MERCER OLIVER WYMAN

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Selecting a Risk Adjusted Shareholder Performance Measure
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Pressure on Performance Measurement

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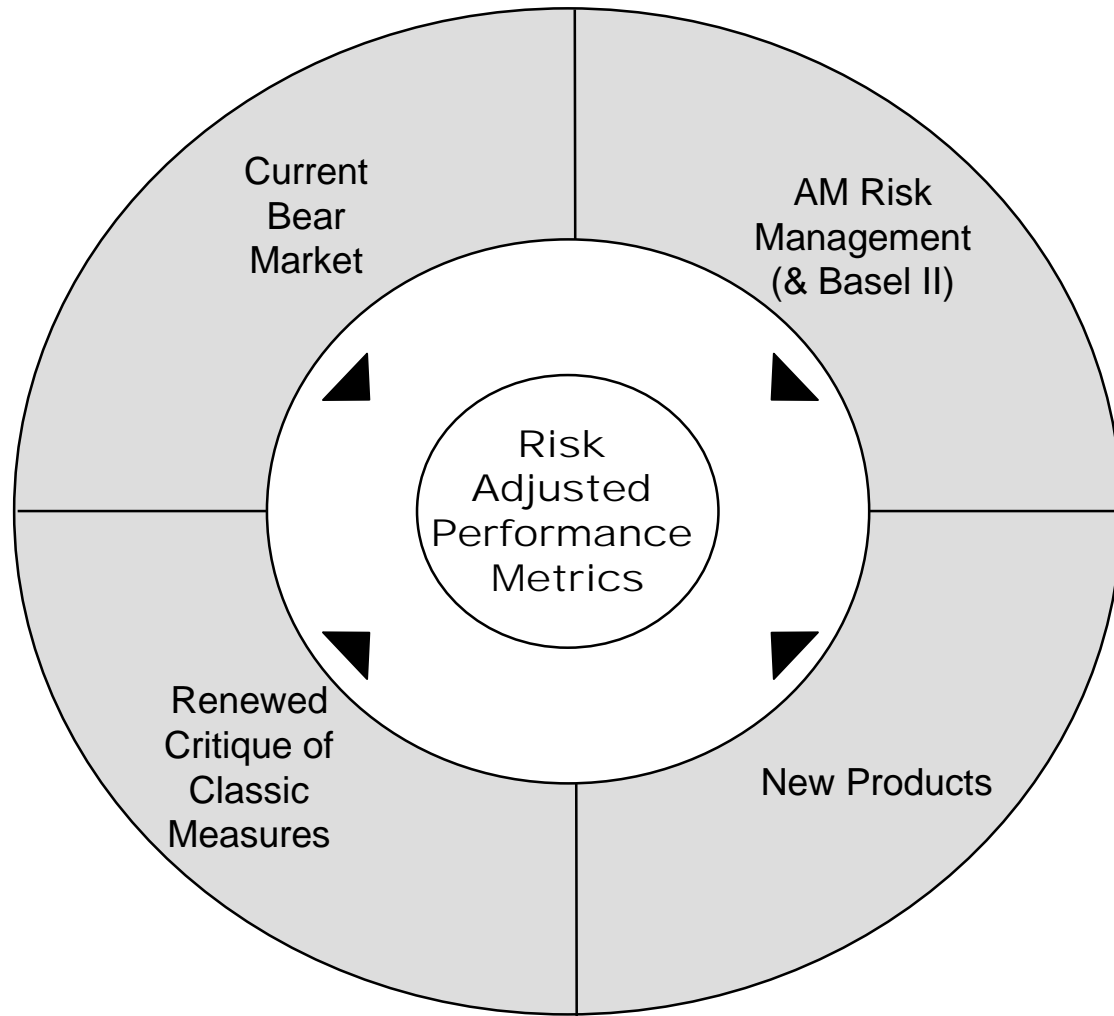
Criteria for a Good Performance Measure

- **Appropriateness:** Captures essential features of distribution, at minimum risk and return

- **Foundation:** Grounded in theory or accepted 'market standard'

- **Clarity:** Easy to explain to non-technical individual

- **Special cases**, e.g.
  - Consistency with risk/return frontier (asset allocation)
  - Capture international differences (shareholder value measures)

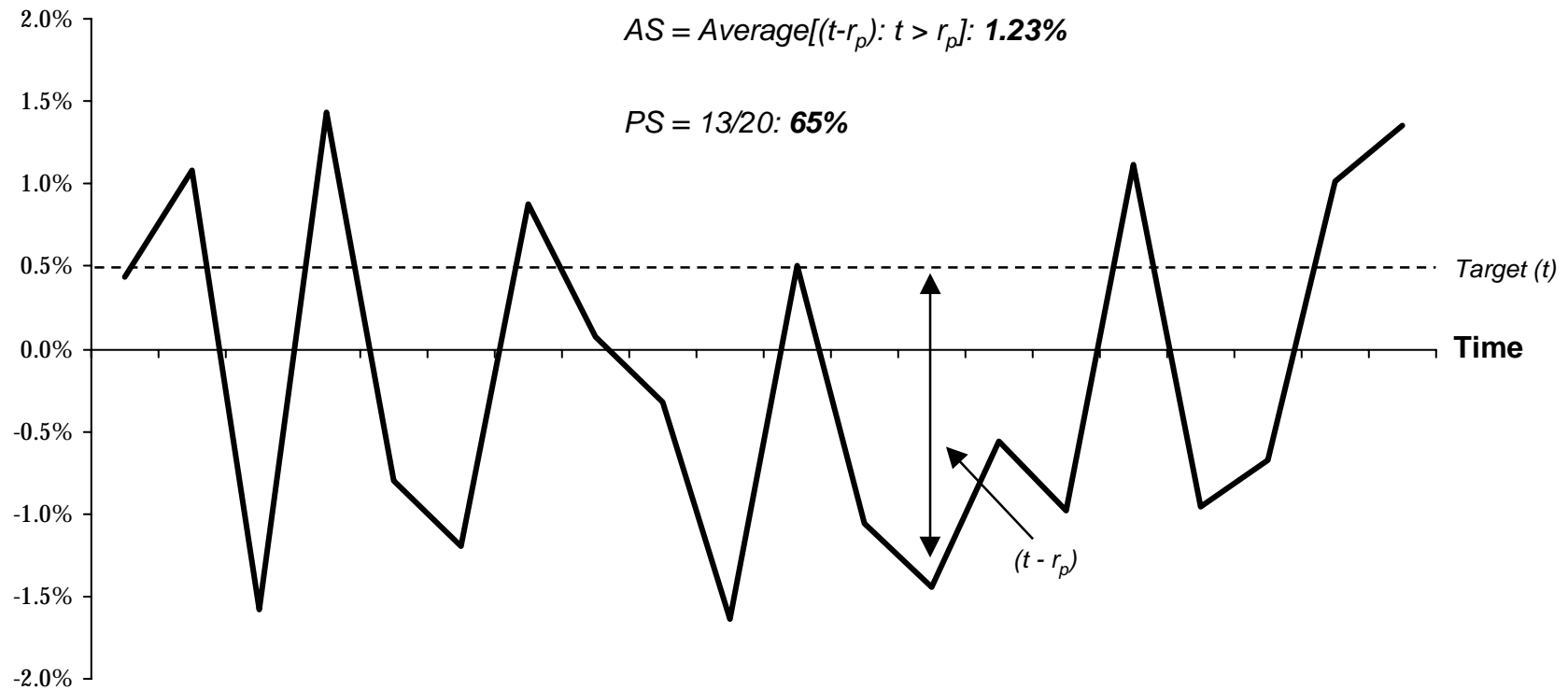# Quick Recap of Downside Risk Measures

Returns (r_p)

Volatility: **1.06%**

$SSD = Sqrt[Average[(t{-}r_p)^2: t > r_p]]$: **5.23%**

$AS = Average[(t{-}r_p): t > r_p]$: **1.23%**

$PS = 13/20$: **65%**

Target (t)

Time

$(t - r_p)$

Survey of Existing Measures – Theory

Mean-Variance (Classic)

- Sharpe: $\dfrac{r_p - r}{\sigma_p}$

- Treynor: $\dfrac{r_p - r}{\beta_p}$

- Jensen: α_p

- Normal distribution or quadratic utility
- CAPM: $r_p = \alpha_p + \beta_p (r_m - r) \times \varepsilon_p$

Asymmetric Preferences

- Sortino: $\dfrac{r_p - r}{SSD}$

- ROAS, ROPS: $\dfrac{r_p - r}{AS}$; $\dfrac{r_p - r}{PS}$

- Revised equilibrium measures
  - Treynor (SSD) ; $\dfrac{r_p - r}{\beta_p^{SSD}}$

  - Jensen (SSD) ; α_p

- Axiomatic derivation
- Equilibrium results

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Survey of Existing Measures – Practitioner

- Total Return: r_p

- Calmar Ratio: $\dfrac{r_p}{MDD}$

- Sterling Ratio: $\dfrac{r_p}{Average\ (MDD) + 10\%}$

- Information Ratio: $\dfrac{r_p}{\sigma_p}$

MDD =   Maximum Drawdown = Maximum sustained drop over relevant period

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Measures Against Criteria

Rule of Thumb

	Appropriateness in Non-MV Space	Foundation Theory	Market	International Comparisons
Sharpe Ratio	✗	✓	✓	✓
Treynor Index	✗	✓	✓	✗
Jensen's Alpha	✗	✓	✓	✗
ROAS	✓	✓	✗	✓
ROPS	✓	✓	✗	✓
Sortino Ratio	✓	✓	✗	✓
Treynor (SSD)	✓	✓	✗	✗
Jensen (SSD)	✓	✓	✗	✗
TSR	✗	✗	✓	✗
Information Ratio	✗	✗	✓	✗
Calmar Ratio	✓	✗	✓	✗
Sterling Ratio	✓	✗	✓	✗

✗ Denotes relative weakness   ✓ Denotes relative strength

Key Observations

- All 'practitioner' measures use absolute returns rather than 'relative to risk-free'

- Risk-free in International Comparisons
    - Capturing inflation

- CAPM – dependent measure in International comparisons
    - The market portfolio

- No single measure satisfies all criteria

- General hypothesis
    - Use Sharpe Ratio if MV satisfied
    - Select carefully an alternative if not

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The Mean Variance Assumptions Are Key

Preference Driver

Volatility ⟶ **Downside Risk** ⟶ **Extreme Loss**

Return Data

Higher Liquidity

Longer History

More 'Normal'

① **Mean-Variance Assumptions Apply**

- Classical Measures
    - Sharpe Ratio (3)
    - Treynor Index (4)
    - Jensen's Alpha (5)
- Information Ratio (18)

② **Downside Aversion, Non-normal Returns**

- Sortino Ratio (12)
- ROAS (9)
- Sterling Ratio (17)

③ **Extreme Loss Aversion, Extreme Returns**

- ROPS (10)
- Calmar Ratio (16)

Empirical Analysis

| Asset Class	JB Rejection[1]	Median[1]	Median Skew
Investment grade bonds	14.3%	2.1	-0.27
OECD Market Indices	15.8%	2.2	-0.33
FX Rates	26.1%	1.1	0.33
Large OECD Equities	36.9%	3.3	0.25
Large Financial Institutions	37.9%	3.7	-0.04
Emerging Market Country Indices	43.8%	5.3	0.47
OECD Mid Cap Equities	47.5%	5.4	0.35
Financial Institutions	49.8%	5.9	0.24
Gas	52.4%	6.5	0.47
Mid Cap Financial Institutions	53.9%	6.9	0.35
Electricity	62.0%	11.6	0.35
Low Grade Bonds	66.7%	18.6	-0.26
Emerging Market Stocks	71.0%	20.8	0.93
Telecoms	79.3%	41.1	1.20
Hedge Funds	84.6%	63.5	-1.05
Tiny Firms (AIM)	89.0%	67.4	1.15

1. % of assets rejecting Jarque-Bera test at 5% level; median value of Jarque-Bera statistics

Sharpe vs. Sortino

Financial Institutions (SPI)
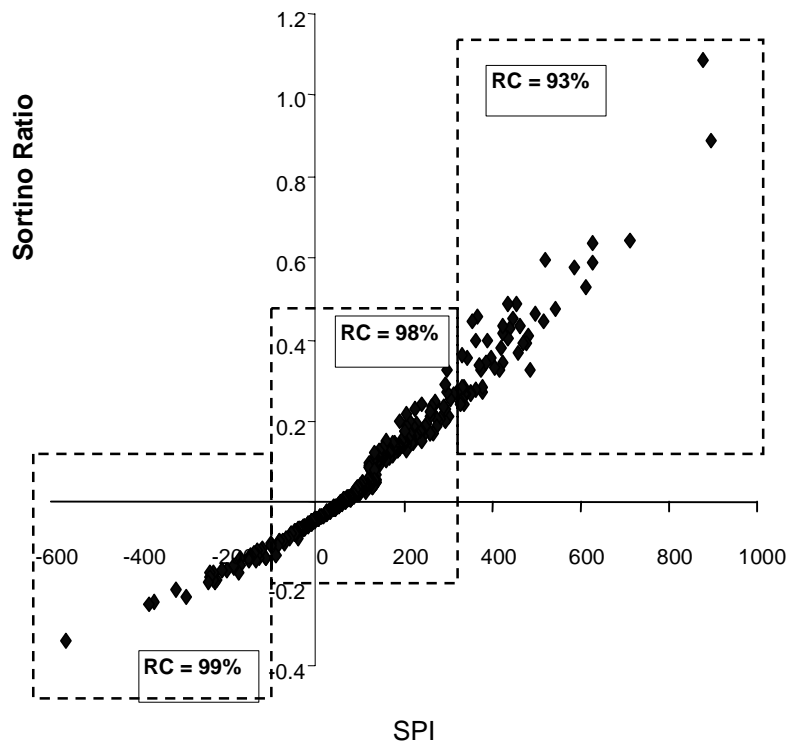
Alternative Investment Market (AIM)

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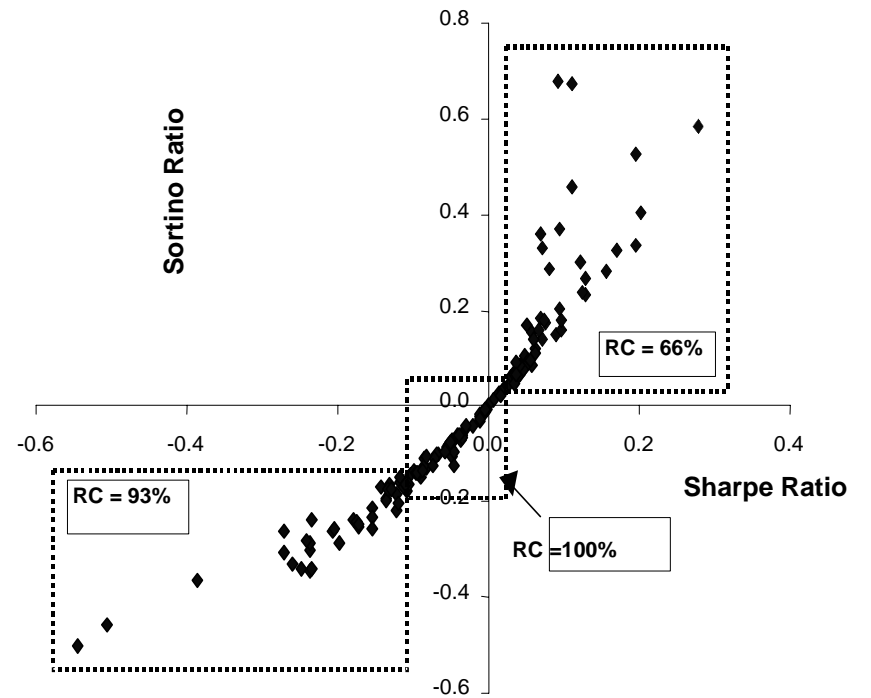
Examples of Actual Rankings

Name	Avg Monthly Excess Return	ST Dev of Excess Return	SSD of Excess Return	Sharpe		Sortino		ROPS	
				Ratio	Rank/ 254	Ratio	Rank/ 254	Ratio	Rank/ 254
Heath (Samuel)	1.5%	5.0%	2.7%	29%	1	53.4%	10	153%	43
Yeoman GP	8.8%	95.5%	13.0%	9%	38	67.8%	5	111%	6
Parallel Media	7.7%	108.9%	23.4%	7%	54	32.9%	25	58%	8
West Bromwich Albion	-1.7%	6.4%	5.6%	-27%	248	-30.6%	243	-61%	171
Gaming Insight	-3.4%	31.4%	16.0%	-11%	187	-21.2%	214	-30%	234

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Rank Correlations – Whole Sample

SPI

Rank Correlation Coefficient for SPI400 (Financial Firms)

	Sortino Ratio	ROAS	ROPS	Inform. Ratio	Sterling Ratio	Calmar Ratio	TSR	SPI
n=400								
SPI	0.996	0.997	0.974	0.904	0.864	0.860	0.853	1.000
TSR	0.848	0.849	0.821	0.934	0.992	0.986	1.000	
Calmar Ratio	0.854	0.856	0.813	0.941	0.994	1.000		
Sterling Ratio	0.859	0.862	0.820	0.945	1.000			
Information Ratio	0.901	0.902	0.876	1.000				
ROPS	0.976	0.975	1.000					
ROAS	0.998	1.000						
Sortino Ratio	1.000							

AIM

Rank Correlation Small (AIM) Firms

	Sortino Ratio	ROAS	ROPS	Inform. Ratio	Sterling Ratio	Calmar Ratio	TSR	SPI
n=254								
SPI	0.991	0.991	0.938	0.908	0.732	0.688	0.651	1.000
TSR	0.638	0.631	0.676	0.792	0.792	0.993	1.000	
Calmar Ratio	0.676	0.670	0.699	0.831	0.983	1.000		
Sterling Ratio	0.716	0.714	0.725	0.873	1.000			
Information Ratio	0.892	0.889	0.856	1.000				
ROPS	0.956	0.941	1.000					
ROAS	0.995	1.000						
Sortino Ratio	1.000							

- **Key factors driving correlation**
  - Data asymmetry (market liquidity etc.) and history
  - Using or not using the risk-free rate
  - Degree of asymmetric preference used
  - Equilibrium-based measures or not

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Rank Correlations – Top Performers

SPI

Rank Correlation Coefficient for SPI400 (Financial Firms) Top Quartile

	Sortino Ratio	ROAS	ROPS	Inform. Ratio	Sterling Ratio	Calmar Ratio	TSR	SPI
n=100								
SPI	0.933	0.944	0.635	0.898	0.792	0.815	0.726	1.000
TSR	0.545	0.525	0.550	0.669	0.826	0.720	1.000	0.541
Calmar Ratio	0.708	0.680	0.493	0.849	0.918	1.000	0.755	0.736
Sterling Ratio	0.697	0.684	0.562	0.836	1.000	0.923	0.851	0.717
Information Ratio	0.774	0.768	0.516	1.000	0.810	0.834	0.690	0.829
ROPS	0.671	0.658	1.000	0.487	0.387	0.331	0.538	0.579
ROAS	0.958	1.000	0.673	0.818	0.689	0.721	0.645	0.937
Sortino Ratio	1.000	0.962	0.679	0.808	0.677	0.712	0.646	0.926

AIM

Rank Correlation Small (AIM) Firms Top Quartile

	Sortino Ratio	ROAS	ROPS	Inform. Ratio	Sterling Ratio	Calmar Ratio	TSR	SPI
n=100								
SPI	0.670	0.727	0.199	0.895	0.812	0.812	0.826	1.000
TSR	0.822	0.850	0.713	0.896	0.939	0.912	1.000	0.859
Calmar Ratio	0.691	0.733	0.474	0.892	0.975	1.000	0.912	0.761
Sterling Ratio	0.704	0.751	0.501	0.903	1.000	0.975	0.939	0.786
Information Ratio	0.528	0.591	0.236	1.000	0.865	0.858	0.852	0.837
ROPS	0.722	0.668	1.000	0.145	-0.025	-0.012	0.077	0.359
ROAS	0.966	1.000	0.579	0.513	0.477	0.490	0.528	0.717
Sortino Ratio	1.000	0.966	0.692	0.435	0.380	0.395	0.444	0.663

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Questions to Ask When Selecting a Measure

- Are mean-variance assumptions satisfied?

- Does the application permit approaches deviating from fundamentals or 'the norm'?

- Are returns absolute or relative to a benchmark?

- Can international comparisons be made?

- Are there differences in rankings implied by alternative measures?

Conclusion

- Improved risk management for asset managers
  - New investment products (illiquid markets and asymmetric returns)
  - Risk budgeting rules
  - Mapping investor preferences to optimal asset allocations
  - Operational risk
  - Regain confidence of investors

- Examine differences in asset allocations in volatile markets

- Key next steps: research and application
  - Flesh out map of best measures by preferences and data properties
  - Link more formally to investor preferences/utility theory/rationality arguments
  - Incorporate measures in tracking error models
  - More product/market sensitive trading rules