

EQUITY RISK AND SKILL ANALYTICS

Dodge & Cox International Equity Fund

based on predictive Statistical Equity Risk Models built to isolate active contribution from passive differences, that explain 97% of out-of-sample variance and - uniquely - statistically prove active skill

	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>3-yrs</u>	
Incremental Return	-5.8	4.0	-1.6	-3.6	Isolating active return from return due to consistent passive beta-differences with a benchmark reveals negative security-selection skill.
Components:					
Passive	2.1	0.9	1.1	4.2	
Security Selection	-5.7	-2.9	-2.6	-10.8	
Timing	-2.5	6.2	-0.3	3.3	
Trading/undefined	0.3	-0.2	0.2	0.3	

Skill Analytics (3-yr.)

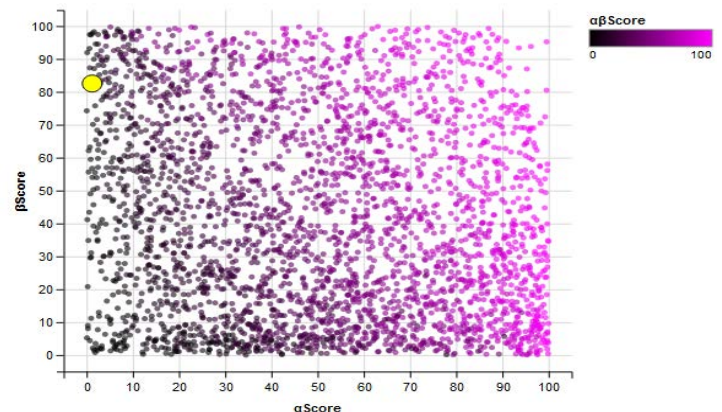
Security Selection, Factor Timing, and Active scores:

	Percentile
Security-Selection	1 st
Timing	88 th
Combined Active	5 th

Scores: information ratios for stock selection, timing, and combined active

Skill Distribution (3-yr.)

Active, Security Selection, and Factor Timing scores relative to the group:



Skill persists for top and bottom score deciles!

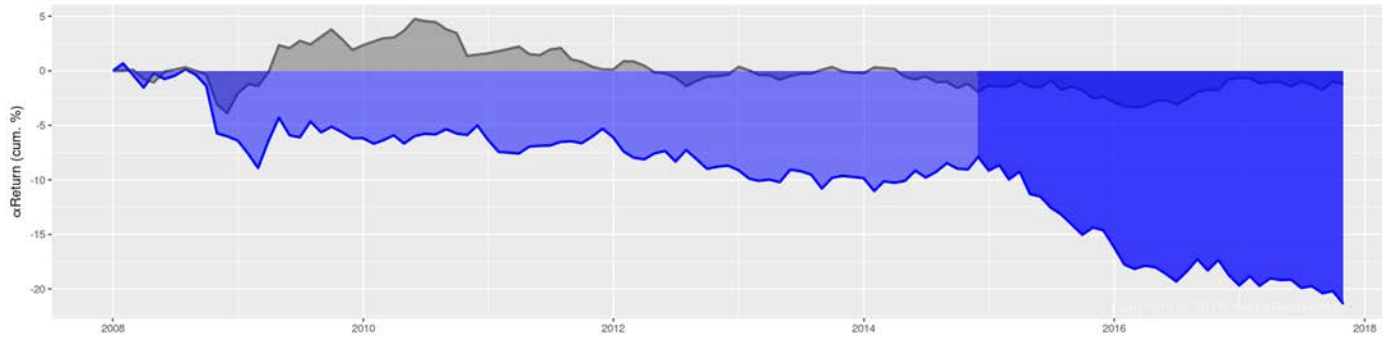
Managers with top decile stock-selection skill are twice as likely to outperform over the next few years. Bottom decile managers are more than twice as likely to underperform.

Dodge & Cox, in the bottom skill-decile, is more than twice as likely to underperform as not over the next few years.

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Security Selection Return

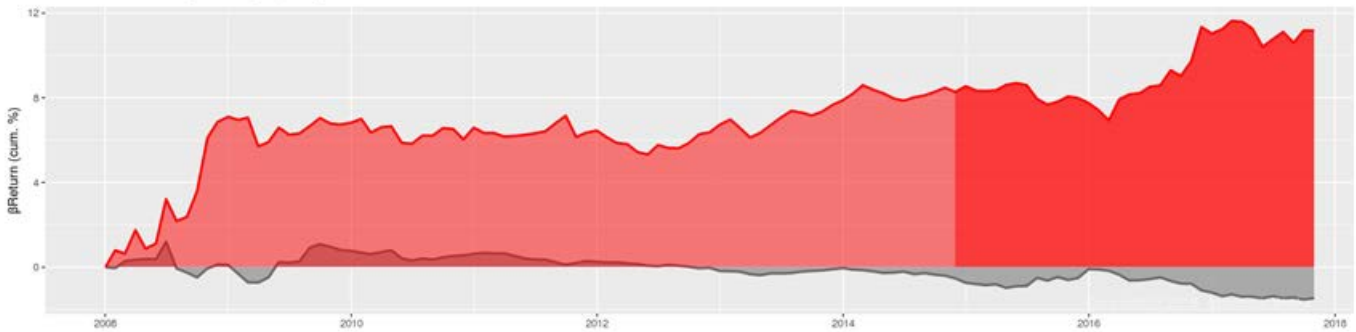
Cumulative return due to security selection, excluding compounding effects:



Significant losses from security selection have been offset by passive return (consistent passively-available differences with a benchmark) and timing (changes in passive exposures, shown below).

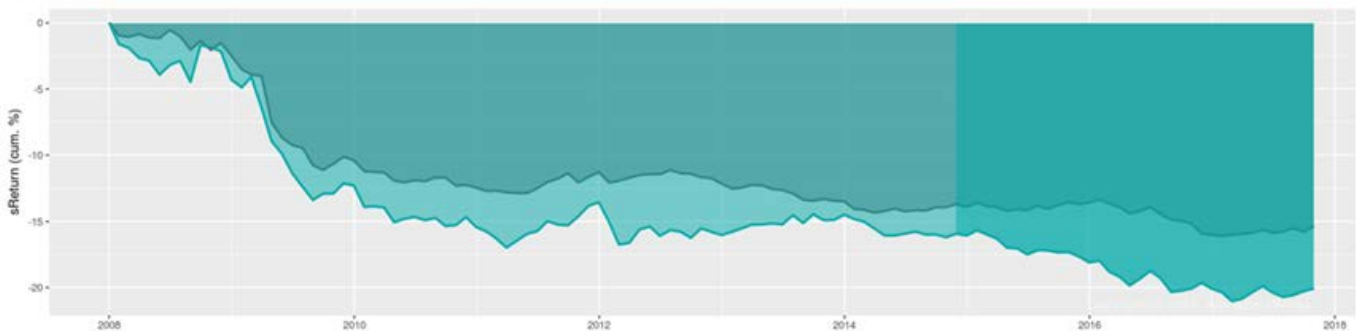
Timing Return: changes in passive exposures

Cumulative return due to factor timing, excluding compounding effects:



Position Sizing Return

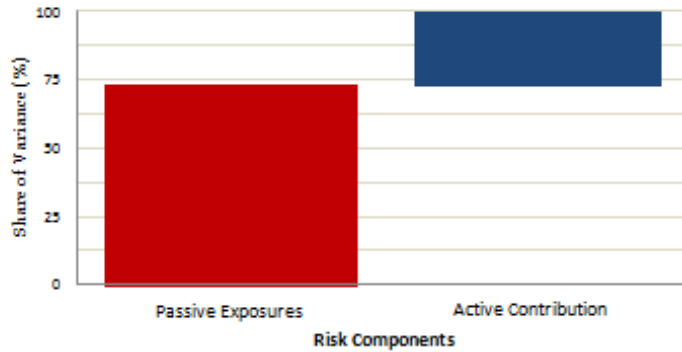
Cumulative return due to position sizing, excluding compounding effects:



Negative position-sizing return -- the difference between security-selection return and the return on an equivalent equally-weighted portfolio -- is an indication of an over-capitalized manager. Position-sizing here fully explains cumulative security-selection losses.

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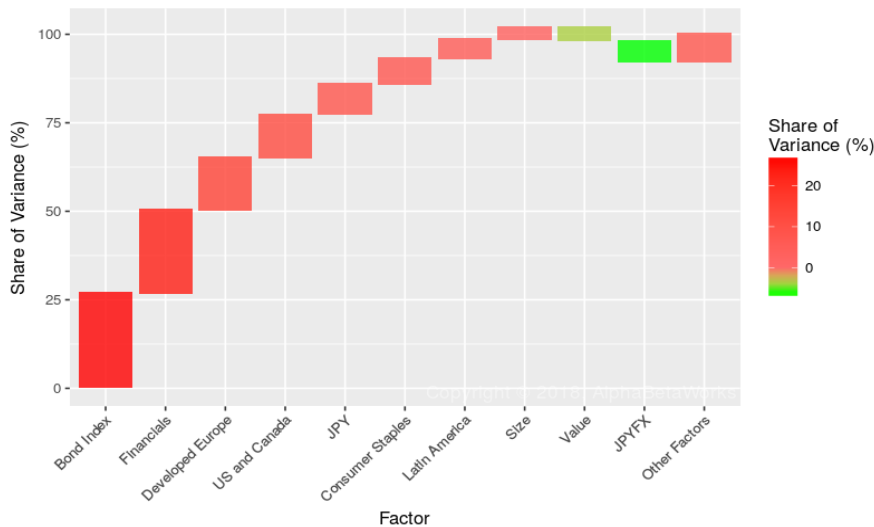
Relative Risk: Active and Passive Components Dodge & Cox International



Source	Volatility (%)	Share of Variance (%)
Passive Exposures	3.3	72.9
Active Mgmt.	2.0	27.1
Total	3.9	100.0

Isolating active from passive risk reveals the one-third of managers who take too little active risk to ever offset their fees.

Significant Relative Factor Exposures



Statistical exposures, relative to benchmark, that explain future incremental return.

Passively-available exposures explain 73% of Dodge & Cox' current risk relative to ACWI ex U.S. Index. Half of that risk is explained by U.S. interest rates and financial sector.

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This analysis uses U.S. and Global statistical risk models built to separate the impact of passively-available market exposures from stock selection, timing, and trading.

Risk Oversight

Current portfolio risk -- rather than time-period average -- risk changes noted immediately

Manager current risk -- absolute and relative to benchmark

- distinguish among active and passive risks -- ensure sufficient net active risk to justify fees
- confirm active risk exposures are consistent with stated philosophy

Scenario analysis, stress-testing, position-sizing impact, and all drivers of incremental risk and return

Better combine managers to mitigate unintended passive exposures in aggregate equity portfolio

Skill Assessment

Separate components of incremental return:

- consistent passive differences from benchmark
- stock-selection
- timing (changes in passive exposures)
- trading/unexplained

Properly isolated, [stock-selection skill persists](#). Managers with top decile stock-selection skill are twice as likely to outperform. Bottom decile managers are more than twice as likely to underperform.

[One-third of active equity funds are closet indexers](#) taking too little real active risk to ever overcome active fees, even with skill.

Identify current risk exposures that explain future incremental return

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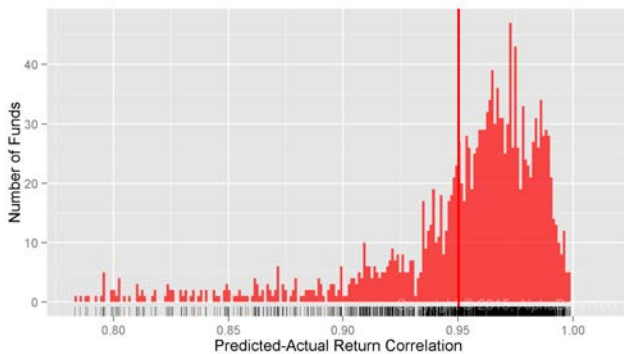
Model Validation

Though mathematically complex and hard to compare, equity risk models are easily tested.

To evaluate the accuracy of an equity risk model, we compare returns predicted by past factor exposures to subsequent portfolio performance: We measure factor exposures using end-of-month holdings and predict the following month's return as a function of index returns.

The correlation between predicted and actual return measures a model's accuracy. The higher the correlation, the more effective a model is at hedging, stress testing, and scenario analysis, as well as evaluating investment *risk* and *skill*.

Our risk models are highly predictive and deliver over 0.96 median correlation between predicted ex-ante and reported ex-post portfolio returns for both U.S. and Global Equity mutual funds (see: [testing predictions of equity risk models](#) and [testing global equity risk models](#)).



Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.666	0.942	0.9623	0.950	0.977	0.999

Prospective clients need not rely on our out-of-sample tests, we're happy to provide passive ETF replicating portfolios for any of your managers and you can evaluate the models' accuracy independently. A few weeks of observations can provide dozens of observations and establish a high statistical confidence in the models' predictive accuracy.