

The Lawton Bond Model™
Ten-Year Forecasting Results
Challenge Conventional Wisdom

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Executive Summary

The most important question in finance is “Where are interest rates going?” The price of fixed income securities, equities, real estate, and consumer credit are all directly affected by the cost of money. Despite the importance of interest rates, most investors have accepted the conventional wisdom that it is impossible to forecast interest rates. This study of the Lawton Bond Model during the last ten years challenges that wisdom.

Over the last decade, Lawton Bond Model forecasts and commentary were distributed regularly to investors and central banks and are currently available on the website of Seagate Global Advisors at seagateglobal.com. This paper analyzes the performance of the US, German, UK, and Japanese Models since inception.

The study concludes that the Model:

- Correctly forecasted the monthly direction of interest rates with an accuracy of 74% in the US and from 65% to 71% in other major markets.
- Quantified the degree of confidence of a forecast such that the higher its absolute value, the higher the probability that the forecast would be correct.
- Enhanced returns and reduced downside risks when trading rules based on the Model’s forecasts were systematically applied to the management of fixed income portfolios.
 - Model-based management of a 10-year Treasury portfolio would have returned 13.99% annually compared to a static benchmark return of 4.55% per year.
 - Model-based country allocations within a global bond portfolio added 489 basis points per year to a static benchmark.
 - Model-based management produced higher Sharpe ratios and lower standard deviations compared to their benchmarks.

Lawton Bond Model Overview

The Lawton Bond Model is a proprietary analysis and decision support tool. William Lawton and his teams at two large institutional bond managers used the Model to manage fixed income portfolios from 1989 to 1996. Since 1996, Seagate Global Advisors, which Lawton founded and where he is Chief Investment Officer, has used the Model. Additionally, a number of central banks, commercial banks, securities firms, and institutional investors have used the Model as an input to their investment process.

Since purely quantitative models are driven by statistically fitted historical relationships, they tend to miss regime changes or at least lag in recognizing them. Conversely, qualitative forecasting processes lack the rigor, structure, and philosophical continuity of quantitative models. The Lawton Bond Model attempts to avoid both pitfalls by modeling the fixed income markets dynamically and combining qualitative and quantitative factors comprehensively into a composite forecast.

The Model can:

- Describe the internal dynamics of a country’s bond market, identifying the major factors that impact bond prices and their dynamic interrelationships.

- Quantify and weigh the major factors that impact bond prices and synthesize these results into a composite score.
- Provide short-term forecasts for the direction of bond prices.
- Provide long-term forecasts for the direction of bond prices.
- Quantify the degree of confidence of each forecast, thus allowing trading bets to be proportional to the level of confidence.
- Offer a framework to review why a forecast was correct or incorrect.
- Provide a basis for allocating assets between bond markets by comparing different markets concurrently.

The Model does not:

- Analyze specific securities or yield curves, though the Model can target specific maturities on the curve.
- Determine the effects of currency movements on non-dollar fixed income portfolios.

There are two basic variations of the Model, one for developed countries and one for emerging markets. Within these two basic Model types, individual country Models are adjusted to account for country-specific factors and regional economic factors. Additionally, “macro factors” are incorporated. “Macro factors” are global factors and events that influence all bond markets. Examples include the Asian crisis and Brazilian currency devaluation. Increased correlation between markets has elevated the importance of “macro factors.”

Graphical Presentation of the Model’s History

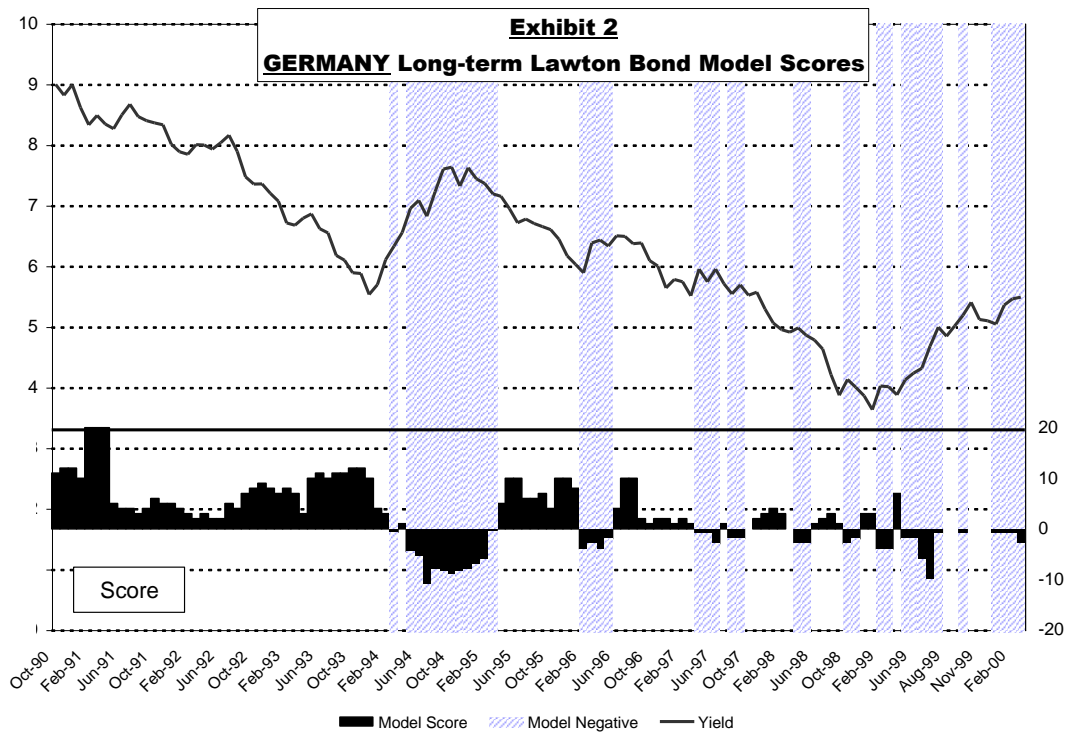
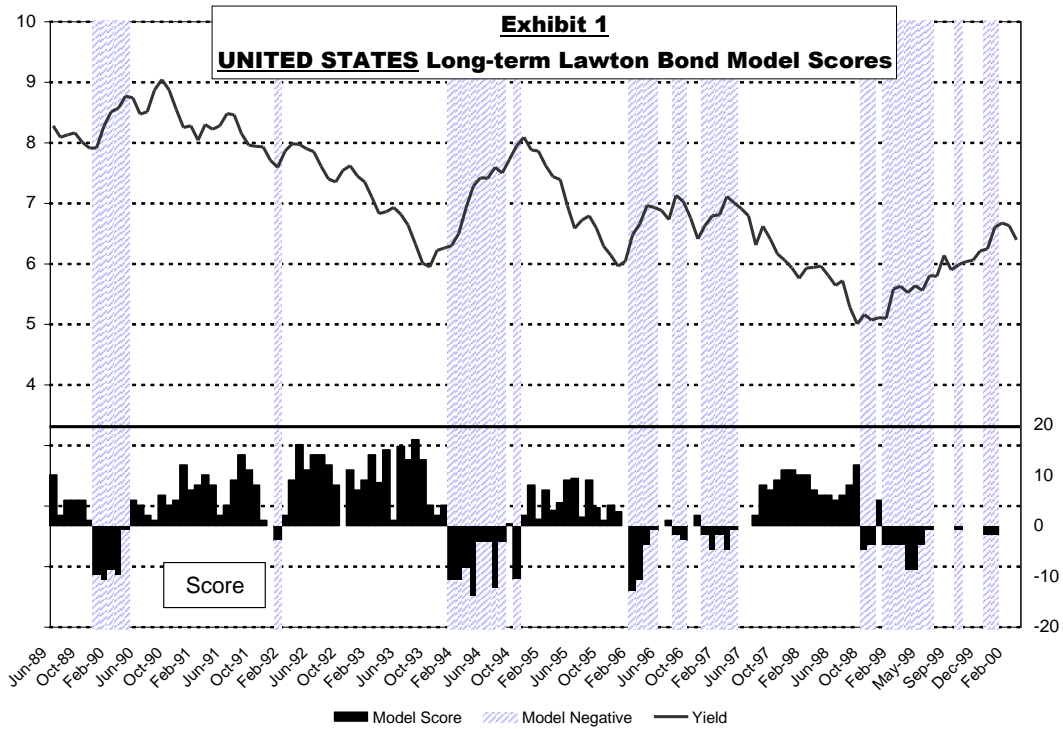
The primary output of the Lawton Bond Model is a numerical score for each bond market. A positive score forecasts higher bond prices and hence lower yields. Conversely, a negative score indicates lower bond prices and higher yields. A neutral score or zero means that bond prices and yields should trend sideways, or alternatively, the market has already discounted all available information, and that a move up or down in yields is equally likely.

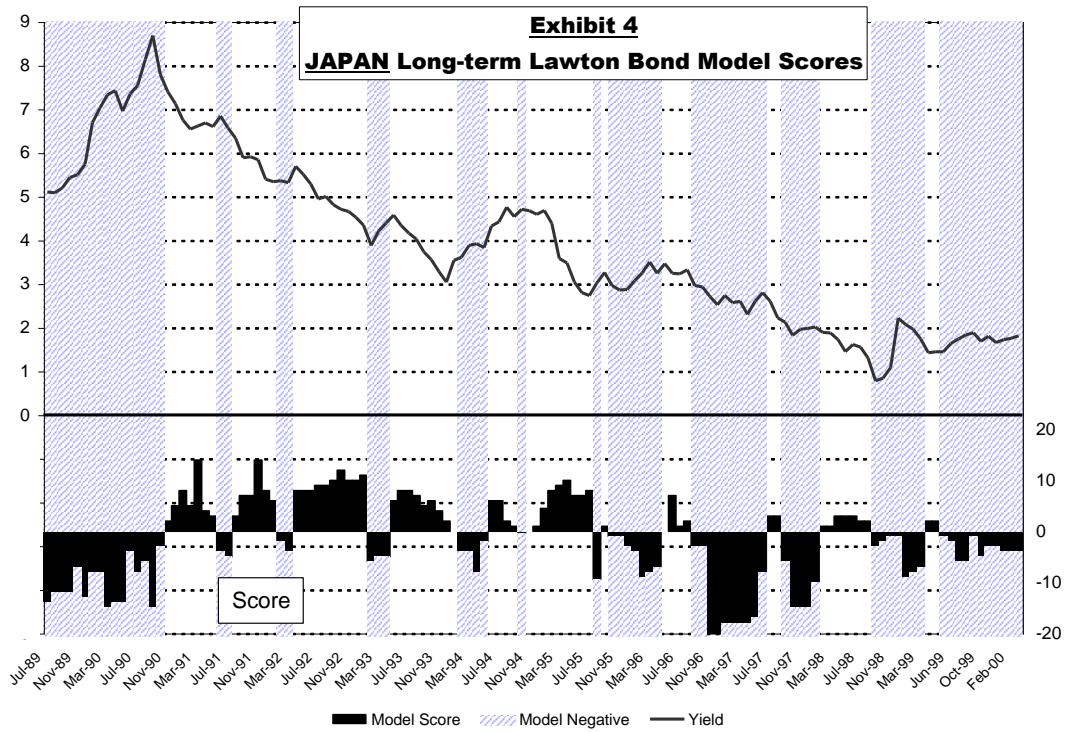
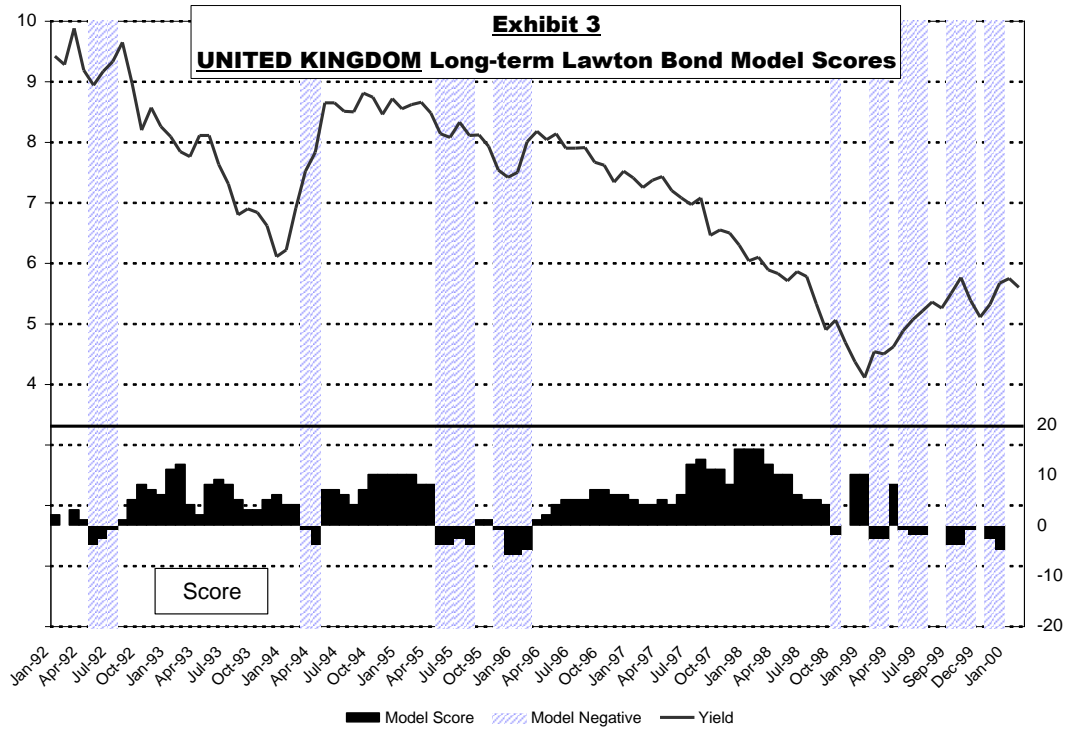
Exhibits 1-4 show the ten-year bond yield plotted against each country’s long-term score. If the Model is positive or neutral, forecasting lower or steady rates, the graph is white, and if the Model is negative, forecasting higher rates, the graph is gray. This graphical format provides a visual history of the Model and a simple way to observe the Model’s accuracy over time.

The graphs also show the strength of each score compared to the actual movement of the market. A higher absolute score corresponds to a higher degree of confidence in a forecast. The Exhibits show that the Model’s accuracy improves when the score is higher.

The direction of the change in the Model score is also of interest. For instance, if a score is becoming increasingly negative (positive), it indicates that the internal dynamics of the market are deteriorating (improving). Additionally, the Model scores help identify inflection points or major market shifts. By studying these inflection points you can see directly how well the Model captures market tops and bottoms.

Exhibit 1 illustrates all of these implications. The two worst years for the US bond market over the past 30 years were 1994 and 1999. The US Model produced an accurate and timely bearish signal during both of those years.

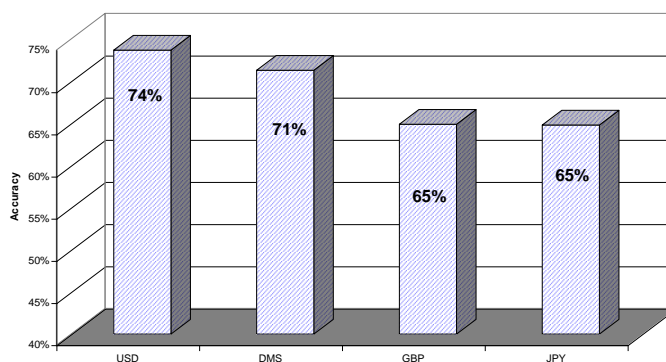




Accuracy of Directional Forecasts

The simplest measure of the Model's performance is to assess how frequently its forecasts of the monthly changes in interest rates are correct. By this measure, the Model is successful whenever a positive (negative) score at the beginning of the month corresponds to a monthly decline (rise) in interest rates. Within the four major fixed income markets, the Model successfully predicted the monthly trend in ten-year rates 69% of the time. As Exhibit 5 shows, the Model was most successful in the US where its accuracy rate was 74%. The Model also performed well in Germany (71%), the UK (65%), and Japan (65%).

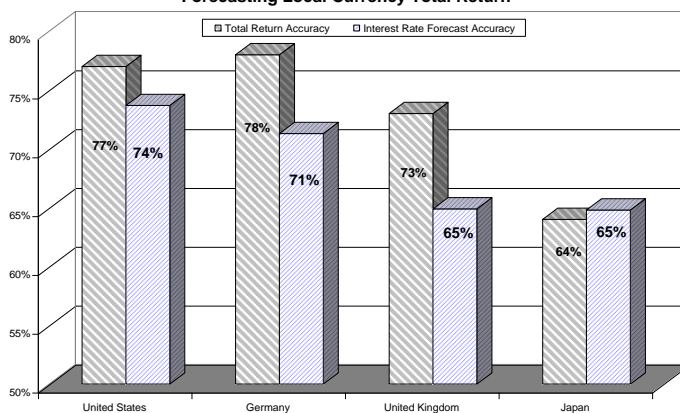
Exhibit 5
Long-term Lawton Bond Model Performance
Forecasting 10-Year Government Bond Yields



Total Return Accuracy

Forecast accuracy improved when judged against the total return of a market in local currency terms. A forecast was considered accurate when a positive (negative) score at the beginning of the month was matched by a rise (fall) in the total return of a market. As shown in Exhibit 6, the monthly accuracy over the ten-year period was 77% for the US, 78% for Germany, 73% for the UK, and 64% for Japan. Performance of the Model was better by this measure than when measuring pure forecast accuracy. In some of the months when the forecasts were incorrect, the movements in rates were so small that either coupon or carry outweighed the capital loss.

Exhibit 6
Long-term Lawton Bond Model Performance
Forecasting Local Currency Total Return



Back-tested Returns on Model Portfolios

A more interesting and practical measure of performance is the returns generated in back-tests of model portfolios based on Lawton Bond Model forecasts.¹ From June 1989 to December 1999, the US Model portfolio returned 10.70% annually, beating the US Index by 287 basis points per year. Exhibit 7 shows that all Lawton Bond Model-based portfolios beat their respective indexes.

Exhibit 7			
Long-term LBM Generated Long-Only Portfolio			
Annualized Returns			
		Salomon Brothers'	
Country	LBM Strategy	Country Index	+/-
United States	10.70%	7.83%	2.87%
Germany	9.00%	8.31%	0.69%
United Kingdom	12.60%	10.88%	1.72%
Japan	7.20%	6.18%	1.02%

Adjusting the model portfolios to allow shorting is a more aggressive utilization of the Model's output.² Exhibit 8 compares the long-short model portfolios with the individual country indexes.

Exhibit 8			
Long-term LBM Generated Long-Short Portfolio			
Annualized Returns			
		Salomon Brothers'	
Country	LBM Strategy	Country Index	+/-
United States	11.87%	7.83%	4.04%
Germany	8.39%	8.31%	0.08%
United Kingdom	12.46%	10.88%	1.58%
Japan	6.54%	6.18%	0.36%

The inclusion of shorting improved the returns of the US portfolio by 117 basis points. However, returns in Germany, UK, and Japan were lower than the long-only portfolios. The failure of the long-short approach to add incremental value was influenced by the general downtrend in interest rates over the last ten years. The probability that a local currency total return index was

¹ Monthly Lawton Bond Model scores were used to construct model portfolios in Salomon Brothers' local country indexes. A positive or neutral Model score at the beginning of the month was equivalent to buying the index. A negative Model score entailed investing cash in three-month local Libor.

² A positive or neutral Model score at the beginning of the month was equivalent to buying the index. A negative Model score entailed selling the index and investing cash in three-month local Libor.

positive during this period ranged from 65% in Japan to 76% in Germany. In retrospect, correctly forecasting higher rates, the countervailing trend, was a difficult task. Overall, forecasts for higher rates were 65% accurate versus a 72% accuracy rate for a prediction of lower rates. The US Model was able to overcome this by the fact that its negative calls were 86% accurate compared to a low of 56% for Japan.

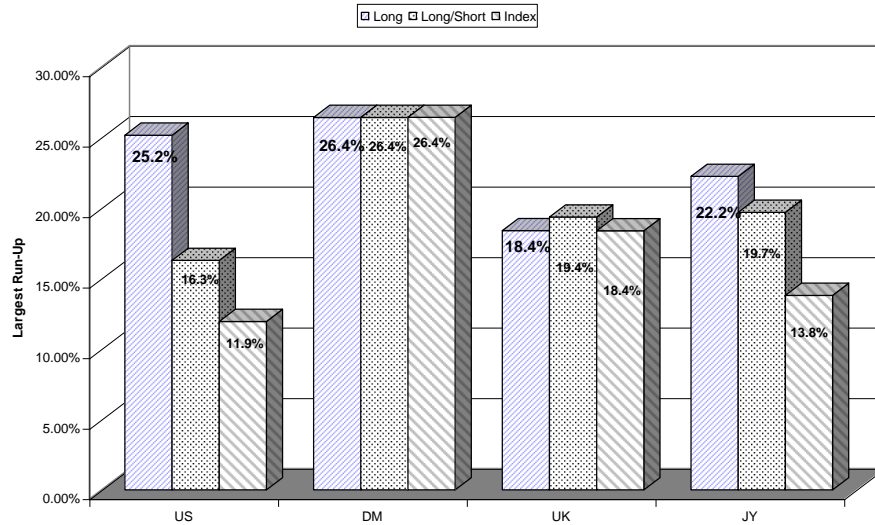
Moreover, as Exhibit 9 shows, the Model's ability to accurately forecast higher interest rates surpassed its ability to predict a market's total return. For instance, positive model scores predicted the total return of the local index with the accuracy rate of 84% but only predicted the direction of rates 72%. Conversely, negative score accuracy for yields was 65% compared to 52% for the index. The decline in the accuracy rate was due to negative carry.

Exhibit 9				
Model Score Accuracy Rate				
	Positive		Negative	
	10-Year		10-Year	
	Yields	Local Index	Yields	Local Index
United States	68%	86%	86%	57%
Germany	76%	89%	64%	52%
United Kingdom	67%	79%	61%	57%
Japan	76%	81%	56%	48%
Total	72%	84%	65%	52%

Another useful way to judge the success of the Model is to analyze the largest consecutive run-ups and run-downs in the model portfolios. In the US long-only portfolio, the largest run-up was 25.15%, representing twenty-four consecutive profitable months. The next largest run-up was 13.96%, which spanned eleven consecutive months. The largest run-down was -1.75%, which lasted one month. The benchmark's largest run-up was 11.94%, spanning seven consecutive periods and its largest run-down lasted five periods and reduced returns by -5.34%.

Similar results were evident in Japan and the UK. In Germany, both the long-only and long-short portfolios matched the Index's best streak of twenty-two consecutive profitable periods, which resulted in a run-up of 26.41%. However, the next best positive streaks achieved by the long-only portfolio were twenty-two and seventeen months. The next best streak of the long-short portfolio was eight months with a run-up of 11.49%. Both of these performances beat the Index's next best streak of seven consecutive months with a run-up of 9.53% (see Exhibit 10).

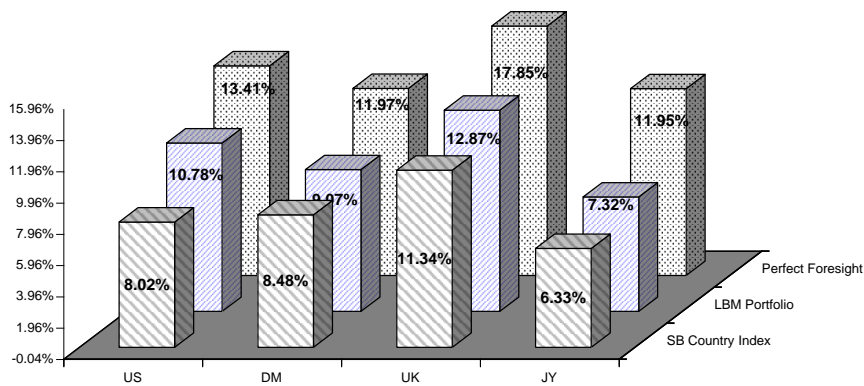
Exhibit 10
Consecutive Profitable Periods



Comparison to Portfolio Managed with Perfect Foresight

Another accuracy test is how well a model portfolio performed compared to a portfolio's performance managed with perfect foresight. For this perfect foresight portfolio, the monthly returns equaled the higher of the local country's index return or local three-month Libor. In the US, the Lawton Bond Model long-only portfolio captured 80% of the perfect foresight portfolio returns while the US Treasury Index captured only 60% of these returns. In the other core markets, the absolute and relative results were not as good, but they all outperformed the passive benchmarks (see Exhibit 11).

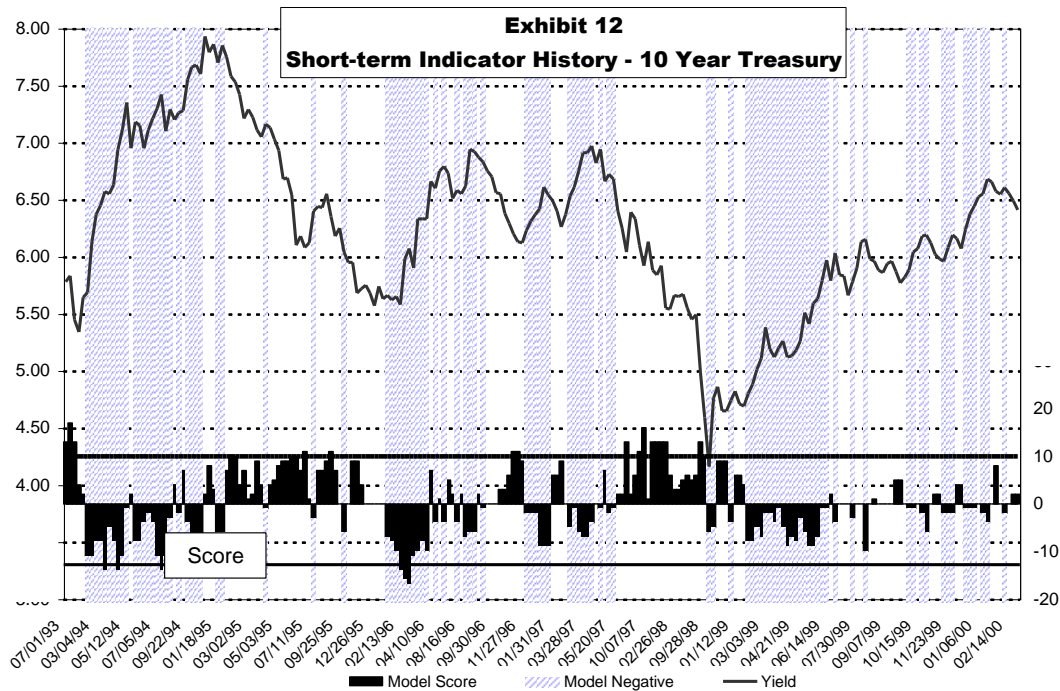
Exhibit 11
Performance Comparisons



Short-term Model Accuracy

From 1989 to 1993, the Model only produced long-term (monthly) forecasts. In 1993, short-term forecasts were added to take advantage of short-term trading opportunities and to reduce risk.

Exhibit 12 shows the short-term indicator plotted against ten-year US Treasury yields. The short-term Model is more robust than the long-term indicator. This is evident by the number of forecast changes and increased number of trend changes in interest rates.



Starting in July 1993, a long-only portfolio based on the short-term indicator returned 10.27% per year while a long-short portfolio returned 13.99% per year.³ During the same period, the Merrill Lynch 10-Year Index returned an annualized 4.55%. Exhibit 13 shows the performance of the indicator-based portfolios compared to the Merrill Lynch Index. As the exhibit shows, the model portfolios had some spectacular years. The long-short portfolio outperformed the index by more than 10% in four of the six full years. However, the model performed less spectacularly in 1997. The long-only portfolio returned 9.09% while the long-short portfolio returned 4.94%. While the returns were positive, the portfolios did not match the index's performance. A poor forecasting performance from April to June lowered 1997's entire performance. In retrospect, the Model's global macro factors missed the initial stages of the emerging markets crisis that started with the devaluation of the Czech krona and caused a flight to quality. From April to June, the Index increased 4.8% while the long-short portfolio, which was mostly short, declined

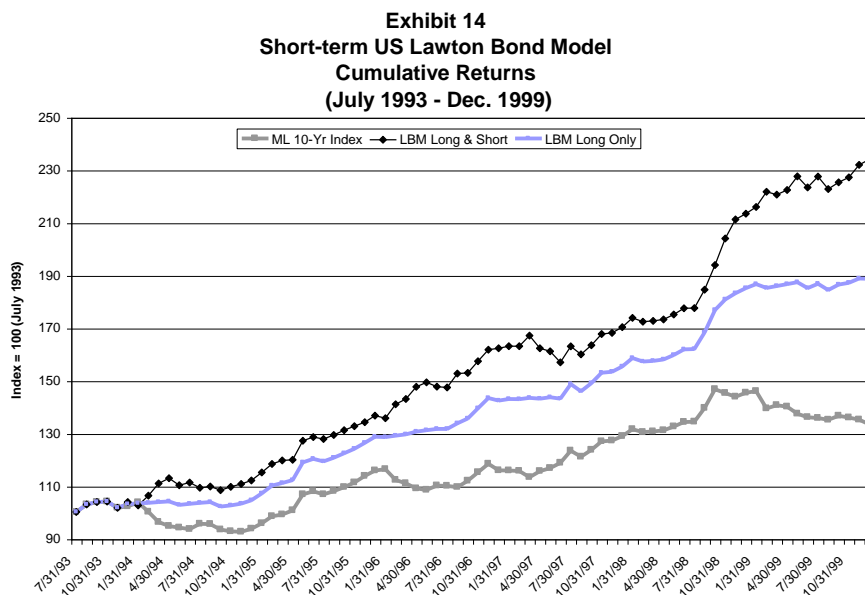
³ Short-term scores were used to construct model portfolios in Merrill Lynch's 10-Year Index. A positive or neutral Model score was equivalent to buying the index for both the long-only and long-short portfolio. For the long-only portfolio, a negative Model score entailed investing cash in the Merrill Lynch's three-month Treasury Index. In the long-short portfolio, a negative Model score equaled shorting the Merrill Lynch's 10-Year Index and investing cash in the Merrill Lynch's three-month Treasury Index.

6.1%. At the end of June, the Model recognized the beginnings of the global meltdown and correctly forecasted lower rates ahead.

Exhibit 13						
ST US Bond Model Portfolio vs. Merrill Lynch 10-Year Treasury Index (July 1993- Dec. 1999)						
	Long-Only	Index	+/-	Long-Short	Index	+/-
1993*	3.30%	2.43%	0.87%	4.09%	2.43%	1.66%
1994	1.38%	-8.30%	9.68%	7.90%	-8.30%	16.20%
1995	23.07%	23.60%	-0.53%	21.89%	23.60%	-1.71%
1996	10.62%	0.06%	10.56%	18.69%	0.06%	18.63%
1997	9.09%	11.14%	-2.05%	4.94%	11.14%	-6.20%
1998	19.12%	12.76%	6.36%	25.26%	12.76%	12.50%
1999	1.91%	-8.26%	10.17%	9.68%	-8.26%	17.94%
Total	10.27%	4.55%	5.72%	13.99%	4.55%	9.44%

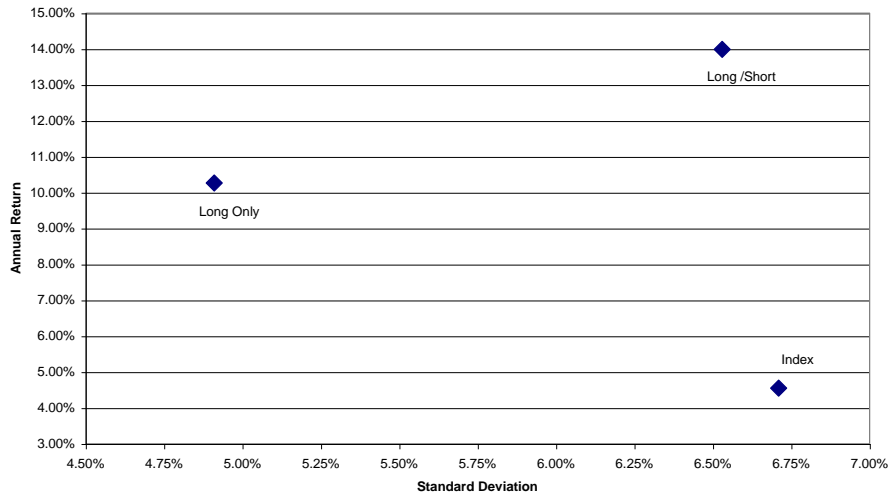
* Performance from July to Dec.

Exhibit 14 shows the cumulative returns of each strategy. An investment of \$100 in the long-only portfolio in June 1993 would have been worth \$189 at the end of 1999. A similar investment in the long-short portfolio equaled \$234, while an investment in the Index equaled \$134.



The short-term indicator also reduced risk. The annualized standard deviation of returns was 4.91% in the long-only portfolio, 6.53% in the long and short portfolio, and 6.71% in the Merrill Lynch 10-year Index. Exhibit 15 plots returns and standard deviations.

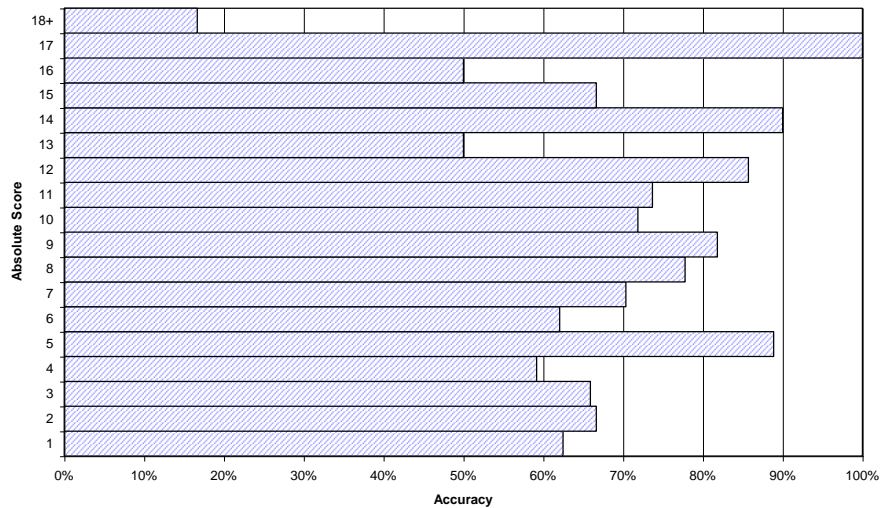
Exhibit 15
Short-term Bond Model
Risk Return



Model Scores and Forecast Accuracy

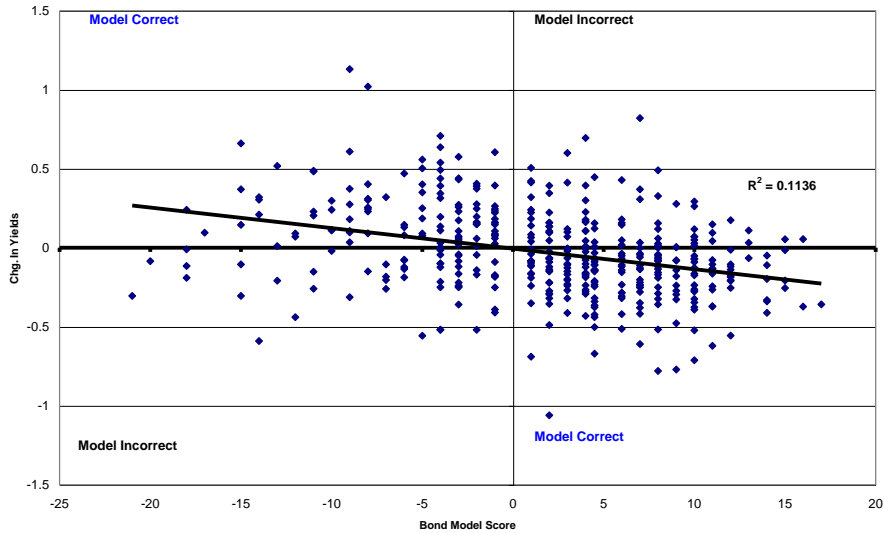
At first glance, there is no clear relationship between the magnitude of Lawton Bond Model scores and (1) the Model's accuracy and (2) the degree of change in yields (see Exhibit 16).

Exhibit 16
Accuracy Rate By Scores



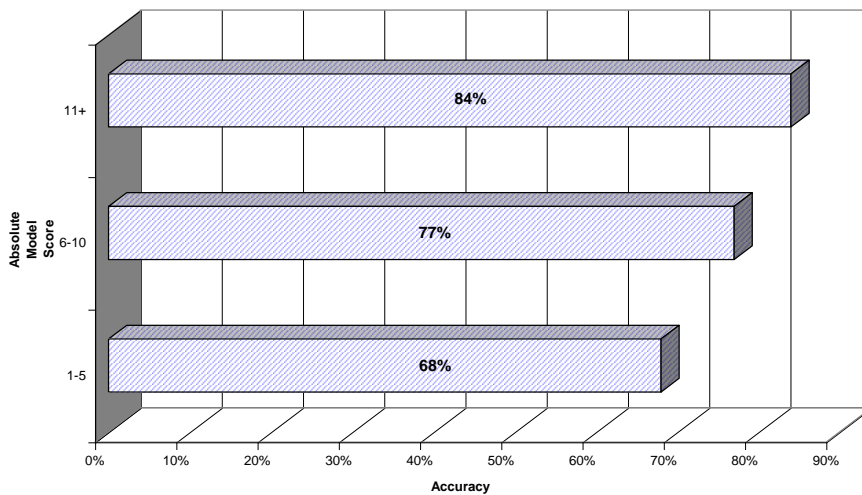
Similarly, Exhibit 17 shows that regression analysis conducted on Model scores and the degree of change in interest rates produced a disappointing R^2 of only 0.11.

Exhibit 17
Long-term Lawton Bond Model Scores & Yield Chgs.



Nevertheless, a relatively strong relationship does exist between Model scores and forecast accuracy. Instead of looking at Model scores in isolation, scores were broken into intervals ranging from lower absolute scores to higher absolute scores. The rationale behind this is that perhaps a difference of one or two points in a Model score is not meaningful. As Exhibit 18 depicts, forecast accuracy increased from 68% for the lowest scores to 84% for the highest scores.

Exhibit 18
Long-term Lawton Bond Model
Model Score vs. Total Return Forecasting Accuracy



The scatter graph labeled Exhibit 19 shows the relationship between Model scores and average monthly index returns. Model scores and their associated monthly return for each of the core countries were separated into quartiles. The average score and monthly return for each country were plotted. The results confirm that Model scores have a relatively strong relationship with investment returns.

Exhibit 19
Long-term Lawton Bond Model

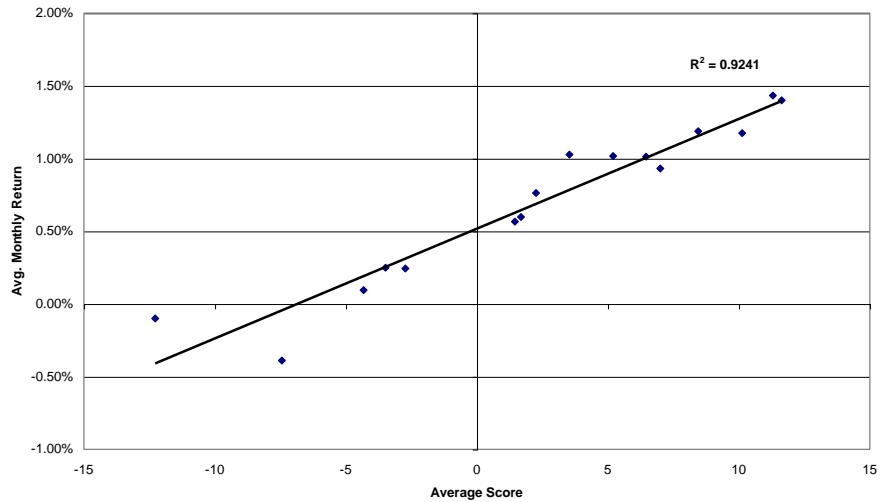
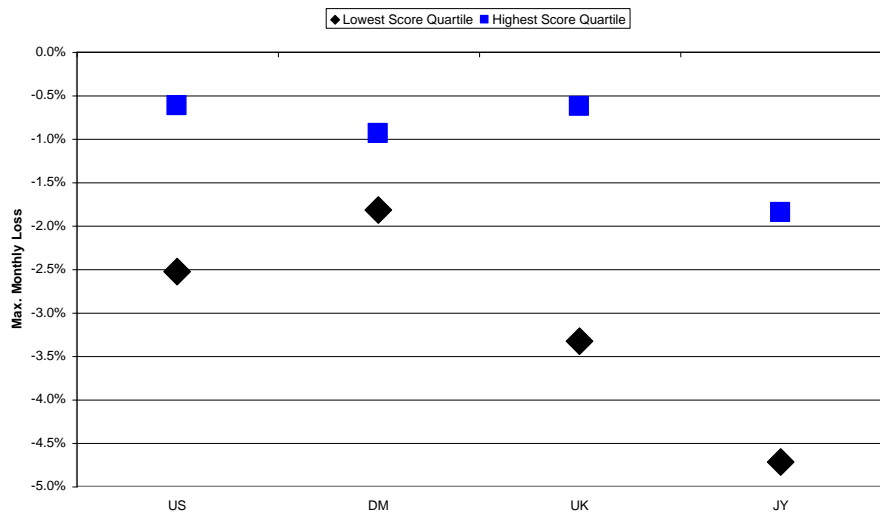


Exhibit 20 demonstrates that higher Model scores reduced downside risks. For instance, in the US, the maximum loss suffered in a month with a top 25% score was -0.6% while the maximum loss suffered in the bottom quartile of scores was -2.5%. This relationship was consistent for all of the core countries.

Exhibit 20
Long-term Lawton Bond Model

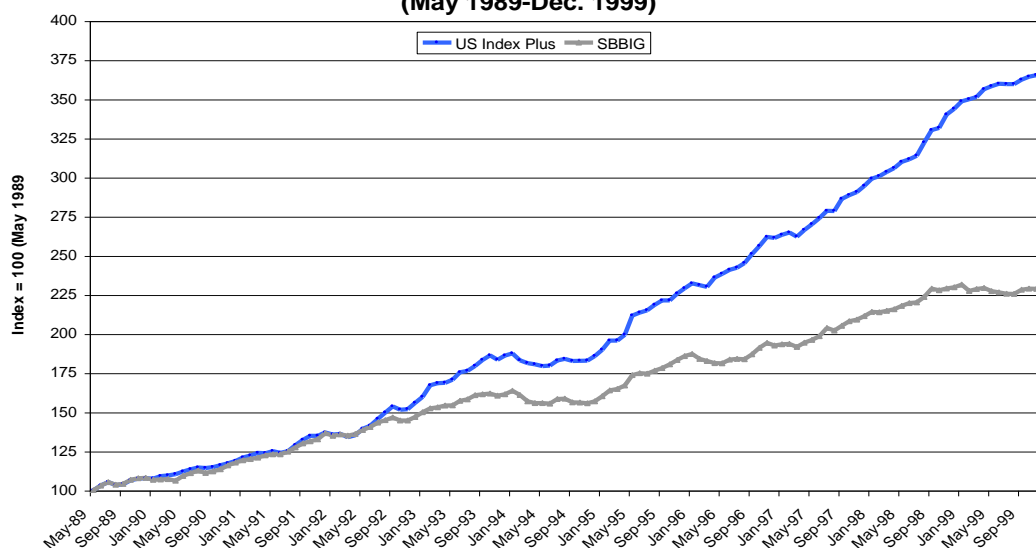


Thus, position size and duration can be scaled according to score level. Higher absolute scores justify larger positions and more duration, either long or short.

The Lawton Bond Model as an Asset Allocation Tool

As exemplified through the performance of Seagate's US Bond Index Plus, the Lawton Bond Model effectively allocated assets across global markets. Over the past ten years, US Bond Index Plus relied on the Model to first analyze the US market and then identify non-US markets that would outperform the Salomon Broad Index.⁴ From 1989 to 1999, US Bond Index Plus returned 12.98% versus 8.09% for the Salomon Broad Investment Grade Index, or 4.88% over the index per year (see Exhibit 21). US Bond Index Plus's out-performance of both the Salomon Broad Index and the portfolios shown in Exhibits 7-8 suggests that the Model successfully allocated assets across global markets.

Exhibit 21
US Index Plus vs. Salomon Broad index
Cumulative Returns
(May 1989-Dec. 1999)

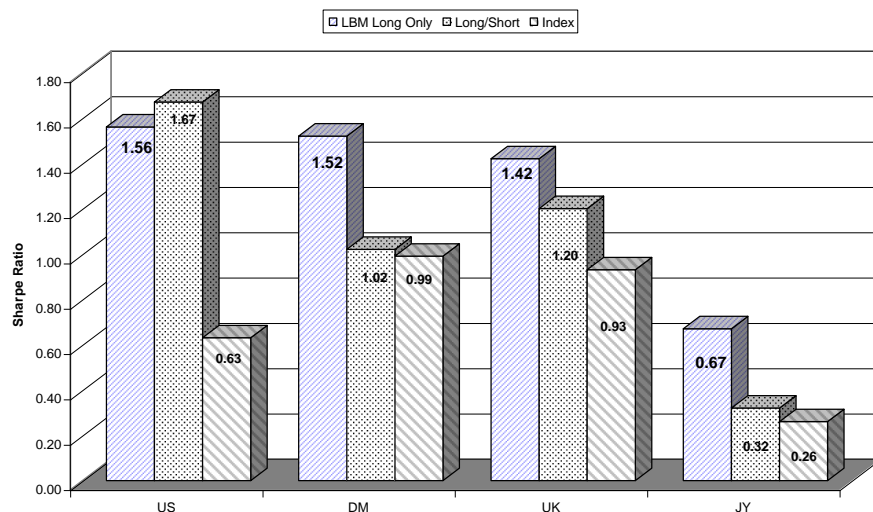


The Model and Portfolio Risk

The accuracy of the Lawton Bond Model and the confidence level associated with each Model score reduced portfolio risk. First, as Exhibit 22 shows, all model portfolios had higher Sharpe ratios than their respective local currency indexes. The model portfolios also had higher Sortino ratios. Second, with the exception of Japan's long-short portfolio, all model portfolios had lower total and downside standard deviations. For example, the standard deviation of the US long-short portfolio was 3.85% and its downside deviation was 1.91%. The US Index's standard deviation was 4.36% and its downside deviation was 2.45%. The standard deviation of Japan's long-short portfolio was 4.88% compared to the index of 4.79%. However, the downside deviation of 2.35% was still lower than the 3.34% registered by the index.

⁴ US Index Plus model portfolio strategy allocates assets between the US, Germany, UK, and Japan on a currency hedged basis. Countries with positive Model scores receive equal weighting. If all Models are negative then all assets are invested in one month US Libor.

Exhibit 22
Sharpe Ratios



Conclusion and Future Uses for the Lawton Bond Model

This study reviewed the Lawton Bond Model in its first decade of operation. The results show that the Lawton Bond Model is unique with respect to accuracy, consistency, longevity, and real-world utility. The Model produced signals that if followed in a portfolio context would have comfortably place its performance in the top 1% of fixed income managers. The Model performed especially well in 1994 and 1999, the two worst years in the US bond market in the last thirty years.

Additionally, the study underscored the utility and value of the Model and stimulated thinking about additional ways to use the Model beyond the realm of the bond market. Additional studies on the correlation between interest rate trends and non-fixed income asset classes may yield new investment strategies. In fact, in conjunction with one of the world's largest investment banks, a strategy involving the Lawton Bond Model and emerging market debt has been created. Other areas of promise include convertible bonds, REITs, utility stocks, commercial loans, junk bonds, and asset allocation strategies between stocks and bonds.

Interest rate risk is omnipresent for individuals. Despite this, there is little accurate and actionable help or advice available to manage interest rate risk or profit from interest rate opportunity. Such advice could be provided based on the Lawton Bond Model to assist individuals in managing CD's, bond portfolios, mutual funds, annuities, mortgages, and other interest rate related products. New technologies for delivering information will make this possible on a real-time basis.

Model Portfolios