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Dissecting Beta - A Time Series Analysis

It is safe to say that "Beta" is one of the most prominent and frequently discussed terms amongst investment professionals. It is synonymously equated with risk in that a higher beta equals higher risk. Technically, the beta of an asset is a function of the regression of the asset's return (independent variable) against that of the market (dependent variable). The beta of an asset (or portfolio) is the slope of a line of best fit denoting the number of "units" that an asset's return is predicted to change when the market changes by one unit[i]. Roughly speaking, asset betas in excess of 1.1 are considered "high" while those less than 0.9 are considered "low". Betas figure importantly into the cost of equity via the Capital Asset Pricing Model, which, in turn, weaves its way into the weighted average cost of capital (WACC). We utilize WACC in many ways, not the least of which includes evaluating a firm's ability to generate economic value by earning a return on capital higher than the WACC. The WACC is also used as a discounting mechanism in performing discounted cash flow analyses for companies held in and being considered for our core equity strategies. Consequently, the magnitude of changes in beta can meaningfully influence both our analyses of economic value creation and valuation. While the beta of the market, by definition, will always be 1.0, we have witnessed pronounced changes within its constituent base that are worth dissecting, particularly at the sector level. More specifically, we have seen that certain sectors with historically high betas have moderated over the near term while others are showcasing parallel swings in the other direction.

To begin compiling the data for this study we composed a list, via FactSet Research Systems, Inc., of all constituents in the S&P 500 (for the Large Cap comparisons) and the S&P Small Cap 600 (for the Small Cap comparisons) using the correlating ETF. We then pulled each company's 1-year beta relative to its respective benchmark at 12/31 of every year going back to 2001. Finally, we calculated the median of each sector for the given period. It is important to note that while the beta of the overall market is equal to 1.0, using median rather than a weighted average will mean that the combined constituents in our data analysis may not have an aggregate beta equal to 1.0. The results for the Large Cap analysis are shown below.

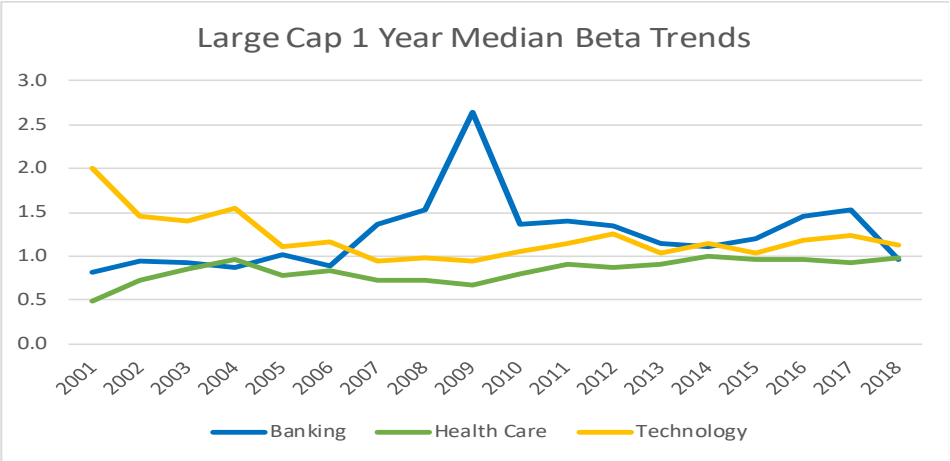
CHART 1

LARGE CAP MEDIAN 1 YR BETA	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Banking	0.82	0.94	0.93	0.87	1.02	0.88	1.37	1.53	2.64	1.37	1.40	1.34	1.15	1.11	1.19	1.46	1.52	0.97
Building	0.84	0.87	0.94	0.99	1.29	1.27	1.24	1.05	1.62	1.60	1.41	1.82	1.77	1.23	1.12	1.22	1.40	1.02
Capital Goods/Industrial	0.98	0.97	1.06	1.14	1.13	1.15	1.01	1.01	1.19	1.20	1.21	1.17	1.18	1.14	1.01	1.22	1.25	1.00
Chemicals	0.85	0.98	0.98	1.13	1.25	1.15	1.06	1.03	1.06	1.01	1.23	1.34	1.04	1.02	1.00	1.15	1.31	0.99
Consumer Durables	0.97	0.96	0.98	1.15	1.36	1.13	1.10	1.07	1.38	1.38	1.28	1.52	1.33	1.14	1.03	1.18	1.12	0.90
Consumer Staples	0.26	0.44	0.59	0.66	0.77	0.58	0.68	0.61	0.51	0.61	0.60	0.56	0.86	0.75	0.76	0.57	0.56	0.55
Energy	0.31	0.79	0.50	0.77	1.37	1.45	1.09	1.39	1.36	1.45	1.45	1.45	1.19	1.17	1.24	1.60	1.15	1.07
Financials	1.17	1.08	1.07	1.08	1.10	1.20	1.41	1.63	2.03	1.35	1.32	1.11	1.10	0.98	0.93	0.94	0.72	0.67
Health Care	0.48	0.73	0.86	0.96	0.77	0.83	0.72	0.72	0.67	0.79	0.91	0.87	0.90	1.00	0.97	0.96	0.92	0.98
Insurance	0.65	0.88	0.98	0.86	0.99	0.79	1.12	1.36	1.86	1.10	1.09	0.91	1.05	0.95	0.92	0.90	0.79	0.79
Metals	0.88	0.95	1.03	1.70	1.64	2.35	1.69	1.62	1.94	1.86	1.62	1.72	1.35	1.17	1.17	1.53	1.93	1.17
Paper & Related	0.98	1.39	1.37	1.67	1.31	0.99	1.18	1.32	1.68	1.20	0.88	0.76	1.05	0.56	0.56	NA	NA	NA
Retail	1.08	0.97	1.11	1.11	1.21	1.13	1.13	1.09	1.01	1.07	0.92	1.00	0.91	0.85	0.92	0.94	0.76	0.90
Semiconductors	2.47	1.94	1.79	1.74	1.40	1.83	0.96	0.94	1.11	1.31	1.11	1.29	1.17	1.14	1.17	1.26	1.72	1.34
Services	0.79	0.92	0.99	0.97	0.93	0.90	0.90	1.06	1.16	1.05	1.05	1.03	1.11	1.05	0.98	1.13	0.95	0.92
Technology	2.00	1.45	1.40	1.54	1.10	1.16	0.95	0.98	0.94	1.06	1.15	1.26	1.03	1.15	1.04	1.18	1.24	1.12
Telecommunications	0.89	1.09	1.07	0.85	0.71	0.70	0.82	0.92	0.77	0.60	0.73	0.61	0.83	0.64	0.98	1.01	0.76	0.66
Transportation	0.88	0.81	0.90	0.97	1.19	1.34	1.06	0.89	1.13	1.14	1.05	1.05	1.12	1.15	0.98	1.21	1.34	0.95
Utilities	0.21	0.70	0.63	0.54	1.00	0.64	0.88	0.76	0.62	0.72	0.66	0.42	0.76	0.48	0.65	0.38	0.15	0.20

Source: FactSet Research Systems Inc.

The data above showcases some notable observations. First, notice that the median betas in the Technology sector have come down significantly over time. They were over 2.0 in 2001 (no surprise!), but have fallen to a level just slightly above 1.1. No doubt the Technology companies' increase in size and importance to the market overall has led to the decrease, though the group does remain among the higher beta sectors overall. Banking is another fascinating study. The sector's beta was very close to 1 both fifteen years ago and last year, but the period in between was extremely volatile. The sector's beta spiked to 2.64 in 2009 during and shortly after the Great Recession largely caused by the financial crisis. The non-bank Financials sector saw a similar spike to >2.0 in 2009 as well, but interestingly has fallen to <0.7 last year, coming in as the third lowest beta of all the sectors. Finally, it appears that Health Care is not the defensive sector that it once was. With betas near the beginning of our study often falling below 0.8 or even 0.7 at times, the sector has gradually shifted towards 1.0 – the median beta came in at 0.98 last year. While there are still likely areas of the Health Care market that remain a safe haven, the rise in the number and importance of emerging biopharma companies has perhaps caused a secular shift for that sector as a whole. The line chart below shows these interesting trends.

CHART 2



Source: FactSet Research Systems Inc.

A glance at the Small Cap sectors reveals mostly the same observations - Semiconductors and Technology remain two sectors that have seen some meaningfully lower betas over time, Banking has round-tripped peak betas in 2009, and Health Care betas have been on the rise. One observation seems to be more pronounced in the Small Cap universe, however. Small Cap Energy betas have not reverted much back towards 1.0 since the high points in the middle of the time period as was the case with the Large Cap Energy counterpart. The median Small Cap Energy beta was 1.39 last year, the highest sector in the study. That contrasts with a beta of just over 1.0 in Large Cap. The divergence has magnified in recent years. One could conclude that impact of volatile oil prices is hitting these smaller and more leveraged Energy companies more significantly, as some constituents' survival may be at risk if oil and natural gas prices were to remain low for an extended period of time. The table showing the data for the Small Cap Universe is shown below.

CHART 3

SMALL CAP MEDIAN 1 YR BETA	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Banking	0.61	0.88	0.85	0.82	0.98	0.89	1.33	1.29	1.42	1.08	1.12	1.01	0.96	1.04	1.07	1.11	1.36	0.91
Building	0.71	0.89	0.92	1.08	1.31	1.22	1.04	1.09	1.20	1.30	1.34	1.39	1.27	1.24	1.11	1.16	1.08	1.08
Capital Goods/Industrial	0.79	0.98	0.98	1.07	1.03	1.14	1.13	1.08	1.05	1.12	1.15	1.18	1.13	1.13	1.07	1.11	1.21	1.08
Chemicals	0.63	1.07	1.12	1.02	1.04	1.04	1.17	1.12	1.07	1.15	1.18	1.06	1.09	1.16	1.13	1.02	1.00	0.89
Consumer Durables	1.08	1.04	1.01	0.99	1.10	1.01	1.20	1.14	1.40	1.20	1.26	1.38	1.28	1.01	1.00	1.02	0.93	1.03
Consumer Staples	0.63	0.69	0.75	0.87	0.84	0.81	0.92	0.68	0.66	0.72	0.83	0.75	0.84	0.83	0.85	0.90	0.77	0.66
Energy	0.70	0.85	0.58	1.00	1.31	1.23	0.95	1.25	1.45	1.38	1.49	1.68	1.35	1.67	1.51	1.90	1.21	1.39
Financials	1.03	0.93	1.00	0.73	0.91	0.84	1.13	1.33	1.41	0.92	0.93	0.78	0.87	0.62	0.84	0.94	0.67	0.66
Health Care	0.83	0.80	0.87	0.97	0.87	0.89	0.75	0.73	0.72	0.76	0.92	0.89	0.90	0.92	1.01	1.00	0.84	1.03
Insurance	0.45	0.87	0.86	0.83	0.87	0.70	1.09	1.00	0.89	0.88	0.85	0.77	0.96	0.90	0.99	0.81	0.85	0.76
Metals	0.64	0.84	1.15	1.48	1.42	1.76	1.65	1.61	1.57	1.50	1.55	1.62	1.38	1.34	1.32	1.59	1.50	1.18
Paper & Related	0.89	0.80	0.91	1.27	1.14	1.02	1.35	1.08	1.27	1.30	1.15	1.15	1.08	1.03	0.95	1.12	1.13	0.96
Retail	1.05	1.05	1.12	1.01	1.02	0.97	1.11	1.15	1.13	1.19	1.08	1.16	0.94	0.99	1.06	1.10	1.20	1.00
Semiconductors	2.00	1.95	1.85	1.60	1.18	1.46	1.09	0.95	1.09	1.17	1.10	1.19	1.14	1.26	1.01	1.01	1.14	1.25
Services	0.80	0.91	0.96	0.94	0.92	0.91	1.04	1.07	1.08	1.06	1.07	1.01	0.99	1.00	0.99	0.97	0.97	0.90
Technology	1.58	1.28	1.36	1.36	0.98	1.00	1.00	0.95	.096	1.06	1.10	1.18	1.08	1.17	1.00	1.07	0.96	1.06
Telecommunications	1.17	1.11	1.33	1.09	.067	0.70	1.20	1.51	0.76	0.92	0.97	1.07	0.87	0.91	0.97	0.80	0.94	1.08
Transportation	1.16	1.07	1.12	1.10	1.26	1.24	1.02	1.07	0.98	0.95	0.89	0.83	0.95	0.97	1.12	1.08	1.20	1.11
Utilities	0.47	0.72	0.66	0.67	0.74	0.59	0.87	0.70	0.45	0.63	0.62	0.42	0.74	0.48	0.60	0.38	0.35	0.33

Source: FactSet Research Systems Inc.

Conclusion

As discussed above, the beta movement amongst sectors has been quite pronounced over the time series examined. Interesting… but how can we use this information? We posit a couple ways: First, owning companies in a sector whose average beta is greater than that of the index component's sector average may introduce an unintended bet; for example, owning a large number of Health Care securities with higher than sector average beta may negate the sector's contribution to the portfolio's safe haven zone. If an intent is to have the Health Care portion of a portfolio serve as a risk moderator, one can control for portfolio risk by ensuring that the portfolio's Health Care beta is at or less than that of index component.

Secondly, the knowledge of including a security into a portfolio associated with a sector that has demonstrated volatile betas might cause one to demand a greater discount to intrinsic value. For example, Banking stocks have seen betas fluctuate wildly going back to 2001. Should/when credit conditions revert negatively, one-year betas will likely rise, putting upward pressure on the cost of capital and thus lowering enterprise value, all else equal. This awareness could lead to the demand for a greater discount to underlying value in advance of the realization of a credit turn and resultant higher beta, helping fortify the potential for a security to earn the hoped for required rate of return.

One final observation: while there has been volatility in betas, has there been reversion to the median at the sector level? The answer is: it depends. Some sectors, such as small cap Capital Goods/Industrial, have seen betas persistently above 1.0, with little volatility, and with periodic "check-ins" with the sector median of 1.09 over the last 18 years. Others, such as Health Care (both large cap and small) have seen steady ascents, which may indicate a new normal and could argue for a more persistent use of a higher cost of capital when modeling companies in these sectors.

While the notion that betas fluctuate over time is not a big revelation, the magnitude of the swings and sector breakdown of such appears reflective of the more volatile market we have observed. This observation underscores the risk in anchoring an assumed perception that certain sectors are risky/safe havens and reinforces the need to adapt to changing dynamics when making security selection, security disposal and portfolio construction decisions.

[1]Beta can be further defined as [Covariance(returnasset, returnmarket)]/[Variance(returnmarket)].