FN452: Asset management and portfolio analysis

Performance evaluation

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Risk-adjusted measures of portfolio performance

- Portfolio performance evaluation is an integral part of portfolio management
- Portfolios are essentially evaluated in terms of return, but they should be compared with others in the same risk class
- The risk of a portfolio can be measured by total risk (the standard deviation of the portfolio's return) or Nondiversifiable risk (the beta of the portfolio in the CAPM framework)

Risk-adjusted measures of portfolio performance

- The appropriate measure of risk depends on the *investor's* circumstances: A well-diversified investor is interested in non-diversifiable risk; An undiversified investor is interested in total risk
- A large number of measures of risk-adjusted portfolio performance have been devised, including:
  - The Sharpe ratio
  - Treynor's measure
  - Jensen's Alpha
  - The information ratio (or appraisal ratio)

Sharpe ratio

- The Sharpe measure is the reward to variability ratio for the portfolio *"p"*

$$S_p = \frac{\bar{r}_p - r_f}{\sigma_p}$$

- If the portfolio represents the entire risky investment, then use the Sharpe measure
- The Sharpe ratio is not appropriate for funds considered as part of a larger portfolio
  - In this case, an investor will want to use a measure which looks at the value added relative to the portfolio currently being held

Treynor ratio

- Treynor ratio utilizes a portfolio's beta to measure risk

$$T_p = \frac{\bar{r}_p - r_f}{\beta_p}$$

- If the fund is well diversified, we should use Treynor Measure (systematic risk) to measure the risk-adjusted performance

Jensen's alpha

- Like Treynor's measure, Jensen's measure is based on the asset-pricing implications of the CAPM.

$$E(r_p) - r_f = \beta_p[E(r_m) - r_f]$$

- The best estimate of α_p is the intercept from the following regression:

$$r_{pt} - r_{ft} = \alpha_p + \beta_p[r_{mt} - r_{ft}] + \varepsilon_{pt}$$

- One issue with the alpha is that it does not adjust for the amount of nonsystematic risk in the portfolio

Information ratio

$$\text{Information ratio} = \alpha_p / \sigma_{\epsilon,p}$$

- This formula comes from

$$S_q^2 = S_m^2 + \left[\frac{\alpha_p}{\sigma_{\epsilon,p}}\right]^2$$

- Unsystematic risk could, in theory, be eliminated by diversification
- If we seek an active portfolio to mix with an index portfolio, then we can use the information ratio as a key measurement
- When the hedge fund is optimally combined with the baseline portfolio, the improvement in the Sharpe measure will be determined by its information ratio

Management style and the appropriate benchmark

- If a passive fund manager is tracking the S&P 500, then clearly the appropriate benchmark for the fund is the S&P 500
- An active fund manager can also make small adjustments to the weights of the S&P 500 and use the index as the benchmark
- However, if an active fund manager starts with *small* stocks, and applies his/her views to this, the appropriate index would be small stock indices

Management style and the appropriate benchmark

- Very commonly, funds declare the type of investments they are making, which is known as the fund's **style**
- But often, the style that a fund declares differs from the style that the fund actually follows
- However, it is straightforward to *estimate* a fund's style using historical data, and thus construct an appropriate benchmark for the fund to use for performance evaluation

Active management style

- For example, consider iShares Core S&P Small-Cap ETF (IJR)
- If we go to https://finance.yahoo.com and enter the ticker symbol for this fund, and then go to *Profile*, we can see how the fund describes itself
- Or we can search for *Fund fact sheet* of this ETF
- How do we really know the investment style of this fund, and what is the appropriate benchmark against which to evaluate it?

IJR

iShares Core S&P Small-Cap ETF

Fact Sheet as of 12/31/2020

iShares by BLACKROCK

The iShares Core S&P Small-Cap ETF seeks to track the investment results of an index composed of small-capitalization U.S. equities.

WHY IJR?

1. Exposure to small U.S. companies
2. Low cost access to a specific segment of the domestic stock market
3. Use at the core of your portfolio to seek long-term growth

GROWTH OF 10,000 USD SINCE INCEPTION

The Growth of $10,000 chart reflects a hypothetical $10,000 investment and assumes reinvestment of dividends and capital gains. Fund expenses, including management fees and other expenses were deducted.

KEY FACTS

Fund Launch Date	05/22/2000
Expense Ratio	0.06%
Benchmark	S&P SmallCap 600 Index
30 Day SEC Yield	1.27%
Number of Holdings	601
Net Assets	$56,114,139,046
Ticker	IJR
CUSIP	464287804
Exchange	NYSE Arca

TOP HOLDINGS (%)

BLK CSH FND TREASURY SL AGENCY	0.78
CAPRI HOLDINGS LTD	0.72
NEOGENOMICS INC	0.68
CLEVELAND CLIFFS INC	0.66
YETI HOLDINGS INC	0.59
OMNICELL INC	0.58
BROOKS AUTOMATION INC	0.57
POWER INTEGRATIONS INC	0.56
SAIA INC	0.54
EXPONENT INC	0.53
	6.21

Holdings are subject to change.

Source: ishares.com

PERFORMANCE

	1 Year	3 Year	5 Year	10 Year	Since Inception
NAV	11.24%	7.74%	12.36%	11.89%	10.01%
Market Price	11.30%	7.75%	12.38%	11.89%	10.01%
Benchmark	11.29%	7.74%	12.37%	11.92%	10.10%

TOP SECTORS (%)

Industrials	17.49%
Financials	16.26%
Consumer Discretionary	14.89%
Information Technology	14.77%
Health Care	12.08%
Real Estate	7.90%
Materials	5.59%
Consumer Staples	3.60%
Energy	3.05%
Communication	2.52%
Utilities	1.58%
Cash and/or Derivatives	0.28%

FUND CHARACTERISTICS

Beta vs. S&P 500	1.30
Standard Deviation (3yrs)	25.86%
Price to Earnings	19.56
Price to Book Ratio	1.87

FEES AND EXPENSES BREAKDOWN

Expense Ratio		**0.06%**
Management Fee	0.06%	
Acquired Fund Fees and Expenses	0.00%	
Foreign Taxes and Other Expenses	0.00%	

Source: ishares.com

Style analysis

- In order to establish the appropriate benchmark for an active fund, we use **style analysis**
- The resulting benchmark is known as the **style benchmark portfolio**, which is a portfolio of individual **style indices**, reflecting passive investments in the different styles, such as:
  - Value / growth
  - Small-cap / large-cap
  - US equities / European equities / Emerging market equities
  - Government bonds / High-yield bonds

Style analysis

- When investors invest in a security, what they are really doing is exposing themselves to different factors and risks
- Instead of investing one dollar in that asset, investors could **invest in ETFs and mutual funds that replicate its risk exposure**
- How should investors allocate the dollar across style/factor proxies to replicate the original security as much as possible?

Style analysis

- Similar to asset pricing regressions, investors can then decompose the performance of the interested stock or the active fund into:
  - the performance of the fund that is due to the fund's *style* or *factors* (i.e. the performance of the style benchmark portfolio)
  - the performance that is due to the fund manager's *stock selection* ability (alpha)

Style analysis

- Investors evaluate the active fund by comparing its performance with that of the style benchmark portfolio using the performance measures described earlier, such as alpha
- Essentially, they are replacing the single factor model used in the performance described above, with a multifactor model, where the factors are style indices

$$R_{i,t} = \alpha_i + \beta_{1,i}R_{1,t} + \beta_{2,i}R_{2,t} + \cdots + \beta_{k,i}R_{k,t} + \epsilon_{i,t}$$

Style analysis

- To undertake style analysis or factor regressions for a fund, we first choose a set of style indices or factors; for example, we might choose style indices for
  - Large cap/Growth
  - Large cap/Value
  - Small cap/Growth
  - Small cap/Value
- To replicate these style indices, we can use data on **exchange trade funds** (**ETFs**), which can be obtained from https://finance.yahoo.com

Style analysis

- From the adjusted close prices, we can compute simple returns
- We then construct a style benchmark portfolio from these style indices using random weights, and calculate the squared errors
- To complete the style analysis of the portfolio, we use Excel's Solver to select the style benchmark portfolio weights to minimize the fund's sum of squared errors, subject to the constraints:
  - the weights sum to one
  - the weights are positive (because this is a mutual fund (or ETF) and hence not permitted to take short positions)