

Issues in Security Level Performance Attribution and Measurement

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Overview

- Transaction Based or Buy/Hold?
- Daily or Monthly Attribution?

Transaction Based or Buy/Hold?

- Depends on goal:
 - Performance Measurement: Calculate the performance in terms of percent return on initial investment, accounting for cash flows, transaction costs, and transaction prices → Transaction Based
 - Performance Attribution: Analyze the portfolio performance and relative performance in terms of the decisions that generate returns → Buy/Hold

Analysis Methodology

- Transaction Based:
 - At each transaction time, determine each security's value and change in value. Account for value changes due to price, accrual, dividend, etc, plus changes due to transaction costs and cash flows. Attribute returns according to a model.
- Buy/Hold:
 - At the beginning and end of each buy/hold (decision) period, determine each security's value and change in value using a standardized pricing source. Attribute returns according to a model.

Data Requirements: Valuations

- For transaction based, valuations are needed for all securities at each transaction time.
 - May necessitate storing large quantities of data.
 - May be problematic for thinly traded securities.
- For buy/hold, valuations are needed at beginning and end of each buy/hold period from a standardized source.
 - Standardized data source may facilitate accurate comparison to benchmark.

Security Cash Flows

- For transaction based, cash flows must be considered at each transaction time.
 - Cash inflows and outflows are transactions. Difficulty of applying method depends on their frequency.
- For buy/hold, they are not needed.
 - Return is always a function of beginning market values.
 - To properly apply buy/hold, cash flows should trigger new buy/hold periods.

Transaction Costs

- For transaction based, information about transaction costs is necessary for accurate accounting.
- For buy/hold, transaction costs are assumed to be something that the portfolio manager cannot change.

Can They Be Merged?

- Important to consider the “true” performance.
- Portfolio level transaction based analysis along with buy/hold attribution may give best of both worlds.
 - Data requirements for transaction based are relaxed to the portfolio level.
 - Portfolio managers are judged on more realistic time intervals (i.e. true decision intervals).

Example: Portfolio with Turnover

Description	Coupon		Value	
	Rate	Maturity	Holdings	Held
UNITED STATES TR BD	6	2/15/2026	2,450	2,605,830
COLOMBIA REP AMRTZ N	9.75	4/9/2011	7,100	6,997,447
AT&T WIRELESS SVCS S	8.75	3/1/1931	1,440	1,153,350
UNITED STATES TR NT	4.875	2/15/2012	12,000	12,278,651
HOUSEHOLD FIN CORP N	5.75	1/30/2007	2,261	2,295,003
AOL TIME WARNER INC	7.7	5/1/1932	4,500	4,196,750
BANQUE CENTRALE DE B	7.375	4/25/2012	7,860	7,297,273
CHILE REP BD 5.625%0	5.625	7/23/2007	2,170	2,171,033
MORGAN STANLEY NT	5.8	4/1/2007	2,940	3,056,408
SOUTH AFRICA REP NT	7.375	4/25/2012	5,630	5,654,244
11 Sep02 FWD EUR/USD			-8,174	-345,634
11 Sep02 FWD CAD/USD			-5,000	-24,358
03 July02 FWD USD/JP			-6,000	-1,921
TREASURY 5 3/4% STK	5.75	12/7/2009	2,300	3,663,640
GBP CASH	3.942	6/29/2002	188	286,896
NORTHERN ROCK 5.75%-	5.75	2/28/2017	2,600	3,983,180
REXAM 7.125% EMTN 27	7.125	3/27/2009	2,150	3,395,228
BARCLAYS BANK 6% BDS	6		3,460	5,261,948
GERMANY(FED REP) 4.7	4.75	7/4/2028	3,000	2,869,304
VIVENDI ENVIRONNEM 5	5.875	6/27/2008	3,800	3,735,189
GERMANY(FED REP) 4.5	4.5	8/18/2006	4,700	4,941,841
UNICREDITO ITALIAN 5	5	11/27/2011	6,100	6,108,012
ENBW INTERNATIONAL 5	5.875	2/28/2012	3,270	3,253,125
IMERYS SA	6	5/7/2007	5,325	5,392,043
CANADA GOVT BD	6	6/1/2008	16,023	11,065,136
CANADA GOVT BD	6	6/1/2011	14,000	9,609,238
AUD CASH	4.31	7/1/2002	14,701	8,252,766
	5.996		110,794	119,151,616

- Sold 4500 shares of AOL Time Warner at 91.570 (+1bps trans)
- Sold 1450 shares of US treasury 6% of 2026 at 104.189 (+1bps trans)
- Bought 688 shares of JPY #230 1.1% of 2011 at 99.803 (+2bps trans)

Example: Performance Comparison

Description	Coupon	Maturity	Contributions (bp) to Return				
			Model	Sel.	B/H	Trans	
CANADA GOVT BD	6	6/1/2008		2.0	2.4	4.38	4.38
CANADA GOVT BD	6	6/1/2011		1.7	0.2	1.92	1.92
11 Sep02 FWD CA				-0.4	0.0	-0.46	-0.46
UNITED STATES T	6	2/15/2026		0.6	-0.3	0.23	0.18
COLOMBIA REP AM	9.75	4/9/2011		-0.1	2.8	2.76	2.76
AT&T WIRELESS S	8.75	3/1/2031		-0.1	-1.3	-1.42	-1.42
UNITED STATES T	4.875	2/15/2012		1.2	-1.8	-0.54	-0.54
HOUSEHOLD FIN C	5.75	1/30/2007		0.3	-0.4	-0.17	-0.17
AOL TIME WARNER	7.7	5/1/2032		-1.0	1.3	0.35	0.28
BANQUE CENTRALE	7.375	4/25/2012		0.8	2.2	2.91	2.91
CHILE REP BD 5.	5.625	7/23/2007		0.0	-0.9	-0.88	-0.88
MORGAN STANLEY	5.8	4/1/2007		0.3	-0.1	0.21	0.21
SOUTH AFRICA RE	7.375	4/25/2012		-0.3	1.1	0.81	0.81
03 July02 FWD U				-0.8	0.0	-0.87	-0.87
GERMANY(FED REP	4.75	7/4/2028		-1.9	0.8	-1.11	-1.11
VIVENDI ENVIRON	5.875	6/27/2008		-0.3	0.1	-0.13	-0.13
GERMANY(FED REP	4.5	8/18/2006		-0.3	0.4	0.03	0.03
UNICREDITO ITAL	5	11/27/2011		-1.5	-7.2	-8.67	-8.67
ENBW INTERNATIO	5.875	2/28/2012		-0.6	1.3	0.75	0.75
11 Sep02 FWD EU				0.3	0.0	0.14	0.14
IMERYS SA	6	5/7/2007		0.0	0.0	-0.04	-0.04
TREASURY 5 3/4%	5.75	12/7/2009		1.0	0.3	1.34	1.34
GBP CASH	3.942	6/29/2002		0.1	0.0	0.08	0.08
NORTHERN ROCK 5	5.75	2/28/2017		1.0	-0.7	0.30	0.30
REXAM 7.125% EM	7.125	3/27/2009		1.2	0.0	1.20	1.20
BARCLAYS BANK 6	6			1.6	-0.1	1.48	1.48
AUD CASH	4.31	7/1/2002		0.1	0.0	0.08	0.08
JAPAN 10Y #230 1.1	1.1	3/21/2011		0.0	0.0	0.00	-2.95
				4.9	0.0	4.70	1.62

Example: Compromise Solution

<i>Returns Summary</i>			
<i>Return Sources</i>	<i>Portfolio</i>	<i>Benchmark</i>	<i>Management</i>
Yield	0.0556	0.0344	0.0212
Currency	0.0528	-0.0373	0.0902
Duration	0.2638	0.3463	-0.0824
Term Structure	-0.2913	-0.4394	0.1481
Sector	0.0090	0.0000	0.0090
Quality	-0.0356	0.0000	-0.0356
Other Spread	-0.0057	0.0020	-0.0078
Total Model Return	0.0486	-0.0940	0.1426
Interaction	0.0001	0.0001	0.0000
Hedge Cost	-0.0018	0.0000	-0.0018
Selection	0.0001	-0.0162	0.0163
Buy/Hold Return	0.0470	-0.1101	0.1571
Trading	-0.0308	0.0000	-0.0308
Total Return	0.0162	-0.1101	0.1263

- Begin market value = \$119,151,616
- End market value = \$119,170,900
- $(119,170,900 / 119,151,616 - 1) * 100 = 0.0162\%$

The Verdict

- For true performance attribution, buy/hold applied at decision intervals is adequate.
- For performance measurement, some form of transaction based returns must be calculated.
- In most cases, the two goals can be merged by considering security level performance attribution along with portfolio level transaction based return measurement.

Daily or Monthly Attribution?

- Daily Attribution:
 - Considers the possibility that market forces driving returns change daily.
 - More appropriate for portfolios with frequent transactions.
- Monthly Attribution (Buy/Hold):
 - Views changes in market forces over a longer time period.
 - More appropriate for portfolios that are primarily rebalanced monthly.

Data Requirements

- Security valuations:
 - Securities in the portfolio and benchmark must be valued more frequently depending on attribution frequency.
- Model specification:
 - Model based attribution requires valuation and characteristic information on a universe of securities for each attribution frequency.

Potential Advantages/Disadvantages

- Portfolio Composition:
 - Monthly may miss significant changes in portfolio composition.
 - Daily will capture most composition changes.
- Noise in returns:
 - Daily may incorrectly attribute noise to market forces.
 - Monthly returns tend to be less noisy, minimizing the problem.

Example with 10% Turnover

COMPANY NAME	SEDOL	GICS SECTOR	PERCENT OF PORT MKT VAL (%)
Accor	585284	DSCR	9.77
Bayer Ag	506921	MATS	10.03
Canon Inc	617232	INFT	10.19
Centrica	057343	UTIL	9.54
Credit Suisse Grp	717158	FINA	9.94
Gehe Ag	510518	HLTH	10.46
Nippon Sheet Glass	664144	INDU	10.4
Royal Dutch Petrol	520270	ENER	10.06
Sainsbury(J)	076764	STPL	9.77
Swisscom Ag	553397	TCOM	9.83

- About 2% turnover each day
- Day 1: Sold Accor for Gehe
- Day 2: Sold Canon for Bayer
- Day 3: Sold Sainsbury for Nippon Sheet Glass
- Day 4: Sold Credit Suisse for Swisscom Ag

Returns Comparison

BUY/HOLD	Base Currency : Franc(SFr) - Switzerland				
	Port.	Bench.	Variance		
Group	Base Return (%)	Base Return (%)	Stock Select	Group Weight	Total
06/28/2002 to 07/01/2002	1.115	0.213	0.871	0.031	0.902
07/01/2002 to 07/02/2002	-1.897	-2.343	0.264	0.182	0.446
07/02/2002 to 07/03/2002	-1.291	-1.599	0.172	0.136	0.309
07/03/2002 to 07/04/2002	0.604	1.334	-0.727	-0.003	-0.73
07/04/2002 to 07/05/2002	2.515	3.223	-0.714	0.005	-0.709
Total	0.986	0.732	-0.06	0.314	0.254

DAILY	Base Currency : Franc(SFr) - Switzerland				
	Port.	Bench.	Variance		
Group	Base Return (%)	Base Return (%)	Stock Select	Group Weight	Total
06/28/2002 to 07/01/2002	1.115	0.213	0.871	0.031	0.902
07/01/2002 to 07/02/2002	-1.685	-2.343	0.482	0.175	0.657
07/02/2002 to 07/03/2002	-1.355	-1.599	0.109	0.136	0.245
07/03/2002 to 07/04/2002	0.614	1.334	-0.743	0.023	-0.721
07/04/2002 to 07/05/2002	2.636	3.223	-0.604	0.017	-0.587
Total	1.268	0.731	0.141	0.395	0.536

Example: 1 July to 2 July

<i>Group</i>	<i>Port. Base Return (%)</i>	<i>Bench. Base Return (%)</i>	<i>Variance</i>		
			<i>Stock Select</i>	<i>Group Weight</i>	<i>Total</i>
Consumer Discretionary:					
07/01/2002 to 07/02/2002	-7.586	-2.572	-0.37	0.013	-0.357
Health Care:					
07/01/2002 to 07/02/2002	2.17	-2.864	0.65	-0.015	0.634

On 1 July overweight Health Care at the expense of Consumer Discretionary

The Verdict

- The frequency of transactions within the portfolio should determine the frequency of attribution.
- Data requirements may force reconsideration of the attribution frequency.
 - Noise in data must be balanced with “noise” from portfolio composition changes.

Conclusions

- Methodology chosen depends primarily on:
 - Goal of analysis
 - Frequency of trading
 - Data available
- Usually, compromise alternatives exist that help minimize the data requirement while fulfilling analytical goals.