Performance Attribution Reporting for Clients – interactive discussion

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Performance attribution

Answers: how was performance produced; what were the sources of return and the sources of risk?

- May be *ex-ante* or *ex-post*

- Includes both <u>return attribution</u> and <u>risk attribution</u>
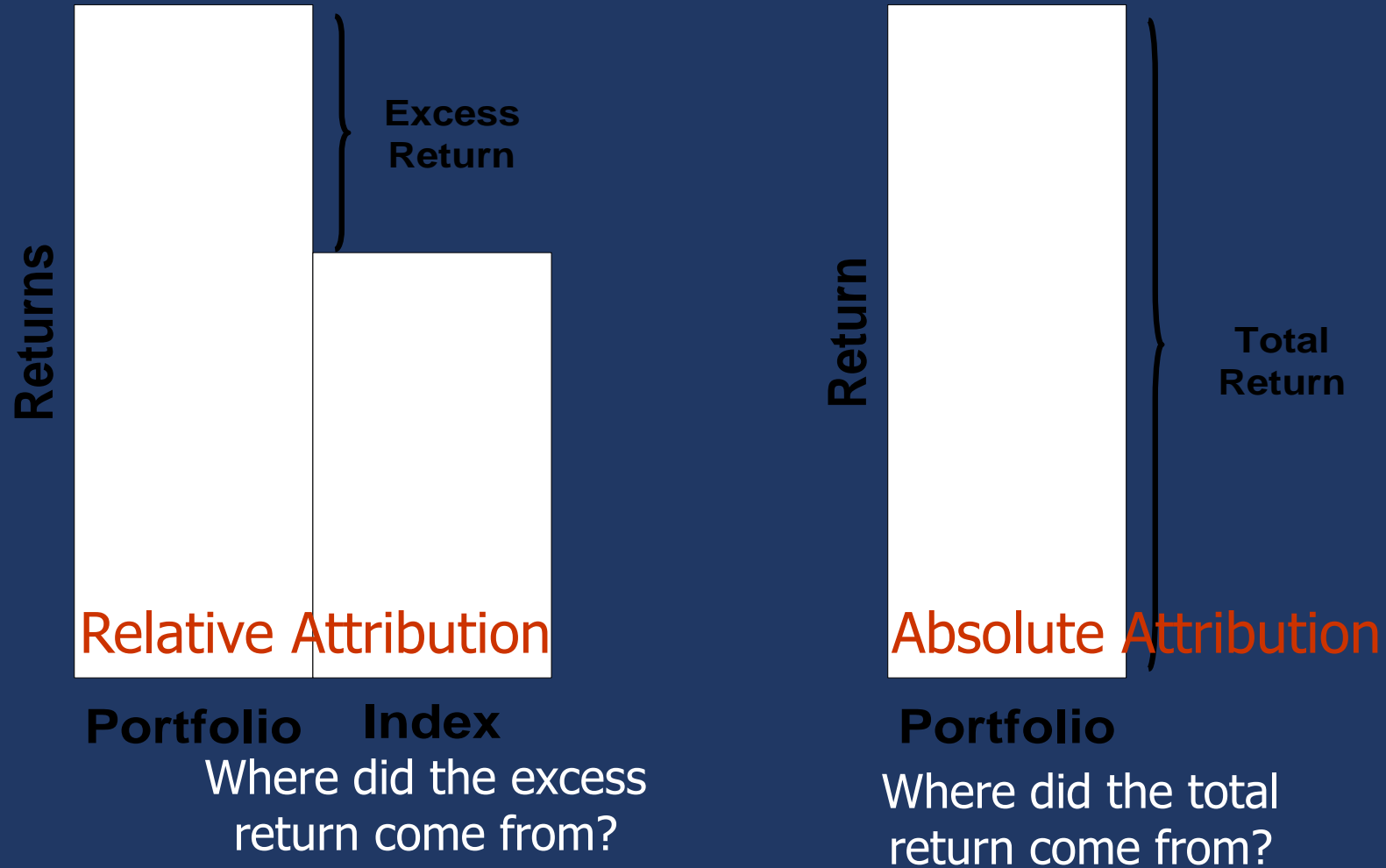
Major classifications of attribution

- **<u>Absolute</u> attribution:**

    Identifies effects contributing to the portfolio's entire return, its absolute return

- **<u>Relative</u> attribution:**

    Identifies effects contributing to the portfolio's return relative to an index; its excess return

Major classifications of attribution

Returns

Excess Return

Relative Attribution

Portfolio   Index

Where did the excess return come from?

Return

Total Return

Absolute Attribution

Portfolio

Where did the total return come from?

Performance Attribution is about reconciling

- For absolute attribution or contribution
  - Reconciling the total return
  - Identifying what contributed to it

- And, for relative attribution
  - Reconciling to the excess return
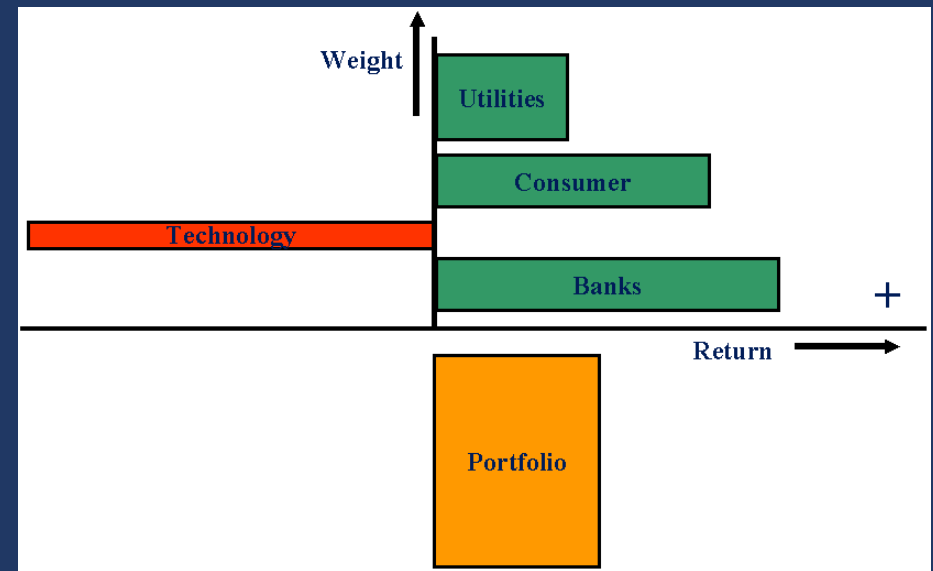 - Figuring out where our active return came from

Absolute Attribution, a.k.a. Contribution

- Contribution = Weight * Return
- Weight = the relative market value

$$Weight_i = \frac{V_{B_i}}{\sum_{i=1}^{n} V_{B_i}}$$

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Visualizing contribution

	Portfolio		Sector
	Weight	ROR	Contribution
Utilities	42%	3.70%	1.55%
Consumer	26%	6.20%	1.61%
Technology	8%	-10.30%	-0.82%
Banks	24%	7.30%	1.75%
Totals	*100%*	*4.09%*	*4.09%*

Security Level Contribution

Security	ROR	Weight	Contribution
A	2%	8%	0.16%
B	2%	8%	0.16%
C	-1%	4%	-0.04%
D	2%	15%	0.30%
E	2%	7%	0.14%
F	-1%	9%	-0.09%
G	2%	12%	0.24%
H	-2%	8%	-0.16%
I	3%	14%	0.42%
J	141%	15%	21.15%
Portfolio	22.28%	100%	22.28%

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Contribution of an asset not held

- (Portfolio Total ROR - Security ROR) * Security Weight in index

- <u>Example</u>: IBM in index; not in portfolio
  - 5% of benchmark
  - 0% of portfolio
  - ROR of IBM = 8%
  - Overall Portfolio ROR = 6%

  Contribution = (6%-8%)*0.05 = -0.1%

Approach could be used to show contribution of stocks recommended to ignored by investor

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Risk attribution approach

- The risk attribution approaches focus on the concept of marginal contribution to risk

  - For absolute returns, marginal contribution to risk in the form of <u>standard deviation </u>(total risk) is used

  - For relative returns, marginal contribution to risk in the form of <u>tracking error </u>(relative risk) is used

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Decomposing absolute risk: standard deviation (1)

- The marginal contribution of an asset to the portfolio's total standard deviation is the correlation of the portfolio and asset returns multiplied by the standard deviation of the asset returns:

$$MC_i = \rho_{iP} * \sigma_i$$

- Mc_i is marginal contribution
- ρ_{iP} is the correlation of asset i and portfolio P returns
- σ_i is the standard deviation of asset i returns

Decomposing absolute risk: standard deviation (2)

- The total portfolio contribution to standard deviation is the sum of the contributions Ci

$$C_i = w_i * MC_i$$

$$\sigma_p = \sum C_i$$

- C_i is asset contribution to risk (standard deviation)
- w_i is the weight of asset i
- σ_P is the standard deviation of the portfolio

Decomposing absolute risk (3)

Risk Attribution – Case 1: Bottom Up Manager, Absolute Returns (weights constant)

Month	Weight of Bonds	Weight of Stocks	Return of Bonds	Return of Stocks	Portfolio Return
Jan-12	35.00%	65.00%	-0.50%	2.20%	1.26%
Feb-12	35.00%	65.00%	1.10%	-7.00%	-4.17%
Mar-12	35.00%	65.00%	2.50%	3.50%	3.15%
Apr-12	35.00%	65.00%	0.25%	-3.00%	-1.86%
May-12	35.00%	65.00%	1.72%	5.55%	4.21%
Jun-12	35.00%	65.00%	-0.09%	8.80%	5.69%
Jul-12	35.00%	65.00%	0.50%	9.00%	6.03%
Aug-12	35.00%	65.00%	0.20%	3.50%	2.35%
Sep-12	35.00%	65.00%	2.00%	8.00%	5.90%
Oct-12	35.00%	65.00%	1.00%	-6.00%	-3.55%
Nov-12	35.00%	65.00%	2.22%	-3.50%	-1.50%
Dec-12	35.00%	65.00%	-0.65%	0.20%	-0.10%
2012					**18.00%**
Standard Deviation			1.03%	5.41%	3.52%
Correlation			5.85%	99.48%	
Marginal Contributions			0.06%	5.38%	
Contribution			0.02%	3.50%	3.52%

Brinson models: equity relative return attribution

Due to allocation: II − I

$$\sum_{i=1}^{n} w_{P_i} \times r_{B_i} - \sum_{i=1}^{n} w_{B_i} \times r_{B_i} =$$

$$\sum_{i=1}^{n} r_{B_i} \times \left(w_{P_i} - w_{B_i} \right) = BHB$$

$$\sum_{i=1}^{n} \left(r_{B_i} - r_B \right) \times \left(w_{P_i} - w_{B_i} \right) = BF$$

Other: (interaction)
IV-III-II+I

$$\sum_{i=1}^{n} \left(w_{P_i} - w_{B_i} \right) \times \left(r_{P_i} - r_{B_i \ i} \right)$$

Due to stock selection: III–I

$$\sum_{i=1}^{n} w_{B_i} \times r_{P_i} - \sum_{i=1}^{n} w_{B_i} \times r_{B_i} =$$

$$\sum_{i=1}^{n} w_{B_i} \times \left(r_{P_i} - r_{B_i} \right)$$

Total: IV-I

$$\sum_{i=1}^{n} \left(w_{P_i} \times r_{P_i} \right) - \left(w_{B_i} \times r_{B_i} \right)$$

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Fixed income attribution

- Three types of fixed income models:

  - Exposure decomposition – duration based
  - Yield curve decomposition – duration based
  - Yield curve decomposition – full repricing

Fixed income attribution: exposure decomposition – duration based

- Key traits of models that fall into this category include:

  - Top-down, benchmark relative view of manager decisions
  - Decisions measured typically include portfolio duration bet, yield curve positioning bets, sector bets and security selection
  - Exposure decomposition is based on "bucketing" of assets into categories – e.g., by duration, sector
  - Brinson-esque in their approach to dealing with weighting decisions made by the manager

Fixed income attribution: yield curve decomposition – duration based

- Key traits of models that fall into this category include:

  - Can be top-down (by group, e.g. sector) or bottom-up (individual bonds) in nature
  - Estimates return of securities, sectors and/or YTM buckets based on the relationship between modified duration and changes in YTM (yield to maturity)

  - Key equations:
    - total return = income return + price return
    - Key equation: %PriceReturn = (-ModifiedDuration)*ChangeinYTM

  - Change in YTM can be broken into:
  - Changes in risk-free government bond curve
  - Premium (spread) demanded by market for holding riskier bonds

Fixed income attribution: yield curve decomposition – full repricing

- Key traits of models that fall into this category include:

  - Bottom-up in nature
  - Requires ability to reprice all bonds in portfolio and benchmark using zero coupon curves (spot rates)
  - Key idea: a bond's market price estimates the present value sum of its future cash flows discounted at the appropriate spot rate for each cash flow's maturity
  - Bottom-up repricings can be used to aggregate portfolio and benchmark returns up to the total or to sub-total groupings

Decomposing relative risk: tracking error (1)

- The marginal contribution of an asset to the portfolio's tracking error is the correlation of the portfolio and asset returns multiplied by the standard deviation of the asset returns:

$$MC_i = \rho(R_i, R_A) * \sigma(R_i)$$

- Mc_i is marginal contribution
- $\rho(Ri, RA)$ is the correlation of asset i and portfolio P active returns
- $\sigma(Ri)$ is the standard deviation of asset i returns

Decomposing relative risk: tracking error (2)

- The total portfolio contribution to tracking error is the sum of the contributions C_i

$$C_i = dw_i * MC_i$$

$$TR = \sum C_i$$

- C_i is asset contribution to risk (tracking error)
- dw_i is the active weight of asset i
- TR is the tracking error of the portfolio

Attribution for passive managers

- Explaining why portfolio returns are not equal to benchmark returns:

  - Impact of fees
  - Sources of tracking error
    - Sampling error
    - Replication error
    - Enhanced index manager value added
    - Etc….

Discussion Topics: Practices, challenges, questions

- For what types of portfolios are you providing (or planning to provide attribution): self-traded accounts? Accounts invested in managed strategies? Wrap accounts?

- For what vehicle will the attribution be calculated: model? Representative account? Composite? Client's actual account?

- Frequency of report distribution? Length of history?

- For which clients is or will attribution be provided?

- Systems used? Or do you use attribution provided by managers?

- Is attribution reporting text-based only, or graphical?

- Is portfolio risk reported to support deeper dive into risk attribution?

- Is attribution provided with market commentary?

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Discussion Topics

- Are all managers calculated using the same model, or can you differentiate based on their decision process? How many models are supported?

- Any particular data challenges?

- Is there a need for an education component for clients that receive attribution?
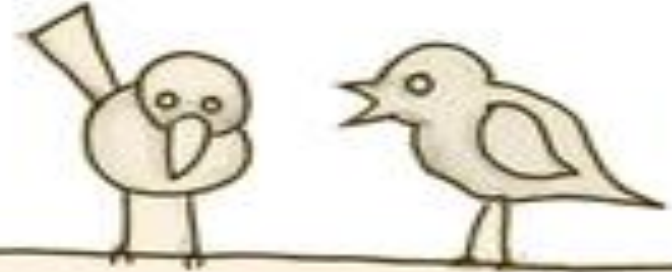
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