LEGG MASON
GLOBAL ASSET MANAGEMENT

BOND MATH EXPLAINED

John Bellows Ph.D.
Portfolio Manager, Research Analyst, Western Asset

Excerpts of remarks by John Bellows Ph.D., Western Asset Portfolio Manager/Research Analyst, at Legg Mason's Investor Day, January 21, 2016.

Ben Bernanke said, "If you can't explain it, then you probably shouldn't be doing it."

That applies just as much to portfolio management as to what he was doing, and we take it very seriously. I appreciate the opportunity to discuss our views on three topics.

JAN 2016

First, how do rising rates impact bond portfolios? How do they impact the business?

Second, what differentiates Western Asset as we go into a rising rate environment? It's not whether rates are higher or lower. It has much more to do with relative performance, the ability to add value in a risk-adjusted way over a cycle. That's not necessarily related to the level of short-term rates.

Third, what is the market outlook? It's on everybody's minds: are Fed rates going up? A few weeks ago I was getting a lot of questions about rates going up. Then you have distinguished investors who run risk parity portfolios out of Connecticut, who I won't name, talking about the next Fed's move is going to be Quantitative Easing ("QE"). You have both sides of the landscape right now that people are talking about, so I want to give our sense of where we are headed.

How do rising fed rates impact bond portfolios?

I want to push back on the misconception that rising rates are bad for bond portfolios: rates go up; bond prices go down. Everybody learned that in Finance 101, that simple rule. If rates go up, it's bad for the fixed income business.

That's actually not true. Let me show you why using a little bond math.

The elementary school version of this is the change in assets under management or the change in the notional value of a bond portfolio from rising interest rates is a product of three things:

The first is duration. That's the bond sensitivity to interest rates. The second thing is the change in interest rates you actually experience. Third is the starting assets, or the starting assets under management.

A typical bond portfolio has a sensitivity to interest rates of about four years. Thus if the Fed raises interest rates by 100 basis points, or 1 percentage point, the Assets Under Management ("AUM") of that portfolio is going to go down by 4 percent.

That's what you're taught in elementary bond school and I think lots of people have that in the back of their head.

But that gives you the wrong answer — a profoundly wrong answer. It misses several things.

First and foremost, it misses the fact that bonds are income instruments. Not only do we care about the price change of the underlying principal, but income comes from holding a bond. What investors should care about is not that instantaneous price change; they care about the total return over the course of a year.

For example, a five-year bond is going to decrease in the principal amount by 4 percent. At the same time, it is going to collect income of about 2 percent. So the income will offset half of that instantaneous price increase. That is a big impact.

Second, as they get closer to maturity, bonds usually increase in value. A five-year bond today with a yield of 150 or 200 basis points is going to be a four-year bond a year from now; at that point it's going to have a four-year maturity with the same yield. That bond is more valuable because it has a higher yield with a lower maturity. We call that "roll down." Appreciation of the bond price over time is another tailwind to offset some of that instantaneous spread increase.

Taking those first two — this is graduate school bond math — a 4 percent instantaneous decrease in the bond price is offset by a 2 percent coupon. That can also be offset by an increase in the principal amount just because you are getting closer to the maturity date.

Those two very powerful forces will, to a large extent, mitigate the impact of rising rates.

Third is the importance of credit spreads. The bond portfolios we manage generally are not Treasury portfolios. They tend to be broad market portfolios, sometimes even credit portfolios, where the income on the bonds is substantially higher than Treasury bond income. Because the bond is an income instrument, there's a lot of coupon and a lot of income that offsets instantaneous price changes. That is especially true of a broad market portfolio.

Our broad market portfolios have generally out-yielded the index, reflecting the additional income and credit exposure. Over time that is a powerful thing.

Fourth is the yield curve shape. When investors think about the Fed raising interest rates, many think all bonds are going to go up by 100 basis points. That's simply not true.

What we've seen in history is the front end of the yield curve will increase pretty mechanically. The Fed governs the front part of the yield curve. But the back end of the yield curve, which is really what you care about if you have a long-dated bond, is unlikely to increase nearly as much.

For instance, the last time the Fed was raising rates, 2004, short-term rates went up by about 300 basis points. Five-year interest rates went up by less than 100 basis points. That emphasizes that the bond prices you care about are much less sensitive to the Fed than you may think.

Adding those four factors together, it is clear that rising rates can have dramatically reduced impacts on bond portfolio AUMs.

In fact, in almost all scenarios, bond portfolios increased in value over the course of a year. Yet not in a single year of those 10 did the five-year Treasury bond have a negative total return.

During the 1970s, one of the biggest bear markets for bonds since we have data, interest rates went from about 4 percent at the beginning to 18 percent at decade's end. That is a huge increase: 12 percentage points over the course of 10 years.

Yet in not a single year of those 10 did the five-year Treasury bond have a negative total return.

Why? The market had priced in to some extent that rates were going to increase. That was reflected in the coupons, and in the roll down. Those factors offset the fact that rates went up.

To summarize: when someone says "rising rates are bad for fixed income," that is the elementary school version. The graduate school version is that the income component will, to a large extent, offset instantaneous price changes. Even in sustained bear markets, such as the 1970s, total returns of those bonds are usually positive.

What distinguishes Western Asset?

Turning to Western Asset, what drives our AUM is not whether rates are at 2 or 3 or 1 percent. It's how we perform relative to benchmarks and, very importantly, relative to our competition.

How did Western Asset do last time the Fed was hiking rates?

In 2004, Western Asset outperformed our benchmark in almost all of our composites.

That was true again in 2005, when 70 percent of our composites outperformed the benchmark.

From a competitive standpoint, we had very strong relative performance in 2004 and 2005.

It was unambiguously positive for our business: AUM grew steadily, the number of clients grew, the number of accounts grew.

This despite the Fed raising rates — precisely because relative performance was so positive.

I'm not a sales guy, so I'm not usually asked to talk about the fact that Western Asset has been nominated for two Morningstar Manager of the Year awards, and we won in 2014. But that is a strong vote of confidence. What Morningstar and other investors recognize is that Western Asset's broad portfolios over the last few years are ranked quite favorably versus their peer group. When the market is off, even in periods of strong risk, our diversified strategies (which have different macro hedges to offset some of the credit) have been able to manage downside volatility.

Those types of things — with the Morningstar awards, strong performance relative to benchmarks and competitors, strong risk-adjusted returns — has distinguished Western Asset going forward.

Again, that has almost nothing to do with the Fed is raising rates. To the extent that it matters, it only matters whether or not we anticipated correctly that the Fed was going to raise rates.

What is the outlook for fixed income markets?

I don't think rates are going up that much. Maybe that's not a surprise, but we do not fundamentally see a case for a sustained bear market in bonds. The most powerful argument is that the inflationary landscape in the United States and globally is extraordinarily subdued.

Wage growth in the U.S. has been stagnant since the start of the recovery. Oil prices are obviously under pressure. The dollar is stronger. Core Consumer Price Index ("CPI") is running at 2 percent but headline inflation has been close to zero.

At the end of 2014,[1] something like one-third of all advanced economies were in outright deflation. Not only did we not have an inflationary scare, but instead we are experiencing a deflationary shock around the world.

Why does that matter? Bond yields, at some level, are a reflection of inflation. As long as inflation remains low, there's almost no chance that bond yields are going to increase.

When inflation is increasing — as in the 1970s, which generated that bear market — bond yields increased. When inflation is coming down — as in the 1980s, 1990s, 2000s, and over the last few years — that has kept bond yields low, at least in a moderate to anchored range.

Moreover, when inflation is low, central banks are very engaged; it keeps them accommodative. It makes sure central banks will keep their reference rates low in order to support the economy. It prevents, or at least is likely to slow down, any central bank from thinking about raising rates.

The Fed hiked rates once; they are thinking about hiking rates again sometime this year.

I'm going to punt on whether it will be March or later. I think they will probably follow through with it sometime later this year.

The main thing to keep in mind now is when the Fed is raising rates, they're going to do so extraordinarily gradually because inflation is so low, in the U.S. and around the world.

There is simply no reason for the Fed to raise rates.

We think the Fed is likely to do maybe one, maybe two hikes this year.

If the economy really takes off, maybe they will do three.

Even three will put them on a tremendously slower pace than previous rate hike cycles. In 2004, they were hiking eight times a year. In 1994, not only were they hiking at a pace of 8 times a year, they were hiking 50 basis point at a time. Past hiking cycles were much more aggressive.

The low inflationary environment which keeps bond yields low in and of itself will also keep the Federal Reserve accommodative. It will make sure that any rate hikes will be slow, they will be measured, and you're not going to see any surprise in the upside.

Rising rates are an important concern, but the main message is that rates aren't going up that fast. Those who are worried about rising rates do not share our outlook, frankly. If you recognize the global disinflationary pressure, you will be a lot more relaxed about this fear of rising rates.

[1] Morningstar 2014 U.S. Fixed-Income Fund Manager of the Year Awarded to Ken Leech, Carl Eichstaedt and Mark Lindbloom for Western Asset Core Plus Bond Fund (WAPSX) named Morningstar 2014 U.S. Fixed-Income Manager of the Year, United States of America. Morningstar Awards 2015 © Morningstar, Inc. All rights reserved. Morningstar Fund Manager of the Year award recognizes portfolio managers who demonstrate excellent investment skill and the courage to differ from the consensus to benefit investors. To qualify for the award, managers' funds must have not only posted impressive returns for the year, but the managers also must have a record of delivering outstanding long-term performance and of aligning their interests with shareholders'. The Fund Manager of the Year award winners are chosen based on Morningstar's proprietary research and in-depth evaluation by its fund analysts.

Brandywine Global

ClearBridge Investments

Martin Currie

Permal

QS Investors

RARE Infrastructure

Royce & Associates

Western Asset

Legg Mason is a leading global investment company committed to helping clients reach their financial goals through long-term, actively managed investment strategies.

- Over $671 billion* in assets invested worldwide in a broad mix of equities, fixed-income, alternatives and cash strategies
- A diverse family of specialized investment managers, each with its own independent approach to research and analysis
- Over a century of experience in identifying opportunities and delivering astute investment solutions to clients

leggmasonfunds.com 1-800-822-5544

Important information

All investments involve risk, including loss of principal. Past performance is no guarantee of future results. Investments in fixed-income securities involve interest rate, credit, inflation and reinvestment risks; and possible loss of principal. An increase in interest rates will reduce the value of fixed income securities.

U.S. Treasuries are direct debt obligations issued and backed by the “full faith and credit” of the U.S. government. The U.S. government guarantees the principal and interest payments on U.S. Treasuries when the securities are held to maturity.

The views expressed are as of the date indicated, are subject to change. These opinions are not intended to be a forecast of future events, a guarantee of future results, or investment advice.

* As of December 31, 2015.

The **Federal Reserve Board (“Fed”)** is responsible for the formulation of policies designed to promote economic growth, full employment, stable prices, and a sustainable pattern of international trade and payments.

A **basis point** is one one-hundredth of one percent (1/100% or 0.01%).

A **yield curve** shows the relationship between yields and maturity dates for a similar class of bonds.

The **Consumer Price Index (“CPI”)** measures the average change in U.S. consumer prices over time in a fixed market basket of goods and services determined by the U.S. Bureau of Labor Statistics.