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Dissecting Beta - Part Two

As equity market volatility remains untamed, we return our attention to the concept of beta. In our Winter 2020 edition of *Isthmus Insights*, we authored a paper which showed how industry/sector betas changed over time, revealing surprising findings. For instance, we spotlit Large Cap Banking's ascension from a sub 1.0 one-year beta in 2001 to over 2.5 in 2009 and back down to 1.0 in 2018. Banking is certainly a sector that is on the minds of investors today. We also saw Large Cap Technology record a 2.0 beta in 2001 off the heels of the dot-com bust and then meander lower to just above 1.0 in 2018.

We revisit the notion of beta, a concept that is synonymously equated with risk. Technically, the beta of an asset is a function of a 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 continued to witness pronounced changes within its constituent base that are worth examining, particularly at the sector level. In this version of our beta dissection, we review the proportionality changes amongst sectors as it relates to their beta quintile rankings.

The idea for this whitepaper was born primarily from the interest in dissecting the top of the sort - namely the stocks with the highest betas - to see if sector representation in the top quintile of stocks, when ranked by beta, has changed meaningfully over time. After all, although we know that the FANMAG stocks dominate the weight of the largest equity indexes, we still wanted to better understand the makeup of the benchmarks on volatile days in the market. To do this we not only looked at the sector weights within the beta-ranked quintiles, but also how those weights compared to the sector weights of the S&P 1500. The following digs more deeply into what we've uncovered.

Specifically, we wanted to look at the sector weights within the quintiles of the S&P 1500 ranked by stock betas. In addition to studying the end of 2022, we looked at that benchmark every five years going back to 1997 and calculated the average of each company's one-, three-, and five-year daily beta vs. the S&P 1500 Index. We sorted the data and put the highest betas in Quintile 1 and the lowest betas in Quintile 5. Each of the five quintiles consists of approximately 300 stocks. The data can be analyzed in the heat map below where we've highlighted the top and bottom quintiles through time; red shading represents a low weight and green shading represents a larger weight.

TABLE 1

Sector Weights	Quintile 1						Quintile 5					
Sector	2022	2017	2012	2007	2002	1997	2022	2017	2012	2007	2002	1997
Banking	2.6%	30.4%	32.8%	4.0%	11.6%	10.2%	0.2%	0.0%	0.1%	0.3%	0.2%	4.0%
Building	0.0%	0.4%	0.9%	0.6%	0.0%	0.0%	0.4%	0.0%	0.0%	0.1%	0.0%	2.2%
Capital Goods/Industrial	9.8%	8.5%	5.8%	10.8%	13.4%	9.6%	4.4%	4.9%	2.2%	6.3%	4.8%	8.5%
Chemicals	1.3%	0.7%	2.7%	1.4%	0.0%	1.4%	0.5%	0.8%	0.5%	0.0%	0.3%	2.4%
Consumer Durables	14.8%	1.0%	2.0%	2.5%	0.1%	1.5%	0.0%	0.3%	0.2%	0.3%	1.7%	1.7%
Consumer Staples	0.4%	0.1%	0.0%	0.0%	0.0%	12.8%	20.8%	20.7%	22.5%	27.6%	36.1%	4.2%
Energy	1.2%	7.4%	15.9%	5.0%	0.1%	7.6%	0.6%	4.6%	0.8%	0.7%	9.7%	5.2%
Financials	4.5%	17.0%	12.2%	38.2%	13.1%	9.4%	3.7%	9.9%	2.1%	0.5%	2.6%	0.5%
Health Care	1.3%	2.5%	0.1%	0.4%	2.4%	17.8%	34.7%	17.2%	24.6%	31.8%	25.8%	1.4%
Insurance	0.3%	2.9%	10.6%	0.9%	0.0%	3.7%	3.3%	5.0%	6.5%	2.4%	0.3%	2.2%
Metals	2.4%	3.3%	4.8%	9.4%	0.0%	0.0%	0.4%	0.1%	0.5%	0.0%	0.6%	5.1%
Paper & Related	0.2%	0.3%	0.3%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	2.0%
Retail	3.1%	0.2%	0.8%	5.8%	2.8%	1.0%	8.3%	11.4%	8.9%	5.3%	0.1%	4.2%
Semiconductors	31.0%	14.4%	2.5%	5.1%	11.5%	4.4%	0.0%	0.0%	0.0%	0.4%	0.0%	0.1%
Services	5.7%	1.6%	4.5%	2.1%	9.6%	1.3%	4.7%	6.7%	4.6%	6.3%	3.2%	8.4%
Technology	19.8%	4.9%	3.1%	10.5%	32.6%	16.3%	2.7%	2.8%	8.7%	5.6%	0.3%	1.3%
Telecommunciations	0.0%	0.0%	1.1%	0.1%	2.3%	2.4%	4.9%	5.8%	6.6%	3.6%	0.0%	1.4%
Transportation	1.3%	4.4%	0.0%	1.2%	0.2%	0.6%	0.3%	0.6%	1.9%	1.8%	2.6%	2.4%
Utilities	0.1%	0.0%	0.1%	1.7%	0.3%	0.0%	10.1%	9.3%	9.1%	7.1%	11.5%	43.0%

Source: FactSet Research Systems Inc.

Some of the output looks perhaps as you would expect.

- Quintile 1 currently has the highest representation from the cyclical Semiconductors industry. Technology has the second highest weight and together these two sectors represent over half of the weight of the first quintile.

- In Quintile 5 (the lowest betas), Health Care and Consumer Staples stocks were the most represented sectors in each time period except for 1997 when Utilities, another low cyclicality sector, held the top spot. Moreover, cyclical industries like Building, Chemicals, Consumer Durables, Metals, Paper & Related and Semiconductors have little to no representation in the 5th Quintile in each period. Interestingly, Banking also has never had much representation here including nothing over 0.3% in the last twenty years.

- Another immediate observation was a confirmation of the swing in the Banking sector betas first discovered in our Winter 2020 whitepaper. Banking saw a big jump from the 2007 data and became the largest weight in the first quintile for both 2012 and 2017 by a fairly wide margin. However, at year-end 2022 it had fallen below the average sector weight in the first quintile. This is consistent with what we've been seeing in our bank security research in recent months though recent events may quickly change the story again.

As we looked at the data above, we thought it would be insightful to study whether or not the weightings were simply large or small within a quintile because of the size of a sector within the index itself. To try to isolate that impact we looked at a sector's weight within a quintile as a percentage of its weight in the index as a whole. This analysis can be seen in the second heat map below.

TABLE 2

Quintile Weight as a Percentage of Index Weight	Quintile 1						Quintile 5					
Sector	2022	2017	2012	2007	2002	1997	2022	2017	2012	2007	2002	1997
Banking	64.2%	438.8%	528.0%	61.0%	123.0%	131.8%	5.8%	0.1%	2.3%	5.0%	2.3%	51.1%
Building	7.9%	97.0%	315.3%	240.2%	2.2%	0.0%	86.0%	0.0%	0.0%	19.7%	2.3%	740.4%
Capital Goods/Industrial	139.6%	108.0%	70.0%	115.0%	163.2%	102.6%	62.4%	62.3%	26.8%	67.0%	58.3%	90.5%
Chemicals	80.8%	40.2%	127.1%	80.3%	2.1%	73.6%	30.9%	42.0%	23.7%	0.3%	22.4%	122.6%
Consumer Durables	621.8%	86.5%	171.8%	355.7%	4.1%	66.2%	0.4%	22.3%	16.9%	44.1%	114.6%	74.7%
Consumer Staples	7.4%	1.0%	0.2%	0.4%	0.0%	109.7%	367.5%	296.7%	247.4%	313.3%	429.2%	36.3%
Energy	26.1%	134.5%	159.4%	41.7%	1.0%	90.8%	14.0%	83.1%	8.4%	5.7%	160.7%	62.0%
Financials	70.0%	251.0%	181.6%	539.1%	216.6%	170.4%	57.6%	146.5%	31.9%	6.4%	42.4%	9.0%
Health Care	9.7%	20.1%	0.8%	3.2%	14.3%	153.5%	266.6%	139.7%	219.6%	271.2%	154.4%	12.1%
Insurance	6.3%	65.7%	252.5%	21.5%	0.0%	100.3%	79.2%	114.7%	154.0%	57.8%	7.1%	59.3%
Metals	392.6%	944.7%	598.5%	862.4%	0.0%	0.0%	68.7%	19.4%	66.5%	0.0%	118.4%	595.5%
Paper & Related	360.1%	214.2%	187.7%	141.5%	16.1%	0.0%	9.9%	0.0%	0.0%	0.0%	106.7%	436.8%
Retail	41.4%	2.3%	11.8%	117.1%	44.7%	24.6%	109.8%	166.2%	130.0%	106.2%	1.4%	99.0%
Semiconductors	583.9%	418.4%	96.8%	172.1%	394.4%	193.4%	0.0%	0.0%	0.0%	14.4%	0.0%	4.0%
Services	74.1%	18.7%	55.6%	33.4%	143.2%	19.5%	60.3%	78.5%	57.7%	102.5%	47.8%	129.7%
Technology	84.6%	25.2%	21.1%	79.2%	275.6%	158.2%	11.6%	14.5%	59.8%	41.9%	2.4%	12.5%
Telecommunciations	0.0%	2.6%	43.3%	3.3%	55.2%	31.0%	383.6%	325.8%	265.7%	117.3%	0.0%	17.9%
Transportation	70.7%	190.6%	0.0%	65.6%	12.1%	34.4%	14.8%	24.4%	98.6%	97.6%	149.3%	147.5%
Utilities	4.4%	0.0%	1.6%	43.8%	11.3%	0.0%	357.4%	341.5%	274.1%	179.9%	374.9%	1174.8%

Source: FactSet Research Systems Inc

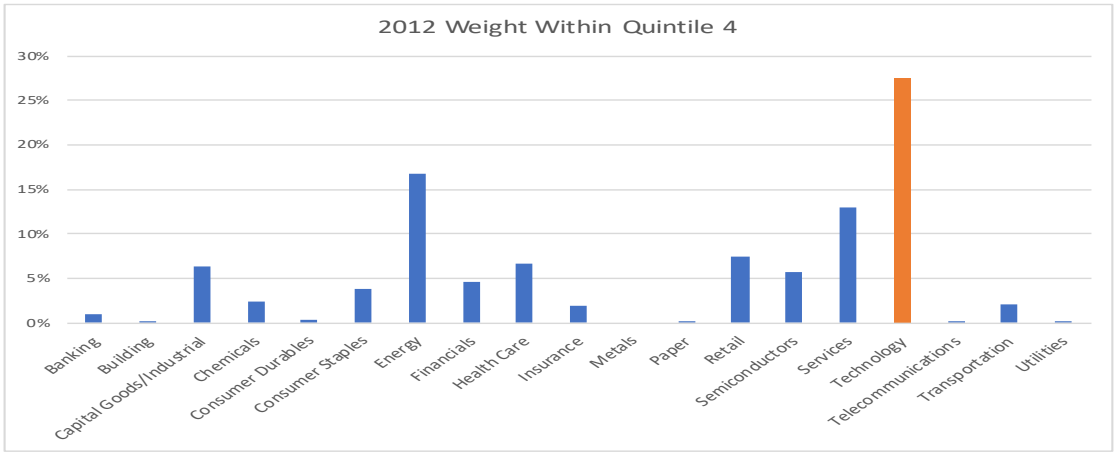
What this did was really emphasize the prevalence of what one would think of as higher beta cyclical sectors in Quintile 1 and those lower cyclicality, lower beta stocks in Quintile 5. You'll notice the following:

- Metals, Paper, Semiconductors, Capital Goods/Industrial and Consumer Durables over-index (green) in Quintile 1, as demonstrated by consistent green shading and large numbers.

- Consumer Staples, Health, Care, Telecommunications and Utilities over-index in Quintile 5, again with consistent green shading and large numbers showing large weights here.

Technology has been an interesting sector to analyze for at least the last 25 years from the dot-com bubble and bust to the rise of the so-called FANMAG stocks often dominating the headlines today. We know that those stocks have been market drivers for some time, so how does that show up in the data we've analyzed? First of all, suffice it to say the impact of those stocks has moved over time. In just the last 15 years we've seen a number of these stocks migrating higher in beta and up in the quintile ranks. In 2012, Technology was most heavily represented in Quintile 4 (not shown above) with a weight of 27.4%. This happens to be where heavyweights Microsoft, Apple and Netflix ranked with average betas between 0.93 and 1.02 at that time.

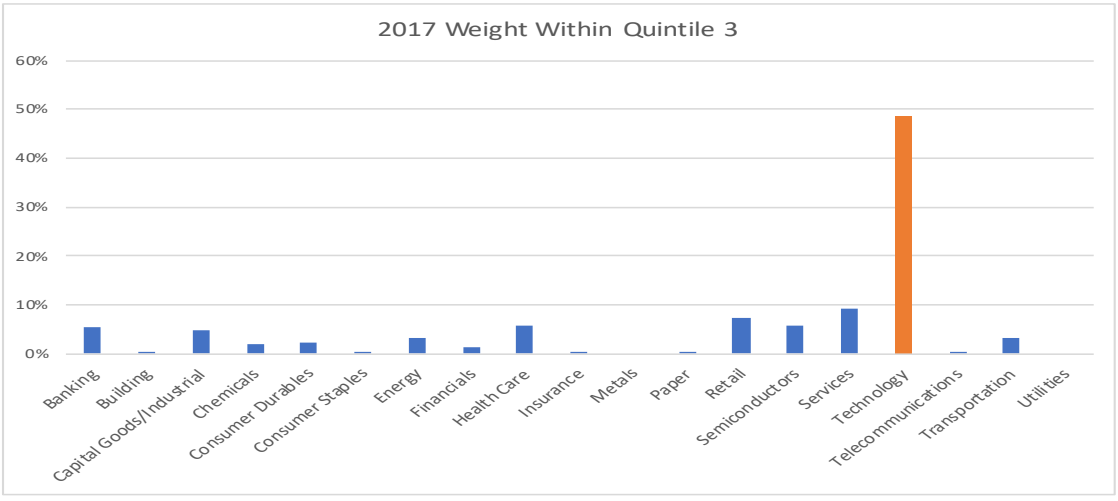
CHART 1



Source: FactSet Research Systems Inc

Moving ahead to 2017, Technology dominated the weight of the third quintile of stocks at 48.5%. While Netflix shot up into quintile 2, Microsoft and Apple were joined by Meta and Google in Quintile 3. Betas shifted higher and ranged between 1.06 and 1.18 for those four constituents of the group.

CHART 2

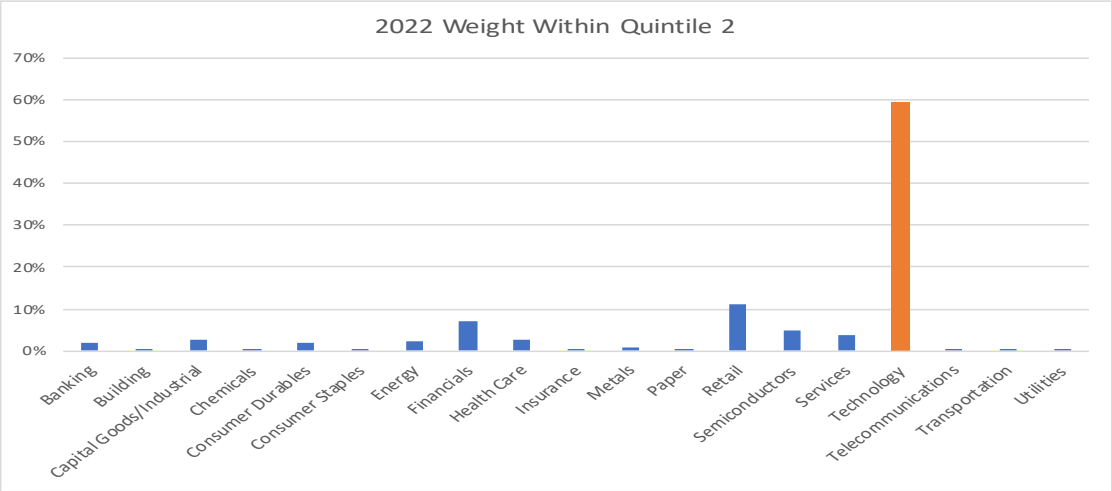


Source: FactSet Research Systems Inc

The trend continued into 2022 as Technology stocks migrated higher again, perhaps due to their massive volatility (declines) during this year. Now, they are astoundingly 59.3% of the second quintile of stocks! Meta, Microsoft, Apple, Google and Netflix all live in the second quintile of beta today and the values have increased to between 1.20 and 1.46! This really demonstrates how important these stocks have become to index performance. Perhaps they are simply too large (and thus determine so much of the index's performance)

to trade with betas in the top quintile. We would surmise that to the extent that Technology heavyweights exacerbate their market cap dominance, they "become the market" and therefore could settle in with betas around 1.0, which would translate back to Quintile 3 profile shown above.

CHART 3



Source: FactSet Research Systems Inc

One other really interesting takeaway from this entire analysis was the shift in Index weight represented by each beta quintile. In 1997, during the period leading up to the dot-com peak, the stocks with the highest 20% of betas represented over half of the weight of the S&P 1500! Incredibly, this has fallen to just 11% in the most recent time period as seen across the top line of the table below. Whereas the highest beta stocks saw a rapid rise in valuation in the late '90s as the market surged higher and thus made up the majority of the market cap of the index, we have found that today the highest beta stocks in the S&P 1500 skew smaller and thus perhaps somewhat riskier than the index as a whole, leading to the low weight of the top quintile. The large technology stocks sit just below that in quintile 2 and the progression in those stocks' participation within quintile 4 to quintile 2 over the last ten years can be seen in the migration of the weights highlighted in red in the table below.

TABLE 3

Weight of Beta-Ranked Quintiles in the S&P 1500						
	1997	2002	2007	2012	2017	2022
Beta Q1	50.7%	25.3%	7.8%	10.5%	9.1%	11.0%
Beta Q2	26.3%	20.5%	14.0%	12.9%	10.1%	28.7%
Beta Q3	12.8%	15.9%	22.1%	13.0%	30.5%	16.4%
Beta Q4	7.2%	17.1%	27.1%	28.6%	21.4%	18.9%
Beta Q5	3.0%	21.2%	28.9%	35.0%	28.7%	25.0%

Source: FactSet Research Systems Inc

Conclusion:

The findings above show that the proportionality of beta by sector is ever-changing. In other words, one cannot always count on certain sectors being "low-risk" or "high-risk" sectors. The dynamics that have transpired over time in areas such as Banking and Technology force the discounted cash flow modeler to carefully consider the type of environment when assigning betas in determining the cost of equity. For example, utilizing higher short-term betas for Bank modeling may be appropriate currently, despite historical betas being muted, given the recent ascension in volatility in the sector. The impacts to the cost of equity due to changes in beta also manifest themselves in the determination of economic value creation; as elevated betas raise the cost of equity/cost of capital, the "hurdle rate" above which companies must return on this capital rises, creating a new lens into our determination of high quality (economic value accretive) companies.

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