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Portfolio Management

CFA二级培训项目

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Reading 48

AN INTRODUCTION TO MULTIFACTOR MODELS

Arbitrage pricing theory (APT) ★★

公式	$E(R_P) = R_F + \beta_{P,1}(\lambda_1) + \beta_{P,2}(\lambda_2) + \ldots + \beta_{P,k}(\lambda_k)$ （均衡模型） 计算 • λ:factor risk premium (or factor price) • β_p: factor sensitivities
Assumption	• A ***factor model*** describes asset returns • There are many assets, so investors can form ***well-diversified portfolios*** that eliminate asset-specific risk • ***No arbitrage opportunities*** exist among well-diversified portfolios
特点	• 不同的asset，λ_1一样，$\beta_{p,1}$不一样 • 只有well-diversified portfolios满足这个公式，no-arbitrage opportunity • ***cross-sectional*** equilibrium pricing model

Carhart four-factor model: an extension of **Fama and French** 理解

$E(R_p) = R_F + \beta_{p,1}$ RMRF + $\beta_{p,2}$ SMB + $\beta_{p,3}$ HML + $\beta_{p,4}$ WML; **WML** = winners minus losers, a ***momentum factor***

- **CAPM:** there are size, value, and momentum ***anomalies***.
- **Carhart model**: size, value, and momentum represent ***systematic risk factors.***

Multifactor models: Types

Macroeconomic Factor model ★★ 计算、性质	$R_i = a_i + b_{i1}F_{GDP} + b_{i2}F_{INT} + e_i$ （回归模型） • R_i = return for asset i • $a_i = E(R_i)$ = expected return for asset I • F_{GDP} = surprise in the GDP rate • Surprise = actual value – expected value • b_{i1} = GDP surprise sensitivity of asset I • ε_i = firm-specific surprise ✓ Time-series data ✓ 不同的asset: F一样，b不一样
Fundamental factor models	$R_i = a_i + b_{i1}F_{P/E} + b_{i2}F_{SIZE} + \varepsilon_i$ • a_i: No economic interpretation • Standardized beta: $b_{i1} = \frac{(P/E)_1 - \overline{P/E}}{s_{P/E}}$ • F: factor return ✓ Cross-sectional data ✓ 不同的asset F一样，b不一样
Statistical factor models 了解	

Multifactor models: Selected Applications ★★

结论、性质

Factor Models in Return Attribution

Active return = $R_p - R_B$

$$\text{Active return} = \sum_{k=1}^{N}\left[\left(\text{Portfolio sensitivity}\right)_k - \left(\text{Benchmark sensitivity}\right)_k\right] \times \left(\text{Factor return}\right)_k + \text{Security selection}$$

Factor tilts: over- or underweights relative to the benchmark factor sensitivities

Security selection: reflects the manager's skill in individual asset selection

Factor Models in Risk Attribution

Active risk squared (variance)= $s^2(R_p - R_B)$ = Active factor risk + Active specific risk (**security selection risk**)

$$\text{Information Ratio} = \frac{\overline{R_P} - \overline{R_B}}{s_{(R_P - R_B)}}$$

resulting from ***the portfolio's different-from-benchmark exposures*** relative to factors specified in the risk model.

the ***active non-factor or residual risk*** assumed by the manager.

Factor Models in Portfolio Construction

Factor Portfolio	sensitivity equal to 1 to only one risk factor and sensitivities of 0 to the remaining factors 应用：***hedge*** that risk (offset it) or ***speculate*** on it
Tracking Portfolio	Portfolio with factor sensitivities that match benchmark-portfolio

Factor Models in Portfolio Construction

Accept above average exposures to risks that they have a ***comparative advantage*** in bearing.

Individual investor ➡

- The investor who ***depends on income from salary or self-employment*** is ***sensitive to business cycle risk*** and he might be very sensitive to invest in ***procyclical assets.***
- An investor with independent wealth and ***no job-loss concerns*** would have a ***comparative advantage in bearing business cycle risk***

Institutional investor ➡

long investment horizons → ***comparative advantage in bearing business cycle risk*** of traded equities or the liquidity risk

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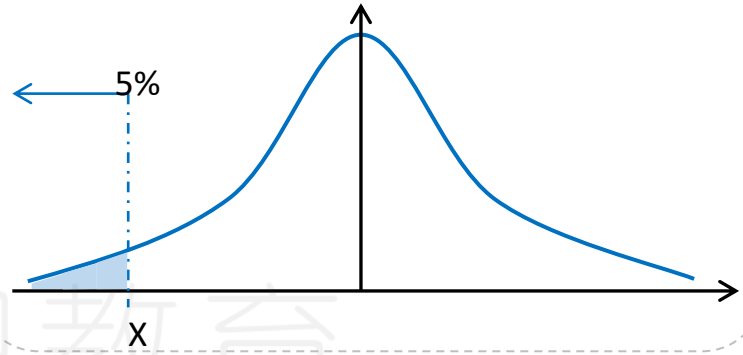
MEASURING AND MANAGING MARKET RISK

Understanding Value at Risk

Value at Risk: Formal Definition

Value at risk (VaR) is the ***minimum loss*** in either currency units or as a percentage of portfolio value that would be expected to be incurred a certain ***percentage*** of the time over a certain ***period of time*** given assumed market conditions.



Estimating VaR ★★ 结论、对比

The Parametric Method (analytical method, variance–covariance method)

Assumption	The risk factors are distributed normally, which allows us to estimate the risk of the portfolio based only on the means, variances, and covariances (or correlations).
Calculation	$\text{VaR}(X\%)_{\text{decimal basis}} = \lvert E(R) - z\sigma \rvert \Leftarrow \sigma_{\text{J-days}} = \sigma_{\text{1-days}} \sqrt{J}$ $\text{VaR}(X\%)_{\text{dollar basis}} = \lvert E(R) - z\sigma \rvert \times \text{asset value}$ 计算

Advantages and disadvantages	• The major advantage of the parametric method is its simplicity and straightforwardness.
	• Disadvantage:
	  • The calculated VaR is also very ***sensitive to the covariance estimate.***
	  • The parametric method apply under the ***assumption of normally distributed*** returns. When the ***portfolio contains options, the parametric method has limited usefulness.***

The Historical Simulation Method

Method	Estimating VaR is based on the ***actual periodic changes in risk factors*** over a lookback period. By ordering the changes in portfolio value from most positive to most negative, we can find the largest 5% of losses. The smallest of those losses is our estimate of the 5% VaR
The Historical Simulation & The Parametric Method	• Under the historical simulation method, ***no adjustments*** are made for different time period • The historical simulation VaRs are much ***smaller*** • Both the parametric and historical simulation methods have the limitation that ***all observations are weighted equally.***
Advantages and disadvantages	**Advantage of the historical simulation method** • ***Do not need the assumption of normality*** • Can be used to estimate the VaR for ***portfolios that include options***. • ***based on what actually happened***. **Weakness of the historical simulation method** • There can be ***no certainty that a historical event will re-occur*** • The historical simulation method is ***best used when the distribution of returns during the lookback period are expected to be representative*** of the future.

The Monte Carlo Simulation

Method	• Monte Carlo simulation is ***based on an assumed probability distribution*** for each risk factor. • ***Computer software*** is used to generate random values. ***The more values we use, the more reliable our answers*** are, but the more ***time-consuming***
Advantages	• The ***flexibility*** of the Monte Carlo method to ***handle more complex distributions.*** The Monte Carlo and historical simulation methods are much ***more capable*** incorporating the effects of ***option*** positions. • With the speed of today's ***computers***, it is relatively ***easy and fast*** to simulate extremely complex processes

Advantages & Disadvantage of Nonparametric Methods Compared To Parametric Methods ★★

Advantage	• The concept of VaR is ***simple and easy to explain*** • VaR allows the ***risk of different portfolios, asset classes, or trading operations to be compared*** • VaR can be used for ***performance evaluation*** (calculation of the ratio of income to VaR). • A firms risk managers can look at the allocation of VaR and optimize the allocation of capital • Global banking ***regulators accept*** VaR • Reliability of VaR as a measure of risk can be ***verified by backtesting***.
Disadvantage	• VaR estimation ***requires many choices*** and can ***be very significantly affected by these choices***. • The ***assumption of normality*** leads to ***underestimates of downside (tail) risk*** • A VaR will understate the actual losses incurred when ***liquidating*** positions • ***Increasing correlations*** mean that VaR measures based on normal levels of correlation will overestimate diversification benefits and underestimate the magnitude of potential losses • ***Many aspects of risk are not quantified or included***. • VaR focuses ***only on downside risk and extreme negative outcomes***.

结论

Extensions of VaR ★★ 概念

Conditional VaR (CVaR): expected tail loss or expected shortfall

- The CVaR is ***the expected loss, given that the loss is equal to or greater than the VaR.***

Incremental VaR (IVaR)

- the ***change in VaR*** from a change in the portfolio allocation to a security

Marginal VaR (MVaR)

- ***the change*** in VaR for ***a 1% increase in the security's weight.***
- Marginal VaR may be used to determine the contribution of each asset to the overall VaR

Ex ante tracking error (relative VaR)

- measures the ***VaR of the difference between the return on a portfolio and the return on its managers benchmark portfolio***

Sensitivity and Scenario Measures ★

概念、对比

- **Sensitivity Risk Measures:** focuses on the effect on portfolio value given a small change in one risk factor.
- **Scenario Risk Measures:** While ***sensitivity analysis*** provides an estimate of the change in portfolio value due to a ***small*** change in a ***single*** risk factor, ***scenario analysis*** provides an estimate of the effect on portfolio value of a set of changes of ***significant*** magnitude in ***multiple*** risk factors.
    - Stress tests: Apply ***extreme negative stress*** to a particular portfolio exposure

Scenario Risk Measures

Historical Scenarios & Hypothetical Scenarios	***Historical Scenarios***: Use a set of changes in risk factors that have ***actually occurred in the past***, ***especially changes during a period of financial disruption and stress*** ***Hypothetical Scenarios***: Any set of changes in risk factors can be used, ***not just one that has happened in the past***. A hypothetical scenario could have ***more extreme changes in risk factors than those that have occurred in the past***
The use of scenario risk measures	• Parties that use leverage, such as banks and hedge funds: ***pass/fail tests*** • ***Long-only asset managers*** do not typically use leverage and are thus ***less likely to become insolvent, making a pass/fail test*** for solvency ***less relevant*** to them • ***Reverse stress testing***: To ***design an effective hypothetical scenario, it is necessary to identify the portfolio's most significant exposures.***

Sensitivity and Scenario Risk Measures & VaR

Sensitivity Risk Measures and VaR

- ***VaR*** is a measure of losses and the ***probability of large losses***
- ***Sensitivity risk*** measures capture ***changes in the value of an asset in response to a change in risk factor***; they do ***not*** tell us anything about the ***probability***

Scenario Risk Measures and VaR

- ***Similarity***: estimate ***potential loss***
- The ***VaR*** estimate is ***vulnerable if correlation relationships and market volatility are not representative of future*** condition
- ***Scenario analysis*** allows the ***risk assessment to be fully hypothetical***

Advantages and Limitations of Sensitivity and Scenario Risk Measures

Sensitivity and scenario risk measures can *complement VaR* in the following ways:

- They do not ***need to rely on history***.
- ***Scenarios*** can be designed to ***overcome any assumption of normal*** distributions
- Scenarios***:*** allowing ***liquidity*** to be taken into account.

Limitations of Scenario Risk Measures

- ***Historical*** scenarios are interesting but are ***not going to happen in exactly the same way again***
- ***Hypothetical*** scenarios may ***incorrectly specify how assets will co-move***
- ***Hypothetical*** scenarios can be very ***difficult to create*** and maintain
- It is very ***difficult*** to know how to ***establish the appropriate limits*** on a scenario analysis or stress test.

Applications of Risk Measures

了解

机构	结论
Banks	• sensitivity measures, scenario analysis and stress testing, leverage risk measures, VaR and asset-liability mismatches
Hedge funds	• non-normal returns distributions
Traditional (long-only) asset managers	• focus on ***relative risk measures*** • ***Ex-post tracking error*** is a measure over a ***lookback period***. Ex-post tracking error is used for ***performance attribution*** and to assess manager skill over prior periods.
Defined benefit pension funds	• ***surplus-at-risk***
Insurance companies	• ***Life insurers:*** more highly correlated with the market risk • ***Property and casualty insurers: Insurance risks*** are reduced by ***purchasing reinsurance*** and by ***geographical diversification***.

Using Constraints in Market Risk Management

- **Risk Budgeting:** ***first determines the acceptable total risk***, and then ***allocates***
- **Position limits:** limit risk because they ensure some minimum level of diversification
- **Scenario limits** are limits on expected loss for a given scenario
- **Stop-loss limits** require that a risk exposure be reduced if losses exceed a specified amount over a certain period of time

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ECONOMICS AND INVESTMENT MARKETS

整章以结论为主

Framework

$$P_t^i = \sum_{s=1}^{N} \frac{E_t\left[CF_{t+s}^i\right]}{\left(1 + l_{t,s} + \theta_{t,s} + \rho_{t,s}^i\right)^s}$$

$l_{t,s}$: ***real default-free interest rate***.
- inflation-linked bond issued by the government of a developed economy.

$\theta_{t,s}$: ***expected inflation*** compensation.
- nominal default-free investment.

$\rho^i_{t,s}$: compensation of ***uncertainty about the asset's future cash flows***.
- Credit risk, liquidity risk

The Discount Rate on Real Default-free Bonds ★★ $l_{t,s}$

Inter-temporal rate of substitution	• m=marginal utility of consumption $_{future}$/marginal utility of consumption $_{today}$ • Wealth ***increases*** → marginal utility ***diminishes*** • Inter-temporal rate of substitution is ***lower*** in the ***good state*** of the economy • One-period real ***risk-free rate is inversely*** related to the ***inter- temporal rate of substitution***. That is, the higher the return the investor can earn, the more important current consumption becomes relative to future consumption.
Pricing a s-Period Default-Free Bond	$P_{t,s}$ = risk neutral present value (discounted at the **risk-free rate**) + **covariance term** (discount for risk) • ***risk-averse investors: Negative*** covariance term → asset return > risk-free rate • ***Positive*** covariance term → asset return < risk-free rate
Default-Free Interest Rates and Economic Growth	***higher*** trend real economic growth →***higher*** real default-free interest rates GDP growth is ***more volatile*** → real interest rates are ***higher***

The Yield Curve on Nominal Default-free Bonds ★★

Impact of inflation

Short-Term Nominal Interest Rates, investors can forecast inflation *perfectly* →
- compensate for the **expected inflation**, $\theta_{t,s}$

Long-Term Nominal Interest Rates, investors are unlikely to forecast inflation accurately →
- ***compensation for taking on the uncertainty related to future inflation*** the **expected inflation**, $\pi_{t,s} + \theta_{t,s}$

Short-Term Nominal Interest Rates	• Be influenced by the ***inflation*** environment and inflation expectations over time • Be influenced by ***real economic activity***, which is influenced by the saving and investment decisions • These interest rates will also be affected by the ***central bank's policy rate***, which should fluctuate around the neutral policy rate
Long-Term Nominal Interest Rates	BEI $=\theta_{t,s} + \pi_{t,s}$

	Yield curve
	• **Investor Expectations:** expect interest rates to ***decline*** → yield curve to be ***downward sloping or inverted***
	• **The Term Spread and the Business Cycle:** Term spread = long-term rate – short-term rate
	  • A ***recession*** is often preceded by a ***flattening, or even an inversion***, in the yield curve.
	  • ***During a recession***, short rates are often lower because central banks tend to lower their policy rate and the slope of the yield curve will typically ***steepen*** during a recession.

	Government Bonds • ***Correlation*** between the bond price and the economic growth is ***negative*** • ***Government bond risk premiums*** are positive and ***related to the consumption hedging benefits*** of government bonds • ***Short-dated bonds have been more reliable hedges*** against bad economic times

Credit-risky Bonds (Corporate Bond) ★★

Credit-risky bonds
- Default-free rate = $l_{t,s} + \pi_{t,s} + \theta_{t,s}$ → interest rate risk
- Credit premium (credit spread)= $\gamma_{t,s}$ → credit risk

结论

Expected loss = probability of default × (1 – recovery rate)

- **Defaults** tend to cluster around ***downturns in the business cycle***. Default rate ***increases***.
- **Recovery rates** tend to be ***higher*** when the ***economy is expanding*** and lower when it is contracting.

Credit Premiums and The Business Cycle

- Bond spreads do tend to ***rise*** in the lead up to and ***during a recession***, and to ***decline*** once the economy ***comes out of recession***.
- As the business cycle turns down, and spreads widen, those ***issuers with a good credit rating tend to outperform.***
- credit risky bonds (corporate or sovereign) tend to ***perform poorly in bad economic*** times

Factors influencing credit spread

- ***Industrial Sectors and Credit Quality***: ***During recession***, the spread on the consumer ***cyclical sector rose more*** dramatically
- ***Company-Specific Factors:*** If this ***ability*** to meet its debt obligations ***declines***, then ***the spread*** demanded on their debt will ***rise***
- ***Sovereign Credit Risk:*** important in ***developing or emerging economies***

Equities and The Equity Risk Premium ★★

Equity risk premium, $\lambda^{i}_{t,s}$
- $\gamma^{i}_{t,s}$ → Credit risk premium
- $\kappa^{i}_{t,s}$ → equity premium relative to credit risky bonds

Equity Risk Premium and the economic cycle	• Equities are a ***bad hedge*** for bad consumption outcomes, so equity risk premium should be ***positive*** (***pro-cyclicality***) • In times of economic ***weakness or stress***, equity risk premium ***rise***
Valuation Multiples	The ***P/E tends to rise*** during periods of ***economic expansion*** • An increase in expectation of future real earnings growth • Falling real interest rates, possibly associated with falling volatility in real GDP growth • A fall in inflation expectations • A decline in uncertainty about future inflation • A fall in the equity risk premium
Investment Strategy	• ***Cyclical sector*** has ***greater sensitivity*** to business conditions • During economic ***expansion***, by rotating into ***growth stocks***, or ***small-cap stocks***, or into ***cyclical stocks***, a manager can, if correct, outperform a broad equity market index.

Commercial Real Estate ★★

Regular cash flow	Commercial Real Estate and the Business Cycle
Bond-like: rent income	Nominal rental income might be relatively ***stable***
Equity-like: value of property	The **capital values** are ***highly sensitive to the economic*** environment. • A ***recession*** will generally cause these values to ***fall*** • The ***pro-cyclical nature*** means that investors will demand a ***high risk premium*** • Bad hedge against bad economic outcomes.
Illiquidity → $\varphi^{i}_{t,s}$	

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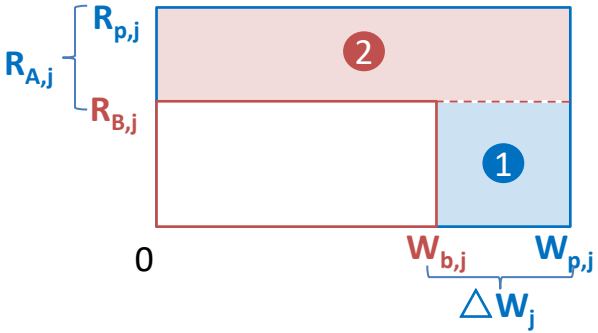
ANALYSIS OF ACTIVE PORTFOLIO MANAGEMENT

Value added ★★

Definition	Active return (value added): $R_p = R_p - R_B$ Alpha (risk-adjusted calculation of value added): $\alpha_P = R_P - \beta_P R_B$
Measurement	1. $R_p = R_p - R_B$ 2. $R_A = \sum_{i=1}^{N} \Delta w_i R_i$, $\Delta w_i = w_{P,i} - w_{B,i}$ (The sum of the active weights is ***zero***) 3. $R_A = \sum_{i=1}^{N} \Delta w_i R_{Ai}$, $R_{Ai} = R_i - R_B$
Decomposition	1. $R_A = R_P - R_B = \sum_{j=1}^{M} w_{P,j} R_{P,j} - \sum_{j=1}^{M} w_{B,j} R_{B,j}$ 2. $R_A = \sum_{j=1}^{M} \Delta w_j R_{B,j} + \sum_{j=1}^{M} w_{P,j} R_{A,j}$



$R_A =$

1. asset allocation → $\sum_{j=1}^{M} \Delta w_j R_{B,j}$
2. security selection → $\sum_{j=1}^{M} w_{P,j} R_{A,j}$

Comparing Risk and Return ★★

结论、计算

Sharpe Ratio ➡

$$SR_P = \frac{R_P - R_F}{\sigma_P}$$

Sharpe ratio is ***unaffected by the addition of cash or leverage*** (created by borrowing risk-free cash) in a portfolio.

- Same Sharpe Ratio → combination = portfolio +/- R_f

Same Sharpe Ratio, change ***volatility*** →

- σ_C (目标volatility) = $w_p\sigma_P$, w_f (cash or leverage比例) =1 - w_p

Information Ratio ➡

$$IR = \frac{\overline{R_P} - \overline{R_B}}{s_{(R_P - R_B)}}$$

The information ratio is ***affected by the addition of cash or the use of leverage***.

The information ratio is ***unaffected by the aggressiveness*** of active weights.

- Same Information Ratio → combination portfolio= active portfolio +/- benchmark

Same Sharpe Ratio, change ***active risk*** →

- $\sigma^C_A = c\sigma_A$ (σ^C_A :目标active risk; σ_A: 原active risk)
- c: 原portfolio的权重; 1 - c: long或short benchmark portfolio的比例

Closet index fund: advertises itself as ***active*** but is actually close to being an ***index fund***

Market-neutral long–short equity fund: offsetting long and short positions →beta=0

Constructing Optimal Portfolios ➡

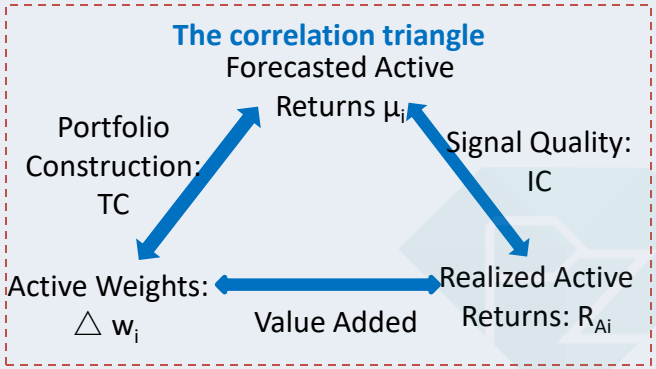
$SR^2 = SR^2_B + IR^2$ → The expected information ratio is the ***single best criterion***

$$\sigma_P^2 = \sigma_B^2 + \sigma_A^2$$

Optimal amount of active risk (maximizing active risk or "aggressiveness") → $\sigma_A = \frac{IR}{SR_B}\sigma_B$

The Fundamental Law of Active Management ★★

$IR = (TC)(IC)\sqrt{BR}$ 计算

Key Parameters	
	**Signal quality: information coefficient (IC)** • $IC = COR\left(\frac{R_{Ai}}{\sigma_i}, \frac{\mu_i}{\sigma_i}\right)$ • higher IC, or ability to forecast returns → add more value **Portfolio construction: transfer coefficient (TC)** • $TC = COR\left(\frac{\mu_i}{\sigma_i}, \Delta w_i \sigma_i\right)$ • degree to which the investor's forecasts are translated into active weights ***BR (breadth)*** • the number of ***independent decisions*** made ***per year***
Basic Fundamental Law	$IR = IC\sqrt{BR}$ $E(R_A) = IC\sqrt{BR}\sigma_A$
Full Fundamental Law	$IR = (TC)(IC)\sqrt{BR}$ $E(R_A) = (TC)(IC)\sqrt{BR}\sigma_A$

Optimal amount of active risk → $\sigma_A = TC\frac{IR^*}{SR_B}\sigma_B$

Constrained portfolio's squared sharpe ratio → $SR^2 = SR^2_B + (TC)(IR^*)^2$

Application of The Fundamental Law 结论

Global Equity Strategy	• ***Unconstrained*** portfolio: IR is ***invariant*** to the level of ***active risk*** • ***Constrained*** portfolio: IR generally ***decreases*** with the ***aggressiveness*** of the strategy, in accordance with an increasingly ***lower transfer coefficient.***
Fixed-Income Strategies	• Cross sectional (选security): 比如credit risk管理 • Time-series (择时): 比如每个季度判断一次市场， BR=4

Practical Limitations of The Fundamental Law 结论

1. Ex Ante Measurement of Skill

- Investors tend to ***overestimate their own skills*** (IC)
- Forecasting ability differs among ***different asset*** segments and ***varies over time***.

2. Independence of Investment Decisions

$$BR = \frac{N}{1+(N-1)\rho}$$

- All the ***stocks in a given industry or all the countries in a given region*** that are responding to similar influences ***cannot be counted as completely independent*** decisions, so ***breadth is lower than the number of assets***.
- ***Breadth can increase*** well beyond the number of securities with ***hedging strategies*** using derivatives or other forms of arbitrage.
- ***Increasing the rebalancing frequency*** may increase the realized information ratio, but only to the extent that sequential active return forecasts are independent from period to period.

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ALGORITHMIC TRADING AND HIGH-FREQUENCY TRADING

The Basics of Algorithmic Trading ★★ 概念、对比

Algorithmic trading: a trading strategy that has been ***automated through the use of a computer.*** Computers and trading algorithms make decisions and execute trades thousands of times faster than a human trader

	Execution Algorithms	High-frequency Trading Algorithms
Definition	***slice a large order into smaller pieces*** and execute them in a way that minimizes price impact	• analyze ***real-time market data*** (The "high frequency" refers to the ***frequency with which data gets updated***.) • These algorithms identify and execute trades in ***milliseconds***.
Types	• Volume-Weighted Average Price (VWAP) Algorithms • Implementation Shortfall Algorithms • Market Participation Algorithms	• statistical arbitrage: buy one security and sell the other so as to realize a profit when they eventually converge. • Pairs trading, Index arbitrage, Basket trading, Spread trading, Mean reversion and Delta neutral strategies • ***Liquidity aggregation and smart order routing: Market fragmentation*** (***price differences*** across markets and a ***lack of liquidity*** within an individual market.) • ***Real-time pricing of securities*** • ***Trading on news*** • ***Genetic tuning: self-evolving*** ("Darwinian trading")
对比	• execution algorithms: ***"how to trade"*** → ***minimizing market impact*** • high-frequency trading algorithms: ***"when to trade"*** and ***"what to trade."*** →***profit***	

Risk Management and Regulatory Oversight 了解

The Use of Technology in Risk Management

Two methods to mitigate trading risk are as follows:

- 1. Real-time pre-trade risk firewall.
- 2. Back testing and market simulation.

The Use of Technology in Regulatory Oversight

- Regulatory Oversight: Real-Time Market Monitoring and Surveillance
- Examples of suspicious trading: Insider trading, Front running, Painting the tape, Fictitious orders, Wash trading and Trader collusion

Impact of Algorithmic and High-frequency Trading 了解

Positive Impacts

- Facilitates large trades.
- Increased liquidity.
- Lower costs. ***minimize manual labor***
- Tighter bid—ask spreads. High-frequency traders that act as market makers
- Improved pricing efficiency. quickly identifying and eliminating any opportunities.
- Promotes open and competitive markets.
- Increased competition between trading venues. ***provide greater order throughput, lower matching latency***, and other services such as ***co-location***

Concerns

- Unfair speed advantages. ***locate themselves as physically close as possible*** to trading venues
- Magnification of market movements.
- Market manipulation.
- Risk of trading errors. A ***simple "fat finger error" can quickly cause havoc and huge losses***
- Out-of-control algorithms. algorithm may "go wild" and place illogical orders
- Denial-of-service.

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THE PORTFOLIO MANAGEMENT PROCESS AND THE INVESTMENT POLICY STATEMENT

<table>
<tr><td>Portfolio Management</td><td colspan="3">✓ planning step
• Creating the Investment Policy Statement
• Forming Capital Markets Expectations
• Creating the Strategic Asset Allocation
✓ the execution step
✓ the feedback step</td></tr>
<tr><td rowspan="2">IPS
★★
案例分析</td><td rowspan="2">Objectives</td><td>Return</td><td></td></tr>
<tr><td>Risk (above/average/below)</td><td>Willingness: 业余爱好、以前的投资
Ability: wealth, age,net income……</td></tr>
<tr><td>Constrains
(significant/insignificant)</td><td colspan="2">1. Liquidity requirement
2. Time horizon
3. Tax concerns
4. Legal and regulatory factors
5. Unique circumstances</td></tr>
<tr><td>Investment strategy</td><td colspan="3">✓ Passive investment
✓ Active approach
✓ Semiactive approach</td></tr>
</table>


Thank
You!