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Fund in Focus: DFA Variable Maturity Strategies David Ott | January 2012

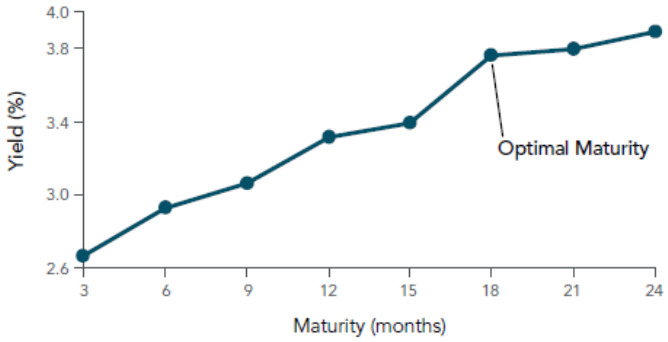
Most investors view bonds as a mystery. Even though they are somewhat simpler than stocks in that they have a defined beginning, middle and end, the fact that the bond market is filled with jargon like sequentials, spreads, speeds, REMICS, and CMOs doesn't help (not to mention the term junk, which refers to non-investment grade bonds).

Now Acropolis is introducing two new terms to our bond strategy: variable maturity and variable credit. This article will deal solely with variable maturity strategy, which sounds complex, but is actually simplicity itself: invest in bonds with the highest expected return.

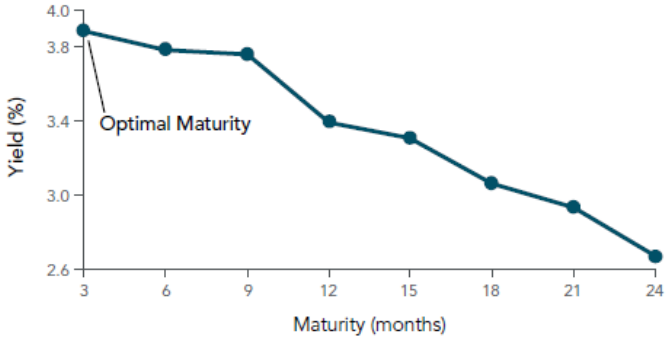
Yield Curve Primer

OK, it's a little more complicated than that, but not by a whole lot.

Before looking at the variable maturity strategy, let's step back for a moment and look at the Treasury bond yield curve, which plots the yield of all Treasury bonds on the y axis in percentage terms against the maturity of the various Treasury bonds on the x axis (by months, in this example).



The curve on top is considered 'normal' and the bottom curve is called 'inverted.'



A normal curve reflects a normal interest rate environment where the longer the loan, the higher the interest rate. Intuitively, this makes sense because the longer the term, or maturity, the more uncertainty there is between now and then, which causes investors to require a higher interest rate.

An inverted curve occurs relatively infrequently and is the result of a lack of liquidity at the short end of the curve (often induced by the Federal Reserve) and strong demand at the long end because investors are expecting interest rates to fall. Generally, an inverted yield curve is a sign of an economic slowdown.

Variable Maturity in Theory

The basic idea of the variable maturity strategy is to vary the maturity of your bond portfolio based on the shape of the yield curve. When the curve is normal, it pays to extend the maturities because the yield is higher. When the curve is inverted, it makes sense to avoid the longer end of the curve because the yields are lower and it doesn't make sense to take the additional risk associated with longer maturities.

When the curve is normal, the optimal maturity isn't necessarily the part of the curve with the highest yield. In the chart, the point identified as the 'optimal maturity' is 18 months out, when the example curve goes out 24 months. Why not buy the longer maturity since the yield is higher?

The answer is that you want to purchase the part of the curve that provides the highest expected total return; not just yield. Total return is comprised of two elements, the interest payments and the change in the value of principal. The yield is the interest payments divided by the value of the principal.

Many investors focus solely on the yield, but the change in market price is just as important to the total return, which is what investors truly care about (or should).

The steeper the interest rate differential, the more pronounced this price change will be. In this example, notice how the curve is steepest between 15 and 18 months, especially compared to the relative flatness of the 18 to 21 month period.

The basic axiom in bonds is that bond prices rise when interest rates fall and vice versa. For example, if you own a two year bond with a five percent yield and the government issues another five year bond at one percent, the demand for your bond rises and the price goes up until the two yields are the same. In that same vein, it makes sense to position yourself where the curve is the steepest because as you 'roll down the curve' the price will appreciate more than in parts of the curve that are flatter.

The strategy doesn't require any interest rate forecasting and simply uses the information embedded in the current yield curve to find the optimal risk-adjusted maturity on the curve and shifts the portfolio in response to changes in the yield curve.

Proof of Concept

To test the concept, I decided to run a relatively simple test to see how the theory might have worked since 1976, when the first high quality bond indexes were introduced.

For the test, I downloaded monthly data for the two-year and ten-year Treasury rates published by the St. Louis Federal Reserve. I also downloaded the Barclays index data for the 1-5 Year Treasury Note Index and the Treasury Index, which includes the entire Treasury bond market.

Each month, I would see which bond had the higher yield, the two year or the ten year. Depending on which was higher, I would invest in either the 1-5 Year Treasury Index or the Treasury Index. If the yield curve was normal, I bought the Treasury Index and if it was inverted, I bought the shorter bond index, the 1-5 Year Treasury Note Index.

The results for this very simple strategy clearly demonstrated that the variable maturity strategy had merit: it had the best returns and the volatility was less than the overall Treasury market.

	1-5 Year Treasury	Treasury	Variable Maturity	1 Mo US Treas Bills
Returns	7.35%	8.20%	8.26%	5.37%
Volatility	3.45%	5.52%	5.21%	0.95%
Sharpe Ratio	0.57	0.51	0.55	-

Source: St. Louis Federal Reserve, Barclays, author calculations. Data from Jun 1976 - Oct 2011

The table to the right summarizes the return, volatility and Sharpe Ratio for both indexes independently along with the variable maturity strategy. In essence, the Sharpe Ratio divides the return of a fund minus the risk free rate (one-month US Treasury bills) and divides that number by the volatility. When comparing investments, a higher Sharpe number is preferable, as it is a measure of amount of return per unit of risk.

Variable Maturity in Practice

In 1983, Dimensional Fund Advisors (DFA) first launched a variable maturity strategy bond mutual fund, the DFA One Year Fixed Income portfolio (DFIHX). Since the fund is highly constrained with a maximum one year average maturity, Acropolis isn't using the fund as part of our strategy, but it seemed appropriate to evaluate the results of this fund since it has the longest track record.

Since inception, the fund has earned an annual rate of return of 5.54 percent net of all fees, which is slightly better than the Merrill Lynch 1-Year US Treasury Note Index, which gained 5.46 from inception through Oct 31, 2011. Importantly, the volatility was also lower, with an annualized standard deviation of 1.09 percent versus 1.20 percent for the benchmark.

The combination of a higher return and lower volatility results in a higher Sharpe Ratio, which allows for a risk-adjusted comparison of returns. The DFIHX has a Sharpe Ratio of 1.06 compared to 0.89 for the benchmark, a substantial improvement.

Variable Maturity at Acropolis

Beginning in 2007, the Acropolis Investment Committee determined that it was important to diversify our bond portfolio to include sectors like US Treasury bonds, corporate bonds and other non-government agency related bonds.

Until that time, approximately 90 percent of our clients' taxable bond portfolios were invested in debt issued Fannie Mae or Freddie Mac or mortgage-backed securities (MBS) that had the implied full faith and credit of the U.S. government.

Although the Fannie and Freddie debt and MBS that we owned held up well through the 2008 financial crisis, we accelerated our diversification into other sectors as the uncertainty about Fannie and Freddie increased.

For our Treasury allocation, we added two iShares Exchange Traded Funds (ETFs), the Barclays 1-3 Year Treasury Bond Fund (SHY) and the Barclays 7-10 Year Treasury Bond Fund (IEF). We maintained a roughly 50/50 allocation between SHY and IEF.

	SHY	IEF	Initial Strategy	DFFGX	DFIGX	Variable Maturity
Return	1.53%	6.81%	4.17%	4.76%	7.96%	6.91%
Volatility	1.08%	7.83%	4.43%	2.79%	5.59%	4.63%
Sharpe Ratio	1.31	0.85	0.92	1.66	1.40	1.47
Duration	1.85	7.45	4.65	2.76	5.13	4.35

Data as of 10/31/2011

By adding the DFA variable maturity funds, we believe that we will be able enjoy better returns in our Treasury sector with only slightly more volatility as reflected in a higher Sharpe Ratio. Because DFIGX has a shorter duration than IEF, we have now increased the allocation to the intermediate term so that the split is roughly one-third DFFGX and two-thirds DFIGX.

The duration for the variable maturity strategy is slightly shorter, but it's important to remember that because the variable maturity portfolio changes as the shape of the curve changes, that duration can move significantly while the durations of SHY and IEF will remain fairly constant.

Conclusion

We are excited to implement the variable maturity strategy for our clients. It is a unique value-added strategy that should optimize the risk/return trade off within the bond market. We are also moving to a variable maturity strategy in corporate/credit bonds that also adjusts the credit quality based on market conditions. I will address this strategy in another article.

Hopefully, this article helped to demystify the variable maturity strategy to some extent without getting bogged down in too much jargon. It's a complex subject, but we believe that there are clear benefits to your bond portfolio for understanding and pursuing this strategy.