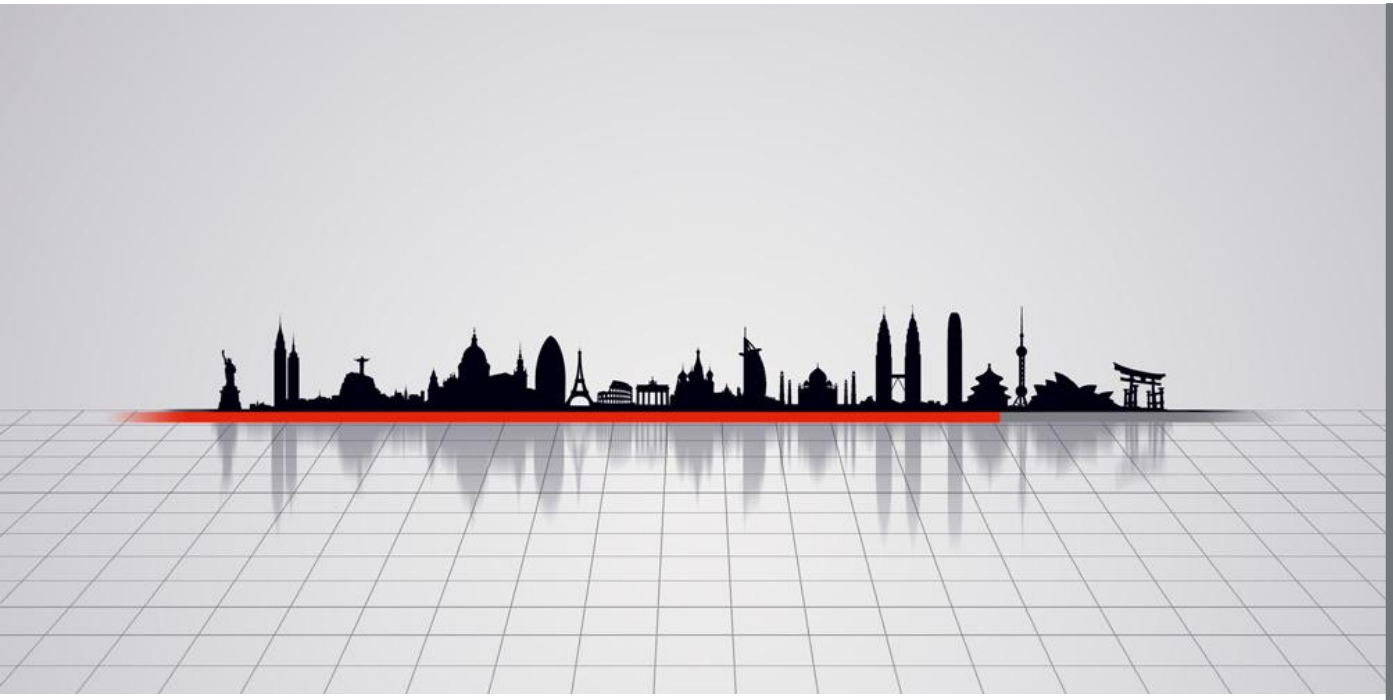


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Liquid Markets Analytics Europe

Elegant Factor Combination

- Methodology and Tool Demo

Wing Cheung

May 2010

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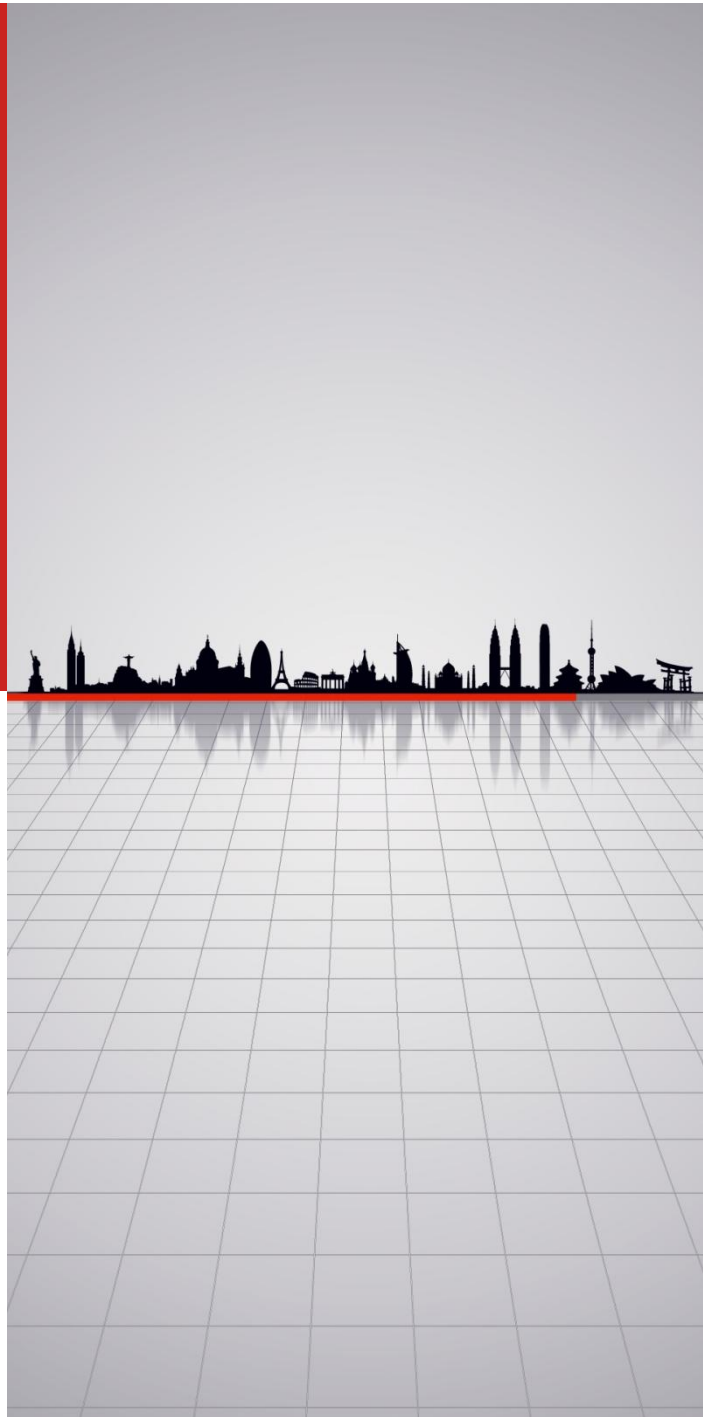
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Motivation: why factor combination?

There are diversification and risk management arguments for factor combination. Question is "How?"

- Uncertain about our factors' performance?
  - Diversify our factors
- Stock selection too concentrated?
  - Combining style portfolios
- Crowded factors?
  - Create 'new' factors through factor combination
- Unwanted risk factor skew?
  - Factor hedging: taking away unwanted factor exposures

- The question is
  - How should we allocate weights to these factors?



A Bayesian Allocation Framework (BAF)

Allocation: our thought process

We know how to deal with no-information, and full-information cases; but reality is often in between. Then how?

- Equal weighting?
  - When no information, we go for the ‘maximal-entropy’ solution
- Market-cap weighting?
  - Partial information: the market equilibrium belief
- Equal-risk weighting?
  - Partial information: let’s massage according to risk
  - Risk from stocks, factors, principal components?
- Equal-information-ratio weighting?
  - Partial information: let’s buy according to unit-risk performance
- Markowitz mean-variance optimisation?
  - Full information: allocate according to mean-variance / correlation trade-off
  - Suspicion: do we really have absolute information?
  - Robustness issue: optimiser is such a stubborn guy !!!
- Bayesian technique is one way to deliver robustness…

We consider a potential Bayesian solution

The original Black-Litterman Model: a brief review (refer to Cheung, 2009A for full explanation)

Economist

3 pillars supporting the BL Model

- Semi-strong market efficiency hypothesis
- Bayes' rule as the law for belief updating
- CAPM for equilibrium pricing

Engineer

Bayes' rule with reverse-optimisation

- The CAPM-based prior is just a special case of reverse-optimisation
- Bayes' rule as the law for belief updating

The Black-Litterman (BL) Model

Confidence weighted-average of view updating

$$\vec{\hat{m}} = [(\tau\boldsymbol{\Sigma})^{-1} + \mathbf{P}^T\boldsymbol{\Omega}^{-1}\mathbf{P}]^{-1}[(\tau\boldsymbol{\Sigma})^{-1}\vec{\hat{\pi}} + \mathbf{P}^T\boldsymbol{\Omega}^{-1}\vec{\hat{q}}]$$

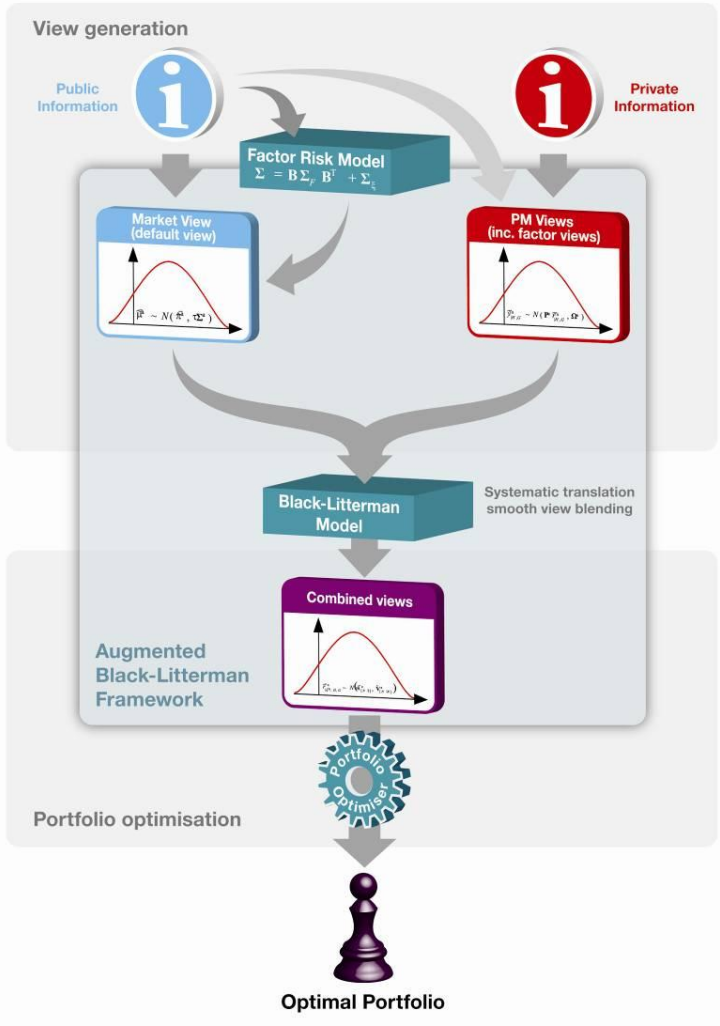
$$\hat{\mathbf{V}} = [(\tau\boldsymbol{\Sigma})^{-1} + \mathbf{P}^T\boldsymbol{\Omega}^{-1}\mathbf{P}]^{-1}$$

- Smooth view-blending engine
- Robustness due to shrinkage
- Freedom to provide any number of views; even no view is fine
- Absolute or relative views

Cheung, W. (2009A), "The Black-Litterman Model Explained", available at SSRN: http://ssrn.com/abstract=1312664

The Augmented Black-Litterman (ABL) Model

Following the same logic of the original BL Model, we obtain the ABL Model (Cheung, 2009B)

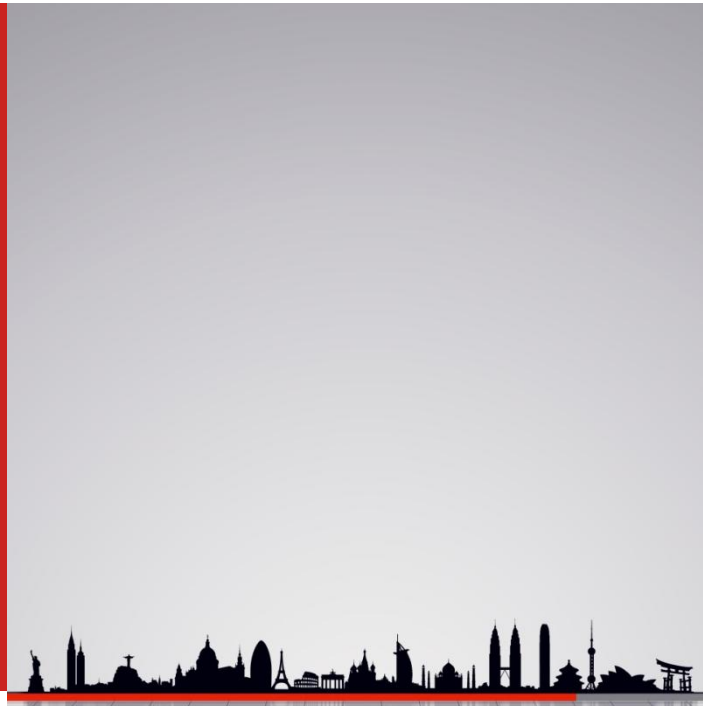


$$\vec{\hat{m}}^{a} = \left[\left(\tau\boldsymbol{\Sigma}^{a}\right)^{-1} + \left(\mathbf{P}^{a}\right)^{T}\left(\boldsymbol{\Omega}^{a}\right)^{-1}\mathbf{P}^{a}\right]^{-1}\left[\left(\tau\boldsymbol{\Sigma}^{a}\right)^{-1}\vec{\hat{\pi}}^{a} + \left(\mathbf{P}^{a}\right)^{T}\left(\boldsymbol{\Omega}^{a}\right)^{-1}\vec{\hat{q}}^{a}\right]$$

$$\hat{\mathbf{V}}^{a} = \left[\left(\tau\boldsymbol{\Sigma}^{a}\right)^{-1} + \left(\mathbf{P}^{a}\right)^{T}\left(\boldsymbol{\Omega}^{a}\right)^{-1}\mathbf{P}^{a}\right]^{-1}$$

- We use the same principles that underlies the BL Model to derive our ABL
- By taking factors and stock idiosyncratic component as additional 'assets', views on these components are readily admittable
- All advantages of BL are maintained in this model subject to factor model errors
- New allocation technique that admits
  - Stock or portfolio views
  - Factor views
  - Stock-specific views
- **ABL is therefore a unified solution for various strategies!**

Cheung, W. (2009B), "Approach The Augmented Black-Litterman Model: A Ranking-Free to Factor-Based Portfolio Construction and Beyond", available at SSRN: http://ssrn.com/abstract=1347648



Bayesian Factor Portfolio Combination

Demo: Combining styles constructed externally

Suppose we combine Fama-French ranked *Value* (View 1) and *Long-term Momentum* (View 2) styles

Nomura Augmented Black Litterman Tool

Market and Risk Model	
Reference Notional (USD)	1,000,000
Risk Model	FRM Europe Long Term (USD)
Date	20100511
Risk Free Rate	6.00%
tau	1
Calibration Multiplier	1
Expected Market Return	13.00%
Sector Scheme	GICS Level 2

Output Portfolio Constraints	
Max Securities	
Max Risk	
Min Stock Weight	
Max Stock Weight	
Min Sector Weight	
Max Sector Weight	
Max Gross Value	
Min Net Value	
Max Net Value	
Min Beta	
Max Beta	

Tilt Portfolio Constraints	
Max % ADV Traded (+/-)	
Max Gross Turnover (%)	
Max Transaction Size (+/-)	
Min Tilt Net Weight	
Max Tilt Net Weight	

Solve ABL

Benchmark and User Views

Benchmark		Stock View Structures			Specific View Structures		
Tickers	Weights	View1	View2	View3	View1	View2	View3
UG FP	0.32%	0.05	0.00	0.05		-1	0.3
INGA NA	1.77%	0.05	0.00	-0.05	-1		0.05
RNO FP	0.66%	0.05	0.00	0		-1	0.2
AF FP	0.21%	0.05	0.00	0.05			
ACA FP	1.67%	0.05	0.00	-0.05	1		0.1
BCP PL	0.23%	0.05	-0.05	0.05		3	0.3
BES PL	0.27%	0.05	-0.05	0.05			
GBLB BB	0.66%	0.05	0.00	0		-1	
GLE FP	2.01%	0.05	0.00	-0.05			0.05
AGN NA	0.61%	0.05	0.00	0			
KBC BB	0.80%	0.05	0.05	0			
DEXB BB	0.46%	0.05	-0.05	0			
CS FP	2.21%	0.05	0.00	-0.05			
SCR FP	0.22%	0.05	-0.05	0.05			
BNP FP	4.22%	0.05	0.00	-0.05			
MMB FP	0.24%	0.05	0.00	0.05			
LG FP	0.98%	0.05	-0.05	0			
CNP FP	0.62%	0.05	0.00	0			
EDPR PL	0.30%	0.05	-0.05	0.05			
GSZ FP	3.92%	0.05	-0.05	-0.05			
CORA NA	0.25%	0	0.00	0.05			
SGO FP	1.21%	0	0.00	0			
VIV FP	1.50%	0	-0.05	-0.05			
DSM NA	0.40%	0	0.00	0			
MT NA	3.03%	0	0.05	-0.05			
UL FP	0.80%	0	0.00	0			
EAD FP	0.78%	0	0.00	0			
PP FP	0.86%	0	0.05	0			
CAP FP	0.40%	0	0.00	0			
AKZA NA	0.67%	0	0.00	0			
CO FP	0.46%	0	0.00	0			

Stock View	Mean
View 1	0.1
View 2	0.1
View 3	0.1

Specific Views	Mean
View 1	0.05
View 2	0.1
View 3	0.2

Stock View	Uncertainty
View 1	0.2
View 2	0.2
View 3	

Specific Views	Uncertainty
View 1	
View 2	
View 3	

Calibration Multiplier Adjusted Uncertainties

Stock View	Uncertainty		
View 1	0.2	0	0
View 2	0	0.2	0
View 3	0	0	1000000

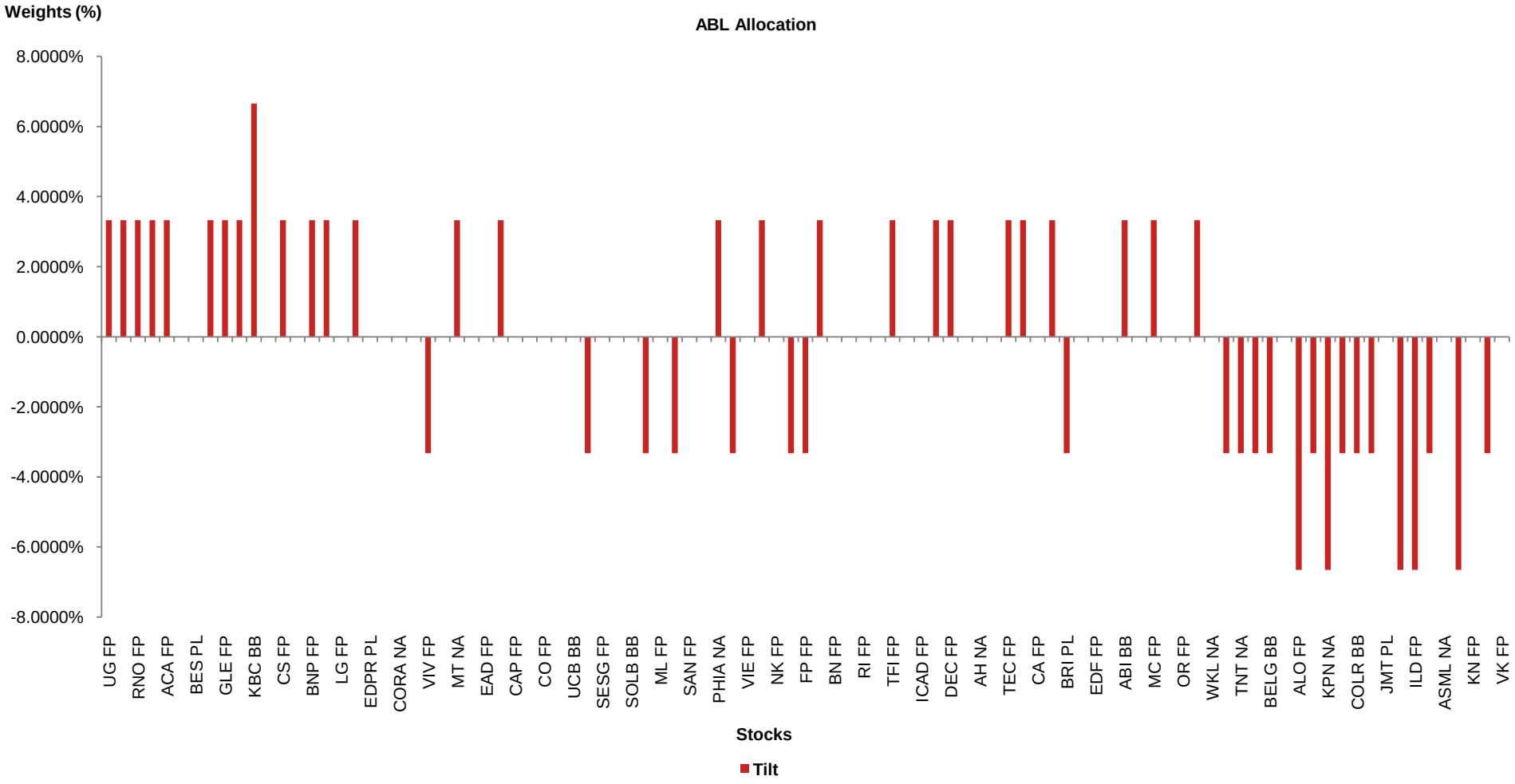
Specific Views	Uncertainty		
View 1	1000000	0	0
View 2	0	1000000	0
View 3	0	0	1000000

View Conviction – signal-noise ratio

∞ High Conviction

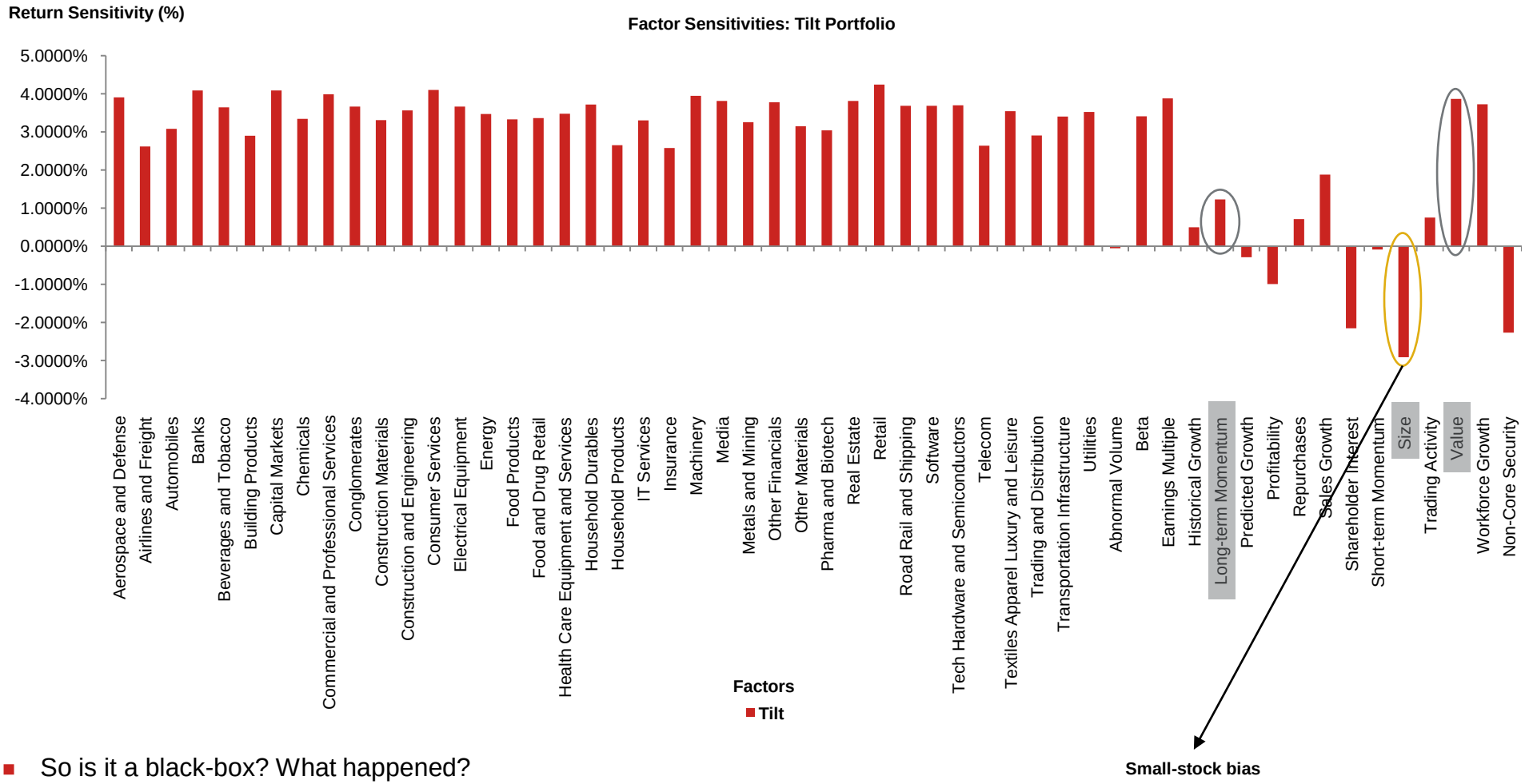
Demo: Bayesian Allocation (tilt)

***Value* and *Long-Term Momentum* styles combined**



Demo: Return sensitivity to factors

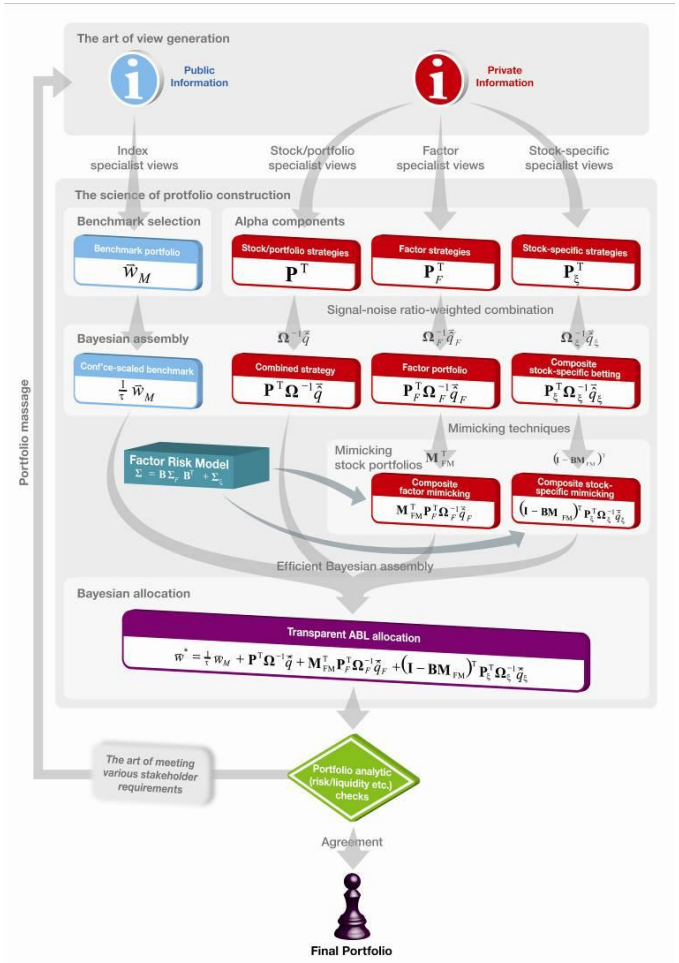
Composite *Value* and *Long-Term Momentum* style



- So is it a black-box? What happened?

The Transparent ABL Model opens it all up

Strategy combination, Factor-Mimicking, hedging and stock-specific bets in a unified and optimiser-free framework (Cheung, 2009C)



$$\vec{w}^{*} = \underbrace{\frac{1}{\tau}\vec{w}_{m}}_{\text{scaled benchmark}} + \underbrace{\mathbf{P}^{\mathrm{T}}\left(\boldsymbol{\Omega}\right)^{-1}\vec{\hat{q}}}_{\text{strategy/stock combination}} + \underbrace{\mathbf{M}_{\mathrm{FM}}^{\mathrm{T}}\mathbf{P}_{F}^{\mathrm{T}}\left(\boldsymbol{\Omega}_{F}\right)^{-1}\vec{\hat{q}}_{F}}_{\text{factor-mimicking portfolio}} + \underbrace{\left(\mathbf{I}-\mathbf{BM}_{\mathrm{FM}}\right)^{\mathrm{T}}\mathbf{P}_{\xi}^{\mathrm{T}}\left(\boldsymbol{\Omega}_{\xi}\right)^{-1}\vec{\hat{q}}_{\xi}}_{\text{idiosyncratic pick}}$$

Factor-Mimicking technique

Hedging technique

Original BL

Augmented tilts in ABL

- The ABL Model admits a completely transparent representation
- The allocation formula enables in-depth intuition
- Natural, modularised portfolio construction
- Endogenous techniques
  - Allocation: universal signal-noise ratio weighting
  - Endogenous Factor-Mimicking technique
  - Endogenous hedging technique

Cheung, W. (2009C), "Transparent Augmented Black-Litterman: Simple and Unified Framework for Strategy Combination, Factor-Mimicking, Hedging, and Stock-Specific Alphas", available at SSRN: http://ssrn.com/abstract=1347663

The endogenous allocation law

Theoretically sound, practically unified allocation law: signal-noise ratio weighting

The Allocation Law

The transparent ABL model mixes view strategies according to their respective signal-noise ratios, signal being the view convictions; and noise being the view uncertainty matrix or the variance of the benchmark

View / Assets / forecast	View Structure $\mathbf{P}^T_{[3\times n]}$		
	View 1 (*Value*)	View 2 (*LT Momentum*)	View 3 (*Size*)
UG FP	**0.05**	0.00	**0.05**
INGA NA	**0.05**	0.00	**-0.05**
RNO FP	**0.05**	0.00	0
AF FP	**0.05**	0.00	**0.05**
ACA FP	**0.05**	0.00	**-0.05**
BCP PL	**0.05**	**-0.05**	**0.05**
BES PL	**0.05**	**-0.05**	**0.05**
GBLB BB	**0.05**	0.00	0
GLE FP	**0.05**	0.00	**-0.05**
AGN NA	**0.05**	0.00	0
KBC BB	**0.05**	**0.05**	0
…	…	…	…
VK FP	**-0.05**	**0.05**	0
View forecast $\tilde{\hat{q}}^T_{[3\times1]}$	**0.10**	**0.10**	**0.10**
Uncertainty $\mathbf{\Omega}_{[3\times3]}$	**0.2**	0	0
	0	**0.2**	0
	0	0	**1,000,000**

$$\mathbf{P}^{\mathrm{T}}\mathbf{\Omega}^{-1}\tilde{\hat{q}} = \frac{0.10}{0.2}\begin{pmatrix}0.05\\0.05\\0.05\\0.05\\0.05\\0.05\\0.05\\0.05\\0.05\\0.05\\\vdots\\-0.05\end{pmatrix}_{[n\times1]} + \frac{0.10}{0.2}\begin{pmatrix}0\\0\\0\\0\\0\\-0.05\\-0.05\\0\\0\\0\\0.05\\\vdots\\0.05\end{pmatrix}_{[n\times1]} + \frac{0.10}{1000000}\begin{pmatrix}0.05\\-0.05\\0\\0.05\\-0.05\\0.05\\0.05\\0\\-0.05\\0\\0\\\vdots\\0\end{pmatrix}_{[n\times1]}$$

Value *LT Momentum* *Size*

Ignoring this view!

How will the Bayesian Allocation perform?

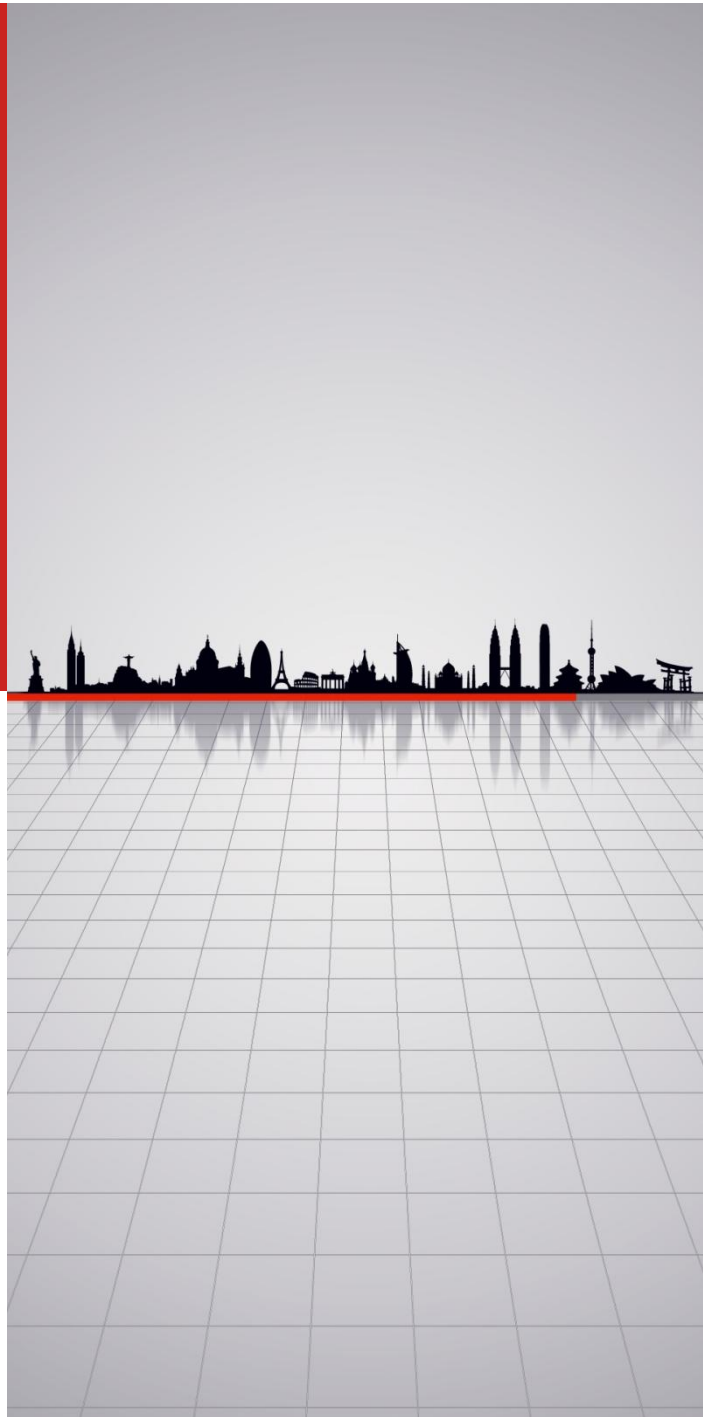
The Bayesian Allocation assembles the user views efficiently, so the performance depends on the view quality

Value Adding

In the presence of only orthogonal views, if the information coefficient (IC) (i.e., forecasting skill) of each view is greater than 0, the Bayesian tilts are expected to perform

- The Bayesian Allocation is mean-variance efficient
  - In the Bayesian framework, views contain 3 components: view structure matrix, signal and noise
  - $\hat{\vec{q}}$: our **signal** vector contains k directional views about these k strategies
  - $\mathbf{\Omega}$: the **noise** matrix tells the model how much we plan to listen to these k views, respectively
  - $\frac{1}{2\lambda}\mathbf{\Omega}^{-1}\hat{\vec{q}}$ is the mean-variance optimised allocation to views
  - $\mathbf{P}$: **view structure** matrix contains k view strategy vectors to which the allocation should apply
- With directionally correct views, the Bayesian Allocation performs with mathematical certainty
  - Bayesian combined stock strategies, $\mathbf{P}^{\mathrm{T}}\mathbf{\Omega}^{-1}\hat{\vec{q}}$; factor strategies, $\mathbf{P}_F^{\mathrm{T}}\mathbf{\Omega}_F^{-1}\vec{q}_F$; and stock-specific strategies, $\mathbf{P}_\xi^{\mathrm{T}}\mathbf{\Omega}_\xi^{-1}\vec{q}_\xi$
  - When views are directionally correct, the returns of the above are positive-definite quadratic forms!
  - Therefore, guaranteed value adding
- Therefore, portfolio massage does not damage alpha!

Bayesian Factor Mimicking



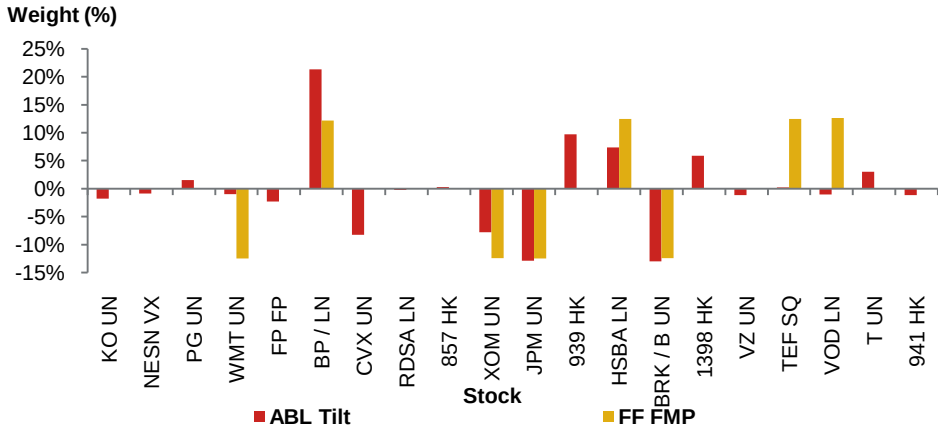
The endogenous Factor-Mimicking (FM) technique

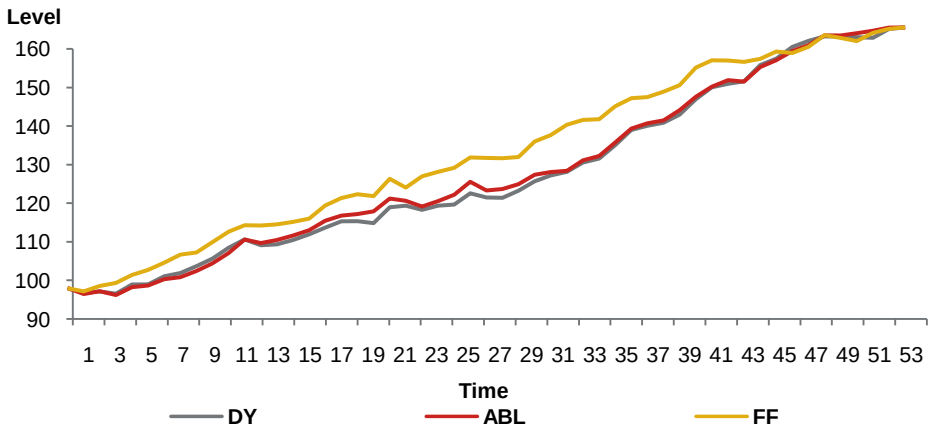
The endogenous choice: minimal tracking-error portfolio

Conjecture 1: (The Intrinsic Bayesian Factor-Mimicking Technique)

The intrinsic Bayesian factor-mimicking technique is $\mathbf{M}^{\mathrm{T}}_{\mathrm{FM}[n\times f]}$. *More specifically, given a factor allocation* $\vec{w}_{F[f\times 1]}$, *the Bayesian factor mimicking stock portfolio* $\vec{w}^{[\mathrm{FM}]}_{[n\times 1]}$ *is:*

$$\vec{w}^{[\mathrm{FM}]}_{[n\times 1]} = \mathbf{M}^{\mathrm{T}}_{\mathrm{FM}[n\times f]}\vec{w}_{F[f\times 1]} = \left(\boldsymbol{\Sigma}^{+}\right)^{-1}\mathbf{B}\boldsymbol{\Sigma}^{+}_{F}\cdot\vec{w}_{F}\,. \qquad (5)$$





- This technique pursues minimal tracking error
- Note this is a general Factor-Mimicking technique without necessary dependence on views

Cheung, W. and N. Mittal (2009), "Efficient Bayesian Factor Mimicking", available at SSRN: http://ssrn.com/abstract=1457022

Is the endogenous FM technique efficient?

In terms of correlation: this technique is superior

MC	Telecom				Financials				Energy				ConStapl			
S No.	ABL	Ind	OLS	GLS	ABL	Ind	OLS	GLS	ABL	Ind	OLS	GLS	ABL	Ind	OLS	GLS
1	95.39%	89.98%	92.74%	94.13%	98.11%	96.53%	97.70%	97.85%	98.15%	94.25%	97.46%	97.92%	94.72%	84.54%	92.28%	93.28%
2	95.36%	89.76%	92.57%	93.99%	98.08%	96.45%	97.64%	97.81%	98.16%	94.29%	97.52%	97.94%	94.62%	84.71%	92.03%	93.03%
3	95.34%	89.63%	92.57%	93.94%	98.10%	96.51%	97.69%	97.85%	98.13%	94.11%	97.37%	97.84%	94.84%	84.50%	92.22%	93.33%
4	95.25%	89.45%	92.44%	93.92%	98.02%	96.47%	97.59%	97.75%	98.13%	94.02%	97.41%	97.87%	94.85%	85.18%	92.56%	93.44%
5	95.47%	89.90%	92.90%	94.23%	98.10%	96.59%	97.68%	97.85%	98.22%	94.40%	97.56%	97.98%	94.92%	84.75%	92.30%	93.33%
6	95.39%	90.00%	92.80%	94.08%	98.07%	96.61%	97.64%	97.79%	98.18%	94.24%	97.50%	97.94%	94.80%	84.55%	92.39%	93.31%
7	95.43%	90.05%	92.81%	94.07%	98.01%	96.39%	97.59%	97.75%	98.22%	94.28%	97.50%	97.96%	94.73%	84.36%	92.30%	93.24%
8	95.49%	90.26%	93.00%	94.25%	98.09%	96.51%	97.67%	97.83%	98.18%	94.13%	97.44%	97.89%	94.87%	85.14%	92.39%	93.38%
9	95.38%	89.89%	92.67%	94.06%	98.08%	96.56%	97.65%	97.82%	98.21%	94.26%	97.47%	97.93%	94.72%	84.51%	92.19%	93.23%
10	95.50%	90.10%	92.86%	94.12%	98.08%	96.52%	97.65%	97.80%	98.21%	94.30%	97.49%	97.98%	94.94%	85.46%	92.54%	93.44%
Avg	**95.40%**	**89.90%**	**92.74%**	**94.08%**	**98.07%**	**96.51%**	**97.65%**	**97.81%**	**98.18%**	**94.23%**	**97.47%**	**97.92%**	**94.80%**	**84.77%**	**92.32%**	**93.30%**

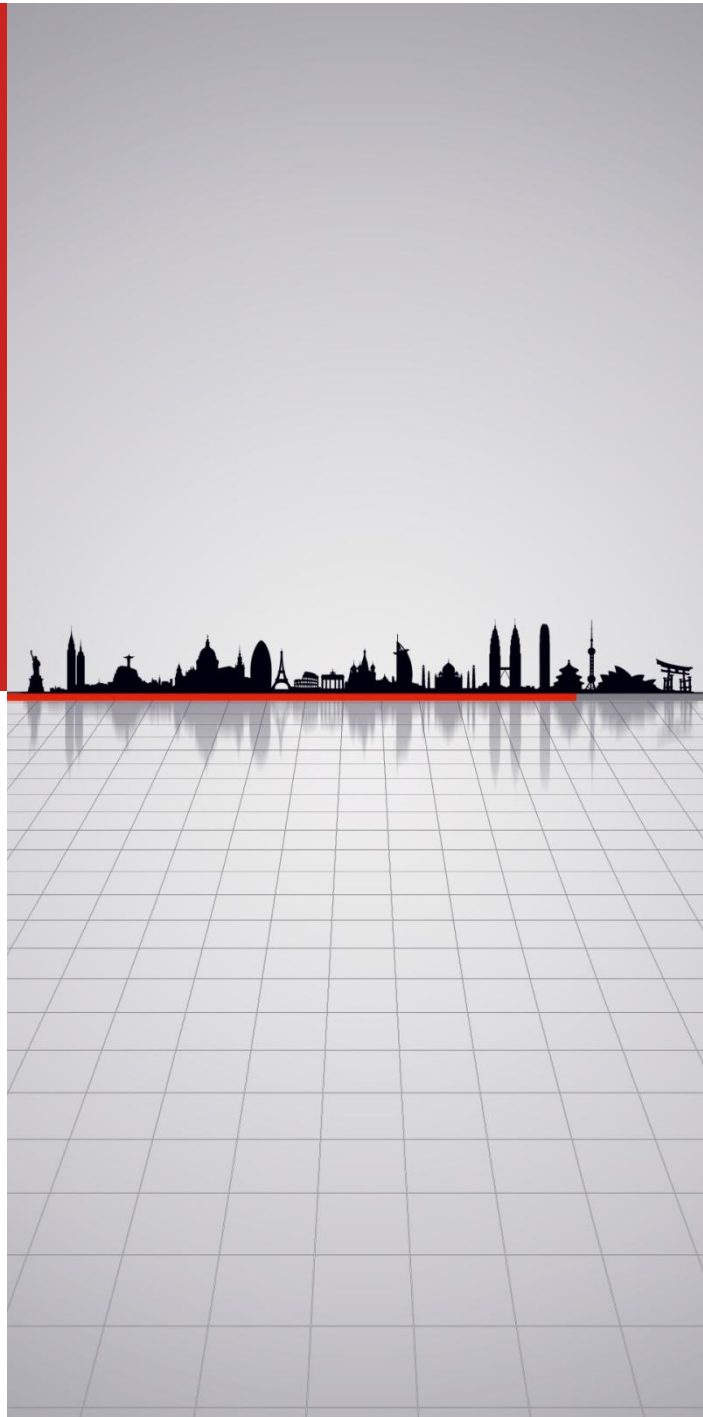
	Industrials			
	ABL	Ind	OLS	GLS
Grp Avg	96.61%	91.35%	95.05%	95.78%

MC	BP				DY				Size				Ret_6M			
S No.	ABL	FF	OLS	GLS	ABL	FF	OLS	GLS	ABL	FF	OLS	GLS	ABL	FF	OLS	GLS
1	87.27%	68.91%	84.73%	86.19%	89.94%	57.91%	87.57%	88.48%	89.45%	67.26%	83.94%	86.83%	95.12%	88.00%	93.04%	94.15%
2	86.80%	67.59%	84.13%	85.72%	89.90%	58.03%	87.43%	88.46%	89.45%	67.00%	83.68%	86.61%	95.26%	88.20%	93.21%	94.30%
3	87.11%	67.98%	84.17%	86.05%	89.86%	57.26%	87.27%	88.31%	89.77%	68.08%	84.13%	86.97%	95.29%	88.42%	93.03%	94.27%
4	87.29%	67.88%	84.74%	86.26%	89.89%	56.74%	87.43%	88.45%	89.54%	68.15%	83.89%	86.82%	95.20%	88.14%	93.02%	94.21%
5	86.95%	67.96%	84.13%	85.77%	89.89%	57.66%	87.56%	88.47%	89.77%	68.18%	84.34%	87.06%	95.14%	88.29%	92.94%	94.13%
6	87.19%	67.92%	84.51%	86.16%	90.10%	57.62%	87.60%	88.64%	89.75%	67.98%	84.02%	86.86%	95.20%	88.35%	93.17%	94.31%
7	87.29%	68.67%	84.63%	86.15%	90.10%	58.47%	87.65%	88.66%	89.73%	67.54%	83.56%	86.74%	95.25%	88.18%	93.33%	94.36%
8	87.31%	68.33%	84.52%	86.18%	89.92%	56.99%	87.46%	88.44%	89.72%	68.28%	84.33%	87.11%	95.23%	88.19%	93.07%	94.20%
9	86.92%	68.01%	84.15%	85.90%	90.01%	57.62%	87.64%	88.61%	89.82%	68.02%	84.21%	87.10%	95.12%	88.37%	93.02%	94.17%
10	87.20%	68.55%	84.46%	86.05%	90.09%	58.41%	87.89%	88.75%	89.61%	67.91%	84.15%	87.09%	95.18%	88.06%	93.18%	94.28%
Avg	**87.13%**	**68.18%**	**84.42%**	**86.04%**	**89.97%**	**57.67%**	**87.55%**	**88.53%**	**89.66%**	**67.84%**	**84.03%**	**86.92%**	**95.20%**	**88.22%**	**93.10%**	**94.24%**

	Fundmentals			
	ABL	FF	OLS	GLS
Grp Avg	90.49%	70.48%	87.27%	88.93%

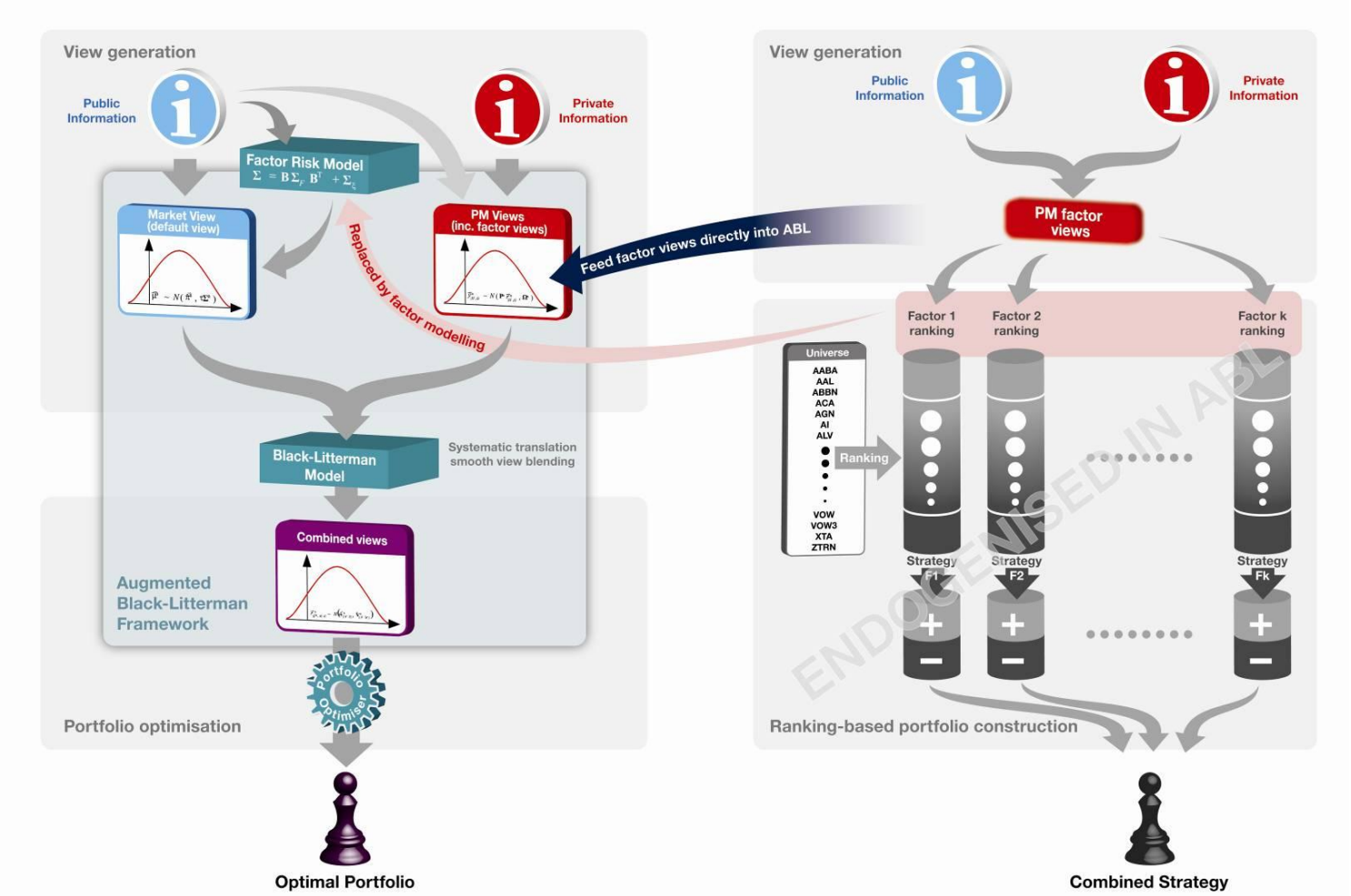
- The Transparent ABL Factor-Mimicking technique is superior

Integrated Bayesian Solution to Factor Combination



ABL was designed for Factor-Mimicking and combination

Also a unified solution to stock-picking, factor-based portfolio construction, stock-specific betting etc. …



- The ABL optimisation is an elegant solution to stock, factor and stock-specific tilts

Demo: Combining ABL endogenous styles

Combining *Value* and *Long-Term Momentum* styles reduces to combining factor views

Factors	Factor View Structures		
Factor	View1	View2	View3
Beta			
Earnings Multiple			
Historical Growth			
Long-term Momentum		1	
Predicted Growth			
Profitability			
Repurchases			
Sales Growth			
Shareholder Interest			
Short-term Momentum			
Size			
Trading Activity			
Value	1		
Workforce Growth			
Non-Core Security			
Food Products			
Food and Drug Retail			
Health Care Equipment and Services			
Household Durables			
Household Products			
IT Services			
Insurance			
Machinery			
Media			
Metals and Mining			
Other Financials			
Other Materials			
Pharma and Biotech			
Real Estate			
Retail			
Road Rail and Shipping			
Software			
Tech Hardware and Semiconductors			
Telecom			
Textiles Apparel Luxury and Leisure			
Trading and Distribution			
Transportation Infrastructure			
Utilities			
Abnormal Volume			

Factor Views	Mean
View 1	0.10
View 2	0.10
View 3	0.10

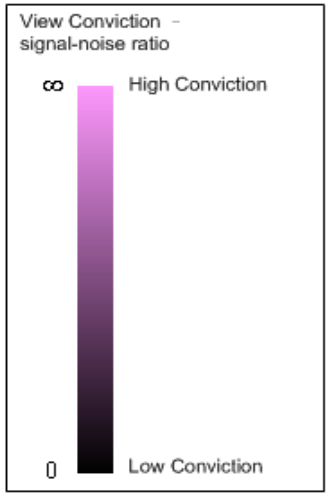
Factor Views	Uncertainty
View 1	0.2
View 2	0.2
View 3	

Refresh Factor List

Calibration Multiplier Adjusted Uncertainties

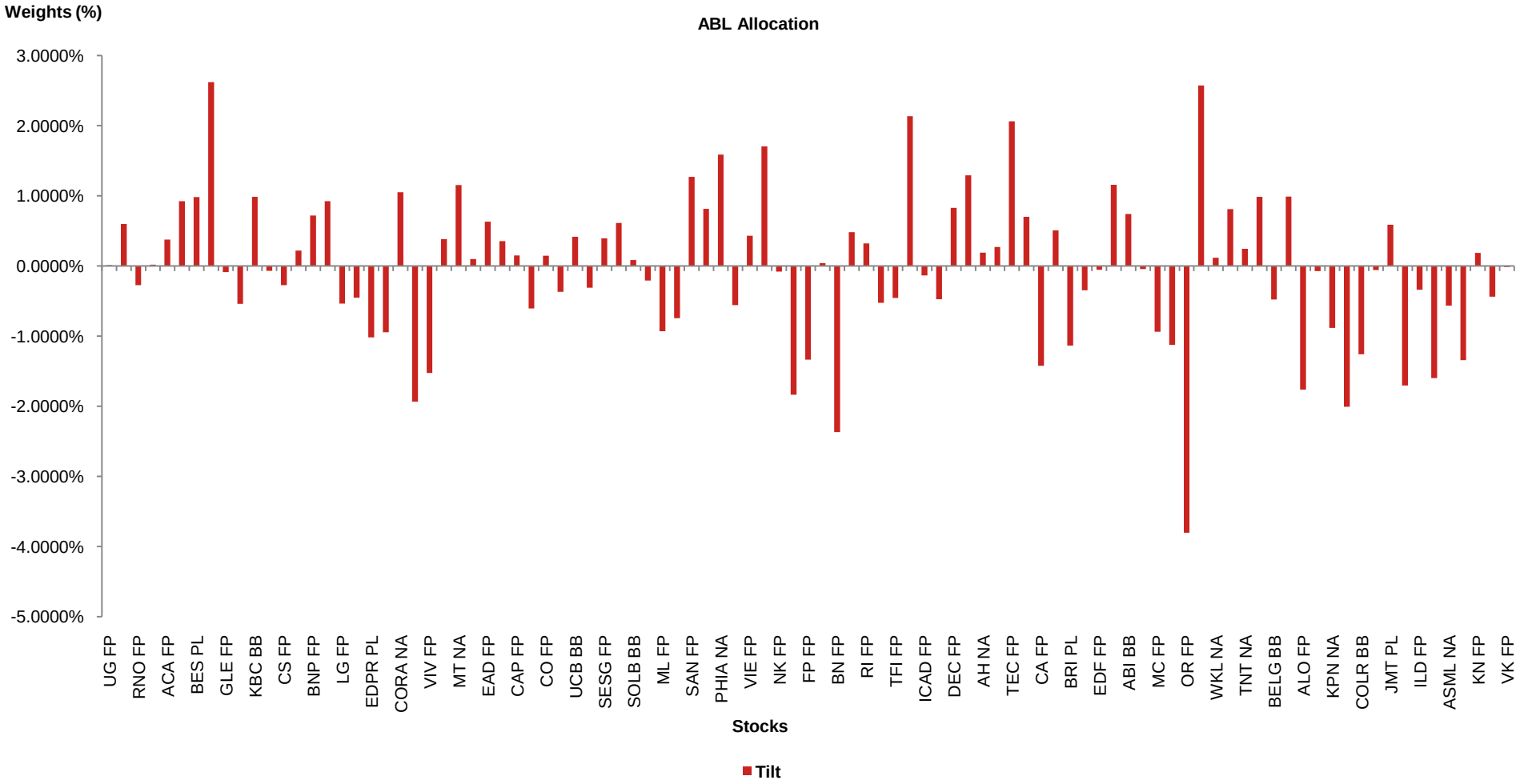
Factor Views	Uncertainty		
View 1	0.2	0	0
View 2	0	0.2	0
View 3	0	0	1000000

Solve ABL

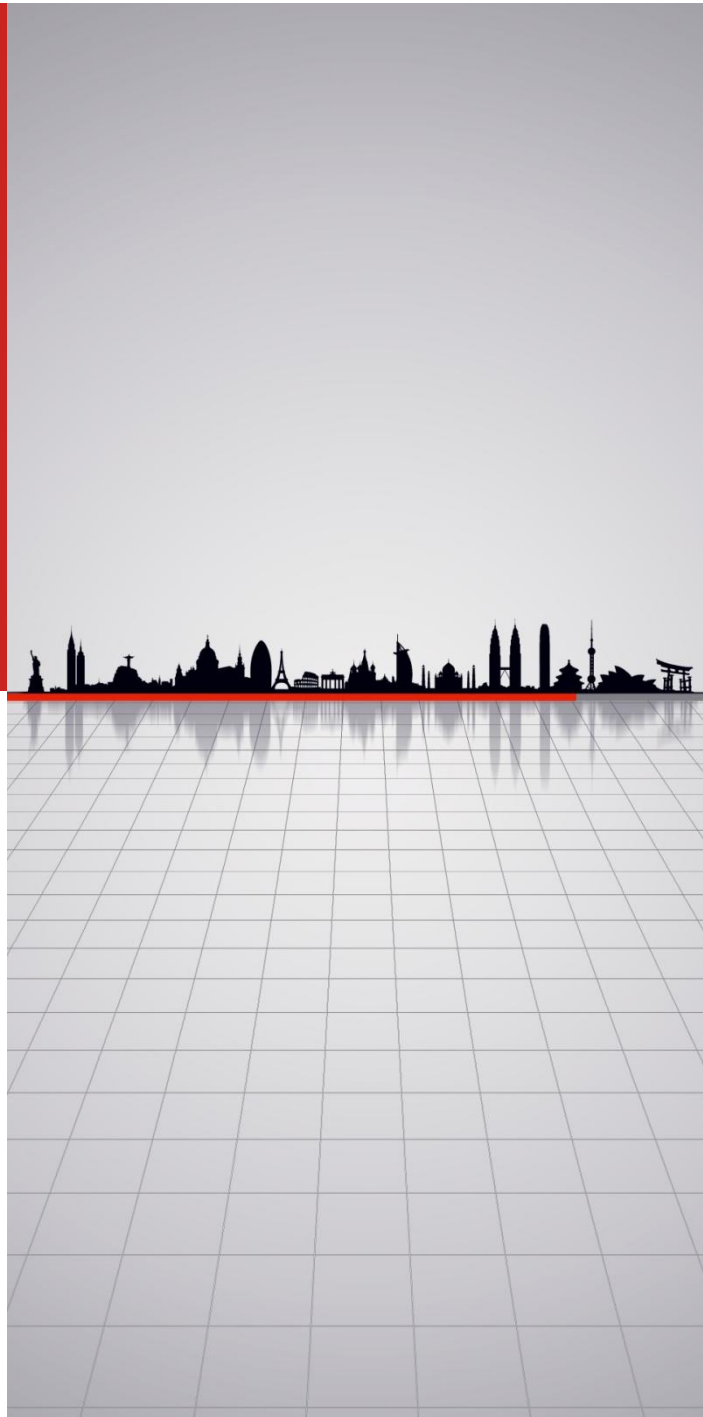


Demo: Bayesian Allocation (tilt)

Value and Long-Term Momentum **styles combined**

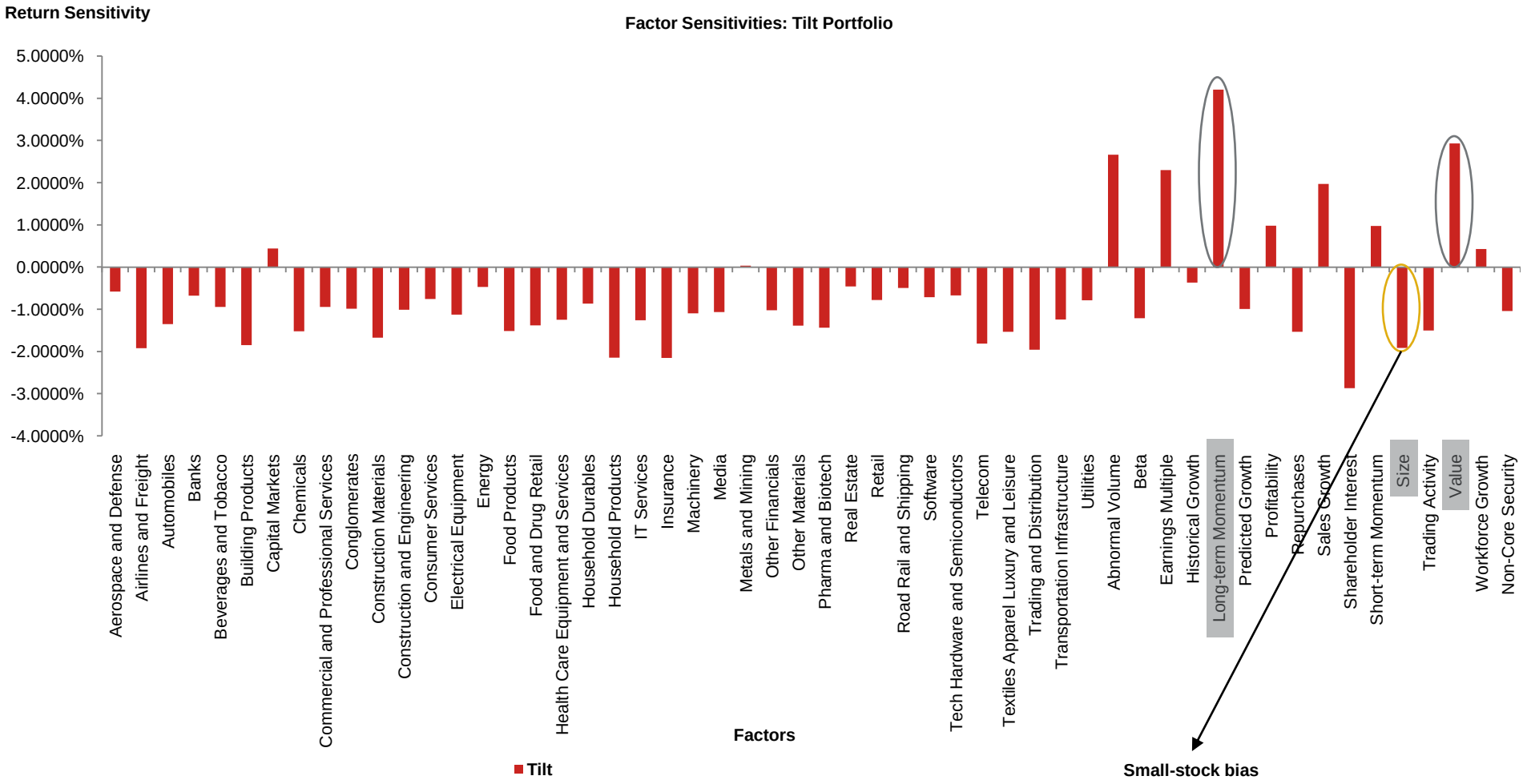


Risk Management: Factor Massage & Hedging



Demo: Factor massage for alpha and risk purposes

Wanted *Value* and *Long-Term Momentum* tilts vs. unwanted *Size* skew



Demo: Bet on *Value* and *Momentum*, hedge *Size*!

Factor massage: finetune *Value* and *Momentum* views and impose a *Size* hedge

Factors	Factor View Structures		
Factor	View1	View2	View3
Beta			
Earnings Multiple			
Historical Growth			
Long-term Momentum		1	
Predicted Growth			
Profitability			
Repurchases			
Sales Growth			
Shareholder Interest			
Short-term Momentum			
Size			1
Trading Activity			
Value	1		
Workforce Growth			
Non-Core Security			
Food Products			
Food and Drug Retail			
Health Care Equipment and Services			
Household Durables			
Household Products			
IT Services			
Insurance			
Machinery			
Media			
Metals and Mining			
Other Financials			
Other Materials			
Pharma and Biotech			
Real Estate			
Retail			
Road Rail and Shipping			
Software			
Tech Hardware and Semiconductors			
Telecom			
Textiles Apparel Luxury and Leisure			
Trading and Distribution			
Transportation Infrastructure			
Utilities			
Abnormal Volume			

Factor Views	Mean
View 1	0.10
View 2	0.10
View 3	0.10

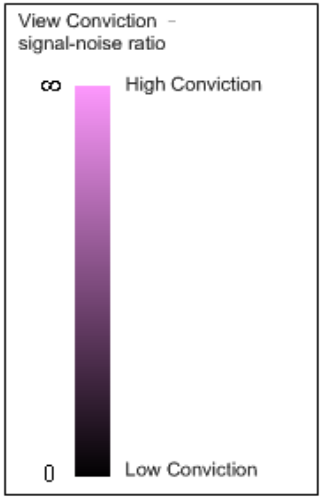
Factor Views	Uncertainty		
View 1	0.1		
View 2		0.212	
View 3			0.255

Refresh Factor List

Calibration Multiplier Adjusted Uncertainties

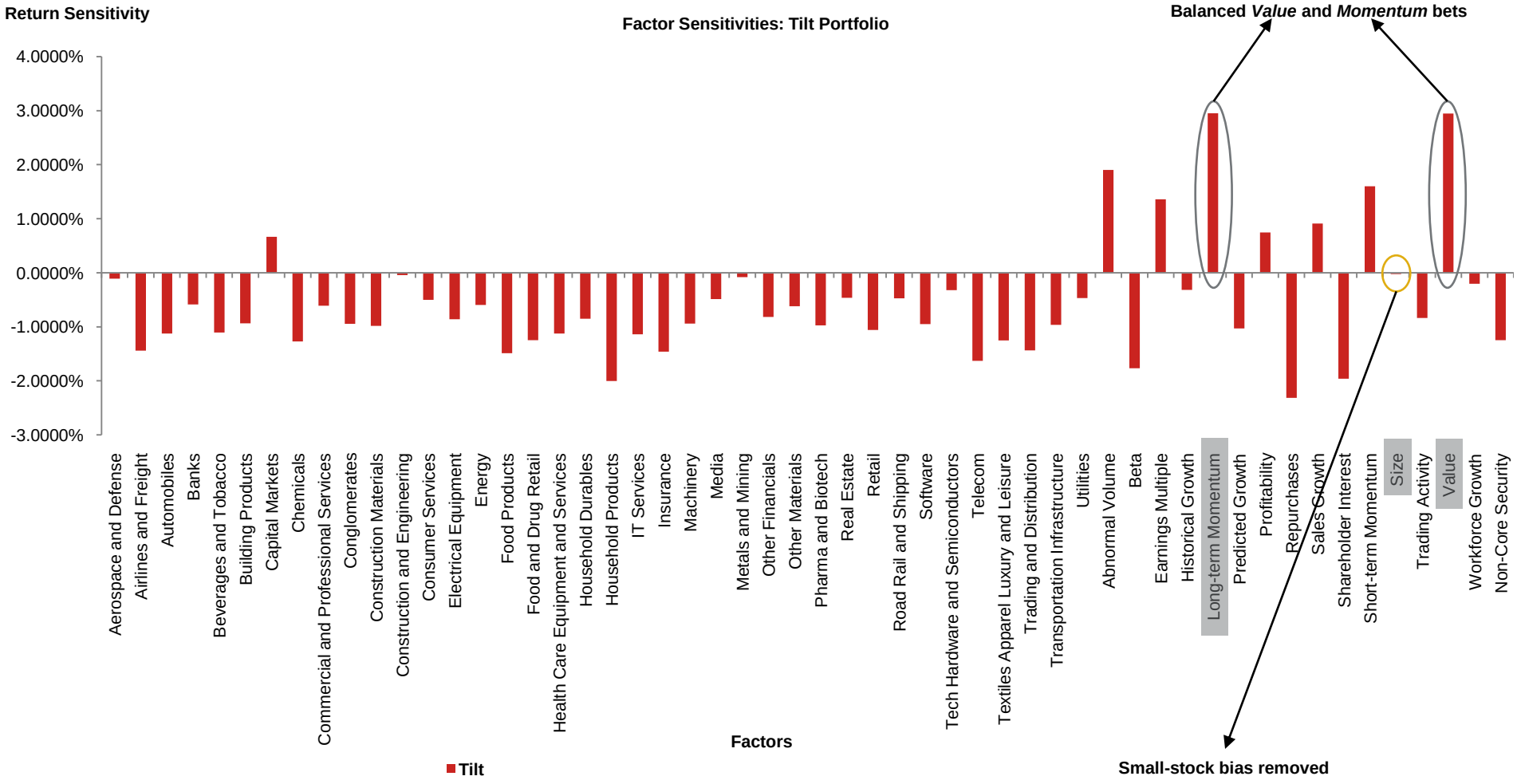
Factor Views	Uncertainty		
View 1	0.1	0	0
View 2	0	0.212	0
View 3	0	0	0.255

Solve ABL



Demo: *Size*-hedged *Value* and *Momentum* bets

Balanced *Value* and *Long-Term Momentum* bets with *Size* bias neutralised



Conclusion

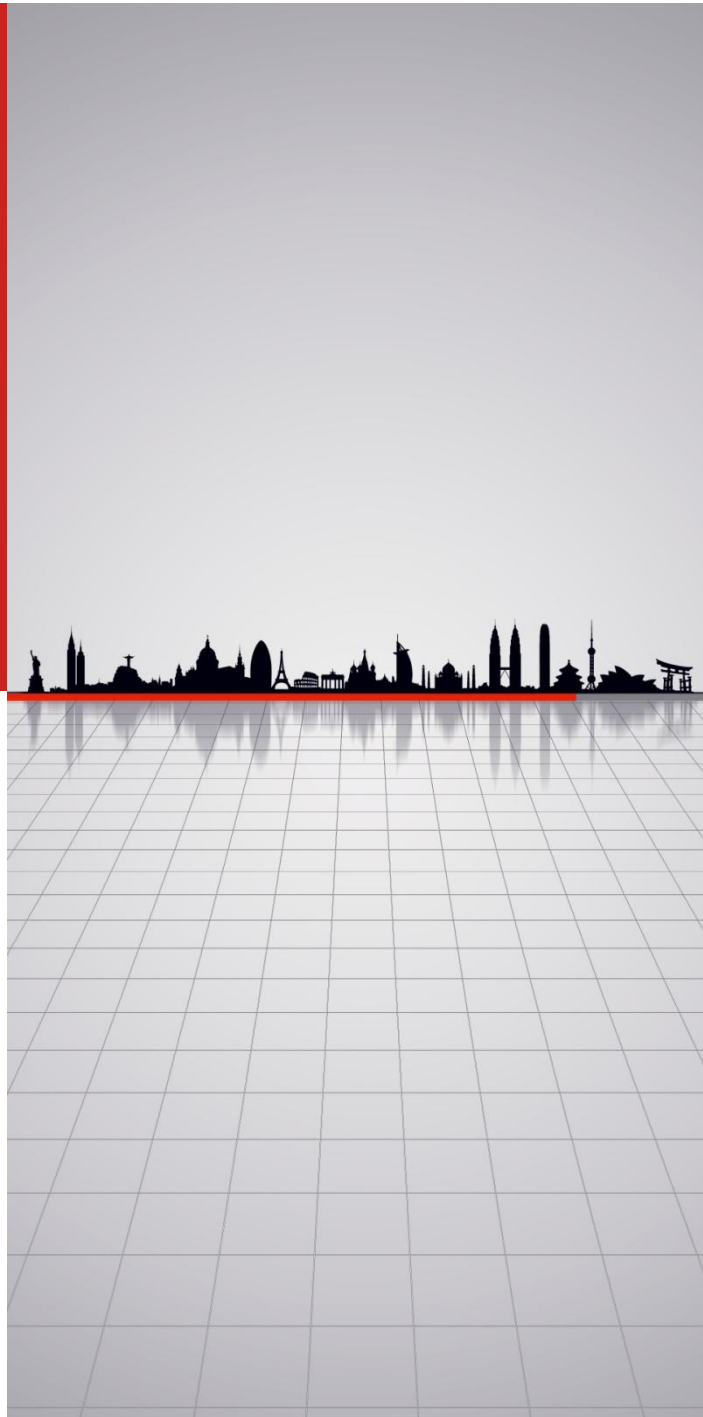
The Bayesian Allocation Framework lends us a structural yet flexible approach to factor combination and hedging

- Motivations for factor combination
  - Alpha: uncertain about our forecasts
  - Risk: risk management at the factor level
  - Trading: creating ‘new’ factors to avoid crowdedness

- The ABL Model is a unified, one-stop solution that addresses the above
  - If we have already built our own factor styles, ABL directly combines them as portfolios
  - If we only have factor views, ABL constructs factor-mimicking portfolios and combines them
  - If we want to hedge an unwanted factor exposure, express an offsetting factor view

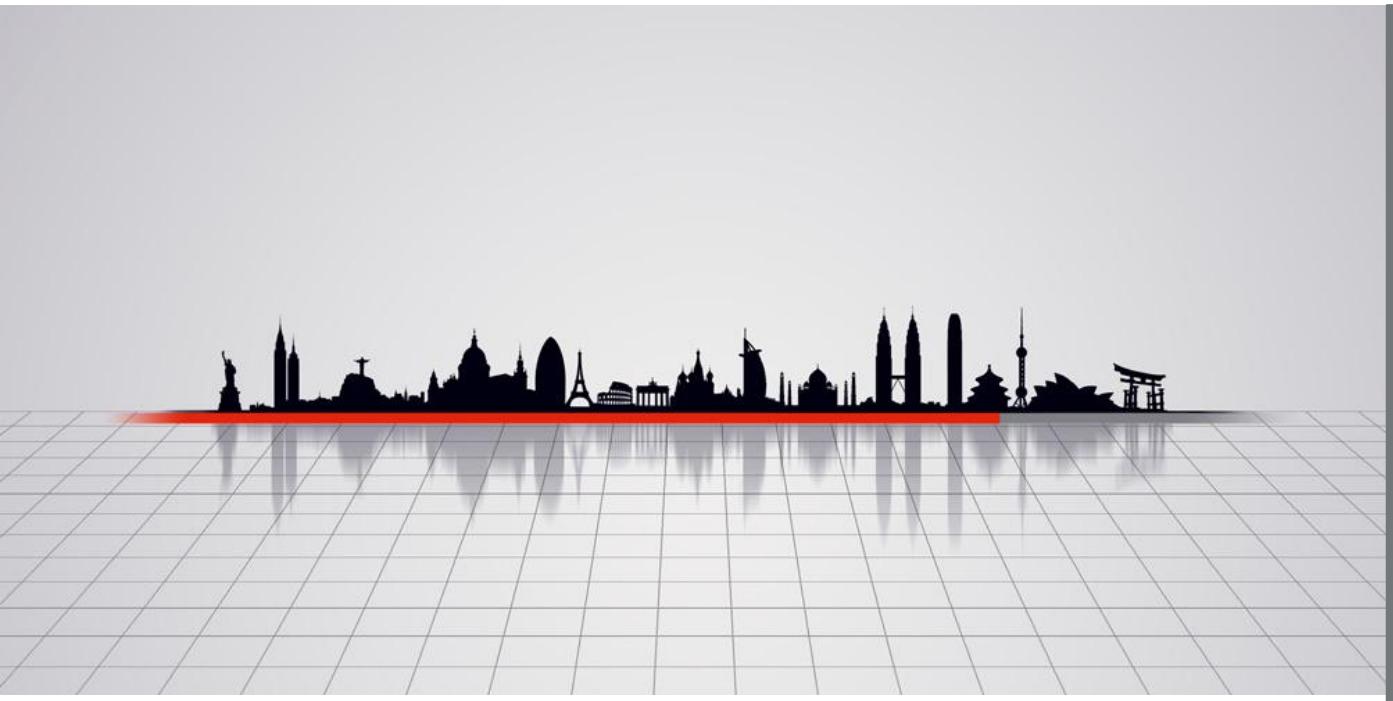
- How and why the framework works?
  - The **Bayesian Allocation rule** is a signal-noise ratio weighting scheme, which is mean-variance efficient
  - The **endogenous factor-mimicking technique** is efficient
  - *With externally built factor portfolios,* ABL only signal-noise weights these factor portfolios
  - *Factor view combination* is achieved through internally creating efficient factor-mimicking portfolios and then allocate according to the Bayesian Allocation rule
  - *Factor hedging* is achieved through internally creating efficient factor-mimicking portfolios to neutralise our unwanted holdings
  - **Portfolio massage** helps us take more information into account and more precisely reflect our investment target

Q & A



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