



## BOTTOM-UP EQUITY SECTOR ANALYSIS: PART 2

This month, we continue the presentation of the sector bottom-up analysis begun in our previous commentary (dated June 4, 2013). This edition highlights recent empirical analyses conducted by the Innealta Investment Committee on the bottom-up equity analysis. This research initiative comprises an extensive bottom-up analysis with the purpose of expanding the information encompassing our empirical framework.

Our readers may recall that the preliminary results presented in our previous commentary were promising, and point to additional avenues of research that may prove fruitful. This month, we expand on those previous results by considering an additional direction: sector-specific factors. Our consideration of sector-specific factors allows for the possibility that any factor may perform well at identifying attractive investment environments in certain sectors and not others. The intuition comes from the observation that the characteristics of firms vary greatly. Sectors are collections of firms classified based on the product space in which they operate. Thus, firms within the same sector are likely influenced by common drivers, whereas firms in different sectors are likely influenced by different factors.

The results presented herein comprise an intermediate step in our bottom-up analysis. In this intermediary step, we consider the sector-level performance of factor types, as opposed to considering portfolios in a rotation strategy across all sectors. This step is intermediary, because our ultimate goal is to develop sector-specific factors tailored to individual sectors, a topic that we actively are researching, the results from which will be presented in future commentaries.

These results also serve as a cautionary tale against over-interpreting point estimates. As we will highlight, in some cases back-tested results are consistent with our priors based on economic intuition. In other cases, the back-tested results present surprising patterns. This is precisely where researchers need to avoid the temptation of allowing the data to guide the process which may result in the complete departure from a sound economic framework. Put simply, just because a factor type performs extraordinarily well in a back-test does not in itself validate that factor type as a useful instrument.

This research has the potential to enhance significantly the investment committee's interpretation of the quantitative framework output. By nature, the framework includes multiple signals and an amalgamated score. The current research has potential to enhance our decision making by identifying which factors work for specific sectors, enabling us to consider a potential dichotomy of factors based on their applicability to each sector.

## Introduction and Motivation

We extend the previous results by “looking under the hood,” so to speak, and considering factors at the individual sector level. The motivation for considering sector-specific factors stems from the fact that the nature of firms vary and each factor likely does not impact all firms equally. Firms within particular industries, by definition, share common characteristics in terms of the nature of their business. For these reasons, looking at factor performance at the individual sector level makes intuitive sense.

As you may remember from previous commentaries, we have been investigating factors of the following categories: Valuation (Value), Operating Efficiency, Quality, Management Behavior, Momentum and Risk. Valuation compares a stock's market price with its intrinsic value measured by accounting information. Value stocks, or low-priced stocks, tend to outperform growth stocks, which are often perceived by investors as more “glamorous” and therefore tend to be overvalued. We measure the intrinsic value of a company using a variety of different metrics that may or may not be good proxies for intrinsic values within sectors. Differences between sectors may exist as to the extent intrinsic value can be measured and how quickly that information is incorporated into stock prices. For example, sectors with a lot of intangibles such as goodwill, etc. tend to be very hard to value. As a result, it may be more difficult to forecast returns for those sectors.

Investors' “growth bias” also can be exploited using our Operating Efficiency (or profitability) factor type, as it turns out that equity investors often place too much emphasis on companies' growth potential and ignore less “glamorous” companies with lower growth, but higher profit margins and cash generating ability. However, the latter tend to outperform their more glamorous counterparts. The extent to which this factor can be used on a sector level, rather than an individual stock level, will vary across sectors.

To provide an illustrative example, the utility industry is regulated heavily and their profits are essentially set by regulators. Thus, a profitability factor such as return on assets (ROA) is not likely to be related to returns to firms in the utilities industry. The case of utility firms' profitability is one of fairly clean economic intuition and common sense. However, as a researcher departs down the road of searching for factors related to returns, such clarity does not often present across all factors and for all sectors. Thus, the researcher must always exercise caution in cases where factors seem “to work,” but the underlying intuition is missing or loosely grounded in theory to avoid falling into the back-test trap.

In addition to investigating the level of earnings relative to capital invested (Operating Efficiency), we also have decomposed earnings into a cash component, which tends to be fairly stable over time, and a more transitory accrual component, which is more difficult to evaluate, and therefore more subject to manipulation. The intuition behind this is: the higher the accrual component of earnings is relative to the cash component, the lower the quality of earnings and the poorer a company's future prospects will be. Firms may recognize revenue even though they are waiting to receive promised cash payments. In this case, management recognizes the revenue and the sales increase in earnings. Until the company collects on their accounts receivable (i.e. the firm receives cash from the customer), however, shareholders do not benefit. Among industries where accruals are a large component of revenues, cash flows may be more value-relevant than earnings. The use of accruals also has been linked to opportunistic behavior by managers, whereby managers rely on accruals to smooth earnings. In such cases, again, the cash flow measure is preferable.

At the most basic level, since shareholders own the company's retained earnings, the reported earnings contain important value-relevant information. Since the natures of businesses differ across industries, the information quality of earnings plausibly differs across sectors. For example, some sectors involve intensive capital investments and earnings are reduced by depreciation expense, which is a non-cash item. In such a case, investors may place more emphasis on cash flow measures that adjust for this non-cash item.

Our Management Behavior factor type captures management's informational advantages relative to outsiders (investors) as well as managerial biases and self-interests. Managers possess superior information than outside investors regarding the company's future earnings and thus its fundamental valuation. In this context, referred to as asymmetric information, investors infer signals from managers' actions, such as the choice of external financing. Under asymmetric information, managers choosing to issue shares are those having the worst private information regarding future earnings. Thus, an equity issuance is perceived as a negative signal. In contrast, a share repurchase is perceived as a positive signal of management's private information. Moreover, company management often has an incentive to use the firm to serve their own self interests. For example, managers may extract private benefits (use of the corporate jet), or engage in empire building rather than maximizing shareholders' value. Hence, companies sometimes overinvest and use excessive debt. Management Behavior type factors capture these as well as other indications of management's motivations. Again, the extent to which these types of factors should be used for certain sectors and not for others depends on the different sector characteristics, such as how strong the asymmetric information problem is for a certain sector. For example, one would expect informational advantages to be relatively lower in heavily regulated sectors such as utilities, because price controls and allowable profit margins are pieces of information that are in the public domain. Therefore, company insiders have fewer informational advantages that they can use to game investors. At the other end of the spectrum are, for example, sectors with high levels of R&D. For these types of sectors, e.g. pharmaceuticals, IT or biotechnology, there will be times when company insiders have far greater information than outsiders regarding the maturity and likely outcome of various R&D projects that they might be able to exploit.

### **A Note of Caution**

While considering factors on a sector-by-sector basis has intuitive appeal, it also presents potential for cherry picking factors based on spurious results. By design, the researcher uses theory and intuition as a guide when designing and testing quantitative strategies. To provide some validation of the idea, the researcher puts the strategy to the test using historical data (i.e. back testing). If the back-tests produce favorable results, should the researcher conclude they have identified a consistent, valuable investment strategy? It is important to note here that the level of certainty in our field, a social science, is embarrassingly low compared to the physical sciences. For this reason, the ability of our models to describe returns is limited. Thus, it is impossible to determine conclusively causality. For this reason, a researcher must remain vigilant against false positives—finding patterns present in historical data and falsely concluding that such patterns will hold in the future.

But all is not lost. The conjunction of solid economic rationale and thorough back-testing takes us a long way toward identifying value-relevant factors. We raise this caution simply to stress the requirement that the researcher remains grounded in theory and sanity and avoids over-interpreting back-test results when pushing the data in innovative directions.

### **Research Design**

We conduct back-tests based on historical data using monthly portfolio rebalancing. Each month, for each sector, we compute the current factor value at the sector level. We then standardize that current sector value relative to the own-sector historical factor levels to facilitate comparison across sectors. We gauge the attractiveness of each sector based on the score relative to a selected threshold. For all sectors not selected based on their factor scores, we invest in bonds, using the Barclays Aggregate Bond Index to proxy for bond returns.

Our research design builds upon and extends the framework presented in the June 4, 2013 commentary. Specifically, we amalgamate factor scores for each industry based on the factor exposures of the individual constituents. However, in the current analysis we consider the performance on an individual sector basis

instead of across the full universe. Again, this design has the benefit of shining light on those sectors for which the factors appear to have power to identify return environments.

## Empirical Results

Exhibit 1 presents the back-test results. Specifically, the table presents Jensen Alpha relative to both the returns to aggregate U.S. bonds and equities. The alpha captures the risk-adjusted performance of the individual sector strategy relative to a static, passive combination of stock and bond indexes. Instead of averaging across multiple sectors, we present the results for individual sectors. Positive values indicate outperformance relative to a passive combination of stocks and bonds. Negative values indicate underperformance.

Each row of the exhibit corresponds to one of 10 sectors. The columns correspond to potential return factors. Although we consider far more than 14 factors, for ease of presentation we present returns to the investment strategies based on 14 factors, comprised of one value factor, eight operational efficiency factors, one earnings quality factor, and four management behavior factors.

The shaded boxes indicate where the factors appear to have power for identifying return environments. For example, referring to the first row, which corresponds to the Energy sector, the Value Factor, Operational Efficiency Factors 3 and 5, the Earnings Quality Factor and Managerial Factors 1-3 appear to perform well at identifying return environments for the Energy Sector. The annualized alphas across these factors range from +1.76% to +4.44%. The other factors, however, do not exhibit power to identify return environments for the Energy sector in the back-tests and have alphas ranging from zero to -4.50%.

Scanning the rows of Exhibit 1, it is clear that much variability exists across sectors and factors. For example, returns based on the Value Factor are positive among five out of ten sectors and negative across the rest. In fact, the sector-specific performance ranges from -5.6% (Telecom) to +6.2% (Info Tech). Interestingly, all selected factors seem to generate attractive risk-adjusted returns for the strategies applied to the Information Technology sector. We do not have an explanation grounded in theory to explain the consistent performance across all factors for this one particular industry. For example, we are at a loss to explain why the operating efficiency factors 1 and 6 are not powerful while the other 6 factors are quite powerful for this sector.

Panel B of Exhibit 1 presents the information ratios for the sector-level strategies. The information ratios capture essentially the signal-to-noise ratio of the alphas presented in Panel A. In general, the information ratios are broadly consistent with the alphas, and indicate cases where the alphas are consistent.

The turnover numbers presented in Panel C help illustrate how variable is the signal. The more volatile the signal, the more trading that takes place as we move in and out of the portfolio. For our purposes, of course, the use of sector ETFs marginalizes our trading costs so our first order concern is not with respect to transactions costs. In the context of our analysis, however, turnover provides insights as to the stability of the factor signals. In cases where turnover is high and the alpha is low, we are confident the factor is not working to identify attractive return environments for a given sector. In other cases, such as many factors in the Information Technology sector, the alphas are positive and turnover is moderate.

## Exhibit 1: Performance of Factors

Jensen Alpha (Equity/Bond)	Value	Op Eff	Op Eff	Op Eff	Op Eff	Op Eff	Op Eff	Op Eff	Op Eff	Op Eff	Quality	Mgmt	Mgmt	Mgmt	Mgmt
	Factor 1	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 8	Factor 1	Factor 1	Factor 2	Factor 3	Factor 4
Energy	3.92%	-2.85%	-4.50%	2.86%	-3.60%	4.44%	-2.88%	0.01%	-2.85%	2.93%	2.77%	1.76%	2.70%	-0.11%	
Materials	-0.44%	6.36%	-0.39%	-0.66%	0.65%	-0.27%	6.66%	-2.60%	-3.85%	0.42%	-1.29%	-3.51%	-2.20%	2.54%	
Industrials	1.49%	-1.69%	0.98%	2.57%	2.55%	4.23%	-1.07%	-0.97%	0.80%	-2.89%	2.04%	-0.05%	3.41%	1.24%	
Consumer Discretionary	0.74%	3.53%	3.53%	-0.11%	3.39%	-0.12%	3.40%	-3.11%	4.50%	0.35%	1.19%	0.42%	-2.91%	1.71%	
Consumer Staples	-2.04%	-0.42%	-1.38%	-2.39%	-2.05%	4.25%	1.62%	1.06%	-2.24%	-0.46%	-1.70%	0.54%	-1.60%	-0.83%	
Health Care	2.24%	-0.22%	0.42%	0.37%	0.37%	0.68%	-0.65%	3.48%	0.29%	-0.63%	2.59%	3.73%	-0.73%	0.62%	
Financials	-2.90%	4.05%	3.59%	-1.00%	-0.93%	0.54%	4.43%	4.70%	1.91%	4.59%	4.79%	3.45%	5.14%	0.16%	
Information Technology	6.22%	7.02%	6.61%	2.61%	7.37%	3.40%	7.02%	7.04%	8.29%	2.33%	9.10%	6.24%	6.47%	11.82%	
Telecom. Services	-5.57%	0.39%	2.77%	6.34%	4.48%	3.70%	-1.12%	5.20%	4.17%	3.76%	3.62%	7.55%	3.76%	6.22%	
Utilities	-2.46%	1.81%	-0.25%	2.74%	0.66%	-3.55%	1.65%	1.29%	1.79%	4.07%	0.78%	-0.19%	0.53%	-6.25%	
AVERAGE	0.12%	1.80%	1.14%	1.33%	1.29%	1.73%	1.90%	1.61%	1.28%	1.45%	2.39%	2.00%	1.46%	1.71%	
STD	0.22%	0.21%	0.20%	0.16%	0.20%	0.17%	0.22%	0.22%	0.24%	0.15%	0.20%	0.21%	0.21%	0.30%	

Jensen Alpha IR (Equity/Bond)	Value	Op Eff	Op Eff	Op Eff	Op Eff	Op Eff	Op Eff	Op Eff	Op Eff	Op Eff	Quality	Mgmt	Mgmt	Mgmt	Mgmt
	Factor 1	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 8	Factor 1	Factor 1	Factor 2	Factor 3	Factor 4
Energy	0.48	-0.22	-0.34	0.20	-0.27	0.31	-0.22	0.00	-0.21	0.23	0.22	0.12	0.26	-0.01	
Materials	-0.03	0.47	-0.03	-0.05	0.05	-0.02	0.48	-0.28	-0.29	0.03	-0.12	-0.39	-0.22	0.24	
Industrials	0.12	-0.18	0.09	0.27	0.22	0.36	-0.11	-0.10	0.07	-0.24	0.19	0.00	0.30	0.10	
Consumer Discretionary	0.06	0.31	0.31	-0.01	0.28	-0.01	0.35	-0.25	0.45	0.03	0.12	0.03	-0.28	0.14	
Consumer Staples	-0.30	-0.05	-0.18	-0.35	-0.25	0.55	0.20	0.14	-0.30	-0.06	-0.25	0.07	-0.23	-0.17	
Health Care	0.23	-0.02	0.05	0.07	0.09	0.09	-0.07	0.35	0.07	-0.07	0.31	0.41	-0.07	0.07	
Financials	-0.23	0.32	0.30	-0.08	-0.07	0.06	0.35	0.38	0.17	0.30	0.35	0.27	0.41	0.02	
Information Technology	0.41	0.45	0.43	0.38	0.47	0.26	0.45	0.43	0.51	0.14	0.58	0.48	0.40	0.73	
Telecom. Services	-0.44	0.04	0.28	0.50	0.49	0.29	-0.11	0.45	0.36	0.33	0.30	0.61	0.31	0.50	
Utilities	-0.25	0.31	-0.03	0.27	0.07	-0.36	0.23	0.15	0.18	0.41	0.08	-0.02	0.05	-0.81	
AVERAGE	0.00	0.14	0.09	0.12	0.11	0.15	0.16	0.13	0.10	0.11	0.18	0.16	0.09	0.08	
STD	0.31	0.26	0.24	0.25	0.26	0.26	0.26	0.28	0.29	0.21	0.24	0.29	0.28	0.41	

Portfolio	Value	Op Eff	Op Eff	Op Eff	Op Eff	Op Eff	Op Eff	Op Eff	Op Eff	Op Eff	Quality	Mgmt	Mgmt	Mgmt	Mgmt
Turnover	Factor 1	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 8	Factor 1	Factor 1	Factor 2	Factor 3	Factor 4
Energy	65.58%	43.35%	28.89%	58.02%	28.93%	108.58%	43.43%	152.12%	28.73%	57.74%	57.31%	43.83%	36.12%	57.55%	
Materials	57.67%	50.79%	21.66%	7.23%	36.06%	101.34%	50.55%	14.31%	36.60%	58.05%	72.79%	43.21%	43.86%	43.30%	
Industrials	36.09%	28.85%	94.25%	57.69%	36.15%	122.90%	43.04%	28.89%	21.64%	130.28%	57.85%	86.81%	86.63%	21.60%	
Consumer Discretionary	36.02%	50.37%	64.92%	21.76%	50.05%	130.15%	64.91%	72.38%	36.03%	86.30%	50.93%	79.59%	58.05%	65.30%	
Consumer Staples	43.20%	57.85%	72.18%	14.36%	57.88%	79.62%	58.05%	101.06%	28.71%	50.69%	21.54%	43.52%	21.57%	43.63%	
Health Care	58.04%	94.20%	43.12%	28.76%	28.82%	36.24%	65.15%	50.76%	14.25%	36.05%	43.37%	50.56%	64.85%	93.94%	
Financials	43.16%	14.28%	28.62%	36.01%	130.43%	72.43%	14.25%	115.31%	28.84%	64.98%	65.16%	79.75%	50.71%	43.78%	
Information Technology	79.35%	7.13%	7.17%	29.05%	22.00%	115.64%	7.13%	64.88%	79.58%	72.36%	14.16%	28.20%	14.14%	28.83%	
Telecom. Services	43.39%	43.36%	101.12%	50.59%	72.50%	79.71%	43.45%	94.33%	36.31%	108.76%	50.68%	21.72%	50.69%	79.31%	
Utilities	14.36%	14.57%	57.95%	72.38%	58.00%	14.39%	29.11%	130.34%	43.68%	79.74%	72.35%	116.18%	86.97%	43.37%	

SOURCE: Innealta Capital

## CONCLUSIONS

In summary, the sector-level results are interesting and raise many questions. To our knowledge, ours is the first attempt to apply the factors identified in the voluminous academic literature to individual sectors. In some cases, economic intuition suggests reasons why certain factors may be more powerful for a particular sector(s) than others. In other cases, the picture is much less clear. Our overall interpretation of the back-test results is that the results are intriguing and have the potential to lead to the isolation of certain factors that are more relevant for each individual industry. At this preliminary stage, however, we will exercise restraint and avoid drawing strong conclusions (i.e. cherry picking factors based on past performance), since in many cases we are not sure why one factor is powerful in one sector but not in another.

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