Chapter 12

Global Performance Evaluation
Introduction

- In this chapter we look at:
  - The three steps of global performance evaluation.
  - Calculate money-weighted and time-weighted rates of return.
  - Decomposition of portfolio return into yield, capital gains (in local currency) and currency contribution.
  - Performance attribution in multi-currency, multi-asset portfolios.
Introduction

- In this chapter we look at:
  - Calculate and interpret Sharpe ratio.
  - Performance appraisal to determine whether the manager has a true ability to add value.
  - Discuss different international benchmarks used in performance evaluation.
  - Discuss various biases that may affect performance appraisal.
Global Performance Evaluation (GPE)

- There are three components:
  - **Performance measurement:**
    - Should not be confused with accounting valuation.
    - The GPE component by which returns are calculated over a measurement period for the overall portfolio and various segments.
GPE (continued)

- **Performance attribution:**
  - The GPE component by which the total portfolio performance is attributed to major investment decisions taken by the manager.

- **Performance appraisal:**
  - The GPE component by which some judgment is formulated on the investment manager’s skill.
  - Risk-adjusted measures are used.
Performance Measurement
Calculating a Rate of Return

- One approach to calculating a rate of return if there are no cash flows in or out of the portfolio:

\[
r = \frac{V_1 - V_0}{V_0} \text{ or } 1 + r = \frac{V_1}{V_0}
\]

- There are two approaches to calculating a rate of return in the presence of an interim cash flow.
  - The money-weighted return (MWR)
  - The time-weighted return (TWR)
Example – Simple Portfolio

- Consider a “Simple Portfolio” with a single cash flow during the measurement period. For simplicity, the measurement period is supposed to be one year. Using the formula on the previous slide, what would be the rate of return? The details on the portfolio are as follows:

- Value at start of the year is $V_0 = 10,000$
- Cash withdrawal on day $t$ is $C_t = -650$
- The cash outflow takes place 40 days after the start of the period, or at $t = 40/365 = 0.1096$ year
- Value on day $t$, before the cash flow is $V_t = 9450$
- Final value at end of the year is $V_1 = 9550$
Example – Simple Portfolio

- If the formula were applied directly, we would find:

\[ r = \frac{V_1 - V_0}{V_0} \]

\[ r = \frac{9,550 - 10,000}{10,000} \]

\[ r = -4.5\% \], which is clearly incorrect
Money Weighted Return (MWR)

- Captures the return on average invested capital.
- It measures net enrichment of the client.
- Sometimes called the dollar-weighted rate of return (in the U.S).
- Sometimes called an internal rate of return.
MWR (formula)

- The MWR is defined as:

\[ V_0 = -\sum \frac{C_t}{(1 + r)^t} + \frac{V_1}{(1 + r)^1} \]

- \( r = \text{MWR} \),
- \( V_1 = \text{final value} \),
- \( C_t = \text{cash flow at time } t \)
- \( V_0 = \text{initial value} \).
- The cash flow convention is a “+” if it represents a contribution by the client, and a “-” if it is a cash flow withdrawal by a client.
MWR - Example

- Consider the “Simple Portfolio” example on slide 7. Calculate the money weighted return.

- **Answer:**

\[
10,000 = \frac{650}{(1 + r)^{\frac{40}{365}}} + \frac{9550}{(1 + r)}
\]

\[r \approx 2.12\%\]
MWR - Example

- Another approach (Dietz Method)...

\[
MWR_1 = \frac{\text{Profit}}{\text{Average invested capital}}
\]

\[
MWR_1 = \frac{9,550 - 10,000 + 650}{10,000 - \frac{365 - 40}{365} \times 650}
\]

\[
MWR_1 \approx 2.12\%
\]
Time Weighted Return (TWR)

- Is the performance per dollar invested (or per unit of base currency).
- It measures the performance of the manager independently of the cash flows to or from the portfolio.
- Obtained by calculating the rate of return between each cash flow date and chain linking these rates over the total measurement period.
Time Weighted Return (TWR)

- This method is necessary for comparing performance among managers or with a passive benchmark.
- The TWR must be used for performance evaluation under GIPS guidelines.
TWR (formula)

- The formula over the measurement period is:

\[
(1 + r) = (1 + r_t)(1 + r_{t+1}) = \frac{V_t}{V_0} \times \frac{V_1}{(V_t + C_t)}
\]

When there is only one cash flow \(C_t\) at time \(t\).
TWR - Example

- Consider the example on slide 7. Calculate the TWR based on the given information.

- **Answer:**

\[
1 + r_t = \frac{9,450}{10,000} \quad r_t = -5.5\
1 + r_{t+1} = \frac{9,550}{8,800} \quad r_{t+1} = 8.523\
1 + r = 0.945 \times 1.08523 \quad TWR = r = 2.554%
\]
MWR versus TWR

- MWR is useful for measuring the return of invested capital.
- MWR gives an assessment of the client’s net enrichment over the measurement period.
- TWR is the preferred method for measuring and comparing the performance of money managers.
- TWR should be used for performance evaluation.
Example 12.5. Valuing Stock Selection Ability on a Japanese Equity Portfolio

Consider a £10 million fund that is restricted to a 10% investment limitation in Japan. ¥100 million (£1 million) are invested in the Japanese stock market and managed by a local money manager. The British fund’s trustee wants to evaluate the manager’s security selection skill in this market. Assuming a fixed exchange rate (i.e., 100¥ per £ rate), we will consider the following scenario. The Japanese manager invests ¥100 million in the Japanese stock index, via an index fund, thereby exactly tracking the index. After two weeks, the index rises from 100 to 130, and the fund’s trustee ask the manager to transfer ¥30 million to a falling market (such as the U.K. market) to keep within the 10% limitation on Japanese investment and rebalance the asset allocation to its desired target. Over the next two weeks, the Japanese index loses 30% of its value (falling to 91), so that by the end of the month, the Japanese portfolio is down to ¥70 million. The calculations for the MWR, using the Dietz method, and the TWR are indicated below. The fund uses a consultant that performs a GPE with monthly MWR to estimate performance. What would be the conclusions regarding the security selection ability of the manager in Japan?
Exhibit 12.1: TWR and Dietz Approximation to MWR for a Hypothetical Japanese Portfolio

<table>
<thead>
<tr>
<th>Day</th>
<th>0</th>
<th>15</th>
<th>30</th>
<th>TWR %</th>
<th>MWR %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index</td>
<td>100</td>
<td>130</td>
<td>91</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Portfolio before transfer</td>
<td>100</td>
<td>130</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portfolio after transfer</td>
<td>100</td>
<td>70</td>
<td>–9</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Solution

The TWR on the Japanese portfolio is -9%; that is the performance of the Japanese index, which was perfectly tracked and fell from 100 to 91.

The MWR computed by the consultant will be 0% (a net profit equal to 0, divided by some average capital), wrongly implying that the manager outperformed the Japanese market and has great skills in Japanese stock selection. In fact, the manager precisely tracked the Japanese market and no more.
Performance Attribution in Global Performance Evaluation

- To conduct a detailed GPE, one should calculate the return for various segments of the portfolio.

- Return in local currency:
  - \( r_j = p_j + d_j \)
  - where \( p_j = \) capital gain
  - \( d_j = \) yield in percent
Exhibit 12.2: International Portfolio: Composition and Market Data

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Number of Shares</th>
<th>Price (in local currency)</th>
<th>Portfolio Value on Dec. 31</th>
<th>Portfolio Value on Mar. 31</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dec. 31</td>
<td>Mar. 31</td>
<td></td>
<td>Local Currency</td>
</tr>
<tr>
<td>Japanese Stocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sony</td>
<td>400</td>
<td>10,000</td>
<td>11,000</td>
<td>4,000,000</td>
</tr>
<tr>
<td>European Stocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMW</td>
<td>100</td>
<td>600</td>
<td>600</td>
<td>60,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>100,000</strong></td>
</tr>
<tr>
<td>Market Data</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>International index benchmark ($)</td>
<td>100</td>
<td>98.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japanese index (¥)</td>
<td>100</td>
<td></td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>European index (€)</td>
<td>100</td>
<td></td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>Yen per dollar ($) : ¥</td>
<td>100</td>
<td>105</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Euro per dollar ($) : €</td>
<td>1</td>
<td>0.98</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Currency Contribution

- The currency contribution for a portfolio is the difference between the portfolio return measured in base currency and the portfolio return measured in local currency (i.e. assuming no change in exchange rates over the measurement period).
Exhibit 12.3: Market and Currency Gains

Example: British market goes up 10% and £ goes up 5%

Diagram: Graph showing the relationship between value of investment in pounds (on the y-axis) and exchange rate in dollars per pound (on the x-axis). The graph illustrates the impact of a 10% increase in the value of the British market and a 5% increase in the British pound. The initial value is £10,000, and the final value is £11,000, corresponding to a dollar exchange rate of 2.1.
Total Return Decomposition

- The portfolio’s total return, measured in base currency, can be decomposed as:
  - Capital gain (in local currency)
  - Yield
  - Currency

- To perform the calculation it is useful to break down the portfolio into homogenous segments by asset type and currency (e.g., one segment is foreign stocks).
Total Return Decomposition (formula)

- Let’s denote:
  - $p_j$ — the percentage capital gain on segment $j$
  - $d_j$ — the percentage yield on segment $j$
  - $c_j$ — the percentage currency contribution on segment $j$
  - $w_j$ — the percentage of segment $j$ in the total portfolio at the start of the period

$$r = \sum_j w_j p_j + \sum_j w_j d_j + \sum_j w_j c_j$$
Exhibit 12.4: International Portfolio: Total Return Decomposition

<table>
<thead>
<tr>
<th>(1) Portfolio Weights</th>
<th>(2) Rate of Return in $</th>
<th>(3) Rate of Return in Local Currency</th>
<th>(4) = (2) - (3)</th>
<th>(5) Market Index</th>
<th>(6) = (3) - (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japanese Stocks</td>
<td>40%</td>
<td>4.76%</td>
<td>10.00%</td>
<td>5.00%</td>
<td>5.00%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10.00%</td>
<td>-5.24%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>European Stocks</td>
<td>60%</td>
<td>2.04%</td>
<td>0.00%</td>
<td>-5.00%</td>
<td>5.00%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.04%</td>
<td>5.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Portfolio</td>
<td>100%</td>
<td>3.13%</td>
<td>4.00%</td>
<td>-1.00%</td>
<td>5.00%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.00%</td>
<td>-0.87%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Exhibit 12.5: International Benchmark: Total-Return Decomposition

<table>
<thead>
<tr>
<th></th>
<th>(1) Benchmark Weights</th>
<th>(2) Rate of Return in $</th>
<th>(3) Rate of Return in Local Currency</th>
<th>(4) Currency Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japanese Index</td>
<td>50%</td>
<td>0.00%</td>
<td>5.00%</td>
<td>-5.00%</td>
</tr>
<tr>
<td>European Index</td>
<td>50%</td>
<td>-3.06%</td>
<td>-5.00%</td>
<td>1.94%</td>
</tr>
<tr>
<td>Benchmark</td>
<td>100%</td>
<td>-1.53%</td>
<td>0.00%</td>
<td>-1.53%</td>
</tr>
</tbody>
</table>
Performance Attribution
Performance Attribution

- Superior performance can result from any of the following major investment decisions:
  - Asset allocation
  - Currency allocation
  - Market timing (time variation in the weights)
  - Security selection on each market.
Security Selection

- Ability is determined by isolating the local market return of the various segments.
- Part of the return measures the performance that would have been achieved had the manager invested in a local market index instead of individual securities.
Example of Security Selection

- The return attributed to security selection can be determined by comparing to market index returns.

- Let’s denote

  \( I_j \) The local-currency return on the market index of segment \( j \).

Then:

\[
r = \sum w_j I_j + \sum w_j (p_j - I_j) + \sum w_j d_j + \sum w_j c_j
\]
Asset Allocation

- The word “contribution” in this context indicates performance relative to a selected benchmark.
- A manager’s relative performance, \( r - I^* \), can be attributed to:
  - A market allocation different from that of the index.
  - A currency allocation different from that of the index
  - Superior security selection
**Exhibit 12.6: Summary of Previous Results**

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weights</td>
<td>Rate of Return in $</td>
<td>Rate of Return in Local Currency</td>
<td>Currency Contribution</td>
</tr>
<tr>
<td><strong>International Portfolio</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japanese stocks</td>
<td>40%</td>
<td>4.76%</td>
<td>10.00%</td>
<td>−5.24%</td>
</tr>
<tr>
<td>European stocks</td>
<td>60%</td>
<td>2.04%</td>
<td>0.00%</td>
<td>2.04%</td>
</tr>
<tr>
<td><strong>Total portfolio</strong></td>
<td>100%</td>
<td>3.13%</td>
<td>4.00%</td>
<td>−0.87%</td>
</tr>
<tr>
<td><strong>Benchmark</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japanese Index</td>
<td>50%</td>
<td>0.00%</td>
<td>5.00%</td>
<td>−5.00%</td>
</tr>
<tr>
<td>European Index</td>
<td>50%</td>
<td>−3.06%</td>
<td>−5.00%</td>
<td>1.94%</td>
</tr>
<tr>
<td><strong>Benchmark</strong></td>
<td>100%</td>
<td>−1.53%</td>
<td>0.00%</td>
<td>−1.53%</td>
</tr>
</tbody>
</table>
Market Timing

- Market timing makes a contribution due to time variation in weights, $w_j$. 
More on Currency Management

- In general, there are two major ways to take active currency exposure relative to a benchmark.
  - Deviations from benchmark currency weights
  - Using derivatives

- The overall currency component of the portfolio return can be viewed as the sum of:
  1) The currency component of the passive benchmark
  2) The currency allocation contribution
  3) Return on currency hedges.
Exhibit 12.7: Data on Portfolio and Benchmark

<table>
<thead>
<tr>
<th>PORTFOLIO</th>
<th>Country Component</th>
<th>Country Weights</th>
<th>Rate of Return in Base Currency</th>
<th>BENCHMARK</th>
<th>Country Weights</th>
<th>Rate of Return in Base Currency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Period 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>0.60</td>
<td>30.0%</td>
<td>50.0%</td>
<td>20.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>0.40</td>
<td>10.0%</td>
<td>50.0%</td>
<td>0.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Portfolio</td>
<td>100%</td>
<td>22.0%</td>
<td></td>
<td>10.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Period 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>0.55</td>
<td>5.0%</td>
<td>50.0%</td>
<td>10.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>0.45</td>
<td>30.0%</td>
<td>50.0%</td>
<td>15.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Portfolio</td>
<td>100%</td>
<td>16.25%</td>
<td></td>
<td>12.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compounded over overall period</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td></td>
<td>36.5%</td>
<td></td>
<td>32.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td></td>
<td>43.0%</td>
<td></td>
<td>15.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>40.30%</td>
<td></td>
<td>23.75%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Exhibit 12.8: Multiperiod Performance Attribution

<table>
<thead>
<tr>
<th>Country</th>
<th>Portfolio Country Weights</th>
<th>Rate of Return on Portfolio Segment</th>
<th>Rate of Return on Market Benchmark</th>
<th>Performance</th>
<th>Attribution to Security Selection</th>
<th>Attribution to Market Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Period 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>0.60</td>
<td>30.0%</td>
<td>20.0%</td>
<td>6.00%</td>
<td>1.00%</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>0.40</td>
<td>10.0%</td>
<td>0.0%</td>
<td>4.00%</td>
<td>1.00%</td>
<td></td>
</tr>
<tr>
<td><strong>Total Portfolio</strong></td>
<td>100%</td>
<td><strong>22.0%</strong></td>
<td><strong>10.0%</strong></td>
<td><strong>12.00%</strong></td>
<td><strong>10.00%</strong></td>
<td><strong>2.00%</strong></td>
</tr>
<tr>
<td><strong>Period 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>0.55</td>
<td>5.0%</td>
<td>10.0%</td>
<td>−2.75%</td>
<td>−0.125%</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>0.45</td>
<td>30.0%</td>
<td>15.0%</td>
<td>6.75%</td>
<td>−0.125%</td>
<td></td>
</tr>
<tr>
<td><strong>Total Portfolio</strong></td>
<td>100%</td>
<td><strong>16.25%</strong></td>
<td><strong>12.5%</strong></td>
<td><strong>3.75%</strong></td>
<td><strong>4.00%</strong></td>
<td><strong>−0.25%</strong></td>
</tr>
<tr>
<td><strong>Linked over Total Period</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Portfolio Unadjusted</td>
<td></td>
<td></td>
<td></td>
<td>18.075%</td>
<td>14.400%</td>
<td>1.745%</td>
</tr>
<tr>
<td><strong>Total Portfolio Adjusted</strong></td>
<td></td>
<td></td>
<td></td>
<td>18.075%</td>
<td>16.130%</td>
<td>1.945%</td>
</tr>
</tbody>
</table>
Exhibit 12.9: Analysis of Performance: Non-North American Equity Return in U.S. Dollars: One year (in percent)
Performance Appraisal
Risk

- The most common approach to global investment involves two steps:
  - The investor decides on an asset allocation across various asset classes based on expected returns and risks for the various asset classes.
  - An actively managed portfolio is constructed for each asset class, and a benchmark is assigned.
Risk Measures - Total, or Absolute Risk (Standard Deviation)

- Usually annualized and expressed in percent per year.
- If a global benchmark is assigned to the total portfolio, the standard deviation of the total portfolio and the global benchmark can be compared.
- The formula is: 
  \[ \sigma_{TOT} = \sqrt{\frac{1}{T-1} \times \sum_{t=1}^{T} (r_t - \bar{r})^2} \]

  Where \( T \) is the number of observations (e.g., 12 months)
Risk Measures (Continued)

- **Relative Risk (Tracking Error):**
  - Usually annualized, expressed in percent per year.
  - Tracking error is sometimes called *active risk*.
  - Measures how closely the portfolio, or segment of a portfolio, tracks a benchmark.

$$
\sigma_{er} = \sqrt{\frac{1}{T-1} \times \sum_{t=1}^{T} (er_t - \overline{er})^2}
$$

where $$er_t = r_t - I_t$$
## Exhibit 12.10: Tracking Error and Total Risk of International Portfolio

<table>
<thead>
<tr>
<th>Portfolio Segment</th>
<th>Total Risk (% per year)</th>
<th>Tracking Error to Relevant Benchmark (% per year)</th>
<th>Information Ratio (annualized)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japanese stocks</td>
<td></td>
<td>6%</td>
<td>3.33</td>
</tr>
<tr>
<td>European stocks</td>
<td></td>
<td>8%</td>
<td>2.50</td>
</tr>
<tr>
<td>Total portfolio</td>
<td>24%</td>
<td>7%</td>
<td>2.66</td>
</tr>
<tr>
<td>Benchmark</td>
<td>20%</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Risk-Adjusted Performance

- The Sharpe ratio measures reward to variability.
- The Sharpe ratio should be used only for the investor’s global portfolio.
- The Sharpe ratio is defined as:

\[
\text{Sharpe ratio} = \frac{\bar{r} - R_0}{S_{\text{tot}}} \]

Where \( R_0 \) is the risk-free rate.
Risk-Adjusted Performance

- Other measures include Treynor ratio which uses market risk (beta) and Jensen’s measure.

- The pertinent measure of risk of a portfolio of foreign assets should be its “contribution” to the risk of the global portfolio of the client.
Information Ratio

- Defined as the ratio of the excess return from the benchmark divided by the tracking error relative to the benchmark.

- Measures whether the excess return generated is large relative to the tracking error incurred.

- Grinold and Kahn (1995) assert that an IR of 0.50 is “good” and that an IR of 1.0 is “exceptional”.

- The formula is:

\[
IR = \frac{\text{er}}{\sigma_{\text{er}}}
\]
Examples - Question

- You are provided with annual return, standard deviation of returns, and tracking error to the relevant benchmark for three portfolios. Calculate the Sharpe ratio and information ratio for the three portfolios and rank them according to each measure.

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Return</th>
<th>Standard Deviation</th>
<th>Tracking error</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14.50%</td>
<td>19.50%</td>
<td>7.50%</td>
</tr>
<tr>
<td>2</td>
<td>17.25%</td>
<td>25.00%</td>
<td>8.00%</td>
</tr>
<tr>
<td>3</td>
<td>18.00%</td>
<td>24.00%</td>
<td>7.50%</td>
</tr>
<tr>
<td>Benchmark</td>
<td>14.00%</td>
<td>21.00%</td>
<td></td>
</tr>
<tr>
<td>Risk-free rate</td>
<td>6.00%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Examples

- **Sharpe Ratio** calculations

\[
\begin{align*}
\text{Portfolio 1} &= \frac{0.145 - 0.06}{0.195} = 43.59\% \quad \text{Rank 3} \\
\text{Portfolio 2} &= \frac{0.1725 - 0.06}{0.25} = 45.0\% \quad \text{Rank 2} \\
\text{Portfolio 3} &= \frac{0.18 - 0.06}{0.24} = 50.0\% \quad \text{Rank 1}
\end{align*}
\]
Example

- **Information ratio calculations:**

\[
\text{Portfolio 1} = \frac{0.145 - 0.14}{0.075} = 0.067 \quad \text{Rank 3}
\]

\[
\text{Portfolio 2} = \frac{0.1725 - 0.14}{0.08} = 0.4063 \quad \text{Rank 2}
\]

\[
\text{Portfolio 3} = \frac{0.18 - 0.14}{0.075} = 0.533 \quad \text{Rank 1}
\]
Exhibit 12.11: Risk-Return Performance Comparisons: World Equity Portfolios (U.S. dollars) *Four years*
Risk Allocation and Budgeting

- Performance appraisal requires that both return and risk measures be unbiased.

- The total risk (standard deviation) of a portfolio is the result of decisions at two levels:
  - The absolute risk allocation to each asset class.
  - The active risk allocation of managers in each asset class.
Implementation

- Important issues in constructing customized international benchmarks are:
  - Individual country/market weights
  - Countries, industries, and styles
  - Currency hedging
- Standard international equity indexes are weighted by market capitalization.
- Some prefer weights based on relative national GDP.
Biases in Performance Evaluation
Some Potential Biases in Return and Risk

- Infrequently traded assets
- Option-like investment strategies
- Survivorship bias: return
- Survivorship bias: risk
- Tricks sometimes used
Infrequently Traded Assets

*Smoothed pricing:* Infrequently traded assets: Some assets trade infrequently. This is the case for many alternative assets that are not exchange-traded, such as real estate or private equity. This is also the case for illiquid exchange-traded securities or OTC instruments often used by hedge funds.
Infrequently Traded Assets (cont’d)

Because prices used are often not up-to-date market prices, but estimates of fair value, their volatility is reduced (smoothing effect). It introduces serial correlation of returns and a downward bias to the measured risk of the assets. In addition, it reduces the apparent correlation with conventional (liquid) equity and fixed income assets.
Infrequently Traded Assets (2)

The bias can be large, so the true risk is much larger than the reported estimates. As suggested by Asness, Krail, and Liew (2001), Lo (2002) and Getmansky, Lo, and Makarov (2004), the correction requires taking serial correlation of return into account. This will lead to an increase in the estimated standard deviation and a decrease in the Sharpe ratio commonly used to measure risk-adjusted performance. After adjusting for serial correlation, Lo (2002) finds estimates that differ from the naive Sharpe ratio estimator by as much as 70 percent.
Infrequently Traded Assets (2)

Some hedge funds purport to be market neutral (i.e., funds with relatively small market betas), but Asness, Krail, and Liew (2001) show that including both contemporaneous and lagged market returns as regressors and summing the coefficients yields significantly higher market exposure.
Option-like investment strategies

- Risk measures used in performance appraisal assume that portfolio returns are normally distributed.

- Many investment strategies followed by hedge funds have some option-like features that violate the normality assumption. For example, hedge funds following so-called arbitrage strategies will generally make a “small” profit when asset prices converge to their arbitrage value, but they run the risk of a huge loss if their arbitrage model fails. Standard deviation or traditional VaR measures understate the true risk of losses.
Biases in Returns

- **Self-selection bias:** Hedge fund managers decide themselves whether they want to be included in a database. Managers that have funds with an unimpressive track record will not wish to have that information exposed. Some managers only include the best-performing funds.
Biases in Returns (cont’d)

- **Backfilling bias:** When a hedge fund enters a database, it brings with it its track record. Because only hedge funds with good track records enter the database, this creates a positive bias in past performance in the database. Ibbotson and Chen (2006) studied the TASS database from 1995 to 2006 and estimate that excluding backfilled data reduces the average annual return by some 350 basis points. Reliable index providers have recently taken steps to minimize backfill bias.
Biases in Return (2)

- **Survivorship bias:** In the investment industry, unsuccessful funds and managers tend to disappear over time. Only successful ones search for new clients and present their track records. This creates a survivor bias.
Biases in Return (2) (cont’d)

This problem is acute with hedge funds because they often do not have to comply with performance presentation standards. It is not uncommon to see hedge fund managers present the track records of only their successful funds, omitting those that have been closed. If a fund begins to perform poorly, perhaps even starting to go out of business, it may stop reporting its performance entirely, thus inflating the reported average performance of hedge funds. Hedge fund indexes and databases may only include funds that have survived. Funds with bad performance disappear and are removed from the database that is used by investors to select among existing funds.
Survivorship Bias

Most academic studies suggest that survivorship bias overstates return by 200-400 basis points per year. Malkiel and Saha (2005) studied the TASS database from 1996 to 2003 and estimated the average annual bias in performance to be 442 basis points. A similar survivorship bias exists for equity mutual funds, but it is smaller because the attrition rate of mutual funds is much smaller than the hedge fund attrition rate (of the order of 8 to 15 percent per year on average).
Survivorship Bias (cont’d)

Reliable hedge fund indexes are now be much less susceptible to survivorship bias as defunct hedge funds are kept in the database; however, funds that simply stop reporting still pose a problem.
Tricks sometimes played

A manager without any expertise has decided to launch five long/short hedge funds with some seed money. The investment strategies of the five funds are quite different. Actually, the investment strategy of fund A is just the opposite of that of fund E. After a couple of years, some have performed well and some badly, as could be expected by pure chance. The manager decides to close funds A, B, and C and to enter funds D and E in a well-known hedge fund database. The marketing pitch of the manager is that the funds have superior performance (Sharpe ratio of 1.7 and 2.7). What do you think?

<table>
<thead>
<tr>
<th>Fund Name</th>
<th>Mean Annual Return</th>
<th>Standard Deviation</th>
<th>Sharpe Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fund A</td>
<td>–30%</td>
<td>10%</td>
<td>–3.3</td>
</tr>
<tr>
<td>Fund B</td>
<td>–20%</td>
<td>10%</td>
<td>–2.3</td>
</tr>
<tr>
<td>Fund C</td>
<td>0%</td>
<td>10%</td>
<td>–0.3</td>
</tr>
<tr>
<td>Fund D</td>
<td>+20%</td>
<td>10%</td>
<td>1.7</td>
</tr>
<tr>
<td>Fund E</td>
<td>+30%</td>
<td>10%</td>
<td>2.7</td>
</tr>
</tbody>
</table>
Answer

The performance on the funds is purely random. But only the good-performing funds are included in the hedge fund database. The performance reported for a selection of funds is misleading. There is obvious survivorship and self-selection bias. Similarly, the performance of the hedge fund index is biased upward and misleading.
Tricks sometimes played (2)

An investment company decides to merge two of its international equity mutual funds:

- **Fund A** has 100 million of AUM, with a mediocre track record. The manager is fired.
- **Fund B** has 1 million of AUM, with a great track record. The manager will takeover the merged funds.

What will be the name and published track record of the new Fund?
Answer (2)

- The temptation for the investment company is to give the name of Fund B and use solely its track record, as the same manager takes over the merged fund.
- Ethical performance standards should not allow this track-record game.
Tricks sometimes played (3)

A manager leaves investment company X and joins investment company Y. He has a bad track record.

Should the accounts he/she managed be removed from the universe (composite) of his/her former investment company X when it reports its track record?

Should it be added to the universe (composite) of investment company Y newly-joined by the manager?
Answer (3)

- The temptation for Investment company X is to remove the past record of the accounts managed by the former manager from the reported track record of its composites, because the bad performance was due to a guy who is no longer with the firm. Hence including his/her bad performance would not be representative of the current firm.

- Investment company Y does not include the bad performance of the new manager. Anyway, they never had the accounts under management and the bad performance was caused by the old firm, not by the manager.

*Ethical performance standards should not allow Investment company X to adjust its reported past performance.*

*A similar question arises when a client leaves the investment company because of the bad performance of her account.*
Global Investment Performance Standards (GIPS®)

*Designed by the CFA Institute*

- Allow investors to compare investment firms on a global level and allows investment managers to compete globally.
- Also ensure uniformity in reporting so that results are directly comparable among investment managers.
- TWR is required.
- The concept of composites is central to AIMR presentation standards.
- A composite is an aggregation of a number of portfolios into a single group that is representative of a particular objective or strategy.
Global Investment Performance Standards (GIPS®)

- In 2005, a new version of GIPS was published to be used worldwide.
- As of 2006, GIPS replaced the AIMR-PPS standards and are being adopted by many countries.
### Exhibit 12.A: Account Valuation Reports (explanation)

<table>
<thead>
<tr>
<th>Description of Security</th>
<th>(1) Number of Securities or Nominal</th>
<th>(2) Market Price (local currency)</th>
<th>(3) Accrued Interest (%)</th>
<th>(4) Capital Amount ($)</th>
<th>(5) Accrued Interest ($)</th>
<th>(6) Subtotal ($)</th>
<th>(7) Subtotal (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Equity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States (in $)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMAX</td>
<td>1,000</td>
<td>24.50</td>
<td></td>
<td>24,500</td>
<td></td>
<td>24,500</td>
<td>24,500</td>
</tr>
<tr>
<td>Exxon</td>
<td>500</td>
<td>37.25</td>
<td></td>
<td>18,625</td>
<td></td>
<td>28,125</td>
<td>29.8</td>
</tr>
<tr>
<td>Japan (in yen)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hitachi</td>
<td>10,000</td>
<td>800</td>
<td></td>
<td>34,320</td>
<td></td>
<td>34,320</td>
<td></td>
</tr>
<tr>
<td>TDK</td>
<td>1,000</td>
<td>6,500</td>
<td></td>
<td>27,885</td>
<td></td>
<td>34,405</td>
<td>43.0</td>
</tr>
<tr>
<td>France (in euros)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Club Med</td>
<td>200</td>
<td>77</td>
<td></td>
<td>18,326</td>
<td></td>
<td>18,326</td>
<td>12.7</td>
</tr>
<tr>
<td><strong>Bonds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Govt. 6% 92</td>
<td>2,000,000</td>
<td>91.0%</td>
<td>0.52%</td>
<td>7,807</td>
<td>45</td>
<td>8,262</td>
<td>14.5</td>
</tr>
<tr>
<td>EIB 8.5% 93</td>
<td>3,000,000</td>
<td>98.5%</td>
<td>3.47%</td>
<td>12,677</td>
<td>447</td>
<td>13,124</td>
<td></td>
</tr>
<tr>
<td><strong>Cash</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. dollars</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>144,140</td>
<td>492</td>
<td>144,632</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Exchange rates:  
Yen = 0.00429 dollars  
Euro = 1.19 dollars  

Market indexes (price only):  
U.S. stocks = 100  
Japanese stocks = 100  
Yen bonds = 100  
World index = 100  
French stocks = 100
# Exhibit 12.A: Account Valuation Reports (explanation) (cont’d)

<table>
<thead>
<tr>
<th>(1) Description of Security</th>
<th>(2) Number of Securities of Nominal</th>
<th>(3) Market Price (local currency)</th>
<th>(4) Accrued Interest (%)</th>
<th>(5) Capital Amount ($)</th>
<th>(6) Accrued Interest ($)</th>
<th>(7) Subtotal ($)</th>
<th>(8) Subtotal (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Equity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States (in $)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMAX</td>
<td>1,000</td>
<td>23.50</td>
<td></td>
<td>23,500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exxon</td>
<td>500</td>
<td>38.00</td>
<td></td>
<td>19,000</td>
<td></td>
<td>42,500</td>
<td>28.8</td>
</tr>
<tr>
<td>Japan (in yen)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hitachi</td>
<td>10,000</td>
<td>820</td>
<td></td>
<td>36,900</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDK</td>
<td>1,000</td>
<td>6100</td>
<td></td>
<td>27,450</td>
<td></td>
<td>64,350</td>
<td>43.5</td>
</tr>
<tr>
<td>France (in euros)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Club Med</td>
<td>200</td>
<td>87</td>
<td></td>
<td>19,140</td>
<td></td>
<td>19,140</td>
<td>12.9</td>
</tr>
<tr>
<td><strong>Bonds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Govt. 6% 92</td>
<td>2,000,000</td>
<td>90.0%</td>
<td>1.04%</td>
<td>8,100</td>
<td>94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EIB 8.5% 93</td>
<td>3,000,000</td>
<td>96.9%</td>
<td>4.16%</td>
<td>13,081</td>
<td>562</td>
<td>21,837</td>
<td>14.8</td>
</tr>
<tr>
<td><strong>Cash</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. dollars</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>147,171</td>
<td>656</td>
<td>147,827</td>
<td>100</td>
</tr>
</tbody>
</table>

Exchange rates:
- Yen = 0.0045 dollars
- Euro = 1.10 dollars

Market indexes (price only):
- U.S. stocks = 102.5
- Japanese stocks = 98
- French stocks = 108
- Yen bonds = 99
- World index = 102