Deutsche Bank
Markets Research

North America
United States

Quantitative Strategy
QCD Stock Selection

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QCD Model Update

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December 2012 update

Model recommendations

For December 2012, our model suggests allocating more weight to value and quality, and less weight to growth, momentum, revision, and technical factors.

In the large cap space, i.e., Russell 1000 index, our model suggests overweighting the health care and financial sectors, and underweighting the telecommunication services and energy sectors.

Within small-cap universe, i.e., Russell 2000 index, our model suggests financials and utilities are likely to outperform, while the energy and information technology sectors are likely to underperform.

The QCD model performance

Last month, our QCD model underperformed with a sector-neutral rank information coefficient (IC) of -1%.

Our five model portfolio performance

Last month, the five model portfolios (large-cap core, large-cap value, large-cap growth, small-cap, and market neutral) produced after-cost active returns of -0.15%, 0.16%, -0.56%, 0.39%, and 0.45%, respectively.

An in-depth description of our model methodology can be found in our *DB Quant Handbook*, July 22, 2010. QCD model scores for all stocks in our universe and the exact holdings in our five model portfolios are available in two separate spreadsheets. Please contact us to be added to the spreadsheet distribution list.

Please note that all our research is distributed from DBEQS.Americas@db.com. A list of our recent publications can be found in the Appendix.

Factor performance review

Every month, we review the performance of about 80 factors from our factor library (Figure 1). Please note that this is only a small fraction of our factor library, which includes over 1,200 factors for the US market. We choose these 80 factors to provide a balanced view for each broad factor category – they are not necessarily the best 80 factors or the factors in our QCD model.

We measure factor performance in five standard analyses: long/short hedged portfolio, Pearson information coefficient, Spearman rank IC, sector-neutral IC, and risk-adjusted IC. For simplicity, we present only Spearman rank IC in this report.

Due to space limitations, we will present the results for only the broad investable universe, i.e., the union of Russell 3000, S&P 1500, and MSCI USA indices. We perform standard factor backtesting for more sub-universes on a daily basis, e.g., all major Russell and S&P index families, GICS sectors/industry groups, etc. Please contact us for customized factor backtesting.

The performance of quant factors were mixed last month. Value, quality, and technical factors continued to perform well, while growth, momentum, and sentiment factors-had a down month on average.

Figure 1: Broad factor performance review, Spearman rank IC

			Average (%)			Since Inception										
Factor Name	Direction[1]	Current # of Stocks	Last M	12M Avg	3Y Avg	Avg	Std Dev	Max	Min	p-value[2]	# of Months	Avg # of Stocks	%Positive	Avg in Up Mkt (%)	Avg in Dn Mkt (%)	Serial Corr (%)[3]
1. Value																
1 Dividend yield, trailing 12M	Ascending	2,969	(5.97)	3.08	2.27	2.77	14.65	42.97	(32.99)	0.00	299	2,807	54.85	(2.61)	12.14	99.30
2 Expected dividend yield	Ascending	2,969	(4.96)	3.25	2.48	3.01	14.96	43.95	(33.50)	0.00	299	2,807	54.52	(2.56)	12.72	99.30
3 Price-to-operating EPS, trailing 12M, Basic	Descending	2,405	4.83	1.48	0.59	2.84	10.55	30.99	(31.21)	0.00	214	2,365	59.35	1.16	5.79	95.19
4 Operating earnings yield, trailing 12M, Basic	Ascending	2,941	6.52	2.59	2.95	4.73	13.17	46.14	(33.66)	0.00	214	2,874	62.15	(0.12)	13.19	96.25
5 Earnings yield, forecast FY1 mean	Ascending	2,817	7.13	3.39	2.93	4.40	12.33	47.81	(34.64)	0.00	299	2,532	62.54	1.09	10.16	95.04
6 Earnings yield, forecast FY2 mean	Ascending	2,809	7.83	1.98	2.23	3.93	11.92	46.10	(34.00)	0.00	299	2,434	63.55	1.90	7.46	94.32
7 Earnings yield x IBES 5Y growth	Ascending	1,765	12.15	1.06	0.70	1.74	10.55	41.07	(27.79)	0.02	214	1,947	58.88	4.33	(2.76)	93.48
8 Sector-rel Operating earnings yield, trailing 12M, Basic	Ascending	2,941	8.23	2.05	2.60	4.03	8.46	28.32	(15.90)	0.00	214	2,874	66.82	1.23	8.93	95.80
9 Hist-rel Operating earnings yield, trailing 12M, Basic	Ascending	2,499	(0.21)	2.32	0.36	0.86	6.98	17.36	(17.54)	0.10	179	2,492	53.07	0.90	0.81	93.40
10 Operating cash flow yield (income stmt def)	Ascending	2,943	2.41	1.12	2.08	3.99	11.15	46.09	(33.07)	0.00	299	2,763	64.88	0.99	9.21	95.72
11 Cash flow yield, FY1 mean	Ascending	1,606	3.30	(0.21)	0.93	1.51	13.48	35.91	(50.37)	0.10	221	918	57.01	0.97	2.45	96.28
12 Free cash flow yield	Ascending	2,899	7.13	3.71	2.92	4.82	7.99	32.77	(19.47)	0.00	262	2,532	74.05	2.53	8.90	94.50
13 Price-to-sales, trailing 12M	Descending	2,906	12.62	1.38	0.96	1.93	11.00	40.74	(29.81)	0.00	299	2,740	57.19	1.84	2.09	99.08
14 Price-to-book	Descending	2,888	(3.47)	1.61	(0.20)	0.99	10.73	34.90	(25.76)	0.11	299	2,723	49.83	0.02	2.67	97.54
15 EBITDA/EV	Ascending	2,566	3.46	0.42	2.00	4.04	10.28	40.08	(27.90)	0.00	299	2,427	64.88	1.20	8.99	95.21
16 Price-to-book adj for ROE, sector adj	Descending	2,742	3.56	1.17	(0.25)	0.60	8.75	32.74	(21.73)	0.23	299	2,456	50.50	1.20	(0.44)	95.44
2. Growth																
17 Hist 5Y operating EPS growth	Descending	2,811	3.14	1.78	1.68	0.80	7.44	20.08	(20.78)	0.12	207	2,651	54.59	(1.05)	3.86	97.12
18 Hist 5Y operating EPS acceleration	Ascending	2,811	3.76	2.46	(0.39)	1.02	6.55	20.67	(17.13)	0.03	207	2,651	57.97	0.55	1.79	94.43
19 IBES 5Y EPS growth	Ascending	1,744	6.49	0.05	1.44	0.73	8.85	22.89	(30.72)	0.16	299	1,873	53.51	1.79	(1.12)	98.24
20 IBES 5Y EPS growth/stability	Ascending	1,744	5.73	0.32	1.39	1.18	8.19	22.70	(21.10)	0.01	299	1,873	55.85	0.81	1.84	98.62
21 IBES LTG EPS mean	Descending	2,006	(6.62)	1.71	(0.13)	1.82	15.98	52.29	(37.63)	0.05	299	2,143	49.16	(3.77)	11.56	97.87
22 IBES FY2 mean DPS growth	Ascending	2,144	(2.02)	2.76	1.09	1.03	8.51	23.63	(20.85)	0.18	126	1,482	51.59	(2.76)	7.62	88.27
23 IBES FY1 mean EPS growth	Ascending	2,691	(0.78)	3.99	0.97	0.83	8.41	21.14	(29.38)	0.09	299	2,141	59.20	2.30	(1.72)	88.84
24 Year-over-year quarterly EPS growth	Ascending	2,958	3.03	3.88	2.53	2.41	7.12	24.42	(21.21)	0.00	214	2,883	67.76	2.40	2.43	80.99
25 IBES FY1 mean CFPS growth	Descending	1,379	(15.37)	(1.21)	(0.81)	0.00	10.63	44.54	(27.02)	1.00	171	633	49.12	(0.66)	1.17	92.41
26 IBES SUE, amortized	Ascending	2,581	0.49	0.89	0.97	1.29	6.08	20.29	(15.67)	0.00	237	2,293	60.34	1.92	0.22	73.32
3. Price momentum and reversal																
27 Total return, 1D	Descending	2,969	2.43	0.60	2.86	4.93	7.24	34.12	(15.48)	0.00	299	2,766	77.59	5.05	4.73	1.57
28 Total return, 21D (1M)	Descending	2,969	3.90	1.62	1.93	2.09	10.89	41.80	(27.33)	0.00	299	2,765	59.20	4.00	(1.24)	0.12
29 Maximum daily return in last 1M (lottery factor)	Descending	2,754	(2.44)	3.13	2.93	4.91	14.99	55.47	(38.43)	0.00	299	2,645	63.21	(1.31)	15.75	51.82
30 21D volatility of volume/price	Descending	2,754	0.24	1.06	1.25	0.43	6.80	17.84	(24.88)	0.28	299	2,645	51.17	1.12	(0.79)	54.65
31 Total return, 252D (12M)	Ascending	2,857	(1.69)	3.04	2.37	2.82	14.03	38.83	(55.89)	0.00	299	2,687	60.87	1.07	5.87	89.10
32 12M-1M total return	Ascending	2,857	(1.29)	3.75	3.01	3.71	13.19	37.33	(48.45)	0.00	299	2,687	64.55	2.56	5.72	87.67
33 Price-to-52 week high	Ascending	2,759	(6.40)	1.45	1.47	3.12	16.72	48.56	(58.37)	0.00	299	2,700	62.21	(2.75)	13.35	82.94
34 Total return, 1260D (60M)	Ascending	2,524	0.29	(1.33)	1.70	0.86	10.87	24.15	(34.44)	0.18	287	2,146	55.05	(0.12)	2.57	97.21
4. Sentiment																
35 IBES LTG Mean EPS Revision, 3M	Ascending	1,902	(1.69)	0.99	1.10	0.86	3.87	12.21	(12.43)	0.00	299	2,064	61.54	0.63	1.27	59.26
36 IBES FY1 Mean EPS Revision, 3M	Ascending	2,755	(3.58)	2.74	1.93	2.84	8.44	26.28	(33.32)	0.00	299	2,471	65.55	2.44	3.53	75.91
37 IBES FY1 EPS up/down ratio, 3M	Ascending	2,761	(3.74)	2.32	1.97	3.07	7.82	24.11	(24.60)	0.00	299	2,336	66.56	3.26	2.74	79.48
38 Expectation gap, short-term - long-term	Ascending	1,954	0.08	4.20	1.07	1.32	5.23	15.38	(23.14)	0.00	299	2,122	65.55	1.45	1.10	87.42
39 IBES FY1 Mean CFPS Revision, 3M	Ascending	1,517	(0.22)	0.95	1.69	1.03	10.18	29.55	(38.42)	0.14	214	847	61.21	(0.18)	3.14	65.02
40 IBES FY1 Mean SAL Revision, 3M	Ascending	2,696	(7.38)	2.67	2.23	1.20	7.75	27.87	(24.50)	0.03	197	2,175	60.91	0.71	1.96	71.54
41 IBES FY1 Mean FFO Revision, 3M	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
42 IBES FY1 Mean DPS Revision, 3M	Ascending	1,221	2.85	(0.91)	0.40	0.53	5.19	15.34	(16.88)	0.26	123	993	55.28	0.30	0.93	61.85
43 IBES FY1 Mean ROE Revision, 3M	Ascending	2,117	(3.38)	0.95	1.24	0.78	6.50	21.59	(21.65)	0.18	123	1,735	57.72	0.02	2.15	66.46
44 Recommendation, mean	Descending	2,813	(0.25)	0.88	1.50	0.84	8.19	21.62	(23.69)	0.12	228	2,275	56.58	2.65	(2.31)	94.36
45 Mean recommendation revision, 3M	Descending	2,770	(3.60)	1.16	1.00	1.31	4.25	12.05	(19.74)	0.00	225	2,187	64.44	1.24	1.42	60.11
46 Target price implied return	Ascending	2,738	4.77	0.36	1.29	0.71	16.88	61.56	(38.26)	0.59	164	2,112	53.66	8.88	(11.12)	78.65
47 Mean target price revision, 3M	Ascending	2,689	(3.36)	0.96	1.04	1.96	13.34	30.44	(43.80)	0.06	161	2,010	62.11	(0.74)	5.86	75.78
5. Quality																
48 ROE, trailing 12M	Ascending	2,865	12.29	2.01	3.10	4.13	11.04	35.90	(31.78)	0.00	214	2,803	64.02	0.28	10.84	97.92
49 Return on invested capital (ROIC)	Ascending	2,933	11.03	1.28	3.01	3.97	10.12	31.94	(29.59)	0.00	214	2,866	64.95	0.50	10.04	98.10
50 Sales to total assets (asset turnover)	Ascending	2,945	19.48	(0.34)	1.88	1.55	8.84	22.82	(22.05)	0.00	299	2,761	57.19	2.47	(0.06)	99.44
51 Operating profit margin	Ascending	2,874	(8.94)	(0.49)	0.83	1.06	5.37	16.03	(14.12)	0.00	299	2,603	60.20	0.61	1.84	98.48
52 Current ratio	Descending	2,310	(5.49)	1.40	0.62	1.91	10.38	38.65	(31.32)	0.00	299	2,225	54.85	(0.99)	6.95	97.85
53 Long-term debt/equity	Ascending	2,858	(2.05)	3.77	1.54	0.75	9.62	35.26	(27.69)	0.18	299	2,699	47.83	(1.09)	3.96	98.49
54 Altman's z-score	Ascending	2,260	3.39	0.47	1.33	0.14	9.22	31.88	(30.18)	0.79	299	2,157	49.50	0.65	(0.75)	98.23
55 Merton's distance to default	Ascending	2,073	0.82	0.51	2.38	3.03	11.81	34.04	(43.07)	0.00	299	2,117	65.22	(1.11)	10.26	94.75
56 Ohlson default model	Descending	2,236	4.83	(0.21)	1.57	2.07	6.20	18.36	(15.46)	0.00	262	2,109	65.27	1.37	3.32	98.11
57 Campbell, Hilscher, and Szilagyi model	Descending	2,571	9.61	(0.74)	1.59	2.41	11.61	26.07	(36.79)	0.00	215	2,528	56.28	(1.30)	8.94	97.06
58 Accruals (Sloan 1996 def)	Descending	1,574	(7.56)	(1.01)	(0.23)	0.52	4.35	13.89	(11.30)	0.04	299	1,414	55.85	0.56	0.45	89.09
59 Firm-specific discretionary accruals	Descending	1,505	(3.07)	(0.56)	0.59	0.42	4.20	13.35	(11.53)	0.16	206	1,364	50.49	(0.12)	1.29	98.57
60 Hist 5Y operating EPS stability, coef of determination	Ascending	2,811	7.34	0.45	(0.07)	0.50	4.87	13.10	(12.40)	0.14	207	2,651	52.66	0.28	0.86	96.59
61 IBES 5Y EPS stability	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
62 IBES FY1 EPS dispersion	Descending	2,633	2.51	1.41	3.70	2.40	10.50	28.72	(36.13)	0.00	299	2,313	61.87	(0.74)	7.87	84.98
63 Payout on trailing operating EPS	Ascending	2,305	(8.48)	1.13	0.54	0.74	13.70	38.82	(30.46)	0.35	299	2,191	50.50	(4.24)	9.41	99.23
64 YoY change in # of shares outstanding	Descending	2,927	8.72	1.98	2.48	2.61	8.94	45.61	(18.85)	0.00	299	2,712	59.87	(0.86)	8.65	93.94
65 YoY change in debt outstanding	Descending	2,206	(1.02)	1.66	0.08	0.34	4.11	10.50	(12.63)	0.16	299	2,163	56.52	1.11	(1.01)	89.69
66 Net external financing/net operating assets	Ascending	2,898	5.65	2.71	2.38	2.83	10.03	47.84	(27.56)	0.00	299	2,472	60.20	(0.23)	8.16	94.76
67 Piotroski's F-score	Ascending	2,156	(0.65)	3.11	2.08	3.05	10.80	36.15	(30.73)	0.00	214	2,144	59.81	(1.04)	10.19	90.38
68 Mohanram's G-score	Ascending	567	(5.61)	0.51	1.08	2.06	8.70	23.34	(28.53)	0.00	214	457	59.35	(0.13)	5.88	94.94
6. Technicals																
69 # of days to cover short	Descending	2,968	13.06	1.73	1.12	2.44	9.54	25.22	(33.94)	0.01	116	2,887	56.03	3.09	1.21	93.25
70 CAPM beta, 5Y monthly	Descending	2,632	(7.98)	0.69	0.67	0.99	17.35	47.56	(46.71)	0.38	239	2,289	48.12	(7.41)	15.67	98.76
71 CAPM idosyncratic vol, 1Y daily	Descending	2,759	(1.38)	4.33	3.82	4.79	17.86	57.90	(39.85)	0.00	299	2,660	60.87	(2.10)	16.79	99.04
72 Realized vol, 1Y daily	Descending	2,759	(1.83)	4.40	3.55	4.70	18.63	59.19	(40.28)	0.00	299	2,660	59.87	(2.84)	17.83	98.97
73 Skewness, 1Y daily	Descending	2,759	0.40	(0.72)	(0.29)	1.05	5.33	20.13	(14.38)	0.00	299	2,660	56.19	0.52	1.97	88.97
74 Kurtosis, 1Y daily	Descending	2,759	(7.31)	(0.55)	0.83	1.28	5.67	16.89	(15.30)	0.00	299	2,660	61.87	0.88	1.97	90.62
75 Idiosyncratic vol surprise	Descending	2,759	1.83	1.83	2.87	2.80	7.56	26.35	(26.78)	0.00	298	2,647	66.44	0.78	6.31	86.11
76 Normalized abnormal volume	Ascending	2,759	2.55	2.32	2.54	1.19	6.78	19.96	(20.68)	0.00	299	2,796	60.20	2.43	(0.98)	80.95
77 Float turnover, 12M	Descending	2,970	(9.24)	0.88	1.21	2.09	15.80	54.84	(36.88)	0.02	299	2,811	50.84	(4.88)	14.24	99.20
78 Moving average crossover, 15W-36W	Ascending	2,745	(5.55)	(0.95)	(0.03)	1.97	13.23	44.35	(52.50)	0.01	299	2,408	58.86	0.40	4.71	90.33
79 Log float-adj capitalization	Ascending	2,969	10.16	2.92	2.93	3.02	10.90	26.51	(38.42)	0.00	299	2,807	60.54	2.41	4.10	99.36
80 # of month in the database	Ascending	2,970	6.86	2.13	1.96	2.00	7.66	34.91	(20.93)	0.00	298	2,811	57.72	(0.21)	5.84	86.76
81 DB composite options factor	Ascending	1,434	1.14	0.91	2.28	1.96	4.71	15.40	(19.02)	0.00	136	1,459	66.91	0.83	3.80	2.35

Note

1 Direction indicates how the factor scores are sorted. Ascending order means higher factor scores are likely to be associated with higher subsequent stock returns, and vice versa for descending order.
2 P-value indicates the statistical significance of a factor's performance. A smaller p-value suggests that it is more likely the factor's performance is different from zero.
3 This is the autocorrelation of a factor's scores over time. Higher serial correlation is likely to have lower portfolio turnover based on the factor.

Source: Compustat, Bloomberg Finance LP, IBES, Russell, S&P, Thomson Reuters, and Deutsche Bank

Model recommendations

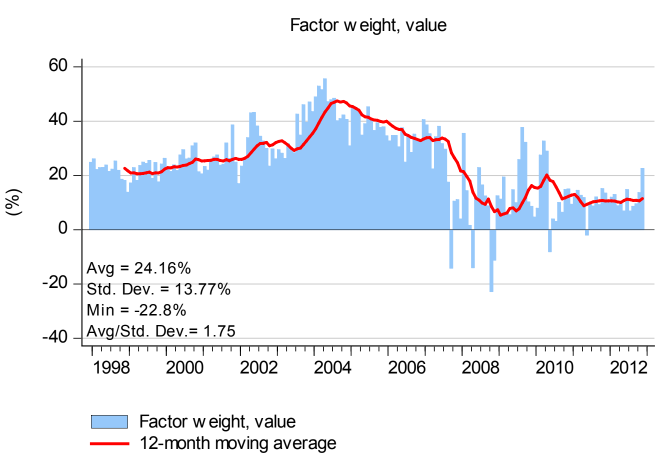
Our QCD model is primarily designed as a stock-selection tool. However, as a side benefit, it also gives us style and sector views.

Style outlook

Figure 2 to Figure 7 show the weightings of the six style factors in our QCD model. Please note that this is based on our style rotation model, i.e., our predicted factor performance for the six style factors.

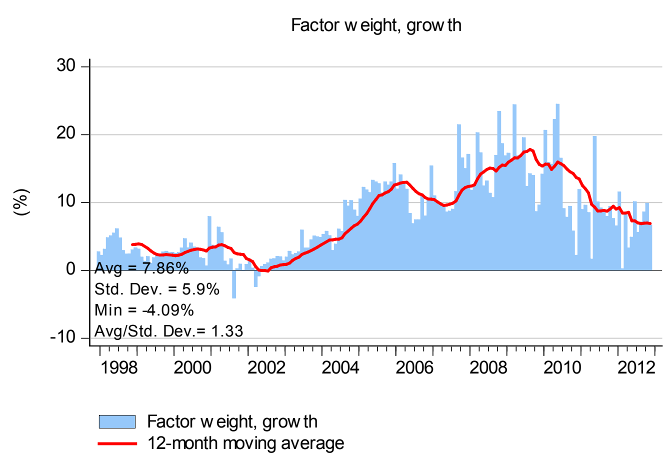
For December 2012, our model suggests allocating more weight to value and quality, and less weight to growth, momentum, revision, and technical factors.

Figure 2: Factor weight, value



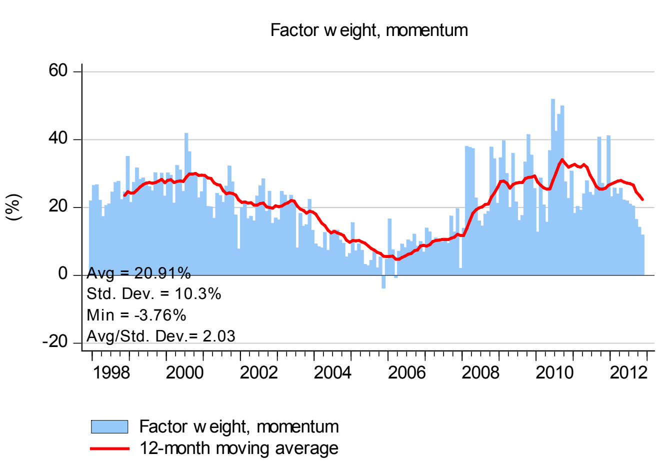
Source: Compustat, IBES, Russell, S&P, Thomson Reuters, Deutsche Bank

Figure 3: Factor weight, growth



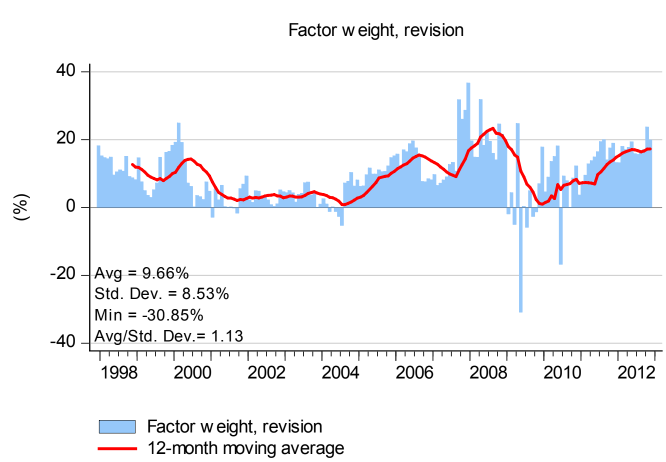
Source: Compustat, IBES, Russell, S&P, Thomson Reuters, Deutsche Bank

Figure 4: Factor weight, momentum/reversal



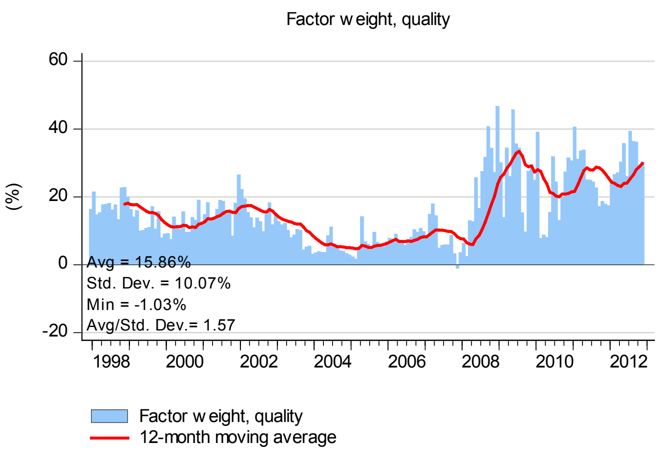
Source: Compustat, IBES, Russell, S&P, Thomson Reuters, Deutsche Bank

Figure 5: Factor weight, revision/sentiment



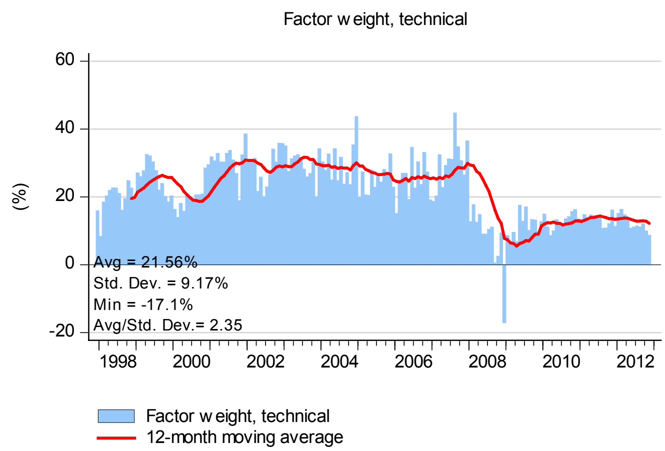
Source: Compustat, IBES, Russell, S&P, Thomson Reuters, Deutsche Bank

Figure 6: Factor weight, quality



Source: Compustat, IBES, Russell, S&P, Thomson Reuters, Deutsche Bank

Figure 7: Factor weight, technical

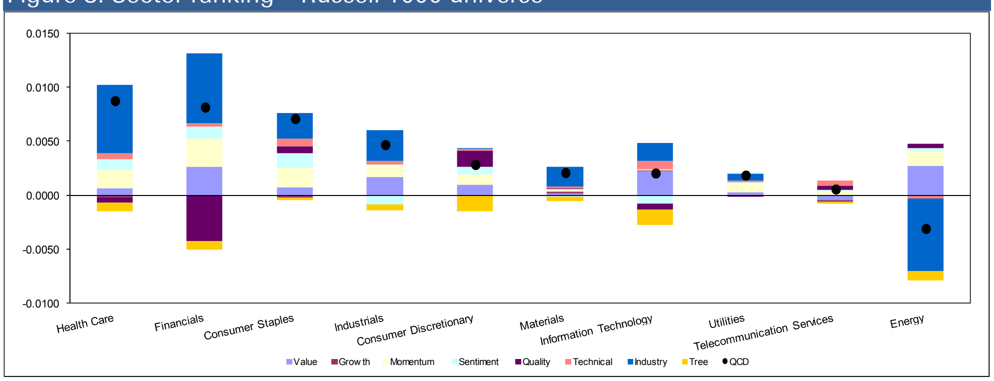


Source: Compustat, IBES, Russell, S&P, Thomson Reuters, Deutsche Bank

Sector outlook

In the large cap space, i.e., Russell 1000 index, our model suggests overweighting the health care and financial sectors, and underweighting the telecommunication services and energy sectors (Figure 8).

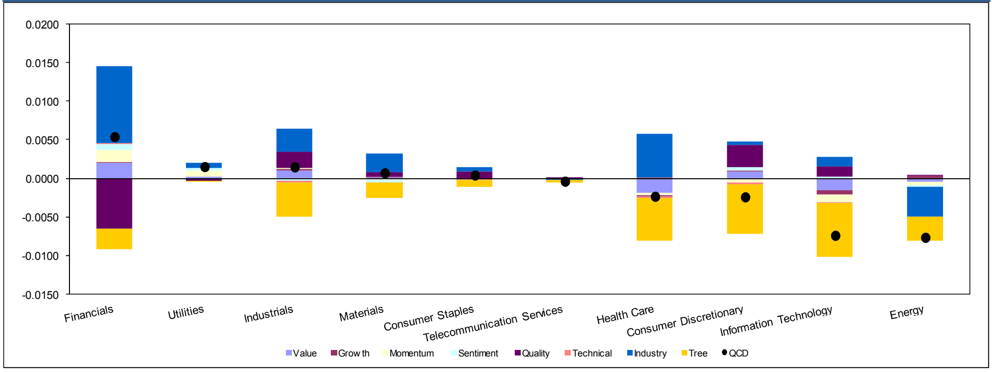
Figure 8: Sector ranking – Russell 1000 universe



Source: Compustat, IBES, Russell, S&P, Thomson Reuters, and Deutsche Bank

Within small-cap universe, i.e., Russell 2000 index, our model suggests financials and utilities are likely to outperform, while the energy and information technology sectors are likely to underperform (Figure 9).

Figure 9: Sector ranking – Russell 2000 universe



Source: Compustat, IBES, Russell, S&P, Thomson Reuters, and Deutsche Bank

Stock recommendations

Due to space limitation, we do not present detailed stock rankings in the report. Detailed rankings are available in our monthly spreadsheet. Please contact us to be added to the spreadsheet distribution list.

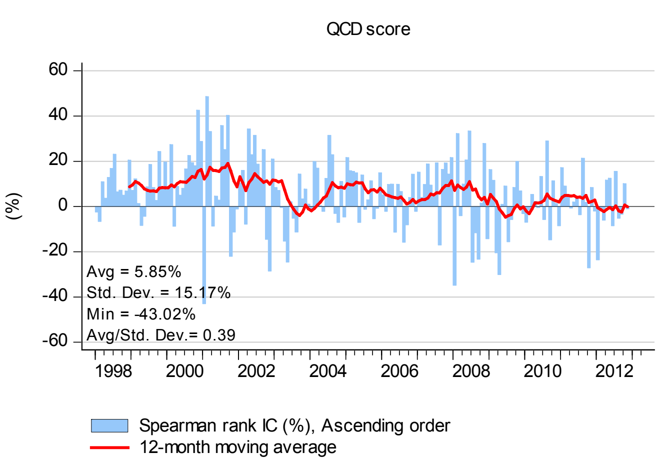
QCD model performance review

Since December 1997, the QCD model has performed well. The most challenging periods for the QCD model were in late 2003/early 2004 and 2009/early 2010. We have seen some recovery in recent months (Figure 10).We recommend using the QCD model in a sector-neutral context, as the model has stronger skill in selecting stocks than ranking sectors (Figure 10 vs.Figure 11).

Last month, our model underperformed with a sector-neutral rank information coefficient (IC) of -1%.

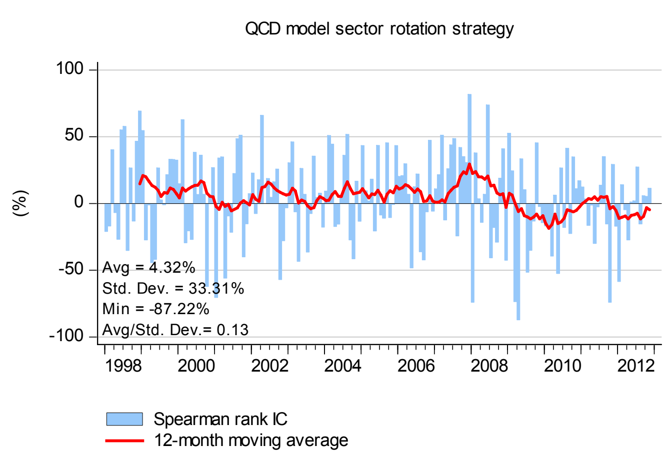
A more useful and realistic performance measurement is done at the portfolio level. We have five model portfolios: long-only large-cap core, long-only large-cap value, long-only large-cap growth, long-only small-cap, and long/short market neutral with typical institutional constraints and transaction costs. The IR/Sharpe ratio for the five model portfolios ranges from 1.5 to 3.2 and stays positive almost every year since 1998. Even in 2008 and 2009, two of the most challenging years for quantitative investing, our market-neutral strategy produces Sharpe ratio of 0.82 and 1.64, respectively.

Figure 10: Sector-neutral rank IC



Source: Compustat, IBES, Russell, S&P, Thomson Reuters, Deutsche Bank

Figure 11: Rank IC – industry rotation



Source: Compustat, IBES, Russell, S&P, Thomson Reuters, Deutsche Bank

Model portfolios

On a monthly basis, we build five standard model portfolios: 1) a long-only large-cap core portfolio benchmarked to the Russell 1000 index; 2) a long-only large-cap value portfolio benchmarked to the Russell 1000 Value index; 3) a long-only large-cap growth portfolio benchmarked to the Russell 1000 Growth index; 4) a long-only small-cap portfolio benchmarked to the Russell 2000 index; and 5) a long/short market neutral portfolio. We can also create customized portfolios for clients, e.g., large-cap value portfolio, large-cap growth portfolio, 130/30 portfolios. Please contact us for details.

The IR/Sharpe ratio for the five model portfolios ranges from 1.5 to 3.2 and stays positive almost every year since 1998. Even in 2008 and 2009, two of the most challenging years for quantitative investing, our market-neutral strategy produces Sharpe ratio of 0.82 and 1.64, respectively.

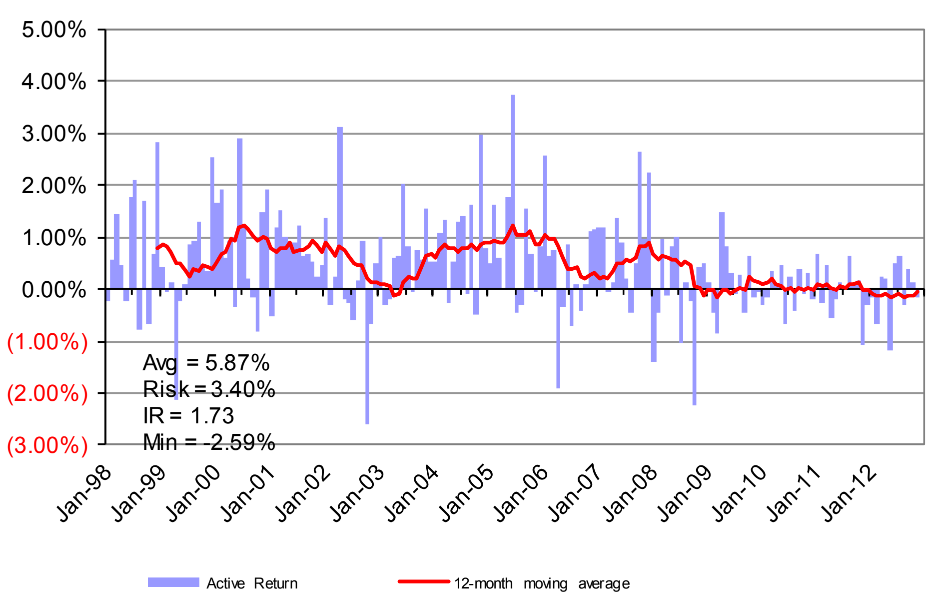
Last month, he five model portfolios (large-cap core, large-cap value, large-cap growth, small-cap, and market neutral) produced after-cost active returns of
-0.15%, 0.16%, -0.56%, 0.39%, and 0.45%, respectively.

Detailed holdings for the five model portfolios for next month are available in our monthly spreadsheet. Please contact us to be added to the spreadsheet distribution list.

Long-only large-cap core portfolio

For the long-only large-cap core portfolio, we try to maximize expected return with about 3.5% realized tracking error, using Russell 1000 as the benchmark. Figure 12 shows the portfolio performance vs. the benchmark.

Figure 12: Active return – long-only large-cap core portfolio

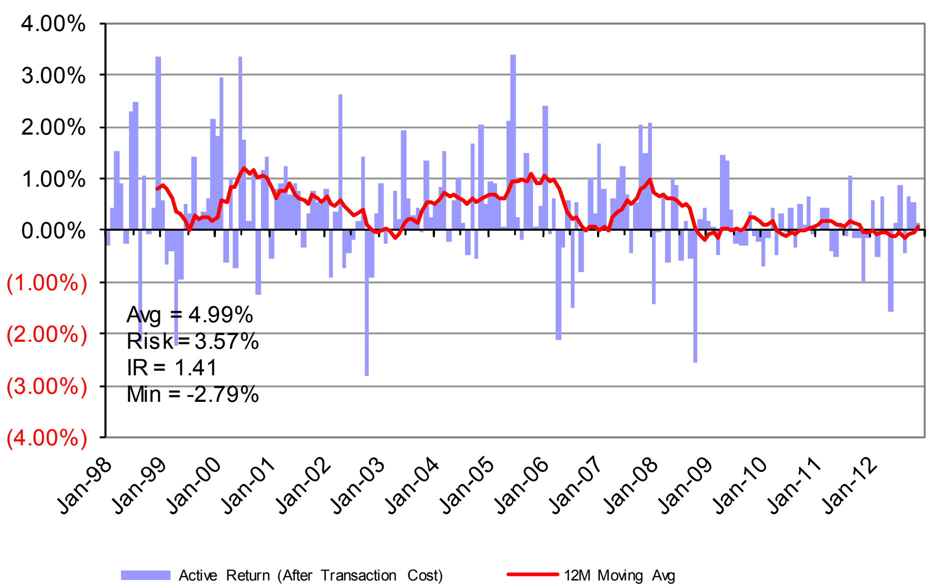


Source: Axioma, Compustat, IBES, Russell, S&P, Thomson Reuters, Deutsche Bank

Long-only large-cap value portfolio

For the long-only large-cap value portfolio, we try to maximize expected return with less than 4% realized tracking error, using Russell 1000 Value as the benchmark. Figure 13 shows the portfolio performance vs. the benchmark.

Figure 13: Active return – long-only large-cap value

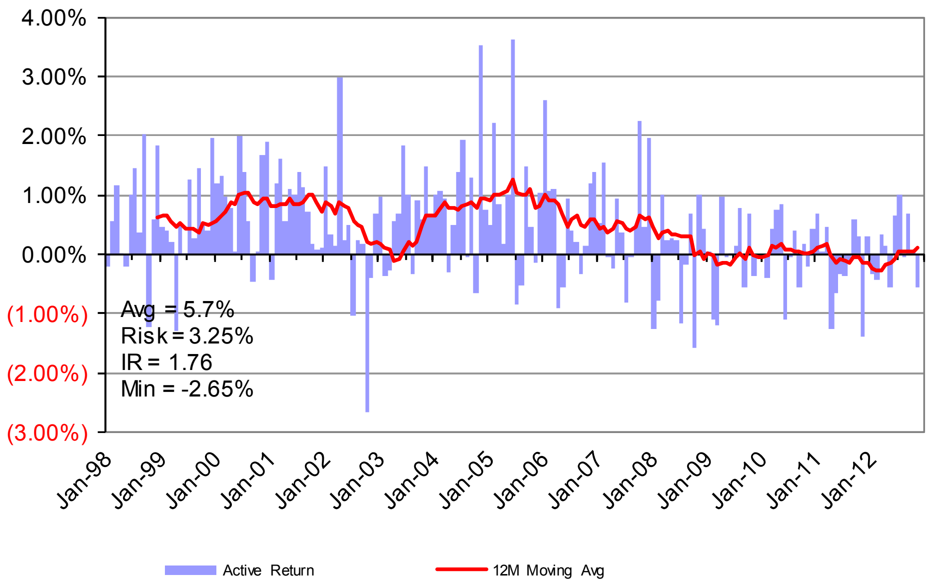


Source: Axioma, Compustat, IBES, Russell, S&P, Thomson Reuters, Deutsche Bank

Long-only large-cap growth portfolio

For the long-only large-cap growth portfolio, we try to maximize expected return with about 3% realized tracking error, using Russell 3000 Growth as the benchmark. Figure 14 shows the portfolio performance vs. the benchmark.

Figure 14: Active return – long-only large-cap growth portfolio

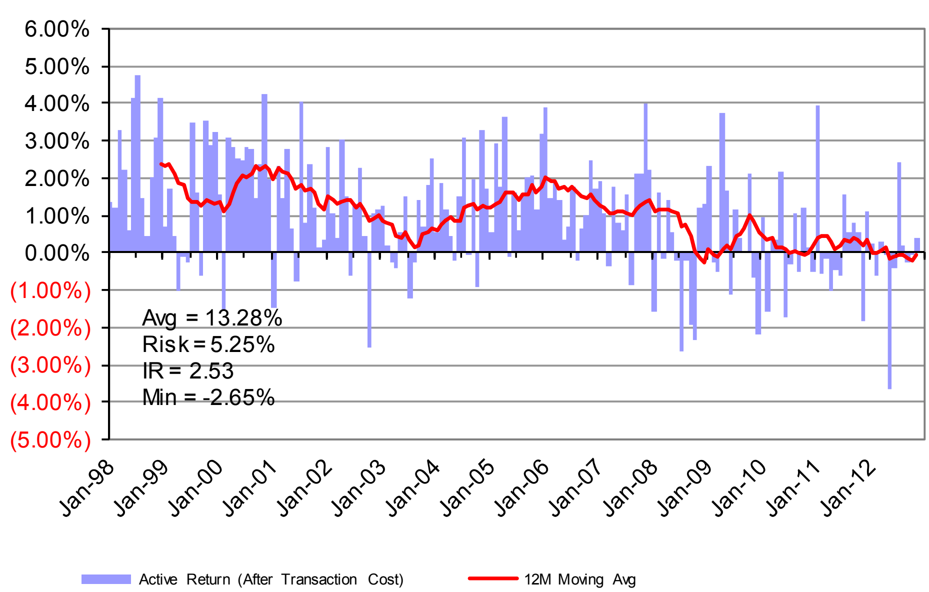


Source: Axioma, Compustat, IBES, Russell, S&P, Thomson Reuters, Deutsche Bank

Long-only small-cap portfolio

For the small-cap long-only portfolio, we try to maximize expected return with about 5% realized tracking error, using Russell 2000 as the benchmark. Figure 15 shows the portfolio performance vs. the benchmark.

Figure 15: Active return – long-only small-cap portfolio

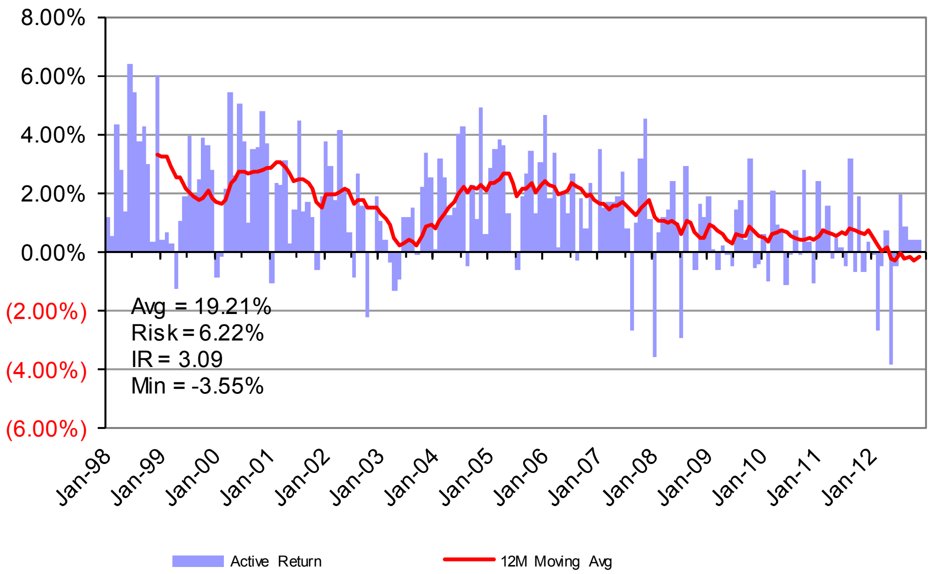


Source: Axioma, Compustat, IBES, Russell, S&P, Thomson Reuters, Deutsche Bank

Long/short market-neutral portfolio

For the long/short market neutral portfolio, we try to maximize expected return with about 6% realized volatility. Figure 16 shows the portfolio performance.

Figure 16: Active return – long/short marketing neutral portfolio



Source: Axioma, Compustat, IBES, Russell, S&P, Thomson Reuters, Deutsche Bank

Please note that with each of the model portfolios, past performance is no guarantee of future results. Calculations include transaction costs. Additional information is available on request.

Appendix – Deutsche Bank US/Global Quant Research Library

Deutsche Bank's US/Global quantitative strategy team produces one monthly newsletter, *Quantum*, and six regular research series: 1) *Signal Processing* on stock-selection factors/signals; 2) *Portfolios Under Construction* on risk and portfolio construction; 3) *Emerging Issues* on topical and emerging issues; 4) *QCD Model* on stock-selection models; 5) *Academic Insights* on academic research; and 6) *Canada Quant* on topics unique to the Canadian equity market.

All our research is distributed from DBEQS.Americas@db.com. Please contact us to be added to our research distribution list.

Quantum

Quantum is our monthly newsletter. The aim of Quantum is to make it easier for clients to keep track of all the research we publish, and to serve as a forum to highlight the latest news and thinking in the quant investing world. If you only read one email from us every month, make it *Quantum*.

- **Quantum** (Nov 23, 2012)
- **Quantum** (Oct 31, 2012)
- **Quantum** (Sep 28, 2012)
- **Quantum** (Aug 27, 2012)
- **Quantum** (July 25, 2012)
- **Quantum** (June 29, 2012)
- **Quantum** (May 30, 2012)
- **Quantum** (April 30, 2012)
- **Quantum** (Mar 29, 2012)
- **Quantum** (February 29, 2012)
- **Quantum** (January 26, 2012)
- **Quantum** (November 23, 2011)
- **Quantum** (October 28, 2011)
- **Quantum** (September 29, 2011)
- **Quantum** (August 25, 2011)
- **Quantum** (July 30, 2011)
- **Quantum** (June 29, 2011)
- **Quantum** (May 20, 2011)
- **Quantum** (April 29, 2011)

- **Quantum** (March 31, 2011)
- **Quantum** (February 28, 2011)
- **Quantum** (January 27, 2011)
- **Quantum** (November 29, 2010)
- **Quantum** (October 28, 2010)
- **Quantum** (September 20, 2010)

Signal Processing

This is our flagship monthly alpha signal research series. We try to identify new data sources, build new and innovative factors, and investigate various style rotation models.

- **Cross Asset Class Momentum** (Nov 5, 2012). We test the momentum anomaly in seven different asset classes including traditional asset classes like commodities and treasuries as well as more exotic asset classes like hedge fund strategies and equity indices.
- **Disentangling the Downside** (Sep 20, 2012). In this report, we study the puzzling relationship between risk and return by investigating new risk factors and studying the multi-period dynamics of these factors. We use our results to suggest a smarter way to capture a risk premium.
- **Rebooting Revisions** (Sep 11, 2012). In this report, we design an enhanced sentiment factor by combining two traditional sentiment factors using a technique we call Triangle Factor Mapping. Empirical tests show this factor has strong and consistent predictive power before, during, and after the financial crisis.
- **The Rise of the Machines** (June 5, 2012). In this report, we introduce our N-LASR (Non-Linear Adaptive Style Rotation) global stock-selection model. The N-LASR model uses machine learning techniques to select and combine factors, taking into account seasonal and evolutionary trends in factor performance. The model shows consistent outperformance, with a long-term average rank IC of 8.6% for the Russell 3000 from 1988 to 2012.
- **From Macro to Micro** (May 2, 2012).The opportunity set explained by macro timing (e.g., country, industry, style) is at all-time highs. In this new environment, we would argue that combining a top-down macro view with a bottom-up securities selection process is one of the new frontiers in quantitative investing.
- **The Tree of LIFO** (April 25, 2012). In this report we introduce a model to help pick which accounting factors matter for a given sector at a given point in time. The model is dynamic, so it evolves over time to reflect changing market conditions. The model is also non-linear, which allows it to capture conditional relationships that are not easily modeled with standard linear techniques.
- **Pairs Trading with a Fundamental Flavor** (March 20, 2012). We find that pairs trading strategies tend to work well during periods of high volatility and risk aversion and in those challenging countries for quants (e.g., Japan and US). We further show that the performance of pairs trading strategies can be significantly improved by constraining pairs with similar fundamental characteristics. In the end, we find that integrating a pairs trading model into a traditional factor-based strategy can significantly enhance performance.

- **New Insights in Country Rotation** (February 9, 2012). We study three types of country selection signals: risk premium, bottom up and top down. We find a cross-sectional measure of country tail risk (we call it Kelly's tail risk) and VRP (variance risk premium) have strong predictive power for market timing/TAA within countries and country rotation across the globe. We also find bottom-up country value, momentum, and sentiment factors can be used in conjunction with top-down factors. In the end, we build a composite country rotation model (CCRM).

- **Quant 2.0** (November 18, 2011). In this report we explore a new frontier for quantitative investors: web-based data. Historically web data has been difficult for quants to use, given its unstructured nature, and the difficulty in procuring a history for backtesting. However, advances in natural language processing techniques now make it possible to transform text based information into a structured, machine-readable form in real-time. As a result, the time is ripe for quants to take a look at this cutting-edge new data source.

- **Quant tactical asset allocation (QTAA)** (September 19, 2011). We test a wide range of macroeconomic, capital market, seasonal, aggregate firm fundamental factors in the tactical asset allocation context. We also find a new and interesting factor – variance risk premium – has strong predictive power for future returns of equity, fixed income, and commodities in many countries/regions. In the end, we develop an integrated TAA model, using a realistic return prediction model, risk model and optimizer. The TAA model outperforms its benchmark by 447% in Sharpe ratio.

- **Targeting Takeovers** (August 22, 2011). We build a systematic model for forecasting likely targets of M&A activity. A unique feature of our model is the use of "informed trading" variables derived from high frequency tick-by-tick data and options data. We show how these variables can augment the more traditional fundamental factors by helping to zero in on the actual timing of takeover announcements.

- **Quantiles: Launching Asian Quantitative Strategy** (July 18, 2011). In the launch piece, we discuss the unique nature of quantitative investing in Asia. We also extend our research of using securities lending data/factors to the Asian market. We show that going beyond short interest can add significant alpha in Asia.

- **Reviving Momentum: Mission Impossible?** (July 6, 2011). In this report, we analyze the link between Beta and Momentum factor performance. We find that Beta is a major driver of risk and performance for Momentum strategies over time. In fact, Beta played a significant role in the drawdown experienced by the momentum factor during the "junk" rally in 2009. We find that controlling Beta risk in the right way can lessen drawdown and improve overall risk-adjusted performance.

- **Do Bonds Know Better?** (May 4, 2011). In this report, we show that fixed income data is useful for quantitative equity investors. We use a unique Deutsche Bank database of corporate bonds – the DBIQ database – to analyze whether fixed income metrics have predictive power for future stock returns. We find that certain signals from the bond market do lead the equity market and as such can offer a new alpha source, even for those who can trade only equities.

- **A Quant Handbook on REIT Investing** (May 2, 2011). We find REITs stocks behave differently from non-REIT stocks. We test both traditional factors, but also a new data source – SNL, the de facto standard on REIT industry data. We find performance can be significantly improved by incorporating REIT-specific factors. In fact, our QCD-REIT model has outperformed our generic QCD model, by boosting portfolio IR by 81% in the past 11 years and 240% in the past three years.

- **Oil Shock: A Quant Perspective** (March 25, 2011). Once again the price of oil is caught up in a nexus of political and economic uncertainty. In this report we develop a better way to measure a stock's sensitivity to oil price movements. The enhanced oil beta that we develop is less backwards-looking than the traditional regression beta, and does a better job at capturing future oil price sensitivity.

- **The Long and the Short of It** (January 18, 2011). We use the DataExplorers securities lending database to develop new alpha signals based on stock lending and borrowing data. We show that we can combine these signals into a composite factor that works well in forecasting month-ahead stock returns. We also develop a way to adjust the factor scores for shorting costs, which helps steer the factor towards less costly names on the short side.

- **Frequency Arbitrage** (November 10, 2010). We try to bridge the gap between high and low frequency quant, and find that factors derived from high frequency data do have predictive power even for "traditional", lower-frequency quant investors.

- **Style Rotation** (September 7, 2010). We investigate three potential data sources to predict style factor performance: macroeconomic, capital market, and seasonal patterns. We find most academic research using economic variables in style timing suffers significant look-ahead bias. We test ten style prediction models, ranging from simple averages (assuming no style timing ability), linear regression, robust regression, Markov-switching, state-space, to nonlinear *TREE*, *FOREST*, and *PLANET* techniques. We find style rotation strategies can exhibit significant timing ability, which translates into better portfolio performance. Indeed, the multi-factor model built on style rotation strategies outperforms the naïve model (assuming no style rotation) by 54% in IR in the past 10 years. In the past three years, style rotation boosts IR by 1.30.

- **Beyond the Headlines** (July 19, 2010). In this research, we study text mining and natural language processing (NLP) in stock selection. We use three nonlinear model techniques (*TREE*, *FOREST*, and *PLANET*) to analyze news sentiment data and find signals can be used in both high and low frequency strategies.

- **Industry-Specific Factors** (June 7, 2010). Industry-specific data and factors like loan loss provision, same store sales growth, or break-even load factor have better predicative power than traditional/generic factors. We study 164 industry-specific factors in 12 industries. We found adding industry-specific factors to traditional multi-factor models can enhance model IC and portfolio IR.

- **The Options Issue** (May 12, 2010). We find options market tends to lead equity market. We find four signals from the options market have significant predictive power in forecasting month-ahead stock returns.

- **Launching US Quantitative Strategy** (April 12, 2010). We study three factors: 1) decomposing value factors – valuation ratios can be decomposed into a trend component (persistent) and cyclical component – both can be used to enhance value factor performance; 2) accruals and earnings quality – a small scaling adjustment can make a big difference; 3) market friction and price delay.

Portfolios Under Construction

In this series, we study various issues related to risk modeling and portfolio construction.

- **Risk & Alpha alignment** (August 22, 2012). We shed light on the ambiguity behind the alpha/risk misalignment problem. We find that the disconnect between alpha and optimized portfolio performance is not necessarily a problem with optimization nor simply a result of risk model error.
- **This risk in low risk?** (July 19, 2012). We introduce a novel metric for measuring crowdedness called Median Pairwise Tail Dependence (MPTD). This is designed to measure the likelihood that stocks in a portfolio have simultaneous large negative drawdowns. We argue that as a strategy becomes more crowded, the stocks held by that strategy will begin to commove more closely, since investors will trade them more as a basket rather than individual names. Such crowdedness-induce co-movement should be easier to spot in the left tail.
- **Uncertainty and Style Dynamics** (April 18, 2012). We propose a simple and effective way to monitor factor dynamics in the face of uncertainty and strong changes in risk aversion. We also investigate style dynamics in the past to analyze factor shifts in past episodes of market uncertainty.
- **Standing out from the crowd** (January 31, 2012). We use three unique data sources to develop proxies for factor crowding: securities lending data, high frequency data, and institutional ownership data. Our evidence suggests that in the long-run, crowdedness is bad for performance, but in the short-run it can actually help drive factor returns for some factors. However, in risk space the results are intuitive: higher crowding is positively correlated with larger drawdowns in factor performance.
- **Correlation & Consequences** (January 24, 2012). Average pairwise stock correlation is close to all-time highs. The uncertainty in US employment and European debt crisis mean correlation may stay high for 2012. However, high correlation doesn't necessarily mean low stock selection opportunity. What has become more important is to protect stock-picking skill from macro risk using accurate and effective risk control. In addition, the increasing relative opportunity from macro timing suggests potential new sources of alpha from country rotation, style timing, and sector/industry selection.
- **Risk Parity and Risk-based Allocation** (October 13, 2011). This research investigates the mechanics and efficacy of three popular risk-based asset allocation strategies – risk parity, minimum variance, and maximum diversification. We find risk parity and maximum diversification strategies are more robust to asset concentration and market environment. We also demonstrate how to incorporate alpha in risk parity, in the context of quantitative equity portfolio management.
- **Tail Risk in Optimal Signal Weighting** (June 7, 2011). Traditional multi-factor stock selection models are built on mean-variance optimization without explicitly accounting for tail risk. Most common factors have negative skewness/excess kurtosis; therefore, most common multi-factor models also show greater tail risk than what's implied by a normal distribution. In this research, we demonstrate the benefit of incorporating tail risk in our optimal signal weighting decision process.

- **Learning to Drive in the Fast Lane** (April 26, 2011). This research analyzes and tests a new methodology that incorporates factor and portfolio dynamics into the optimal factor weighting decision. Specifically, we look at the efficacy of a new and simple technique that uses the underlying decay of each factor and the portfolio turnover policy to arrive at the optimal factor weighting decision. The framework and technique tells us how to find the optimal allocation to a fast decay signal when turnover constraints are stringent.
- **Minimum Variance: Exposing the "Magic"** (February 9, 2011). There are some nice properties for minimum variance portfolios, i.e., higher IR than the market portfolios, low turnover, and low correlation with traditional strategies. However, we find MVP is not necessarily a low-risk strategy. In the end, we propose a slight and simple enhancement to the strategy, which significantly improves MVP IR without increasing its risk. We also demonstrate that we can combine the MVP strategy with other active alpha models.
- **Robust Factor Models** (January 24, 2011). Traditionally, managers focus on selecting factors, while using the sample factor covariance matrix in constructing multifactor models. We compare the performance of the sample factor covariance matrix with 12 structured models (constant correlation, single index, four Bayesian shrinkage estimators, and six multivariate GARCH models). Our backtesting suggests that robust factor models incorporating structured covariance matrices improve portfolio IR significantly.
- **Correlation and Opportunity** (December 3, 2010). We find that stock return correlation has a long-term cyclical component that is linked to economic cycles. Negative economic sentiment is linked to increasing correlation.
- **Factor Neutralization and Beyond** (September 21, 2010). We expand our previous factor neutralization for the US market to Europe and find similar evidence. Many alpha factors have significant exposures to volatility. Neutralizing volatility exposure can improve factor consistency.
- **It's all in the Timing** (August 19, 2010). We examine, using "perfect foresight" simulations, whether style-timing actually adds value above and beyond the additional turnover costs incurred. We also use a real-world example, our QCD model, and find style timing is difficult, but not impossible.
- **Volatility = 1/N** (June 16, 2010). Many alpha factors have significant exposures to volatility. Neutralizing volatility exposure can improve factor consistency.
- **Quantiles versus Mean Variance** (April 23, 2010). Comparing quantile portfolios with mean-variance optimization. Two extreme cases of constructing a portfolio – quantiling or mean-variance optimization – can we learn something from both sides?

Emerging Issues

- **QUANTitative Easing** (Sep 28, 2012). Past episodes of Quantitative Easing have had far reaching consequences for quant factor portfolios. In this report we study the implications of the latest round of QE on quant factors, and suggest ways to mitigate its impact and even profit from it.
- **QUANTifying European exposure** (May 21, 2012). Unfortunately European credit concerns have returned with a vengeance. In this report we use a three-pronged approach to identify stocks with significant European exposure. Our technique blends fundamental earnings exposure with statistical measures of co-movement.
- **A Roadmap for Quantitative Investing** (May 17, 2011). In this report we put all our research ideas into a more unified framework. Our goal is to help our clients prioritize among the many topics we have studied so far. We also want to draw out the key themes that are common across all our research papers.
- **What's Hot in the World of Quant?** (April 12, 2011). Since we launched our research in April 2010, we have had the privilege of doing over 700 one-on-one meetings with quantitative investors around the world. In each of those meetings, we noted the topics that you, the clients, requested we present on. This report aggregates that information into a unique set of statistics that tell an interesting story about what ideas are top of mind for buy-side quants rights now.
- **Global Macro–Quant Equity (GMQE) Model** (March 18, 2011). Even a temporary shock of a single economic variable is likely to affect other economic variables for a period of time. In this research, we build a VAR-based macroeconomic model to predict the shocks on the VIX index and oil price. From our economic forecasts, we further calculate the implied factor, industry, and stock performance. We call the bottom-up stock selection model with macro input, Global Macro–Quant Equity (GMQE) model.
- **Quant Crisis? What Crisis?** (January 28, 2011). We believe that sound quantitative research and investment should rest on in-depth and serious research rather than passive reaction to market speculation. We propose factor neutralization and robust factor modeling as two techniques dealing with sudden changes in risk regimes.

Academic Insights

On a monthly basis, we compile a list of practical academic papers related to investing. Every third month we also delve deeper into the most interesting ideas by carrying out our own backtesting and analysis.

- Academic Insights (November 20, 2012).
- Academic Insights (October 25, 2012).
- Academic Insights (September 27, 2012).
- Academic Insights (August 23, 2012).
- Academic Insights (July 23, 2012).
- Academic Insights (June 29, 2012).
- Academic Insights (May 25, 2012).
- Academic Insights (April 27, 2012).
- Academic Insights (March 21, 2012).
- Academic Insights (February 23, 2012).
- Academic Insights (January 11, 2012).
- Academic Insights (November 25, 2011).
- Academic Insights (October 26, 2011).
- Academic Insights (September 28, 2011).
- Academic Insights (August 24, 2011).
- Academic Insights (July 21, 2011).
- Academic Insights (June 24, 2011).
- Academic Insights (May 27, 2011).
- Academic Insights (April 28, 2011).
- Academic Insights (March 29, 2011).
- Academic Insights (February 25, 2011).
- Academic Insights (January 20, 2011).
- Academic Insights (November 23, 2010).
- Academic Insights (October 27, 2010). *Backtesting edition* – We explore an interesting academic finding that momentum works better for high volatility stocks and reversal works better for low volatility stocks. We suggest four potential ways to exploit this relationship.
- Academic Insights (September 27, 2010)
- Academic Insights (August 23, 2010)
- Academic Insights (July 22, 2010). *Backtesting edition* – We confirm an academic finding that gross profitability over total assets is a better measure of profitability than traditional metrics like ROE and ROA. Furthermore, we show that this ratio is useful for conditioning value factors.
- Academic Insights (June 16, 2010)

- **Academic Insights** (May 20, 2010)
- **Academic Insights** (April 16, 2010). *Backtesting edition* – We show how a concept called the “capital gains overhang” can be used to exploit a behavioural bias and enhance the earnings surprise factor.
- **Academic Insights** (March 15, 2010)
- **Academic Insights** (February 12, 2010)

Canada Quant

On a monthly basis, we publish quant strategies unique to the Canadian equity market.

- **Quantitative Earnings Forecasts** (September 15, 2011). In this report, we develop a quantitative based earnings forecast model derived from underlying firm level fundamentals. We show how a quantitatively driven earnings forecast model can be used to enhance existing consensus analyst estimates. These enhanced factors show strong predictive power in forecasting one month ahead returns in the Canadian marketplace.
- **Technically Savvy Alpha** (May 6, 2011). In this report we show that quant factors derived from technical indicators have significant predict power in forecasting future stock returns. In particular, we find that quant factors derived from technical indicators have clearly outperformed conventional quantitative factors during the past three years, a period of unprecedented market volatility and uncertainty.
- **The Illusion of M&A and Asset Expansion** (February 14, 2011). In this research piece, we test whether M&A activity and other asset expansion transactions actually lead to a subsequent increase in stock returns. Contrary to the common belief, we find that companies that increase and expand their asset base actually have a tendency to underperform.
- **New Options in Canada** (November 23, 2010). In this research, we expand a previous US quant research and find factors based on options data (put/call ratio, options implied volatility, skew, relative volume, and put-call parity) are useful in predicting stock returns in Canada.
- **Introducing Canada Quantitative Strategy** (October 24, 2010). Quant investing in Canada used to be easy – all you needed was price momentum and earnings revisions. In the past three years, however, as more and more quant investors outside of Canada start to diversify into less crowded markets like Canada, the performance of traditional factors has dropped severely. In this research, we suggest two potential ways to add alpha in Canada in this challenging environment – identifying new and less crowded factors; and style rotation.

QCD Model

QCD is our flagship stock-selection model and illustrates our philosophy for picking stocks quantitatively. The model is updated every month, and is accompanied by an interactive spreadsheet.

- **DB Quant Handbook** (July 22, 2010). QCD is our main stock-selection model with a few unique features: factors are dynamically re-selected every month based on pre-determined algorithms; a nonlinear *TREE* model is combined with a linear panel data econometric model; and style rotation and industry timing models are incorporated in the bottom-up stock-selection model.
- **QCD Model Update** (November 6, 2012)
- **QCD Model Update** (October 6, 2012)
- **QCD Model Update** (September 6, 2012)
- **QCD Model Update** (August 6, 2012)
- **QCD Model Update** (July 6, 2012)
- **QCD Model Update** (June 6, 2012)
- **QCD Model Update** (May 7, 2012)
- **QCD Model Update** (April 5, 2012)
- **QCD Model Update** (March 7, 2012)
- **QCD Model Update** (February 7, 2012)
- **QCD Model Update** (January 6, 2012)
- **QCD Model Update** (December 6, 2011)
- **QCD Model Update** (November 7, 2011)
- **QCD Model Update** (October 6, 2011)
- **QCD Model Update** (September 8, 2011)
- **QCD Model Update** (August 8, 2011)
- **QCD Model Update** (July 6, 2011)
- **QCD Model Update** (June 6, 2011)
- **QCD Model Update** (May 6, 2011)
- **QCD Model Update** (April 7, 2011)
- **QCD Model Update** (March 9, 2011)
- **QCD Model Update** (February 7, 2011)
- **QCD Model Update** (January 6, 2011)
- **QCD Model Update** (December 6, 2010)
- **QCD Model Update** (November 2, 2010)
- **QCD Model Update** (October 6, 2010)
- **QCD Model Update** (September 8, 2010)
- **QCD Model Update** (August 6, 2010)

Appendix 1

Important Disclosures

Additional information available upon request

For disclosures pertaining to recommendations or estimates made on securities other than the primary subject of this research, please see the most recently published company report or visit our global disclosure look-up page on our website at http://gm.db.com/ger/disclosure/DisclosureDirectory.eqsr

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