Risk Management and Investment Management

FRM二级培训讲义-强化班

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Topic Weightings in FRM Part II

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Framework

Risk Management and Investment Management

- Factor Investing
- Portfolio Construction
- Portfolio Risk
  - Portfolio Risk Measures
  - Portfolio Risk Management
- Performance Measurement and Evaluation
- Hedge Funds
- Due Diligence and Fraud Risk

Reading 1

Factor Investing

Factor Investing

- **Factor Theory**
  - Factors matter, not assets.
  - Assets are bundles of factors.
  - Different investors need different risk factors.
- The **factor theory** is trying to explain the phenomenon:
  - Investors exposed to losses during bad times are compensated by risk premiums in good times.

$$E(R_P) = R_f + \beta_P[E(R_M) - R_f]$$

  - While the CAPM captures the notion of bad times **solely** by means of low returns of the **market portfolio,** each factor in a multifactor model provides its own definition of bad times.
- Multifactor models recognize that **bad times** can be defined **more broadly** than just bad returns on the market portfolio.

$$E(r_i) = r_f + \beta_{i,1}E(f_1) + \beta_{i,2}E(f_2) + \cdots + \beta_{i,k}E(f_k)$$

Why Inefficient

- **In a rational explanation**, high returns compensate for losses during bad times.
  - The key is defining those bad times and deciding **whether these are actually bad times** for an individual investor.
    - ✓ Certain investors benefit from low economic growth even while the majority of investors find these to be bad periods.
- **In a behavioral explanation**, high expected returns result from agents' **under-or overreaction** to news or events. Behavioral biases can also result from the inefficient updating of beliefs or ignoring some information.
- For some risk premiums, the most compelling explanations are rational (as with the volatility risk premium), for some behavioral (e.g., momentum), and for some others **a combination of rational and behavioral** stories prevails (like value/growth investing).

Factors

- **There are two types of factors.**
  - The **first type** is **macro, fundamental-based factors,** which include economic growth, inflation, volatility, productivity, and demographic risk.
  - The **second type** is **investment-style factors** like the market factor of the capital asset pricing model (CAPM). To be more specific, investment-style factors can be divided into
    - ✓ **Static factors**, like the **market factor** in CAPM, which we simply go long to collect a risk premium;
    - ✓ **Dynamic factors**, which can only be exploited through constantly trading different types of securities.

Macroeconomic Risk Factors

- **Volatility:**
  - **leverage effect:** The negative relation between volatility and returns.
- Volatility protection
  - Enter into **volatility swaps** as fixed volatility payer
  - **Buy** out-of-the-money puts
  - Buy Bonds
- The risk to sell volatility protection
  - **Sold volatility** prior to the financial crisis
  - Steady payoffs during stable times V.S. huge crash
  - The relation between volatility and expected returns is **time varying**

Dynamic Risk Factors

- The Fama–French (1993) model explains asset returns with three factors. There is the traditional CAPM market factor and there are two additional factors to capture a size effect and a value/growth effect:

$$E(r_i) = r_f + \beta_{i,MKT} E\left(r_m - r_f\right) + \beta_{i,SMB} E(SMB) + \beta_{i,HML} E(HML)$$

  - **SMB factor**, which refers to the differential returns of small stocks minus big stocks.
    - ✓ **Size strategy**: long small cap stocks and short large cap stocks
  - **HML factor**, which stands for the returns of a portfolio of high book-to-market stocks minus a portfolio of low book to market stocks.
    - ✓ **Value strategy**: long value stocks and short growth stocks
      - ◆ Value stock company has **high and asymmetric adjustment cost**.

Momentum Investment Strategies

- **Momentum(also called WML or UMD)** is the strategy of buying stocks that have gone up over the past six (or so) months (winners) and shorting stocks with the lowest returns over the same period (losers).
  - The momentum effect refers to the phenomenon that winner stocks continue to win and losers continue to lose, just like "**Matthew Effect**".
  - Implementation of Momentum strategy
    - ✓ Price **rebounds in the short run.**
    - ✓ Price **eventually reverses** in the long run.
  - The cumulated profits of momentum has been significantly larger than that of size or value strategies.

Value and Momentum Investment Strategies

- **Same**:
  - The momentum strategy, like size and value, is a **cross-sectional strategy**, meaning that it compares one group of stocks against another group of stocks in the cross section, rather than looking at a single stock over time.
- **Difference**:
  - Value is a **negative feedback strategy**, where stocks with declining prices eventually fall far enough that they become value stocks.
  - Momentum is a **positive feedback strategy**. Stocks with high past returns are attractive, momentum investors continue buying them, and they continue to go up!

Factor Regression

- **The first approach:** Estimate the risk-adjusted factor benchmark
  - CAPM Benchmark

$$r_{it} - r_{ft} = \alpha + \beta(r_{mt} - r_{ft}) + \varepsilon_{it}$$

  - Size and Value-Growth Benchmarks

$$r_{it} - r_{ft} = \alpha + \beta(r_{mt} - r_{ft}) + sSMB_t + hHML_t + \varepsilon_{it}$$

  - Adding Momentum

$$r_{it} - r_{ft} = \alpha + \beta(r_{mt} - r_{ft}) + sSMB_t + hHML_t + uUMD_t + \varepsilon_{it}$$

- **The second approach:** Mimic portfolio
  - Without risk free asset: A benchmark is a passive portfolio of index funds in stocks and bonds

$$r_{it} = \alpha + \beta_s r_{st} + \beta_b r_{bt} + \varepsilon_{it}$$

  - Adding real estate

$$r_{it} = \alpha + \beta_{REIT} REIT_t + \beta_s r_{st} + \beta_b r_{bt} + \varepsilon_{it}$$

- The changes in **style weights** reflect changes in **investment styles**.

Low-risk Anomaly

- **The risky anomaly—**that stocks with **low betas and low volatilities** have **high returns**—appears to be a strong source of alpha relative to standard market-weighted benchmarks and value-growth, momentum, and other dynamic factors.
- **The low risk anomaly is a combination of three effects**
  - Volatility is **negatively related** with future returns.
  - Realized beta is **negatively related** with future returns.
  - Minimum variance portfolios **do better** than the market.

Volatility Anomaly

- **Data evidence:**
  - Lagged Volatility and Future Returns(negative correlation)
  - Contemporaneous Volatility and Returns(negative correlation)
  - Lagged Beta and Future Returns(negative correlation but insignificant)
  - Contemporaneous Beta and Returns(positive correlation)
- **Risk Anomaly Explanations**
  - Data Mining
  - Leverage Constraints(can’t take more risk as they are leveraged)
  - Agency Problems(Many institutional managers can’t or won’t play the risk anomaly)
  - Preferences(If asset owners simply have a preference for high-volatility and high-beta stocks.)

Example

- Given the formula below, where gamma, γ, is the risk aversion of the average investor and σ_m^2 is the variance of the market return:

$$E(r_m) - r_f = \bar{\gamma}\sigma_m^2$$

- Which of the following statements is TRUE about the relationship between returns (or earned premiums) and volatilities?
  A. In theory, the risk aversion coefficient is negative; but in data, the risk aversion is always positive
  B. Pure derivatives volatility trading takes a stance on expected returns; i.e., is necessarily directional
  C. Rebalancing as a portfolio strategy is a short volatility strategy which earns a volatility risk premium
  D. Selling volatility protection through derivatives markets is ultimately a low-risk strategy due to long-term mean reversion
- **Correct answer: C**

Example

- The Fama-French three-factor model is given by the following formula

$$E(r_i) = r_f + \beta_{i,MKT}E\left(r_m - r_f\right) + \beta_{i,SMB}E(SMB) + \beta_{i,HML}E(HML)$$

- Which of the following statements about Fama-French model is TRUE?
  A. Unlike the size factor, the value premium is robust and outperforms over the long-run
  B. Since 1965 to roughly the present, the size factor (size effect) in Fama-French has been significant and robust
  C. Although the size effect continues to be robust and significant, small stocks do NOT have higher returns, on average, than large stocks
  D. The salient feature of value stocks is their tendency, both in theory and in the data, to outperform growth stocks especially during bad times for the economy
- **Correct answer: A**

Reading 2

Portfolio Construction

Inputs to the Portfolio Construction Process

- **Portfolio construction requires several inputs:**
  1. The current portfolio: of these inputs, we can measure only the current portfolio with near certainty.
  2. Alphas
  3. Covariance estimates
  4. Transactions cost estimates
  5. Active risk aversion: Most active managers will have a target level of active risk that we must make consistent with an active risk aversion.

Refining Alphas

- With alpha analysis, the alphas can be adjusted so that they are in line with the manager's desires for risk control and anticipated sources of value added.
  - Scale the alphas: $\alpha = \sigma \times IC \times Score$
  - Trim alpha outliers: Data cleaning
  - Neutralization
    - ✓ Benchmark- and Cash-Neutral Alphas
    - ✓ Risk-Factor-Neutral Alphas

Transactions Cost

- **Implications Transaction Costs have on Portfolio Construction**
  - Transactions costs force greater precision on our estimates of alpha.
  - **Rebalancing** incurs transaction costs.
- **Frequent revision or less frequent revision**
  - If a manager knows how to make the correct trade-off between expected active return, active risk, and transactions costs, frequent revision will not present a problem
  - If manager is unsure of ability to correctly specify alphas, active risk, and transactions costs, **a crude but effective cure is to revise the portfolio less frequently.**
- **Dispersion:** The difference between the maximum return and minimum return for separate account portfolios.
  - Trade off between dispersion and rebalance cost

Practical Issues

1. **Determination of Optimal Risk Aversion**

$$\lambda_A = \frac{IR}{2 \times TEV}$$

2. **Incorporation of Specific Risk Aversion**
   - Classify risk aversion into specific risk aversion and common-factor risk aversion.
3. **Proper Alpha Coverage**
   - If we forecast returns on stocks that are not in the benchmark, we can always handle that by **expanding the benchmark** to include those stocks, albeit with zero weight.
   - If there is a lack of forecast returns in the benchmark, **adjust alphas to make benchmark neutral.**

Exercise

- Which of the following is correct with respect to adjusting the optimal portfolio for portfolio constraints?
  A. No reliable method exists.
  B. By refining the alphas and then optimizing, it is possible to include constraints of both the investor and the manager.
  C. By refining the alphas and then optimizing, it is possible to include constraints of the investor, but not the manager.
  D. By optimizing and then refining the alphas, it is possible to include constraints of both the investor and the manger.

- **Correct Answer: B**

Portfolio Construction Techniques

- **Four portfolio construction techniques**
  - Screens
  - Stratification
  - Linear programming
  - Quadratic programming

Portfolio Construction Techniques

- **Screens**
  - Rank the original stocks by alpha.
  - Choose the first 50 stocks (for example).
  - Equal-weight (or capitalization-weight) the stocks
- **Strength**
  - Easy to implement and understand.
  - It **enhances return** by selecting high-alpha assets and controls risk by having a sufficient number of assets for **diversification.**
- **Weakness**
  - **Ignores** all information in alphas aside from ranking.
  - **Excluding those categories** of assets that tend to have low alphas.

Portfolio Construction Techniques

- **Stratification**
  - Stratification is "glorified" screening.
  - Divide the stocks in categories (e.g., economic sectors, big/medium/small) and mimic the screening exercise.
- **Major strength over screens**
  - ignoring biases in the alphas across categories.

Portfolio Construction Techniques

- **Linear Programming**
  - The linear programming approach characterizes stocks along dimensions of risk, e.g., **industry, size, volatility, and beta**.
  - The linear program will then attempt to build portfolios that are reasonably close to the benchmark portfolio in all of the dimensions used for risk control.
- **Strength**
  - Takes all the information about alpha into account and controls tracking risk by keeping the characteristics of the portfolio close to the characteristics of the benchmark.
- **Weakness**
  - Has difficulty producing portfolios with a pre-specified number of stocks.
  - The risk-control characteristics may conflict with the alphas.

Portfolio Construction Techniques

- **Quadratic Programming**
  - **Ultimate** in portfolio construction
  - Explicitly considers all three elements: **alpha, risk, and transactions costs**.
- **Weakness**
  - Requires a great many more inputs than the other portfolio construction techniques. **More inputs mean more noise**.

Reading 3

Portfolio Risk Measures

Portfolio VaR

- **Individual VaR**

$$VaR_i = Z_c\sigma_i|V_i| = Z_c\sigma_i|\omega_i|V_p$$

- **Diversified VaR and Undiversified VaR**
  - Diversified VaR accounts for diversification effects.

$$VaR_p^2 = VaR_1^2 + VaR_2^2 + 2\rho VaR_1 VaR_2$$

  - Undiversified VaR is simply the sum of the individual VaRs.

$$VaR_p = VaR_1 + VaR_2$$

Exercise 1

- A risk manager is evaluating a pairs trading strategy recently initiated by one of the firm's traders. The strategy involves establishing a long position in Stock A and a short position in Stock B. The following information is also provided:
  - 1-day 99% VaR of Stock A is USD 100 million
  - 1-day 99% VaR of Stock B is USD 125 million
  - The estimated correlation between long positions in Stock A and Stock B is 0.8

  Assuming that the returns of Stock A and Stock B are jointly normally distributed, the 1-day 99% VaR of the combined positions is closest to?

  A. USD 0 million

  B. USD 75 million

  C. USD 160 million

  D. USD 225 million

- **Correct Answer: B**

Portfolio VaR

Marginal VaR

- The **change in portfolio VaR** resulting from taking an **additional dollar** of exposure to a given component. It is also the **partial derivative** with respect to the component position.

$$MVAR_A = \frac{\partial VaR_p}{\partial V_A}$$

$$= z_\alpha \times \frac{Cov(R_A, R_P)}{\sigma_p}$$

$$= z_\alpha \times \rho_{A,P} \times \sigma_A$$

$$= z_\alpha \times \beta_{A,P} \times \sigma_P$$

$$= \frac{VaR_p}{V_p} \times \beta_{A,P}$$

Portfolio VaR

- **Incremental VaR**
  - **Change in VaR** owing to a **new position.**
  - Differs from marginal VaR: amount added or subtracted can be large.
  - Incremental VaR requires a **full revaluation** of the portfolio VaR with the new trade:

$$Incremental\ VaR = VaR_{a+p} - VaR_p$$

  - Approximate computation:

$$Incremental\ VaR_A \approx MVaR_A \times V_A(any\ amount)$$

Portfolio VaR

- **Component VaR**
  - Is a partition of the portfolio VaR: how much does portfolio VaR change approximately if the given component was deleted?
  - By construction, component VaRs sum to portfolio VaR.

$$CVaR_A = MVaR_A \times V_A$$

$$\frac{CVaR_A}{VaR_P} = \omega_A \times \beta_{A,P}$$

$$\sum_{i=1}^{N} \omega_i \beta_{i,p} = 1$$

Exercise 2

- Given the following information, what is the percent of contribution to VaR from Asset A? There are two assets in a portfolio: A and B.

Asset A marginal VaR	0.05687
Asset A value	$7,000,000
Asset B marginal VaR	0.17741
Asset B value	$4,000,000

A. 64.04%

B. 24.27%

C. 35.94%

D. 63.64%

- **Correct Answer: C**

Exercise 3

- Suppose a portfolio consists of a USD 1 million investment in Euros and a USD 4 million investment in Mexican Pesos. Additional information is given below:
  - Portfolio beta of Euro = 0.90
  - Portfolio beta of Peso = 1.025
  - Diversified Portfolio VaR = USD 324,700
  - Based on the given information, the marginal VaR and the component VaR of the Euro position are closest to:

	Marginal VaR	**Component VaR**
A.	USD 0.058	USD 58,446
B.	USD 0.292	USD 292,230
C.	USD 0.084	USD 337,688
D.	USD 0.106	USD 422,110

- **Correct Answer: A**

Reading 4

Portfolio Risk Management

VaR Applications to Different Risks

- **VaR applications to different risks**
  1. Absolute Risk vs. Relative Risk
  2. Policy mix risk vs. Active management risk
  3. Funding Risk
  4. Sponsor Risk

Measure Different Risks

① Absolute Risk vs. Relative Risk

- The difference is whether the loss is measured relative to zero or a benchmark.
- Absolute Risk: risk of a dollar loss over the horizon.
- Relative Risk: the risk of a dollar loss relative to benchmark. Shortfall measured as dollar difference between the fund return and benchmark return. Relevant return is the tracking error (TE), which is excess return of asset over benchmark.

$$TE = R_P - R_B$$

$$TEV = \sigma(e) = \sqrt{{\sigma_p}^2 - 2\rho\sigma_p\sigma_B + {\sigma_B}^2}$$

Measure Different Risks

② **Policy mix risk vs. Active management risk**

- The absolute risk can be broken down into two components, one is the **policy mix risk,** the other is **active management risk.**
  - ✓ **Policy mix risk:** the policy mix risk is the risk of a dollar loss owing to the policy mix selected by the fund.
  - ✓ **Active management risk:** the active management risk is the risk of a dollar loss owing to the total deviations from the policy mix.
  - ✓ **Total VaR ≤ Policy mix VaR+ Active management VaR**

Measure Different Risks

③ Funding Risk

- **Surplus** (S) is the difference between the value of the assets (A) and the liabilities (L).

$$Expected\ surplus = A \times (1 + R_A) - L \times (1 + R_L)$$

$$\Delta S = \Delta A - \Delta L$$

$$\sigma_{Surplus} = \sqrt{{V_A}^2{\sigma_A}^2 + {V_L}^2{\sigma_L}^2 - 2V_A \times V_L \times \sigma_A \times \sigma_L \times \rho_{AL}}$$

- **Funding risk** should be measured as the potential shortfall in surplus over the horizon, this is sometimes called **surplus at risk**.

$$Surplus\ at\ risk = Z_\alpha \times \sigma_{Surplus}$$

$$Surplus(one\ tail) = E_{surplus} - Z_\alpha \times \sigma_{Surplus}$$

Measure Different Risks

④ **Sponsor risk**

- **The sponsor is the owner of the fund,** who is ultimately responsible for the pension fund.
- **The sponsor risk**
  - ✓ **Cash-flow risk:** is the risk of year-to-year fluctuations in contributions to the pension fund.
  - ✓ **Economic risk:** is the risk of variation in total economic earnings of the plan sponsor.

Risk Budgeting

① Budgeting across Asset Classes

- **Process** of allocating and managing risk using a top-down approach to different aspects of the investment process.
- Process intended to systematically allocate return volatility across portfolio components (asset class, managers, and/or securities) to maximize return at a targeted level of risk.
  - ✓ First, **determine the total Value at Risk** (VaR) which can be "budgeted" to the firm.
  - ✓ Second, choose the optimal allocation of assets given the total risk profile.

Example

➢ A manager has a portfolio with only one position: a $500 million investment in W. The manager is considering adding a $500 million position X or Y to the portfolio. The current volatility of W is 10%. The manager wants to limit portfolio VaR to $200 million at the 99% confidence level. Position X has a return volatility of 9% and a correlation with W equal to 0.7. Position Y has a return volatility of 12% and a correlation with W equal to zero. Determine which of the two proposed additions, X or Y, will keep the manager within his risk budget.

$$VaR_W = 2.33 \times 10\% \times 500 = 116.50million$$

$$VaR_X = 2.33 \times 9\% \times 500 = 104.85million$$

$$VaR_Y = 2.33 \times 12\% \times 500 = 139.80million$$

$$VaR_{W+X} = \sqrt{(116.5)^2 + (104.85)^2 + 2 \times 0.7 \times 116.5 \times 104.85} = 204million$$

$$VaR_{W+Y} = \sqrt{(116.5)^2 + (139.8)^2} = 182million$$

- Y keeps the total portfolio within the risk budget.

Risk Budgeting

② Budgeting across Active Managers

- The optimal allocation across managers is:

$$\omega_i = \frac{IR_i \times TEV_p}{IR_p \times TEV_i}$$

- **Do not forget benchmark!**

Risk Budgeting

➢ **Budgeting across portfolios**

① **Create minimum portfolio risk**

✓ The portfolio manager can decrease portfolio risk by reducing positions with the highest marginal VaR.

◆ Repeat process until the portfolio risk has reached a **global minimum**.

✓ At this global minimum, all of the marginal VaRs must be equal, or all of the portfolio betas, must be equal to 1.

② **Create highest Sharpe ratio**

✓ The best combination of expected risk and return

✓ In order to make this ratio maximized, we have:

$$\frac{R_i - risk\ free\ rate}{MVaR_i} = \frac{R_j - risk\ free\ rate}{MVaR_j}$$

Liquidity Considerations

➤ **Liquidity Duration**

- The number of days required to liquidate any given security we term the liquidity duration for that security.

$$LD_i = \frac{Q_i}{0.15 \times V_i}$$

- Estimate how long it would take to liquidate a portfolio's holdings in an orderly fashion that is, without material market impact.

Exercise

➢ The pension management analysts at Bing Inc. use a two-step process to manage the assets and risk in the pension portfolio. First, they use a VaR-based risk budgeting process to determine the asset allocation across for broad asset classes. Then, within each asset class, they set a maximum tracking error allowance from a benchmark index and determine an active risk budget to distribute among individual managers. Assume the returns are normally distributed. From the first step in the process, the following information is available.

	Expected Return	Volatility	Asset Allocation	Individual VaR	Marginal VaR
Small cap	0.2%	2.66%	35.0%	6,491	0.055
Large cap	0.15%	2.33%	40.0%	6,497	0.044
Commodities	0.10%	1.91%	16.7%	2,216	0.020
Emerging market	0.15%	2.70%	8.3%	1,570	0.047
	Total VaR:13,322				

Exercise

- Which of the following statements is/are correct?
  I. Using VaR as the risk budgeting measure, the emerging markets class has the smallest risk budget.
  II. If an additional dollar were added to the portfolio, the marginal impact on portfolio VaR would be greatest if it were invested in small caps.
  III. As the maximum tracking error allowance is lowered, the individual managers have more freedom to achieve greater excess returns.
  IV. Setting well-defined risk limits and closely monitoring risk levels guarantee that risk limits will not be exceeded.
  A. I and II only
  B. II,III and IV
  C. II and III
  D. I only
- **Correct Answer: A**

Reading 5

Performance Measurement and Evaluation

Performance Evaluation

- Tool 1: The Green Zone
- Tool 2: The Sharpe and Information Ratios
- Tool 3: Alpha versus the Benchmark
- Tool 4: Alpha versus the Peer Group
- Tool 5: Attribution of Returns

Performance Evaluation

- **Tool 1: The Green Zone**
  - For prior week, month, year: calculate normalized returns (excess returns/tracking error) and tracking error.
  - Compare actual to target.
  - Policy decisions about deviations. (green/yellow/red)
    - ✓ **Green zone**: usual event with insignificant deviations.
    - ✓ **Yellow zone**: unusual event, but still is expected to occur with some regularity.
    - ✓ **Red zone**: truly unusual events and required immediate follow-up.

Performance Evaluation

Tool 2: The Sharpe and Information Ratios

- Holding Period Return

$$r_i = \frac{Total\ Proceeds}{Initial\ investment} = \frac{Int(Div)Income + Capital\ gain}{Initial\ investment}$$

- Time-Weighted Return

$$1 + r_G = [(1 + r_1)(1 + r_2) \ldots (1 + r_n)]^{1/n}$$

- Dollar-Weighted Return

✓ The rate of return at which the present value of cash inflows equals the present value of cash outflows.

Performance Evaluation

Tool 2: The Sharpe and Information Ratios

- Can be used to measure relative performance vis à vis the competition; e.g., peer group comparisons.
- Examples

✓ Sharpe's ratio and M² : $SR = \frac{R_P - R_F}{\sigma_P}$;

$$M^2 = \frac{\sigma_M}{\sigma_P}(R_p - R_f) - (R_M - R_f) = \sigma_M \times (SR_P - SR_M)$$

✓ Treynor ratio: $TR = \frac{R_P - R_F}{\beta_P}$

✓ Jensen's alpha: $\alpha_P = E(R_P) - \{R_F + \beta_P[E(R_M) - R_F]\}$

✓ Information Ratio: $IR = \frac{\alpha}{\sigma_\alpha}, or\ IR = \frac{excess\ return}{TE}$

Risk-Adjusted Performance Measures

Risk-free rate (T-bill)	5.0%	

	Portfolio P	Market M
Average return (r)	25%	20%
Beta	1.2	1.0
Standard deviation	18.0%	15.0%
Tracking error	6.0%	0

$$Sharpe\ Ratio = \frac{25\% - 5\%}{18\%} = 1.11$$

$$M^2 = 15\%(1.11 - 1) = 1.65\%$$

$$Treynor's\ Measure = \frac{25\% - 5\%}{1.2} = 0.1667$$

$$Jensen's\ Alpha = 25\% - [5\% + 1.2(20\% - 5\%)] = 2\%$$

$$Information\ Ratio = \frac{5\%}{6\%} = 0.833$$

Fundamental law of active management

- **Fundamental Law of Active Management**

$$IR \approx IC \times \sqrt{BR}$$

  - IC is the **information coefficient**, which is the correlation of the manager's forecast with the actual returns (how good the forecasts are);
  - BR is the **breadth** of the strategy (how many bets are taken).

- **Limitations**
  - It ignore transactions costs, restrictions on trading, and other real-world considerations
  - A crucial assumption is that the forecasts are independent of each other.

Performance Evaluation

- **Tool 3: Alpha versus the Benchmark**
  - This tool regresses the excess returns of the fund against the excess returns of the benchmark.
  - The outputs of this regression are:
    - ✓ An **intercept,** often referred to as **"alpha"**, or skill.
    - ✓ A **slope coefficient** against the excess returns of the benchmark, often referred to as **"beta"**.
- **Tool 4: Alpha versus the Peer Group**
  - This tool regresses the manager's excess returns against the excess returns of the manager's peer group.

Statistical Significance of Alpha

- **Alpha plays a critical role in determining portfolio performance.**
  - In order to assess a manger's ability of generate alpha, we conduct a t-test under the following hypotheses:
    - ✓ H_0: True alpha is zero
    - ✓ H_A: True alpha is not zero

$$t = \frac{\alpha}{\sigma/\sqrt{N}}$$

    - ✓ Where
    - ✓ α = alpha estimate;
    - ✓ σ = alpha estimate volatility
    - ✓ N = sample number of observations

Exercise

- Over the past year, the HIR Fund had a return of 7.8%, while its benchmark, the S&P 500 index, had a return of 7.2%. Over this period, the fund's volatility was 11.3%, while the S&P index's volatility was 10.7% and the fund's TEV was 1.25%. Assume a risk-free rate of 3%. What is the information ratio for the HIR Fund and for how many years must this performance persist to be statistically significant at a 95% confidence level?
  - A. 0.480 and approximately 16.7 years
  - B. 0.425 and approximately 21.3 years
  - C. 3.840 and approximately 0.2 years
  - D. 1.200 and approximately 1.9 years

- **Correct Answer: A**

Performance Evaluation

- **Tool 5: Attribution of Returns**
  - Identify the sources of **value addition** to the portfolio.
    - ✓ How much of the performance (excess returns above **bogey portfolio**) is attributable to the selection of the **risk asset classes.**
    - ✓ How much is attributable to **selection of right sector** or **security within an asset class.**

Market Timing Ability

- **Market Timing**
  - The ability to predict the future direction of market and **shifting funds** between the **market index portfolio** and **risk-free assets** depending on whether the market will outperform the risk-free assets.
- **No Market Timing**
  - the security characteristic line will be straight line with a **constant slope**.

$$r_p - r_f = a + b(r_M - r_f)$$

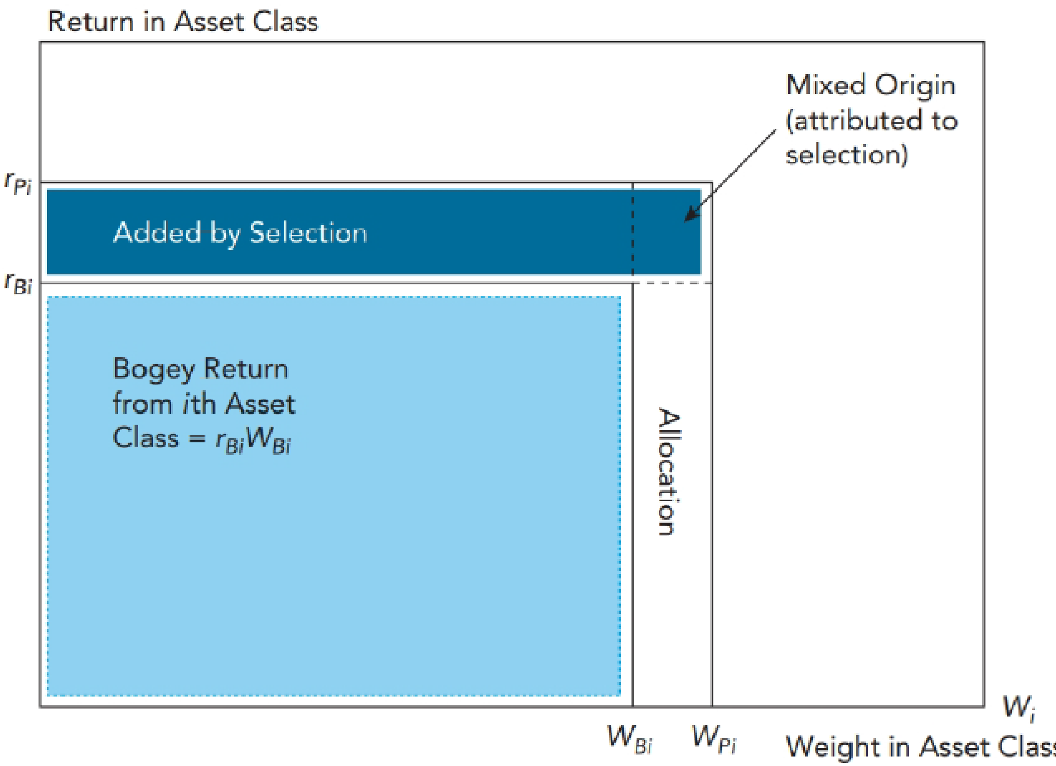
- **Market Timing (Treynor and Mazuy)**

$$r_p - r_f = a + b(r_M - r_f) + c(r_M - r_f)^2 + e_p$$

- **Market Timing (Henriksson and Merton)**

$$r_p - r_f = a + b(r_M - r_f) + c(r_M - r_f)D + e_p$$

Performance Attribution



Contribution from **Asset Allocation**

= Excess weight in asset class

× Benchmark return

$= (\boldsymbol{W_{Pi}} - \boldsymbol{W_{Bi}}) \times \boldsymbol{R_{Bi}}$

Contribution from **Security Selection**

= Weight in asset class

× Excess return

$= \boldsymbol{W_{Pi}}(\boldsymbol{R_{Pi}} - \boldsymbol{R_{Bi}})$

Total contribution from asset i

$= W_{Pi} \times R_{Pi} - W_{Bi} \times R_{Bi}$

$$R_A = \sum_{j=1}^{M} w_{P,j}\left(R_{P,j} - R_{B,j}\right) + \sum_{j=1}^{M}\left(w_{P,j} - w_{B,j}\right) R_{B,j}$$

Reading 6

Hedge Fund

Introduction of Hedge Funds

- **Hedge Funds versus Mutual Funds**
  - Private versus public
    - ✓ Historically, hedge funds are private investment vehicles not open to the general investment public.
    - ✓ Consequently, hedge funds face less regulation than publicly traded mutual funds.
  - Ability to take short positions
    - ✓ Typically hedge fund managers generate profit from both long as well as short positions.
  - Freedom to use high leverage
  - Ability to employ derivatives

Introduction of Hedge Funds

- **Bias in Hedge Fund Databases**
  - **Survivorship Bias**
    - ✓ Few hedge-fund databases maintain histories of funds that have shut down, partly for legal reasons, and partly because the primary users of these databases are investors seeking to **evaluate existing** managers they can invest in.
  - **Self-Selection Bias**
    - ✓ If a manager operates several hedge funds, it is questionable whether the poor performing ones will find their way into databases. In other words, there may well be a tendency to **"put the best face forward"**
  - **Backfill Bias**
    - ✓ A related and important form is sometime referred to as the "instant history" bias.
    - ✓ When **a new fund enters the database** some of its performance history during its incubation period is incorporated without clear distinction from the live performance data going forward.

Hedge Fund Strategies

- **Directional Strategies**
  - Trend Followers (Managed Futures)
  - Global Macro
- **Event-Driven Strategies**
  - Risk Arbitrage
  - Distressed Securities
- **Relative Value and Arbitrage-like Strategies**
  - Fixed Income Arbitrage
  - Convertible Arbitrage
  - Long/Short Equity
- **Niche Strategies**
  - Dedicated Short Bias
  - Emerging Market
  - Equity Market Neutral

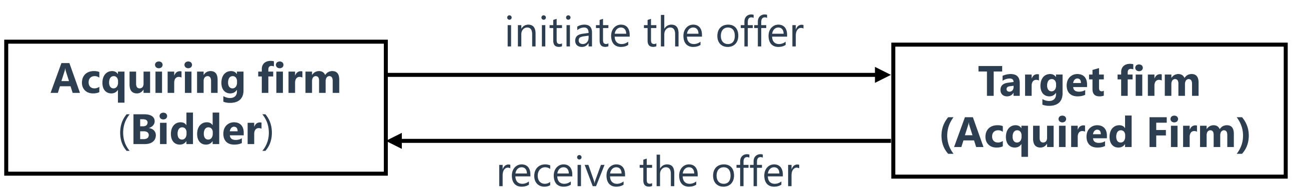
Hedge Fund Strategies

- **Directional Strategies: Trend Followers (Managed Futures) and Global Macro**
  - **Managed Futures**
    - ✓ Managed futures funds typically focus on investing in listed bond, equity, commodity **futures** and currency markets, globally.
  - **Global Macro**
    - ✓ Global macro funds typically focus on identifying **mis-pricings** in equity, currency, interest rate and commodity markets.
    - ✓ Managers typically employ a top-down global approach to analyze how **political trends and global macroeconomic events** may affect the valuation of financial instruments.

Hedge Fund Strategies

➢ **Event-Driven Strategies: Risk Arbitrage & Distressed Securities**

- **Risk Arbitrage:** As known as Merger Arbitrage.



  ✓ The **principal risk** is usually **deal risk**, should the deal fail to close.

- **Distressed Securities**

  ✓ Invest across the capital structure of companies subject to financial or **operational distress or bankruptcy proceedings**. Such securities often **trade at discounts** to intrinsic value due to difficulties in assessing their proper value, lack of research coverage, or an inability of traditional investors to continue holding them.

  ✓ The strategy may focus on mispricing caused by expected restructuring, reorganization, legal or regulatory issues, or corporate transactions.

Hedge Fund Strategies

- **Relative Value and Arbitrage-like Strategies:**
  - **Fixed Income Arbitrage**
    - ✓ Strategies may include leveraging long and short positions in similar fixed income securities. For instance, long swap and short Treasuries with same duration.
  - **Convertible Arbitrage**
    - ✓ Managers typically build long positions of convertible and other equity hybrid securities and then hedge the equity component by shorting the underlying stock or options of that company.
    - ✓ **Net long gamma and vega**
  - **Long/Short Equity**
    - ✓ Invest in both long and short sides of equity markets, often with a specific focus on certain sectors, regions or market capitalizations.
    - ✓ Have flexibility of shifting from value to growth stocks, small cap to large cap stocks, and net short to net long position.

Hedge Fund Strategies

- **Niche Strategies: Dedicated Short Bias, Emerging Market and Equity Market Neutral**
  - **Dedicated Short Bias**
    - ✓ Take more short positions than long positions and earn returns by maintaining net short exposure in long and short equities.
  - **Emerging Market**
    - ✓ Invest in currencies, debt instruments, equities and other instruments of developing countries' markets.
  - **Equity Market Neutral**
    - ✓ Achieving almost zero beta(s) against a broad set of equity indices.

Hedge Fund Strategies

- **Funds of Hedge Funds**
  - A fund of hedge funds are portfolios of hedge funds, which add value by providing automatic diversification and careful selection of styles and investment managers.
  - A major objective of the fund of hedge funds is optimal diversification.
  - Funds of funds charge additional management fees on top of those levied by the underlying funds, typically around 1%.

Exercise 1

- An acquisition has been announced by Company A to merge with Target Company T. Before the announcement, Acquirer A's shares traded at $21 and Target T's shares traded at $6 price. The proposed share-for-share exchange ratio was 1:2. Subsequent to the announcement, Acquirer A's shares trade down to $20 and Target T's shares trade up to $8. At this time, a merger arbitrage hedge fund takes a short position in Acquirer's A's stock hedged by a long position in Target T's stock. The merger is successful and the prices close at $28 (Acquirer) and $14 (Target). What is the gain per each single shorted share of Acquirer A?
  A. Zero per share of Acquirer A
  B. -$2 loss per share of Acquirer A
  C. +$1 gain per share of Acquirer A
  D. +$4 gain per share of Acquirer A

- **Correct Answer: D**

Exercise 2

- How would the risk in a merger arbitrage strategy best be characterized?
  - A. The arbitrage can be structured so there is a gain no matter the outcome.
  - B. The arbitrageur's loss if the deal does not go through is much greater than the gain if the deal goes through.
  - C. The arbitrage can be structured as riskless, assuming no other bidders come forward after the initial offer.
  - D. The arbitrageur's gain on the deal if it does go through is much greater than the loss if the deal does not go through.

- **Correct Answer: B**

Exercise 3

- Samantha Moore manages a hedge fund for a mid-sized money management firm. The fund frequently changes styles according to identified profit opportunities. At the beginning of the year, the fund took a long position in 10-year subordinated 8% coupon debt issued by a firm expected to undergo reorganization. Moore felt that analysts had been paying too little attention to the issuer. Six months later, the fund completed a second transaction involving a long position in Swiss Francs and a short position in Japanese Yen based on forecasted movements in interest rates in the two countries. What two hedge fund strategies are most likely being employed by Moore's hedge fund?
  - A. Distressed securities strategy and equity long/short strategy.
  - B. Fixed-income arbitrage and global macro strategy.
  - C. Distressed securities strategy and global macro strategy.
  - D. Fixed-income arbitrage and equity long/short strategy.
- **Correct Answer: C**

Exercise 4

- The Big Bucks Hedge fund has the following description of its activities. It uses simultaneous long and short positions in equity with a net beta close to zero. Which of the following statements about Big Bucks are correct?

  I. It uses a directional strategy.

  II. It is an Equity Market Neutral strategy.

  III. This fund is exposed to idiosyncratic risks.

  A. I and II

  B. II and III

  C. I and III

  D. II only

- **Correct Answer: B**

Reading 7

Due Diligence and Fraud Risk

Due Diligence Process

- **The due diligence process**
  - Investment process
    - ✓ Investment strategy
    - ✓ Record
  - Related risk controls
    - ✓ Valuation method
  - Operational Environment
    - ✓ Internal Control Assessment
    - ✓ Documents and Disclosures
    - ✓ Service Provider Evaluation
  - Model Risk and Fraud Risk

Exercise

- Lisa Tahara, FRM, is considering an institutional investment in a hedge fund that has experienced volatile and generally positive returns in the past. Which of the following considerations about the fund's track record is least relevant for consideration in her investment decision?
  - A. Size of investment assets
  - B. Absolute level of past returns.
  - C. Verification of returns by a third party.
  - D. Employment continuity of the investment team.

- **Correct Answer: B**

Detecting Fraud

- In the U.S., investment advisers must file Form ADV to disclose information about their operations, conflicts of interest, disciplinary histories, and other material facts.
  - Form ADV disclosures related to **past regulatory violations**, **conflicts of interest**, and **monitoring** are <u>all significant predictors of fraud.</u>

Detecting Fraud

- **Efficacy of Information Disclosures**
  - **Past Regulatory Violations**
    - ✓ Past violations could in crease the rate of detected fraud due to the increased probability of an SEC examination.
  - **Conflicts of Interest**
    - ✓ Referral Fees
    - ✓ Interest in Transaction
  - **Monitoring**
    - ✓ **Broker in Firm(**in-house brokerage,removes external oversight)
    - ✓ **Investment Company Act**
    - ✓ **Large investors** may deter fraud because of a higher probability of detection.
    - ✓ **Percent Client Agents**

Detecting Fraud

- **Barriers and Costs**
  - During the sample period, the SEC did not provide public access to historical Form ADV filings; investors could access only a contemporaneous cross-section.
  - To implement a fraud prediction model, an investor would have had to collect manually a large number of Form ADV filings, convert the filings into a database and estimate a prediction model.
  - For most investors the cost of individually downloading thousands of Form ADV filings may well have exceeded the perceived benefits.
- **Improve Investors' Ability**
  - The marginal cost to the SEC of allowing public access would be quite low.
  - Simple changes to data access policies that could improve investors' ability to predict fraud.

It’s not the end but just beginning.

If you have people you love, allow them to be free beings. Give and don't expect. Advise, but don't order. Ask, but never demand. It might sound simple, but it is a lesson that may take a lifetime to truly practice. It is the secret to true Love. To truly practice it, you must sincerely feel no expectations from those who you love, and yet an unconditional caring.

如果你有爱的人，允许他们自由随意的存在。给予而不指望；建议而不命令；请求而不要求；可能听起来简单，但这需要一辈子去实践。这就是真爱的秘诀。真正去实践它，你必须对那些你爱的人没有期望，并给予无条件的关爱。

问题反馈

- 如果您认为金程**课程讲义/题库/视频**或其他资料中**存在错误，欢迎您告诉我们**，所有提交的内容我们会在最快时间内核查并给与答复。
- **如何告诉我们?**
  - 将您发现的问题通过电子邮件告知我们，具体的内容包含：
    - ✓ 您的姓名或网校账号
    - ✓ 所在班级（eg.2111FRM一级长线无忧班）
    - ✓ 问题所在科目（若未知科目，请提供章节、知识点）和页码
    - ✓ 您对问题的详细描述和您的见解
  - 请发送电子邮件至：academic.support@gfedu.net
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