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Undergraduate Student Investment Management Fund

Semi-Annual Presentation

Friday, December 2, 2011

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Fund Members

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Process

- Determine allocation process
  - Two levels of Mean-Variance Optimization, Black-Litterman
  - Adjustments, improvements, and views
- Select asset classes
  - Sectors/regions and commodities/REITs
- Gather data
  - What, where, how
- Build/modify allocation models
- Run models with data
  - Testing, quality control, evaluate output

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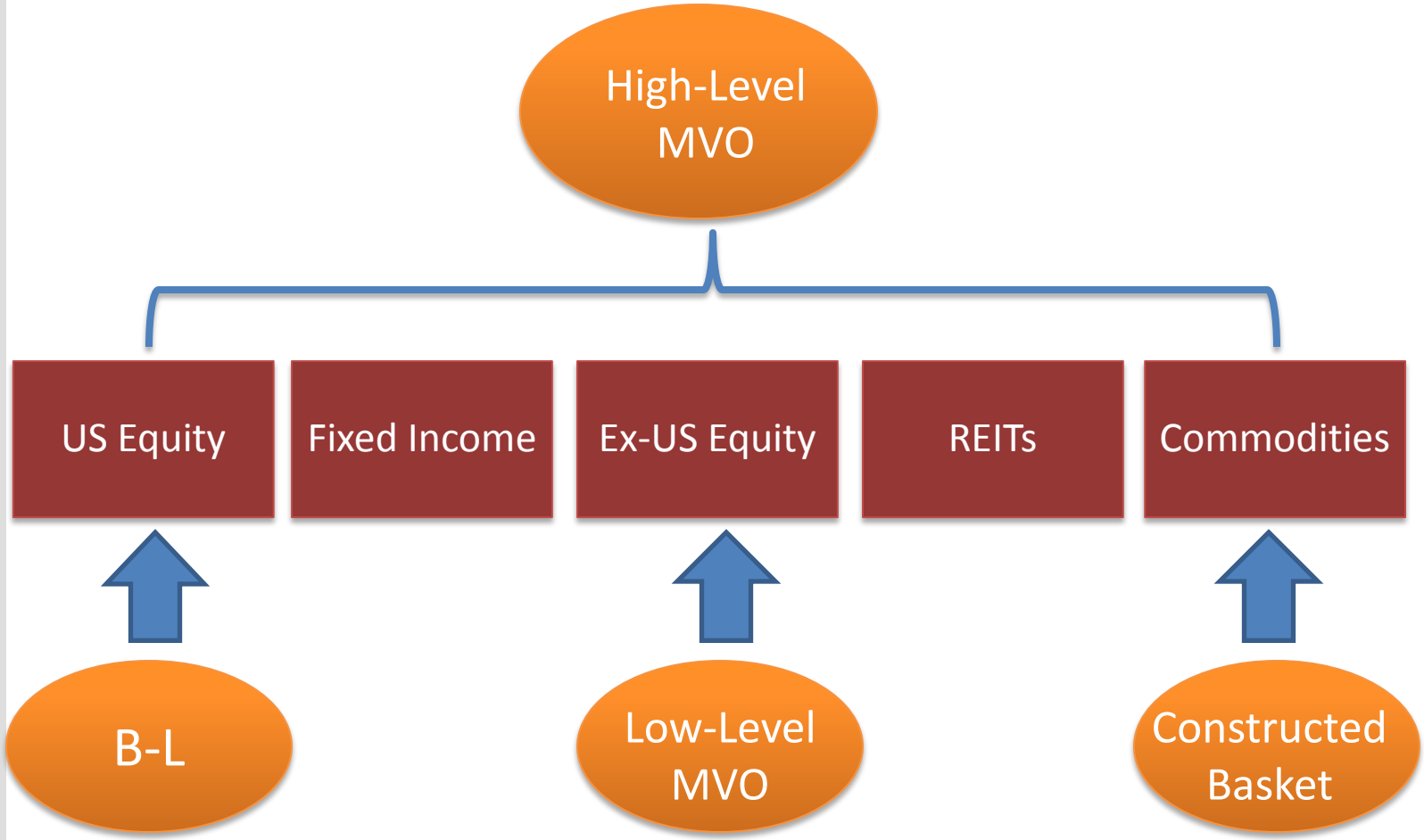
Optimization Structure



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Optimization Inputs

Returns | Correlation | Standard Deviation

- Static MVOs are highly sensitive to the input data
- Historical data is not the best indicator for the future
- Correlations across asset classes have increased over the last decade
- Different methods to estimate volatility

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Resampling

Returns

- Reduces the sensitivity of the model
- Iterations of rolling sets of historical returns
- MVO performed on each iteration to construct a unique efficient frontier – maximizes the Sharpe ratio on each frontier
- Averaged the optimized portfolio over all frontiers
- Results in a more diversified portfolio

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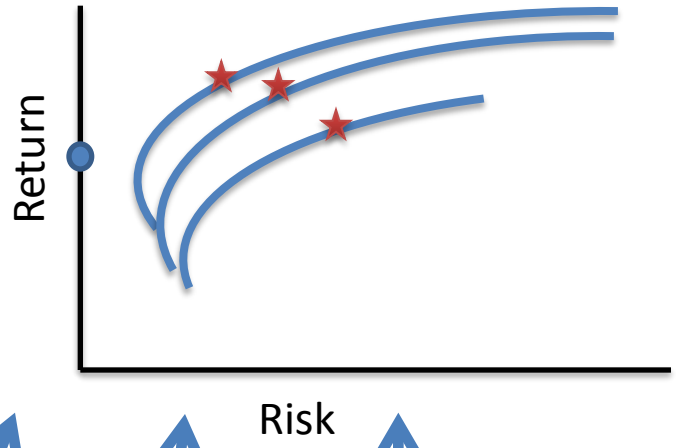
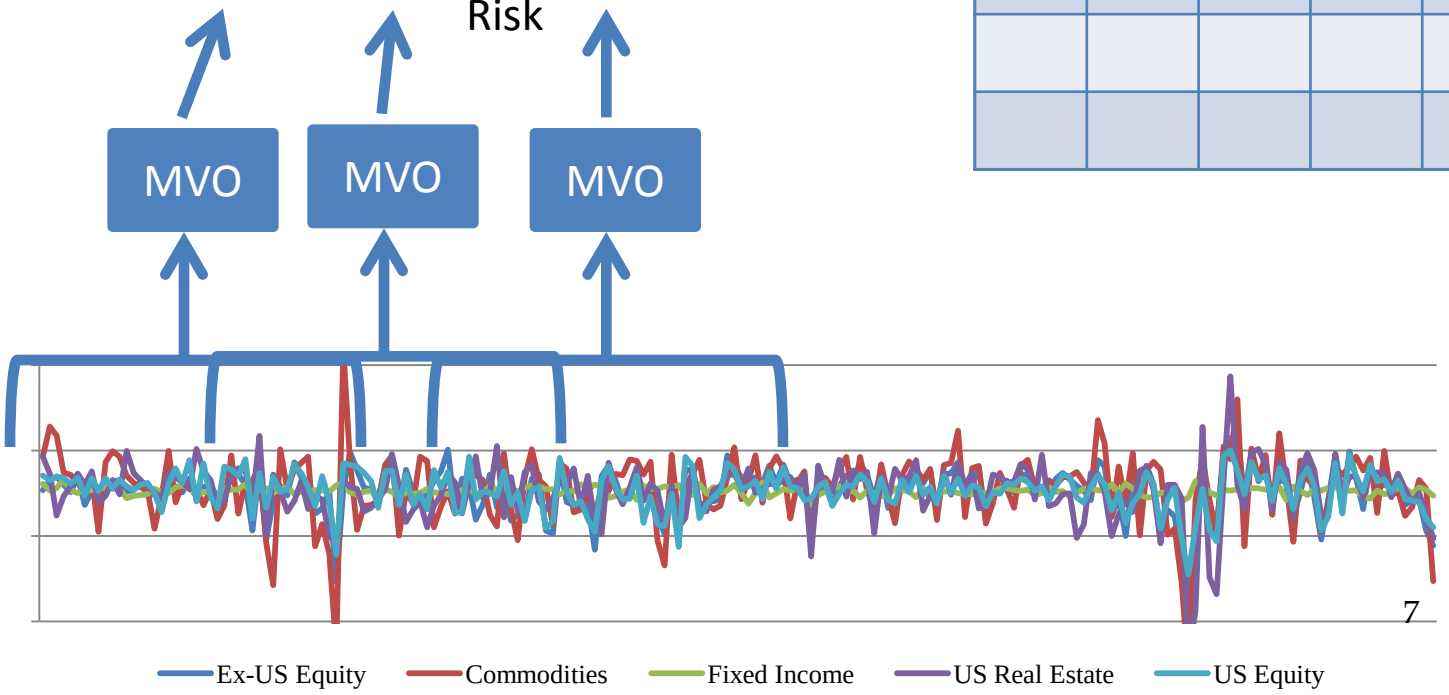


.51	.05	.19	.05	.2
.507	.032	.19	.05	.22
.49	.049	.19	.05	.22



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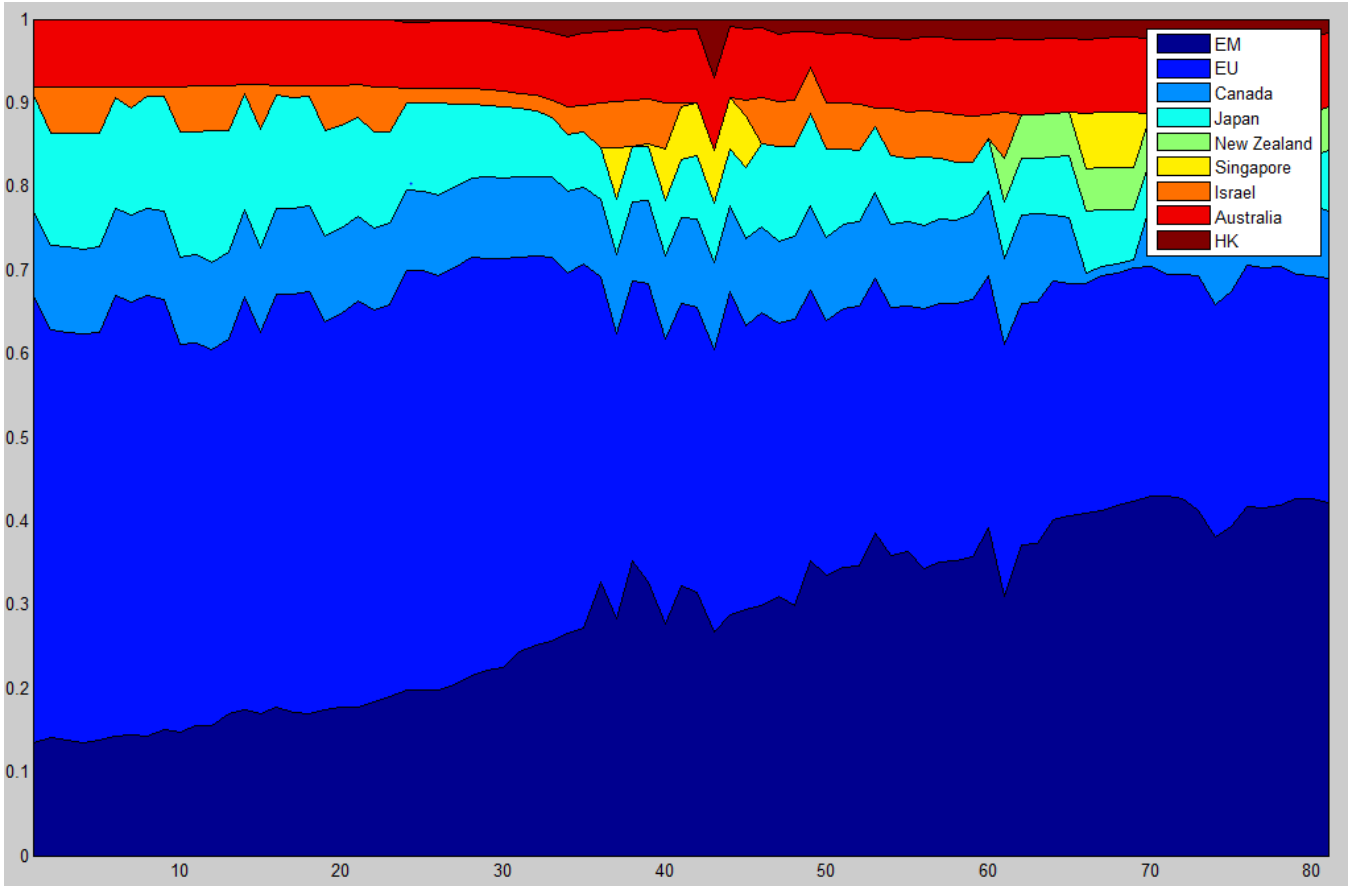
MVO Weights Over Time



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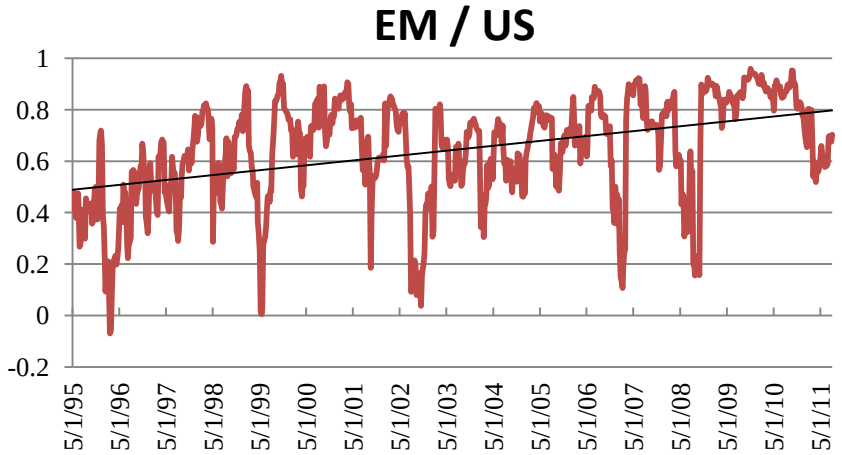
Weighted Covariance

Correlation

- Used an exponentially weighted moving average to account for increasing correlations across asset classes
- In an exponential weighting scheme, each observation is assigned a multiple of the weight assigned to its predecessor to better reflect current conditions
- Half-life: 3 years



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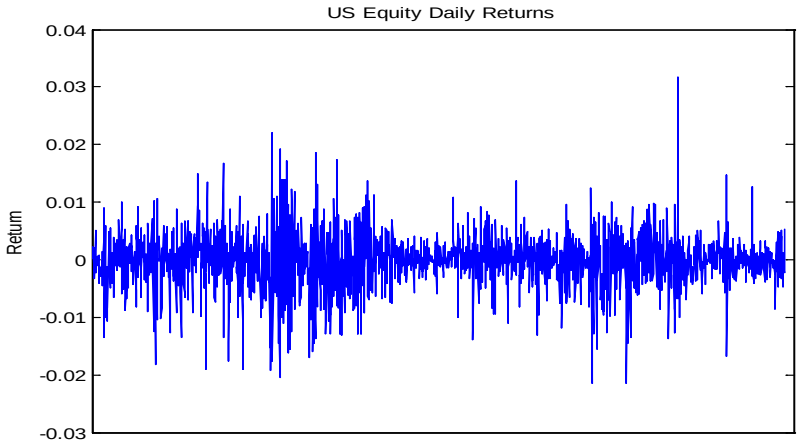
GARCH Volatility Forecast

Standard Deviation

- Squared monthly return data tested positive for auto-correlations
- Garch volatility provides accurate forecasts of variances and covariances through its ability to model time-varying conditional variances
- Problem: only useful to forecast up to 3 periods



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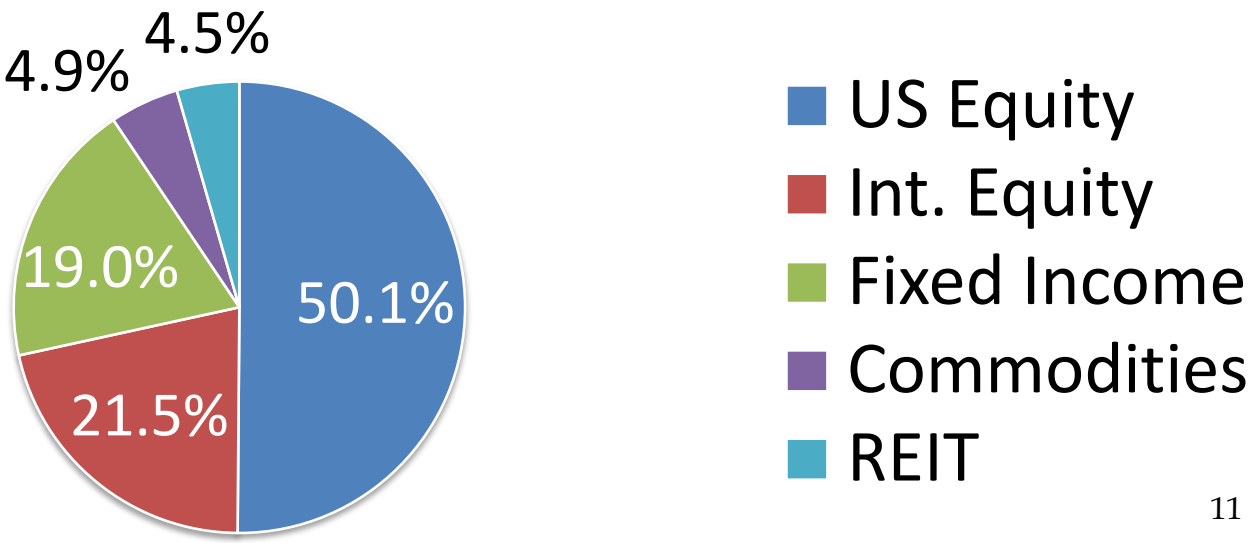
Charter Allocation

Asset Class	US Equity	Ex-US Equity	US Fixed Income	Commodities	REITs
Upper Bound	100%	25%	20%	5%	5%
Lower Bound	0%	0%	0%	0%	0%



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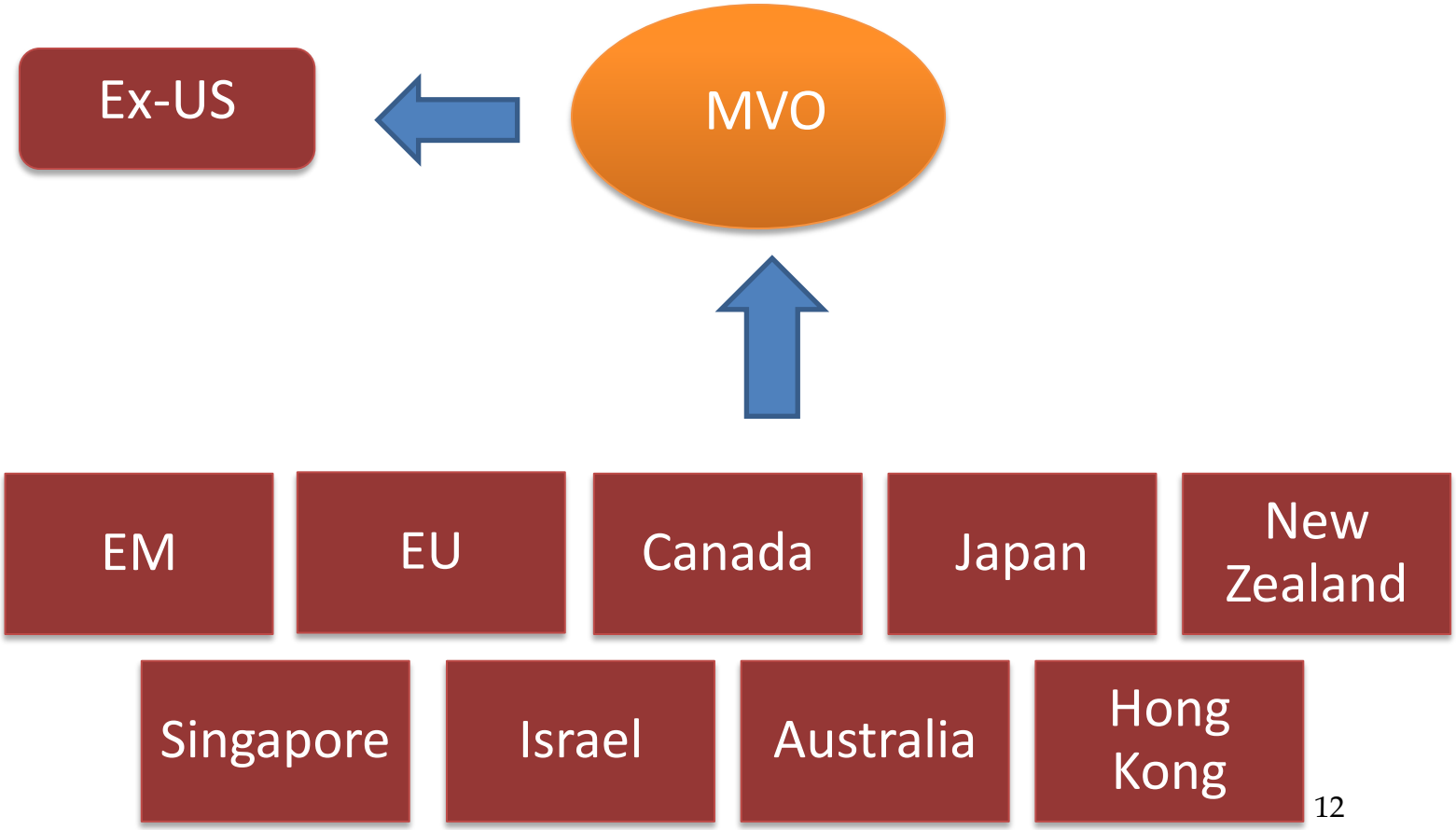
Ex-US Equity MVO



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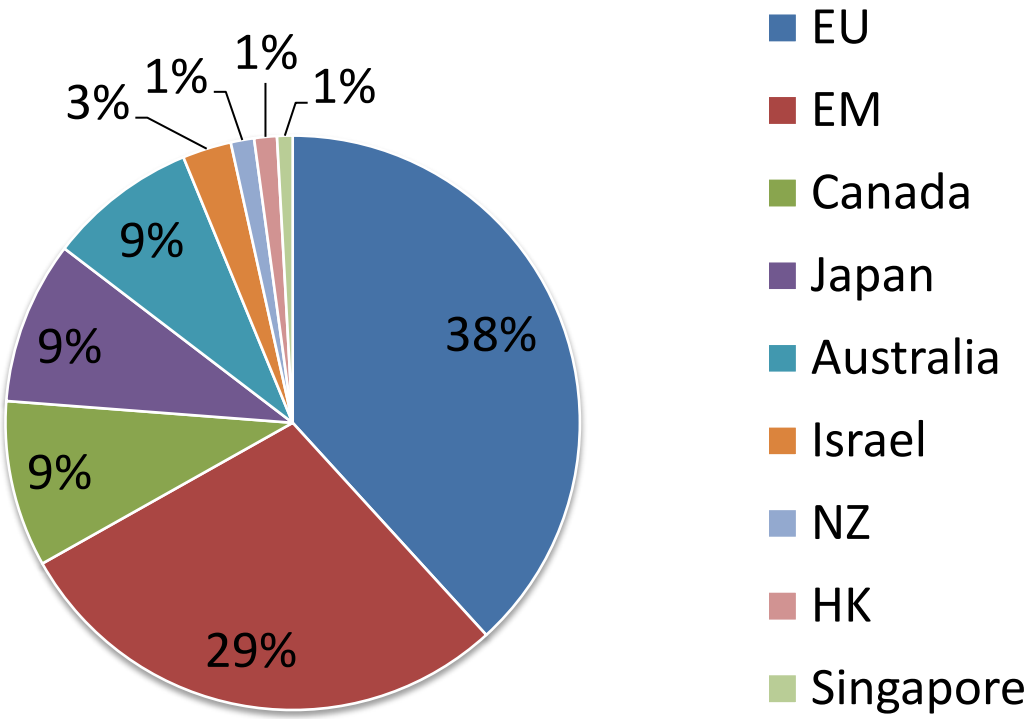
Ex-US Equity MVO

- All assets constrained +/- 5% of market weights



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Black-Litterman

- Benefits
  - Ability to incorporate investor views
  - Lessen the historical returns bias
- Procedure
  - Use a reverse optimization process to obtain excess equilibrium returns for each US Sector from market caps and covariances
  - Express under/outperform views
  - Run Black-Litterman optimizer to combine the two distributions

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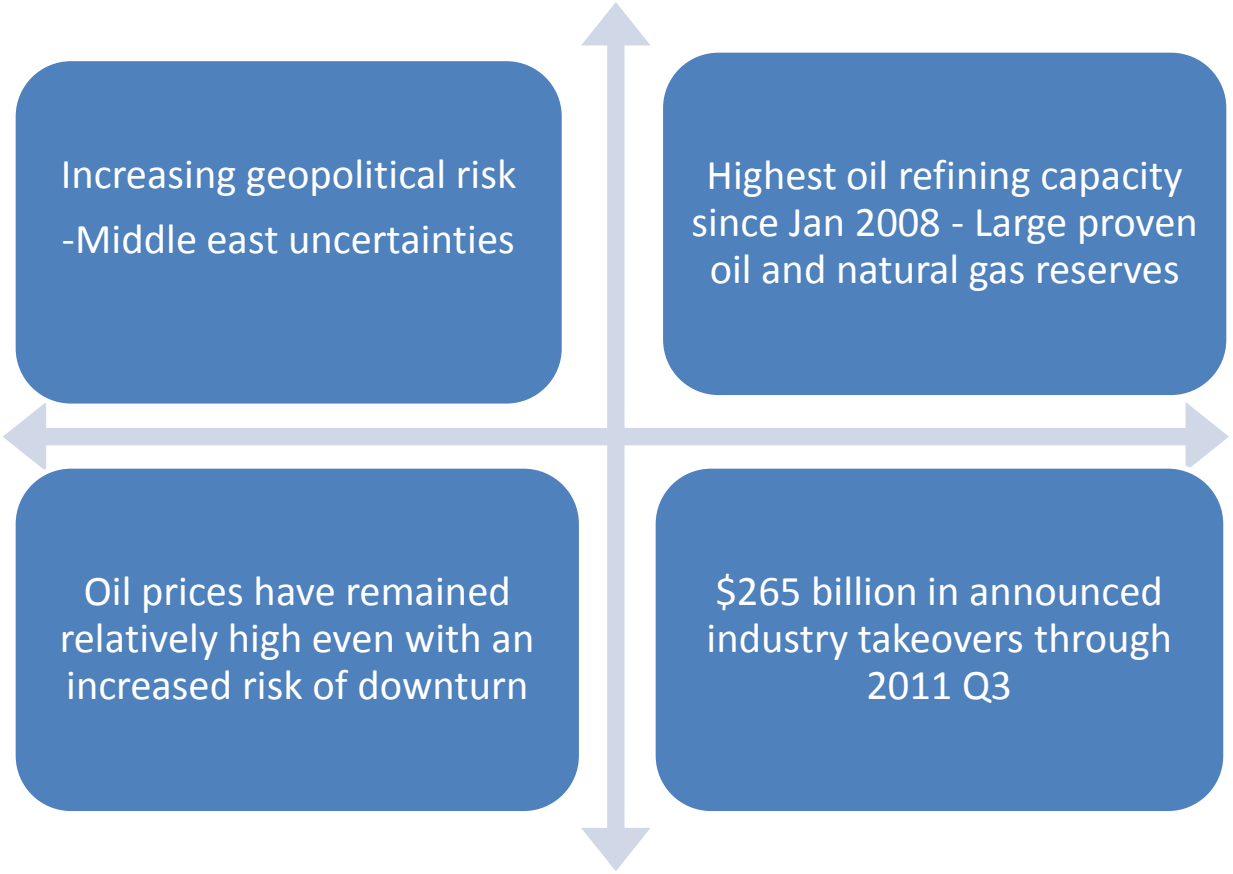
Example Fundamental View



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Our Views: +/- 50bps

Excess Return Views	View (relative to market)	Equilibrium Excess Return	Absolute +/- 50 bp
Consumer Discretionary	Underperform	6.51%	6.01%
Energy	Outperform	4.95%	5.45%
Financials	Underperform	7.21%	6.71%
Industrials	Outperform	6.44%	6.94%
Technology	Outperform	9.00%	9.50%

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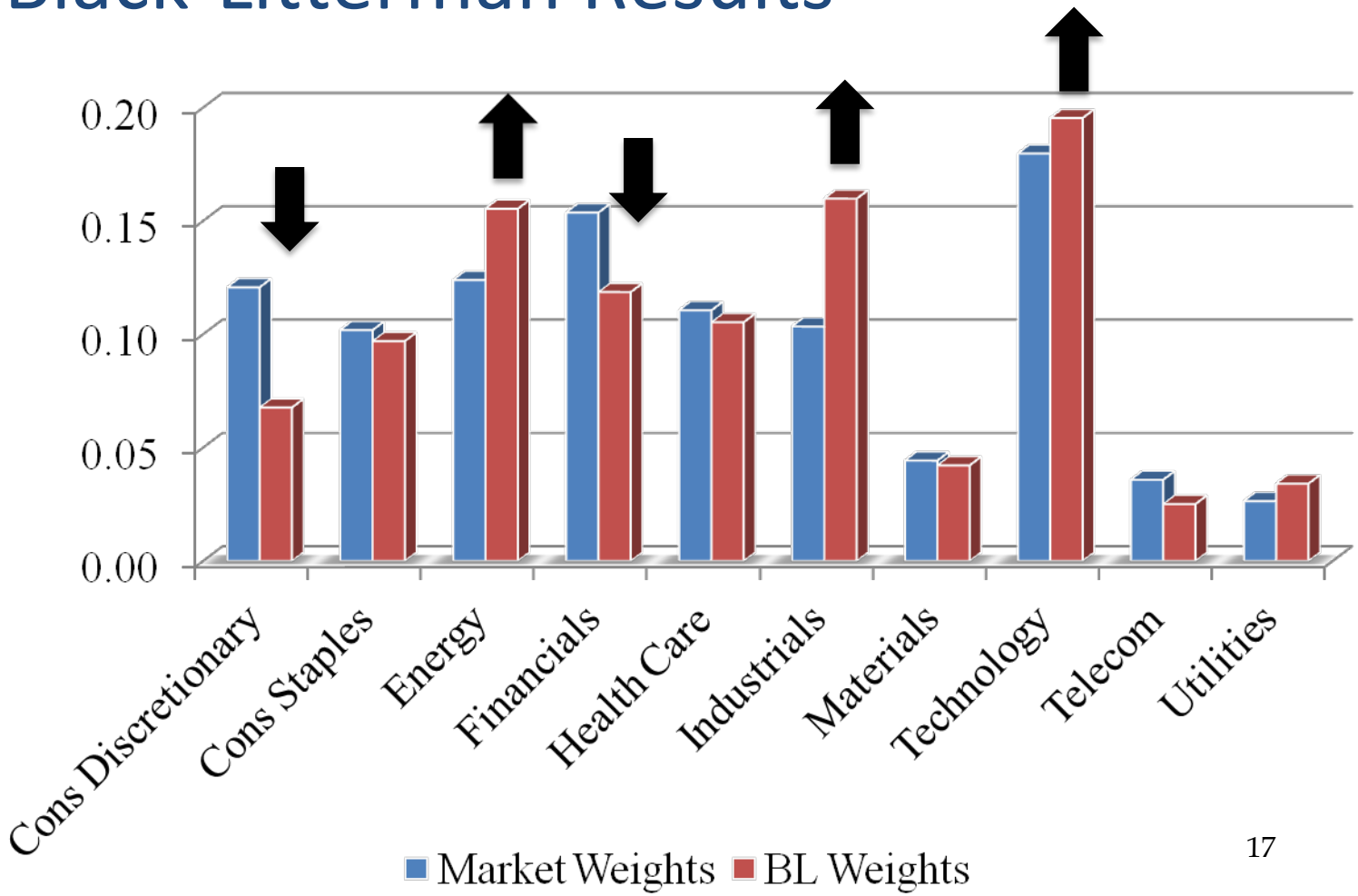
Black-Litterman Results



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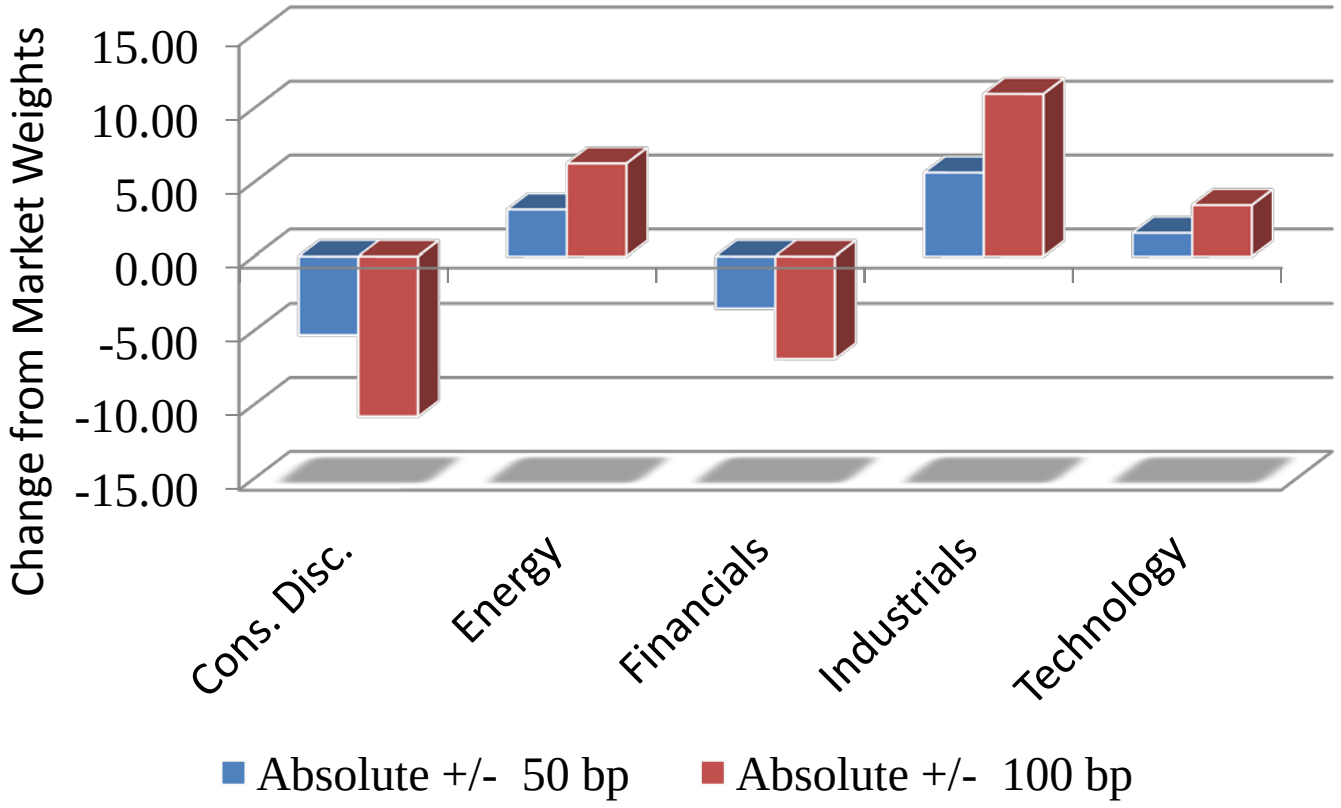
Sensitivity of Views



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Commodities

- Reason for investment
  - High correlation, diversification
- Restricted by charter constraints from direct investment
  - Solution: basket of stocks with high commodity exposure

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Commodities Basket

- Company selection
  - Regressed companies against commodity and US Equity indices
- Selection criteria
  - High correlation to commodities, low correlation to US Equity

  Ex. $R=\alpha+\beta(S\&P\ 500)+\beta(Oil)+\varepsilon$
- Incorporation into portfolio
  - Built a custom index using the selected firms

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Commodities Holdings

Company	Exposure
Barrick Gold	Gold
Goldcorp	Gold
Agrium International	Agribusiness
Syngenta	Agribusiness
CF Industries	Agribusiness
Brasil Foods	Agribusiness
Monsanto	Agribusiness
Canadian Natural Resources	Oil
Cameron International	Oil
International Paper	Forestry
Helca Mining Company	Mining
Silver Wheaton Corp	Mining

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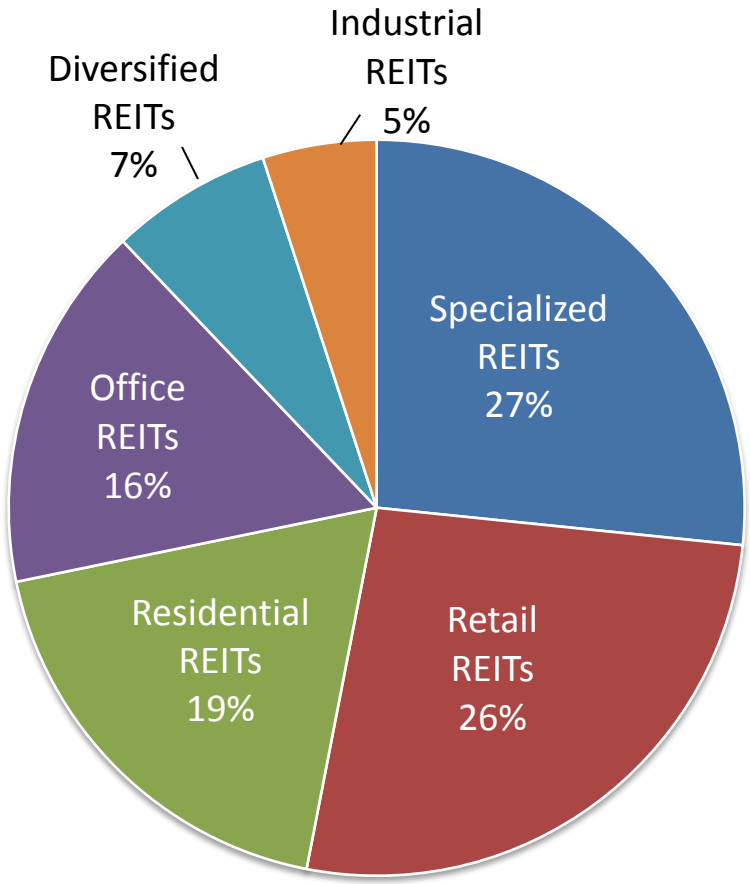
REITs – ETF Selection



- Vanguard VNQ REIT
- Number of holdings: 106
- Total net assets: $17.5B
- Expense ratio: 0.12%
- Turnover ratio: 12.1%
- Equity REITs

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Fixed Income

- Forego TIPS
  - Inflation expectations low
  - 5 year breakeven rate = 1.76% as of 10/24/11
- Intermediate over short term
  - Interest rates to stay low
- Corporate vs. Treasury
- Chose iShares GVI (Intermediate Bond Fund)

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ETF Selection

Country ETFs
iShares MSCI Japan Index
Vanguard MSCI Europe
Vanguard MSCI Emerging Markets
iShares MSCI New Zealand
iShares MSCI Canada Index
iShares MSCI Australia Index
iShares MSCI Hong Kong Index
iShares MSCI Singapore Index
iShares MSCI Israel

Sector ETFs
Vanguard Consumer Discretionary
Vanguard Consumer Staples
Vanguard Energy
Vanguard Financials
Vanguard Healthcare
Vanguard Industrials
Vanguard Materials
Vanguard Technology
Vanguard Telecom
Vanguard Utilities

General Considerations

- Holdings overlap
- Composition
- Tracking error
- Expense ratio
- Liquidity
- Prior holdings

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Benchmarks

Standard Benchmarks

- MSCI World Equity Index
- Russell 3000

Composite Benchmark

Applied charter constraints to market portfolio

- 55% MSCI US Equity
- 25% MSCI Ex-US Equity
- 20% Barclays Capital Aggregate Bond Index

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Fund Performance

	Holding Period Return	Annualized Return	Holding Period Std. Dev.	Volatility
SIM Fund	-1.57%	-16.18%	7.42%	27.03%
Custom BM	-1.07%	-11.25%	6.11%	22.27%
Russell 3000	-1.00%	-8.38%	7.57%	30.60%
World Equity	-1.55%	-15.95%	8.40%	27.56%

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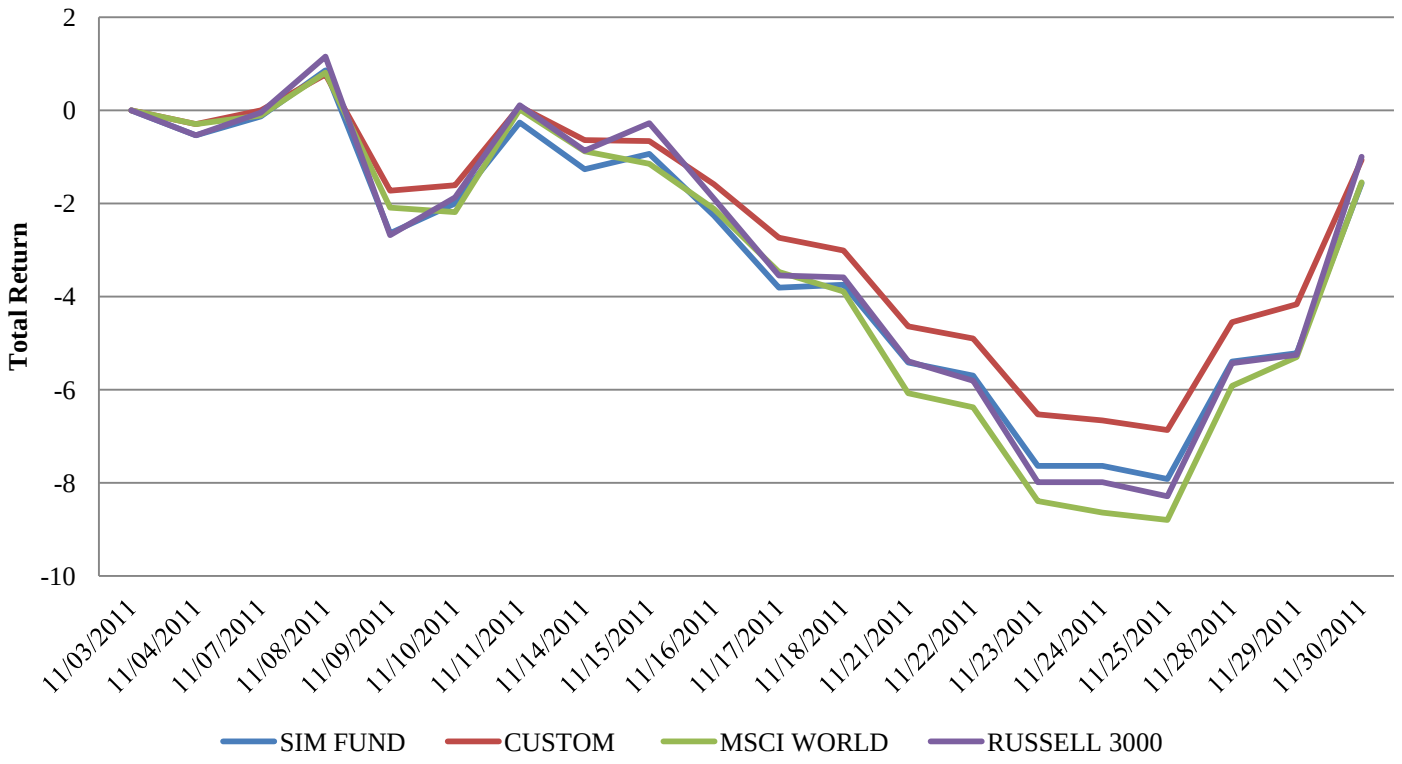

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Going Forward

- Rebalancing
- Attribution analysis
- Monitoring
- Developing SIM Fund for next year

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What We Learned

- Strengths and weaknesses of models
- There is no right answer
- Details, details, details
- There are always constraints

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Questions?