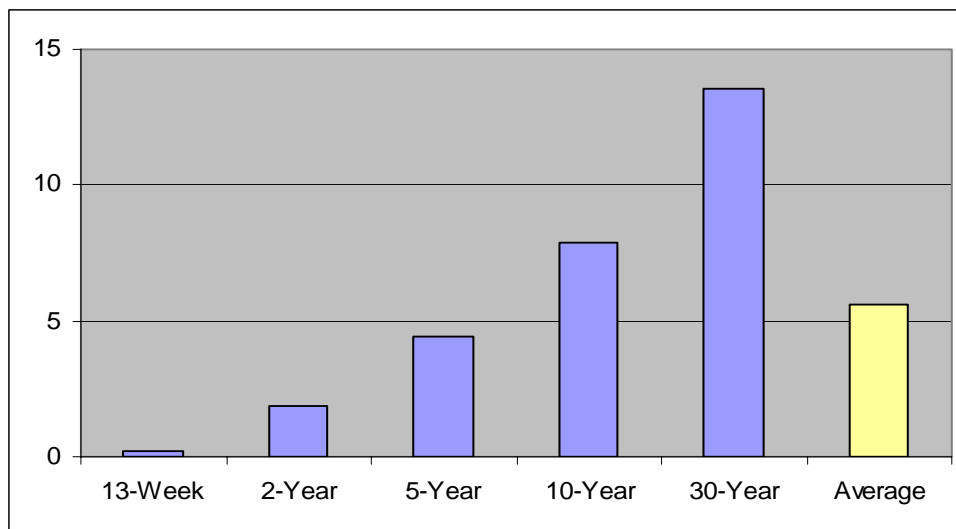
To measure the price sensitivity to this risk, duration of a particular issue (or basket of bonds) is calculated to gauge the sensitivity of an incremental change in yield to the price of that bond. The higher the duration, the more sensitive is the bond's price to a change in interest rates. While there are different calculations of duration, one of the most widely used is modified duration. The calculation for duration can be cumbersome, but is fortunately found in many financial databases. Once duration is known, then calculating the percentage price change due to a shift in yields is simple:

$$\% \text{ Change in Price of Bond} = - \text{Duration} * \text{change in yield}$$

To illustrate this, let us assume that the yield of a 10-year US Treasury with duration of 7.9 years increases by 25 basis points, the price of the bond will decrease by 2%, and will weigh down on the value of an investor's portfolio. Alternatively, if the yield declines we would calculate an increase in price.

There are a number of key characteristics of duration, and that includes the notion that the longer the term to maturity, the higher the duration. As is evident in the Chart 2, the longer the maturity the higher the duration (when the yield curve assumes its normal upward sloping shape). Another important characteristic of duration is that the higher the coupon payment the less sensitive is the bonds price to changes in yield.

Chart 2. Durations



Finally, the use of duration is not exclusive to individual bonds, but can be calculated for a portfolio of bonds by using the weighted average of the duration of bonds in the portfolio. For example, we take a portfolio of 13-week, 2-year, 5-year, 10-year, and 30-year Treasuries. If we assume that each makes up 20% of the portfolio and we use the durations in the graph, the duration of the entire portfolio is about 5.59 years. The key point here is that, while coupon payments may remain unaffected throughout the life of an issue, the price of the bond will fluctuate depending on the interest rate environment. For the investor that plans on holding the bond until maturity, this may not matter, as the cash flow from the coupon payments may be more important than any capital appreciation in the value of the bond. If the investor is more concerned about how shifts in interest rates will influence the value of their portfolio at any given time, then duration is something to keep an eye on.

Conclusion

It is important for the investor to have a firm understanding of some of the concepts and tools with respect to risk that are used in the market. While both concepts of beta and duration are important stepping stones in having a firm grasp in being able to manage your own portfolio with effectiveness, they are not the only ones.