**Performance Evaluation**

* Why do we need it?
	+ Evaluating actively managed funds
		- Pension funds
		- Mutual funds
	+ Comparing the performance of portfolios with different risks
		- Absolute measures not sufficient (simple returns)
		- Relative measures control for risk (risk-adjusted returns)
	+ Determining where to allocate funds
		- Which managers have skill?
* Sharpe Ratio
	+ Measures reward-to-risk using total risk
		- Uses the standard deviation, which captures all variations in the stock returns
	+ If we are in a mean-variance world, the Sharpe ratio is the most important ratio we can calculate
		- We don’t have assumptions about what risk is important, so we use it all
* Treynor Measure
	+ If we assume that we are in a CAPM world, then the Treynor measure is an important number
		- If systematic risk is all that matters, then it’s all we should base our ratio of reward-to-risk on
* Example: Risk-Adjusted Measures
	+ Consider the following risk and return measures for an actively managed portfolio and a market index portfolio:

|  |  |  |
| --- | --- | --- |
|  | Active Portfolio | Market Portfolio |
| Average Return | 24% | 19% |
| Std Deviation | 35% | 22% |
| Beta | 1.4 | 1.0 |

* + If the risk-free rate is 6%, evaluate the relative performance of the actively managed portfolio (use Sharpe ratio and Treynor measure)
* Limits of risk-adjusted measures
	+ Assumptions underlying measures limit their usefulness
		- What’s the investment situation?
		- For what type of risk do we require compensation?
	+ When the portfolio is being actively managed, basic stability requirements are not met
		- Changing investment strategies could bias the statistics
	+ Practitioners often use benchmark portfolio comparisons to measure relative performance
* Performance Attribution
	+ We can use the benchmark portfolio in order to evaluate our decision-making across 2 dimensions:
		- Asset Allocation: how well did we do in deciding what assets or industries to invest in?
		- Security selection: how well did we do in picking individual securities?
	+ It’s not always possible to cleanly divide these 2 effects, so we will also calculate a third Interaction value
* Performance Attribution: Asset Allocation
	+ Calculate the value added through asset allocation using the formula:
	+ Benchmark return in industry vs. benchmark overall
	+ i represents a particular industry/asset class
		- The formula indicates the effect of each of these
	+ p represents our portfolio, while B represents the benchmark portfolio
	+ for each industry/asset class i, we multiply the 2 terms together:
		- the weight of i in the benchmark minus the weight of i in our portfolio
		- the benchmark’s return in i minus the total benchmark return
* Example: Performance Attribution
	+ You want to analyze your portfolio’s performance over the last year. You start with some basic stats:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Asset Class | Weight (P) | Return (P) | Weight (B) | Return (B) |
| Equity | 85% | 5% | 75% | 4% |
| Bonds | 15% | 2% | 25% | 3% |
| Total | 100% | 4.55% | 100% | 3.75% |

* + How much value did you add via asset allocation?
* Performance Attribution: Security Selection
	+ Calculate value added through security selection using formula:
	+ For each industry/asset class, we multiply 2 terms together:
		- The weight of i in the benchmark
		- The return of i in our portfolio minus the return of i in the benchmark
* Example: Performance Attribution
	+ Recall data from the previous example:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Asset Class | Weight (P) | Return (P) | Weight (B) | Return (B) |
| Equity | 85% | 5% | 75% | 4% |
| Bonds | 15% | 2% | 25% | 3% |
| Total | 100% | 4.55% | 100% | 3.75% |

* + How much value did you add via security selection?
* Performance Attribution: Interaction
	+ The leftover that we are unable to classify is captured by the formula:
	+ For each industry/asset class i, we multiply 2 terms together:
		- The weight of i in our portfolio minus the weight of i in the benchmark
		- The return of i in our portfolio minus the return of i in the benchmark
* Example: Performance Attribution
	+ Recalling the data, how much value were you not able to attribute to a cause?
* Summing it up
	+ Value added from asset allocation=0.1%
		- Good decision to overweight stocks (0.025%)
		- Good decision to underweight bonds (0.075%)
	+ Value added from security selection=0.5%
		- We chose better stocks than the benchmark (0.75%)
		- This was partially offset by us picking inferior bonds to the benchmark (-0.25%)
	+ Value added that we couldn’t identify=0.2%
		- We over-weighted our outperforming stocks (0.1%)
		- We underweighted our outperforming bonds (0.1%)
	+ These add up to the difference in our portfolios return and our benchmark