Deutsche Bank

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Canada Quant

The Illusion of M&A and Asset Expansion

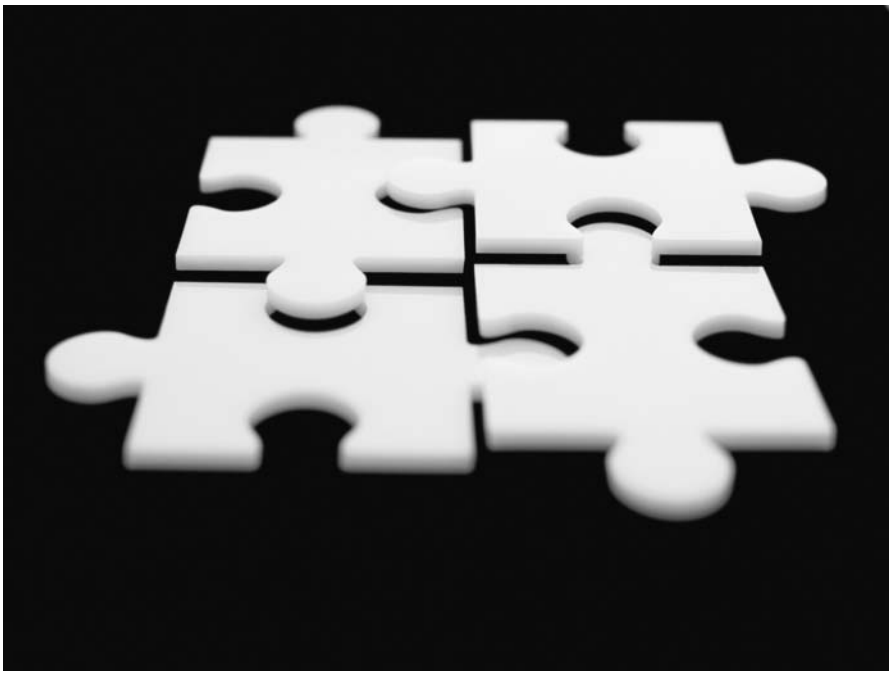
Conditions seem prime for an onslaught in M&A activity

The market has recently experienced a sharp surge in M&A activity. With improving economic conditions, combined with tempting valuations, balance sheets rich in cash holdings, and access to inexpensive debt, the conditions seem ripe for an onslaught of M&A activity. M&A transactions are generally perceived as a profitable venture for shareholders.

But will shareholder value be diminished?

However, our findings cast doubt on whether M&A activity and other asset expansion transactions actually lead to an increase in shareholder value. 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 underperform.

Please note that all our research is distributed from DBEQS.Americas@db.com. For all factors mentioned in our research reports, we also provide regular quant screens. Please contact us or your sales representative for details.



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A letter to our readers

Welcome to the third edition of *Canada Quant*

Indeed we have recently seen a surge in the number of M&A transactions. This is likely fueled by attractive corporate valuations, favorable borrowing conditions, and access to balance sheets with hefty cash holdings. Managers are clearly upbeat about growing their businesses since the past three years has seen diminished market conditions.

Conventionally, there is the perception that M&A transactions and other asset expansion ventures are advantageous to shareholders. Merged or acquired companies can benefit from a plentitude of synergies and other efficiencies. However, our research findings indicate that these traditional beliefs regarding asset expansion may be a thing of the past.

In this report, we investigate whether year over year asset growth has predictive power in the Canadian marketplace. Our findings actually dispel the notion that higher asset growth is often followed by higher subsequent returns. In fact, our results indicate the opposite.

For clients who are unfamiliar with our research, we highly recommend *The DB Quant Handbook*, July 23, 2010, which describes our research methodology in more detail

In the future, we plan to publish the *Canada Quant* series regularly. In addition to published research, we work closely with clients in conducting customized research projects, providing data feeds, and other services. For all factors mentioned in our research papers, we also provide regular quant screens. Please contact us or your sales representative for details.

Please note that all our research is distributed from DBEQS.Americas@db.com. Recent factor performance can be found in Appendix I. You can also find a list of our recent publications in Appendix II.

Regards,

Yin, Rocky, Miguel, Javed, and John
Deutsche Bank North American Quantitative Equity Strategy Team

Stock screens

Picking stocks using asset growth

The two screens below constitute our best long (overweight) and short (underweight) ideas for TSX Composite members based on the asset growth factor described in this research. The details of the asset growth factor are discussed in the remainder of this report.

Long or overweight ideas

Figure 1: Potential long/overweight

Ticker	Name	GICS Sector
NDN	NORDION INC	Health Care
PVE	PROVIDENT ENERGY LTD	Energy
ECA	ENCANA CORP	Energy
ATP	ATLANTIC POWER CORP	Utilities
BRC.U	BROOKFIELD RENEWABLE PWR FD	Utilities
CIX	CI FINANCIAL CORP	Financials
DOL	DOLLARAMA INC	Consumer Discretionary
MFL	MINEFINDERS CORP LTD	Materials
BPO	BROOKFIELD PROPERTIES CORP	Financials
CP	CANADIAN PACIFIC RAILWAY LTD	Industrials

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

Short or underweight ideas

Figure 2: Potential short/underweight

Ticker	Name	GICS Sector
PMG	PETROMINERALES LTD	Energy
QUX	QUADRA FNX MINING LTD	Materials
NSU	NEVSUN RESOURCES LTD	Materials
ELD	ELDORADO GOLD CORP	Materials
PBG	PETROBANK ENERGY RES LTD	Energy
LSG	LAKE SHORE GOLD CORP	Materials
VEN	VENTANA GOLD CORP	Materials
IVN	IVANHOE MINES LTD	Materials
DGC	DETOUR GOLD CORP	Materials
PBN	PETROBAKKEN ENERGY LTD	Energy

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

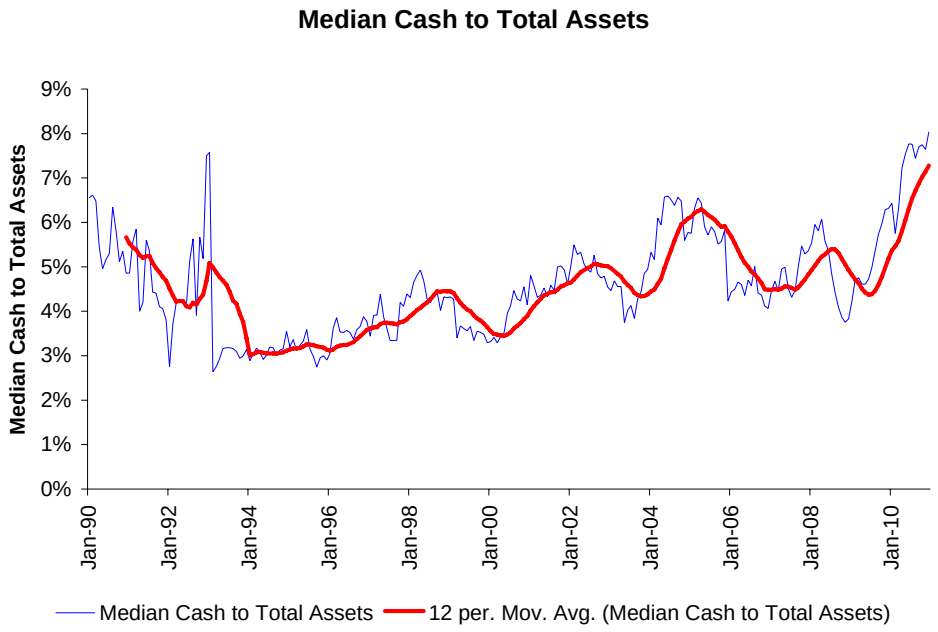
Why Explore Asset Growth?

Impetus

With economic and market conditions gradually improving, analysts and economist are showing modest optimism towards the outlook for 2011 dealmaking activity. PWC's M&A forecast for 2011 shows that mid-market M&A activity has increased more than 70% since 2009[1]. Similarly, Bloomberg's 2011 M&A outlook showed that global M&A activity saw a strong comeback in 2010 with over 21,000 deals announced and a total dollar volume of more than $1.9 trillion dollars[2]. The hype about a strong resurgence in M&A activity is compounded by the fact that conditions seem ideal for dealmaking.

Corporate cash holdings are at a 20-year high (Figure 3). Attractive corporate valuations coupled with access to inexpensive debt financing are strong arguments for a revival in M&A activity. In addition, the difficult economic environment during the past three years has likely encouraged corporate mangers to seek out growth opportunities.

Figure 3: Median cash to total assets for Canadian universe



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

In general, M&A activity is thought to increase shareholder value through synergistic benefits such as operating expense reduction, consolidation of supply chain, amalgamation of real-estate and operating plants, and production efficiency gains. However, our findings suggest that such transactions are more likely to diminish shareholder value. A simple proxy for examining M&A activity is year-over-year asset growth. Asset growth is an informative factor to investigate because it not only encompasses M&A activity, but it also accounts for broad asset expansion.

1 For the complete presentation, see "PwC's M&A forecast for 2011"
2 For the complete presentation, see "2011 M&A Outlook"

Academic evidence

Before delving further, we feel it is prudent to briefly explore the academic literature related to asset growth. Readers who follow academic literature are well aware that asset growth has been thoroughly debated and discussed. A multitude of papers have been written about the asset growth anomaly. The table below briefly summarizes the findings in the key research papers on the subject[3].

Typically, academic papers have a variety of conflicting findings when testing a particular subject area or factor. However, in regards to asset growth, a consistent finding amongst most academic literature is that higher asset growth leads to lower subsequent returns.

Figure 4: Summary of Academic Papers on Asset Growth

Title	Author	Key Findings
Asset Growth And The Cross-Section Of Stock Returns	Cooper, Gulen, and Schill [2007]	Asset growth rates are strong predictors of future abnormal returns and statistically significant. Asset growth has strong predictive power even for large cap securities
The Asset Growth Effect in Stock Returns	Cooper, Gulen, and Schill [2009]	A negative relationship exists between asset growth and subsequent stocks returns. Asset growth shows strong predictive power in both large and small capitalized stocks.
On the Scope and Drivers of the Asset Growth Effect	Lipson, Mortal, and Schill [2010]	Asset growth effect is pervasive. The return effect is concentrated around earnings annoucments and analyst earnings forecast are higher for faster growing firms.
What Explains the Asset Growth Effect in Stock Returns?	Lipson, Mortal, and Schill [2009]	Document a negative correlation between asset growth and future stock returns. The propose two potential explanations that explain the asset growth effect: compensation for risk and arbitrage costs.
Exploring the Asset Growth Effect in the Australian Equity Market	Bettman, Kosev, and Sault	Specifically analyzes the asset growth effect for Australian listed firms. They conclude that the asset growth effect does not exist in the Australian equity market.

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

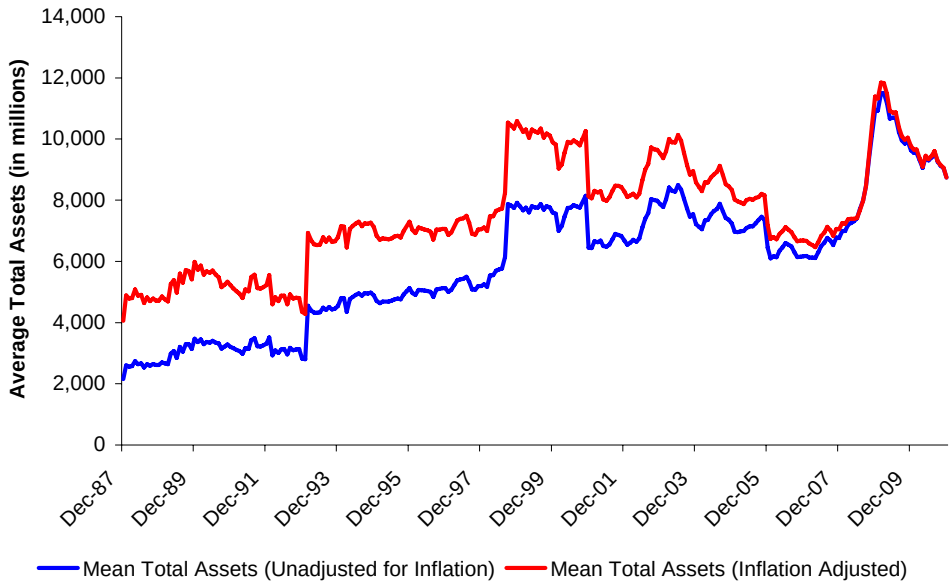
3 For the latest academic research, please refer to our monthly Academic Insights research series"

Asset growth in Canada

Asset makeup

As a first step, we feel it's worthwhile to briefly explore the makeup of Canadian companies by asset base. As disciplined quants, before delving into the details of the factor backtests, it's beneficial to briefly take a high level overview of companies by asset base. Figure 5 shows the average total assets for stocks in our entire Canadian universe. Over this time period, Canadian companies on average have significantly increased their asset base. The average total asset for Canadian companies over the entire time period is approximately $7.5B inflation adjusted.

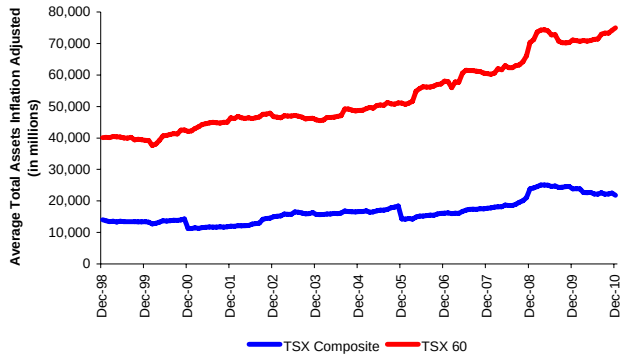
Figure 5: Average total assets for Canadian universe



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

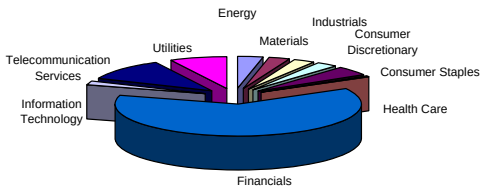
Figure 6 shows the average total assets for companies in the TSX Composite and TSX 60 indices. Notice the large distinction between the two indices. TSX 60 companies hold significantly more assets on average than TSX Composite companies. Although this is expected, it's worthwhile to emphasize that the TSX 60 is largely composed of financial companies. The financial sector dominates the Canadian market in terms of total assets. This can be seen in Figure 7 which illustrates the average total asset of Canadian companies decomposed by sector. The Financial, Utilities, and Telecommunication sectors clearly monopolize the Canadian universe in terms of total assets. Utilities and Telecommunication companies are of course very capital intensive.

Figure 6: Average assets by indices



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

Figure 7: Average assets by sector



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

Defining asset growth

After a brief overview, we are now in a position to define our asset growth factor. Since most standard quant factors have been arbitraged away, many quant-based investors and practitioners have sought out more sophisticated quant factors that are less intuitive and complicated to calculate. In this research, we take a different viewpoint and seek to define a more transparent and economically intuitive asset growth factor. In this research, we define our asset growth factor as the year-over-year change in total assets. The formulaic definition of our asset growth factor is simply:

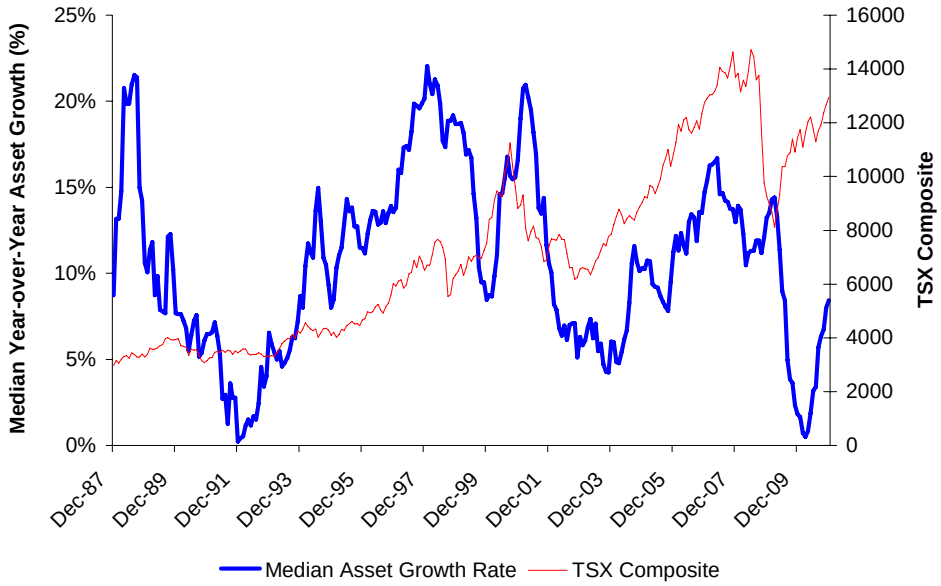
$$AssetGrowth = TotalAssets_{(t)} / TotalAssets_{(t-1)} - 1$$

This simple definition of asset growth enables it to be easily calculated. Investors may be wary towards whether such a simplistically defined factor can actually obtain a foreseeable alpha. This is exactly what we intend to test in this research. Before exploring the backtesting results of the asset growth factor, it's worthwhile to get a sense of the trends and properties of the asset growth within the Canadian universe.

Trends in asset growth

Figure 8 below shows the median asset growth rate over time for Canadian companies overlaid with the TSX Composite index. The median asset growth rate for Canadian companies over the past 20 years is approximately 11%. Figure 8 also shows little discernible evidence that companies tend to grow (shrink) their asset base during rising (falling) markets.

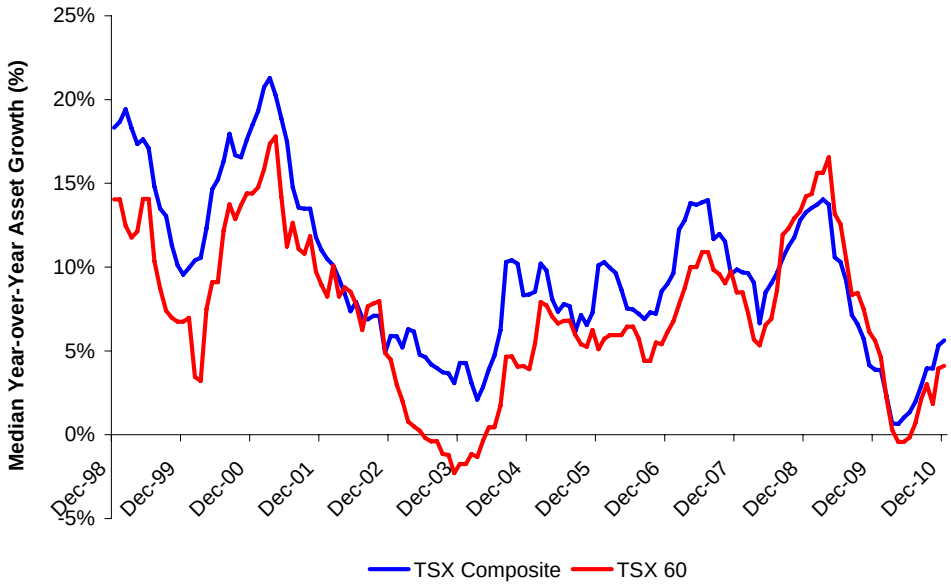
Figure 8: Median asset growth for Canadian universe



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

To determine if the asset growth trend varies significantly by market cap, we have plotted the median asset growth rate over time for companies within the TSX Composite and TSX 60 indices (Figure 9). TSX 60 companies have a slightly smaller asset growth rate than TSX Composite companies. This is not surprising as TSX 60 companies are large cap companies; however, the trend in asset growth rate between the two indices is highly correlated and at first glance, there appears to be no dominating size effect.

Figure 9: Median asset growth by indices

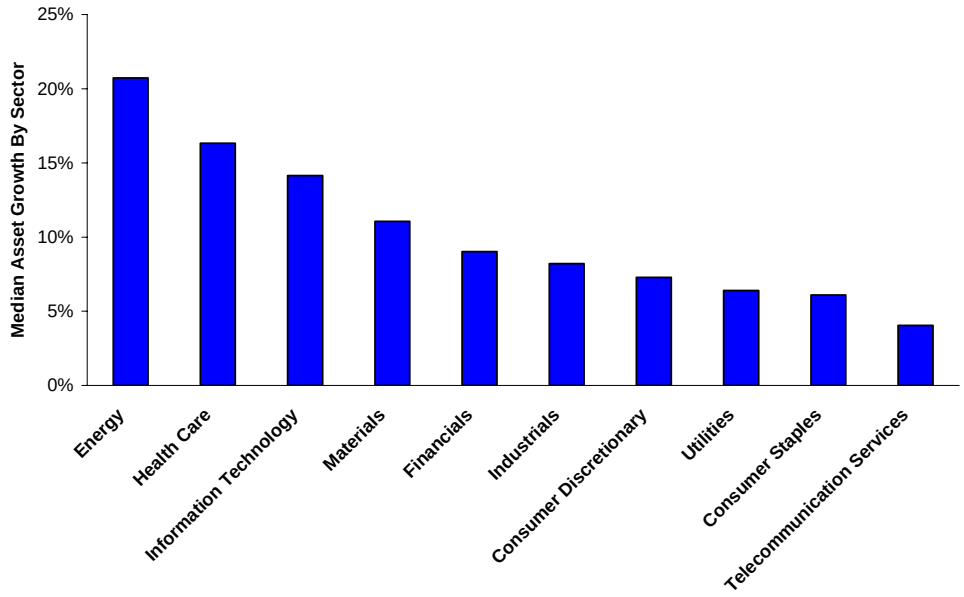


Source: Compustat, IBES, S&P, Thomson Reuters, Deutsche Bank Quantitative Strategy

However, when looking at asset growth from a sector perspective (Figure 10), we clearly see a definite sector bias. The Utilities, Consumer Staples, and Telecommunication sectors have the smallest asset growth rates. This is of course expected as these more stable industries are associated with significant capital investments and high barriers to entry. Growing the

asset base significantly for companies within these industries would require considerable capital costs and maybe even regulatory approval. On the other hand, the Energy and Health Care sectors show the highest asset growth rates. These industries tend to be inherently more exploratory and speculative in nature and as such we would expect their asset growth rates to be much higher.

Figure 10: Median asset growth by sector



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

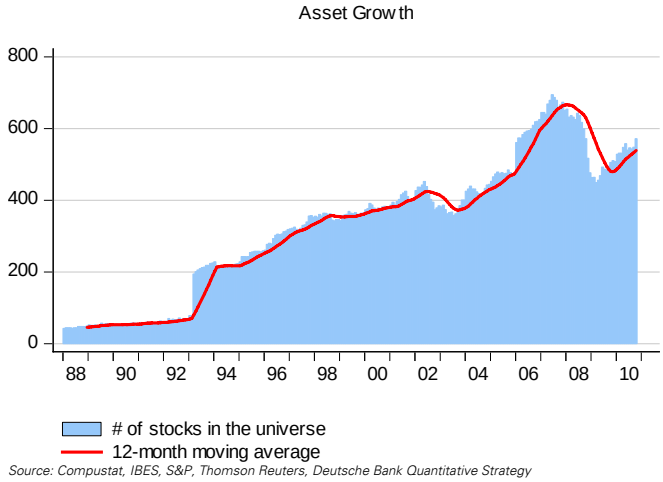
Univariate backtest

Backtesting results are promising

Now that we have defined our asset growth factor and looked briefly at some of its properties, we are ready to focus on the backtesting results. Before we do this, we briefly look at the coverage of the asset growth factor. The factor is easy to calculate and therefore we would expect its coverage to be good (Figure 11).

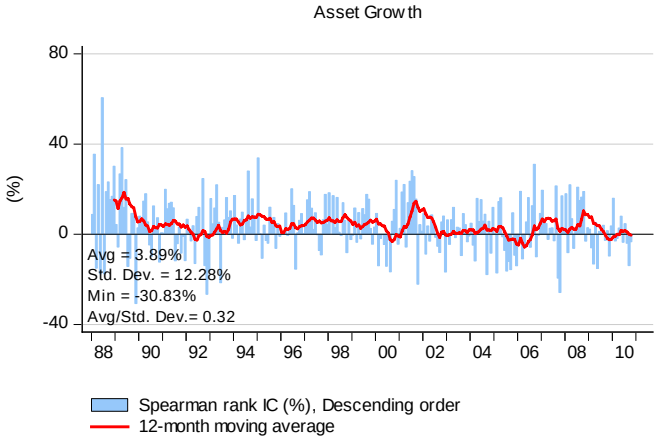
Focusing on the backtest results, Figure 12 shows the rank IC performance skill of the asset growth factor. The backtest results are promising. The overall rank IC for asset growth is approximately 4%.

Figure 11: Asset growth number of stocks



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

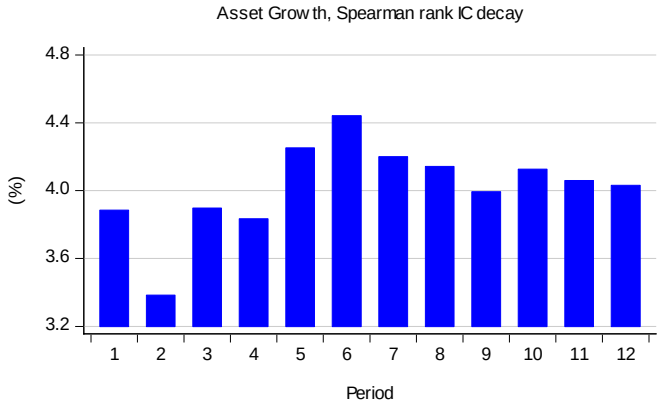
Figure 12: Asset growth Rank IC



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

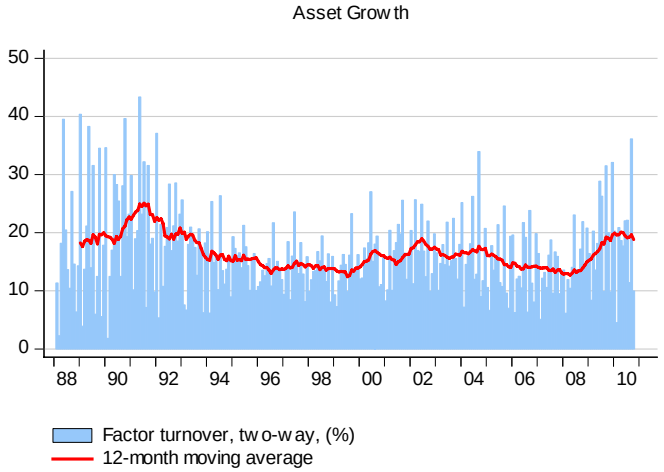
A noteworthy feature about the asset growth factor is that it has relatively slow information decay as shown in Figure 13. The signal shows strong, persistent predictive power even after one year. We also find that asset growth has relatively low turnover (Figure 14). This is preferred from an implementation perspective as this reduces transaction costs while maintaining strong factor predictability.

Figure 13: Asset growth Rank IC decay



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

Figure 14: Asset growth turnover



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

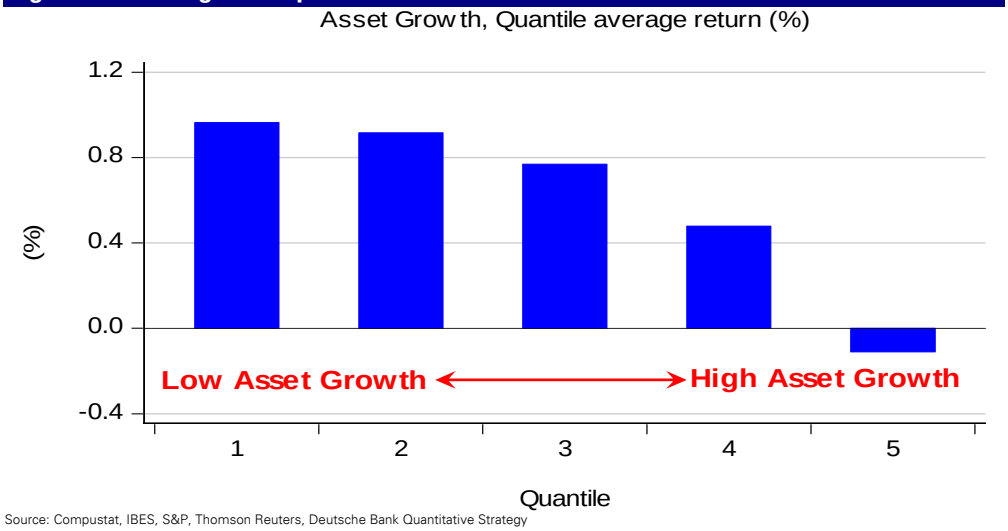
High asset growth underperforms

Overall the asset growth factor results are promising. One of the most noteworthy results apparent from the backtest is that: on average those firms that experience high asset growth actually underperform, while firms that experience low asset growth actually outperform. Figure 15 shows the quintile average return for the asset growth factor. We can clearly see that quintile 5 (high asset growth firms) underperforms quintile 1 (low asset growth firms).

At first glance, this may seem counterintuitive. Surely, we would expect that on average firms that expand their asset base are investing in profitable ventures that will increase shareholder value. However, the backtesting results dispel this notion. The backtesting results show that on average firms that increase their assets through acquisitions or secondary offerings etc., actually produce subsequent lower returns. In turn, companies that shrink their asset base through for example, share buy backs, actually produce higher subsequent returns.

The backtesting results give some credibility to the fact that it may be more advantageous for companies to return their profits to shareholders rather than use their profits to expand their asset base. These results also support many academic papers written about the asset growth anomaly. Most academics find similar results that higher asset growth is associated with lower subsequent returns. However, the counterintuitive nature of the backtesting results warrants further investigation. In the next section, we look at other interesting traits of the asset growth factor in order to help us better understand the anomaly.

Figure 15: Asset growth quintile return



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

Other traits

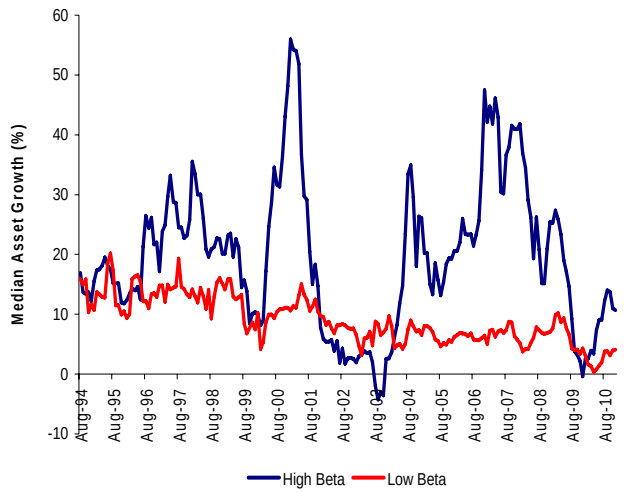
In this section we look beyond the backtesting results to determine if there are any additional favorable or unfavorable characteristics of asset growth.

To investigate additional characteristics, we perform a simple partitioning analysis. First, we partition our universe at each point in time into quartiles based on certain firm characteristic such as beta. High beta companies would belong to the top quartile. Similarly, low beta companies would belong to the bottom quartile. Then we look at the asset growth factor for companies in the top and bottom quartiles at each point in time. For example, if we were interested in analyzing the interaction between beta and asset growth, we would simply calculate the median asset growth rate in the top quartile (high beta firms) and the bottom quartile (low beta firms) at each point in time.

Figure 16 below shows the results of using this type of partitioning analysis to understand the interaction between asset growth and beta. The results are very interesting. Figure 16 shows that low beta firms are associated with low asset growth. This is a promising result given that we found low asset growth companies tend to outperform. By purchasing low beta stocks which are defensive in nature, we are indirectly buying low asset growth stocks which tend to outperform.

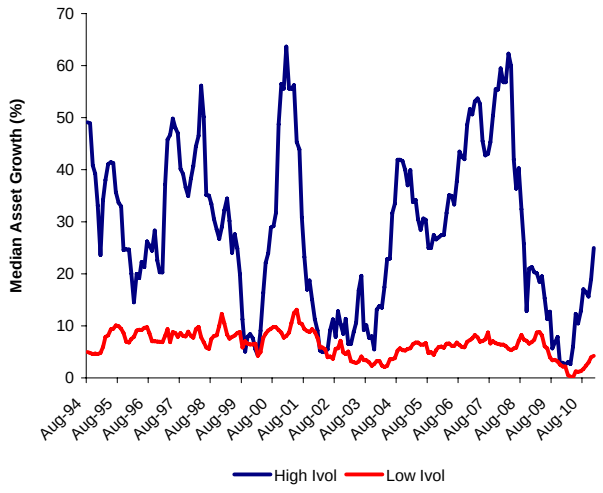
Figure 17 shows the same type of analysis but with idiosyncratic volatility. Again, the results are promising. Low asset growth firms are associated with low stock idiosyncratic volatility. Hence, if we employ a strategy of buying low asset growth firms, then we will also indirectly be buying securities with low stock specific volatility. These types of securities are of course considered to be relatively safer investments.

Figure 16: Beta analysis



Source Compustat, IBES, S&P, Thomson Reuters, Deutsche Bank Quantitative Strategy

Figure 17: Idiosyncratic volatility analysis

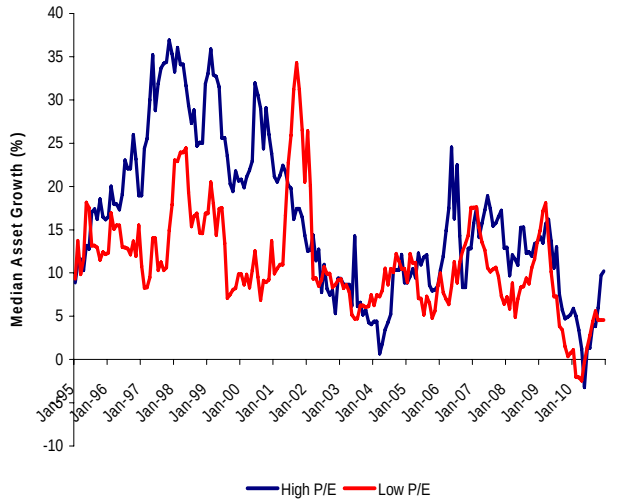


Source: Compustat, IBES, S&P, Thomson Reuters, Deutsche Bank Quantitative Strategy

Furthermore, we focused on the interaction between asset growth and price-to-earnings (P/E). Figure 18 shows that the majority of the time, high asset growth companies are associated with high price-to-earnings. This is yet another positive outcome since the asset growth anomaly involves selling or shorting high asset growth firms (i.e. expensive firms with high price-to-earnings ratio). By purchasing relatively inexpensive securities as measured by P/E, we are indirectly buying lower asset growth firms.

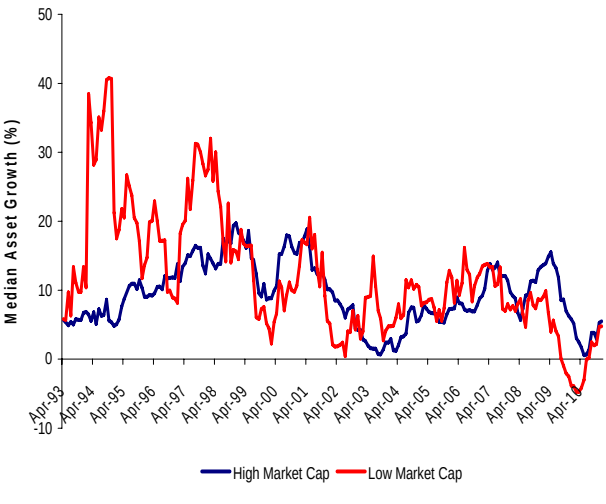
Last, we investigate the interaction between asset growth and market capitalization. The motivation for this is to ensure that there is no apparent size bias inherent in the asset growth factor. We want to be certain that low asset growth firms are not dominated by riskier, small capitalized companies. Figure 19 shows the results of our analysis. Aside from the earliest period, there appears to be no strong association between market cap and asset growth. This indicates to some extent the absence of a dominant size bias in the asset growth factor.

Figure 18: P/E analysis



Source Compustat, IBES, S&P, Thomson Reuters, Deutsche Bank Quantitative Strategy

Figure 19: Market cap analysis



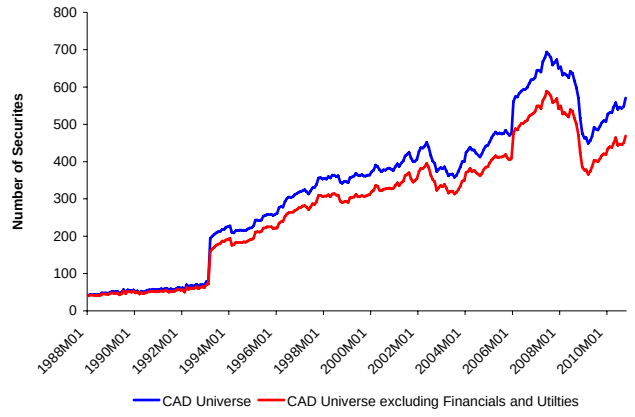
Source: Compustat, IBES, S&P, Thomson Reuters, Deutsche Bank Quantitative Strategy

Does regulation play a role?

One potential bias that we have not considered thus far is a bias inherent in the universe of securities. The universe employed for asset growth factor is the entire Canadian stocks contained in our securities database. Some academics argue that Financials and Utility companies should be removed when implementing the asset growth factor because asset growth in these sectors may be driven by regulatory guidelines rather than economic and corporate needs. We address this issue by backtesting asset growth within a universe that excludes companies within the Financials and Utility sectors.

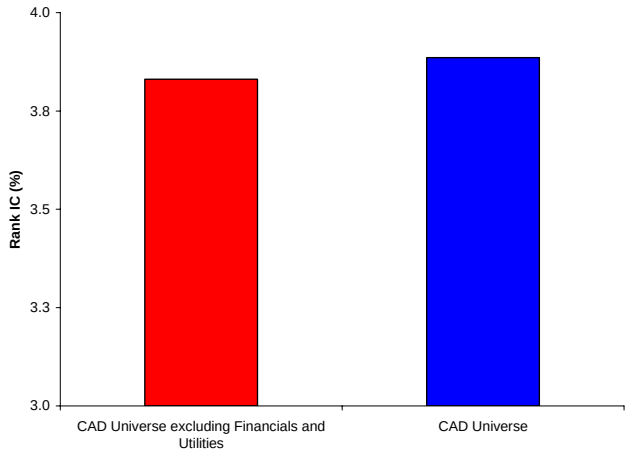
Figure 20 shows the number of stocks in the Canadian universe compared to the same universe of stocks excluding Utilities and Financials. Figure 21 shows the backtesting results of these two distinct universes. Clearly, the removal of Utility and Financial companies from the universe definition does not improve the overall performance. Therefore, we include Utility and Financial companies in the universe of stocks.

Figure 20: Number of stocks in Canadian universe



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

Figure 21: Rank IC for each universe



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

Decomposing asset growth

Asset investments and disinvestments

Typically the next step in the quantitative investing process would be to test whether the combining the asset growth factor into a multi-factor model will reap promising results. However, before proceeding, we feel it's prudent to look more closely at the drivers of asset growth. Decomposing asset growth into its component drivers will give us better insight into why asset growth is a good predictor of subsequent stock returns.

To get started, we briefly review the corporate events associated with asset growth. Figure 22 summarizes the corporate events associated with asset expansion and contraction. Firms typically expand or growth their asset base through acquisitions, buying profit generating equipment/infrastructure, or secondary public offerings. Firms can of course shrink their asset base through spinoffs and share repurchase.

Figure 22: Asset investments/disinvestments events

Expansion of Assets	Contraction of Assets
Acquistions	Spinoffs
Public Offering	Share Repurchase
Loan Initiation	Debt Prepayments
Appreciating Investments	Dividend Policy
Debt Offering	Special Dividends

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

Taking into account these corporate events, we decompose asset growth into the two components: investing and financing. Investing activities are inherently derived from the left hand side of the balance sheet whereas financing is derived from the right hand side of the balance sheet. Since asset growth is the sum of components from the left hand (investing) and right hand side (financing) of the balance sheet, it predictive prowess benefits from its sub-components

The investing component is derived from growth in property plant & equipment (PPE), current assets, cash, and other assets. Similarly the financing component is derived from growth in stock financing, retained earnings, debt, and operating liabilities. Figure 23 below shows the definition of each of the sub-components that derive asset growth.

Figure 23: Investing and financing decomposition

Investing	
Factor	**Definition**
PPE Growth	Year over year change in PPE
Current Asset Growth	Year over year change in current assets excluding Cash
Cash Growth	Year over Year change in cash
Other Asset Growth	Total asset growth - investing factors

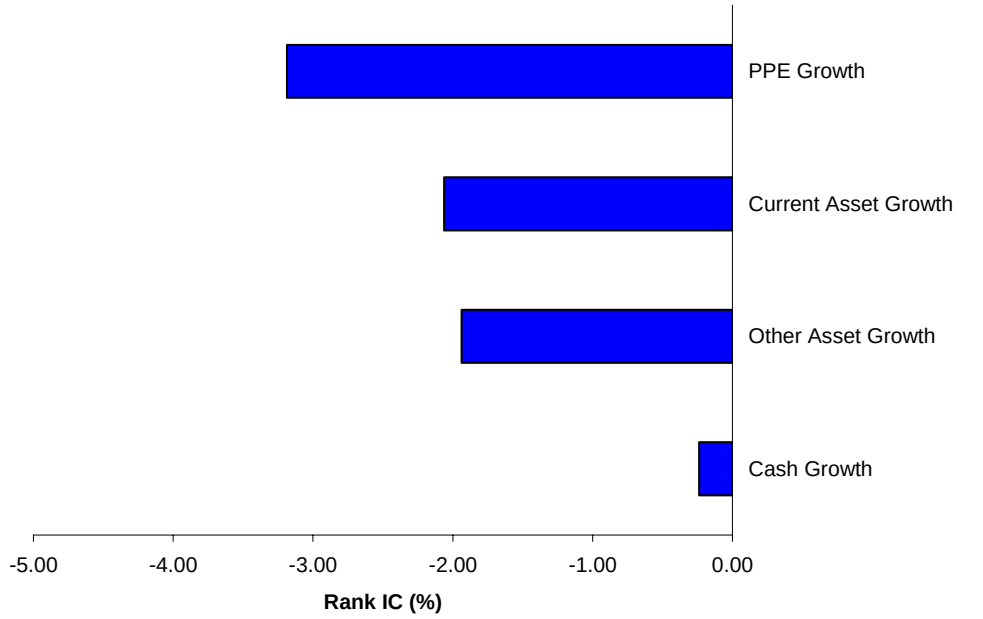
Financing	
Factor	**Definition**
Stock Growth	Prefered shares + common equity + minority interest - retained earnings growth
Retained Earnings Growth	Year over year growth in retained earnings
Debt Growth	Long term debt + debt in current liabilties growth
Operating Liabilites Growth	Total asset growth - financing factors

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

Subcomponent backtests

Now that we have defined each subcomponent, we then backtest each sub-component to determine to what extent asset growth can be explained by these variables. Figure 24 shows the backtesting results for the investing component. PPE growth is the strongest driver of asset growth from an investing perspective. The results indicate that companies with excessive PPE growth underperform on average. This suggests that companies are not efficiently utilizing their operating assets, which may be a result of companies not purchasing operating assets that lead to an increase in shareholder value. The results also suggest that growth in cash is an insignificant driver of asset growth.

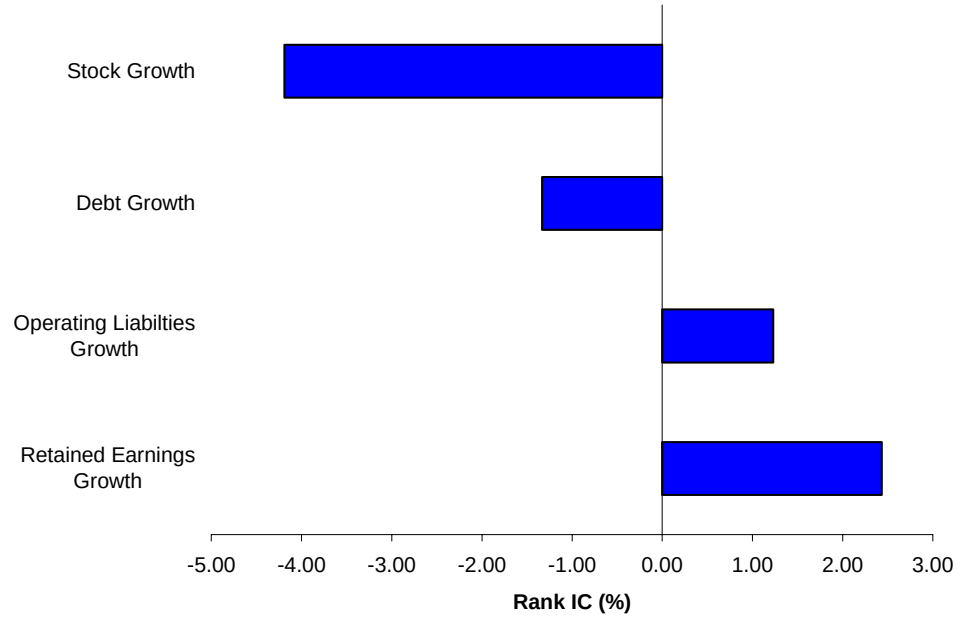
Figure 24: Investing decomposition



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

The key outcome from a financing perspective (Figure 25) is that stock financing growth is the major determinant of asset growth. Companies that grow their asset base through stock financing tend to underperform. The results suggest that companies that increase their asset base though stock financing means such as share issuances, secondary offerings, and acquisitions are not efficiently utilizing the funds raised. Whether it is making unprofitable acquisitions or inadequately investing funds raised, the results suggest that companies who increase their asset base through stock financing tend to underperform. In contrast, Figure 25 shows that companies that grow their retained earnings tend to outperform. This is somewhat intuitive because retained earnings growth is a reflection of net income growth (excluding dividend distribution). So a company growing its retained earnings is likely growing its net income. A growing net income is likely positively correlated to future stock returns.

Figure 25: Financing decomposition



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

In summary, decomposing asset growth into its subcomponents provides a deeper understanding of the major drivers of asset growth. Companies that exhibit excessive PPE expansion and stock issuances should be scrutinized closely. On the other hand, companies that exhibit strong growth in retained earnings on average produce subsequent higher returns. Next, we look at the ultimate test of whether asset growth can add significant value in a multi-factor model.

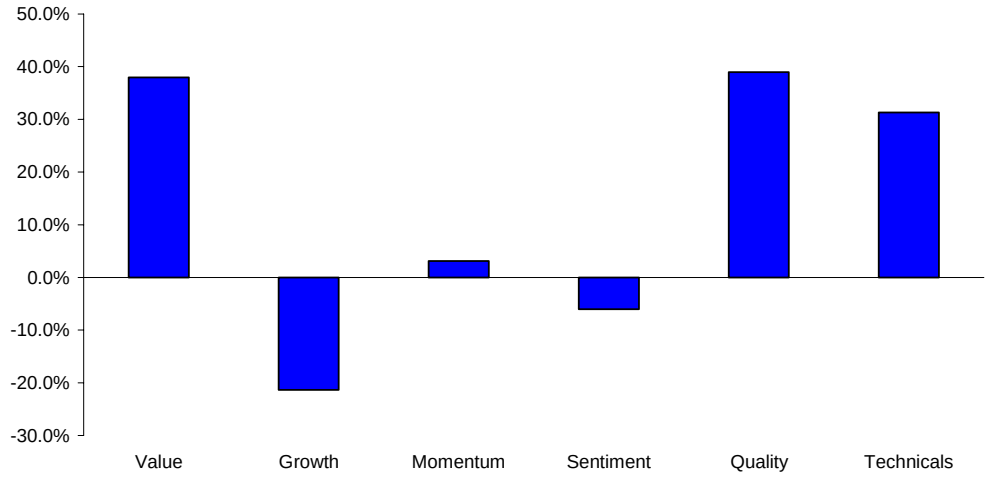
Incorporating asset growth into a multifactor model

Factor correlations

The real test is whether combining the asset growth factor into a multi-factor model will harvest better results. The asset growth factor showed strong predictive power in Canada. However, strong performance is not merely enough to incorporate a new factor into a quantitative model. We must ensure that this factor is somewhat uncorrelated with exiting factors. This is to ensure some diversification in the factor selection.

We analyzed the correlation between the asset growth factor and other standard factors. The figure below shows the average rank IC correlation of asset growth with each factor in six broad style groupings. Overall, the results look promising. Asset growth is weakly correlated with all factor buckets. All factor buckets are less than 40% correlated with the asset growth factor. In addition, asset growth is negatively correlated with the growth and sentiment buckets and essentially uncorrelated with momentum. This result indicates that the asset growth factor is likely to add good diversification benefits when applied to a multi-factor model. We test this presumption next.

Figure 26: Rank IC correlation asset growth and other style buckets

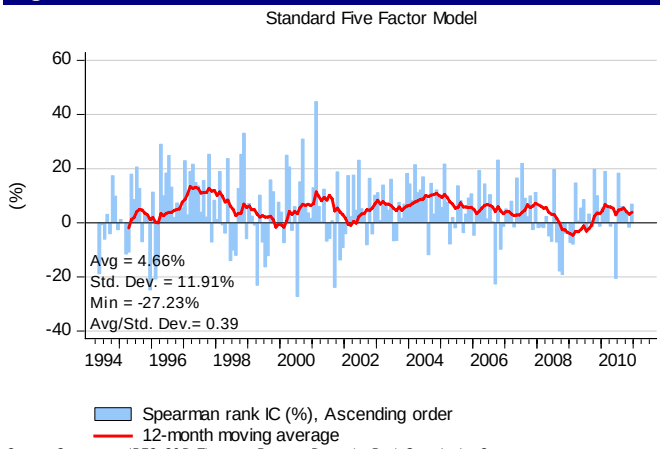


Source: Compustat, IBES, S&P, Thomson Reuters, Deutsche Bank Quantitative Strategy

Multifactor Model

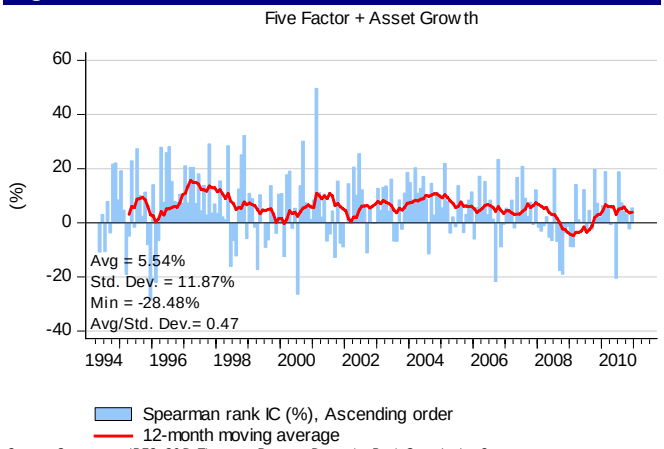
The apex of this analysis will be to test whether the asset growth factor adds value to a multi-factor model. To determine whether its inclusion adds alpha, we backtest the performance of a multi-factor model, with and without the asset growth factor. We start with an equally weighted, five factor model that contains a blend of growth, value, momentum, quality, and sentiment. First, we backtest this standard five factor model and then add the asset growth factor as a sixth factor. The figures below show the Rank IC charts of both models as well as the annualized information ratio. The annualized information ratio is based on quintile portfolios prior to the inclusion of transaction costs. The inclusion of the asset growth factor improves the rank IC and the annualized information ratio by 19% and 13%, respectively.

Figure 27: Five factor model rank IC



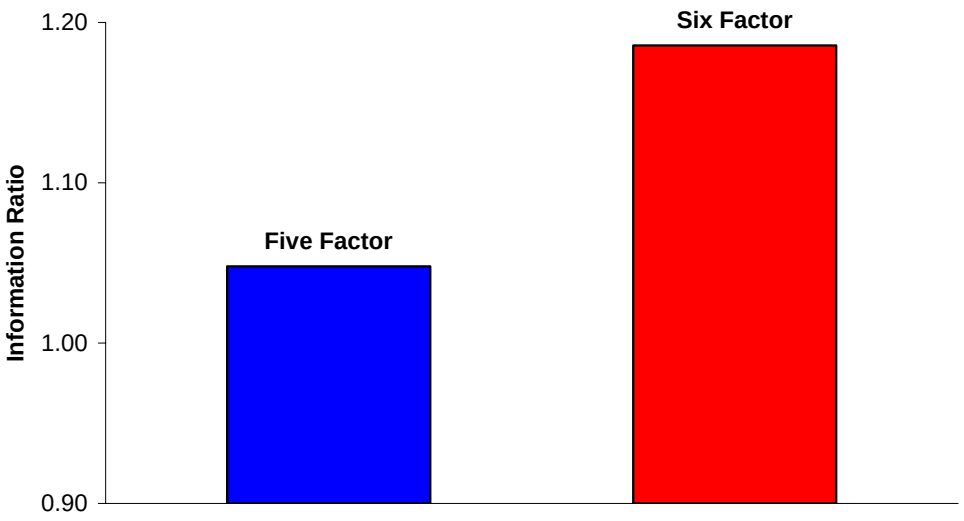
Source: Compustat, IBES, S&P, Thomson Reuters, Deutsche Bank Quantitative Strategy

Figure 28: Six factor model rank IC



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

Figure 29: Annualized information ratio



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

Uncovering the Anomaly

Are investors overreacting?

The asset growth factor showed promising results when included in a multi-factor model. In our last section, we briefly discuss the underlying reasons for the asset growth anomaly. There are three prevalent explanations for the asset growth anomaly:

1. **Risk Based:** The risk-based explanation is prefaced on the notion that companies hold a blend of growth options and existing assets. The growth options that companies hold are uncertain and intrinsically riskier than existing assets. As companies displace their risky growth options for less risky real assets, the asset makeup of the firm becomes inherently less risky. The overall risk of the firm then declines. This reduction in firm risk in associated with lower subsequent performance.
2. **Mispricing Based:** The mispricing-based explanation assumes that investors overreact to information regarding positive asset growth (e.g. acquisitions). This will push stock prices up to the limits restricted by arbitrage costs. As this mispricing unravels, subsequent returns will be dampened.
3. **Agency Based:** Corporate managers sometimes seek out potential growth opportunities in order to fulfill so called "Empire Building" intentions. The tendency to "Empire Build" may conflict and take precedence over the interest of shareholders.

In this section we briefly touch upon the second explanation that the asset growth anomaly is due to mispricing. Essentially, this explanation assumes that investors overreact to announcements regarding an increase in asset growth. Consequently, market perceptions and expectations are overly optimistic towards news about increasing asset growth. To the extent that analyst forecasts are in line with market expectations, we assume that analyst forecasts are inherently biased upwards for firms exhibiting increasing asset growth rates.

If analyst forecasts are biased upwards for firms with high asset growth rates and since firms with high asset growth rates actually underperform, then this would imply that analyst forecast price target estimates are more optimistic for firms with high asset growth rates. Therefore, we test this explanation by analyzing the relationship between analyst forecast price target estimates and asset growth.

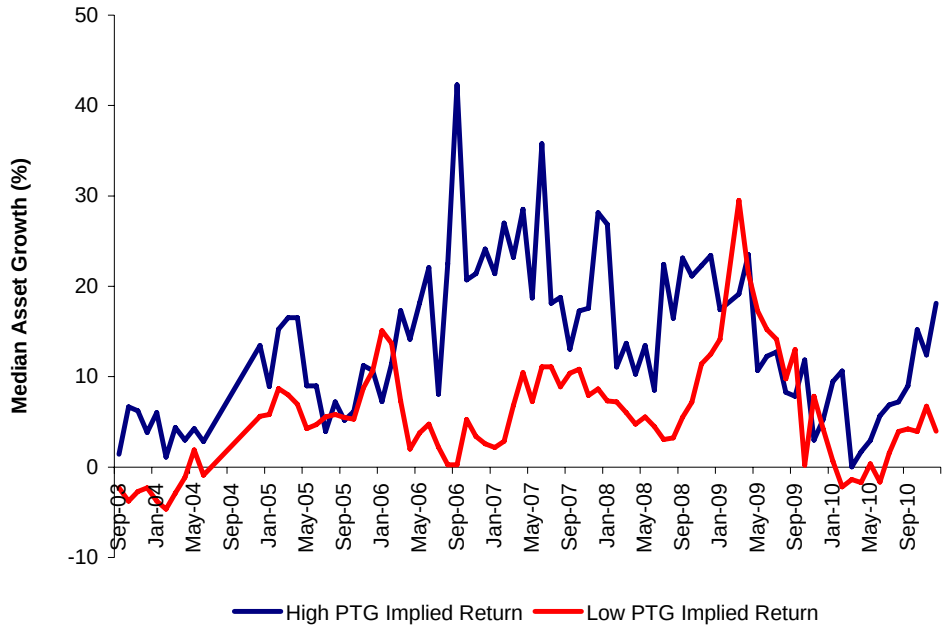
Our proxy for analyst price target estimates is price target implied return (PTIR) which is simply the consensus price target minus the current stock price. The formulaic definition of price target implied return is:

PTIR=[(AnalysisConsensus_PriceTarget)/(CurrentSharePrice)] - 1

To investigate this relationship, we perform the same partitioning based analysis that we employed in the prior sections. First, we partition our universe at each point in time into quartiles based on price target implied return. High PTIR companies would belong to the top quartile. Similarly, low PTIR companies would belong to the bottom quartile. Then we look at the asset growth factor for companies in the top and bottom quartiles at each point in time. Lastly, we simply take the median asset growth rate in the top quartile (high PTIR firms) and the bottom quartile (low PTIR firms) at each point in time.

Figure 30 shows the results of the partitioning analysis. The results are very interesting. The analysis shows that analysts typically give higher price targets to firms with higher asset growth rates and conversely, analysts give lower price targets to firms with lower asset growth rates. However, the backtesting results clearly indicate that firms with higher asset growth rates underperform. This finding lends credence to the mispricing argument. If analyst price targets are an indication of investor tendency, then we would indeed see that high asset growth firms will be mispriced due to overly optimistic expectations.

Figure 30: Asset growth quintile return



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

Appendix A – factor performance review

Every month, we review the performance of about 80 factors from our factor library. Please note that this is only a tiny fraction of our factor library, which includes over 1,200 factors for the Canadian market. We choose these 80 factors to provide a balanced view for each broad factor category.

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 use long/short decile spread for the broad Canada investable universe in this report.

Due to space limitation, we will only present the results for the broad investable universe, three size/style (TSX 60, TSX Composite, and income trust) and 10 GICS sectors on a monthly basis. However, we perform factor backtesting for more sub-universes on a daily basis. Please contact us for customized factor backtesting. For these smaller universes, we present Spearman rank IC instead of long/short decile spread, as for certain sectors (e.g., telecom services), there is not enough number of stocks to form decile portfolios.

Broad Canadian investable universe (Figure 31)

Our Canadian universe of stocks includes all companies that are incorporated in Canada and trade on the TSX including income trusts. Furthermore, we include all stocks that belong to the TSX Composite Index. We have also stipulated certain market capitalization and liquidity constraints.

September was another challenging month for quant in Canada – value, analyst sentiment, quality, and technical factors were mostly negative, while growth and price momentum factors were mixed.

Size and style universe (Figure 32)

We further break down our analysis into: TSX 60, TSX Composite, and income trust.

Although factor performance within the three universes is similar, we see significant divergence in the value category. Value factor actually added alpha in the large cap space, but underperformed significantly in the small-cap universe.

10 GICS sectors (Figure 33)

Lastly, we report factor performance by the 10 GICS sectors: energy, materials, industrials, consumer discretionary, consumer staples, health care, financials, information technology, telecom services, and utilities.

For September, most quant factors generated negative returns in all the 10 sectors.

Figure 31: Canada factor performance, long/short decile spread

Factor Name	Direction[1]	Current # of Stocks	Average (%) Last M	12M Avg	3Y Avg	Since Inception Avg	Std Dev	Max	Min	p-value[2]	# of Months	Avg # of Stocks	%Positive	Avg in Up Mkt (%)	Avg in Dn Mkt (%)	Turnover (two-way)
1. Value																
1 Dividend yield, trailing 12M	Ascending	642	3.84	(0.77)	0.50	0.41	3.92	13.84	(12.90)	0.08	277	386	55.96	(0.66)	2.15	17.16
2 Expected dividend yield	Ascending	642	3.90	(0.70)	(0.03)	0.42	4.11	14.80	(13.88)	0.09	277	386	57.04	(0.75)	2.31	14.36
3 Price-to-operating EPS, trailing 12M, Basic	Descending	396	4.53	0.12	0.88	0.83	3.33	15.68	(8.29)	0.00	201	319	63.68	0.47	1.47	20.09
4 Operating earnings yield, trailing 12M, Basic	Ascending	621	(0.18)	(0.44)	0.28	1.12	5.01	19.42	(12.88)	0.00	201	430	59.20	(0.30)	3.59	14.71
5 Earnings yield, forecast FY1 mean	Ascending	455	(1.64)	(0.37)	0.15	1.04	4.72	22.68	(15.50)	0.00	277	233	58.84	0.18	2.42	19.32
6 Earnings yield, forecast FY2 mean	Ascending	453	0.20	0.08	(0.07)	0.69	4.61	19.61	(17.91)	0.01	277	230	56.68	0.17	1.52	22.37
7 Earnings yield x IBES 5Y growth	Ascending	122	4.13	0.76	0.33	0.34	4.41	14.68	(15.65)	0.28	201	82	53.73	0.56	(0.05)	22.48
8 Sector-relative Operating earnings yield, traili	Ascending	621	(2.11)	0.32	0.47	0.77	3.68	14.99	(10.44)	0.00	201	430	61.69	(0.14)	2.35	18.59
9 History-relative Operating earnings yield, trail	Ascending	506	(3.16)	1.14	(0.23)	0.41	3.89	11.10	(13.55)	0.17	166	319	50.00	0.74	(0.16)	19.78
10 Operating cash flow yield (income stmt def)	Ascending	621	5.61	(0.52)	0.19	0.99	5.61	19.67	(20.13)	0.00	277	339	59.93	(0.14)	2.83	16.23
11 Cash flow yield, FY1 mean	Ascending	410	7.64	(1.55)	0.10	0.71	5.64	27.28	(18.40)	0.07	205	221	57.07	(0.04)	1.98	18.76
12 Free cash flow yield	Ascending	610	1.17	(0.97)	0.10	1.45	4.29	23.74	(9.99)	0.00	240	306	62.92	0.78	2.56	16.25
13 Price-to-sales, trailing 12M	Descending	517	5.06	(0.39)	1.32	0.72	5.40	20.89	(19.03)	0.03	277	313	56.68	0.18	1.59	10.58
14 Price-to-book	Descending	630	9.66	0.06	1.71	0.04	5.30	21.52	(21.67)	0.91	277	344	50.90	(0.39)	0.72	18.25
15 EBITDA/EV	Ascending	583	4.23	(0.83)	(0.02)	0.80	5.37	16.24	(19.21)	0.01	277	294	56.68	(0.19)	2.40	17.52
16 Price-to-book adj for ROE, sector adj	Descending	443	6.47	0.52	1.92	0.40	5.53	27.23	(22.02)	0.25	250	216	52.80	0.13	0.86	27.28
2. Growth																
17 Hist 5Y operating EPS growth	Descending	574	(2.28)	(0.12)	(0.32)	0.63	3.81	13.59	(10.97)	0.03	181	393	54.70	0.06	1.64	10.55
18 Hist 5Y operating EPS acceleration	Ascending	574	0.18	0.50	(0.50)	0.19	3.12	7.23	(13.52)	0.41	181	393	53.59	(0.04)	0.59	14.28
19 IBES 5Y EPS growth	Ascending	115	(5.81)	(0.98)	0.09	0.32	5.04	14.54	(18.47)	0.28	277	73	54.15	0.62	(0.14)	12.92
20 IBES 5Y EPS growth/stability	Ascending	115	(4.43)	(0.98)	0.36	0.34	4.60	16.03	(14.93)	0.22	277	73	51.99	0.33	0.36	12.34
21 IBES LTG EPS mean	Descending	135	(1.42)	(1.66)	(0.35)	0.25	5.63	18.86	(23.17)	0.45	277	80	50.90	(0.95)	2.19	13.62
22 IBES FY2 mean DPS growth	Ascending	323	(1.66)	(0.18)	(0.45)	0.12	4.23	12.74	(25.23)	0.77	104	192	52.88	(0.86)	1.91	27.23
23 IBES FY1 mean EPS growth	Ascending	133	(2.89)	1.97	0.94	0.94	5.05	22.53	(15.49)	0.00	277	79	57.76	1.30	0.36	20.44
24 Year-over-year quarterly EPS growth	Ascending	627	2.91	0.61	(0.55)	1.01	4.06	16.53	(15.98)	0.00	201	431	63.68	0.56	1.78	24.19
25 IBES FY1 mean CFPS growth	Ascending	368	(2.52)	1.06	(0.93)	0.51	4.71	12.49	(18.05)	0.14	194	130	58.25	0.44	0.62	18.18
26 IBES SUE, amortized	Ascending	335	1.26	0.72	(0.57)	0.51	4.04	11.85	(12.65)	0.07	211	137	57.82	0.07	1.27	35.71
3. Price momentum and reversal																
27 Total return, 1D	Descending	617	5.52	1.90	2.29	1.34	3.16	15.15	(6.71)	0.00	277	365	65.70	1.47	1.12	72.94
28 Total return, 21D (1M)	Ascending	617	0.04	0.05	0.76	0.67	4.83	17.29	(20.91)	0.02	277	365	59.21	(0.03)	1.80	72.39
29 Maximum daily return in last 1M (lottery facto	Descending	567	2.27	(1.25)	(0.70)	0.94	5.49	24.97	(17.48)	0.00	277	311	59.57	(0.92)	3.95	61.54
30 21D volatility of volume/price	Ascending	567	4.08	1.41	0.55	0.25	2.72	9.67	(8.96)	0.13	277	311	53.79	(0.17)	0.93	55.20
31 Total return, 252D (12M)	Ascending	595	(4.78)	1.68	(1.26)	1.89	6.06	15.71	(25.56)	0.00	277	355	66.43	1.73	2.16	33.03
32 12M-1M total return	Ascending	595	(4.34)	1.57	(1.18)	1.97	5.76	17.08	(22.99)	0.00	277	355	71.12	1.91	2.06	35.11
33 Price-to-52 week high	Ascending	601	(2.08)	(0.72)	(1.28)	1.73	6.27	22.15	(28.47)	0.00	277	355	65.34	0.05	4.46	42.22
34 Total return, 1260D (60M)	Ascending	484	(8.23)	0.13	(1.27)	0.42	4.42	16.24	(16.65)	0.13	263	268	55.89	0.67	0.00	17.44
4. Sentiment																
35 IBES LTG Mean EPS Revision, 3M	Ascending	113	2.95	0.53	0.95	0.23	4.34	19.74	(15.28)	0.38	277	73	52.35	0.22	0.25	43.94
36 IBES FY1 Mean EPS Revision, 3M	Ascending	424	(3.27)	0.73	0.02	1.63	3.88	13.46	(17.20)	0.00	277	222	68.23	1.23	2.26	39.24
37 IBES FY1 EPS up/down ratio, 3M	Ascending	419	(0.74)	1.11	0.15	1.52	3.25	11.50	(14.85)	0.00	277	210	70.76	1.33	1.81	41.77
38 Expectation gap, short-term - long-term	Ascending	116	0.40	0.54	(0.50)	0.45	5.32	24.58	(16.72)	0.18	255	57	53.73	0.74	(0.02)	28.13
39 IBES FY1 Mean CFPS Revision, 3M	Ascending	387	(1.46)	(0.07)	0.00	1.63	3.77	13.52	(16.23)	0.00	202	209	68.81	1.12	2.50	44.27
40 IBES FY1 Mean SAL Revision, 3M	Ascending	395	(1.75)	0.91	(0.20)	0.26	6.00	16.71	(30.03)	0.60	145	216	61.38	(0.09)	0.84	42.23
41 IBES FY1 Mean FFO Revision, 3M	Ascending	45	(1.59)	1.01	0.32	0.66	4.28	12.00	(8.07)	0.24	59	36	54.24	(0.10)	2.03	42.93
42 IBES FY1 Mean DPS Revision, 3M	Ascending	188	0.68	0.29	(0.64)	0.02	3.85	11.92	(23.73)	0.95	98	142	53.06	(0.41)	0.85	43.41
43 IBES FY1 Mean ROE Revision, 3M	Ascending	300	2.36	0.55	(0.74)	0.75	4.58	8.53	(32.10)	0.11	98	192	65.31	0.60	1.02	39.18
44 Recommendation, mean	Descending	135	(0.33)	0.57	(0.42)	0.00	4.25	16.56	(11.62)	1.00	206	91	51.46	0.63	(1.07)	28.70
45 Mean recommendation revision, 3M	Ascending	113	(3.19)	1.04	0.49	0.17	3.80	13.34	(13.62)	0.54	203	82	53.69	0.34	(0.13)	56.39
46 Target price implied return	Ascending	135	(1.15)	1.77	1.22	0.28	6.97	27.33	(19.03)	0.63	139	100	47.48	1.69	(2.07)	44.55
47 Mean target price revision, 3M	Ascending	113	(4.24)	0.26	(0.30)	1.29	7.35	18.53	(27.17)	0.04	136	90	62.50	0.60	2.43	42.30
5. Quality																
48 ROE, trailing 12M	Ascending	613	1.56	(0.77)	0.01	1.20	5.08	19.01	(14.40)	0.00	201	426	59.20	(0.14)	3.55	10.54
49 Return on invested capital (ROIC)	Ascending	620	1.26	(0.73)	(0.11)	1.18	4.95	19.90	(13.69)	0.00	201	429	60.70	(0.19)	3.58	10.25
50 Sales to total assets (asset turnover)	Ascending	621	5.94	(1.51)	0.00	0.54	5.04	21.85	(13.84)	0.07	277	337	55.96	0.04	1.36	7.45
51 Operating profit margin	Ascending	514	0.58	0.55	0.18	0.47	4.04	12.41	(10.63)	0.05	277	307	54.15	0.55	0.35	10.55
52 Current ratio	Descending	533	7.10	(1.24)	(0.32)	0.39	5.03	14.88	(21.07)	0.20	277	303	54.15	(0.47)	1.77	11.54
53 Long-term debt/equity	Ascending	628	3.50	(1.54)	(0.33)	0.24	4.14	12.29	(10.70)	0.34	277	342	54.87	(0.55)	1.51	9.88
54 Altman's z-score	Descending	532	8.35	(0.41)	0.80	0.20	4.93	17.29	(16.49)	0.51	277	289	53.79	(0.23)	0.89	13.13
55 Merton's distance to default	Ascending	428	(4.10)	(0.67)	(0.93)	0.32	4.84	14.22	(25.15)	0.27	277	243	54.87	(0.96)	2.38	28.31
56 Ohlson default model	Descending	499	(4.10)	0.69	(0.06)	0.36	4.35	13.52	(18.37)	0.20	240	256	52.92	0.13	0.74	13.19
57 Campbell, Hilscher, and Szilagyi model	Descending	498	(1.47)	(0.29)	(0.28)	1.41	6.91	28.07	(24.07)	0.00	266	193	60.15	0.40	3.06	20.60
58 Accruals (Sloan 1996 def)	Descending	519	0.40	0.23	0.39	0.18	3.82	16.80	(12.47)	0.44	277	246	54.15	0.14	0.24	19.65
59 Firm-specific discretionary accruals	Ascending	294	3.13	(0.65)	0.22	0.02	4.66	13.07	(16.74)	0.96	179	177	48.60	0.14	(0.20)	11.39
60 Hist 5Y operating EPS stability, coef of deterr	Descending	574	(0.79)	(0.04)	(0.06)	0.12	2.66	8.03	(7.34)	0.55	181	393	52.49	(0.09)	0.48	15.76
61 IBES 5Y EPS stability	Descending	115	0.35	(1.06)	0.21	0.21	4.52	15.52	(15.26)	0.43	277	73	49.82	(0.59)	1.51	8.78
62 IBES FY1 EPS dispersion	Descending	389	(4.57)	(1.44)	(1.20)	0.29	4.61	19.74	(26.12)	0.29	277	207	54.51	(0.79)	2.05	33.20
63 Payout on trailing operating EPS	Descending	388	(3.26)	0.59	(0.45)	0.03	3.70	9.63	(10.46)	0.90	277	244	48.74	0.73	(1.11)	19.38
64 YoY change in # of shares outstanding	Descending	604	3.23	(1.08)	(0.16)	1.49	5.36	19.52	(14.28)	0.00	277	243	64.26	0.12	3.71	14.94
65 YoY change in debt outstanding	Descending	396	(1.99)	0.50	0.06	0.15	4.88	21.15	(20.02)	0.61	277	170	51.99	0.31	(0.10)	18.60
66 Net external financing/net operating assets	Ascending	617	6.18	(0.99)	0.40	1.02	4.71	15.24	(16.40)	0.00	277	331	61.37	(0.08)	2.79	14.48
67 Piotroski's F-score	Ascending	474	3.51	(0.31)	(0.75)	1.45	5.71	21.17	(17.06)	0.00	191	259	61.78	(0.35)	4.62	29.41
68 Mohanram's G-score	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6. Technicals																
69 # of days to cover short	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
70 CAPM beta, 5Y monthly	Descending	588	1.74	(1.98)	(0.95)	0.49	6.55	26.01	(17.61)	0.26	227	363	50.66	(1.85)	4.49	11.69
71 CAPM idosyncratic vol, 1Y daily	Descending	597	2.18	(1.49)	(1.14)	0.95	6.44	25.24	(19.28)	0.01	277	341	57.76	(1.13)	4.31	10.51
72 Realized vol, 1Y daily	Descending	597	2.73	(1.61)	(1.30)	0.97	6.68	25.71	(19.21)	0.02	277	341	58.84	(1.34)	4.70	10.81
73 Skewness, 1Y daily	Descending	597	0.12	(1.69)	(1.06)	0.02	3.00	13.60	(10.96)	0.93	277	341	53.43	(0.46)	0.78	26.34
74 Kurtosis, 1Y daily	Descending	597	(2.77)	0.26	(0.33)	0.45	3.17	12.43	(10.98)	0.02	277	341	58.12	0.45	0.46	24.42
75 Idiosyncratic vol surprise	Descending	592	3.24	2.22	(0.44)	0.57	3.43	10.97	(14.66)	0.01	276	339	57.97	0.18	1.20	33.23
76 Normalized abnormal volume	Ascending	642	(4.79)	0.25	0.12	0.01	2.87	10.65	(9.84)	0.97	277	385	51.99	0.81	(1.29)	35.89
77 Float turnover, 12M	Ascending	642	(2.18)	1.57	1.18	0.77	4.02	12.04	(14.47)	0.00	277	386	60.29	1.94	(1.13)	10.48
78 Moving average crossover, 15W-36W	Ascending	448	(7.28)	0.02	(1.06)	1.76	6.37	20.39	(20.82)	0.00	277	241	68.59	1.13	2.78	33.14
79 Log float-adj capitalization	Descending	642	4.96	1.65	1.42	0.14	3.72	17.01	(13.04)	0.52	277	386	49.82	0.30	(0.11)	10.71
80 # of month in the database	Ascending	642	0.96	(1.17)	(0.42)	0.52	3.46	16.62	(10.19)	0.01	277	386	55.96	(0.03)	1.40	9.99

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.

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

Figure 32: Factor performance by size and style indices, Spearman rank IC

Factor Name	Last Month				Three-year			
	Universe	S&P/TSX 60	S&P/TSX Composite	Income Trust	Universe	S&P/TSX 60	S&P/TSX Composite	Income Trust
1. Value								
1 Dividend yield, trailing 12M	16.41	14.20	25.28	(2.23)	6.02	2.06	4.06	3.65
2 Expected dividend yield	15.89	9.42	25.21	(1.92)	5.99	1.86	3.82	3.44
3 Price-to-operating EPS, trailing 12M, Basic	16.49	(1.88)	5.51	19.04	3.30	1.47	2.60	2.00
4 Operating earnings yield, trailing 12M, Basic	11.52	(5.46)	12.68	12.73	4.43	1.09	2.05	3.95
5 Earnings yield, forecast FY1 mean	8.11	13.44	10.34	(1.76)	2.96	3.39	0.43	1.83
6 Earnings yield, forecast FY2 mean	3.89	15.46	1.11	(6.45)	1.65	3.13	1.36	0.64
7 Earnings yield x IBES 5Y growth	15.02	(1.65)	7.67	NA	1.13	2.35	0.89	NA
8 Sector-rel Operating earnings yield, trailing 12M, Basic	(2.83)	(15.53)	(3.67)	5.41	3.75	0.59	2.07	5.27
9 Hist-rel Operating earnings yield, trailing 12M, Basic	(14.74)	35.90	(18.42)	6.35	0.22	3.60	(0.39)	2.78
10 Operating cash flow yield (income stmt def)	22.27	16.09	19.39	28.73	3.77	2.21	1.27	4.68
11 Cash flow yield, FY1 mean	26.51	19.91	25.65	15.48	3.65	4.25	1.50	5.09
12 Free cash flow yield	6.02	(3.79)	3.52	18.10	2.06	1.70	(0.25)	(1.19)
13 Price-to-sales, trailing 12M	18.94	(5.78)	6.26	(31.37)	2.95	(1.18)	0.46	0.19
14 Price-to-book	23.10	4.28	9.74	(12.37)	3.89	4.46	3.34	0.27
15 EBITDA/EV	17.47	3.75	7.58	18.87	3.35	1.68	0.57	5.00
16 Price-to-book adj for ROE, sector adj	12.47	(10.56)	(2.78)	(12.79)	3.89	3.13	3.60	2.50
2. Growth								
17 Hist 5Y operating EPS growth	(5.64)	25.68	(11.07)	(7.61)	0.93	5.84	(2.30)	2.51
18 Hist 5Y operating EPS acceleration	(4.41)	30.42	(4.61)	6.26	(0.72)	3.04	0.06	0.96
19 IBES 5Y EPS growth	(17.49)	(12.51)	(19.00)	NA	(0.46)	(3.18)	(0.87)	NA
20 IBES 5Y EPS growth/stability	(12.79)	(9.27)	(12.49)	NA	0.47	(2.62)	0.05	NA
21 IBES LTG EPS mean	(6.92)	3.55	(7.57)	NA	(0.28)	0.36	(0.27)	NA
22 IBES FY2 mean DPS growth	(9.65)	(12.03)	(10.99)	2.18	0.90	(0.74)	0.22	(0.24)
23 IBES FY1 mean EPS growth	(13.40)	4.64	(10.82)	NA	0.83	0.83	0.17	NA
24 Year-over-year quarterly EPS growth	7.62	29.37	1.97	12.14	(0.42)	4.73	(2.48)	(0.27)
25 IBES FY1 mean CFPS growth	(10.33)	8.44	9.25	(16.86)	(1.63)	4.39	1.85	(1.37)
26 IBES SUE, amortized	2.25	1.63	2.34	13.77	0.73	2.50	(1.89)	1.90
3. Price momentum and reversal								
27 Total return, 1D	16.31	3.03	21.88	(26.97)	5.41	5.85	5.47	5.17
28 Total return, 21D (1M)	2.91	(9.35)	(7.69)	(2.64)	0.51	3.38	0.53	(2.11)
29 Maximum daily return in last 1M (lottery factor)	12.57	(6.15)	7.05	1.99	3.52	0.11	0.82	(2.01)
30 21D volatility of volume/price	(2.18)	9.08	15.06	(1.02)	1.82	3.22	2.23	2.31
31 Total return, 252D (12M)	(13.71)	2.23	(12.85)	10.14	(2.25)	(4.29)	(4.23)	(1.25)
32 12M-1M total return	(14.21)	(0.28)	(13.79)	9.85	(2.02)	(3.57)	(4.07)	(0.38)
33 Price-to-52 week high	(4.58)	13.31	0.72	6.47	(0.62)	5.57	(4.92)	2.28
34 Total return, 1260D (60M)	(23.87)	(18.59)	(23.34)	(16.05)	(3.29)	(3.75)	(3.49)	0.01
4. Sentiment								
35 IBES LTG Mean EPS Revision, 3M	14.17	14.59	15.83	NA	2.46	5.35	3.01	NA
36 IBES FY1 Mean EPS Revision, 3M	(7.78)	(21.26)	(10.79)	(11.14)	1.26	(2.64)	(2.52)	4.05
37 IBES FY1 EPS up/down ratio, 3M	(7.58)	(18.10)	(7.39)	5.68	1.82	(1.36)	(1.97)	5.08
38 Expectation gap, short-term - long-term	(2.98)	(2.11)	1.78	NA	(1.48)	3.27	(1.44)	NA
39 IBES FY1 Mean CFPS Revision, 3M	(9.64)	(27.99)	(10.58)	(7.30)	1.26	(2.73)	(1.39)	4.06
40 IBES FY1 Mean SAL Revision, 3M	(0.91)	3.67	1.15	(15.25)	1.13	(1.18)	(1.88)	8.38
41 IBES FY1 Mean FFO Revision, 3M	(13.33)	NA	(6.19)	(11.62)	0.08	NA	0.92	(0.46)
42 IBES FY1 Mean DPS Revision, 3M	(1.77)	(33.04)	(1.32)	3.52	(1.56)	(0.72)	(2.96)	3.69
43 IBES FY1 Mean ROE Revision, 3M	5.00	(11.76)	(2.27)	25.59	0.29	(0.43)	(2.78)	11.23
44 Recommendation, mean	3.93	19.09	8.41	NA	1.62	0.49	1.43	NA
45 Mean recommendation revision, 3M	9.64	19.03	2.93	NA	(2.47)	2.42	(3.25)	NA
46 Target price implied return	(2.35)	(4.10)	(7.86)	NA	4.72	7.46	5.41	NA
47 Mean target price revision, 3M	(17.53)	(37.15)	(20.11)	NA	(1.31)	(3.67)	(2.45)	NA
5. Quality								
48 ROE, trailing 12M	9.24	(2.33)	9.67	2.47	3.91	(2.35)	0.31	4.17
49 Return on invested capital (ROIC)	7.49	(8.83)	4.21	(0.75)	3.42	(2.53)	0.26	3.70
50 Sales to total assets (asset turnover)	18.42	(10.57)	7.45	25.60	2.33	1.17	(0.44)	1.06
51 Operating profit margin	(2.33)	(4.83)	1.50	5.64	1.45	1.39	0.60	2.98
52 Current ratio	20.02	41.11	31.66	16.59	1.29	2.62	1.07	0.88
53 Long-term debt/equity	15.16	3.47	19.99	4.95	2.25	1.73	0.39	0.16
54 Altman's z-score	22.64	22.55	28.11	(5.56)	2.46	3.03	2.41	3.37
55 Merton's distance to default	(12.01)	9.47	(7.42)	(30.22)	0.71	4.22	(1.75)	3.23
56 Ohlson default model	(10.35)	(14.72)	(13.23)	11.31	1.57	(1.96)	0.38	(1.36)
57 Campbell, Hilscher, and Szilagyi model	(1.58)	(6.26)	(5.27)	(8.71)	2.71	(2.28)	(0.13)	2.84
58 Accruals (Sloan 1996 def)	6.00	25.37	12.41	14.53	1.27	5.34	1.05	(1.68)
59 Firm-specific discretionary accruals	(15.67)	6.47	(20.46)	8.36	(1.88)	4.62	(0.88)	(1.27)
60 Hist 5Y operating EPS stability, coef of determination	4.89	(6.81)	2.26	(8.85)	0.36	2.00	(0.79)	2.80
61 IBES 5Y EPS stability	(2.08)	19.88	0.83	NA	0.43	0.63	0.02	NA
62 IBES FY1 EPS dispersion	(7.08)	19.95	1.65	61.27	0.03	3.87	(2.65)	13.77
63 Payout on trailing operating EPS	11.11	(22.27)	22.49	21.45	5.25	(1.77)	4.43	0.57
64 YoY change in # of shares outstanding	15.57	0.14	14.11	(22.72)	0.83	(0.96)	(1.99)	2.13
65 YoY change in debt outstanding	1.59	16.42	(1.62)	10.45	(0.01)	0.61	(1.51)	1.37
66 Net external financing/net operating assets	20.24	16.68	13.94	(9.83)	4.78	2.72	1.85	(1.37)
67 Piotroski's F-score	7.92	(5.14)	8.38	(17.52)	1.19	1.17	(1.21)	2.92
68 Mohanram's G-score	NA	NA	NA	NA	NA	NA	NA	NA
6. Technicals								
69 # of days to cover short	NA	NA	NA	NA	NA	NA	NA	NA
70 CAPM beta, 5Y monthly	10.46	(11.90)	10.41	7.28	1.74	(1.08)	(0.17)	3.34
71 CAPM idosyncratic vol, 1Y daily	14.86	0.51	22.05	14.67	4.07	(2.31)	(0.04)	(0.56)
72 Realized vol, 1Y daily	16.32	(4.77)	20.68	14.28	4.28	(3.12)	0.11	(0.60)
73 Skewness, 1Y daily	4.55	2.98	(1.28)	0.41	0.08	0.55	(1.52)	0.31
74 Kurtosis, 1Y daily	(4.63)	(1.91)	(4.89)	17.20	0.69	(1.58)	0.08	(1.85)
75 Idiosyncratic vol surprise	7.05	0.24	3.69	(5.62)	0.39	(1.49)	0.00	2.04
76 Normalized abnormal volume	(9.04)	16.49	4.63	(18.99)	1.57	1.70	1.36	0.87
77 Float turnover, 12M	14.26	2.53	(16.26)	(11.65)	2.15	2.02	0.99	(0.26)
78 Moving average crossover, 15W-36W	(20.03)	(7.52)	(18.65)	(1.49)	(1.97)	(5.12)	(2.59)	(2.33)
79 Log float-adj capitalization	(10.10)	(1.36)	5.06	25.24	1.16	3.02	(2.24)	(0.80)
80 # of month in the database	8.20	(7.23)	10.97	11.36	2.06	1.06	(0.94)	0.66

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

Figure 33: Factor performance by GICS sectors, Spearman rank IC

Factor Name	Last Month										
	Universe	Energy	Materials	Industrial	Consumer Disc	Consumer Staples	Health Care	Financials	Info Tech	Telecom Services	Utilities
1. Value											
1 Dividend yield, trailing 12M	16.41	(14.59)	9.95	17.20	17.83	(10.33)	(20.22)	2.58	(38.14)	(52.25)	40.31
2 Expected dividend yield	15.89	(14.44)	10.31	12.95	19.09	(10.64)	10.79	6.92	(38.14)	(52.25)	40.31
3 Price-to-operating EPS, trailing 12M, Basic	16.49	16.70	43.13	8.06	0.24	(8.77)	(7.14)	12.54	1.48	(77.14)	(16.36)
4 Operating earnings yield, trailing 12M, Basic	11.52	(4.57)	2.11	18.15	4.13	(12.46)	16.50	7.73	(10.45)	(85.71)	(5.26)
5 Earnings yield, forecast FY1 mean	8.11	(8.53)	21.59	14.41	(2.13)	(36.18)	25.29	(13.63)	7.04	(94.29)	(12.35)
6 Earnings yield, forecast FY2 mean	3.89	(9.83)	14.41	20.39	3.85	(1.35)	12.50	(9.15)	25.80	(94.29)	5.88
7 Earnings yield x IBES 5Y growth	15.02	23.83	8.44	69.29	45.93	12.73	NA	43.38	8.57	NA	NA
8 Hist-rel Operating earnings yield, trailing 12M,	(14.74)	0.21	(0.96)	(21.74)	(17.27)	(9.70)	(28.43)	19.08	(10.78)	30.00	(1.47)
9 Operating cash flow yield (income stmt def)	22.27	9.69	2.24	17.03	(13.58)	(27.26)	8.40	2.86	0.99	(42.86)	2.71
10 Cash flow yield, FY1 mean	26.51	4.77	19.96	7.72	(19.11)	(47.19)	23.64	(16.33)	(13.38)	(82.86)	(2.86)
11 Free cash flow yield	6.02	2.68	11.16	(12.16)	(8.98)	(10.14)	25.58	7.85	(15.49)	(85.71)	(14.14)
12 Price-to-sales, trailing 12M	18.94	6.32	38.56	21.41	(3.69)	(21.71)	(12.98)	(9.81)	23.38	(28.57)	15.79
13 Price-to-book	23.10	(19.01)	21.32	21.18	(9.63)	29.64	20.84	(2.94)	(9.52)	0.00	(26.49)
14 EBITDA/EV	17.47	4.74	0.11	4.83	(2.95)	(40.88)	7.27	(1.56)	(12.53)	(60.71)	0.18
2. Growth											
15 Hist 5Y operating EPS growth	(5.64)	(15.05)	6.54	0.36	(7.10)	(15.60)	(10.39)	15.89	(26.00)	(60.71)	(36.52)
16 Hist 5Y operating EPS acceleration	(4.41)	6.95	0.30	(23.63)	(7.92)	(29.22)	5.32	12.28	25.89	50.00	18.87
17 IBES 5Y EPS growth	(17.49)	35.79	(17.31)	(5.29)	(12.09)	(9.09)	NA	32.71	25.71	NA	NA
18 IBES 5Y EPS growth/stability	(12.79)	25.44	(10.54)	(5.29)	(27.24)	(0.61)	NA	(35.40)	(8.57)	NA	NA
19 IBES LTG EPS mean	(6.92)	1.53	2.20	(54.57)	64.40	(26.14)	NA	26.95	(35.71)	NA	NA
20 IBES FY2 mean DPS growth	(9.65)	(15.75)	(3.32)	19.23	3.84	(48.95)	67.08	(7.42)	38.27	(60.00)	(24.26)
21 IBES FY1 mean EPS growth	(13.40)	(3.72)	0.73	2.45	8.57	11.52	NA	21.98	(10.71)	NA	NA
22 Year-over-year quarterly EPS growth	7.62	15.18	18.10	(14.86)	7.62	(50.53)	22.78	14.44	(10.05)	14.29	(16.54)
23 IBES FY1 mean CFPS growth	(10.33)	1.51	1.54	6.05	10.87	(5.44)	(21.67)	(14.66)	(13.08)	42.86	(40.00)
24 IBES SUE, amortized	2.25	0.96	(8.06)	12.44	(12.00)	30.65	(38.10)	14.29	(18.57)	(31.43)	(21.76)
3. Price momentum and reversal											
25 Total return, 1D	16.31	8.41	8.63	2.26	(17.14)	(14.40)	1.04	22.69	(16.88)	(30.63)	34.40
26 Total return, 21D (1M)	2.91	(7.17)	(4.86)	(4.34)	(5.85)	10.15	17.92	13.30	1.42	(21.43)	25.44
27 Maximum daily return in last 1M (lottery factor	12.57	(9.18)	4.26	5.23	(17.21)	(17.15)	2.45	2.45	(6.03)	77.14	8.77
28 21D volatility of volume/price	(2.18)	(9.33)	(15.65)	11.08	(2.30)	10.85	35.78	8.54	(22.92)	(14.29)	(13.73)
29 Total return, 252D (12M)	(13.71)	(1.37)	(3.58)	(15.03)	44.84	(13.98)	(8.57)	(3.51)	14.71	67.86	(16.32)
30 12M-1M total return	(14.21)	(2.12)	(4.28)	(15.23)	39.75	(26.22)	(19.55)	3.03	11.29	67.86	20.53
31 Price-to-52 week high	(4.58)	0.48	(4.99)	7.78	28.39	(27.11)	1.17	(21.05)	(3.80)	(46.43)	3.68
32 Total return, 1260D (60M)	(23.87)	(10.33)	(15.30)	(23.35)	14.50	28.17	11.87	1.81	3.01	NA	(34.80)
4. Sentiment											
33 IBES LTG Mean EPS Revision, 3M	14.17	(23.55)	43.32	(26.52)	37.32	16.54	NA	(5.84)	(20.00)	NA	NA
34 IBES FY1 Mean EPS Revision, 3M	(7.78)	(6.73)	(9.72)	(33.90)	(10.11)	(41.22)	58.45	(2.79)	24.09	8.57	(64.40)
35 IBES FY1 EPS up/down ratio, 3M	(7.58)	(8.30)	(11.80)	(23.09)	(0.95)	(31.66)	35.79	(3.36)	16.44	2.86	(19.03)
36 Expectation gap, short-term - long-term	(2.98)	(10.01)	5.49	(12.99)	(9.01)	7.88	NA	14.76	NA	NA	NA
37 IBES FY1 Mean CFPS Revision, 3M	(9.64)	(2.77)	(9.91)	(9.43)	(15.08)	(51.93)	27.27	(21.39)	(36.54)	31.43	(3.30)
38 IBES FY1 Mean SAL Revision, 3M	(0.91)	(3.17)	(0.98)	9.65	29.03	(14.44)	20.00	22.58	12.31	8.57	14.64
39 IBES FY1 Mean FFO Revision, 3M	(13.33)	NA	NA	NA	NA	NA	NA	(16.57)	NA	NA	NA
40 IBES FY1 Mean DPS Revision, 3M	(1.77)	(15.71)	7.66	(6.77)	(18.42)	23.65	NA	7.28	NA	NA	6.71
41 IBES FY1 Mean ROE Revision, 3M	5.00	4.16	(1.37)	10.51	(0.78)	33.82	NA	19.53	24.58	30.00	(30.11)
42 Recommendation, mean	3.93	(13.54)	(8.24)	28.36	(2.89)	(1.83)	NA	(19.46)	(50.00)	NA	NA
43 Mean recommendation revision, 3M	9.64	13.44	8.72	49.87	28.37	35.00	NA	(0.98)	20.00	NA	NA
44 Target price implied return	(2.35)	(0.89)	(20.31)	(3.43)	25.71	(30.91)	NA	14.55	7.14	NA	NA
45 Mean target price revision, 3M	(17.53)	6.52	(17.98)	12.50	(19.58)	(33.33)	NA	(8.82)	(14.29)	NA	NA
5. Quality											
46 ROE, trailing 12M	9.24	(8.81)	2.48	7.84	12.55	(18.91)	32.69	5.53	(35.47)	(85.71)	(6.67)
47 Return on invested capital (ROIC)	7.49	(6.88)	0.29	10.13	24.04	(8.73)	32.81	(3.96)	(36.32)	(78.57)	7.37
48 Sales to total assets (asset turnover)	18.42	(2.01)	11.28	(12.33)	(1.59)	(46.74)	21.07	18.12	1.59	(53.57)	4.81
49 Operating profit margin	(2.33)	15.59	(28.96)	(1.08)	(24.41)	(42.50)	(7.19)	20.83	(12.96)	17.86	(14.56)
50 Current ratio	20.02	7.17	(15.76)	1.44	5.91	2.44	(2.73)	(2.88)	7.99	3.57	(2.71)
51 Long-term debt/equity	15.16	(2.01)	17.33	11.41	21.41	8.92	6.03	(2.83)	25.77	(60.71)	34.91
52 Altman's z-score	22.64	(5.75)	(16.96)	8.43	(23.76)	(33.58)	(5.97)	20.75	7.56	(10.71)	16.82
53 Merton's distance to default	(12.01)	(23.85)	(16.25)	0.65	(24.28)	(16.38)	3.57	(33.30)	(8.13)	NA	(17.37)
54 Ohlson default model	(10.35)	(5.93)	(15.65)	3.66	2.07	(24.48)	34.39	26.84	18.62	(53.57)	15.79
55 Campbell, Hilscher, and Szilagyi model	(1.58)	(16.25)	(3.16)	14.23	15.18	11.69	26.76	7.57	(45.83)	60.00	(15.88)
56 Accruals (Sloan 1996 def)	6.00	(11.55)	9.82	(2.19)	(20.41)	14.92	(6.84)	(28.24)	(13.16)	71.43	(8.27)
57 Firm-specific discretionary accruals	(15.67)	2.29	(11.18)	5.69	NA	NA	NA	NA	NA	NA	NA
58 Hist 5Y operating EPS stability, coef of detern	4.89	12.18	3.61	(12.57)	10.66	(20.82)	17.01	13.36	(25.40)	(14.29)	(15.20)
59 IBES 5Y EPS stability	(2.08)	38.07	9.23	26.18	(44.51)	(12.73)	NA	(13.73)	(2.86)	NA	NA
60 IBES FY1 EPS dispersion	(7.08)	(25.85)	(8.07)	6.08	(3.38)	(42.83)	20.98	(9.65)	(26.26)	(48.57)	13.85
61 Payout on trailing operating EPS	11.11	(21.94)	15.95	(11.38)	15.60	(3.86)	(3.71)	7.02	(41.48)	(70.00)	(15.06)
62 YoY change in # of shares outstanding	15.57	5.05	21.51	0.46	(12.93)	27.41	(12.34)	1.13	20.88	(67.86)	16.93
63 YoY change in debt outstanding	1.59	(16.60)	(7.83)	8.89	4.90	35.69	66.67	(5.15)	(17.27)	(10.00)	(19.36)
64 Net external financing/net operating assets	20.24	2.33	27.46	(4.38)	(11.35)	(14.38)	13.51	2.24	(22.00)	(39.29)	12.28
65 Piotroski's F-score	7.92	2.78	10.86	24.60	(20.90)	(8.14)	0.75	(1.90)	(13.33)	14.97	2.85
66 Mohanram's G-score	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6. Technicals											
67 # of days to cover short	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
68 CAPM beta, 5Y monthly	10.46	(8.89)	(15.15)	5.28	3.23	28.70	(13.61)	(10.34)	9.47	(21.43)	15.20
69 CAPM idosyncratic vol, 1Y daily	14.86	(9.59)	(4.11)	1.82	(16.14)	(28.48)	13.98	(10.37)	(19.04)	(31.43)	1.58
70 Realized vol, 1Y daily	16.32	(9.90)	(4.95)	7.87	(12.83)	(29.85)	13.98	(8.25)	(19.86)	(31.43)	5.79
71 Skewness, 1Y daily	4.55	(12.57)	(1.05)	3.18	(20.78)	(11.04)	0.90	(6.63)	14.60	(42.86)	31.58
72 Kurtosis, 1Y daily	(4.63)	(3.46)	(10.92)	(0.54)	5.31	(34.02)	(5.41)	0.35	(1.33)	42.86	(29.47)
73 Idiosyncratic vol surprise	7.05	10.44	7.42	1.97	16.94	30.39	3.33	7.92	9.68	20.00	(0.18)
74 Normalized abnormal volume	(9.04)	(4.46)	(15.76)	(15.94)	0.92	(22.04)	1.88	3.52	(16.16)	(82.14)	18.95
75 Float turnover, 12M	14.26	15.20	(3.97)	(10.33)	(16.90)	21.46	(15.51)	0.56	(17.19)	50.00	11.28
76 Moving average crossover, 15W-36W	(20.03)	3.25	6.26	(11.38)	18.63	(27.79)	(30.00)	16.35	1.65	30.00	14.71
77 Log float-adj capitalization	(10.10)	(12.87)	(14.26)	14.98	(31.50)	(43.14)	2.67	(13.51)	(22.86)	(67.86)	(6.47)
78 # of month in the database	8.20	(6.13)	(0.16)	0.72	(5.19)	(40.32)	(8.50)	(2.62)	(1.11)	(70.42)	(4.31)

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

Appendix B– Deutsche Bank US/Global Quant Research Library

Deutsche Bank's US/Global quantitative strategy team produces one monthly newsletter, *Quantum*, and five monthly research series: 1) *Signal Processing* on alpha factors; 2) *QCD Model* on stock-selection models; 3) *Portfolios Under Construction* on risk and portfolio construction; 4) *Academic Insights* on academic research; and 5) *Canada Quant*.

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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** (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.

- **The long and the short of it** (January 18, 2011). In this report 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..
- **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.

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** (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)

Portfolios Under Construction

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

- **Minimum Variance Portfolios** (February 9, 2011). In this report, we analyze the minimum variance portfolio strategy thoroughly to discover a few of its interesting properties as well as some of its vulnerabilities. In addition, we propose an enhancement which achieves better return with the same risk control.
- **Robust Factor Models** (January 24, 2011). In this paper, we want to see whether we can improve our ability to estimate the factor covariance matrix by structured models. More importantly, we want to see whether a more precise factor covariance matrix estimator leads to better portfolio performance.

- **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?

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** (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.

- **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 revision. 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.

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Appendix 1

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