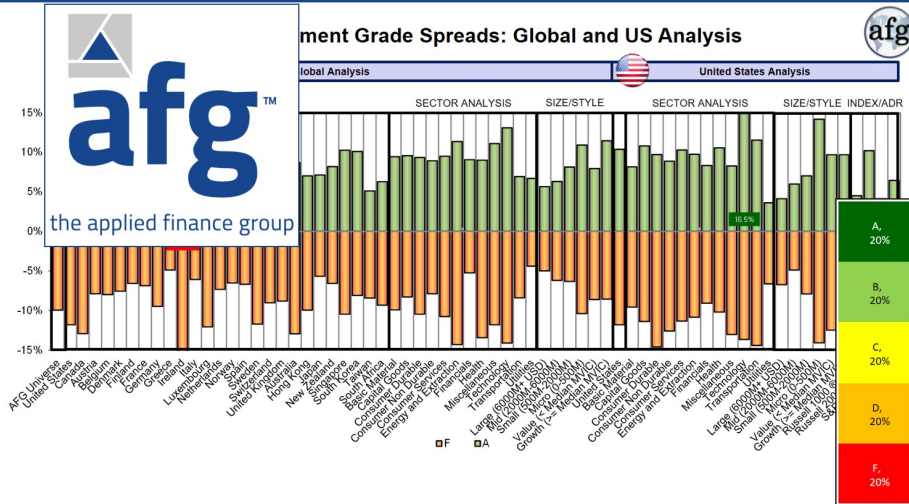


Applied Finance Group
Best Practice Development Portal

3a. AFG Multifactor Grades



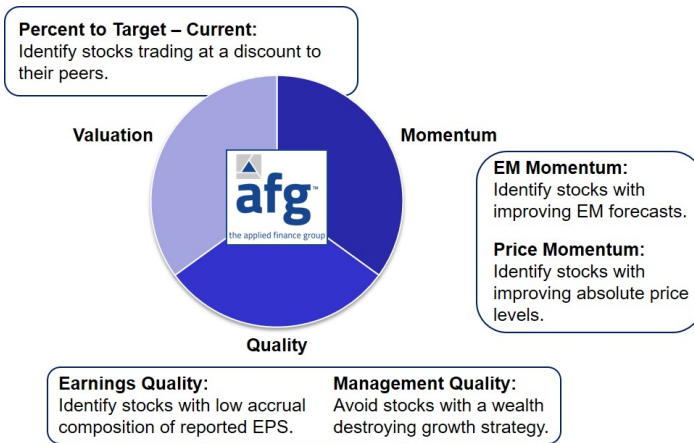
The previous training module reviewed insights from AFG’s Percent to Target – Current metric in various market environments. Over the long-term, a disciplined valuation-based strategy is well-positioned to deliver portfolio outperformance by identifying firms trading at a relative discount to their peers. In the short-term, however, valuation can be out of favor due to market panics, market bubbles, and a number of other justifications for rational and irrational shifts in investor preference.

By incorporating additional metrics with low or inverse correlation to Percent to Target – Current, AFG can glean insights from alternative investment styles, as well as the shifts in these styles, to further enhance the quantitative metrics that define default buy, hold, and sell criteria and improve risk-adjusted performance characteristics. While it is important to develop a portfolio management discipline to emphasize meeting an investor’s long-term goals and practice patience in the short-term when strategy underperformance is realized, AFG improves portfolio management by providing a discipline that systematically emphasizes long-term outperformance, the consistency of outperformance, and appropriate turnover expectations.

Desired Characteristics of a Quantitative Best Practice:

- **Leverage Valuation:** Attempt to identify companies that will outperform a broader universe of stocks over a long-term time horizon
- **Improve Consistency:** Develop a strategy that will help generate more consistent portfolio outperformance in short-term time horizons
- **Be Actionable:** Ensure that the selected strategy has reasonable turnover expectations aligned with portfolio mandate and goals

To meet each of these tenets of a quantitative discipline, AFG combines valuation data to meet long-term goals, momentum data to improve consistency, and quality data to provide lower turnover through increased grade stability. This multifactor approach defines AFG’s Company Grade and Investment Grade research.



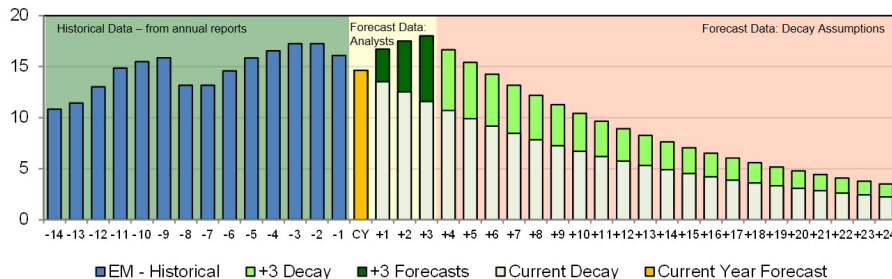
Next, this article will review each of these metrics, then discuss how each metric is combined to develop AFG's Company Grade and Investment Grade.

Valuation: Percent to Target – Current (or Intrinsic Value)

Valuation metrics provide insight into the long-term expectations for individual equities. In aggregate, firms trading at a discount to their intrinsic value estimate will generally realize higher returns than firms trading at a premium. Patience is required, however, to realize the outperformance associated with the long-term stock price movements as possible pricing distortions may take time to normalize.

Calculation

Using historical data, as well as analyst forecasts through the fiscal year most aligned with the current calendar year, AFG can use the EM framework to develop an array of corporate performance data for each forecast company. Percent to Target – Current assumes immediate decay of EM levels following the current calendar year. This array of forecasted economic performance is converted back into cash flow, then discounted back to today to develop an intrinsic value estimate for each firm in AFG's global database. Percent to Target – Current then compares the intrinsic value estimate to the most recent closing price for each firm.



Under the premise that decay starts immediately for all firms, attractively-ranked companies can be identified relative to their sector peers to help identify potentially mispriced securities. AFG uses a global sector rank to develop valuation quintile grades for each company in its global database.

Apple Inc. (AAPL) | Comp Grade: A | Inv Grade: A | Ind: Computer Manu Sec: Technology | Mkt Cap Mil: \$ 604,587.63 USD

Valuation B Intrinsic Value: Current Global Sector Rank: 79 Country Sector Rank: 82	EM + 1 Change C Global Sector Rank: 42 Country Sector Rank: 40	Quality A Management Quality EM+1: 11.98 Asset Growth LFY: 10.74% Wealth Creator	Earnings Quality C Global Sector Rank: 51 Country Sector Rank: 54	Momentum B EM Momentum EM Momentum: 0.02%	D Price Momentum Global Sector Rank: 40 Country Sector Rank: 29		
Industry: COMPUTER MANU	Sector: Technology	Close Price: \$ 113.30	Target: \$ 145.11	% to Tgt: 28.07%	Mkt Cap Mil: \$ 604,587.63	Currency: \$ (USD)	Div Yld Cur: 2.01%

*EquityInsights.com, Snapshot (AAPL), 12/13/16

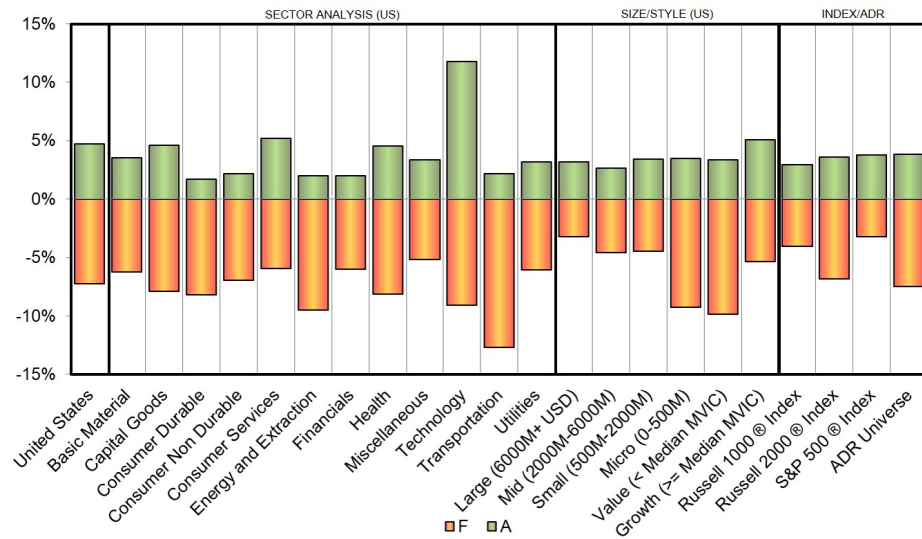
In the example above, AAPL has an intrinsic value estimate of \$145.11 based on EM decay beginning at the end of 2016. This estimate is 28% above its previous closing price of \$113.30, which falls in the 79th percentile on a global sector basis across all Technology companies, which falls in the second highest quintile. Firms with a rank between 81 and 100 will receive an A-grade for Intrinsic Value; firms with a rank between 0 and 20 will receive an F-grade.

Historical Performance

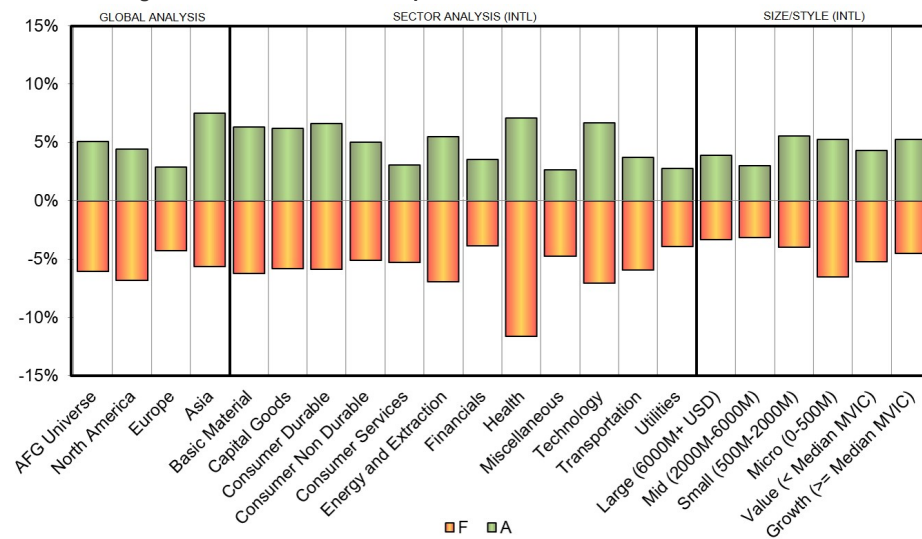
Valuation metric performance was reviewed in much more detail in the previous training module, but it's important to

note that Percent to Target – Current provides significant value as a screening metric over long-term time horizons but can be out of favor when investor preference shifts towards less rational, shorter-term focused investment styles.

Percent to Target - Current: A vs. F Grade Spreads - United States

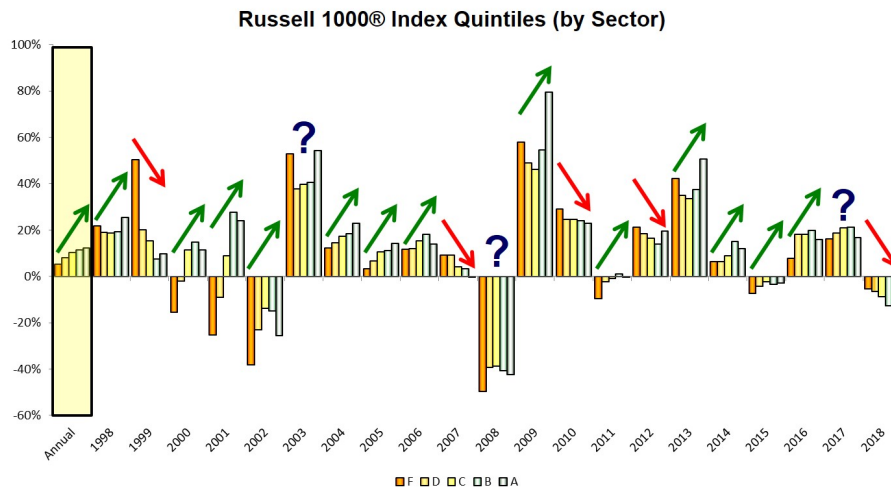


Percent to Target - Current: A vs. F Grade Spreads - International



*AFG Global Backtest Database, Percent to Target (Global Sector Quintiles), 12/31/1991 - 12/31/2018

Over the long-term, relative performance spreads between the top and bottom Percent to Target - Current quintiles confirm that undervalued companies tend to outperform while expensive companies tend to underperform. This is consistent across all sectors, style and size categories in both the US and International stock universes.



*Russell 1000 Percent to Target Quintiles, 9/30/1998 - 12/31/2018 (All Cap)

In the short-term, however, investors don't always act on valuation-based motives in certain market environments. In the Russell 1000 example above, attractive aggregate performance has been delivered between 1998 and 2018, but there are seasons in 1999, 2007, 2010, 2012 and 2018 where the performance delivered by Percent to Target quintiles are inverted from long-term expectations.

Percent to Target Conclusions

If a strategy's mandate is only concerned with outperformance over long-term time horizons, valuation alone would be a reasonable portfolio management screening tool. Percent to Target – Current is a very stable metric. "Cheap" companies typically stay undervalued (i.e., in the top three quintiles of its sector) for an average length of 36 months, which would imply roughly 33% turnover in a year. Unfortunately, investors in aggregate don't always act in a rational manner, so additional metrics are required to help boost performance in periods when valuation is out of favor to improve the tracking error and risk-adjusted characteristics of a strategy.

Markets tend to be efficient in the long-run from an intrinsic value perspective but tend to be inefficient in the short-run from a supply and demand perspective. AFG uses momentum variables to provide insight into short-term supply and demand dynamics of the marketplace that may have a larger influence on short-term stock price movements than intrinsic value considerations in certain market environments, especially in seasons when valuation is out of favor. To accomplish this, AFG uses two momentum variables: EM Momentum, which measures changing analyst opinion, and Price Momentum, which measures changing sentiment from the investment community.

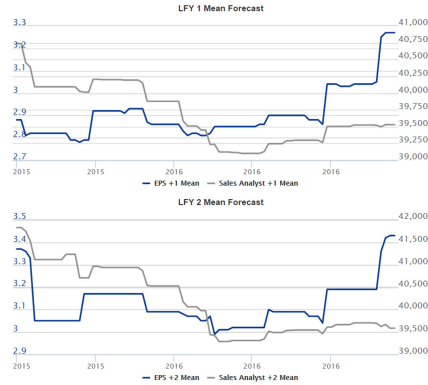
Momentum: EM Momentum

EM momentum incorporates insight from recent changes in consensus analyst forecasts into AFG's multifactor approach.

Calculation

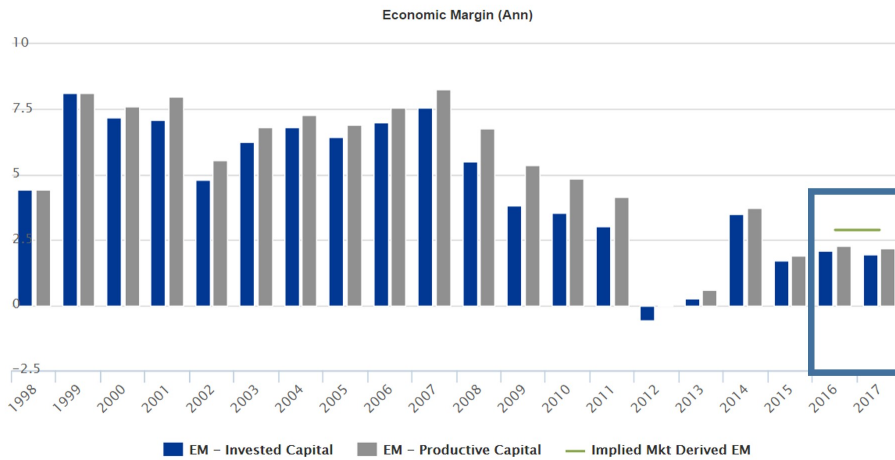
AFG receives weekly analyst updates to provide guidance in calculating forward-looking EM forecasts and intrinsic value estimates. Analyst EPS estimates can be converted into EM forecasts by assuming historical common size relationships in non-cash expenditures, reinvestment at steady growth levels, and fixed asset turns. Common size relationships can then be used to develop line item forecasts for financial statements, which can then be used to calculate Economic Margin forecasts. AFG compares current levels of +1 and +2 EM forecasts to those derived from prior analyst estimates four weeks ago to determine if levels of corporate performance are accelerating, stable, or decelerating.

Estimates	Earnings	Sales
Price Current	48.77	48.77
Number of Analysts	10.00	10.00
LFY Data	3.00	39,528.00
Estimate - Current Year (Plus 1)	3.27 (+8.85%)	39,529.00 (+0.00%)
Plus 1 - 4 Weeks	3.05 (+1.53%)	39,519.00 (-0.02%)
Plus 1 - 8 Weeks	3.02 (+0.53%)	39,524.00 (-0.01%)
Plus 1 - 12 Weeks	3.02 (+0.53%)	39,502.00 (-0.07%)
Relative to Price (Plus 1)	14.91	0.39
Estimate - Current Year (Plus 2)	3.50 (+7.03%)	39,584.00 (+0.14%)
Plus 2 - 4 Weeks	3.25 (+6.56%)	39,693.00 (+0.44%)
Plus 2 - 8 Weeks	3.25 (+7.62%)	39,703.00 (+0.45%)
Plus 2 - 12 Weeks	3.25 (+7.62%)	39,664.00 (+0.41%)
Relative to Price (Plus 2)	13.93	0.39
Analyst - Mean Recommendation	2.60	
Analyst - Mean Recommendation - 4 Weeks	2.70	
Analyst - Mean Recommendation - 8 Weeks	2.70	
Analyst - Mean Recommendation - 12 Weeks	2.60	



*EquityInsights.com, Estimates (BBY), 12/13/16

The estimates page on EquityInsights.com displays the rolling history of consensus median EPS estimates. Four weeks ago, Best Buy's consensus EPS numbers were \$3.05 and \$3.25 for 2016 and 2017, but these have recently grown to \$3.27 for 2016 and \$3.50 for 2017.



*EquityInsights.com, Snapshot (BBY), 12/13/16

The current EPS estimates for +1 and +2 forecast years are used to calculate EM forecasts. In the example above, Best Buy's EPS forecast for 2016 of \$3.27 generates an Economic Margin (Productive Capital) forecast of 2.29%. 2017 EPS of \$3.50 leads to EM-PC forecasts of 2.17%. Due to the recent EPS growth over the prior four weeks, recent expansion in forecasted EM levels in 2016 and 2017 for BBY has been roughly 3% (i.e. 2.22% grew to 2.29%). Positive analyst revisions will lead to positive EM Momentum, and downward revisions will lead to negative EM Momentum; the impact of the revisions are measured through an economic measure of corporate performance instead of simply net income to improve the economic insight gathered from these analyst revisions.

Valuation

B ||
Intrinsic Value:
 Current
 Global Sector Rank: 65
 Country Sector Rank: 64

B
EM + 1 Change
 Global Sector Rank: 60
 Country Sector Rank: 65

Quality

A ||
Management Quality
 EM+1: 2.07
 Asset Growth LFY: -11.39%
 Limited Growth

A ||
Earnings Quality
 Global Sector Rank: 10
 Country Sector Rank: 13

Momentum

A ||
EM Momentum
 EM Momentum: 2.97%

A |
Price Momentum
 Global Sector Rank: 85
 Country Sector Rank: 83

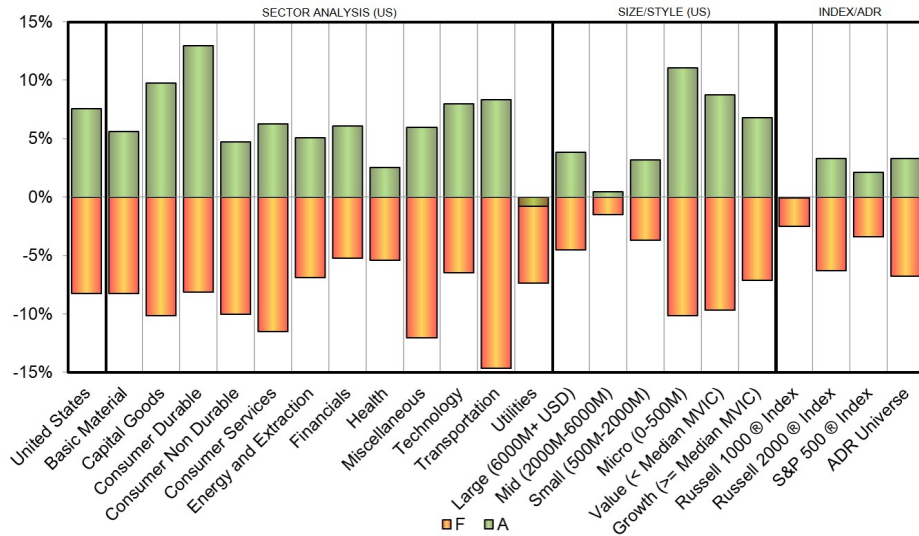
*EquityInsights.com, Snapshot (BBY), 12/13/16

EM Momentum does not provide a consistent normal distribution, as recent revisions may be more common in earnings season, and smaller cap firms may be less subject to timely revisions due to limited analyst coverage. Because of this, AFG uses an absolute scale for measuring EM Momentum. When EM Momentum is greater than 2% on average for the +1 and +2 forecast years, EM Momentum receives an A grade. 0.01 to 2% increases receive a B, stable forecasts receive a C, 0.01 to 2% decreases receive a D, and decreases larger than 2% receive an F. Also, when there are no revisions for +1 and +2 EPS estimates over the last four weeks, AFG calculates a time-weighted momentum over the previous 12 weeks to attempt to identify a non-zero momentum figure if analyst revisions are slightly more than four weeks old.

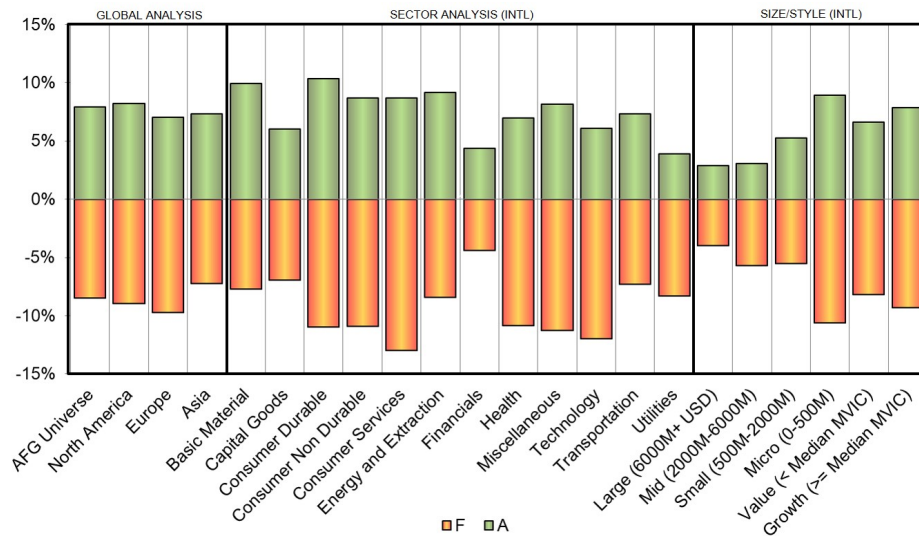
The performance of A and F EM Momentum grades over long-term time horizons are displayed in the charts below.

Historical Performance

EM Momentum: A vs. F Grade Spreads - United States



EM Momentum: A vs. F Grade Spreads - International



*AFG Global Backtest Database, EM Momentum (Momentum Tiers), 12/31/1991 - 12/31/2018

Based on performance charts above, fairly consistent performance is observed across sectors and styles for the spreads between A-graded and F-graded EM Momentum stocks in both the US and international stock universes over the long-term. There is a much stronger micro-cap bias observed with EM Momentum than was observed with Percent to Target - Current, which is common for many quantitative metrics based simply on fundamental data.

Momentum: Price Momentum

Price Momentum incorporates feedback from changing investor sentiment into AFG's multifactor model. Firms that have appreciated in excess of their sector peers likely have positive recent events or are undergoing positive shifts in their performance or operating environment. Attractive momentum over longer time horizons between six months and a year tend to offer a positive signal of future performance, while attractive momentum over shorter horizons tend to be mean reverting.

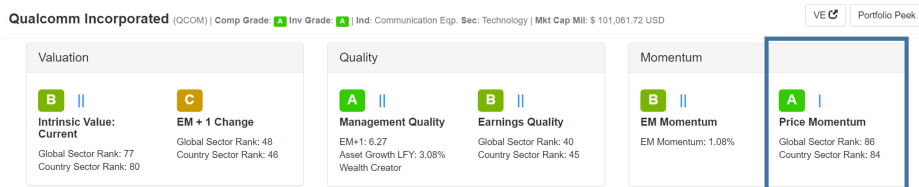
Calculation

AFG employs an eleven month time horizon that has been lagged one month to calculate price momentum. The final grade reflects the relative global sector rank of the percentage change that a company has seen in its stock price over this time horizon.



*EquityInsights.com, Snapshot (QCOM), 12/13/2016

For example, as of 12/13/2016, AFG would calculate price momentum over a time horizon between December 13th, 2015 and November 13th, 2016. Qualcomm closed at \$47.46 on December 11th, 2015, then appreciated by more than 40% by the close on November 11th. (The exact start date and end date both fell on weekends, so most recent close is used in both instances)

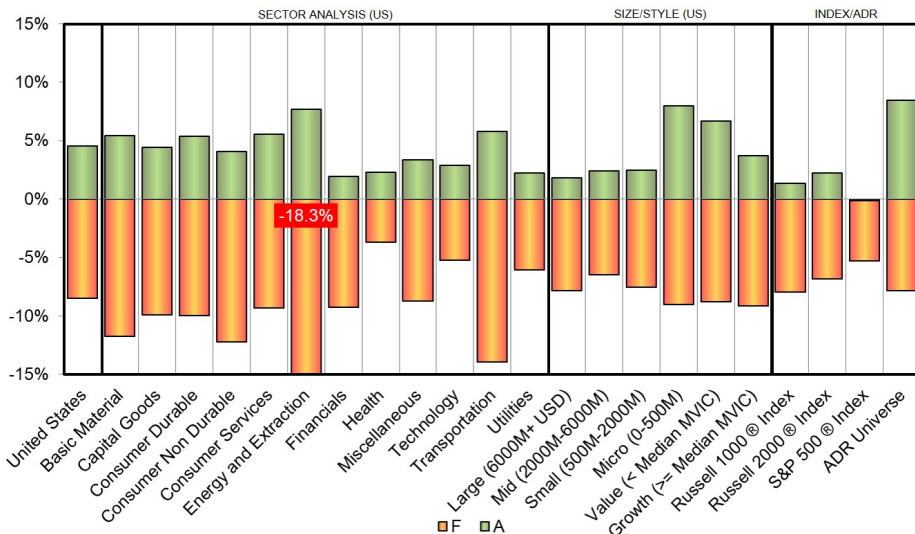


*EquityInsights.com, Snapshot (QCOM), 12/13/2016

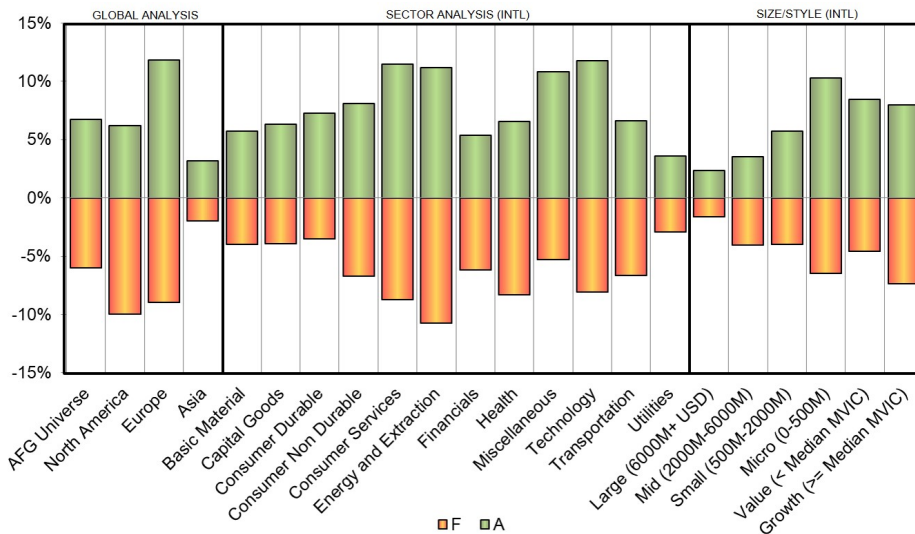
This appreciation of 40% over this 11 month time horizon ranks in the 86th percentile of the Technology sector on a global basis, which leads to an A grade for a Price Momentum thesis due to top quintile appreciation in the sector.

Historical Performance

Price Momentum: A vs. F Grade Spreads - United States



Price Momentum: A vs. F Grade Spreads - International



*AFG Global Backtest Database, Price Momentum (Global Sector Quintiles), 12/31/1991 - 12/31/2018

As a stand-alone variable, Price Momentum delivers attractive relative performance spreads over long-term time horizons, with a similar micro-cap bias as noted for EM Momentum.

Momentum Conclusions

US All Cap Return		EM Momentum				Price Momentum			
		Returns		Spreads		Returns		Spreads	
		F	A	F	A	F	A	F	A
Annual	10.3%	3.3%	15.1%	-7.0%	4.8%	2.8%	14.8%	-7.5%	4.5%
1998	16.0%	15.4%	22.6%	-0.6%	6.6%	14.9%	21.6%	-1.1%	5.6%
1999	26.2%	34.0%	51.9%	7.8%	25.7%	18.2%	62.2%	-8.0%	36.0%
2000	-5.7%	-19.3%	-5.4%	-13.7%	0.2%	-26.0%	19.1%	-20.3%	24.8%
2001	21.0%	12.1%	20.6%	-8.9%	-0.4%	25.0%	16.7%	4.0%	-4.3%
2002	-15.9%	-31.4%	-14.1%	-15.5%	1.8%	-39.7%	0.6%	-23.8%	16.5%
2003	67.7%	77.5%	95.7%	9.8%	28.1%	102.8%	69.3%	35.1%	1.6%
2004	19.4%	11.4%	25.6%	-7.9%	6.2%	17.5%	19.2%	-1.9%	-0.2%
2005	6.3%	-3.6%	10.0%	-9.9%	3.7%	-5.8%	16.1%	-12.1%	9.8%
2006	17.4%	12.3%	23.6%	-5.1%	6.1%	18.0%	14.4%	0.6%	-3.0%
2007	-5.1%	-16.8%	-0.5%	-11.8%	4.6%	-22.4%	8.4%	-17.4%	13.5%
2008	-42.8%	-47.7%	-39.9%	-4.9%	2.9%	-55.0%	-39.0%	-12.2%	3.8%
2009	63.2%	55.0%	85.9%	-8.2%	22.7%	163.4%	12.9%	100.3%	-50.3%
2010	29.8%	26.8%	33.6%	-3.0%	3.8%	24.5%	34.7%	-5.4%	4.9%
2011	-7.5%	-17.3%	-8.2%	-9.8%	-0.8%	-27.1%	-3.9%	-19.6%	3.6%
2012	18.0%	13.6%	27.7%	-4.4%	9.7%	12.2%	22.6%	-5.8%	4.6%
2013	44.5%	44.6%	48.8%	0.0%	4.3%	46.2%	48.7%	1.7%	4.2%
2014	3.2%	-7.9%	5.9%	-11.1%	2.7%	-7.1%	1.1%	-10.3%	-2.1%
2015	-8.5%	-18.8%	-9.8%	-10.3%	-1.3%	-26.0%	1.3%	-17.5%	9.9%
2016	20.3%	20.4%	17.2%	0.1%	-3.1%	19.5%	9.7%	-0.8%	-10.6%
2017	14.6%	9.1%	20.9%	-5.5%	6.3%	5.9%	17.9%	-8.7%	3.3%
2018	-12.1%	-18.1%	-18.9%	-6.1%	-6.8%	-26.7%	-4.6%	-14.6%	7.5%

*United States, EM & Price Momentum Quintiles, 9/30/1998 - 12/31/2018 (All Cap)

EM Momentum and Price Momentum are useful quantitative metrics on a stand-alone basis to better understand short-term shifts in analyst and investor sentiment, which will impact supply and demand of the marketplace in the near-term. EM Momentum delivers very stable relative performance trends on a year-over-year basis, but is subject to very high levels of turnover as upward and downward revisions are common. Price Momentum delivers more volatile strategy performance as performance shifts can be significant (note the significant correction through the market recovery in 2009), but tends to deliver much lower turnover than analyst revisions.

Correlation between A-graded spreads	Percent to Target - Current	EM Momentum	Price Momentum	Beta
Percent to Target - Current	x	-0.10	-0.75	1.101
EM Momentum	-0.10	x	0.24	1.104
Price Momentum	-0.75	0.24	x	0.852

*United States, Valuation & Momentum Quintile Correlation, 9/30/1998 - 12/31/2018 (All Cap)

Despite the increased turnover and volatility created by adding each of these momentum metrics, it is important to note that momentum metrics have negative correlation to valuation. When valuation is outperforming, momentum tends to be out of favor, and when valuation is out of favor, momentum tends to outperform, especially price momentum which has a correlation to valuation of -0.75. Each of these momentum metrics also have fairly low correlation with one another. From a multifactor perspective, this will stabilize outperformance across various market environments by diversifying the sources of alpha. In addition to this, a Beta estimate for each variable is

displayed in the table above. At this point, the market benchmark is simply the equal-weighted returns of forecast stocks in the Russell 3000 to compare with the equal-weighted performance of each A-graded basket. The Beta estimates for Percent to Target and EM Momentum are slightly above 1.1, while the Beta estimate for Price Momentum is 0.852.

A hedge fund, an institution with limited tax considerations on capital gains, or a client who has very little concern related to turnover may find a strategy rooted in only valuation and momentum to be appropriate. Introducing a momentum variable to a quantitative strategy will certainly raise concerns over turnover for most clients with lower turnover constraints. The addition of stable metrics will help further meet the constraints of strategies with low turnover mandates. To accomplish this, AFG includes quality metrics related to earnings composition and management strategy.

Quality: Earnings Quality

Earnings Quality is also known as the accrual anomaly, and it helps identify a distinction between firms that generate high levels of cash flow in their net income from those that generate a high level of non-cash accruals. An accrual is simply the difference between cash flow and net income. Ultimately, accrual-based earnings carry a risk of impairment that already realized cash flows do not, so low accrual companies should outperform high accrual companies. Research on the accrual anomaly identified two ways to approach earnings quality. One is from the cash flow statement, and the other is from a firm's balance sheet. AFG uses the balance sheet approach, with a focus on identifying the percentage change in net operating assets over the prior year and rank this across sectors to form quintiles based on net operating asset growth. High net operating asset growth would be a sign of high accruals or poor earnings quality (F), and low or negative net operating asset growth would be a sign of low accruals or high earnings quality (A).

Calculation

Net Operating Assets are calculated as operating assets minus operating liabilities from a firm's balance sheet.

MSFT	2015 Q4	2016 Q4
Cash	97245	113788
Receivables	17908	18277
Inventories	2902	2251
Other Current Assets	6657	5344
Total Current Assets	124712	139660
Gross Property, Plant & Equip.	32337	38156
Accumulated Depreciation	17606	19800
Net Property, Plant & Equip.	14731	18356
Net Intangibles	21774	21605
Other Assets	15006	14073
Total Assets	176223	193694
Debt in Current Liabilities	7484	12904
Accounts Payable	6591	6898
Other Current Liabilities	35783	39555
Total Current Liabilities	49858	59357
Total Long Term Debt	27808	40783
Other Liabilities	15639	20081
Deferred Taxes	2835	1476
Minority Interest	0	0
Total Liabilities	96140	121697
Preferred Stock	0	0
Total Common Stock	80083	71997
Total Equity	80083	71997
Total Liabilities & Equity	176,223	193,694
Operating Assets	78978	79906
Operating Liabilities	60848	68010
Net Operating Assets	18130	11896
Change in Net Operating Assets		-6234
Standardized Accrual - Balance Sheet		-34.38%
Accrual: Balance Sheet 4Qtr		-6234
Earnings Quality (R4Q)		-34.39

*AFG Research, Earnings Quality Calculation (MSFT), 12/13/2016

[Excel Template to Audit Earnings Quality Calculation for any Company of Interest](#)

Operating assets are highlighted in green in the asset ledger in the Microsoft example above, and operating liabilities are highlighted in green in the liabilities ledger. The accrual is equal to the overall change in net operating assets between two points in time; AFG uses a rolling four quarter approach for US and Canadian firms, and an annual approach for international firms. The standardized accrual reflects the percent change in net operating assets, and this is the metric that is ranked across all firms to develop Earnings Quality quintile grades on a global sector basis.

Valuation

C || C

Intrinsic Value:
Current

Global Sector Rank: 54
Country Sector Rank: 59

EM + 1 Change
Global Sector Rank: 43
Country Sector Rank: 41

Quality

A || A

Management Quality
EM+1: 7.41
Asset Growth LFY: 9.91%
Wealth Creator

Earnings Quality
Global Sector Rank: 4
Country Sector Rank: 9

Momentum

B || C

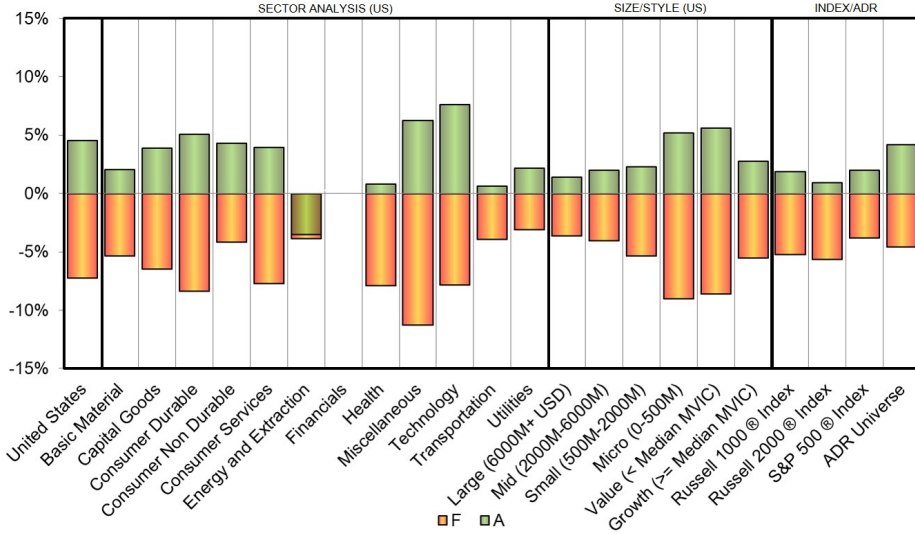
EM Momentum
EM Momentum: 0.08%

Price Momentum
Global Sector Rank: 55
Country Sector Rank: 45

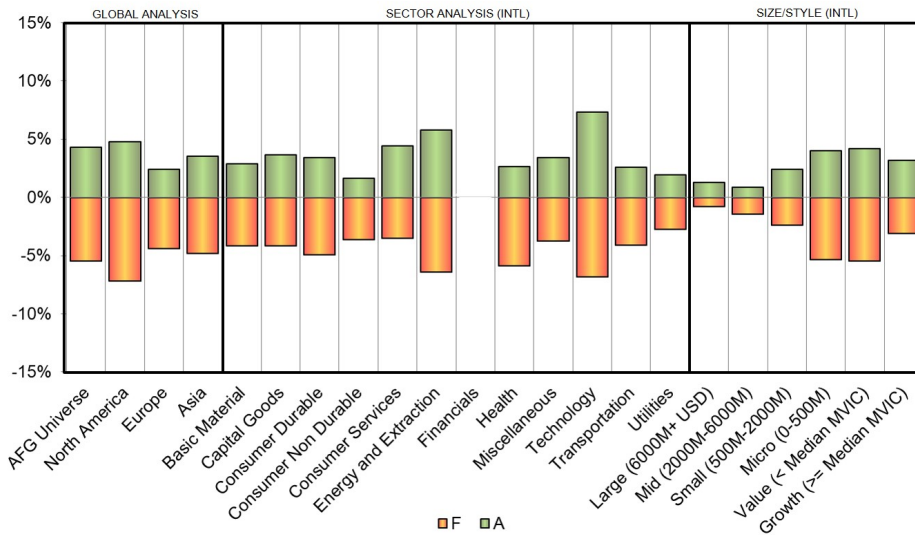
*EquityInsights.com, Snapshot (MSFT), 12/13/2016

Historical Performance

Earnings Quality: A vs. F Grade Spreads - United States



Earnings Quality: A vs. F Grade Spreads - International



*AFG Global Backtest Database, Earnings Quality (Global Sector Quintiles), 12/31/1991 - 12/31/2018

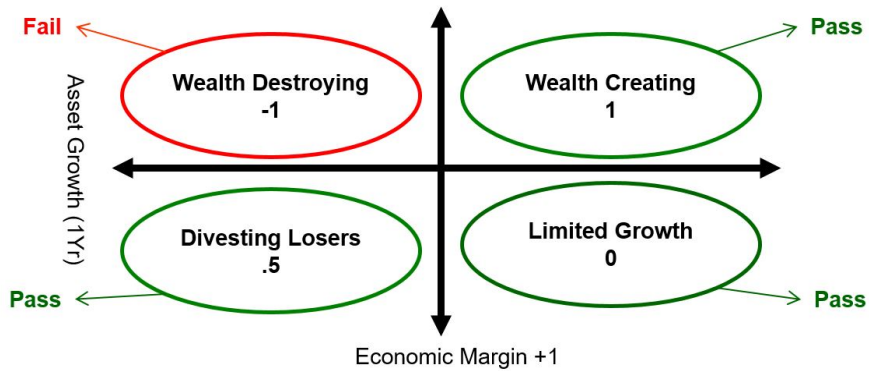
Over the long-term, Earnings Quality performs well as a stand-alone screening metric, although relative return spreads are milder than what has been observed for valuation and momentum variables. Note that AFG does not calculate Earnings Quality for financial firms (including REITs), as the inputs to calculate net operating assets are not available due to adjustments to the EM model for financial stocks.

Quality: Management Quality

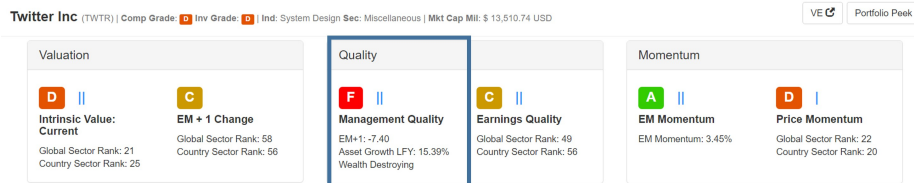
Companies with negative EM levels destroy shareholder value by simply engaging in operations that generate cash flows lower than the firm's cost of capital. It is generally a bad idea to ignore poor operating results and attempt to continue to grow the business, as this will likely destroy even more shareholder value through poor incremental growth. Companies that have positive EMs should grow their business while firms with negative EMs should focus on profitability and earn the right to grow.

Calculation

This metric is pass/fail: firms that have negative EMs and positive growth are assigned an F, while all other firms receive an A.



Four quadrants can be developed based on forecasted EM level on the x-axis and last year's asset growth on the y-axis. "Wealth Creating" refers to stocks with positive EM levels and positive growth, which are typically blue chip stocks that generate positive profits and continue to find positive NPV reinvestment opportunities. "Limited Growth" refers to positive EM but negative growth firms which are typically cash cows that return cash flows to shareholders through increased dividends and share repurchases. "Divesting Losers" are negative EM firms that are actively shedding assets to improve corporate performance, and are likely turnaround stories that might provide abnormal returns once market sentiment reflects these improvements. Each of these quadrants receives an A-grade for Management Quality, as each type of stock has characteristics that can offer attractive investment opportunities. The final quadrant is "Wealth Destroying", which refers to negative EMs and positive asset growth. Wealth Destroyers receive an F-grade for Management Quality.



*EquityInsights.com, Snapshot (TWTR), 12/13/2016

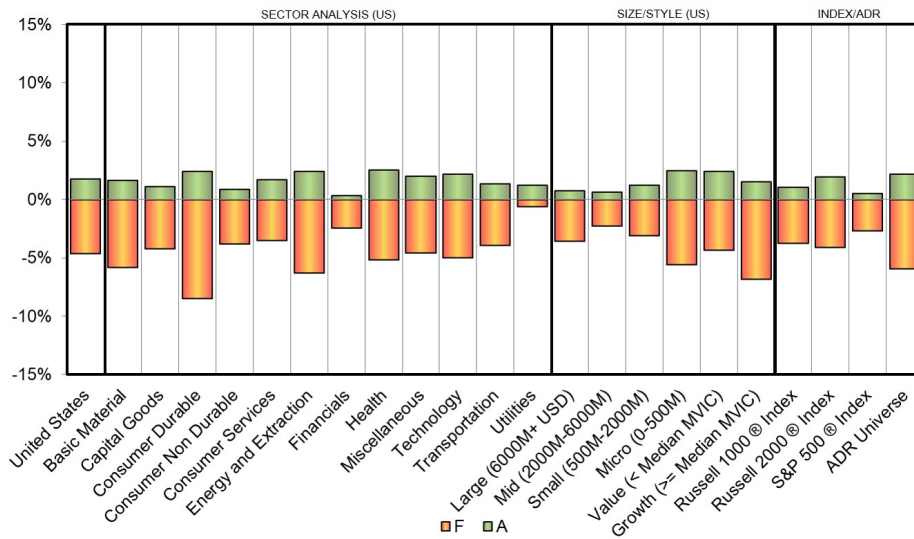


*EquityInsights.com, Wealth Creation (TWTR), 12/13/2016

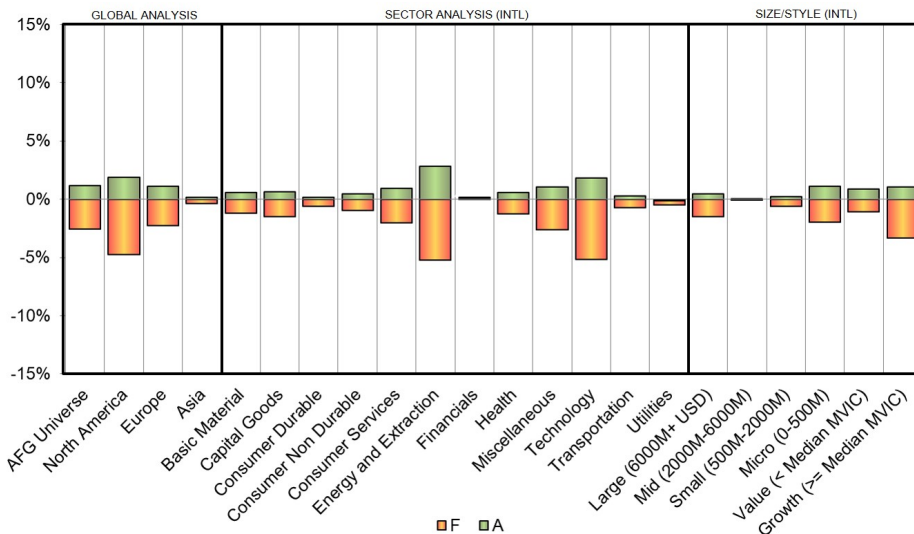
The Twitter example above provides an extreme example of poor management quality. Despite negative EMs since 2011, Twitter's management continues to reinvest significantly into the business. In their current fiscal year, EMs are expected to be -7.4%, but the firm recently grew by more than 15%.

Historical Performance

Management Quality: A vs. F Grade Spreads - United States



Management Quality: A vs. F Grade Spreads - International



*AFG Global Backtest Database, Management Quality (Wealth Creators vs Wealth Destroyers), 12/31/1991 - 12/31/2018

Over the long-term, F-graded management quality firms have drastically underperformed the rest of the stock universe, although performance is much stronger in the US than observed internationally.

Quality Conclusions

Quality metrics generally offer milder outperformance characteristics and lower levels of turnover compared to more short-term focused momentum metrics.

Correlation between A-graded spreads	Percent to Target - Current	Earnings Quality	Management Quality	Beta
Percent to Target - Current	x	0.17	-0.16	1.101
Earnings Quality	0.17	x	-0.16	1.137
Management Quality	-0.16	-0.16	x	0.937

*United States, Valuation & Quality Quintile Correlation, 9/30/1998 - 12/31/2018 (All Cap)

Quality metrics tend to have low or negative correlations to Valuation. Earnings Quality and Management Quality are negatively correlated to one another, as well. The Beta estimate for Earnings Quality (using the equal-weighted forecast universe of Russell 3000 stocks) is 1.137 while the Beta estimate for Management Quality is 0.937.

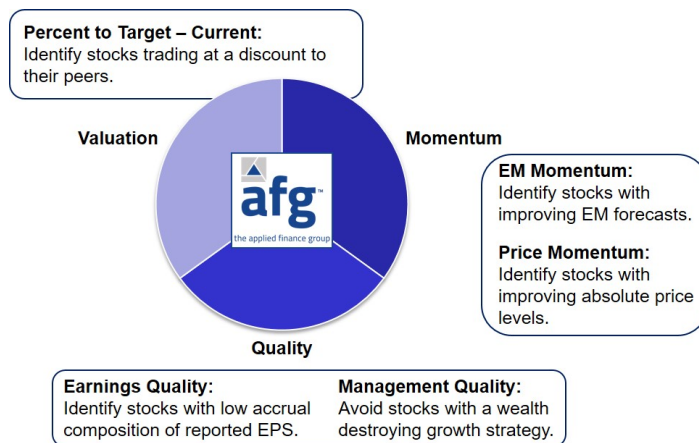
US All Cap Return		Percent to Target Spreads		EM Momentum Spreads		Price Momentum Spreads		Earnings Quality Spreads		Management Quality Spreads	
		F	A	F	A	F	A	F	A	F	A
Annual	10.3%	-7.3%	4.8%	-7.0%	4.8%	-7.5%	4.5%	-6.9%	3.4%	-4.7%	2.0%
1998	16.0%	2.4%	1.6%	-0.6%	6.6%	-1.1%	5.6%	2.4%	5.1%	-3.5%	0.6%
1999	26.2%	32.8%	-5.7%	7.8%	25.7%	-8.0%	36.0%	-3.4%	31.1%	2.8%	-2.8%
2000	-5.7%	-29.1%	-3.5%	-13.7%	0.2%	-20.3%	24.8%	-23.5%	8.4%	-18.5%	13.0%
2001	21.0%	-27.9%	34.0%	-8.9%	-0.4%	4.0%	-4.3%	-15.1%	8.7%	-3.5%	3.2%
2002	-15.9%	-21.6%	15.0%	-15.5%	1.8%	-23.8%	16.5%	-21.7%	0.9%	-13.2%	5.6%
2003	67.7%	13.2%	15.1%	9.8%	28.1%	35.1%	1.6%	2.0%	32.2%	-6.3%	1.5%
2004	19.4%	-11.0%	9.7%	-7.9%	6.2%	-1.9%	-0.2%	-6.6%	-2.9%	-4.4%	1.2%
2005	6.3%	-8.3%	1.5%	-9.9%	3.7%	-12.1%	9.8%	-4.6%	-3.0%	-5.7%	1.7%
2006	17.4%	-4.8%	-0.5%	-5.1%	6.1%	0.6%	-3.0%	-4.0%	4.3%	-1.9%	-0.1%
2007	-5.1%	-3.6%	-3.2%	-11.8%	4.6%	-17.4%	13.5%	5.8%	-5.4%	-5.8%	1.8%
2008	-42.8%	-7.6%	-3.5%	-4.9%	2.9%	-12.2%	3.8%	-11.3%	-1.7%	-1.9%	0.9%
2009	63.2%	7.8%	58.5%	-8.2%	22.7%	100.3%	-50.3%	8.3%	52.5%	-6.6%	2.2%
2010	29.8%	-0.5%	6.9%	-3.0%	3.8%	-5.4%	4.9%	-3.8%	4.9%	-3.1%	1.7%
2011	-7.5%	-6.8%	-4.1%	-9.8%	-0.8%	-19.6%	3.6%	-9.4%	-2.4%	-2.5%	1.3%
2012	18.0%	-3.4%	6.1%	-4.4%	9.7%	-5.8%	4.6%	-7.7%	2.3%	-0.4%	0.0%
2013	44.5%	0.6%	10.0%	0.0%	4.3%	1.7%	4.2%	1.9%	2.3%	-3.7%	2.1%
2014	3.2%	-10.3%	1.5%	-11.1%	2.7%	-10.3%	-2.1%	-4.1%	-4.1%	-2.8%	1.1%
2015	-8.5%	-9.1%	0.6%	-10.3%	-1.3%	-17.5%	9.9%	-4.1%	-5.8%	-2.0%	0.8%
2016	20.3%	-13.2%	9.4%	0.1%	-3.1%	-0.8%	-10.6%	-8.1%	-1.8%	-6.9%	2.9%
2017	14.6%	-1.2%	-1.1%	-5.5%	6.3%	-8.7%	3.3%	6.0%	-5.0%	2.9%	-0.8%
2018	-12.1%	0.8%	-5.8%	-6.1%	-6.8%	-14.6%	7.5%	-4.1%	-3.1%	-0.3%	0.1%

*United States, Valuation/Momentum/Quality Quintiles, 9/30/1998 - 12/31/2018 (All Cap)

The table above aligns relative performance of A-graded and F-graded stocks vs. the equal-weighted all cap performance of AFG's forecast universe. Note that the long-term outperformance of A-graded stocks across each variable highlights the rationale for their inclusion in AFG's multifactor grades. This table can be a useful visual to understand ebbs and flows in variable performance across various market environments to better understand the correlation and Beta estimates for valuation, momentum, and quality themes. For example, valuation was out of favor during the last stages of the tech bubble, but momentum and earnings quality metrics performed strongly in 1999. Valuation was again out of favor in the lead up to the financial crisis, but momentum and management quality metrics performed well in 2007 and 2008. Valuation then performed strongly in 2009 while price momentum was completely out of favor as highly levered stocks that had underperformed recovered as credit markets unlocked.

AFG Company Grade (Static Multifactor Model)

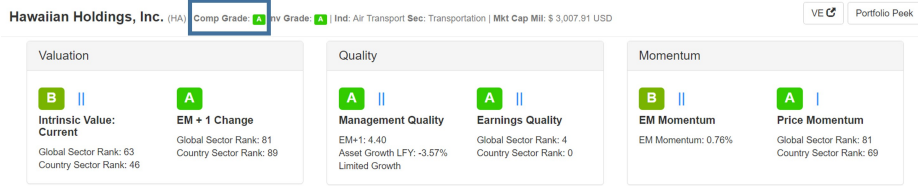
Equipped with quantitative insight from each of these five metrics, AFG has developed a weighted average factor model that calculates a composite grade for each company in its global database. The weights reflect that valuation, momentum, and quality balance one another due to low or negative correlations and their unique roles in meeting long-term outperformance, delivering more consistent outperformance, and keeping turnover manageable.



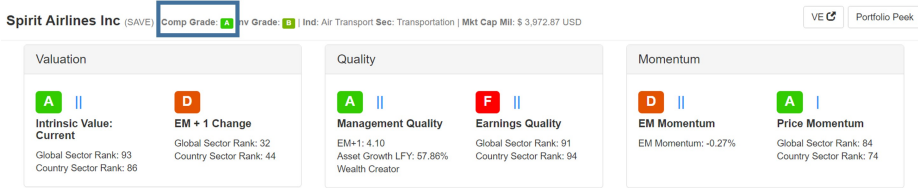
Calculation

The Company Grade is based on a 35% weight for valuation, 35% weight for momentum and 30% weight for quality. Within momentum, a 25% weight is allocated to EM Momentum and the remaining 10% weight to Price Momentum; this is primarily due to the stability of EM Momentum's performance while Price Momentum returns have exhibited seasons of excessive volatility (2009 highlights this well). Within quality, 15% is allocated to Earnings Quality and 15% to Management Quality. These weights are static and reflect a strategic allocation towards factor weights, as they do not incorporate any additional insights from current market trends.

A raw grade point average (GPA) for each company is calculated using these static variable weights across the global database. This raw grade is ranked across sector peers on a global basis to determine the percentile rank of each firm's GPA, which is then used to assign the Company Grade quintile for the firm. The Company Grade is an integral tool in portfolio management. In the next section of this training material, the Company Grade is used in screening workflows to identify potential replacement ideas, as well as portfolio monitoring, as this metric is the basis of a custom holding criteria to help meet turnover goals or constraints that align with a strategy's mandate.



*EquityInsights.com, Snapshot (HA), 12/15/2016

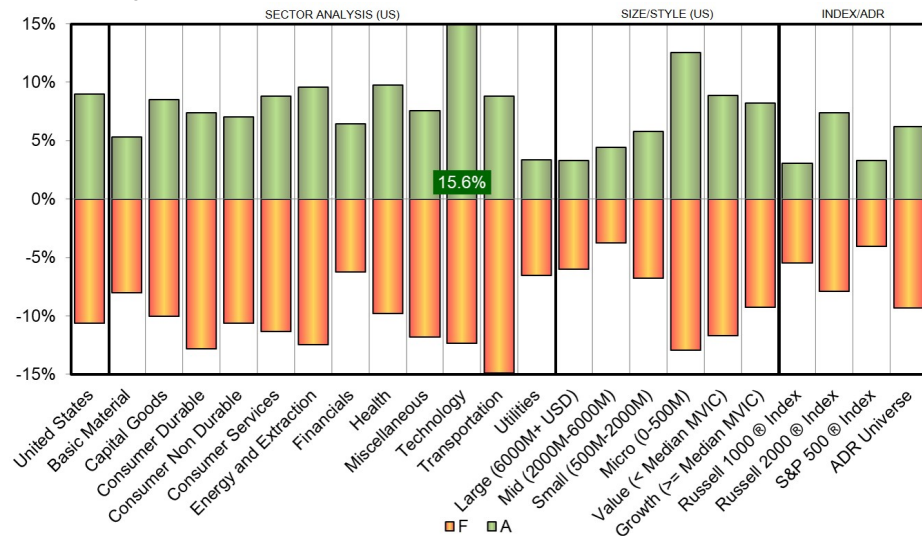


*EquityInsights.com, Snapshot (SAVE), 12/15/2016

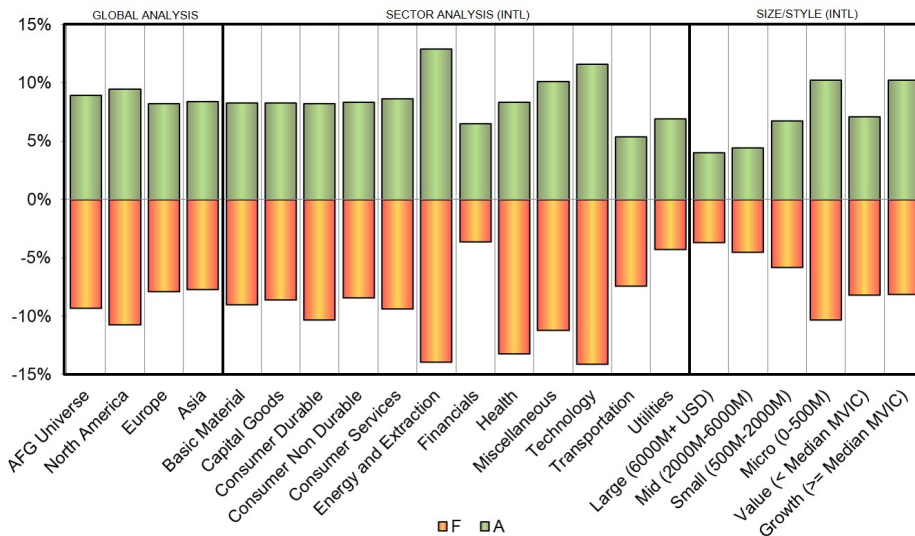
In the examples above, based on the static factor weights of the AFG Company Grade, Hawaiian Airlines has an overall grade point average of 3.4, which ranks in the 98th percentile of the Transportation sector. As a top quintile grade, HA receives an overall Company Grade of A. Spirit Airlines has an overall grade point average of 2.65, which falls in the 81st percentile of Transportation stocks. This GPA is also A-graded as a top quintile stock in the Transportation sector globally. While both stocks would currently meet an A-graded screen on Company Grade, AFG's portfolio optimization workflow will rank HA above SAVE due to the higher raw grade point average, which is leveraged to develop discrete rankings within larger baskets of stocks.

Historical Performance

AFG Company Grade: A vs. F Grade Spreads - United States



AFG Company Grade: A vs. F Grade Spreads - International



*AFG Global Backtest Database, Company Grade (Global Sector Quintiles), 12/31/1991 - 12/31/2018

A multifactor approach delivers significant improvements in relative performance of the A-graded and F-graded quintiles compared to the performance of each of the underlying metrics. Spreads are consistent across all sectors and styles in both the US and international stock arenas. Performance spreads are milder in more efficient large cap markets, but are still significant across all size tiers.

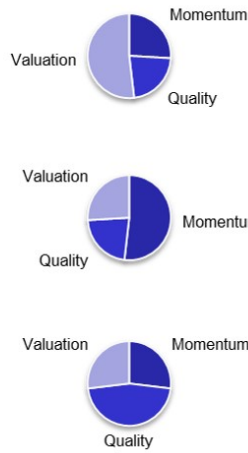
AFG Investment Grade (Dynamic Multifactor Model)

As mentioned earlier, AFG uses a static version of a weighted average factor model to develop the Company Grade metric, and treats this as a strategic approach to screening and monitoring workflows in portfolio management. AFG also calculates a tactical approach to screening that provides an adjusted factor model that reflects recent themes in investor preference to improve a systematic approach to screening across all market environments. This tactical screening tool is AFG's Investment Grade, and it helps further identify if a good company regardless of market environment would make a good investment based on current market dynamics. The Investment Grade serves as an enhancement when screening for potential buy ideas to ensure that broader market trends favor the unique characteristics of a company of interest as a new position is initiated.

Calculation

AFG has calculated A through F letter grades for each of the five underlying valuation, momentum and quality metrics that define AFG's multifactor grades back to 1991. Based on this database of historical performance, AFG calculates a historical array of the spreads between the baskets of A-graded stocks and the baskets of F-graded stocks on a monthly basis over this time horizon, then calculates the average and standard deviation of the array of historic A minus F performance spreads. As each month ends, AFG calculates the previous month's performance of each individual metric and compares recent performance to historic levels to develop claims on the effectiveness of each quantitative metric in the current marketplace. When A vs. F return spreads fall within one standard deviation above or below historic averages, AFG does not adjust the factor model weight for a particular variable. However, when A vs. F return spreads are in excess of one standard deviation above average spreads, the Investment Grade will overweight that metric in the factor model, and when spreads are lower than one standard deviation below average spreads, AFG will underweight that metric. AFG applies this adjusted factor model calculation to all firms in its global database, and uses the adjusted raw grade point average for each company to develop quintiles on a global sector basis.

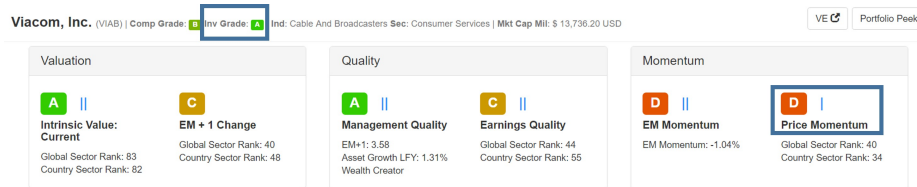
In most stable market environments, AFG will not reweight the factor model for the Investment Grade, as recent return spreads are within one standard deviation of historic averages for all five metrics. As individual metrics begin to deliver significant or impaired performance, AFG will adjust the factor model accordingly to provide better insight into which companies of interest may be the best investment ideas today due to firm-specific characteristics that are in-line or at odds with current themes in investor preference.



Dynamic Factor Model Weights:
 The strength indicators on the Company Snapshot can help identify the dynamic changes made to the factor model score to develop a grade that reflects current market conditions.

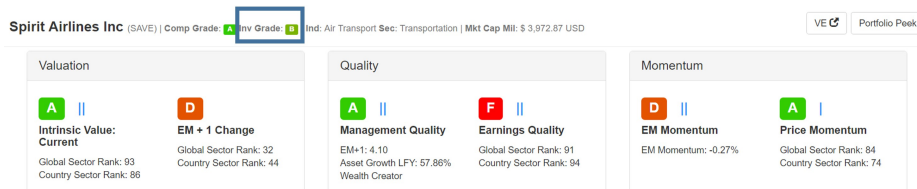
- ||| 3 Bars: Significant Performance
- || 2 Bars: Normal Performance
- | 1 Bar: Impaired Performance

For example, Price Momentum delivered impaired performance in November 2016. This led to a dynamic shift in the Investment Grade that underweighted Price Momentum as of December 1, 2016 in the weighted average factor model. This shift was confirmed on the Snapshot on EquityInsights.com due to the single performance bar to the right of the Price Momentum grade.



*EquityInsights.com, Snapshot (VIA), 12/15/2016

In December 2016, Viacom received an overall Company Grade of B, as its 2.75 raw grade from a static factor model perspective fell in the 79th percentile of the Consumer Services sector. By acknowledging that Price Momentum was currently out of favor, AFG calculated an updated GPA based on modified factor weights that underweighted Price Momentum and developed a new GPA of 2.833, which then fell in the 81st percentile of VIAB's sector and improved the overall grade from a dynamic perspective to an A.

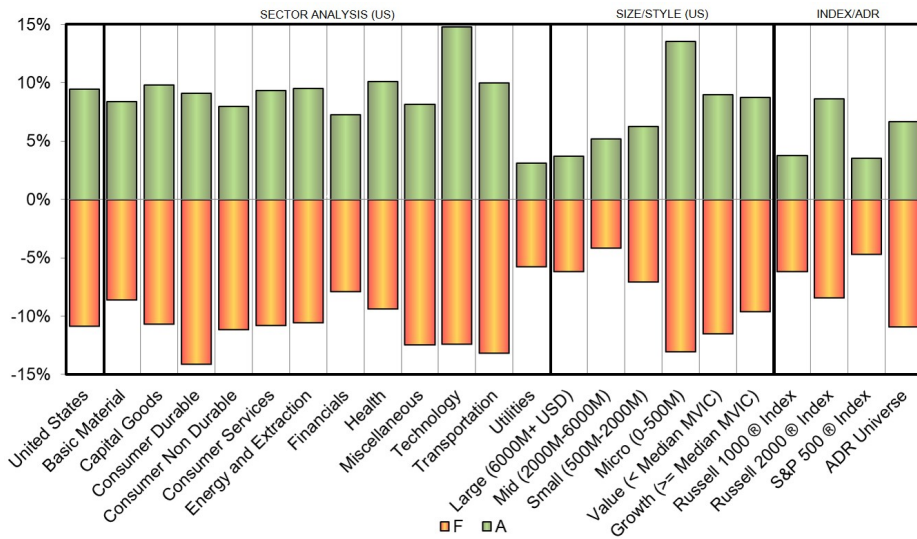


*EquityInsights.com, Snapshot (SAVE), 12/15/2016

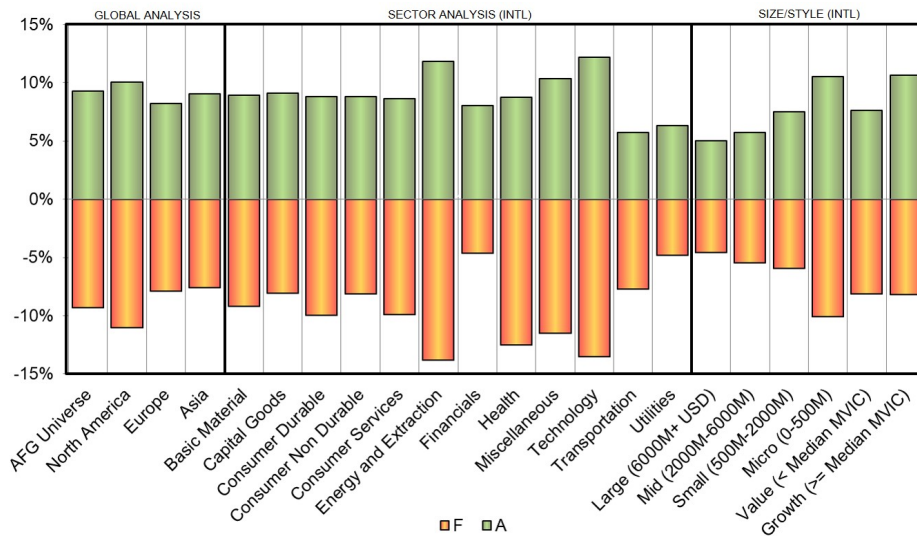
Revisiting the example on Spirit Airlines from before, the updated factor weights in December 2016 lowered the Investment Grade for SAVE to a B due to lowering the impact of the A-grade Price Momentum weight Spirit received in the static Company Grade model.

Historical Performance

AFG Investment Grade: A vs. F Grade Spreads - United States



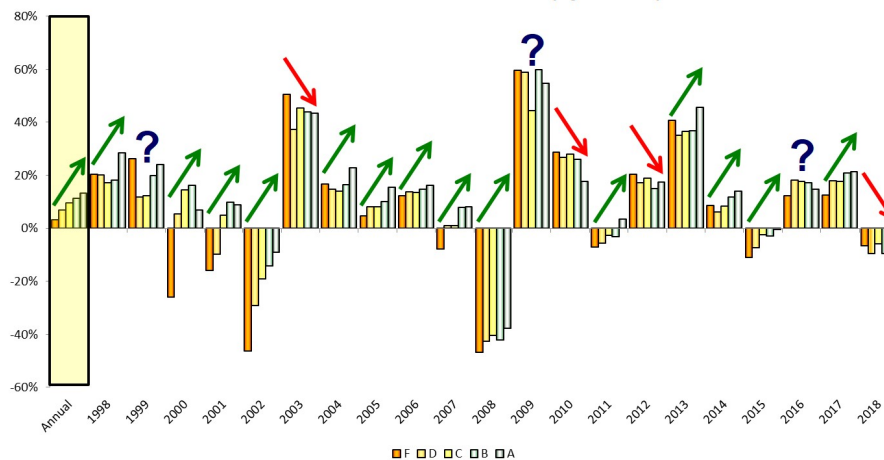
AFG Investment Grade: A vs. F Grade Spreads - International



*AFG Global Backtest Database, Investment Grade (Global Sector Quintiles), 12/31/1991 - 12/31/2018

Over long-term time horizons, aggregate performance of the Investment Grade is very similar to the Company Grade.

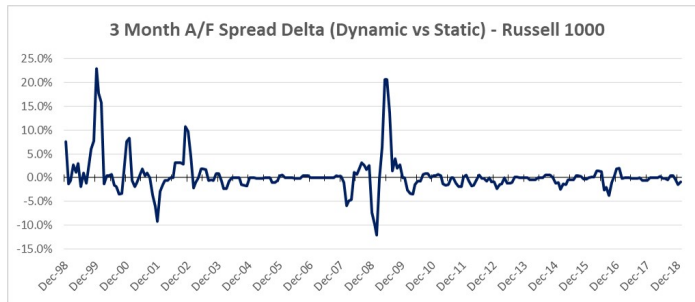
Russell 1000® Index Quintiles (by Sector)



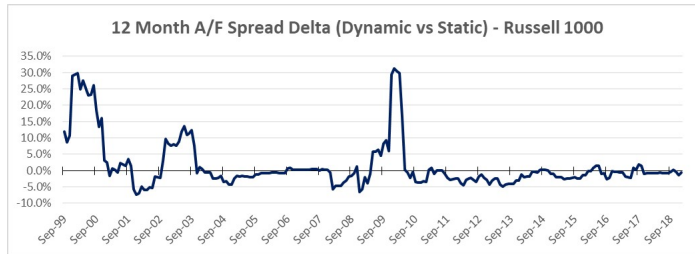
*Russell 1000 Investment Grade Quintiles, 9/30/1998 - 12/31/2018 (All Cap)

Revisiting the Russell 1000 quintile chart through the lens of AFG's Investment Grade, significant improvements in the consistency of year over year performance have been delivered, as well as larger aggregate return spreads compared to valuation alone. In most markets, Company Grade and Investment Grade calculations will be exactly

the same or very similar, leading to marginal deviations between each factor model approach. As individual metrics begin to deliver abnormal performance and the magnitude of these shifts increase, this may provide a signal that the market is experiencing a significant event, and these tactical deviations will better align with short-term investor preference through market panics and bubbles.



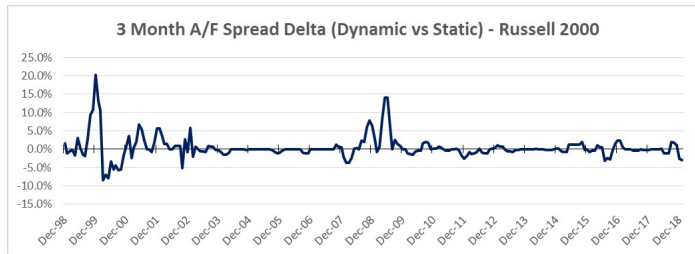
*Russell 1000 Investment Grade A/F Spreads vs. Company Grade A/F Rolling 3 Month Spreads, 9/30/1998 - 12/31/2018



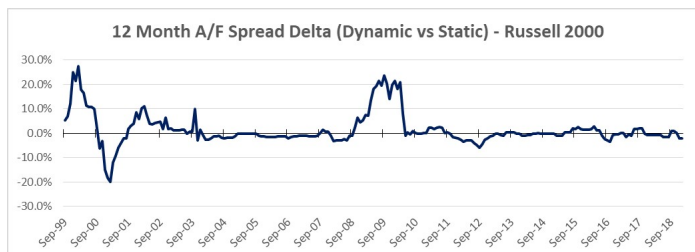
*Russell 1000 Investment Grade A/F Spreads vs. Company Grade A/F Rolling 12 Month Spreads, 9/30/1998 - 12/31/2018

The charts above highlight rolling three month and rolling twelve month differences between A-graded and F-graded spreads between the Investment Grade and Company Grade in the Russell 1000 universe. When rolling return spreads are positive, the graph indicates that the dynamic shifts of the investment grade factor weights improved performance over the static Company Grade, and when rolling return spreads are negative, the dynamic shifts impaired Investment Grade performance relative to Company Grade. When graph performance hovers around zero, it indicates that no dynamic shifts were included in the Investment Grade model, or a single grade shift was immaterial in overall performance.

In most markets, the dynamic shifts of the Investment Grade do not impact overall grade performance, but in certain environments the information from these shifts significantly boost performance, especially on a rolling twelve month basis. (Note the chart spikes around the collapse of the tech bubble in 1999/2000, the season of major accounting scandals in 2002/2003 and the recovery following the financial crisis in 2009)



*Russell 2000 Investment Grade A/F Spreads vs. Company Grade A/F Rolling 3 Month Spreads, 9/30/1998 - 12/31/2018



*Russell 2000 Investment Grade A/F Spreads vs. Company Grade A/F Rolling 12 Month Spreads, 9/30/1998 - 12/31/2018

These themes are consistent in the charts above that highlight relative performance spreads of A/F stocks between Investment Grade and Company Grade in the Russell 2000 universe. While material grade shifts are rare, it is important to leverage the insights provided by them in portfolio screening and monitoring workflows to confidently apply a systematic approach to portfolio construction across normal and irrational market regimes. To best capture

this, AFG advocates using the Company Grade as a screening and monitoring tool, while the Investment Grade is most appropriate when screening for potential replacement ideas so the turnover that accompanies dynamic grade weighting shifts does not impact turnover constraints.

US All Cap Return		Percent to Target Spreads		Company Grade Spreads		Investment Grade Spreads	
		F	A	F	A	F	A
Annual	10.3%	-7.3%	4.8%	-9.5%	8.0%	-9.8%	8.8%
1998	16.0%	2.4%	1.6%	-3.0%	0.1%	-3.8%	1.8%
1999	26.2%	32.8%	-5.7%	8.7%	0.0%	-1.3%	14.2%
2000	-5.7%	-29.1%	-3.5%	-26.7%	16.0%	-27.0%	9.2%
2001	21.0%	-27.9%	34.0%	-18.8%	26.3%	-23.7%	23.8%
2002	-15.9%	-21.6%	15.0%	-24.2%	20.1%	-24.7%	22.4%
2003	67.7%	13.2%	15.1%	-0.6%	10.2%	2.1%	12.3%
2004	19.4%	-11.0%	9.7%	-9.3%	9.7%	-7.9%	9.1%
2005	6.3%	-8.3%	1.5%	-11.0%	8.9%	-10.2%	8.6%
2006	17.4%	-4.8%	-0.5%	-4.7%	2.6%	-4.5%	3.0%
2007	-5.1%	-3.6%	-3.2%	-9.8%	7.6%	-9.4%	8.2%
2008	-42.8%	-7.6%	-3.5%	-8.4%	3.7%	-7.1%	5.9%
2009	63.2%	7.8%	58.5%	-9.4%	11.3%	-16.3%	23.2%
2010	29.8%	-0.5%	6.9%	-1.4%	5.6%	-0.9%	3.6%
2011	-7.5%	-6.8%	-4.1%	-9.2%	7.3%	-6.8%	6.1%
2012	18.0%	-3.4%	6.1%	-6.0%	6.7%	-4.6%	6.2%
2013	44.5%	0.6%	10.0%	-4.0%	6.0%	-3.5%	7.0%
2014	3.2%	-10.3%	1.5%	-8.2%	5.6%	-8.1%	5.3%
2015	-8.5%	-9.1%	0.6%	-7.4%	5.7%	-8.2%	5.4%
2016	20.3%	-13.2%	9.4%	-9.3%	5.0%	-8.7%	4.5%
2017	14.6%	-1.2%	-1.1%	-0.9%	4.2%	-0.9%	4.0%
2018	-12.1%	0.8%	-5.8%	0.0%	0.2%	-0.2%	-0.8%

*United States, Valuation/Multifactor Grade Quintiles, 9/30/1998 - 12/31/2018 (All Cap)

The table above highlights the consistency in outperformance on an all-cap basis delivered by AFG's multifactor grades.

Correlation between A-graded spreads	Percent to Target - Current	Company Grade	Investment Grade	Beta
Percent to Target - Current	x	0.36	0.34	1.101
Company Grade	0.36	x	0.78	0.889
Investment Grade	0.34	0.78	x	0.897

*United States, Valuation & Multifactor Grade Quintile Correlation, 9/30/1998 - 12/31/2018 (All Cap)

By adding momentum and quality characteristics to a valuation metric, the multifactor grades end up with a correlation to valuation roughly equal to the weight that valuation carries in the multifactor construction (35%). Further echoing the thesis that material dynamic weighting shifts are rare but informative, the correlation between Company Grade and Investment Grade is close to 0.8. The Beta estimates delivered by a multifactor approach are significantly lower than 1.0, with both Company Grade and Investment Grade estimates below 0.9. These low Beta estimates that accompany significant outperformance underscore why this approach to portfolio management screening and monitoring reflects AFG's best practice.

AFG's Company Grade and Investment Grade research systematically addresses both outperformance goals over long-term time horizons and navigation of various market environments across short-term horizons. As noted earlier, AFG recommends using the Investment Grade as an enhancement to overlay on the Company Grade when screening for potential replacements. The volatility created by shifts in investor preference on factor model weights will lead to volatility in Investment Grades, but this volatility does not impact a strategy when it is only applied to a universe of stocks that serve as potential replacement ideas. When screening for long buy ideas, AFG's best practice can leverage Company Grade = A and Investment Grade = A to find long-term investment ideas that align with current investor preference. Once a stock has been added to a portfolio, best practice simply recommends monitoring using the Company Grade so volatile factor model weights do not create unexpected turnover when factor weights shift. In the next section, AFG will further review incorporating best practice buy and hold rules to meet unique strategy goals and constraints.

Practitioner Notes

Global Sector Rank

AFG multifactor research compares each firm to a global set of sector peers to develop quantitative rankings. Sector weighting ensures that comparisons are made across a reasonable set of similar firms, and global weighting ensures that analysts identify both domestic and foreign sources of potential competition. US stocks tend to have very similar sector ranks from both a US-only ranking vs. a global ranking due to the high percentage of US stocks in the global database, but global ranking significantly improves metric performance where sector counts would be limited in smaller countries. The following table summarizes where AFG uses global sector quintiles in the Company Grade and Investment Grade research.

Variable	Weight	Ranking Style	Purpose
Percent to Target - Current	35%	Global Sector Quintile	Exploit Mispricing
EM Momentum	25%	Momentum Tiers	Recent Sentiment
Price Momentum	10%	Global Sector Quintile	Recent Sentiment
Earnings Quality	15%	Global Sector Quintile	Stabilize Grades
Management Quality	15%	Pass/Fail	Stabilize Grades
Company Grade	Static	Global Sector Quintile	Buy & Hold Resource
Investment Grade	Dynamic	Global Sector Quintile	Buy Overlay

Ranking Adjustments

Due to potential biases that may be created by increasing company counts in the Emerging Market stock universe, AFG calculates global sector ranks within the 26 developed countries that comprise its global backtest back to 1991.

This ensures that potentially significant skews from micro-cap stocks in the emerging market realm do not distort grade distributions that lead to unexpected turnover. The remaining global stock universe outside of these 26 countries are assigned overall grades consistent with similar GPA peers from the developed world stock universe.

Data Availability

Company Grade and Investment Grade data must include Percent to Target - Current, EM Momentum, and Management Quality; if any of these underlying metrics are NULL for a specific company, the overall multifactor grade will be NULL as well. Price Momentum may be NULL for recently issued equities following an IPO or a corporate action that resets pricing history. When this is the case, the full 35% weight for momentum will be applied to EM Momentum for the individual security. Earnings Quality may be NULL for financial/REIT stocks or firms with limited annual/quarterly financial statement history. When this is the case, the full 30% weight for quality will be applied to Management Quality for the individual security.

Accuracy / Model Bias

AFG calculates a measure of model accuracy for each company based on the relationship between default intrinsic value estimates and realized market prices over the last seven years. This serves as meaningful guidance to determine whether additional analyst research can improve a model bias by overriding default model assumptions with adjustments that are more aligned to the economics of a firm, which should reduce error in an estimate of intrinsic value. In the systematic component of portfolio management, AFG does not advocate including a screen on accuracy to simply seek out only highly accurate default models. These firms tend to be easier to model due to financial statement transparency, business model simplicity, or the lack of distortions caused by corporate action or management discretion, but they may also likely exhibit more efficient pricing in the marketplace which may prevent finding stocks that deliver abnormal returns through active management.

Earnings Quality Analysis

The balance sheet approach to estimating accruals has a known bias that high levels of overall growth will deliver high growth in net operating assets. When a firm believed to deliver strong cash flow generation has a poor earnings quality grade, confirm if significant organic growth or acquisitions occurred over the past year. If so, a poor grade can likely be disregarded. Also, reclassifying a large amount of cash into long-term investments has been a culprit behind an inaccurate poor grade, which has become more common as US firms have stockpiled cash offshore. When this is the case, a poor Earnings Quality grade can be disregarded.

Management Quality Analysis

Negative EMs and positive asset growth tend to negatively impact shareholders based on the backtest research on this variable. If a firm has very mild negative EMs (-1% to 0%) or mild positive asset growth (0% to 3%), this is less problematic than firms with much larger absolute levels, and may not pose as significant of a concern.

What's Working

AFG's What's Working research is available under Tools on EquityInsights.com. Under the "Universe Analysis" mode, menus are available to select an appropriate time frame and universe to analyze each of the metrics reviewed in this article from both recent and long-term perspectives in a unique investment arena of interest.

Mode

Universe Analysis Variable Analysis

Timeframe: Quarter to Date | Universe: Russell 1000 | Analysis: AFG Sector | Sub Universe: All Sectors | Update Table

Sep-30-2016 to Nov-30-2016	Returns							Return Spreads				
	Uni	F	D	C	B	A	F	D	C	B	A	
Russell 1000 : AFG Sector												
Investment Grade	3.1	0.9	1.9	2.5	3.7	5.0	-2.2	-1.1	-0.6	0.7	2.0	
Company Grade	3.1	1.8	1.9	3.2	3.6	3.9	-1.2	-1.2	0.1	0.6	0.8	
Percent to Target - Current	3.1	4.1	2.1	4.2	5.1	4.0	-2.9	-1.0	1.1	2.0	0.9	
EM Momentum	3.1	4.4	4.3	-2.2	1.2	5.8	1.3	1.2	-5.2	-1.9	2.7	
Price Momentum (Model)	3.0	0.8	7.2	4.8	0.9	1.0	-2.2	4.1	1.8	-2.1	-2.0	
Earnings Quality *	2.3	0.0	1.2	3.1	2.4	4.5	-2.3	-1.1	0.8	0.1	2.2	
Management Quality	3.1	0.8				3.6	-2.2				0.5	

*EquityInsights.com, What's Working, 12/16/2016

Additional Resources

[Percent to Target Insights](#)

[Sector, Country, Style Classifications](#)

[< Previous](#) | [Next >](#)