Measuring non-U.S. equity portfolio performance

This system breaks out market and stock selection results.

Gary P. Brinson and Nimrod Fachler

This paper has two aims. First, we establish the correct benchmark index for measuring the performance of non-U.S. equity portfolios. Second, we propose an analytical framework for analyzing and evaluating the portfolio's performance.

THE CAPITAL INTERNATIONAL INDEXES

The most widely used international return indexes are the Capital International Perspective (CIP) Indexes published in Geneva, Switzerland by Capital International S.A.[1] The advantages of the CIP indexes are:

1. The uniformity of the calculation method and the base date allow easy and accurate comparison among the various indexes.
2. The indexes date back, in most cases, to 1959, creating an extensive database for research and analysis.
3. CIP provides industry indexes allowing for a comparison of industrial trends across national stock markets.
4. The separation into local currency and dollar-adjusted returns allows an explicit evaluation of the impact of the currency movements on the returns and risk of the non-U.S. markets.

The main drawback of the CIP data is the limited and varied quality and depth of the market coverage. As of December 31, 1983, the companies included in the "World Index" accounted for 59.9% of world capitalization. For the individual markets, the percentage coverage varied from lows of 53% for Australia and 55% for Denmark to a high of 81.4% for the Netherlands.[2]

Table I examines the representativeness of the national market CIP indexes. Note, in particular, the results for the Netherlands, Switzerland, and France, where the movements of the domestic indexes explain only 74%, 88%, and 90%, respectively, of the movements of the relevant CIP index. The domestic indexes we chose for this analysis were, by our judgment, the most comprehensive and well constructed indexes available.

Table II shows the results of a regression analysis for 12 markets covered where, in each case, the CIP index return is the dependent variable and the domestic index is the independent variable (the same domestic indexes as in Table I). All the constants are insignificantly different from zero. The betas, however, show some significant deviations from 1.0. That is the case for Japan, Australia, Italy, Belgium, and Canada, where the betas are 1.168, 1.076, 0.956, 1.072, and 1.052, respectively. In the Japanese case, the high beta of the CIP index versus the domestic index can be a significant factor, as the Japanese market will be the largest single-country holding in most non-U.S. equity portfolios. Regardless of the weaknesses revealed in Tables I and II, CIP is the most widely used international index and, like its U.S. counterpart (S&P 500), is *generally* suitable for *general* measures of investment performance.

1. Footnotes appear at the end of the article.

TABLE I

Statistics Summary — Five Years ending 12/31/83
(Monthly Data, Local Currency, Price Change Only)

Market	Domestic Index	CIP Annual Return (%)	Domestic Annual Return (%)	CIP Annual Std. DV. (%)	Domestic Annual Std. DV. (%)	R^2 Domestic/ CIP
Australia	All Ordinary	15.95	16.19	24.03	22.14	.983
Belgium	Belgian S.E.	6.43	6.80	16.62	15.28	.972
Canada	Toronto S.E.	14.16	14.27	22.85	21.42	.973
France	CAC	11.31	10.50	20.30	18.26	.898
Germany	Commerz Bank	5.65	4.97	13.07	12.99	.989
Hong Kong	Hang Seng Bank	13.23	12.04	36.72	35.65	.990
Italy	Banca Comm.	23.41	22.71	27.57	28.51	.978
Japan	Tokyo S.E.	12.44	10.24	10.64	8.80	.933
Netherlands	ANPCBS	15.61	11.62	15.19	17.07	.738
Singapore	Straits Times	19.04	23.47	24.30	24.49	.917
Switzerland	Swiss Bank Co.	6.05	5.20	11.16	11.24	.879
UK	FT All Share	15.77	16.40	17.81	17.38	.979

TABLE II

Regression Summary — Five Years Ending 12/31/83
(Monthly Data, Local Currency, Price Change Only)

Market	Constant	T-Stat Constant	Beta	T-Stat Beta	Durbin-Watson
Australia	−.093	−0.77	1.076	57.94	1.83
Belgium	−.058	−0.54	1.072	44.49	2.53
Canada	−.051	−0.36	1.052	45.86	1.72
France	.008	0.03	1.055	22.20	1.64
Germany	.054	1.04	1.001	72.23	2.62
Hong Kong	.083	0.59	1.025	74.30	2.18
Italy	.116	0.73	0.956	50.42	2.21
Japan	.039	0.35	1.168	28.40	1.66
Netherlands	.356	1.06	0.965	12.78	1.64
Singapore	−.216	−0.79	0.950	25.32	2.25
Switzerland	.099	0.67	0.931	20.52	2.89
UK	−.059	−0.60	1.014	52.49	1.78

THE SELECTION OF THE BENCHMARK INDEX

Nevertheless, the correct aggregate index to be used for performance analysis depends on the objectives and policy constraints of the portfolios being evaluated. Global portfolios, for example, should benchmark off the World Index. This index includes the U.S. and all non-U.S. markets. The proportions are based on the relative market capitalization of the individual markets.

For non-U.S. portfolios, most people use CIP's Europe, Australia, and Far East (EAFE) Index. We suggest below that this index does not properly cover the non-U.S. universe. Specifically, it excludes Canada, South-African Gold Mines, and Mexico. To overcome that weakness, we have constructed a more meaningful non-U.S. index. The information we use for constructing the index is taken directly from the CIP monthly publication.

Let us define:

$P_{U.S.}$ = Proportion of total capitalization represented by the U.S. in the World Index,

$(1 - P_{U.S.})$ = Proportion represented by non-U.S. in the World Index,

$R_{U.S.}$ = Total return of the U.S. index,

R_W = Total return of the World Index, and

R_X = Total return of the non-U.S. Index.

Then:

$$(1) \qquad R_W = R_{U.S.} \cdot P_{U.S.} + R_X \cdot (1 - P_{U.S.}),$$

and

$$(2) \qquad R_X = \frac{R_W - (R_{U.S.} \cdot P_{U.S.})}{(1 - P_{U.S.})}.$$

The difference between the returns on the non-U.S. and EAFE indexes can be significant. The difference in the returns and standard deviations of the two indexes during 1983 are shown in Table III.

TABLE III

Annualized Total Returns and Standard Deviations,
Periods ending 12/30/83
Net Yield, monthly data

	EAFE Index	Non-U.S. Index
10 years' total return	10.5	10.8
10 years' standard deviation	15.9	16.4
5 years' total return	9.5	10.5
5 years' standard deviation	14.9	15.5
3 years' total return	6.5	6.4
3 years' standard deviation	15.2	15.2

PERFORMANCE ATTRIBUTION SYSTEMS

Once we have the appropriate index for per-

formance comparison, we can define results in the following context:

Performance Differential =
Return on active Portfolio − Return on the Index.

The remainder of this paper deals directly with the analysis and evaluation of the performance differential arising from active management.

Let us define our terms as follows:

$W_{x,i}$ Proportion of market x in the index where $\Sigma W_{x,i} = 1$.

$W_{x,p}$ Proportion of market x in the portfolio where $\Sigma W_{x,p} = 1$.

$R_{x,i}$ Return on market x in the index in U.S. dollar terms.

$R_{x,p}$ Return on market x in the portfolio in U.S. dollar terms.

R_I Return on non-U.S. index in U.S. dollar terms.

R_P Return on the active portfolio in U.S. dollar terms.

We present here a two-dimensional model. It considers two decisions: market selection across countries and security selection within markets.

1. Market Selection

This component measures the effect of a decision to be active on market selection — that is, to overweight or underweight a certain market vis-à-vis its normal position as defined by the weight of that market in the non-U.S. Index. We define the impact of market selection as:

(3) $\text{Market Selection}_{(x)} = (W_{x,p} - W_{x,i}) \cdot (R_{x,i} - R_I)$.

Four cases are possible:

	Overweight (Wx,p > Wx,i)	Underweight (Wx,p < Wx,i)
Rx,i > R_I	(+) Market selection > 0	(−) Market selection < 0
Rx,i < R_I	(−) Market selection < 0	(+) Market selection > 0

A positive market selection is associated with being overweight in an above-average performance country or underweight in a below-average performance country. Negative market selection occurs when the portfolio is overweighted in a below-average performance country or underweighted in an above-average performance country. A neutral market selection is associated with taking a passive stance on market weight, $W_{x,p} = W_{x,i}$, or is implied when the performance of market x is the same as the overall index, $R_{x,i} = R_I$.

2. Stock Selection

This component measures the effect of having an active selection of stocks within each country market that is different from the market portfolio. We define the stock selection component as:

(4) $\text{Stock Selection}_{(x)} = (R_{x,p} - R_{x,i}) \cdot W_{x,i}$.

Two points require explicit discussion. First, if we were to index our holdings in market X and thus cause the performance to exactly match that of the index, that is $R_{x,p} = R_{x,i}$, then by definition the stock selection component will equal zero. Second, it is important to notice that the return differential is being multiplied by the passive weight, $W_{x,i}$, so that the two return components of market selection and stock selection are totally independent of each other.

It can be difficult to evaluate the stock selection ability of the investment manager simply by looking at the stock selection component, because we have multiplied the return differential by the weight to properly identify the sum of stock selection across all markets. Small performance in a large market can result in a larger stock selection component to total performance differential than a substantial overperformance in a small capitalization market.

We can, however, isolate the stock selection capability by constructing a time series of the return differential $R_{x,p} - R_{x,i}$. This differential is neutral of market size biases and can be examined for its statistical significance.

3. Cross Product

A cross product between two phenomena or two decisions can occur each time that the two occur simultaneously. We define the cross product in our case as:

(5) $\text{Cross Product}_{(x)} = (W_{x,p} - W_{x,i}) \cdot (R_{x,p} - R_{x,i})$.

In order for the cross product to be different from zero, both the market selection *and* the stock selection components should be different from zero.

To put it all together on one market level, using Equations (3), (4), and (5), we find:

(6) $$\text{Total Performance Differential}_{(x)} = \underbrace{(W_{x,p} - W_{x,i}) \cdot (R_{x,i} - R_I)}_{\text{(Market selection)}} + \underbrace{(R_{x,p} - R_{x,i}) \cdot (W_{x,i})}_{\text{(Stock selection)}} + \underbrace{(W_{x,p} - W_{x,i}) \cdot (R_{x,p} - R_{x,i})}_{\text{(Cross product)}}.$$

Therefore:

(7) Total Performance Differential$_{(x)}$ =
$$W_{x,p} \cdot (R_{x,p} - R_f) - W_{x,i} \cdot (R_{x,i} - R_f).$$

On a portfolio level, Equation (7) reduces to:

(8) Total Portfolio Performance Differential =
$$W_{x,p}\, R_{x,p} - W_{x,i} \cdot R_{x,i}.$$

This is an intuitively appealing result, as it states that the total performance differential is equal to the total return on the portfolio minus the total return on the benchmark index.

FOR EXAMPLE . . .

Let us assume that we have a non-U.S. portfolio currently invested in Japan, U.K., and Germany. The portfolio is being measured against its Index. The relevant data during the period were:

MARKET	% in Portfolio ($W_{x,p}$)	Return in Portfolio ($R_{x,p}$)	% in Index ($W_{x,i}$)	Return in Index ($R_{x,i}$)
Japan	55	6	45	4
U.K.	30	−2	35	4
Germany	15	4	20	6

Total Return Portfolio $= 6 \cdot 0.55 + (-2) \cdot 0.30 + 6 \cdot 0.15 = 3.3$
Total Return Index $= 4 \cdot 0.45 + 4 \cdot 0.35 + 6 \cdot 0.20 = 4.4$
Total Differential $= 3.3 - 4.4 = -1.1$

The component breakdown table looks like this in basis points:

Market	Market Selection Equation (3)	Stock Selection Equation (4)	Cross Product Equation (5)	Total Equation (7)
Japan	−4	+90	+20	+106
U.K.	+2	−210	+30	−178
Germany	−8	−40	+10	−38
Total	−10	−160	+60	−110

EXTENSIONS

The model described here assumes a portfolio that is fully invested in equities and has no direct currency strategies. Extensions are possible for investors who use cash or active currency strategies in their portfolios.

Investors who use cash in their portfolio can introduce an element of market timing. The component will measure the effect of not being fully invested in equities in each market. All the variables necessary for the analysis, i.e., return on equities, return on cash, and proportion of cash out of total holding, are readily available for a normal accounting system supporting the portfolio.

Investors who use active currency strategies can introduce a currency selection component. All the previously discussed components would then be analyzed in local currency terms. The data we need for this analysis are the change of each currency rate against the U.S. dollar during the period, the index weight in each currency (equal $W_{x,i}$), and the portfolio weight in each currency. The analysis of the currency component is relatively complicated because of the number of cross products that have to be introduced. The exact specification of the currency factor is beyond the scope of this study, but it should provide a useful topic for further research.

SUMMARY

A performance measurement system similar to the one described in this paper can be beneficial for both the international investor and the international investment manager. For the investor, it can provide a better understanding of the risks and returns associated with the different types of decisions taken by the money manager and with the different equity markets outside the U.S.A. For the investment manager, the system can help in understanding the consequences of each major portfolio decision; it can also simplify and improve the articulation and communication of performance results and their attribution.

Since most international active management results will be discussed relative to a benchmark, with references to the respective contribution of market selection and stock selection effects, the analytical benchmark suggested in this paper should provide a timely and useful set of performance measurement techniques.

[1] For a comprehensive description of the coverage and methodology the reader can refer to the quarterly edition of CIP. Also see an expanded explanation in N. Sikorsky, "The Origin and Construction of the Capital International Indices," *Columbia Journal of World Business*, Summer 1982, pp. 24-29.

[2] For a full description of the market coverage, refer to CIP Quarterly Edition, 4th quarter 1983.