

# Transaction-based Contributions: Accuracy of Fixed-Income Measurement & Attribution

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# Transaction-based vs. Holdings-based Returns: Which Is Better?

- Define terms
- Develop criteria
- Compare methodologies
- Examine realized accuracy in fixed-income case

This presentation reproduces and expounds upon material contained in an upcoming article from the *Journal of Performance Measurement*.

# “vs.” Is an Oversimplification: A Continuum of Performance Methodologies

- Spaulding\* outlines a full range of choices:
  - Monthly holdings-based
  - Daily holdings-based
  - Monthly, beginning holdings plus weighted flows (Modified Dietz)
  - Daily, beginning holdings plus weighted flows
  - Calculate security returns using actual transaction prices
  - Capture 100% of transaction activity

*\*Spaulding, David, “Holdings vs. Transaction-based Attribution, an Overview,” The Journal of Performance Measurement, Fall 2003, Vol. 8 No. 1, pp. 52-56*

# Criteria for Comparison and Evaluation

- Return, weight and contribution
- Granularity
- Simplicity
- Intuitiveness
- Periodicity
- Time-period linking
- Attribution Effects
- Accuracy!!!



# Return, Weight and Contribution

- *Should explicitly specify the calculations for return, weight and contribution.*
- At every level of granularity
- For single and multiple periods
- Contribution is key to effective transaction-based methodologies

# CASE STUDY: Return, Weight, Contribution

$$R_{i,t} = \frac{M_{i,e(t)} + O_{i,t}}{M_{i,b(t)} + I_{i,t}} - 1$$

$$W_{i,t} = \frac{M_{i,b(t)} + I_{i,t}}{M_{P,b(t)}} = \frac{M_{i,b(t)} + I_{i,t}}{\sum_i M_{i,b(t)}}$$

$$C_{i,t} = R_{i,t} * W_{i,t}$$

➤ Fully-weights inflows, zero-weights outflows



# Granularity – How Low Can You Go?

- *Should calculate performance at the lowest, most granular level possible.*
  - Portfolio
  - Asset Class
  - Region/Country
  - Currency
  - Sector/Industry
  - **CASE STUDY:** Position
  - Leg
  - Tax Lot
  - Strategy
  - Factor



# Simplicity & Intuitiveness

- *Should be as simply constructed as possible, and free of special-case logic or exceptions.*  
Consider:
  - Opened positions
  - Flipped positions
  - Long/short crossover
- *Should produce results which, in all transactional circumstances, match our intuitive expectations of performance.*

# Periodicity

- *The periodicity of the methodology should match the availability of holdings valuations*
- **CASE STUDY:** daily
- Arguments against:
  - Input noise, auto-correlation, heteroskedacity
  - Cannot infer anything about manager performance from daily returns
- Arguments for:
  - Not trying to compare 1-day returns to each other
  - Are trying to get a to-date read on how our strategies are working
  - Easier to tie out to daily accounting

# Time-period Linking

- *Returns should be geometrically linked*
- Attribution effects – a whole other topic
  - See Cariño, Menchero, Frongello, Laker, Mirabelli, Valtonnen, David, et al.
- Contribution – CASE STUDY: adjust to cumulative portfolio return index
- Weight – beginning, end, average, implied adjusted
  - Whichever you use, label it clearly



# Why Transaction-based Attribution Is Rarely Feasible

- Must have, at each decision point:
  - valuation of every portfolio **and benchmark** position
  - analytics – duration, key rate duration, convexity, OAS
  - yield/key rate curve
- Use of transaction-based returns, excess returns & weights otherwise introduces spurious attribution effects
- Worse, transacting is not the only way a manager expresses a decision – **not transacting** is equally significant
- **CASE STUDY**: difference between transaction-based contribution and holdings-based attribution effects is measured but not attributed
  - “Un-attributable”, not “Transaction/Trading” Effect
  - Not because “apples-to-apples” comparison to un-transacted benchmark
  - Reports include un-attributable in selection

# ACCURACY!!!


- *The sum of the most granular contributions should equal the portfolio return, for every period*
- When they don't:
  - an explanation will be asked for,
  - this explanation, and the time it takes to make it will distract from the actual point that the performance analysis is intended to make,
  - the explanation, each time it is proffered, will generate dissatisfaction,
  - and the dissatisfaction so generated will cumulate over time.

# CASE STUDY: Benefits of Accuracy

- Managers organized by FI Asset Class
- Allocation policy managed top-down
- Managers NOT measured on effects of FX, local curve, roll, allocation
- Managers ARE measured on selection excess return to local curve (to nearest  $\frac{1}{4}$  bps)
- Accuracy Requirement: position contribution rollup → portfolio return +/- 5bps per month
- Accuracy Achieved:
  - +/- 5bps/month: 100%
  - +/- 2ps/month: 80%
- Primary causes of remaining residual
  - Lack of daily pricing for certain securities
  - Analytic calculation portfolio/benchmark differences

# CASE STUDY: Benefits of Granularity

Fixed Income Performance Attribution																	
	Portfolio							Benchmark							Attribution		
	Weight	Duration	DurCont	Excess	ExcessCont	Weight		Duration	DurCont	Excess	ExcessCont	Allocaion	Selection		Total		
Treasury	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
Agency	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
Corp Credit	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
Aerospace/Defense	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
0-3 yrs	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
AAA	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
MNO Inc. 8-1/2 '08	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
PQR Corp 6-3/4 '09	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
STU LLC 7-3/8 '08	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
AA	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
A	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
BBB	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
Other	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
3-5 yrs	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
5-8 yrs	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
8+ yrs	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
Other	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
Airlines	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
Automotive	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
Banking	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
Beverage	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
Brokerage	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		
Real Estate	99.9%	99.99	99.99	99.99	99.99		99.9%	99.99	99.99	99.99	99.99		99.99	99.99	99.99		



# Are the Inputs Available? What Is the Cost of Filling the Data Gap?

- Daily positions
  - !!! corrected for as-of transactions? !!!
  - all securities (private placements, STIFs)?
  - analytics (duration, key rate durations, convexity, OAS)
  - separate long from short?
  - separate cash from short-term?
  - accruals? paydowns?
  - FX rates?
  - segment classifications?
- Complete transaction data
  - !!! corrected for as-of transactions? !!!
  - reflexive cash transactions?
  - outflow/inflow by transaction type?
  - separate long from short (no crossover)?
  - FX rates?
  - Commissions and fees detail?



## Are the Inputs Available? (cont.)

- Daily benchmark constituents
  - valuations?
  - analytics? (duration, key rate durations, convexity, OAS)
  - segment classifications?
  - valuations, analytics, segment classifications: same or different than portfolio?
- Daily local yield curves, key rates

# Conclusions

- All-out transaction-based performance provides superior accuracy, thus insight and confidence.
- Transaction-based performance measurement (but not attribution) is quite feasible now, and technology and markets conspire to make it more so.
- But - depending on your data gap - it can be expensive to implement.
- Make sure you know who you're doing it for and why they need it.

## For more information:

- *The Journal of Performance Measurement*
  - Upcoming article
  - Reprint Fall 2003, Vol. 8 No. 1
- [www.essexriver.com](http://www.essexriver.com)
  - TransactionBasedPerformance.xls
  - Worked-through examples of methodology
- [mark.david@essexriver.com](mailto:mark.david@essexriver.com)