BARRA IN THE INVESTMENT PROCESS

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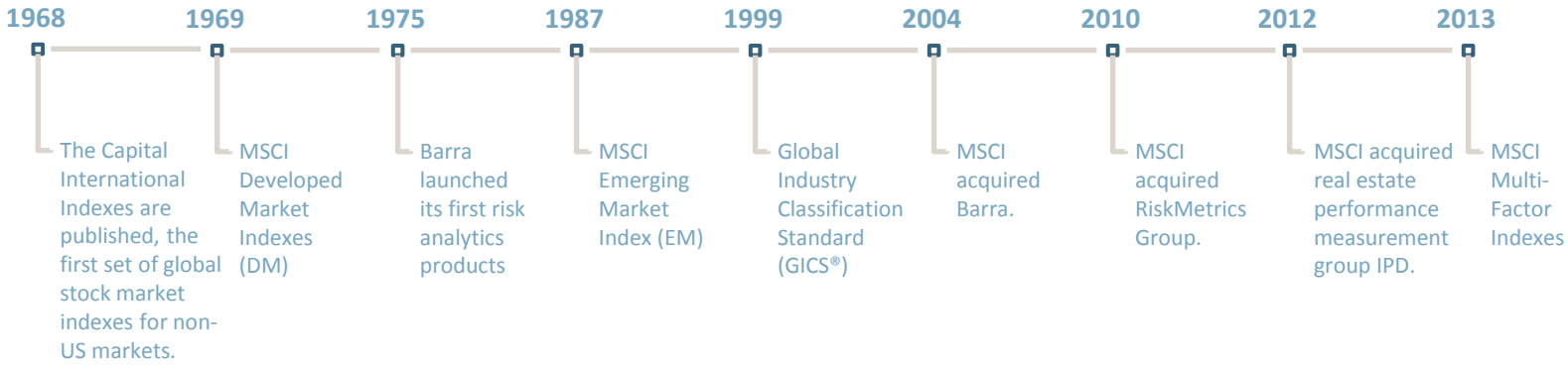
AGENDA

- Overview of MSCI
- A Typical Investment Process
  - Alpha Model
  - Risk Model
  - Portfolio Optimization
  - Performance Attribution
- Summary

Overview of MSCI

WHY MSCI



- **Delivering** indexes, risk and return portfolio analytics, and corporate governance tools for use throughout the investment process
- **Independent** provider of research-driven insights and tools for institutional investors
- Covering **major asset classes**: equity, fixed income, hedge funds, energy, commodities and real estate
- **First** provider of global equity indexes and multi-factor risk models
- **Large and experienced** team of index, portfolio analytics and governance specialists with over 2,600 employees in 24 countries

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INSTITUTIONAL INVESTORS FACE UNPRECEDENTED CHALLENGES TODAY

Need to attract assets through

Investment Differentiation

Business complexities that require

Best Practices in Risk Management

Pressure to implement

Operational Efficiencies and Controls

Continually evolving requirements for

Regulatory Compliance and Reporting

MSCI SUPPORTS YOUR INVESTMENT PROCESS

INVESTMENT DIFFERENTIATION

To attract assets, you must stand out in the crowd. MSCI provides best-in-class models and tools with which to build and manage better portfolios.

Our offerings include:

- Equity models
- Multi-asset class, multi-currency models
- A library of Barra portfolio construction tools
- A cloud-based, interactive portfolio management platform
- Access to MSCI's proprietary research, and meetings with members of our research team

RISK MANAGEMENT

MSCI's powerful, multi-asset class risk and performance platform supports investors from asset allocation through reporting.

Our solutions provide a unified and consistent view of risk and return and can be integrated seamlessly into any investment workflow.

Our offerings include tools and services powered by RiskManager for:

- Stress testing
- Statistical analysis
- Data visualization
- Risk reporting

REGULATORY COMPLIANCE

MSCI's analytics and high-volume processing capability help investors address ever-changing regulatory requirements accurately and efficiently.

We offer:

- An in-depth understanding of regulatory requirements around the globe
- Deep experience and best practices in designing and implementing customized regulatory reporting solutions

OPERATIONAL EFFICIENCY THROUGH OUTSOURCING

MSCI's highly experienced team can serve as an extension of your middle and back office operations.

Our services include:

- Data collection and management
- Data reconciliation
- Workflow design
- Internal and regulatory reporting
- System implementations

WE SERVE THE WORLD'S TOP INVESTORS, ONE CLIENT AT A TIME

50 of the top 50 global **asset managers**

42 of the top 50 global **asset owners**

31 of the top 50 global **hedge funds**

27 **of the top** **50** global **banks**

Sources: MSCI as of June 30, 2015 and *P&I*, *aiCIO, Hedge Fund Intelligence* and *The Banker* as of December 31, 2014

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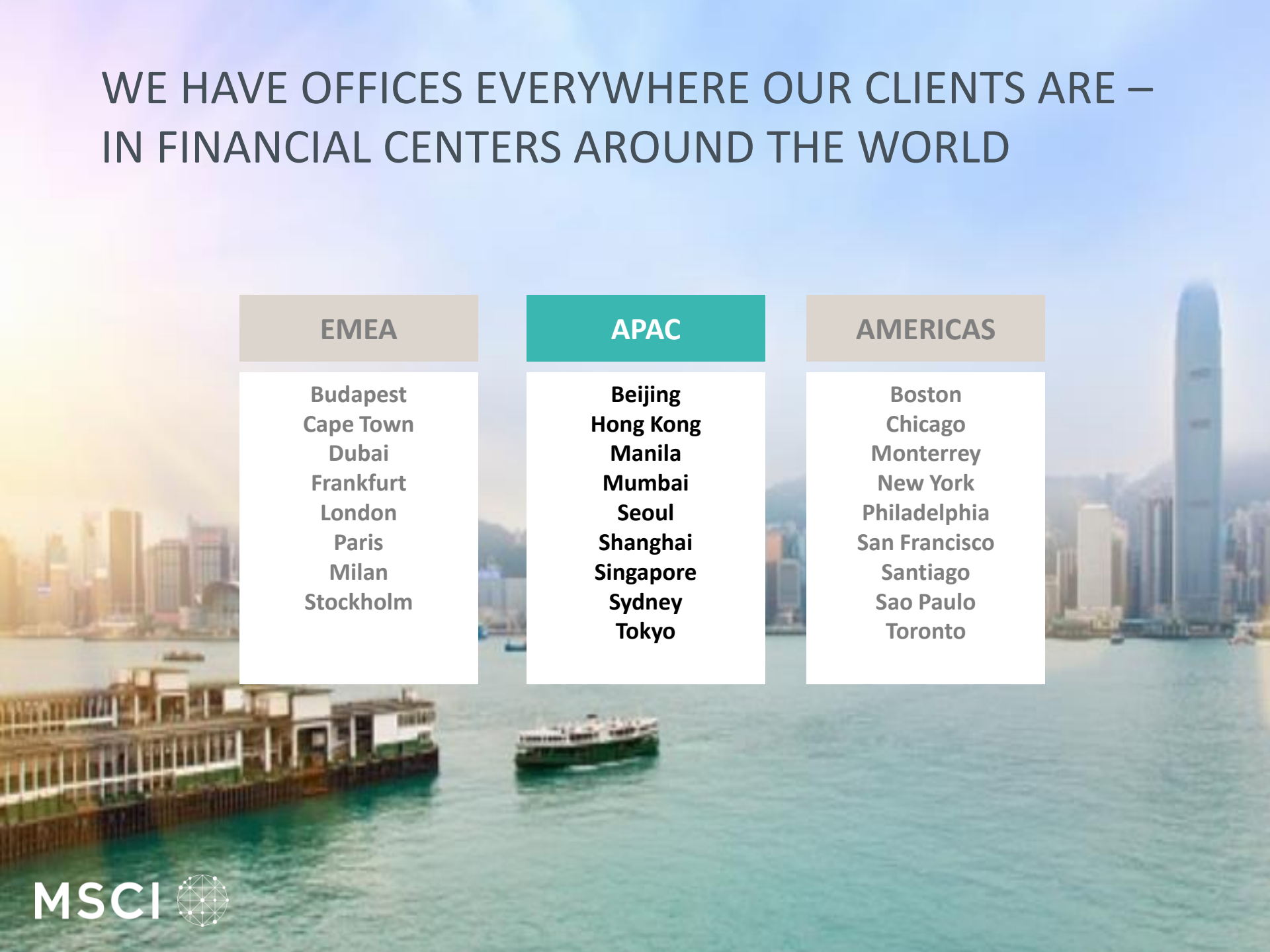
WE HAVE OFFICES EVERYWHERE OUR CLIENTS ARE – IN FINANCIAL CENTERS AROUND THE WORLD



EMEA	APAC	AMERICAS
Budapest	**Beijing**	Boston
Cape Town	**Hong Kong**	Chicago
Dubai	**Manila**	Monterrey
Frankfurt	**Mumbai**	New York
London	**Seoul**	Philadelphia
Paris	**Shanghai**	San Francisco
Milan	**Singapore**	Santiago
Stockholm	**Sydney**	Sao Paulo
	Tokyo	Toronto

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A Typical Investment Process

A TYPICAL INVESTMENT PROCESS

	Alpha Model	Risk Model	Portfolio Optimization	Performance Attribution
User (s):	• **Analyst, Research, or PM**	• **Risk Manager**	• **Portfolio Managers**	• **Risk Team**
Need:	• Find repeatable alpha	• Oversight, monitor risk	• Construct/rebalance portfolio	• Monitor sources of return and IR
Use cases:	• Signal or Factor Research • Stock/Sector Research • Screening & selection • Strategies testing s	• Ex-ante risk management • VaR, volatility, factor exposures, liquidity risk	• Optimizations • Back-testing portfolios • Long-short construction • Portfolio balancing and weighting	• Skill or luck • Further strategy adjustments
Our products:	**Aegis Portfolio Manager, BarraOne, Flatfiles** **MSCI global, regional, country, style, sector and custom indices**			

Step 1:
Alpha Model

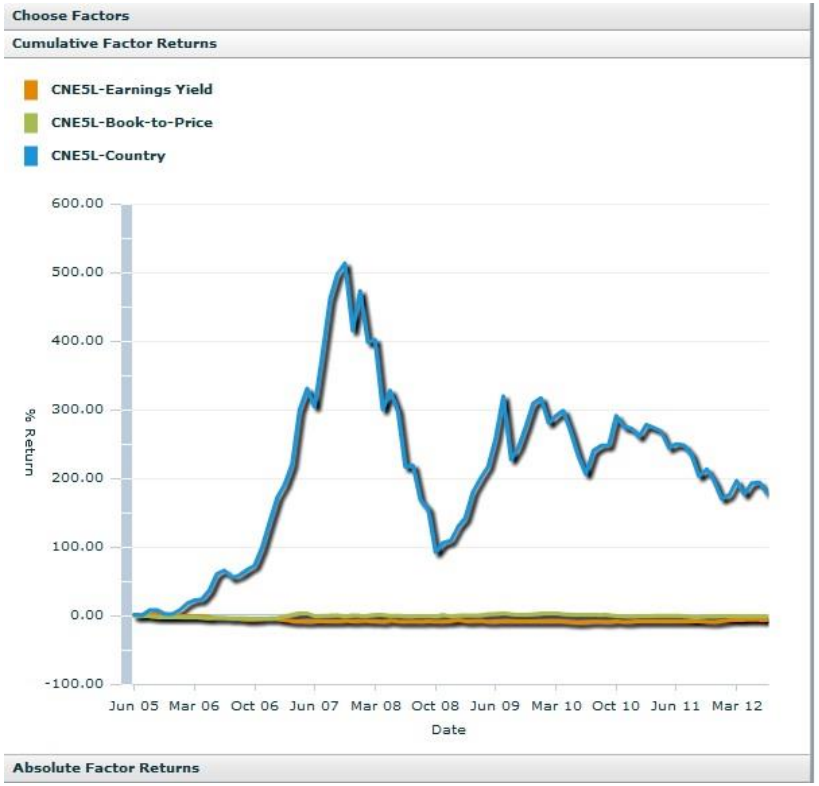
BARRA IN ALPHA BUILDING PROCESS

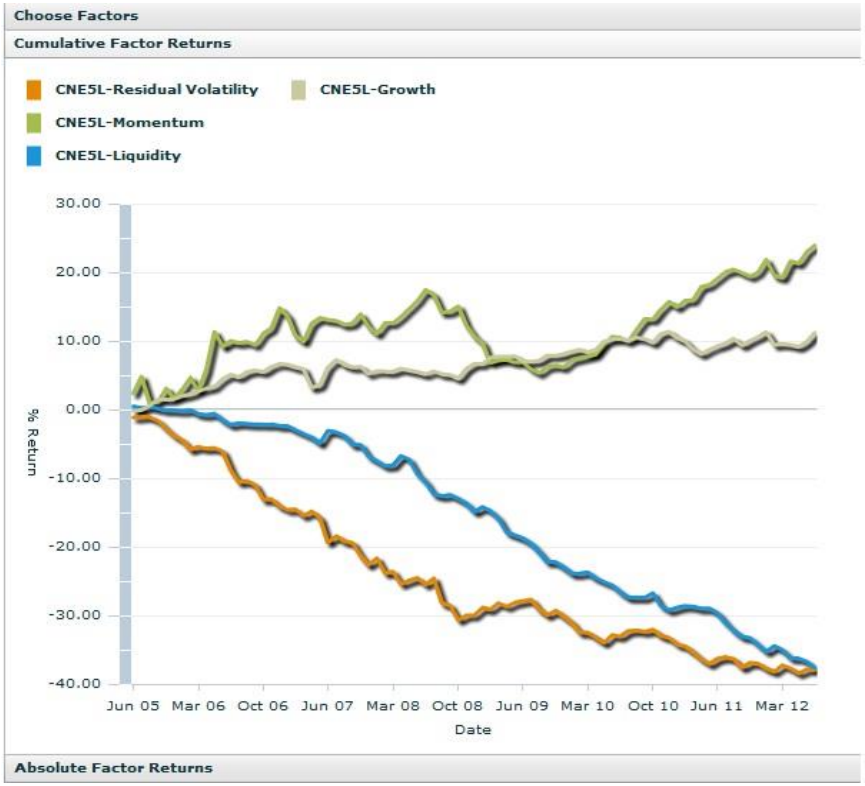
- Alpha is about information processing and forecasting
- Broadly speaking, alpha comes from both asset allocation and stock selection
- Alpha model is highly proprietary and most clients choose to develop their Alpha models on their own
- Nevertheless, Barra can provide clients with informative factor data and a platform to explore their alpha strategies
  - Historical factor return and covariance data can be used for factor allocation
  - Factor exposure and Alpha refinement tool can be used in asset selection
  - Backtesting tool allows clients to try different strategies and backtest their performances

BARRA FACTOR PERFORMANCE

■ The historical factor return provide an ***alternative angle*** to examine the fundamental drivers of the market

■ Barra's factors are ***pure factors***, which have exposure only to the style in question but net zero exposure to other factors





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Stock Selection Process

- Clients can use the screening tool in Barra to select stocks based on their exposure to our factors. This help investors to capture the systematic component of the stock return

- Clients can supply stock-specific information, such as cash-flow based quality metrics and target price from their research team, to capture the specific component of the stock return

- Once the raw scores or rankings for stocks are established, Barra can help refine and convert them to normalized alpha scores, which are ready to be used in the portfolio optimization

Alpha Refinement

- Active Portfolio Management**: A Quantifiable Approach** for Producing **Superior Returns** and **Controlling Risk**

Alpha = Score x Volatility x Skill*

* Active Portfolio Management by Richard Grinold and Ronald Khan

Score indicates how strongly you feel about an asset.

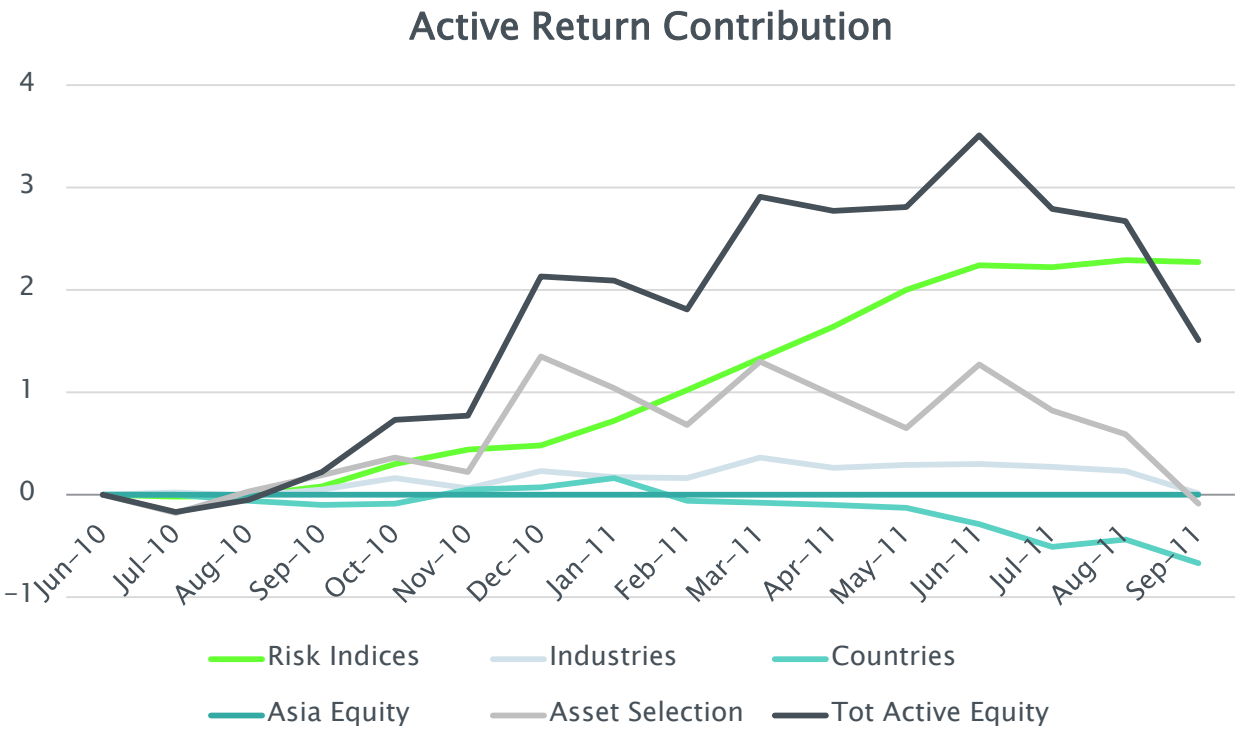
Volatility is the volatility of the asset return you are forecasting

Skill (Information coefficient) measures the confidence of the signal.

Strategy Backtesting

- Clients can use Barra as a playground to try different investment strategies, converting them into portfolios with Optimizer, and backtest the performance

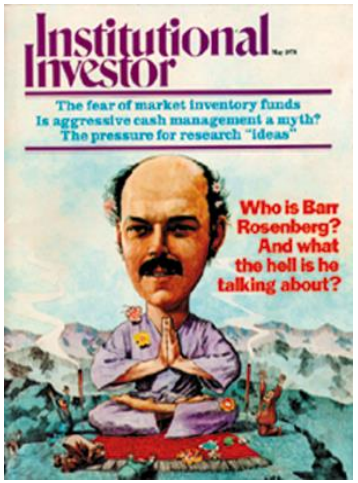
- For example, a client can construct a portfolio with Value, Growth, Momentum and Size tilts and backtest the past-year performance of this strategy



Step 2:
Risk Model

BARRA FUNDAMENTAL MULTIPLE FACTOR MODEL

- Barra has been developing tools for the investment process for over 40 years**
- Barr Rosenberg commercialised modern portfolio theory when he pioneered the fundamental multiple factor model (MFM) on which Barra models are based



Barr Rosenberg, 1978

*** Barra was founded in 1975. Its operations were combined with MSCI in 2004*

BARRA FUNDAMENTAL MULTIPLE FACTOR MODEL

- Challenges to traditional methods
  - Challenge #1: Too much data to calculate and estimate

	Asset 1	Asset 2	Asset 3
Asset 1	σ	Corr	Corr
Asset 2	Corr	σ	Corr
Asset 3	Corr	Corr	σ

  - Challenge #2: Correlations can be spurious and volatile
  - Challenge #3: History is not best indicator of the future

- Resolving three challenges with Barra Multiple Factor Model
  - #1: Using common factors to reduce the number of r and s to summarize asset behavior

$$F = \begin{bmatrix} F(1,1) & & \\ & \cdots & \\ & & F(K,K) \end{bmatrix}$$

  - #2: observe themes from aggregate behaviors of many assets and individual behaviors can be diversified away
  - #3: Commonality of themes can better reflect a portfolio over a long period of time

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Not Every Factor Models Are Created Equal

STATISTICAL MODEL	MACROECONOMIC MODEL	FUNDAMENTAL MODEL (BARRA)
▪ **Uses Principal Component Analysis (PCA) to estimate fit, Security returns driven**	▪ **Time-series regression, Security returns and macro-economic variables**	▪ **Cross-sectional regression, Security returns and characteristics**
Pro's: Little data requirements	**Pro's:** Intuitive factors (e.g. oil prices, inflation, GDP, etc.), Factor series are observable	**Pro's:** Intuitive factors, Handles new securities well , Identification of risk source/return attribution, Performs well out-of-sample , Strong explanatory power R2
Con's: Spurious / transitory factors pick up noise, Non-intuitive factors, Blind factors, Un-actionable, Doesn't handle new issue data well	**Con's:** Dependent on in-sample data that does not allow for rapid factor sensitivity change, Doesn't handle new issue data, Low out-of-sample R2	**Con's:** High data requirements

MODEL STRENGTHS

- Fundamental Multiple Factor Model outperforms

Model	Average Variation Explained (%)
Macroeconomic	10.9
Statistical	39.0
Fundamental (Barra)	42.6

Source: "The Three Types of Factor Models: A Comparison of Their Explanatory Power" by Greg Connor, *Financial Analysts Journal,* May-June 1995

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A PORTFOLIO INVESTED IN FACTORS

- Portfolio is also an investment in factors
- Example: Investing in Microsoft $\Rightarrow$ Investing in

  (1) U.S.

  (2) Large Cap

  (3) Computer Software

  plus the specific risk of Microsoft

- An asset investment is also a factor investment, and we can express portfolio return as a combination of the returns of those factors

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CROSS-SECTIONAL REGRESSION

- What is ***known***: stock return r_i and stock's factor exposure $x_{i,j}$
- What is ***unknown***: factor return f_i and stock's specific return $u_{i,Spec}$
- Estimate the factor returns and stocks' specific returns via cross-sectional regression

$$r_i = x_{i,1} \times \hat{f}_1 + x_{i,2} \times \hat{f}_2 + \ldots + x_{i,d} \times \hat{f}_d + \hat{u}_{i,\text{Spec}}$$

Calculated

Estimated

STYLE FACTOR SELECTION

- Good style factors should:
  - Significantly increase explanatory power of model
  - Have high statistical significance
  - Be stable across time
  - Not be excessively collinear with other factors
  - Be intuitive and consistent with investors' views

- Stability Measure:

$$\rho_k^t = \mathrm{corr}\left(X_k^t, X_k^{t+1}\right)$$

Factor Stability Coefficient

- Collinearity Measure:

$$X_{nk} = \sum_{l \neq k} X_{nl} b_l + \varepsilon_{nk} \quad \rightarrow \quad VIF_k = \frac{1}{1 - R_k^2}$$

Variance Inflation Factor

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BARRA CHINA EQUITY MODEL (CNE5)

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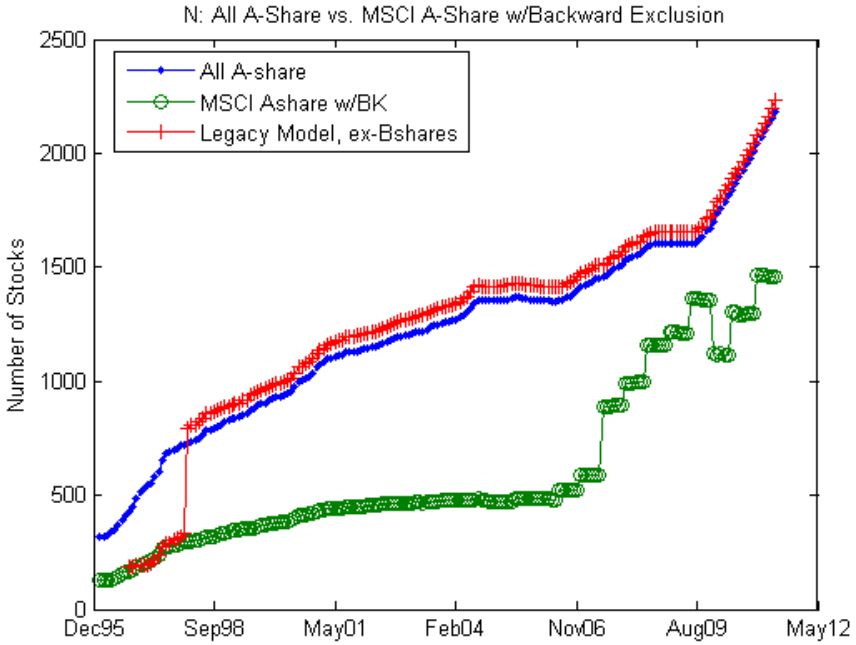
ESTIMATION UNIVERSE (ESTU)

- Broad A-share ESTU similar to legacy model
- Legacy model
  - Launched in 2005 with ESTU ~ 1500 stocks
  - ESTU has grown by 38% in 6.5 years to 2069 stocks
- Growth in Chinese market supports much richer industry structure



INDUSTRY FACTORS

- There are 32 industry factors in CNE5, which are based on GICS and tailored to the Chinese market

Sample period 29-Jan-1999 to 30-Dec-2011				
GICS Sector	CNE5 Code	CNE5 Industry Factor Name	Average Weight	30-Dec-2011 Weight
Energy	1	Energy	11.05	**15.38**
Materials	2	Chemicals	6.13	4.13
	3	Construction Materials	1.17	1.14
	4	Diversified Metals	8.84	5.96
	5	Materials	0.97	0.65
Industrials	6	Aerospace and Defense	0.38	0.40
	7	Building Products	0.44	0.33
	8	Construction and Engineering	1.82	2.49
	9	Electrical Equipment	2.32	3.16
	10	Industrial Conglomerates	1.33	0.28
	11	Industrial Machinery	3.86	5.12
	12	Trading Companies and Distributors	1.50	0.80
	13	Commercial and Professional Services	0.23	0.52
	14	Airlines	0.96	0.73
	15	Marine	0.78	0.47
	16	Road Rail and Transportation Infrastructure	4.55	2.32
Consumer Discretionary	17	Automobiles and Components	3.33	2.56
	18	Household Durables (non-Homebuilding)	2.16	1.57
	19	Leisure Products Textiles Apparel and Luxury	2.35	1.77
	20	Hotels Restaurants and Leisure	0.99	0.85
	21	Media	0.73	0.80
	22	Retail	2.71	1.79
Consumer Staples	23	Food Staples Retail Household Personal Prod	0.60	0.65
	24	Beverages	2.34	3.37
	25	Food Products	2.58	2.22
Health Care	26	Health	4.31	4.45
Financials	27	Banks	9.45	**17.89**
	28	Diversified Financial Services	3.29	5.86
	29	Real Estate	5.95	3.38
Information Technology	30	Software	1.06	1.33
and Telecommunication Services	31	Hardware and Semiconductors	5.81	4.56
Utilities	32	Utilities	5.99	3.08

STYLE FACTORS

- Size
- Beta
- Momentum
- Residual Volatility
- Non-linear Size
- Book-to-Price
- Liquidity
- Earning Yield
- Growth
- Leverage

Sample period 29-Jan-1999 to 30-Dec-2011

Sub-Period A. 29-Jan-1999 to 30-Jun-2005 (78 months)

Factor Name	Average Absolute *t*-stat	Percent Observ. |*t*|>2	Annual. Factor Return	Annual. Factor Volatility	Factor Sharpe Ratio	Correl. with ESTU	Factor Stability Coeff.	Variance Inflation Factor
Size	3.65	70.5	-1.74	2.87	-0.61	-0.07	0.994	2.66
Beta	3.53	62.8	2.3	5.19	0.44	0.78	0.95	1.55
Momentum	3.47	62.8	4.92	3.63	1.36	-0.14	0.91	2.27
Residual Volatility	3.62	74.4	-7.73	3.21	-2.41	0.25	0.93	1.46
Book-to-Price	2.16	44.9	0.23	2.43	0.10	0.12	0.95	1.62
Non-linear Size	1.71	33.3	-3.53	1.54	-2.29	0.22	0.97	1.13
Earnings Yield	2.05	43.6	-0.46	2.35	-0.19	0.34	0.95	1.99
Liquidity	1.21	16.7	-1.33	1.15	-1.15	0.03	0.95	1.11
Leverage	1.38	23.1	1.03	1.25	0.83	-0.07	0.98	1.16
Growth	1.07	14.1	0.19	1.45	0.13	0.11	0.96	1.59
Average	2.39	44.62	-0.61	2.51	-0.38	0.16	0.95	1.65

Sub-Period B. 1-Jul-2005 to 30-Dec-2011 (78 months)

Factor Name	Average Absolute *t*-stat	Percent Observ. |*t*|>2	Annual. Factor Return	Annual. Factor Volatility	Factor Sharpe Ratio	Correl. with ESTU	Factor Stability Coeff.	Variance Inflation Factor
Size	5.66	89.7	-1.25	4.71	-0.27	-0.18	0.995	4.04
Beta	4.20	69.2	8.57	6.65	1.29	0.81	0.94	1.83
Momentum	3.26	64.1	2.78	3.41	0.82	-0.08	0.87	2.22
Residual Volatility	3.14	62.8	-7.09	3.94	-1.80	0.46	0.93	2.14
Book-to-Price	2.45	51.3	0.02	3.19	0.01	0.43	0.96	2.05
Non-linear Size	2.64	57.7	-2.62	2.75	-0.95	0.23	0.98	1.4
Earnings Yield	2.09	42.3	-1.38	2.55	-0.54	0.26	0.94	2.59
Liquidity	2.42	47.4	-6.75	2.26	-2.98	0.13	0.94	1.51
Leverage	1.65	35.9	0.99	1.65	0.60	-0.03	0.99	1.47
Growth	1.73	35.9	1.72	1.98	0.87	0.37	0.94	1.41
Average	2.93	55.64	-0.5	3.31	-0.3	0.24	0.95	2.07

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STYLE FACTOR COMPARISON

- CNE5 is A-share only
  - CHE2 includes B-shares => special B-share factors
- CNE5 has 10 styles
  - CHE2 has 9 styles relevant to A-shares
- CNE5 breaks out Value, Volatility descriptors

CHE2	CNE5
Size	Size
Momentum	Momentum
Volatility	Historical Beta
	Residual Volatility
Downside Volatility	
Trading Activity	Liquidity
Value	Book-to-Price
	Earnings Yield
Growth	Growth
Leverage	Leverage
	Non-Linear Size
Shenzhen Exchange	
B-Share	N/A
B-Share Shenzhen	N/A

FACTOR DESCRIPTORS

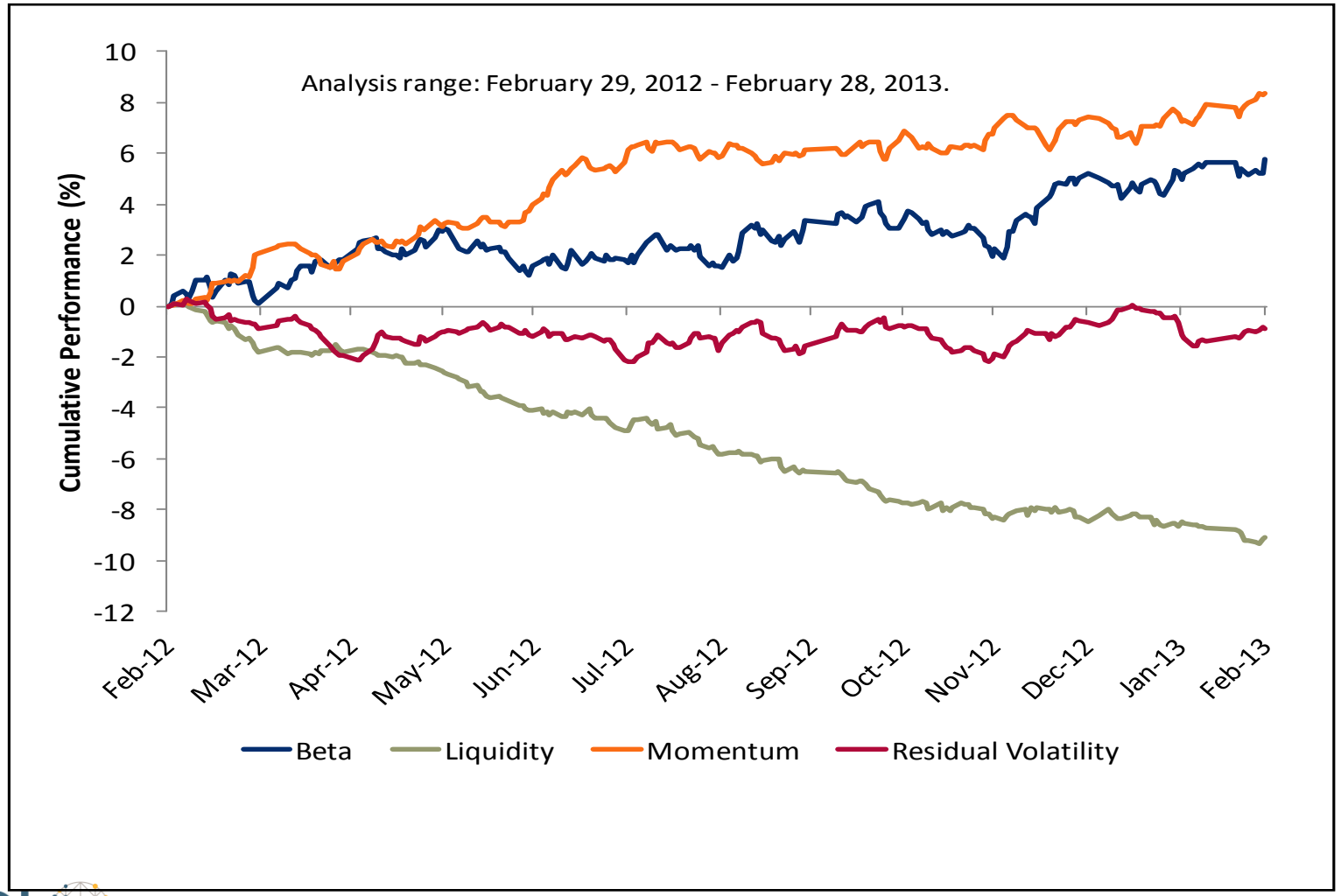
- Liquidity
  - Share turnover, trailing one month (35%)
  - Average share turnover, trailing 3 months (35%)
  - Average share turnover, trailing 12 months (30%)

- Growth
  - Long-term predicted earnings growth (18%)
  - Short-term predicted earnings growth (11%)
  - Earnings growth, trailing 5 years (24%)
  - Sales growth, trailing 5 years (47%)

- Residual Volatility
  - Daily standard deviation (74%)
  - Cumulative range (16%)
  - Historical sigma (10%)

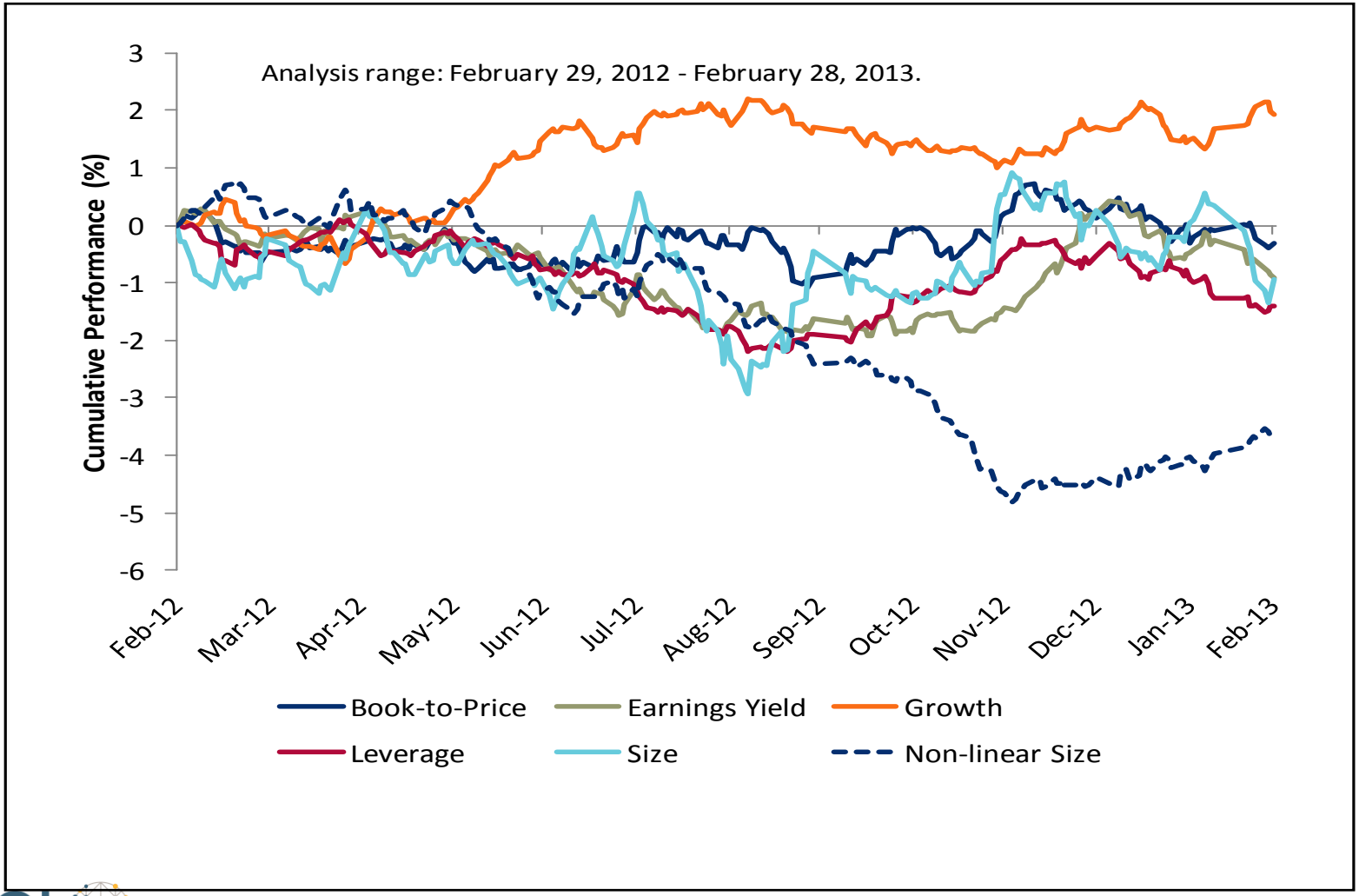
ABSOLUTE STYLE FACTOR PERFORMANCE

- Market Data Related Styles Over Past 12 Months



ABSOLUTE STYLE FACTOR PERFORMANCE

- Fundamental Data Related Styles Over Past 12 Months



EIGENFACTOR RISK ADJUSTMENT

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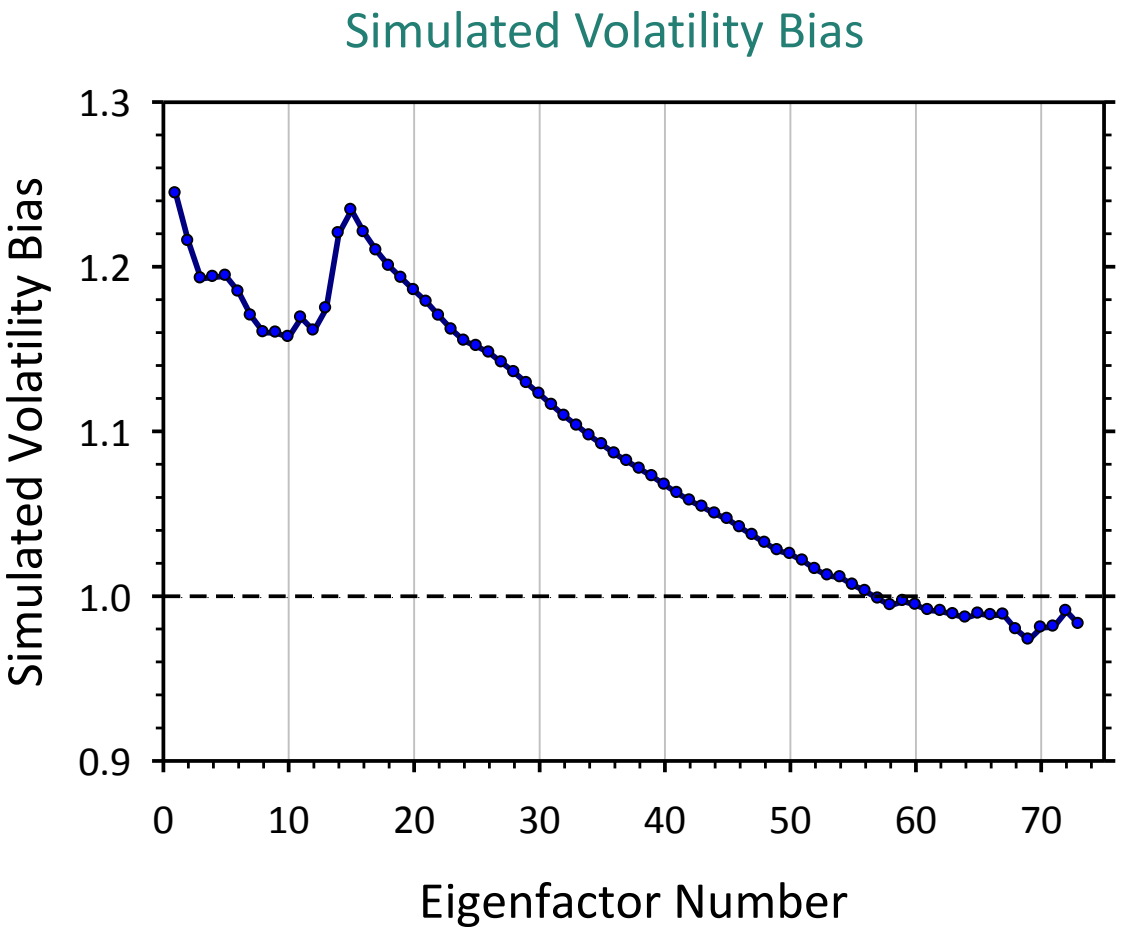
EIGENFACTOR VOLATILITY ADJUSTMENT FUNCTION*



- Simulated results explain most of the observed bias in optimized portfolios
- Shape of curve is very robust across time
- Simulated results assume normality and stationarity
- Empirical factor returns have fat tails and are non-stationary
- Minor additional scaling is required to completely eliminate eigenfactor biases

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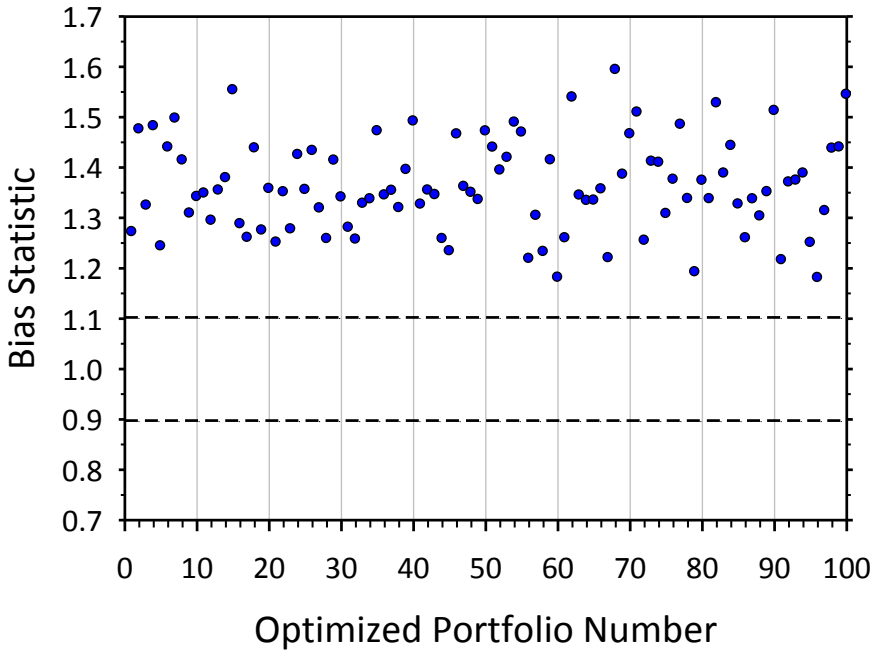
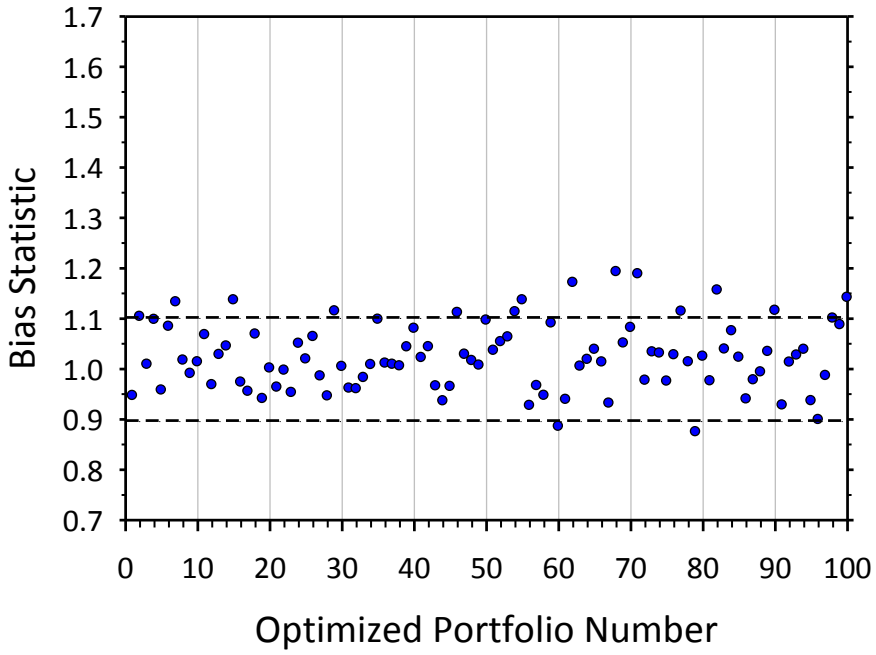
BIAS STATISTICS OF OPTIMIZED FACTOR PORTFOLIOS (BEFORE/AFTER)*

Before



After



Biases of optimized portfolios have been eliminated

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VOLATILITY REGIME ADJUSTMENT FOR FACTORS

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VOLATILITY REGIME ADJUSTMENT FOR FACTOR COVARIANCE

- Construct factor covariance matrix **F** using "standard" time-series techniques (e.g., EWMA with serial correlation adjustments)
- Use cross-sectional observations (bias statistics) to calibrate factor volatilities σ_k to current levels

$$B_t^2 = \frac{1}{K}\sum_k \left(\frac{f_{kt}}{\sigma_{kt}}\right)^2$$

Cross-Sectional Bias Statistic (squared)

$$\lambda_F^2 = \sum_t B_t^2 \gamma_t \quad \text{(EWMA)}$$

λ_F Factor Volatility Multiplier

$$\tilde{\sigma}_k = \lambda_F \sigma_k \rightarrow \boxed{\tilde{\mathbf{F}} = \lambda_F^2 \mathbf{F}}$$

Volatility Regime Adjusted Factor Covariance Matrix

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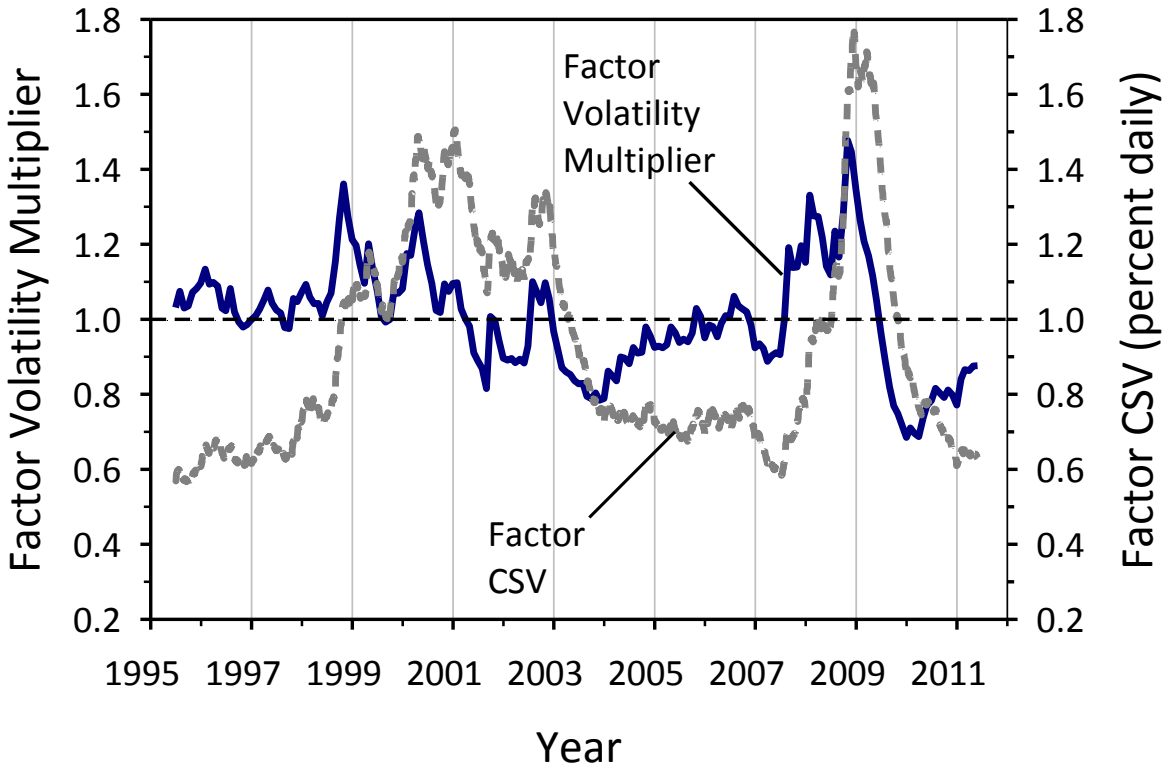
VOLATILITY REGIME ADJUSTMENTS FOR FACTOR COVARIANCE MATRIX*

Volatility Regime Adjustment (CNE5S)



$$CSV_t^F = \sqrt{\frac{1}{K}\sum_k f_{kt}^2} \qquad \text{(Factor CSV)}$$

- Cross-sectional observations provide an "instantaneous" measure of factor volatility levels
- During stable periods, Volatility Regime Adjustment tends to be very small
- Adjustments are rapid and intuitive following market shocks
- Volatility Regime Adjustment helps "when needed most"

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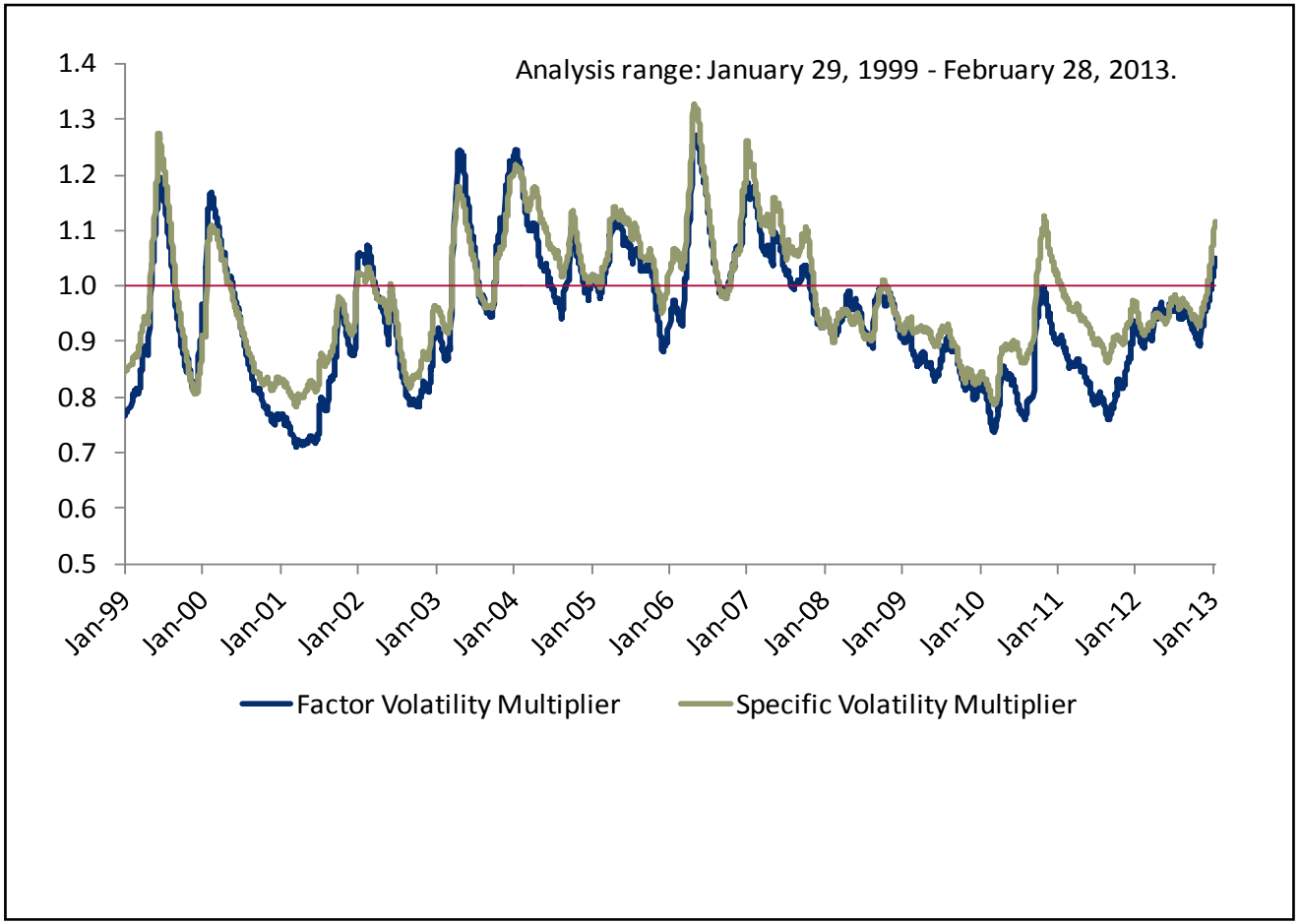
Volatility Regime Adjustment Factor

■ Volatility regime adjustment factor is a good indicator of the change in the overall market risk level



SPECIFIC RISK MODEL WITH BAYESIAN ADJUSTMENT

TIME-SERIES BASED SPECIFIC RISK MODEL*

- CNE5 leverages the EUE3 specific risk methodology
- Uses daily specific returns to compute asset-level specific risk forecasts
- Accounts for auto-correlation using Newey-West methodology

$$\sigma_n^{TS} = C_n^{NW}\left[\sum_t w_t\left(u_{nt} - \bar{u}_n\right)^2\right]$$ (Pure time-series estimate)

- For assets with poor return quality or short history (e.g., IPOs), blends time-series estimates with a structural estimate

$$\hat{\sigma}_n = \gamma_n \sigma_n^{TS} + \left(1-\gamma_n\right)\sigma_n^{STR}$$ (Blended estimate)

Model	Specific Volatility Half-Life	Newey-West Auto-Corr. Lags	Newey-West Auto-Corr. Half-Life	Bayesian Shrinkage Parameter q	Specific CSV Half-Life
CNE5D	42	0	N/A	0.1	4
CNE5S	84	5	252	0.25	42
CNE5L	252	5	252	0.25	168

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BAYESIAN SHRINKAGE METHODOLOGY*

Solution: shrink to the cap-weighted mean for each *Size* decile:

$$\sigma_n^B = v_n \bar{\sigma}(s_n) + (1 - v_n)\hat{\sigma}_n$$

Bayesian-adjusted forecast

$$\bar{\sigma}(s_n) = \sum_{n \in s_n} w_n \hat{\sigma}_n$$

Cap-weighted mean (Bayesian prior)

$$v_n = \frac{q\left|\hat{\sigma}_n - \bar{\sigma}(s_n)\right|}{\Delta_\sigma(s_n) + q\left|\hat{\sigma}_n - \bar{\sigma}(s_n)\right|}$$

Shrinkage intensity

$$\Delta_\sigma(s_n) = \sqrt{\frac{1}{N(s_n)} \sum_{n \in s_n} \left(\hat{\sigma}_n - \bar{\sigma}(s_n)\right)^2}$$

Standard deviation of Size decile

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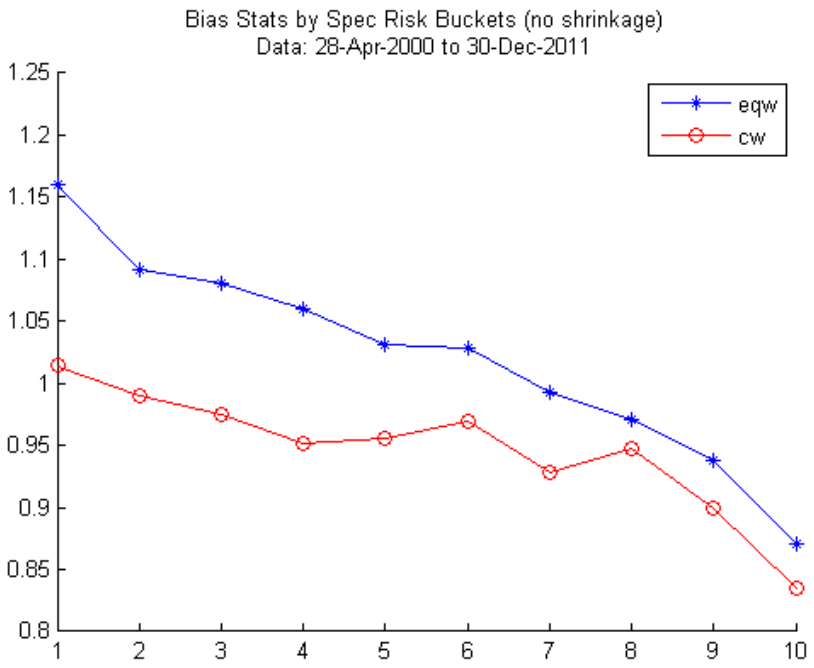
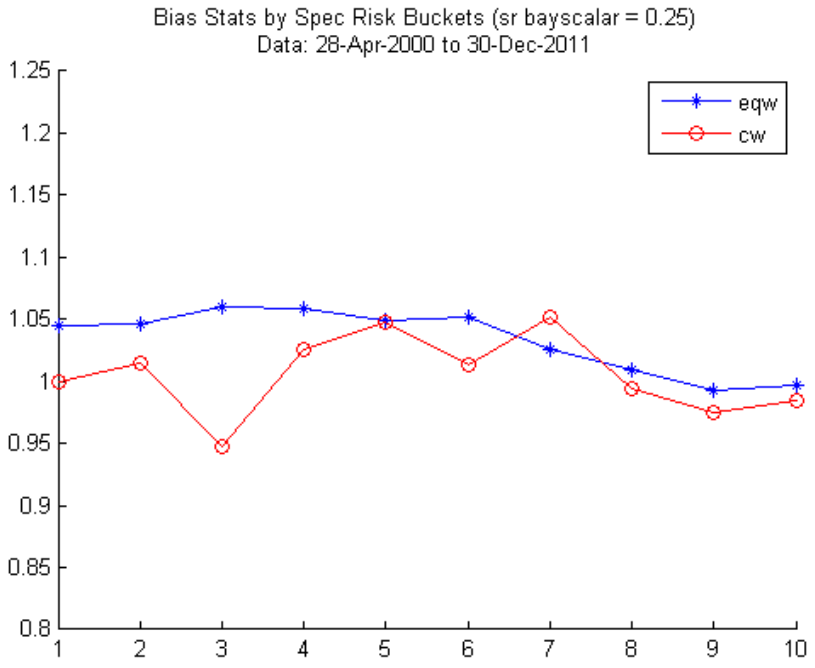
SPECIFIC RISK MODEL: BAYESIAN SHRINKAGE INTENSITY

No Shrinkage



Enhanced Shrinkage



- Enhanced level of shrinkage intensity (0.25) necessary to remove bias

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Step 3:
Portfolio Optimization

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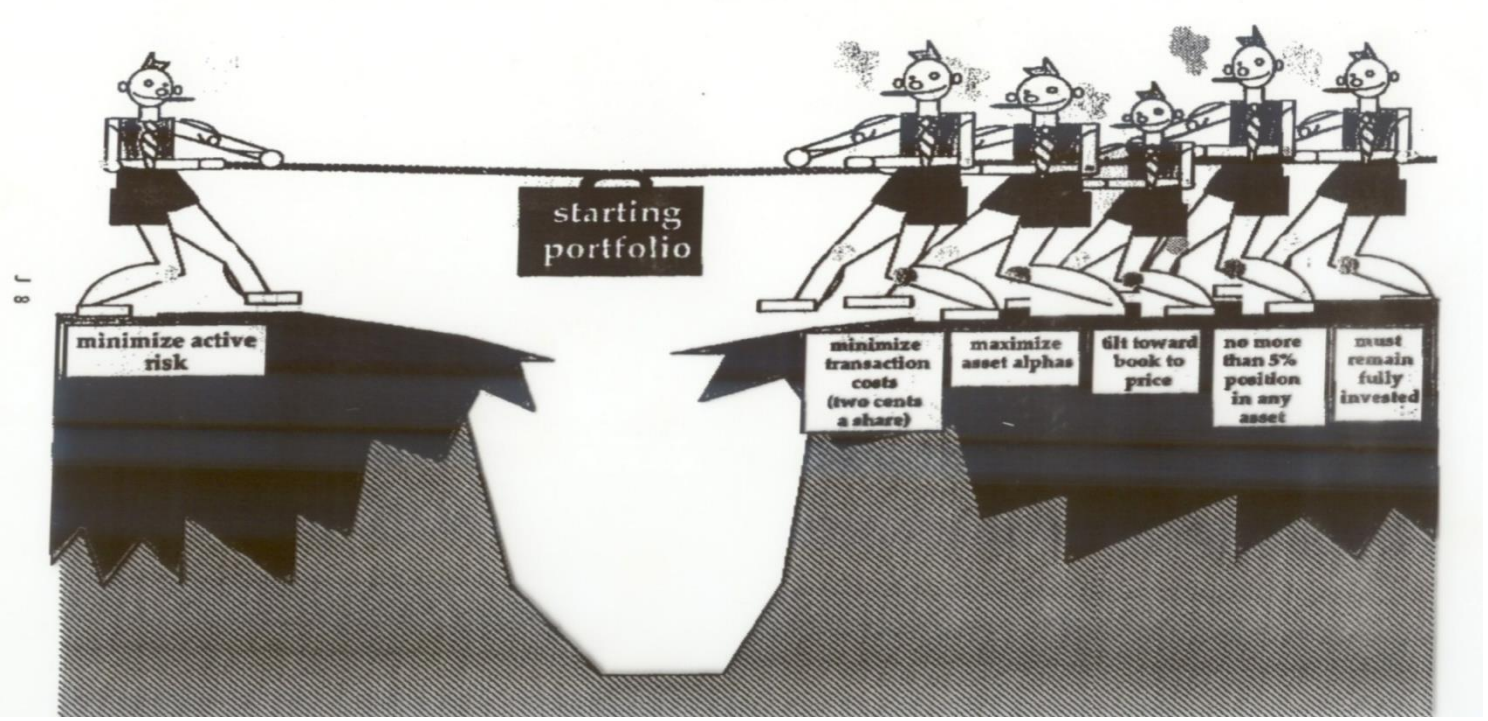
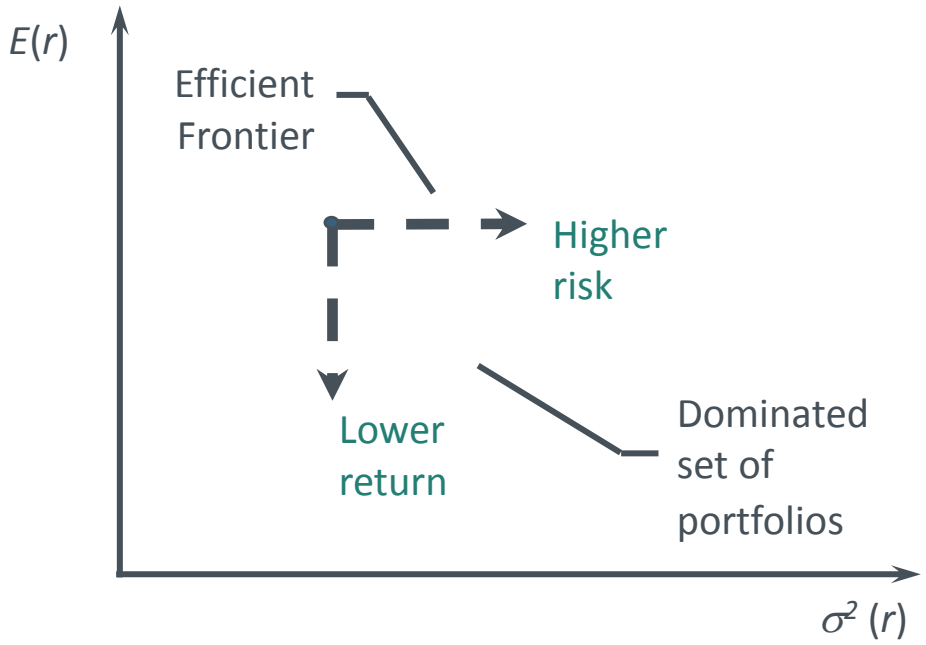
PORTFOLIO CONSTRUCTION SEEKS TO IMPLEMENT IDEAS

- Portfolio construction is the process of determining asset weights that best represent return and risk trade-off



OPTIMAL PORTFOLIOS ARE ON THE EFFICIENT FRONTIER

- The efficient frontier is the set of portfolios that dominates the rest of the investment set
  - Each point on the frontier has the lowest risk for its level of return (or, equivalently, the highest return for its level of risk)



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PORTFOLIO OPTIMIZATION

- Translate information into portfolios effectively
- Utility function quantifies the relationship between risk and return
- The standard mean-variance optimization is to maximize the utility function subject to any constraints one may have

$$\text{Maximize } U = E(r) - \lambda * \sigma^2(r) - \ldots$$
$$\text{Subjec to: any constraints,}$$
$$\text{e.g. total turnover } \leq 30\%,$$
$$\text{at most 20 buys.}$$

The result is an optimally constructed portfolio or efficient frontier

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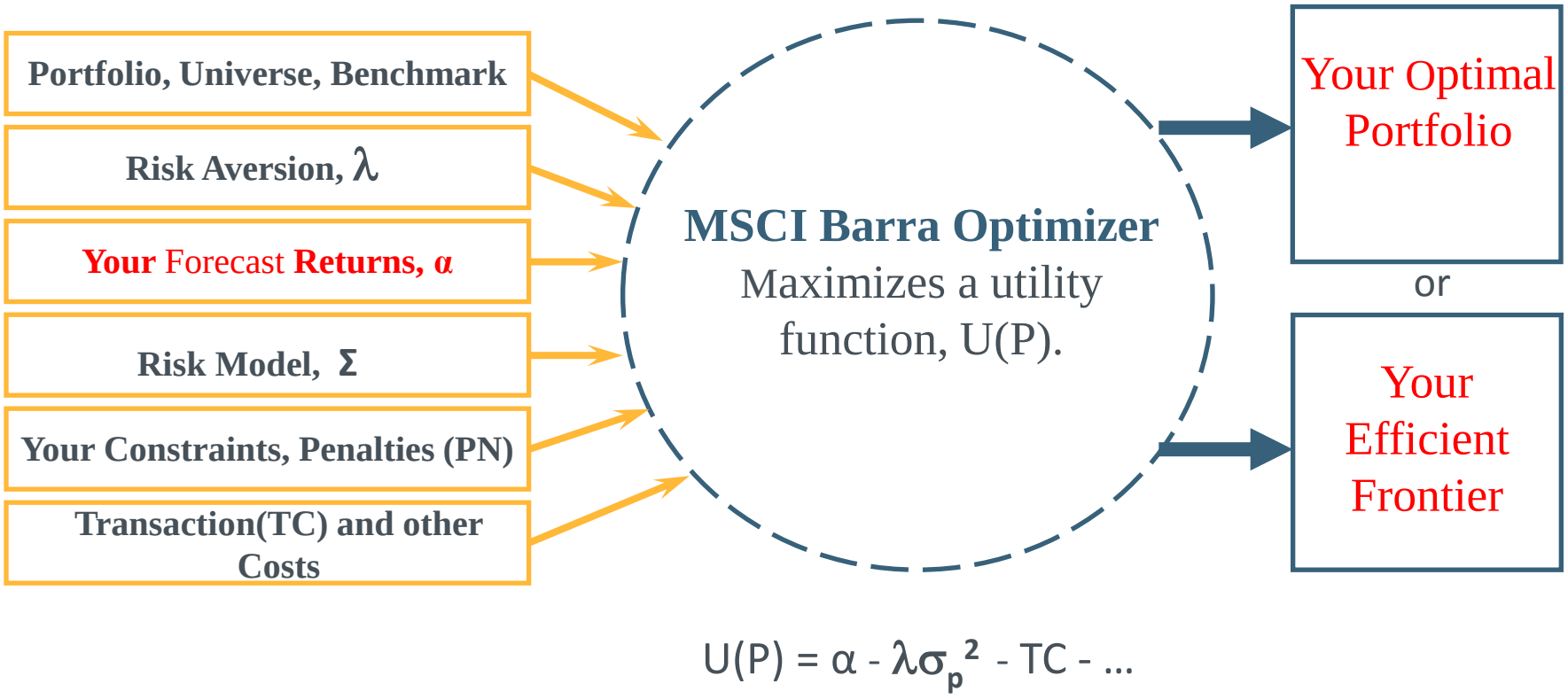
PORTFOLIO CONSTRUCTION WITH BARRA OPTIMIZER

- You can use the MSCI Barra Optimizer to create your own set of efficient portfolios, based upon both your constraints and forecast returns



OVERVIEW OF BARRA OPTIMIZER

- Barra Optimizer is specially designed for portfolio optimization
- Barra Optimizer is a fast, open and feature-rich optimization engine
- Used as a component in MSCI applications
  - Aegis/BarraOne/MSCI Index production
- Available on vendor's platforms: FactSet, ClariFi
- Also sold as a library: *Barra Open Optimizer* that can be easily integrated with most investment platforms

STANDARD CONSTRAINTS VS SPECIAL CONSTRAINTS

Standard Constraints:

- Holding (total investment) constraint
- General linear constraints
- Factor constraints
- Turnover limit constraint
- Transaction cost limit constraint
- General piece-wise linear constraints
- Bounds on assets
- Beta (and/or shortfall beta) constraint

They are all convex!

One or all those constraints can be in same problem!

Special Constraints:

- **Paring constraints,** e.g. # of names <=60
- **Round lotting**, e.g. only trade at multiples of 100 shares
- **5/10/40 rules**
- **Leverage (Hedge or Long/Short) constraints**, e.g. total long exposure to bank industry <= 0.3
- **Tax related constraints**, e.g. total short term loss >=$20k
- **Risk budgeting and advanced constraints**

Only limited combinations of special constraint types are supported!

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BARRA OPTIMIZER: STRENGTHS

- **Open** – Can be used with most risk models
- **Fast** – Faster than IBM ILOG CPLEX
  - Takes advantages of the special structure of the factor risk model
  - Uses right algorithms for portfolio optimization problems
  - Efficiently handles piece-wise linear functions (not split variables)
  - Tolerances are tuned specially for portfolio optimization
  - Well designed heuristic approaches to non-convex problems
- **Feature-Rich**
- **Easy** – Fully-featured API with documentations/tutorials/working sample code provides easy integration with proprietary or third party investment platforms.

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Step 4:
Performance Attribution

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PERFORMANCE ATTRIBUTION

- The ultimate question in performance attribution revolve around drivers of the portfolio's performance and what can be said about the quality of the results
  - Allow clients to better understand the impact of their upstream decisions on the performance downstream
  - Help clients to identify strengths and weaknesses in a research process
  - Allows clients to distinguish between skillful and lucky results
  - A rigorous performance attribution will serve as an indispensable preparation toll for client meetings

QUESTIONS TO ASK IN PERFORMANCE ANALYSIS

- Some sample questions that clients would seek for answers in the performance attribution
  - Is my return coming from areas I actively manage?
  - Are there any unintended bets?
  - Did my favorite names reward me with additional return?
  - How does a strategy perform and why does it perform as it does?
  - Are returns coming from areas where the managers claims expertise?
  - Have the manager's policies been consistent?

- Performance attribution is able to answer all these questions through Barra lens

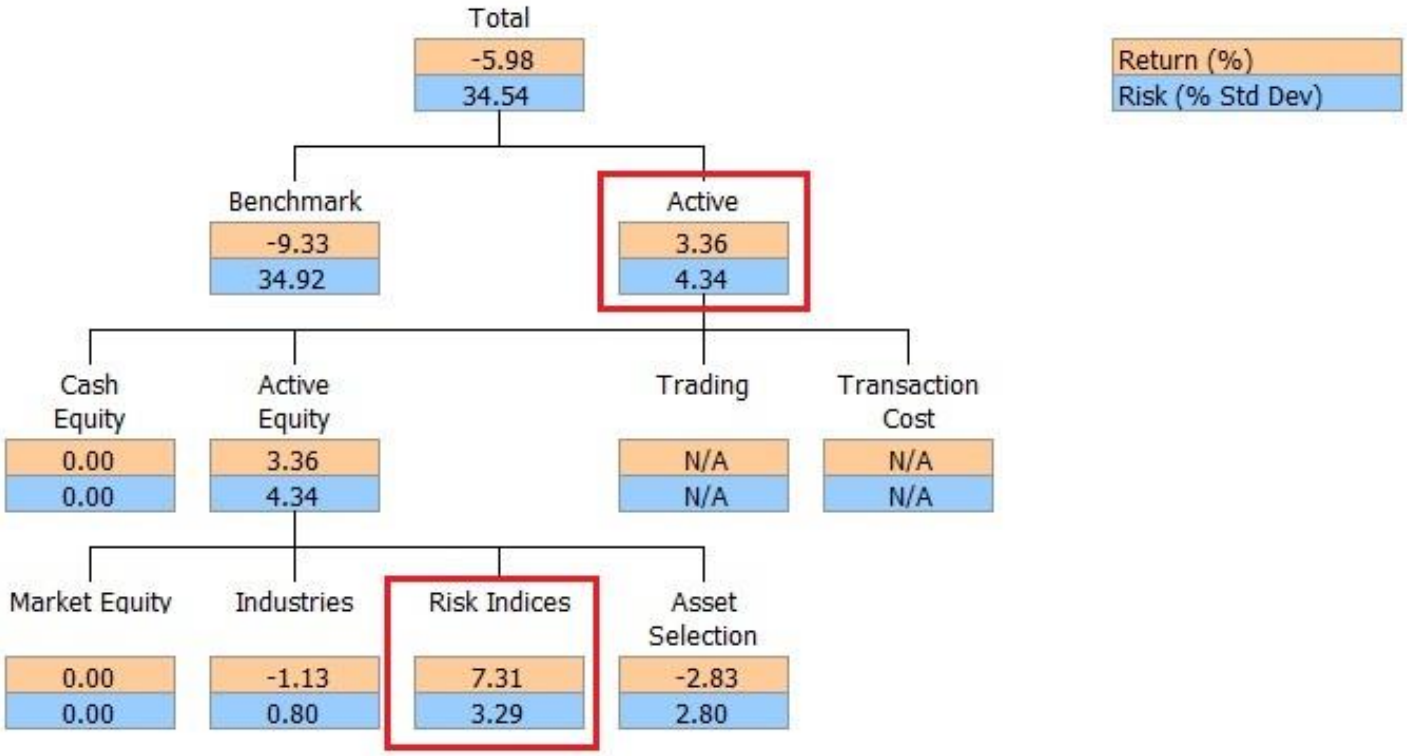
SEPARATE LUCK FROM SKILL THROUGH BARRA LENS

Portfolio Name: FT_RESVOL_V3
Benchmark: CSI300
Numeraire: CHN

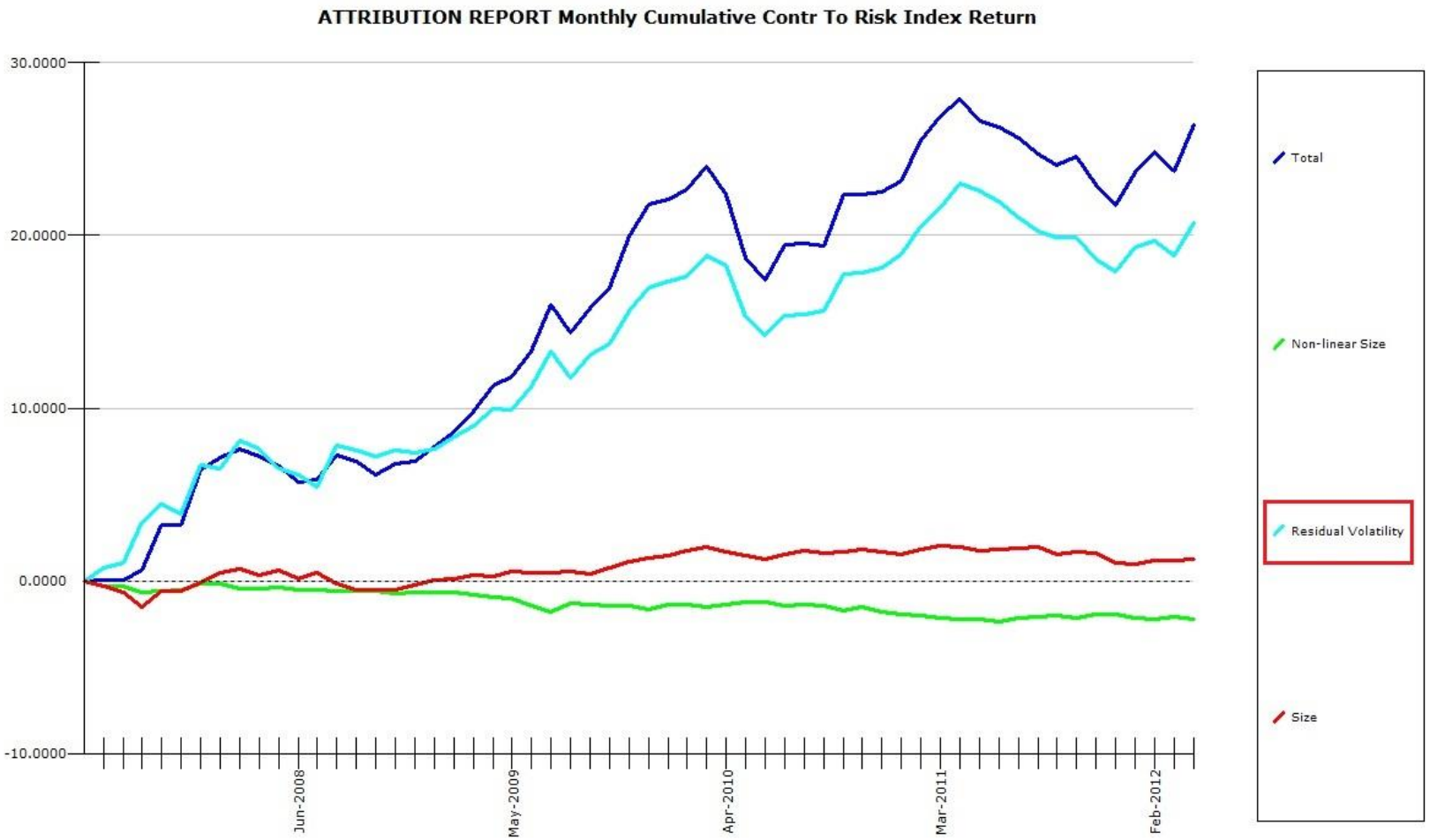
Total Annualized Attribution Chart

CQ Monthly
Aug-2007 to Apr-2012 (57 Months)
08-Jul-2012 (Sun)

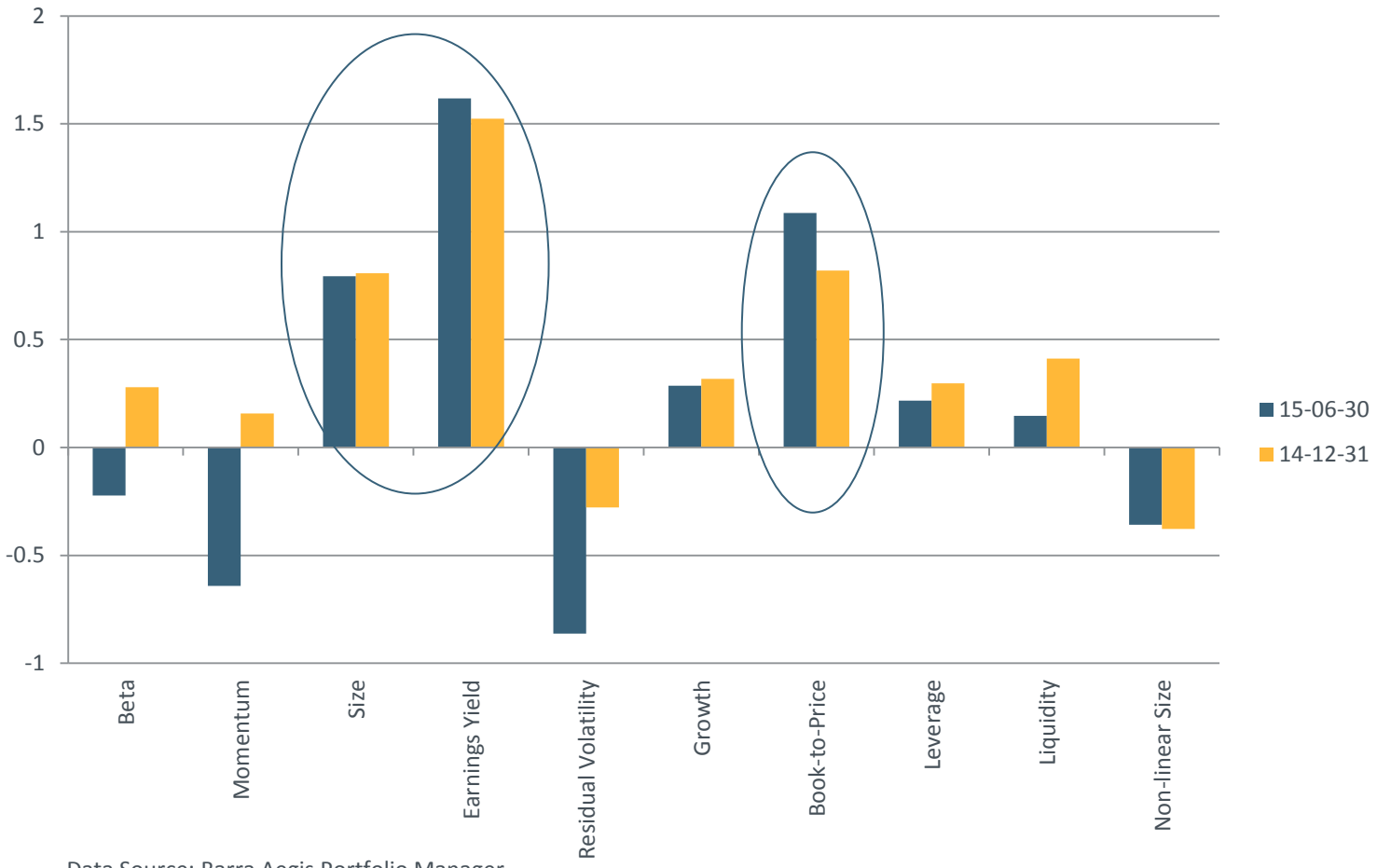
Attribution Chart
Annualized Contributions To Total Return



CHECK CUMULATIVE STYLE FACTOR CONTRIBUTION



STYLE ANALYSIS - A CHINA LARGE CAP EQUITY FUND



Data Source: Barra Aegis Portfolio Manager

Large-Cap Equity

- Positive **Size** exposure means large cap
- High **Earning Yield** and **Book-to-Price** exposures both explain the value strategy.

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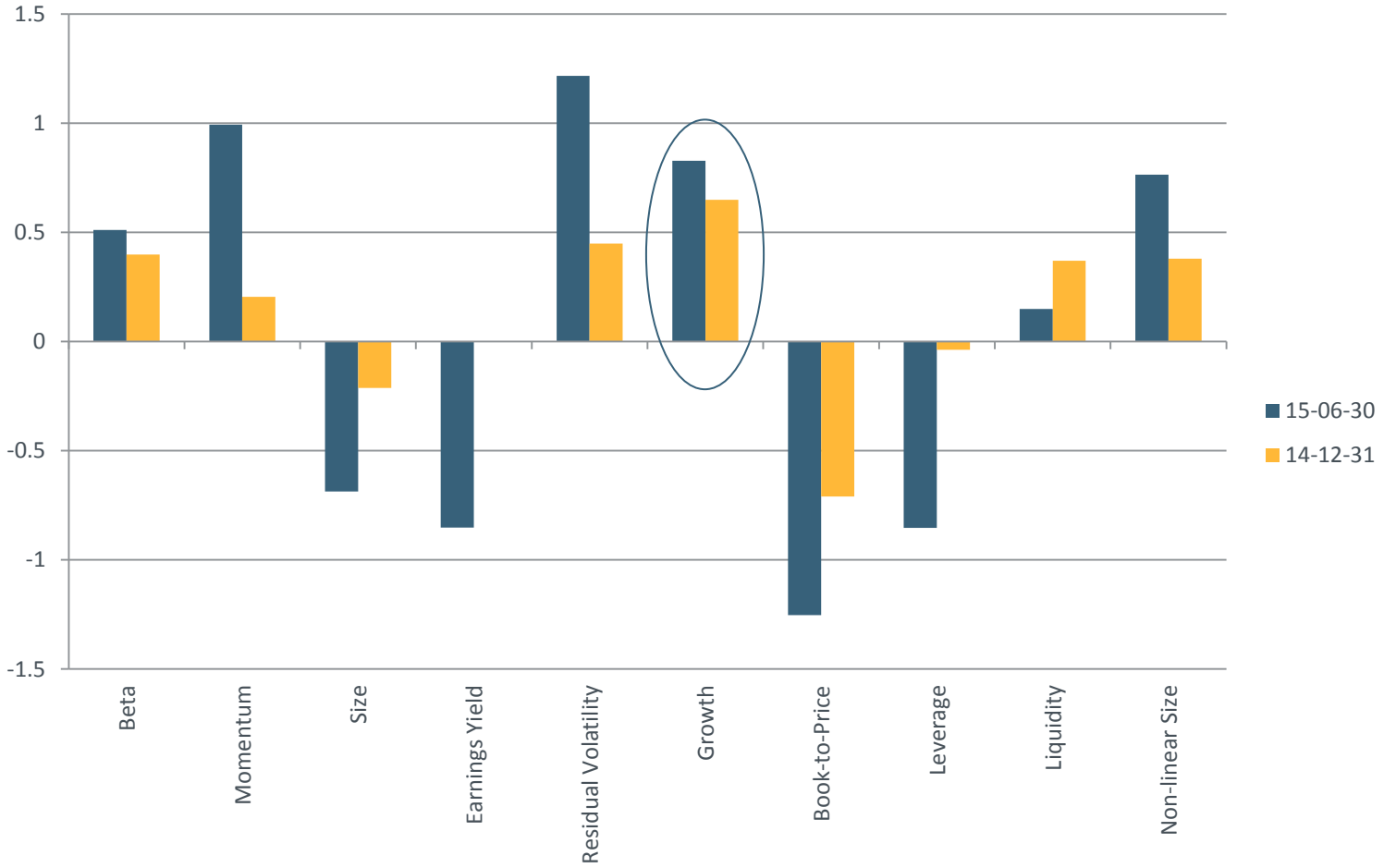
STYLE ANALYSIS - A CHINA GROWTH EQUITY FUND

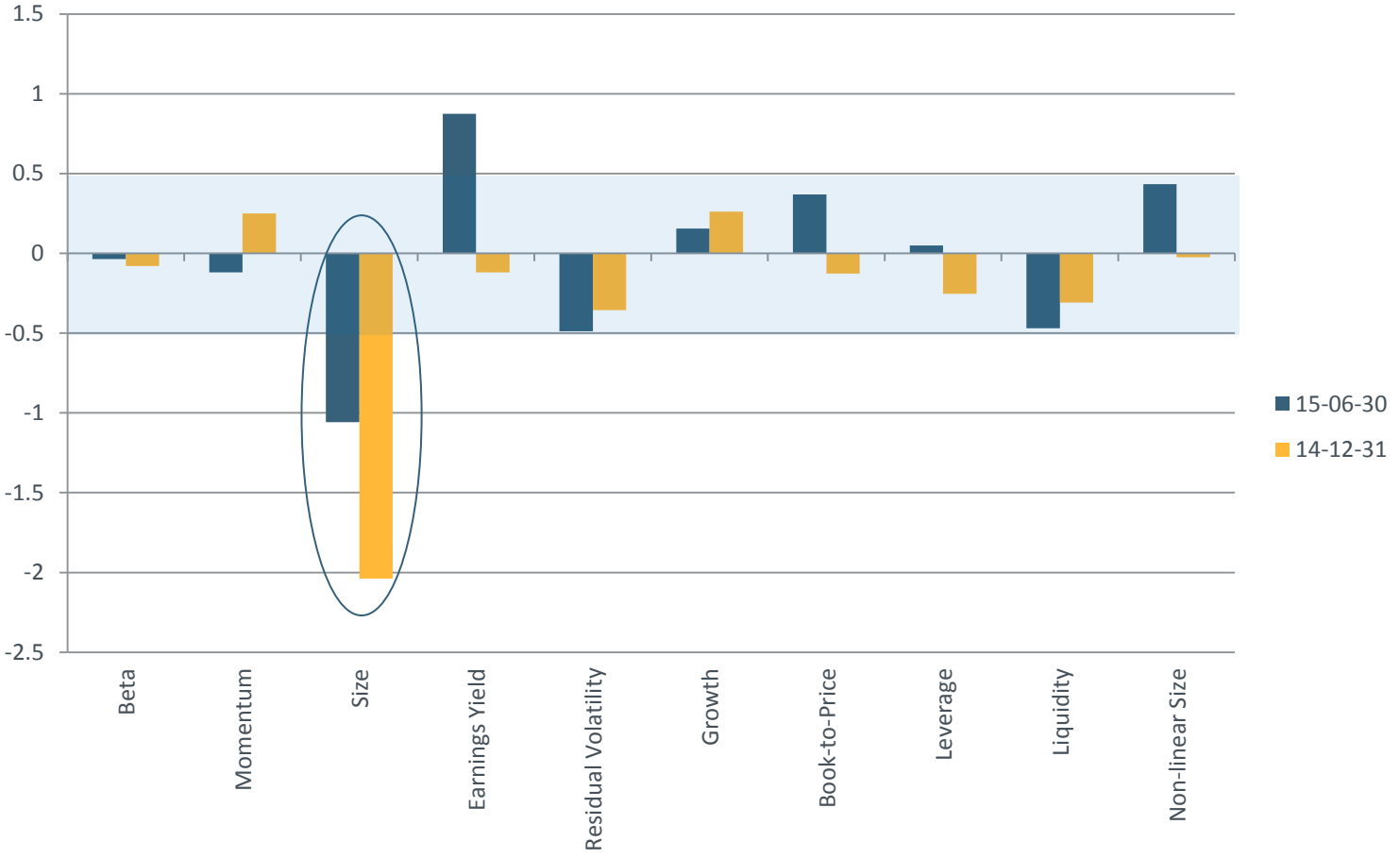


Data Source: Barra Aegis Portfolio Manager

Growth Equity

- Growth strategy is shown by positive **Growth** factor exposure.
- The styles shifted a bit over time, but overall the fund style comply with what it claimed.

STYLE ANALYSIS - A CHINA SMALL-CAP QUANT FUND



Data Source: Barra Aegis Portfolio Manager

Small-Cap Quant

- Significantly negative **Size** exposure reveals the small-cap strategy.
- Quant strategy normally intentionally has control over style exposures.

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Summary

SUMMARY

- Alpha model, risk model, portfolio optimization and performance attribution are all essential elements for achieving consistent active return
- Successful investment firms would find a way to integrate them together and constantly search for improvements in all of them to stay ahead of the market and the competitors
- The goal of seeking active return is never easy to achieve, but Barra can assist you in every step of your journey
  - A platform for Alpha strategy development in terms of both asset allocation and selection
  - Industry-leading risk model with high risk forecast ability
  - Portfolio optimizer to convert your strategies into portfolios
  - Performance attribution to have a comprehensive and consistent view on performance through Barra lens

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