Russell Investments

Russell Research

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The Russell-Axioma U.S. Long-only Factor Indexes

The Russell-Axioma U.S. Long-only Factor Indexes are a powerful set of new tools designed to serve as blueprints for investment products that can be used by institutional asset managers, other informed investors and their advisors to analyze factor exposures in portfolios. Products based on these indexes could make it possible for more investors to trim or add factor exposures with an ease that until now has been enjoyed only by the largest and most sophisticated asset managers.

This paper summarizes the design principles of the Russell-Axioma U.S. Factor Indexes and reports key aspects of their historical performance.

General overview of Russell U.S. large cap and small cap factor indexes

The Russell-Axioma U.S. Long-only Factor Indexes series includes a set of large cap indexes based on the Russell 1000® Index and a set of small cap indexes based on the Russell 2000® Index. These indexes provide efficient exposure to the momentum, market beta and volatility factors.

"Factors" are drivers of the consistent performance patterns observed in equity markets that significantly affect the risk and returns of stocks. Researchers have observed that the size, or market capitalization, of firms is broadly related to their stock returns. For example, the return patterns of small cap stocks have been shown to be distinct from those of large cap stocks. The "size factor" captures this difference. Indexes are constructed to identify specific factors. For example, the Russell 1000 has U.S. large cap exposure, and the Russell 2000 has U.S. small cap exposure. Style indexes such as the Russell 1000® Growth and Value indexes can also be considered to deliver exposures to "style factors" (here, as the names indicate, growth and value). The Russell-Axioma U.S. Factor Indexes are based on three factors – medium-term momentum, market sensitivity and volatility – as they are defined by the Axioma U.S. Equity Medium Horizon Fundamental Factor Risk model.[1]

[1] For information on Axioma risk models, see www.axioma.com/robust.htm.

Limitations of the standard approach to factor index construction

The standard approach to constructing a factor index is to start by defining a factor and ranking the stocks in a given parent index by their factor scores. Sub-indexes, comprising stocks within a particular range of factor scores, can then be constructed. Take momentum, for example. Academic and industry research has long shown that stocks that have outperformed in the past tend to continue to outperform.[2] The most widely used measure of stock momentum is the total return of a stock from a year before the current date to one month before the current date.[3] Stocks in an index such as the Russell 1000 can be ranked according to their momentum scores. The stocks with the highest momentum scores can then be assigned to a high-momentum index.

There are two key problems with the standard method of factor index construction. The first is the possibility of high turnover in index holdings. Turnover can be high because factor indexes are generally rebuilt monthly in order to properly track fast-changing factors. The second problem is that factor indexes can develop unbalanced exposures to other factors, sectors or industries. For example, a high-momentum index could have easily become overweight technology companies during the technology bubble of the late 1990s. Exposure imbalances are defined relative to the parent index. Thus a large cap high-momentum index is overweight the technology sector if the technology sector has a larger weight in the momentum index than in the Russell 1000. Such unintended factor exposures are called "non-target factor exposures."

How optimization helps

The Russell-Axioma Factor Indexes track the performance of standard factor indexes constructed in the manner just described. The respective standard factor index represents the target exposure to be captured. Optimization is used to reduce index turnover and constrain non-target factor exposures while keeping the return performance close to that of the target factor index.[4]

Investment products based on the Russell-Axioma Factor Indexes enable investors to easily increase or reduce their exposures to a factor. An investor looking for direct exposure to a factor may now obtain it readily, and at less expense. An investor looking to modify the factor exposure of an existing portfolio now has a feasible alternative to restructuring the portfolio itself. For example, an investor with a growth-tilted large cap equity portfolio may find its beta or volatility exposures uncomfortably high. The investor could reduce such exposures by adding products that track the Russell-Axioma U.S. Long-only Large Cap Low Beta or Low Volatility indexes – or, alternatively, by taking a short exposure to the High Beta or High Volatility indexes.

[2] Ilya Figelman's "Stock return momentum and reversal: A comprehensive study," in the *Journal of Portfolio Management*, Fall 2007, pp. 51–67, provides a systematic and global analysis of the returns to momentum investing. Academic interest in momentum can be traced back at least to Narasimhan Jegadeesh and Sheridan Titman's "Returns from buying winners and selling losers: Implications for market efficiency," in the *Journal of Finance*, 1993, pp. 65–91.

[3] This is also called "medium-term momentum." The most recent month of performance is left out of momentum measures because of the "reversal effect." The reversal effect is the name given to the observation that stocks that outperform in one month tend to underperform in the next.

[4] Further information about the construction of the Russell-Axioma U.S. Long-only Indexes can be found in "Russell-Axioma U.S. Small and Large Cap Factor Indexes (Long-only) Construction and Methodology," May 2011, available at www.russell.com/indexes.

Overall performance of the Russell-Axioma U.S. Long-only Factor Indexes

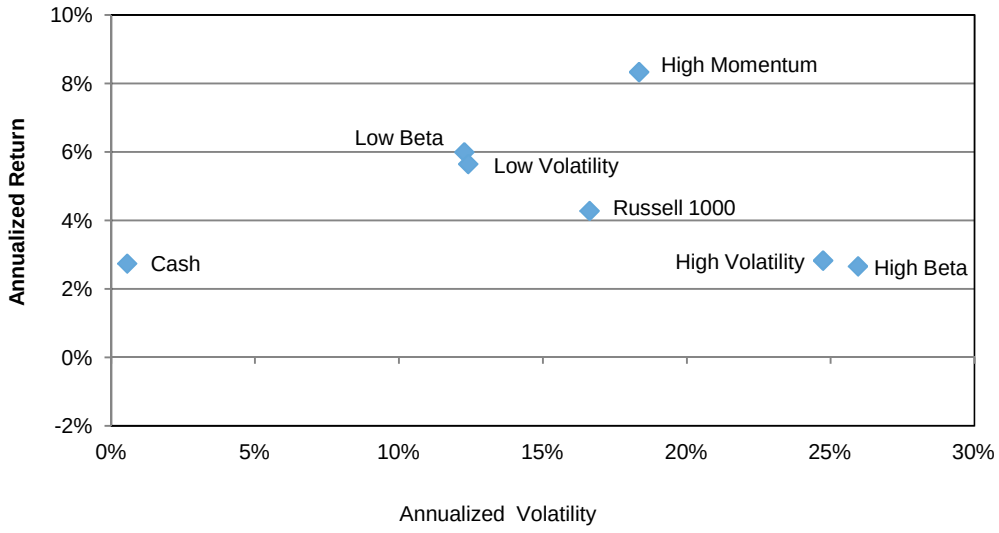
Risk/return profiles

The most basic index performance characteristics are risk and return. The risk/return profiles of all Russell-Axioma U.S. Long-only Factor Indexes are charted here – the large cap indexes in Figure 1, and the small cap indexes in Figure 2. The full available simulated performance history is used. This history includes monthly returns from January 1998 through July 2011.

The vertical axis in each of these charts represents annualized return, calculated as the annualized rate of return over the time period.[5] The horizontal axis, annualized volatility, is the annualized standard deviation of the monthly returns.

Figure 1 presents the risk/return profiles of the Russell-Axioma U.S. Long-only Large Cap Indexes. High Momentum had by far the highest return, 8.33% per year, over this time period. This was achieved with volatility only slightly higher than that of the Russell 1000. Both High Beta and High Volatility were considerably more volatile than the Russell 1000; however, their annualized returns were about equal to the annualized return on 91-day treasury bills, our proxy for the risk-free rate or "cash." Low Beta and Low Volatility both had significantly lower volatility than did the Russell 1000, and their returns were almost 2% per year greater.

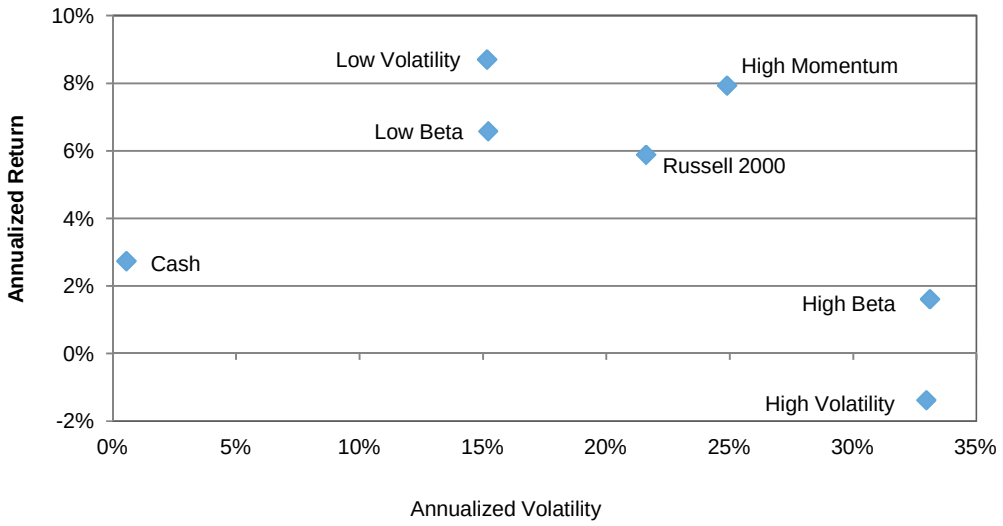
Figure 1 / Risk/return profiles of Russell-Axioma U.S. Large Cap (Long-only) Factor Indexes, based on monthly returns from January 1998 to July 2011



Source: Axioma, FactSet

[5] "Annualized return" is the constant rate of return, assuming annual compounding, that results in the same ending value of the index.

Figure 2 / Risk/return profiles of Russell-Axioma U.S. Small Cap (Long-only) Factor Indexes, based on monthly returns from January 1998 to July 2011



Source: Axioma, FactSet

Figure 2 presents the risk/return profiles of the Russell-Axioma U.S. Long-only Small Cap Indexes. The general performance pattern is similar to that seen for the large cap indexes. The most salient difference is the considerable variation in performance between the beta and volatility indexes. High Beta and High Volatility returned less than cash over the performance history, with High Volatility showing a negative return.

Figures 1 and 2 show that the factor exposures embodied in the Russell-Axioma U.S. Long-only Factor Indexes delivered significant performance differentials compared to the core Russell 1000 and 2000 Indexes. As we discuss below, the general performance pattern is what should be expected, although the elements of this pattern may surprise some investors.

Explanations for the outperformance of low-volatility strategies

The most potentially surprising pattern in these risk/return profiles is that Low Beta and Low Volatility indexes outperformed the core index and the High Beta and High Volatility indexes. This pattern is contrary to our intuition that higher risk should be rewarded with higher return, at least over long investment horizons. While this intuition is consistent with many financial models, including Sharpe's capital asset pricing model (CAPM), 40 years of academic research, most of it not widely known until recently, has shown that risk has not been rewarded in a manner consistent with the simple CAPM.[6] This is consistent with the recent finding that many

[6] This is an important topic for investors, particularly investors contemplating factor strategies. However, it is a complex topic beyond the scope of this paper. A very accessible introduction to the topic that advances the hypothesis that this effect is at least partially driven by the fact that investment managers are benchmarked is provided by "Benchmarks as limits to arbitrage: Understanding the low volatility anomaly," by Malcolm Baker, Brendan Bradley and Jeffrey Wurgler and published in the *Financial Analysts Journal*, Jan/Feb. 2011, pp. 40–54. A global survey of the volatility effect is provided in David Blitz and Pim van Vliet's "The volatility effect: Lower risk without lower return," in the *Journal of Portfolio Management*, Fall 2007. Early papers on this subject include "The capital asset pricing model: Some empirical tests," by Fischer Black, Michael Jensen and Myron Scholes, first published in 1972, and Robert Haugen and James Heins's "Risk and the rate of return on financial assets: Some old wine in new bottles," in the *Journal of Financial and Quantitative Analysis*, 1975, pp. 775–84.

institutional investment managers have seen plan performance significantly degraded by unintentional volatility exposures.[7]

The difference between beta and volatility: idiosyncratic volatility

The risk/return portrait of the Russell-Axioma U.S. Long-only Factor Indexes provided by Figures 1 and 2 is also notable in that the performance characteristics of the large cap beta and volatility indexes are very similar, whereas the performance characteristics of the small cap beta and volatility indexes are much more distinct. A stock's (market) beta represents the systematic part of its volatility that is correlated with the market. The remaining "idiosyncratic" volatility is that part not correlated with the market. The similarity in performance of the Large Cap Low Beta and Large Cap Low Volatility indexes reflects the relatively high correlation of beta and idiosyncratic volatility over the time period covered by index histories.

The correlation between systematic and idiosyncratic volatility among small cap stocks is not as high. The performance differences between the Small Cap Low Beta and Small Cap Low Volatility indexes may reflect lower correlation between beta and idiosyncratic volatility for small cap stocks. The Small Cap Low Volatility outperformance relative to Small Cap Low Beta is consistent with the growing evidence that the market penalizes stocks for the higher levels of idiosyncratic volatility found in the Small Cap Low Beta index.[8]

Performance statistics

Tables 1 and 2 report historical performance statistics for the same indexes and time periods as above; Table 1 for large cap indexes and Table 2 for small cap indexes. Annualized arithmetic average returns are more indicative of short-term performance than are annualized geometric average returns. It can be seen that the arithmetic average returns of the High Beta and High Volatility indexes were considerably higher than their geometric average returns. The noticeable difference between arithmetic and geometric average returns follows from the level of volatility of these indexes – the greater the volatility of returns, the greater the difference between arithmetic and geometric average returns.[9] This indicates short-term investment opportunities.

Beta

The beta statistic represents the average sensitivity of an index to changes in the Russell 1000 for large cap indexes and to the Russell 2000 for small cap indexes. Beta is the average percentage change in the index associated with a percentage increase in the core index. Not surprisingly, the High Beta and High Volatility indexes had high betas, and the Low Beta and Low Volatility indexes had low betas.

[7] Exposure to volatility in institutional investment manager portfolios is documented in Bob Collie and John Osborn, "Defensive equity: Is the market mispricing risk?" *Russell Research*, June 2011.

[8] Penalization of idiosyncratic volatility is contrary to the customary belief that diversifiable risk should not be priced by the market. This is an area of continuing research. The first paper to find penalization of idiosyncratic volatility is Andrew Ang, Robert Hodrick, Yuhang Xing and Xiaoyan Zhang's "The cross-section of volatility and expected returns," published in the *Journal of Finance*, 2006, pp. 259-299.

[9] See chapter 4 of Jon A. Christopherson, David R. Cariño, and Wayne E. Ferson, *Portfolio Performance Measurement and Benchmarking*, New York: McGraw-Hill, 2009.

Table 1 / Performance statistics for Russell-Axioma U.S. Large Cap (Long-only) Factor Indexes, monthly simulated historical total returns, December 31, 1997 to July 31, 2011

	Russell-Axioma U.S. Large Cap Long-only						
	High Beta	High Momentum	High Volatility	Low Beta	Low Volatility	Russell 1000	91-Day T- Bill
Annualized arithmetic return	6.26%	10.16%	6.09%	6.80%	6.47%	5.60%	2.74%
Annualized geometric return	2.66%	8.33%	2.83%	6.00%	5.65%	4.28%	2.74%
Annualized standard deviation	25.95%	18.34%	24.73%	12.27%	12.40%	16.62%	0.55%
Beta to Russell 1000	1.46	0.96	1.39	0.62	0.65	---	0.00
Maximum drawdown	73.6%	49.6%	71.3%	38.4%	36.7%	51.1%	0.00
Sharpe ratio	0.00	0.30	0.00	0.27	0.23	0.09	---

Source: Axioma, FactSet

Maximum drawdown

The maximum drawdown for an index is the greatest peak-to-trough decline in value over the observed history. The Large Cap and Small Cap High Beta and High Volatility indexes had by far the highest maximum drawdowns, these stemming from the technology bubble. The High Momentum maximum drawdowns were similar to those of the respective parent indexes.

Sharpe ratio

A Sharpe ratio is a measure of return per unit of volatility. The reported Sharpe ratio is based on the annualized return minus the annual risk-free rate (here the 91-day treasury bill). This quantity is then divided by the annualized standard deviation. The Large Cap and Small Cap High Momentum, Low Beta and Low Volatility indexes had higher Sharpe ratios than the respective parent indexes over the complete history.

Table 2 / Performance statistics for Russell-Axioma U.S. Small Cap (Long-only) Factor Indexes, monthly simulated historical total return data, December 31, 1997 to July 31, 2011

	Russell-Axioma U.S. Small Cap Long-only						
	High Beta	High Momentum	High Volatility	Low Beta	Low Volatility	Russell 2000	91-Day T-Bill
Annualized arithmetic return	7.10%	10.75%	4.09%	7.57%	9.54%	8.41%	2.74%
Annualized geometric return	1.61%	7.93%	-1.38%	6.58%	8.71%	5.89%	2.74%
Annualized standard deviation	33.11%	24.89%	32.96%	15.21%	15.16%	21.60%	0.55%
Beta to Russell 2000	1.43	1.05	1.44	0.60	0.63	---	0.00
Maximum drawdown	80.1%	53.5%	82.7%	48.2%	40.9%	52.9%	0.00
Sharpe ratio	-0.03	0.21	-0.12	0.25	0.39	0.15	---

Source: Axioma, FactSet

Volatility drag

The poor long-term return performance of the High Beta and High Volatility indexes in both large and small cap versions has already been discussed. Another aspect of the determinants of the long-term performance of these indexes is also visible in these tables. The relationship between arithmetic average returns and geometric average returns can be explained by the return volatility. The geometric average return is approximately equal to the arithmetic average return minus one-half the return variance (square of standard deviation, or volatility-squared). The drain on performance associated with volatility was thus approximately 3.4% for the Large Cap High Beta Index and only 0.8% for the Large Cap Low Beta index. The volatility

differences in these indexes built in a 2.6% long-term drain on any arithmetic average return performance advantage that Large Cap High Beta might have had over Large Cap Low Beta.[10]

Historical performance profiles

Performance over multiple time horizons

The statistics so far presented show performance over a nearly 14-year horizon. The following tables show annualized return, annualized standard deviation and Sharpe ratios for trailing 1-, 3-, 5- and 10-year windows ending July 31, 2011. Table 3 shows results for large cap indexes, and Table 4 shows results for small cap. As should be expected, these tables show that volatilities were relatively stable over different time horizons, but that returns and Sharpe ratios varied much more widely. It can be seen that High Beta and High Volatility performed very well over the one-year horizon in both large and small cap.

Table 3 / Multiple horizon risk/return statistics for Russell-Axioma U.S. Large Cap (Long-only) Factor Indexes, monthly simulated historical total return data, December 31, 1997 to July 31, 2011

	Russell-Axioma U.S. Large Cap Long-only					
	High Beta	High Momentum	High Volatility	Low Beta	Low Volatility	Russell 1000
1-year annualized return	17.4%	21.9%	20.9%	19.4%	17.6%	20.7%
3-year annualized return	2.8%	–0.1%	2.3%	3.6%	4.3%	3.3%
5-year annualized return	2.2%	1.8%	0.9%	3.7%	4.3%	2.8%
10-year annualized return	1.6%	4.8%	2.0%	4.6%	5.0%	3.1%
1-year annualized standard deviation	18.8%	14.0%	16.1%	11.0%	10.6%	13.5%
3-year annualized standard deviation	29.4%	20.8%	28.1%	16.4%	15.7%	21.7%
5-year annualized standard deviation	24.4%	17.9%	23.6%	13.9%	13.5%	18.2%
10-year annualized standard deviation	22.8%	15.3%	22.2%	11.9%	11.6%	16.0%
1-year Sharpe ratio	0.92	1.55	1.28	1.74	1.65	1.51
3-year Sharpe ratio	0.08	–0.02	0.07	0.20	0.25	0.14
5-year Sharpe ratio	0.02	0.00	–0.04	0.14	0.19	0.06
10-year Sharpe ratio	–0.01	0.18	0.00	0.22	0.26	0.07

Source: Axioma, FactSet

[10] For a general discussion of volatility drag, see Bob Collie, "The volatility paradox: When winners lose and losers win," *Russell Research*, July 2011.

Table 4 / Multiple horizon risk/return statistics for Russell-Axioma U.S. Small Cap (Long-only) Factor Indexes, monthly simulated historical total return data, December 31, 1997 to July 31, 2011

	Russell-Axioma U.S. Small Cap Long-only					
	High Beta	High Momentum	High Volatility	Low Beta	Low Volatility	Russell 2000
1-year annualized return	19.1%	38.9%	21.2%	25.0%	25.5%	23.9%
3-year annualized return	7.0%	2.2%	2.0%	1.4%	8.3%	5.3%
5-year annualized return	2.8%	4.1%	–0.2%	2.0%	5.9%	4.1%
10-year annualized return	3.3%	7.8%	1.1%	7.2%	9.1%	6.5%
1-year annualized standard deviation	24.3%	18.1%	23.0%	13.0%	15.2%	18.8%
3-year annualized standard deviation	35.1%	26.3%	33.7%	21.1%	20.4%	27.6%
5-year annualized standard deviation	29.2%	22.2%	28.1%	17.8%	17.6%	22.9%
10-year annualized standard deviation	28.2%	20.0%	28.0%	15.6%	15.7%	20.9%
1-year Sharpe ratio	0.77	2.14	0.91	1.90	1.66	1.26
3-year Sharpe ratio	0.19	0.07	0.05	0.05	0.39	0.18
5-year Sharpe ratio	0.04	0.10	–0.07	0.02	0.24	0.10
10-year Sharpe ratio	0.05	0.29	–0.03	0.33	0.45	0.22

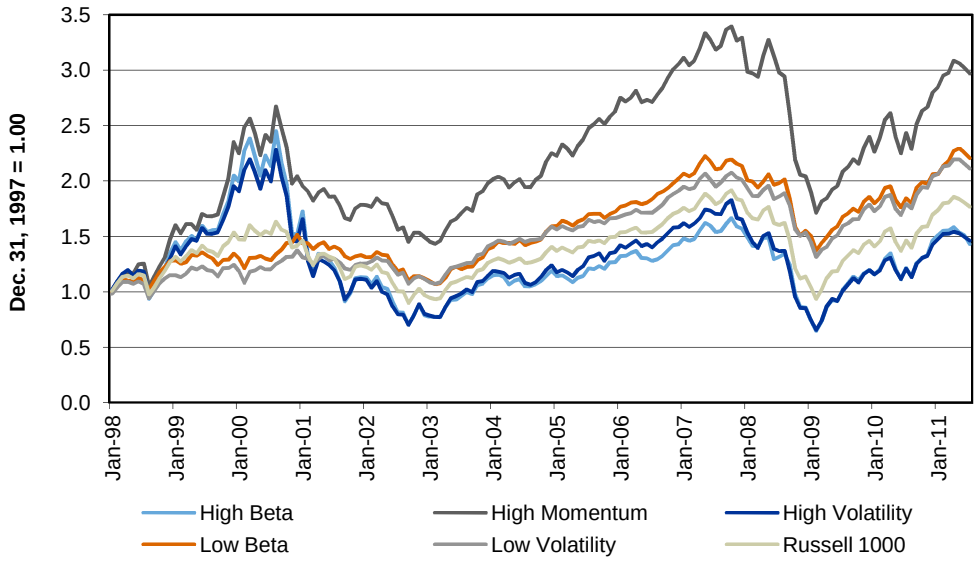
Source: Axioma, FactSet

The large cap statistics reported in Table 3 show that Low Beta and Low Volatility had consistently superior returns and Sharpe ratios. Momentum did very poorly over the last three years, and risk-adjusted performance did not look strong until the 10-year horizon was reached. The small cap statistics reported in Table 4 show that only Low Volatility achieved consistently high returns and Sharpe ratios.

Graphic representation of performance

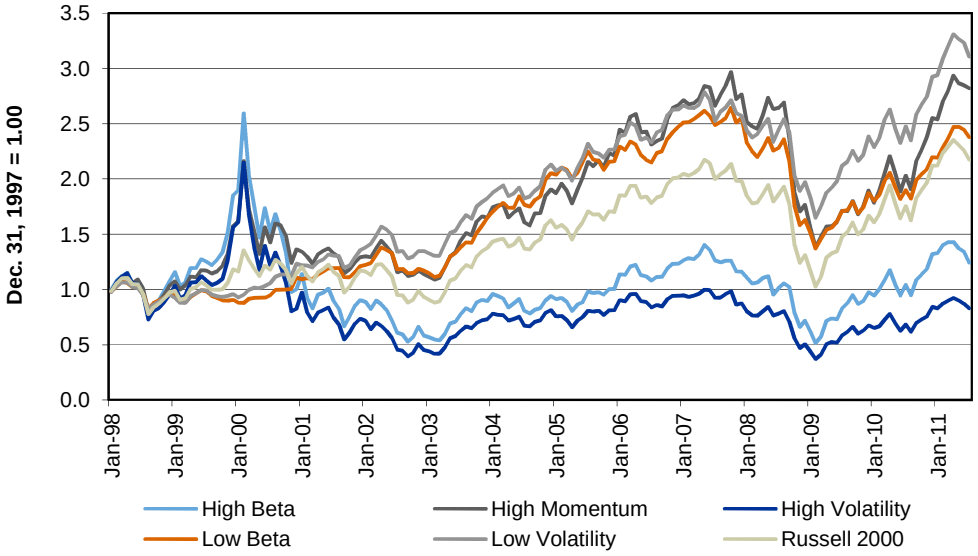
Graphic presentation of cumulative performance is shown in Figures 3 and 4. These “growth of a dollar” charts start with portfolio values of 1.00 as of December 31, 1997. Figure 3 shows cumulative performance of the Russell-Axioma Large Cap (Long-only) Factor Indexes and the Russell 1000 over this period. Figure 4 shows the same for the Small Cap Factor Indexes and the Russell 2000.

Figure 3 / Cumulative performance of Russell-Axioma U.S. Large Cap (Long-only) Factor Indexes, December 31, 1997 to July 31, 2011



Source: Axioma, FactSet

Figure 4 / Cumulative performance of Russell-Axioma U.S. Small Cap (Long-only) Factor Indexes, December 31, 1997 to July 31, 2011



Source: Axioma, FactSet

Figures 3 and 4 display a wide range of longer-term performance trajectories, significantly different factor performance patterns between large and small cap versions, and different responses to market events in the technology bubble and subprime crisis periods. High Beta, High Momentum and High Volatility outperformed during the technology bubble, particularly in large cap. The performance of Large Cap High Momentum was clearly distinct from the

performances of all other large cap indexes. It was tremendously successful from March 1, 2003 to October 31, 2007, with a compound annual return of 20.3% and an annualized standard deviation of 9.4%. Its downturn, starting on June 1, 2008 and running until February 28, 2009, culminated in a decline of 49.6%.

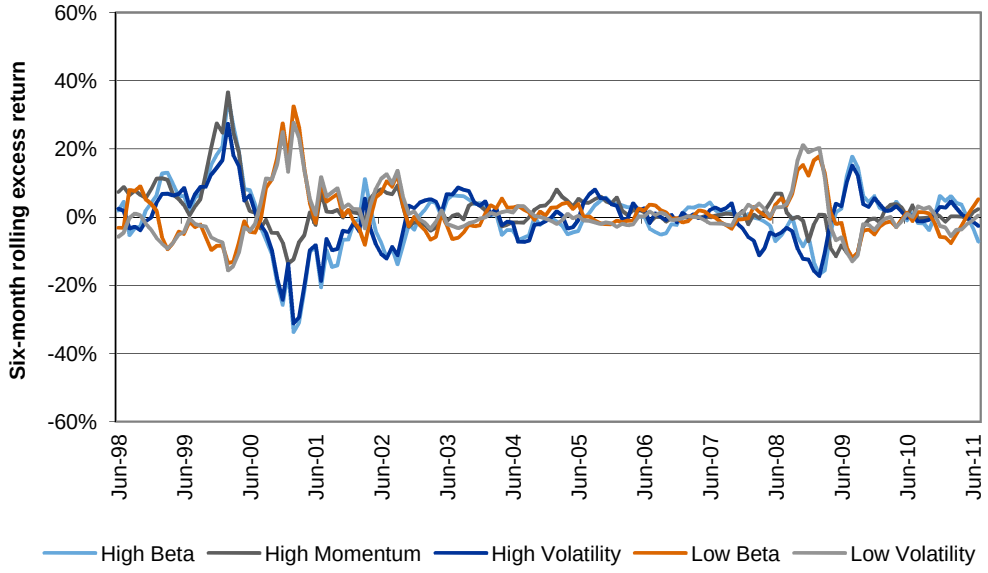
Small Cap High Momentum, Low Volatility and Low Beta had remarkably similar performance patterns in the period starting January 2001, after the technology bubble. Low Volatility performance was consistently ahead of that of Low Beta, and this performance advantage sharpened in the period after June 2009. As we noted above, this performance differential may have been driven by penalization of idiosyncratic volatility.

Rolling excess returns: factor indexes made large moves relative to the market

Another useful perspective on performance is gained by examining excess returns relative to the core indexes. Figures 5 and 6 chart rolling six-month performance relative to the core index – for example, relative to the Russell 1000 for large cap indexes. This excess return is calculated as the geometric difference in cumulative total returns between the two indexes over the six months ending on a specific date. This type of chart gives a fair idea of how a six-month position in one of the factor indexes would have changed performance at certain points in the past.

Particularly evident in Figures 5 and 6 are the large excess returns during the periods of financial stress associated with the technology bubble and the financial crisis. The general pattern of returns was similar for large and small cap. Momentum was very strong going into the technology bubble, but declined sharply after the peak in February 2000. High Beta and High Volatility had a similar peak, but for both large and small cap indexes, a much sharper subsequent decline. This decline was mirrored by a peak in the Low Beta and Low Volatility indexes. Periodic smaller fluctuations were visible until the run-up of Low Beta and Low Volatility in 2008, which was followed by a dramatic reversal and spike in High Beta and High Volatility.

Figure 5 / Six-month rolling return for the Russell-Axioma U.S. Large Cap (Long-only) Factor Indexes, in excess of the Russell 1000, monthly December 31, 1997 to July 31, 2011

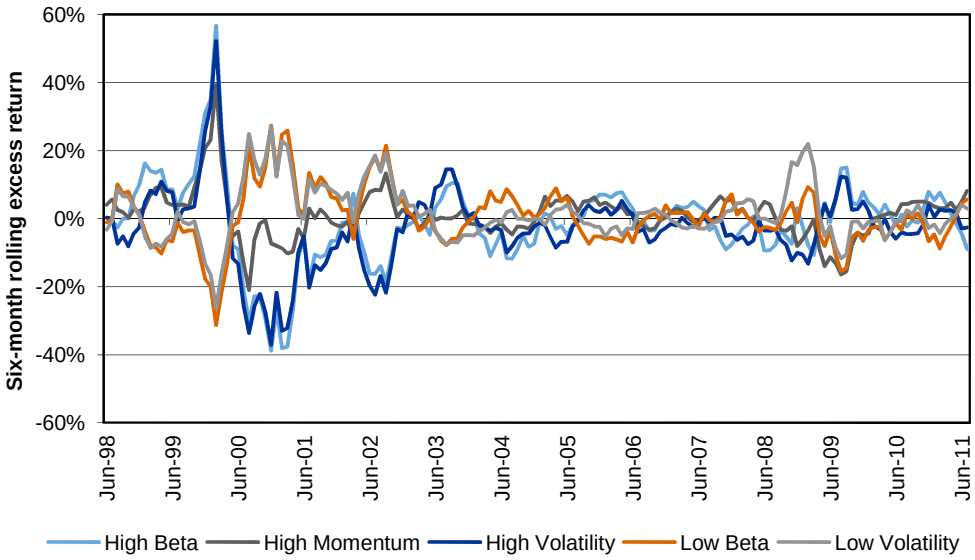


Source: Axioma, FactSet

These patterns demonstrate that the Russell-Axioma U.S. (Long-only) Factor Indexes made large moves relative to the market when the market made large moves. The indexes' moves are those that should be expected from the particular factors. Key market events are clearly identified, here at least down to the monthly reporting frequency of the chart.

Small cap factor index performance shows some distinctive features. Principally, the boom and bust of the technology bubble was more dramatic for small cap than for large. On February 29, 2000, the six-month excess return of Small Cap High Beta was 56.7%; then it was –38.8% as of December 31, 2000. Small cap performance was also distinctive in that the Low Volatility excess return spike of 20.3% as of February 28, 2009 was much greater than the Low Beta increase of 9.3%. The period from September 1, 2008 to February 28, 2009 was very much a period of "flight to safety". These results are consistent with the proposition that idiosyncratic volatility was an important factor in the pricing of U.S. small cap stocks.

Figure 6 / Six-month rolling return for the Russell-Axioma U.S. Small Cap (Long-only) Factor Indexes, in excess of the Russell 2000, monthly December 31, 1997 to July 31, 2011



Source: Axioma, FactSet

Long-only Factor index excess return correlations

The correlations between factor indexes give an indication of the similarity of factors over short periods of time, here maybe one to three months. The correlations reported here are based on returns in excess of the return of the parent index. Ideally, excess return correlations between different unrelated factors should be close to zero, and excess return correlations between opposed but related factors (e.g., large cap high beta and low beta) should be close to minus one. Correlation of minus one implies that when one index goes up relative to the parent index, the other index tends to go down to the same degree.

Strong association between beta and idiosyncratic volatility

Table 5 presents excess return correlations of the Russell-Axioma U.S. Large Cap (Long-only) Indexes relative to the Russell 1000. Table 6 presents small cap factor index excess return correlations relative to the Russell 2000. Looking at Table 5, we see that High Momentum correlations with other indexes were all quite close to zero. The correlations of the high and low legs of the beta and volatility indexes were also close to minus one. The only significant departure from the ideal pattern was the 90%-plus correlations between the same legs of the beta and volatility indexes. These correlations reflect the strong association between beta and idiosyncratic volatility.

Table 5 / Excess return correlations for Russell-Axioma U.S. Large Cap (Long-only) Factor Indexes, relative to the Russell 1000, December 31, 1997 to July 31, 2011

	Russell-Axioma U.S. Large Cap Long-only				
	High Beta	High Momentum	High Volatility	Low Beta	Low Volatility
High Beta	100%				
High Momentum	9%	100%			
High Volatility	91%	10%	100%		
Low Beta	–89%	2%	–84%	100%	
Low Volatility	–89%	–8%	–90%	89%	100%

Source: Axioma, FactSet

The small cap excess return correlations reported in Table 6 are similar to those reported in Table 5, except that High Momentum correlations with other indexes were higher in absolute value.

Table 6 / Excess return correlations for Russell-Axioma U.S. Small Cap (Long-only) Factor Indexes, relative to the Russell 1000, December 31, 1997 to July 31, 2011

	Russell-Axioma U.S. Small Cap Long-only				
	High Beta	High Momentum	High Volatility	Low Beta	Low Volatility
High Beta	100%				
High Momentum	30%	100%			
High Volatility	90%	34%	100%		
Low Beta	–90%	–29%	–91%	100%	
Low Volatility	–84%	–33%	–93%	91%	100%

Source: Axioma, FactSet

Performance in tracking target factor indexes

An important aspect of the performance of the Russell-Axioma Factor Indexes is the degree to which they track their target indexes. These target factor indexes define the return pattern for each factor. Optimization techniques are used to substantially reproduce this pattern while generating less turnover in stocks and maintaining non-target factor neutrality (as briefly described above, at “How optimization helps”).

Tracking error is a standard measure for quantifying the degree to which the Russell-Axioma Indexes track their targets. Tracking error is, approximately, the standard deviation of the stream of return differences between two sets of returns. Another standard measure is the average difference in returns between the optimized indexes and their targets. Table 7 reports these statistics and averages across the sub-indexes of both the Russell-Axioma Large Cap and Russell-Axioma Small Cap Long-only indexes.

The average tracking error for the large cap indexes was 1.05% per month. The average for the small cap indexes rose slightly to 1.16% per month. These tracking errors annualize to 3.65% and 4.01%, respectively; small relative to index total volatilities reported in Tables 1 and 2.

Table 7 / Monthly tracking error and average monthly excess returns for Russell-Axioma U.S. Large Cap and Small Cap (Long-only) Factor Indexes relative to target factor indexes, December 31, 1997 to July 31, 2011

	Russell-Axioma U.S. Large Cap Long-only					
	Average	High Beta	High Momentum	High Volatility	Low Beta	Low Volatility
Large cap						
Monthly tracking error	1.05%	1.24%	0.94%	1.10%	1.13%	0.86%
Average monthly return difference	0.06%	0.08%	0.02%	–0.01%	0.08%	0.11%
Small cap						
Monthly tracking error	1.16%	1.46%	0.99%	1.27%	1.07%	1.00%
Average monthly return difference	–0.06%	–0.08%	–0.02%	–0.17%	–0.05%	0.04%

Source: Axioma, FactSet

Correlation statistics provide a similar picture. The average large cap factor index’s correlation with its target was 97.7%; for the average small cap, it was 98.5%. The large cap average correlation was brought down by the 94.9% correlation between Low Beta and its target index. Interestingly, however, the corresponding tracking error, 1.13%, was not high.

Conclusion

The Russell-Axioma U.S. Long-only Factor Indexes are designed to provide efficient momentum, beta and volatility exposures for large cap and small cap portfolios. Optimization reduces turnover and non-target factor exposures while maintaining the performance of the optimized indexes relative to the target indexes.

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