A Framework for Examining Asset Allocation Alpha

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Simplified Investment Process

- Asset Allocation Selection
  - Institution (pension, endowment, insurance company) requires a real income stream or needs to defease long-term liabilities
  - Investment Committee determines investment policy (Asset Allocation) in accordance with its income requirements and risk tolerance
  - Determines 10% allocation for Emerging Markets Equity

- Manager Selection & Evaluation
  - Performs a manager search and selects an active EM equity manager
  - Managers are evaluated relative to their benchmarks (e.g. MSCI EM)

- Typically Unasked Question: Asset Allocation Evaluation
  - How to evaluate the asset allocation deviations from policy portfolio?

Goal

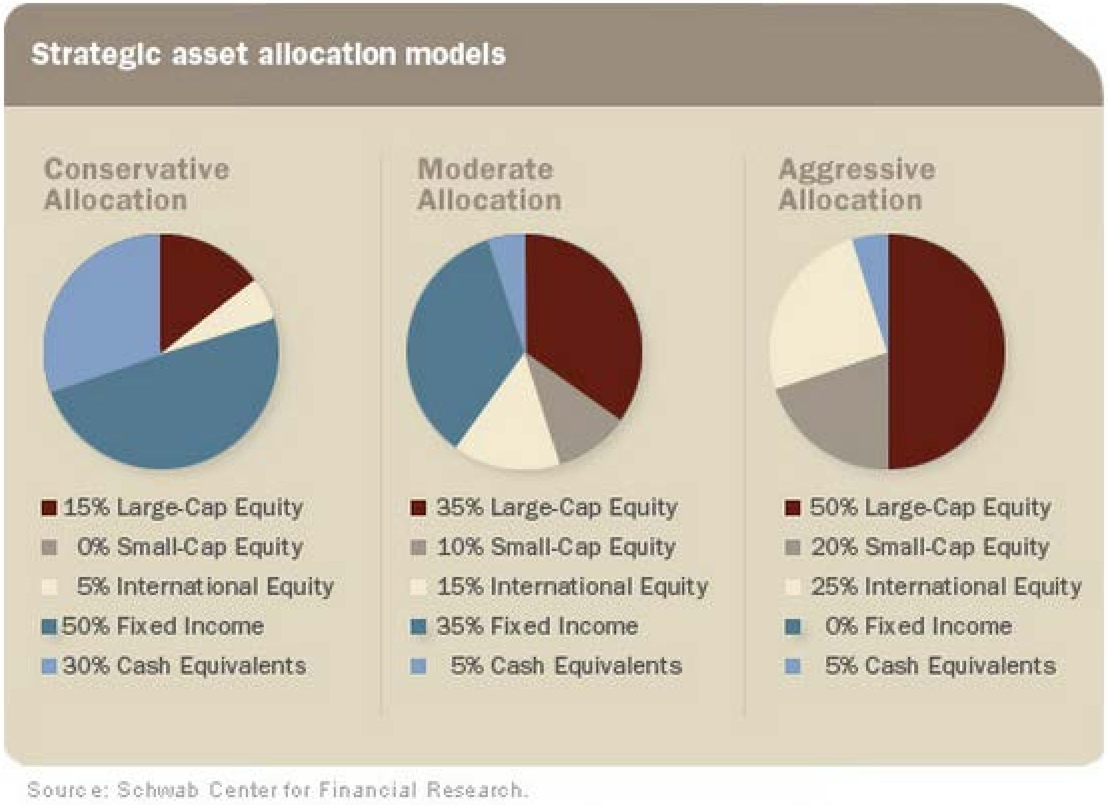
- Identify sources of portfolio outperformance
  - Skill? Timing? Excess Risk? Luck?
  - For purpose of this talk: "alpha" = "excess return"

- Well-established methodologies exists for evaluating actively managed equity/bond portfolios

- We propose a methodology for evaluating asset-allocation decisions
  - Asset allocation is the dominant determinant of performance
  - Brinson-Hood-Beebower 1986[1]: Asset allocation explains ~90% of variation in portfolio returns

[1] Brinson, Gary P., L. Randolph Hood, and Gilbert L. Beebower. 1986. "Determinants of Portfolio Performance." *Financial Analysts Journal*, vol. 42, no.4 (July/August):39-48.

Example Policy Portfolios



Asset Allocation model portfolios from Schwab

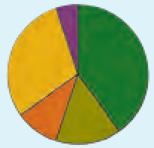
http://www.schwabmoneywise.com/public/moneywise/money_basics/investing/asset_allocation.html

Example Policy Portfolios

Asset Classes (allocation)

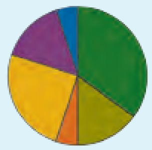
Investor Profile

Aggressive



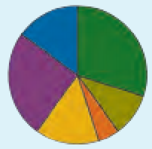
International stock funds	30%
Small-cap stock funds	10%
Mid-cap stock funds	15%
Large-cap stock funds	40%
Bond funds	5%
Short-term investments	0%

Moderately Aggressive



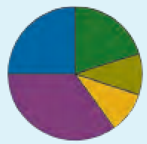
International stock funds	25%
Small-cap stock funds	5%
Mid-cap stock funds	15%
Large-cap stock funds	35%
Bond funds	15%
Short-term investments	5%

Moderate



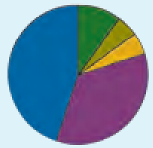
International stock funds	15%
Small-cap stock funds	5%
Mid-cap stock funds	10%
Large-cap stock funds	30%
Bond funds	25%
Short-term investments	15%

Moderately Conservative



International stock funds	10%
Small-cap stock funds	0%
Mid-cap stock funds	10%
Large-cap stock funds	20%
Bond funds	35%
Short-term investments	25%

Conservative



International stock funds	5%
Small-cap stock funds	0%
Mid-cap stock funds	5%
Large-cap stock funds	10%
Bond funds	40%
Short-term investments	40%

Asset Allocation model portfolios from Ibbotson Associates

https://www.nysdcp.com/tcm/nysdcp/static/BrochureAssetAllocation.pdf

Sources of Portfolio Outperformance

- Decomposition of Portfolio Alpha
  - **Manager Selection Alpha**
    - Due to each fund’s security deviations from its benchmark
  - **Asset Allocation Alpha**
    - Due to asset allocation deviations from policy portfolio

- Decomposition Asset Allocation Alpha
  - **Static**
    - Risk-Based Alpha
    - Relative Valuation Alpha
  - **Dynamic**
    - Factor-Timing Alpha
    - Unexplained Residual

Asset Allocation Alpha

- Define “Tactical Portfolio”
  - Identical asset class exposure as total portfolio
  - Actively managed funds replaced by passive benchmarks
- Asset Allocation Alpha: outperformance of the Tactical Portfolio
- Decompose the sources of outperformance
  - Risk-Based Alpha
  - Relative Valuation Alpha
  - Factor Timing Alpha
  - Unexplained Residual

Asset Classes vs Risk Exposures

» Asset Based Framework
  » Equities, bonds, commodities, real estate, etc
  » Asset classes are vehicles for “owning” risk exposures

» Risk-Based Approach
  » Asset classes are bundles of risk exposures
  » Example: High Yield Bonds have large equity risk exposure

» Simple Analogy
  » Risk exposures are like nutrients (Protein, Carbohydrates, Fat)
  » Assets are food (Grilled Chicken, Bread, Rice, Cheese)

Risk-Based Framework for Asset Allocation

- Asset class returns sensitive to shocks to a few common macroeconomic risk factors
  - Ross (1976) APT[1], Chen, Roll, Ross (1986)[2]
  - Examples:

Common Macro Risk	Investable Proxy
GDP Growth	S&P 500
Credit Availability (funding liquidity)	High-Yield – Investment Grade Credit Spread
Inflation	Long treasuries
Central Bank Policy	Basket of currencies
Geopolitical Stability	Basket of commodities

$$r = \alpha + \beta_1 F_1 + \cdots + \beta_k F_K + \varepsilon$$

[1]Ross, Stephen A. 1976. "The Arbitrage Theory of Capital Asset Pricing." *Journal of Economic Theory*, vol. 13, 341-360.

[2]Chen, Nai-Fu, Richard Roll, and Stephen A. Ross. 1986. "Economic Forces and the Stock Market." *The Journal of Business*, vol. 59, no. 3 (July):383-403.

Risk Based Alpha

» Persistently higher risk exposure

Factor Loadings for Asset Classes and Asset Allocation %

	Growth Factor Loading (equity)	Liquidity Factor Loading (credit)	Wt. in Policy Portfolio	Wt. in Tactical Portfolio
S&P 500	1	0.1	60%	40%
MSCI EM	1.2	0.3		20%
BarCap Agg	0.1	0.1	40%	30%
BarCap HY	0.5	0.7		10%

Factor Loadings for Policy vs. Tactical Portfolio

	Growth Factor Loading (equity)	Liquidity Factor Loading (credit)
Policy Portfolio	0.64	0.1
Tactical Portfolio	0.72	0.2

» Risk-Based Alpha:

- Higher risk exposure might be most reliable source of long-term outperformance
- Generates most significant tracking error vs policy portfolio, reflecting alteration of intended risk characteristics

Hsu, Jason and Shakernia, Omid. 2013; “A Framework for Examing Asset Allocation Alpha”. *The Journal of Index Investing*, vol. 3, no. 4, (Spring)

Relative Valuation Trades

- Same factor exposure with different asset mix

Factor Loading for Asset Classes and Asset Allocation %

	Growth Factor Loading	Policy Portfolio	Tactical Portfolio
S&P 500	1	60%	10%
MSCI EAFE	1.1		10%
MSCI EM	1.2		10%
REITS	1.3		10%
BarCap Agg	0.1	40%	30%
BarCap HY	0.5		30%

Factor Loadings for Policy vs. Tactical Portfolio

	Growth Factor Loading
Policy Portfolio	0.64
Tactical Portfolio	0.64

- Relative Valuation Alpha:
  - Manager views on asset class “attractiveness”
  - Here, HY Bonds and EM Equities are cheaper vehicles for accessing the growth factor

Hsu, Jason and Shakernia, Omid. 2013; “A Framework for Examing Asset Allocation Alpha”. *The Journal of Index Investing*, vol. 3, no. 4, (Spring)

Factor Timing Trades

» Capturing time-varying risk premia

Asset Allocation over a Business Cycle

	Growth Factor Loading	Wt. in Policy Portfolio	Tactical Portfolio Wt. During Recession	Tactical Portfolio Wt. During Expansion	Tactical Portfolio Wt. Average over Business Cycle
S&P 500	1	60%	80%	40%	60%
BarCap Agg	0.1	40%	20%	60%	40%

Factor Loadings (Portfolios)

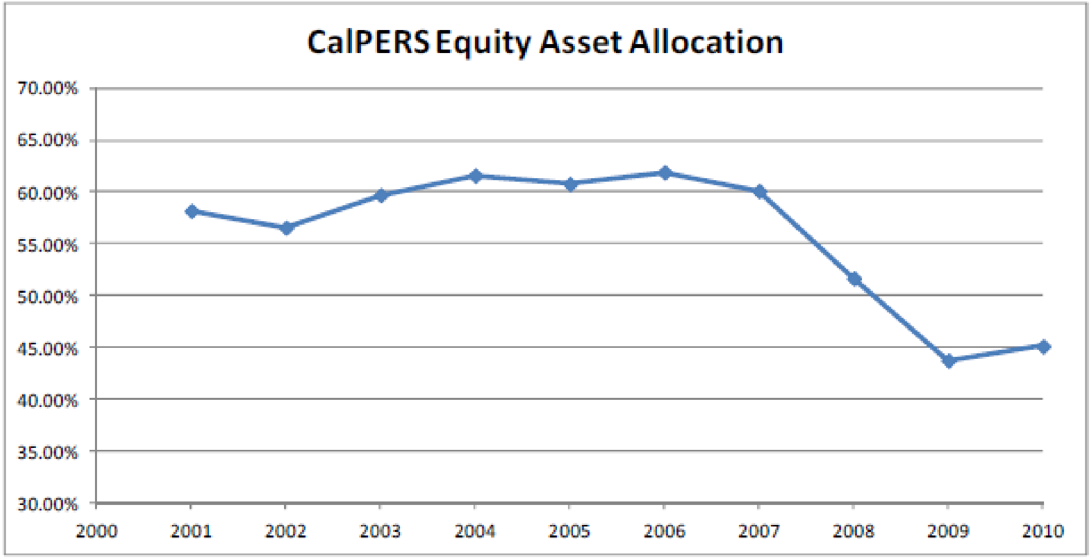
	Growth Factor Loading
Policy Portfolio	0.64
Tactical Portfolio (Recession)	0.82
Tactical Portfolio (Expansion)	0.46
Tactical Portfolio (Average)	0.64

» Counter-cyclical investing when risk-premia are high

Hsu, Jason and Shakernia, Omid. 2013; “A Framework for Examing Asset Allocation Alpha”. *The Journal of Index Investing*, vol. 3, no. 4, (Spring)

Factor Timing Gone Wrong

Time Frame	S&P 500 Annualized Excess Return
1926 – 2007	6.4%
2008	-38%
2009 – 2013	17.8%



- » Other side of CalPERS trade: Norwegian Govt Pension fund was largest buyer of equities in 2008-2009[1]

- » Long-horizon investors can exploit time-varying risk premia through counter-cyclical investing

[1]Ang, Andrew and Knut Kjaer. 2011. "Investing for the Long Run." Available at SSRN: http://ssrn.com/abstract=1958258.

Numerical Example

Asset Allocations and Realized Returns

Asset Class	Policy Portfolio Allocation (Period 1 & 2)	Tactical Portfolio Allocation (Average)	Tactical Portfolio Allocation (Period 1)	Tactical Portfolio Allocation (Period 2)	Realized Return (Average)	Realized Return (Period 1)	Realized Return (Period 2)
S&P 500	60%	40%	50%	30%	6.3%	10.5%	2.1%
MSCI EM		20%	30%	10%	8.4%	10.8%	5.9%
BarCap Agg	40%	30%	10%	50%	3.5%	3.1%	3.9%
BarCap HY		10%	10%	10%	6.9%	8.6%	5.2%

- Higher EM equity and High Yield bond allocations
- Higher equity weights in Period 1, higher bond weights in Period 2

Portfolio Realized Returns

Realized Portfolio Returns	Average Return	Return (Period 1)	Return (Period 2)
Policy Portfolio	5.2%	7.5%	2.8%
Tactical Portfolio	6.7%	9.7%	3.7%

- What is the source of tactical portfolio outperformance?

Hsu, Jason and Shakernia, Omid. 2013; “A Framework for Examing Asset Allocation Alpha”. *The Journal of Index Investing*, vol. 3, no. 4, (Spring)

Numerical Example

Factor Loadings for Asset Classes and Portfolios

	S&P 500	MSCI EM	BarCap Agg	BarCap HY	Policy Portfolio	Tactical Portfolio (Average)	Tactical Portfolio (Period 1)	Tactical Portfolio (Period 2)
Growth Factor	1.00	1.20	0.10	0.50	0.64	0.72	0.92	0.52
Duration Factor	0.00	0.00	0.80	0.50	0.32	0.29	0.13	0.45
Credit Factor	0.10	0.30	0.10	0.70	0.10	0.20	0.22	0.18

- Tactical portfolio has higher growth & credit exposure, lower duration
- Higher growth exposure during Period 1, higher duration in Period 2

Realized Factor Returns

Return	Average	Period 1	Period 2
Growth Factor	5.0%	7.0%	3.0%
Duration Factor	3.0%	2.0%	4.0%
Credit Factor	2.0%	3.0%	1.0%

- **Factor returns positive:**
  - Expect a positive risk-based alpha
- **Higher factor exposures coincide with higher factor returns :**
  - Expect a positive factor-timing alpha

Hsu, Jason and Shakernia, Omid. 2013; “A Framework for Examing Asset Allocation Alpha”. *The Journal of Index Investing*, vol. 3, no. 4, (Spring)

Numerical Example: Decomposition of Asset Allocation Alpha

Decomposition of Asset Allocation Alpha

Asset Allocation Alpha	**1.50%**	*Value–add of Tactical Portfolio over Policy Portfolio*
Static	0.75%	*(Avg Tactical Wt – Policy Wt) * (Avg Asset Returns)*
Risk–Based	***0.51%***	*(Avg Tactical β –Policy β) * (Avg Factor Returns)*
Relative Valuation	***0.24%***	*Static Alpha – Risk–based Alpha*
Dynamic	0.75%	*Avg (Tactical Wt * Asset Returns) – (Avg Tactical Wt) * (Avg Asset Returns)*
Factor–Timing	***0.58%***	*Avg (Tactical β * Factor Returns) – (Avg Tactical β) * (Avg Factor Returns)*
Unexplained Residual	***0.17%***	*Dynamic Alpha – Factor Timing*

Hsu, Jason and Shakernia, Omid. 2013; “A Framework for Examing Asset Allocation Alpha”. *The Journal of Index Investing*, vol. 3, no. 4, (Spring)

Potential directions for future work

- Take this methodology to the data
  - Evaluate “balanced fund” asset allocation mutual fund managers
  - Evaluate the statistical significance of various sources of asset allocation alpha

- Interesting questions
  - Do asset allocators exhibit positive alpha?
  - Do allocators have more skill at market timing or relative valuation?

Appendix

Mathematical Derivation

» Asset and Factor Returns

$$R_{i,t} = \alpha_i + \sum_k \beta_{i,k} F_{k,t} + \varepsilon_{i,t}$$

Asset Return

Intercept

Factor Exposure

Factor Return

Residual

» Asset Allocation Alpha

$$\text{Asset Allocation Alpha} = \frac{1}{T} \sum_t \sum_i (w_{i,t} - w_{b,i}) R_{i,t}$$

Tactical weight

Policy weight

» Decomposition of Asset Allocation Alpha

$$\text{Static Allocation Alpha} = \sum_i (\overline{w}_i - w_{b,i}) \overline{R}_i$$

$$\text{Risk} - \text{based Alpha} = \sum_i \sum_k (\overline{w}_i - w_{b,i}) \beta_{i,k} \overline{F_k}$$

$$\text{Relative Valuation Alpha} = \sum_i (\overline{w}_i - w_{b,i}) \alpha_i$$

$$\text{Dynamic Allocation Alpha} = \frac{1}{T} \sum_t \sum_i (w_{i,t} - \overline{w}_i) R_{i,t}$$

$$\text{Factor} - \text{Timing Alpha} = \frac{1}{T} \sum_t \sum_i \sum_k (w_{i,t} - \overline{w}_i) \beta_{i,k} F_{k,t}$$

$$\text{Unexplained Residual} = \frac{1}{T} \sum_t \sum_i (w_{i,t} - \overline{w}_i) \varepsilon_{i,t}$$

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