

Barclay Trading Group, Ltd.

special report

September 1999

Bonds and the Barclay Futures Index

This report examines the benefits of the Barclay Futures Index (BFI) when used as a diversifier for bonds. The study first reviews the goals and rationale behind diversification strategies involving bonds. We describe the Barclay Futures Index. We then evaluate the BFI and bonds using the following criteria:

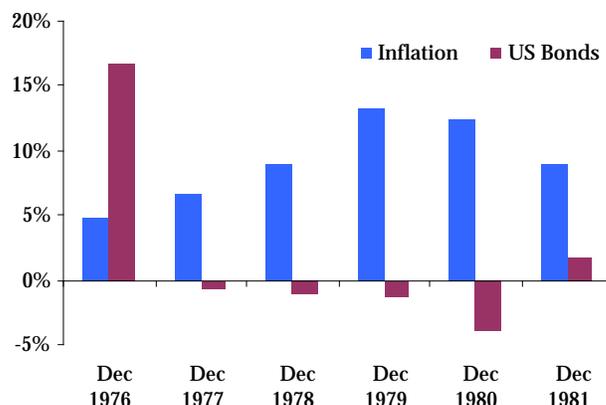
- ▼ *Risk-adjusted performance* of the BFI and various debt instruments as stand-alone investments;
- ▼ *Correlation* of the BFI with fixed income investments; and
- ▼ *Contribution to the overall performance* of combined portfolios, both as a diversifier to equities and as a way to improve performance of bonds.

Bonds and Diversification

As all fixed income investors know, inflation is the most damaging impediment to bond returns. To some extent, anticipated inflation is factored into the price of bonds at the time of purchase. However, unanticipated inflation/deflation causes the largest deviations between expected and realized returns for bonds. An example is the 6.9% decline in the long-term US government bond index between December 1976 and 1980.

Inflation and US Gov't Bond Returns

1976 - 1981



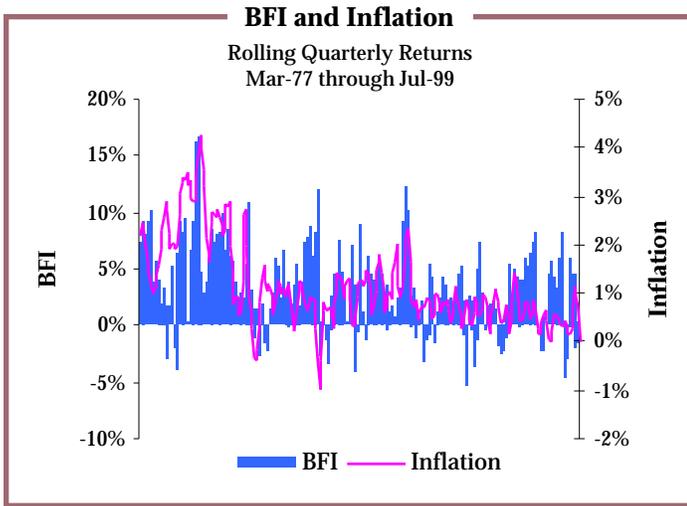
Although inflation has been relatively steady and unusually low over the past several years, experience tells us that the best time to reexamine asset mix for optimal diversification and to identify protections against unanticipated economic shifts is before these changes actually occur.

Owning a combination of stocks and bonds has proved a successful strategy over the long term. The reason is that the two asset classes are not completely related and have distinct behavioral characteristics. However, they are not completely

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independent from one another, either, since they both represent claims on similar entities and rely upon the same economic process—the creation and growth of capital—for appreciation.

Thus, most pension investors recognize the need for alternative sources of diversification, ones that not only demonstrate risk and return characteristics that are genuinely distinct from those of stocks, but also investments that can protect bonds themselves from the negative effects of unanticipated inflation.

Volatility as a Diversifier

Our research indicates that the Barclay Futures Index qualifies as an alternative and attractive diversifier in both regards. This is partly because the commercial markets included in the BFI yield returns through a completely different economic process than those at work in capital markets, namely, the unloading of excessive price risk by commercial hedgers.

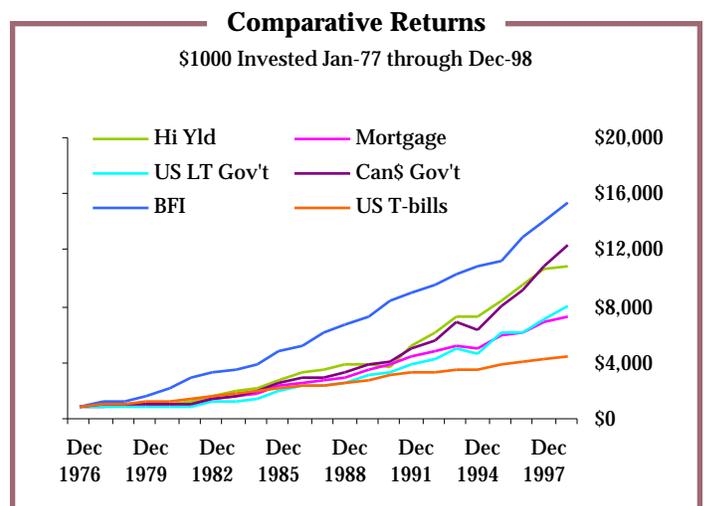
Hedgers experience excessive price risk—or volatility—as sustained price moves against their commercial interests. Hedgers thus have an

incentive to transfer price volatility to investors, who are paid a premium for assuming that risk. The BFI takes advantage of this important economic function by investing in commercial market volatility itself through a momentum-capturing investment process, rather than by investing in the underlying assets.

What is the Barclay Futures Index?

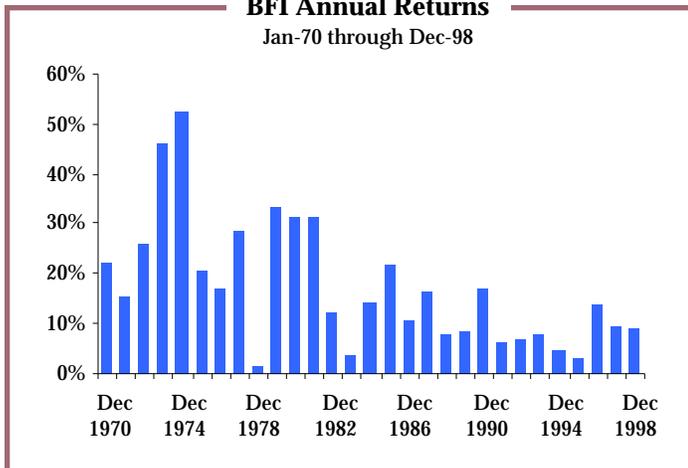
The BFI is a fully investable benchmark representing the returns of a momentum-based strategy applied to 25 equally weighted commercial markets. It attempts to capture sustained price movement in these markets and to provide investors with a means for owning price volatility that hedgers seek to offload.

The BFI follows a predefined process for determining whether to be long or short in each market, based on either positive or negative price momentum. Thus, the BFI differs in its design from the Goldman Sachs Commodity Index (GSCI) and the Commodity Research Bureau Index (CRB), which are long-only baskets of commodities. The BFI's position signals are



BFI Annual Returns

Jan-70 through Dec-98



Long-term Performance

Over the period January 1977 through December 1998, the BFI turned in attractive absolute and risk-adjusted performance relative to fixed income benchmarks. Since its inception in 1970, the BFI has done very well during periods of high unexpected inflation. This behavior is consistent with research indicating that managed futures, in general, provide a hedge during "shock periods" when stock and bond performance declines.

reexamined every four weeks. In order to maintain continuous positions, the BFI also follows a systematic roll strategy that seeks to maintain continuous positions in the most liquid contract month.

The BFI is valuable as an investment benchmark because its performance closely mirrors the returns achieved through managed investments in commercial markets. Yet, the BFI effectively addresses concerns investors have expressed about managed futures as an investment strategy:

- ▼ The Index is unleveraged and fully transparent in its methodology.
- ▼ The Index invests solely in U.S. exchange-traded futures contracts.
- ▼ All positions are highly liquid (during exchange hours).
- ▼ The Index can be implemented at relatively low cost.

Our criteria for evaluating the BFI as an alternative to fixed income include its long-term risk-adjusted performance, its correlation with fixed income investments, and its contribution to overall performance when combined with other assets.

Relative Performance

Annual Returns 1977 - 1981 & 1982 - 1998

	Cmpd. Annl. Rtns.	Std. Dev.	Sharpe
<i>1977 - 1981</i>			
BFI	24.60%	13.27%	1.125
U.S. LT Gov't	-1.06%	2.06%	-5.197
U.S. LT Corp.	-1.33%	2.29%	-4.803
High Yield	4.40%	4.73%	-1.116
Mortgage	1.02%	1.06%	-8.196
Can\$ LT Gov't	1.63%	4.73%	-1.703
<i>1982 - 1998</i>			
BFI	10.12%	5.07%	0.748
U.S. LT Gov't	13.46%	13.10%	0.544
U.S. LT Corp.	13.44%	11.83%	0.602
High Yield	13.64%	13.17%	0.566
Mortgage	12.16%	9.96%	0.585
Can\$ LT Gov't	15.45%	11.88%	0.768

Because the late 1970s to early 1980s represented a period of poor fiscal management in the U.S., accompanied by excessive inflation, we decided to break down the analysis of long-term performance into two periods - 1977 through

1981 and 1982 through 1998. The results of the analysis appear below.

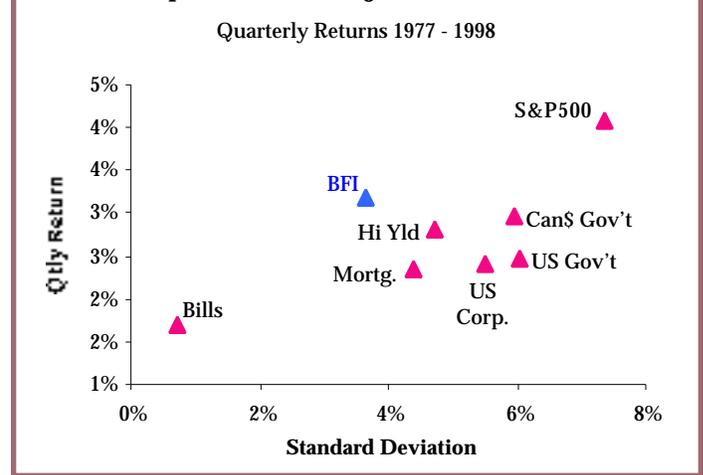
Beginning in 1982, bond market returns rebounded substantially and began a period of sustained positive momentum. During the period 1982 through 1998, a period of positive performance for bonds, the BFI maintained a consistent return stream, lower risk and attractive risk-adjusted returns.

The chart opposite illustrates comparative risk-adjusted performance for the period 1977 through 1998 in its entirety. Quarterly rates of return are plotted on the y-axis and standard deviation on the x-axis for a number of benchmark indices. All of the benchmarks, excepting T-bills and the S&P 500, are clustered below the BFI, indicating sub-optimal bond performance during this period, relative to the BFI.

Downside Deviation

Investors are most concerned with the frequency and size of negative returns, so we compared some downside performance numbers for our fixed income benchmarks and the BFI, based on rolling 3-month return windows from March 1977 through July 1999. The results appear below.

Comparative Risk-adjusted Performance



Of all the other investments, the Mortgage Index yielded the lowest percentage of negative quarterly returns (excluding T-bills), with 19%. It also had the lowest minimum quarterly return (-10.42%) and the lowest standard deviation of quarterly returns (4.36%). The BFI outperformed even the Mortgage Index in terms of the frequency and magnitude of negative returns, with a minimum quarterly return that was nearly half that of the Mortgage Index. It also had the highest average quarterly return.

Comparison of Negative Performance

	% neg. qtrs.	min. qtr. return	avg. qtr. return	std. dev. qtr. rtns.	semi-dev. qtr. rtns.	Risk-adjusted Return avg. rtn./semi-dev.
BFI	18.2%	-5.3%	3.2%	3.6%	1.3%	2.444
U.S. LT Gov't	33.5%	-14.5%	2.5%	6.0%	3.1%	0.810
U.S. LT Corp	27.9%	-13.6%	2.4%	5.5%	3.2%	0.774
High Yield	20.1%	-14.1%	2.8%	4.7%	3.0%	0.965
Mortgage	19.3%	-10.4%	2.4%	4.4%	3.0%	0.794
Can\$ LT Gov't	28.3%	-12.4%	3.0%	5.9%	3.1%	0.962

Based on 3-month Rolling Returns (Mar-77 through Jul-99)

We also considered semi-deviation, defined here as the standard deviation of returns less than zero. The BFI's semi-deviation was well below any of the fixed income benchmarks shown here, indicating that when negative BFI returns occur, they are relatively concentrated around the mean. The combination of highest negative quarterly return and the lowest semi-deviation produced far superior risk-adjusted performance for the BFI, relative to the other benchmarks.

A Source of Diversification

In order to determine whether the BFI is a useful hedge against negative performance periods for bonds, we first examined the correlation of quarterly returns for the period 1977 through July 1999. The results of that analysis appear in the table opposite.

As you can see, the correlations with the BFI were slightly negative, indicating that its return source is independent of that for fixed income. The results also show a significant positive correlation between the BFI and inflation, which makes sense, since commercial assets typically provide an inflation hedge.

In addition to correlations, the utility of a hedge can be measured by its performance during down markets for the asset being hedged. We sorted the rolling 3-month returns for the US long-term government index from lowest to highest and took the average of the returns less than zero and, separately, the average of the returns greater than zero. We then looked at the average returns for the BFI and the Canadian long-term government index for the negative and positive

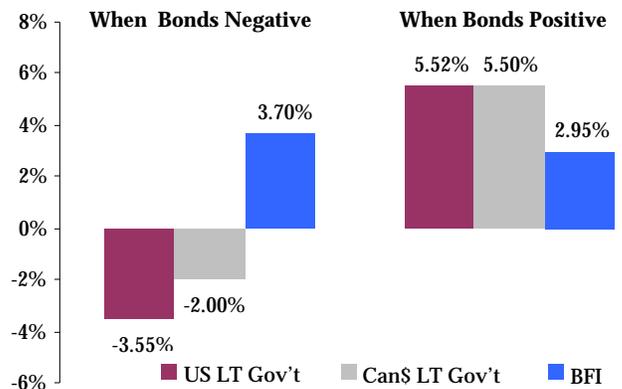
Correlation Quarterly Returns

	BFI	US Gov't	US Corp	HY	Mortg.	C\$ Gov't	Inflation
BFI	1	-0.05	-0.11	-0.13	-0.08	-0.09	0.37
U.S. LT Gov't		1	0.96	0.60	0.88	0.85	-0.29
U.S. LT Corp			1	0.69	0.93	0.87	-0.29
High Yield				1	0.66	0.628	-0.28
Mortgage					1	0.833	-0.22
Can\$ LT Gov't						1	-0.28

Based on 3-month Rolling Returns (Mar-77 through Jul-99)

Hedging Bonds with the BFI

Average 3-mos Rolling Return



periods for US bonds. During down quarters for US bonds, Canadian government bond returns also were negative; however, returns to the BFI were positive. The results appear above right.

Improving Returns

Because of its attractive risk-adjusted performance and low correlation with fixed income benchmarks, the BFI should improve long-term performance when added to a fixed income portfolio. To test this prediction, we compared a portfolio of 100% US corporate bonds

to an investment that included a 20% allocation to the BFI (80% US corp/20% BFI) for the period Jan 1977 through December 1998. The results appear below left. Terminal wealth increased 19% and returns variability declined 23%. A similar analysis with Canadian government bonds achieved the same reduction in variability, but with a 9% improvement in terminal wealth.

When the objective is to track returns to a combined portfolio of stocks and bonds, equally weighting bonds and the BFI in combination with equities demonstrated similarly attractive results. The table below right shows the results

of a 60/40 S&P/corporate bond investment compared with a 60/20/20 stock/bond/BFI investment. Adding the BFI increased terminal wealth 17% and reduced returns variability 18%.

Conclusion. The BFI has proved useful as a hedge for bonds according to all our criteria. It offered superior risk-adjusted returns as a stand-alone investment. BFI returns were correlated with with inflation but not with returns from bonds. Finally, combining the BFI with other assets in a portfolio smoothed the return distribution significantly and, in most cases, increased the average compounded rate of return.

U.S. Corporate Bond Portfolio

	US LT Corp.	BFI	80/20
Cpd. Annl. Rtn.	9.9%	13.3%	10.8%
Std. Dev.	12.3%	9.7%	9.4%
Sharpe	0.23	0.64	0.39
Term. wealth	\$7984	\$15466	\$9518

Balanced Portfolio

	S&P/Bond 60/40	S&P/Bond/BFI 60/20/20
Cpd. Annl. Rtn.	13.7%	14.5%
Std. Dev.	11.5%	9.4%
Sharpe	0.58	0.80
Term. wealth	\$16877	\$19727

About Barclay, Trilogy and Index Publication

Barclay Trading Group Ltd., founded in 1986, specializes in the collection, analysis and distribution of CTA and hedge fund performance data. Barclay is also the developer of the Barclay MAP software, a performance analysis tool and proprietary database of performance data for hedge funds and CTAs.

Trilogy Capital Management LLC was founded in 1995 to develop investment solutions geared to the needs of institutional investors. Trilogy is a registered trading advisor and commodity pool operator under the Commodity Exchange Act, is a member of the National Futures Association, and is a registered investment advisor under the Investment Advisors Act of 1940.

Index publication. The BFI is published quarterly in the *Barclay Institutional Report*, distributed by the Barclay Trading Group, Ltd. Monthly Index data is available on Bloomberg (BARCFUTR <Index>) or the Barclay website (www.barclaygrp.com).

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