VALUING MACRO ALLOCATION DECISIONS: A "FORESIGHT" STUDY

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Introduction

Many investment managers seek to outperform the Lehman U.S. Aggregate Index by investing in non-index securities such as high yield, emerging markets, or by taking currency exposure. These are often referred to as "core-plus" strategies. Do these strategies add value? If so, how skillful must the manager be to produce a given information ratio?

A client recently asked us to measure the historical relative value of three core-plus strategies: currency overlay and exposures to high yield and emerging markets (represented by the respective Lehman indices). This report presents the findings of this analysis. In addition, we study the performance of a simple duration timing strategy. The duration strategy results allow us to gauge the relative value of adding non-index securities compared to staying within the index and making duration decisions.

Study Formulation

We employ the "imperfect foresight" approach developed in the course of an earlier project that measured the historical value of investment skills.[1] At that time, we quantified the relative value of security selection, sector selection, credit quality selection, and duration positioning versus the Lehman Brothers Credit Index. For the MBS Index, we measured the relative value of skill at forecasting changes in mortgage risk factors such as realized volatility and prepayments.[2]

This time, we look at the relative value of simple core-plus strategies popular with managers trying to outperform the Lehman U.S. Aggregate Index. In these strategies the manager always has just two choices, "good" and "bad." The skill in selecting the winning strategy (the good choice) is assumed to range from 0% to 100%. At 0% skill, the manager has a 50% chance of selecting the winning strategy. At 100% skill, the manager makes the winning choice with certainty. Probabilities at intermediate skill levels are prorated. For example, at a 40% skill level, the probability of making the good choice is 0.5 + 0.5 x 0.4 = 0.70. Correspondingly, the probability of making the bad choice is 0.30.

A manager with skill will make the correct decision more often than not. Figure 1 shows the probability of making the right decision as a function of the manager's skill level. As this figure shows, a 40% skill level, for example, is quite respectable: the right choice is made 70% of the time.

The return on a core-plus strategy is determined by the appropriate probability weighting of the good and bad outcomes. As an example, let us look at the performance

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[1] *Value of Security Selection versus Asset Allocation in Credit Markets: Part II - An "Imperfect Foresight" Study*, Lehman Brothers, July 2000.

[2] *Value of Risk Taking in a Mortgage Portfolio: A Perfect Foresight Study*, in Lehman Brothers Global Relative Value, February 2001.

Figure 1. **Probability of the Right Choice as a Function of Skill Level,** %

Skill Level	Probability of the Right Choice
0	50
20	60
40	70
60	80
80	90
100	100 (perfect foresight)

of the high yield strategy with 40% skill level in May 2001 with only long positions allowed. In this month, the Lehman High Yield Index outperformed the Aggregate by 120 bp. Scaled by the bet size (3%, discussed below) this outperformance becomes 3.6 bp. As shown in Figure 1, 40% skill translates into 70% probability of the right decision which in this month is to invest in high yield. The wrong decision is not to invest and to earn the index return (zero outperformance). The strategy return for May 2001 is then computed as 30% x 0 bp + 70% x 3.6 bp = 2.5 bp. The success of each strategy is measured by the annualized *information ratio*, i.e., average outperformance versus the Aggregate Index divided by the volatility of this outperformance.

We assume that duration decisions are always symmetrical in that we allow both shortening and lengthening versus the index. For each of the core-plus strategies, we investigate both the case where the investor can only go long the core-plus sector and the case where the investor can either go long or short. In the "long positions only" variant, the two decisions are: take exposure to the core-plus sector if it leads to outperformance over the Aggregate Index, or earn the index return if it doesn't. In the "long and short positions" variant we allow shorting the core-plus sector. In practice shorting the high yield and emerging markets sectors can only be done effectively if the benchmark contains these asset classes (e.g. the Lehman Universal Index). In that case, shorting simply means *not* investing in (or underweighting) them. Arguably, this flexibility is one of the advantages of a broader benchmark such as the U.S. Universal Index.

The core-plus strategies we analyze are extremely diverse in terms of their mean returns and return volatilities. Without some risk-equalizing assumptions, results would not really be comparable. We choose a quarter-year duration exposure as our standard bet size and scale each of the other three strategies so that all four strategies have comparable risk. To do this we compute volatility of excess returns over the Aggregate Index for each strategy. The bet size for each strategy is set based on the ratio of its excess return volatility to that of the quarter-year duration exposure (as shown in Figure 2). As explained below, the starting point for this study is January 1993. To make our assumptions more robust, we decided to also look at a longer period (from August 1988) and average the resulting bet sizes. The duration strategy outperformance proves to be much less volatile than the other three, so the bet sizes for each of the core-plus strategies are relatively small.

To simulate the currency overlay strategy, we use historical exchange rates between the U.S. dollar and euro (deutsche mark prior to January 1999), as well as the respective deposit rates. The return on the overlay consists of two components: a pure "currency"

return based on the change in the exchange rate and an "income" return based on the deposit rates differential. At the beginning of each month, we look forward and determine whether the euro appreciated or depreciated against the dollar. If short positions are allowed, the strategy always takes currency exposure, going long or short the euro depending on the direction of the exchange rate move. If only long positions are permitted, the currency overlay is bought only when the exchange rate move is beneficial. In all other months the strategy earns the index return. The strategy return in each month is scaled by the bet size (1.8%).

The emerging markets and high yield strategies are implemented similarly. Based on the historical time series of the return differences between each index and the Aggregate, we determine at the beginning of each month whether the index out- or underperformed. If short positions are allowed, the strategy takes an appropriate exposure to the index scaled by the bet size (3% for the high yield and 1.2% for the emerging markets). If not, in underperforming months it earns the index return.

The duration exposures are modeled as follows. The U.S. Treasury component of the U.S. Aggregate Index is broken down into the short and long pieces (represented by the Lehman Intermediate and Long U.S. Treasury indices respectively). The lengthening or shortening of duration is achieved by the appropriate reweighting of these two components. The difference between the weighted average return of the two pieces and that of the Treasury Index represents the strategy's excess return.

Results

We performed historical simulation of the four strategies over the 8.5-year period from January 1993 through May 2001.[3] Results for both variants, long positions only and long and short positions, are presented in Figures 3 and 4. The tables in Figures 3a and 4a show annualized mean and standard deviations of each strategy's outperformance over the Aggregate Index, as well as the information ratios. For easier comparison, the information ratios are also plotted in Figures 3b and 4b.

[3] The starting point was determined by the availability of the emerging markets data.

Figure 2. **Bet Sizes**

	0.25 Year Duration	Currency	High Yield	Emerging Markets
August 1988-May 2001				
Standard Deviation of Return Difference vs. Agg. (bp/yr)	19	1082	705	N/A
Risk-Equivalent Percent		1.79%	2.74%	N/A
January 1993-May 2001				
Standard Deviation of Return Difference vs. Agg. (bp/yr)	18	961	539	1512
Risk-Equivalent Percent		1.92%	3.43%	1.22%
Risk-Equivalent Percent Used in Simulation		1.8%	3.0%	1.2%

Figure 3a. **Performance Results: Long Positions Only,** January 1993-May 2001

	Currency (EUR)			Duration			High Yield			Emerging Markets		
Skill Level	Mean Outperf. (bp/yr)	Volatility (bp/yr)	Information Ratio	Mean Outperf. (bp/yr)	Volatility (bp/yr)	Information Ratio	Mean Outperf. (bp/yr)	Volatility (bp/yr)	Information Ratio	Mean Outperf. (bp/yr)	Volatility (bp/yr)	Information Ratio
0%	-4.3	12.3	-0.35	0.0	18.6	0.00	0.5	11.4	0.05	3.9	12.8	0.30
20%	0.6	12.1	0.05	10.4	18.3	0.57	4.2	11.1	0.38	8.2	12.4	0.66
40%	5.5	11.7	0.47	20.9	17.6	1.19	7.9	10.6	0.74	12.4	11.7	1.06
60%	10.4	11.1	0.93	31.3	16.2	1.93	11.6	10.1	1.15	16.7	10.9	1.53
80%	15.3	10.4	1.47	41.8	14.1	2.96	15.3	9.4	1.63	21.0	9.9	2.13
100%	20.2	9.3	2.16	52.2	10.9	4.80	19.0	8.5	2.24	25.2	8.5	2.96

Figure 3b. **Performance Results: Long Positions Only,** January 1993-May 2001

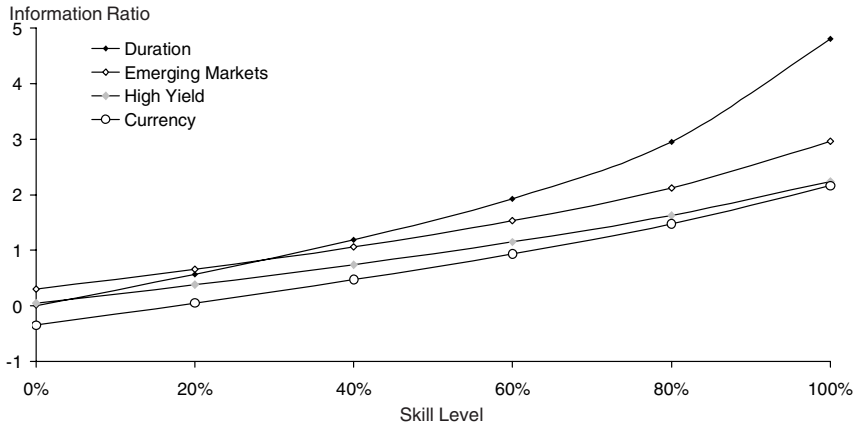


Figure 4a. **Performance Results: Long and Short Positions,** January 1993-May 2001

	Currency (EUR)			Duration			High Yield			Emerging Markets		
Skill Level	Mean Outperf. (bp/yr)	Volatility (bp/yr)	Information Ratio	Mean Outperf. (bp/yr)	Volatility (bp/yr)	Information Ratio	Mean Outperf. (bp/yr)	Volatility (bp/yr)	Information Ratio	Mean Outperf. (bp/yr)	Volatility (bp/yr)	Information Ratio
0%	0.0	17.4	0.00	0.0	18.6	0.00	0.0	16.1	0.00	0.0	18.2	0.00
20%	9.8	17.2	0.57	10.4	18.3	0.57	7.4	15.9	0.46	8.5	18.0	0.47
40%	19.6	16.4	1.19	20.9	17.6	1.19	14.7	15.5	0.95	17.1	17.5	0.97
60%	29.4	15.2	1.93	31.3	16.2	1.93	22.1	14.8	1.50	25.6	16.6	1.54
80%	39.1	13.2	2.96	41.8	14.1	2.96	29.5	13.7	2.15	34.2	15.3	2.23
100%	48.9	10.2	4.81	52.2	10.9	4.80	36.9	12.1	3.04	42.7	13.5	3.17

Figure 4b. **Performance Results: Long and Short Positions**
January 1993-May 2001

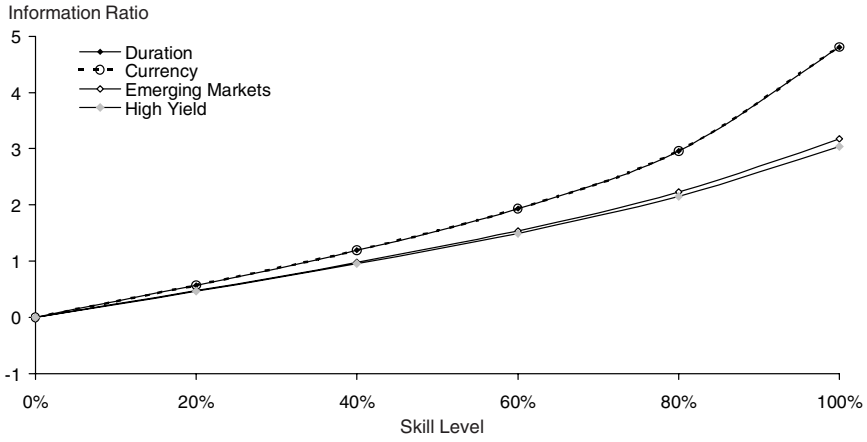


Figure 3b shows that the duration strategy outperforms the three core-plus strategies at most skill levels. The emerging markets strategy is second best and outperforms the currency and high yield strategies which are roughly similar. The duration strategy does not have a long-only variant. As Figure 4b shows, when short positions are allowed in all strategies, the currency strategy performs as well as duration, and both outperform the high yield and emerging markets strategies.

We divide the interpretation of results into two sections depending on whether or not the manager is allowed to short the non-index sectors or currency overlay.

Long Positions Only for Currency, Emerging Markets, and High Yield

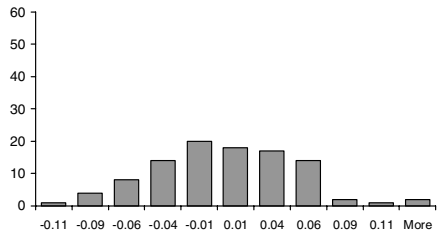
Note that the shape of the information ratio function for the duration strategy is different than for the other three long-only strategies. Compared to the core-plus strategies, the duration strategy tends to improve faster as skill increases. This is primarily due to the ability of the duration strategy to go short when appropriate.

To illustrate how the ability to go short affects the information ratio curve consider the currency overlay strategy. The distribution of currency returns is roughly symmetric around zero (see the histogram in Figure 5a). As skill improves, the investor who can short currency essentially transforms the negative half of the currency returns distribution into positive returns. If currency exposure in a given month produces a -1% return, then as skill improves the investor will more likely short currency that month. If the investor has 100% skill, then his return for the month will be +1%. In other words, as skill improves the negative half of the currency returns distribution is "folded" over the zero vertical axis onto the positive half. Because the currency returns distribution is roughly symmetric around a mean return of zero, this folding produces a currency strategy returns distribution with a higher mean and lower standard deviation (Figure 5b).

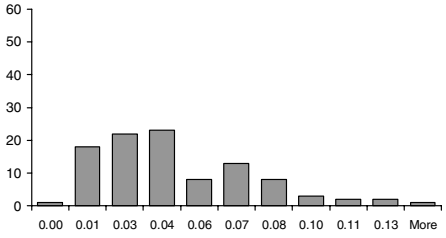
In contrast, for the long-only strategy (Figure 5c), the distribution of returns changes differently as the investor's skill improves. When currency exposure produces a negative return the best the investor can do as his skill increases is to hold the index and earn zero excess return. As a result, as skill increases, the distribution of returns does not "fold over." Instead, the distribution adds observations at zero while removing the negative half of the currency returns distribution. This limits the potential for improvement in the mean as skill increases. In addition, the lack of improvement

Figure 5. **The Currency Overlay Strategy: Distribution of Returns,** January 1993-May 2001

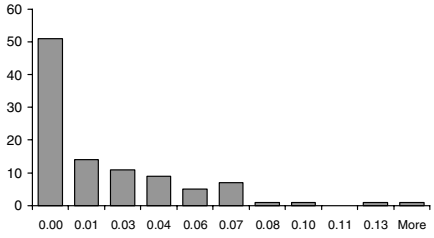
a. **Currency Returns**



b. **Currency Overlay Strategy: Long and Short Positions, 100% Skill**



c. **Currency Overlay Strategy: Long Positions Only, 100% Skill**



in the mean is not likely to be offset by a sufficiently large decrease in the standard deviation. As the new observations are added at the left tail of the currency strategy returns distribution, and not distributed around the mean, there is less chance for a large reduction in the standard deviation (and increase in the information ratio) compared to the case where the investor can short.

Another notable result in Figure 3b is that at 20% or lower skill level, the emerging markets long-only strategy outperforms the duration strategy, whereas at a 40% or higher skill level the reverse occurs. What causes this reversal? The distribution of emerging market returns for the 1993 - 2001 period is characterized by a positive mean return (3.9 bp per year) with almost twice as many positive excess returns as negative excess returns, and a large negative outlier. In contrast, the distribution of duration returns has a zero mean return and a relatively smooth and symmetric distribution. At 0% skill level, given that the bet sizes for both strategies are scaled to produce the same realized volatility, the positive mean for emerging markets produces an information ratio greater than that for the duration strategy. However, as discussed above, the information ratio for the duration strategy which can go both long and short, improves at a faster rate than does the emerging markets long-only strategy. Given the relatively small initial value of the information ratio for emerging markets, at a skill level of approximately 30% the two curves cross.

The emerging markets strategy outperforms both high yield and currency. The emerging markets strategy benefits because of its higher mean return. In addition, the distribution of emerging markets returns contains a large negative outlier. As skill improves, the impact of this large negative observation is reduced. That gives the emerging markets strategy a slightly better reduction in its standard deviation. Consequently, not only does the emerging markets strategy start at a higher information ratio, but it improves as a slightly faster rate than the other two core-plus strategies.

Long and Short Positions for All Core-Plus Strategies

When the manager is allowed to go short in the core-plus strategies, the information ratio curves change significantly. As expected, for each strategy the information ratios improve compared to the long-only variant. However, the ranking of the strategies changes as well.

There is a notable improvement in the currency strategy. In fact, currency is now virtually equivalent to duration in terms of information ratio. There are two reasons for this. First, because both long and short positions are allowed, the average return at 0% skill is now zero for all strategies. For the long-only currency strategy, the mean return was negative because the strategy was not able to short euros when the euro return was negative. Second, the distributions of currency returns and duration returns are now both symmetrical around their mean. As we already showed, with the improvement in skill, the negative portion of the returns distribution is essentially folded over to the positive portion of the distribution, producing a comparable increase in the mean and reduction in the standard deviation.

However, the emerging markets and high yield distributions are skewed to the positive side, where the majority of the observations lie. In addition, their negative observations tend to be clustered close to zero. The emerging markets returns distribution has one

large negative observation. As a result, when the negative side of the distribution is folded into the positive side, there is less of a reduction in standard deviation because few observations are near the new mean. This limits the improvement in the information ratio for both emerging markets and high yield compared to currency and duration.

Conclusions

While the presented results are a product of the data period examined, we show that there is significant value to core-plus strategies at even relatively modest levels of skill. At 40% skill level, all four strategies (with long and short positions allowed) produce an information ratio of about 1.

The results of this study allow plan sponsors to quantify the value of different investment skills and allocate assets more efficiently across managers. For example, a plan sponsor evaluating different specialist managers of equivalent skill can use these results to allocate assets to those sectors that would have produced the best information ratio. Similarly, an investment manager who can demonstrate a certain skill level in timing exposure to a particular sector can use these results to quantify the potential benefit for his client.

The information ratios we present show the potential benefit of a given strategy at a particular level of skill. Unfortunately, these results do not say whether a given level of skill is *attainable* for a particular strategy. For example, the efficient markets hypothesis would suggest that the only skill level attainable on a consistent basis is 0%. Some might argue that this is the case for duration and currency strategies. Others, however, might believe that high yield and emerging markets are "under-researched" and subject to technical factors which skillful managers can profitably anticipate. If so, then perhaps a significant skill level might be attainable for high yield and emerging market strategies whereas for duration and currency a lower skill level might be more realistic. Consequently, managers seeking to develop a core-plus skill to realistically achieve a given information ratio might well consider allocating resources to high yield and emerging markets.

Foresight studies will continue to aid investment managers in their evaluation of various investment strategies. In fact, foresight studies might be particularly helpful for managers who are benchmarked against the Global Aggregate Index with three macro strategies (exposures) to evaluate: currency (USD, JPY, GBP, and EUR), global sector (*e.g.,* Global Credit versus Global Treasury), and global yield curve timing. Which strategy offers the best potential for risk-adjusted outperformance? We plan to report the findings soon.

Publications—L. Pindyck, A. DiTizio, B. Davenport, W. Lee, D. Kramer, J. Threadgill, R. Madison, A. Acevedo, K. Kim, C. Rial, J. Batstone